C O N T I N E N T A L   A I R L I N E S
TECHNICAL SERVICES DIVISION
FORM: 30.0030 DATE 11-5-91

RECORD OF TEMPORARY REVISIONS

INSTRUCTIONS: TEMPORARY REVISIONS NOT LISTED, OR LISTED AS CANCELLED, SHOULD BE REMOVED AND DISCARED.
MICROFILM: FILE THIS RTR IN FRONT OF THE AFFECTED MICROFILM SUPPLEMENT BINDER. FILE TEMPORARY REVISIONS AS LISTED BELOW.
PAPER: FILE THIS RTR IN FRONT OF THE AFFECTED MANUAL. FILE TEMPORARY REVISIONS IN THE AFFECTED SECTIONS.

MANUAL INFORMATION

MANUAL : CAL FLIGHT MANUAL (JEP SIZE)
: MD-80
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VENDOR : CAL
MANUAL CODE: 715709

	ECRA/TR	REV	SECTION	TOTAL PAGES	DATE	NOTES
*	MD80 TR 02-01				01/22/02	
	TB-MD-80-00-01				02/10/00	
	TB-MD-80-00-07				11/28/00	
	TB-MD-80-01-01				05/09/01	
	TB-MD-80-01-02				05/15/01	
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	TB-MD-80-99-10				10/22/99	

* = ADDED   CANCELLED = REMOVE AND DISCARD

TECH PUBS RELEASE   MANUAL USER SIGNOFF:
APPROVED:____________   FILED BY:____________________DATE:__________
PAGE: 1 OF ________

RECORD OF TEMPORARY REVISIONS

Temporary Revisions are issued by Flight Operations Training as the need arises. Information contained in Temporary Revisions is of a time-critical nature, which requires issuance earlier than the next formal revision. This information will be incorporated in a formal revision at the earliest opportunity, or will be canceled if the information becomes obsolete.

This record page will be updated with the issuance of any Temporary or formal revision. The reverse side of this record provides a List of Effective Pages applicable to all Temporary Revisions designated as "In Effect."

Remove and discard the previously issued Record of Temporary Revisions and insert this copy. File attached yellow page(s) adjacent to existing white pages as indicated by the page information located at the top of each page. Do not discard affected white pages until instructed to do so by permanent revision.

Yellow Temporary Revisions should remain in this manual until such time as a new record page lists them as "Canceled" or "Incorporated."

The following "Status" terminology is used:

<u>In Effect</u> - Identifies that the revision contains current and pertinent information which is not otherwise covered in the Flight Manual. Temporary Revision should remain in the manual.

<u>Incorporated</u> - Identifies that appropriate information has been incorporated into this Flight Manual. Temporary Revision should be removed from the manual.

<u>Canceled</u> - Temporary Revision is no longer in effect. Remove from the manual.

Temporary Revisions may be obtained from Flight Publications, Qualitron Building, IAHQT, Room 206C.

REVISION NUMBER	REVISION DATE	STATUS		REVISION NUMBER	REVISION DATE	STATUS
00-01	12/01/00	Incorporated				
01-01	04/16/01	Incorporated				
01-02	05/30/01	Incorporated				
02-01	01/22/02	In Effect				

TEMPORARY REVISIONS
LIST OF EFFECTIVE PAGES

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02-01	INTRO	2	01/22/02
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02-01	4	196	01/22/02

FAA APPROVED

Don Klos
Principal Operations Inspector

HIGHLIGHTS OF MD-80 FLIGHT MANUAL REVISION 29

INTRO

- New guidance for resetting of circuit breakers.

LIMITATIONS

- LAHSO required runway lengths added as parameter.

EMERGENCY PROCEDURES

- Pulling APU control cb added to APU FIRE checklist.

ABNORMAL PROCEDURES

- CIRCUIT BREAKER(S) TRIPPED revised.
- INTERMITTENT AC POWER INTERRUPTIONS revised.
- CENTER TANK DOES NOT FEED revised.
- HYD PRESS LOW LIGHT(S) ON revised.
- UNSAFE GEAR LIGHT IN CRUISE, GEAR HANDLE UP revised.
- UNSAFE GEAR, GEAR HANDLE DOWN revised.
- ICE PROTECT TEMP LOW LIGHT ON revised.
- START VALVE DOES NOT OPEN revised.
- OIL PRESSURE LOW LIGHT ON AND/OR OIL PRESSURE LOW revised.
- VOLCANIC ASH PROCEDURES revised.

NORMAL PROCEDURES

- CAT III & autoland-to-touchdown procedures removed.

SYSTEMS SECTIONS COMPLETELY REVISED

QRH UPDATED

INTRODUCTION

TABLE OF CONTENTS

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AUTHORIZATION PAGE

This Continental Airlines Flight Manual contains all the approved Airplane Flight Manual (AFM) operating procedures and performance data as revised and/or modified, and includes any appropriate data or information from revisions dated or numbered:

MD-80 #89 10/19/01

This manual meets or exceeds all requirements of the MD-80 approved Airplane Flight Manual in accordance with F.A.R. 121.141.

FLIGHT DECK DATA

The items listed below are provided in the cockpit for flight crew convenience. In the event a listed document is temporarily missing or unusable, operations may be continued using the source material from the applicable Flight, Operations, or Planning & Performance Manual. Missing or out of date documents should be replaced at a station where replacements are available.

MD80

ITEM	FORM NO.	DATE
Normal Cockpit Checklist	24.6019	01/01/00
First Flight of Day Checklist	24.6056	08/01/98
Quick Reference Handbook	24.0012	12/01/00
Landing Speed Cards	21.6101	09/01/98
Jumpseat Briefing Card	21.0020	07/01/94
AMT Taxi Checklist	47.0034	06/30/00
AMT Towing Checklist	47.0105	06/30/00
CAST Chart	24.6031	08/15/91
Emergency Response Guidebook	ERG/Red Book	2001-2002
Emergency Evacuation Placard		
Onboard Security Incident & Medlink Procedures Card	21.9016	01/01/02

Note: The Emergency Response Guide must be on board whenever hazardous materials are transported.

INTRODUCTION

General

The purpose of this manual is to provide Continental Airlines flight crews with a document which serves both as a training aid and as an inflight tool for handling emergency and abnormal situations.

Included in this introduction is an overview of the organization and procedures of Sections 1 through 5 and a detailed discussion of the standard formatting devices used in developing all normal, abnormal, and emergency checklists.

Flight crews are expected to be familiar with these formatting devices and to be prepared to operate under these guidelines on the line and during simulator training.

CRM

Effective Crew Resource Management (CRM) can substantially improve safety in line operations. Technical proficiency, knowledge of aircraft systems and adherence to standard operating procedures continue as the foundation of aviation safety. Effective CRM should also help a crew achieve safe conclusion of the flight when abnormals, emergencies, or other problems occur. Continental Airlines is committed to fostering a high level of CRM skills. The practice of effective CRM is expected behavior among all crewmembers.

Pilots should routinely utilize effective CRM skills as discussed during the Crew Coordination Concepts (CCC) workshops. All crewmembers are expected to build strong CRM skills, so that each pilot can contribute fully during both normal and abnormal line operations. Industry studies have shown that most airline mishaps were attributable to poor CRM. Failure to follow standard operating procedures, failure of non-flying pilots to monitor the flying pilot, and unchallenged tactical decision errors by the Captain were the leading causes identified. Effective CRM would have broken the chain of events leading to an accident in the majority of mishaps studied.

Use Of Checklists

Checklist Initiation

There are three ways to initiate a checklist. The proper method is "Called For," the backup method is "Prompted," and the method of the last resort is "Self Initiated."

"Called For" checklist initiation is the checklist habit pattern with the highest reliability. The Captain/PF initiates the checklist at the appropriate time. This manner ensures both crewmembers are aware that the checklist is in progress and specific actions are required.

"Prompted" checklist initiation is used as a backup "second line of defense" to ensure a checklist is accomplished. The pilot (who will accomplish the checklist) reminds the Captain/PF (who was supposed to call for the checklist) that the checklist needs to be accomplished. The Captain/PF, after being prompted, should then call for the checklist. Although it is not desirable, "Prompted" checklist initiation is an acceptable way to manage errors and recover total crew participation. A prompt (by the pilot who will accomplish the checklist) is required if a checklist has not been called for by the time a flight arrives at a certain point or time. This certain point or time is a bottom line for prompting a checklist. The following table lists the bottom lines for prompting all normal checklists.

PROPER "CALLED FOR" CHECKLIST INITIATION	Accom-plished By:	BOTTOM LINE FOR PROMPTING
RECEIVING / FFOD Called for by Capt when checks are done and there are no distractions.	F/O	When Agent asks "Are you ready?".
BEFORE START Called for by Capt when main cabin door is closed, all passengers are seated, carry-on luggage properly stowed, and aircraft movement is imminent.	F/O	Ready for pushback from ramp (or engine start if no pushback).
AFTER START Called for by Capt after the engine(s) have reached a stabilized idle and the headset operator has been cleared to disconnect.	F/O	Prior to brake release for taxi.
TAXI Called for by Capt clearing the ramp.	F/O	Approaching the run-up area for the departure runway.
BEFORE TAKEOFF Called for by Capt when cleared on to the active runway.	F/O	Crossing the hold short line.

PROPER "CALLED FOR" CHECKLIST INITIATION	Accom-plished By:	BOTTOM LINE FOR PROMPTING
AFTER TAKEOFF Called for by PF after slats retract callout.	PM	10,000 feet MSL.
IN RANGE Called for by PF at 18,000 feet MSL.	PM	10,000 feet MSL.
APPROACH Called for by PF in the approach environment.	PM	Cleared for the approach.
LANDING Called for by PF in conjunction with the "Gear Down" call.	PM	1,000 feet AGL.
AFTER LANDING Called for by Capt after clear of all active runways.	F/O	Approaching ramp.
PARKING Called for by Capt after aircraft comes to a stop at the gate or parking spot.	F/O	Chocks in, parking brake off.
TERMINATION Called for by either Capt or F/O after PARKING checklist is complete.	CAPT or F/O	Prior to leaving aircraft.

"Self Initiated" is the last chance method of ensuring a checklist is accomplished. The pilot performing the checklist initiates the checklist without participation of the other pilot. Self initiating any checklist is unprofessional and increases the chances for error due to lack of crewmember situational awareness. Self initiated checklist action has been contributory in many incidents and accidents. However, accomplishing the checklist under any condition is of such crucial importance that <u>self initiating a checklist is appropriate when it is the only way to complete the checklist</u>.

Checklist Completion

An unwritten last step of any checklist is for the pilot accomplishing the checklist to call the checklist complete. Calling the checklist complete is a last safeguard that everything is in order. When a checklist is complete, the announcement of "________ CHECKLIST COMPLETE" mentally closes the loop on the process that began when the checklist was called for. This also mentally opens the door for the next activity. If the "_______ CHECKLIST COMPLETE" call has not been made, there is a strong possibility that things are not in order. The pilot performing the checklist should review it to verify all items have been accomplished and then make the "________ CHECKLIST COMPLETE" call.

Normal Checklists

During preflight, if the flight deck is left unsupervised (all pilots away from the flight deck) prior to engine start, all previously accomplished checklists must be re-accomplished in their entirety. If a non-crewmember is present on the flight deck during the absence of one or more crewmembers, the non-crewmember must be supervised by a remaining crewmember or any previously accomplished checklists must be re-accomplished.

The Captain will call for all checklists during ground operations. The Pilot Flying will call for all checklists in flight. Each item will be challenged out loud by the designated crewmember unless otherwise noted. The responding crewmember will visually confirm that the challenged action has been properly accomplished and will respond appropriately to the challenge, confirming the action or describing the configuration. Any item listing an "AS REQUIRED" response will be responded to by the actual configuration or condition as described in the expanded section. When responses are required by both crewmembers (C, F), the pilot responding to the checklist replies first followed by a crosscheck and identical reply from the other pilot. If a checklist item is not installed in a particular aircraft, the crewmember will nevertheless challenge the item and the response will be "Not Installed." Any action which has not been performed or completed when challenged must be completed before the next challenge is read. If performance of the challenged action cannot be completed immediately, the crewmember responding will reply "Standby" or other suitable response to indicate that further reading of the checklist will be suspended until the item can be accomplished.

Both pilots are responsible for visual confirmation that all checklist items are completed. Each checklist item will be treated separately, read in a command tone, and answered only when the challenged action has been completed and is in agreement with the appropriate response. When the crewmember reading the checklist has ascertained that all items have been completed, he will announce, "__________ CHECKLIST COMPLETE."

Emergency / Abnormal Checklists

"Fly the aircraft" is always an unwritten immediate action for any emergency or abnormal procedure. Both pilots will first give their attention to continued safe flight of the aircraft, with particular attention to flight path and communications.

Emergency/Abnormal checklists assume crewmembers will:

- Silence aural warnings and reset Master Caution/Warning lights as soon as the cause of the warning is recognized
- Test warning/status lights to verify valid indications
- Check for tripped circuit breakers (refer to procedures below)

Procedures that prescribe an engine shutdown must be evaluated by the Captain to ascertain if an actual shutdown or operation of the engine at reduced thrust is the safest course of action. Consideration in this case must be given to probable effects if the engine is left running at minimum required thrust.

When an emergency or abnormality occurs, the Pilot Flying (PF) will stabilize the aircraft and call out Immediate Action items. The Pilot Monitoring (PM) will accomplish the immediate action items and the PF will call for the appropriate checklist. The Captain will then make the final determination as to who will be the PF and PM. In making this determination, the Captain should give consideration to his primary responsibility of managing the situation, in addition to the necessity of formulating a plan for successful resolution of the problem. By its very nature this includes a comprehensive coordination among ATC, the F/A, the company, and all other aspects of delegation of duties. The Pilot Monitoring (PM) will accomplish the appropriate checklist.

Circuit Breaker Procedures

WARNING: Resetting of any tripped fuel boost pump, fuel quantity indication system, or lavatory flush motor circuit breaker is prohibited.

Caution: The intentional pulling and resetting of a circuit breaker is prohibited due to potential impact on multiple aircraft systems, except when specifically directed by a non-normal checklist or appropriate technical authority.

A circuit breaker found in the **out position** may be the result of:

- Tripped condition due to electrical fault.
- Inadvertent pulling by contact/catching with an object.
- Intentional pulling during mx/ops procedure and failure to reset.

A **tripped** CB refers to a circuit breaker that was previously verified to be in the normal closed position, then subsequently pops out due to an electrical fault. Given the significance of any circuit breaker that is found in the **out position**, the following guidelines should be adhered to in order to address the issue:

Prior to Block Out:

A circuit breaker that is found in the "**out position**" prior to block out (i.e. the crew does not know whether it has tripped or has been pulled out) may be reset one time, **unless** any of the following conditions are noted:

- There is reason to believe that it has tripped due to an electrical fault.
- The crew heard the CB pop or observed a change in the associated aircraft system / warning light, which was previously normal but is now unpowered as a result of the CB being out.
- There is a previous logbook entry about the same CB being tripped in the previous 3 days.
- There is any associated electrical smoke / smell, or evidence of overheating of any aircraft system.

If any of the above conditions are noted, the crew should not reset the CB, but instead enter the findings in the logbook and call maintenance for investigation prior to departure.

After Block Out but Prior to Takeoff

Any CB that is confirmed to have **tripped,** should not be reset by the crew. The crew can continue the flight with the CB left in the **tripped** mode, provided the affected system is not required as per the MEL, and all appropriate MEL procedures are complied with. Also there must be no electrical smoke/smell, or evidence of overheating of any aircraft system. In all cases a logbook entry is required.

After Takeoff but Prior to Block In

One reset of a tripped circuit breaker may be attempted after a cooling period of approximately two minutes if called for by an emergency /abnormal checklist, or unless, in the judgement of the Captain**, resetting the CB is necessary for the safe completion of the flight**. If the circuit breaker trips again, **do not attempt another reset**. In all cases a logbook entry is required.

All **tripped** circuit breakers regardless of phase of flight and whether reset or not, *must be written up in the aircraft logbook*. This entry should include:

1. Name and location of the CB.
2. Z -time when trip occurred (if known).
3. Phase of flight, altitude/airspeed, etc, when trip occurred.
4. Weather conditions if appropriate.
5. Any pilot action that occurred prior or during the trip sequence.
6. Attempted reset and results.

Emergency and abnormal checklists are designed, with the exception of Immediate Action items, as “Read and Do” checklists. All items of any emergency or abnormal checklist will be read aloud. The pilot designated by the Captain to accomplish the checklist (PM) shall first read and respond to Immediate Action items (if applicable) to ensure that such items have been accomplished completely and correctly. The PM shall then complete the Secondary Action items by reading each item, accomplishing the required task, and reading the response. The PM, while accomplishing the checklist, will coordinate with the PF before changing any switch or control position which could potentially affect systems integrity or aircraft configuration. Emergency and abnormal checklists may be combined with other normal or emergency / abnormal checklists to reduce or eliminate the need for crews to reference several different checklists in response to an abnormal situation. For example the **ONE ENGINE INOPERATIVE APPROACH AND LANDING** checklist includes the normal **IN-RANGE**, **APPROACH**, and **LANDING** checklists so that the aircraft may be safely landed in this situation with reference to only one checklist. Another example is the **REJECTED TAKEOFF** checklist which includes the **EMERGENCY EVACUATION** checklist procedures since an evacuation may possibly be required following a rejected takeoff and the crew would not need to reference an additional checklist.

When the performance of an additional checklist may be required following the completion of another checklist, a reference will be made at the bottom of the first checklist as a reminder to the crew. As each normal, abnormal, or emergency checklist is completed, the crewmember performing the checklist will announce "___________ CHECKLIST COMPLETE."

Quick Reference Handbook (QRH)

To facilitate more expeditious access to emergency and abnormal checklists, a Quick Reference Handbook (QRH) is carried in the cockpit. It contains a copy of all the emergency checklists and most of the abnormal checklists from the Aircraft Flight Manual. This would preclude having to take out the Flight Manual to reference a specific abnormal or emergency checklist.

The QRH is set up in a simple to use and easy to read format. The highlights of its construction are:

- All immediate action items are listed on the front cover.
- The first inside page has an alphabetical listing of all major sections aligned with the corresponding tab.
- All tabs are labeled with the name of the major systems for that section (because of the limited number of tabs, some of the sections are combined into logical system groups).
- The index is cross-referenced by situations and systems.

- Additional information not normally used to operate the aircraft is contained in the white pages located in the back of the handbook.

Because the QRH has limited space, some emergency checklists may have verbiage directing you to other abnormal or emergency checklists that will then follow to a logical conclusion. Normal checklists which are referenced in an emergency or abnormal checklist may either be printed in their entirety or only have applicable items listed.

SECTION OVERVIEW & PROCEDURES

Section 1 - Limitations

There are two separate categories for items contained in the Limitations section. The first category, titled "Limitations", includes limitations from the manufacturers' FAA approved Airplane Flight Manual and additional items declared to be limitations by the Company. The Company limitations are designated by the symbol ◘. All limitations must be memorized. The second category, titled "Operating Parameters", contains items which should be complied with to ensure safe and efficient operation of aircraft systems. Flight crews are expected to have a working knowledge of the operating parameters. Working knowledge means the ability to recall most of the operating parameters without reference to the flight manual.

Section 2 - Emergency Procedures

Emergency procedures are presented in groups called "modules" composed of the checklist, an expanded version checklist, and in some cases a short narrative description and/or a profile or graphic description of the procedure. The checklist is printed on heavier paper with a red border to stand out from the rest of the section.

The emergency procedures in this manual represent the best available information. Flight crews should follow these procedures as long as they fit the emergency. At any time they are not adequate or do not apply, the flight crew's best judgment should prevail.

The immediate action items will be memorized by each crewmember.

No throttle, fuel control lever, fire handle, or critical system control will be moved during any emergency or abnormal procedure without the concurrence of both crewmembers. All aural warnings should be silenced as soon as the emergency is recognized.

Time permitting, the Captain should utilize all available resources including, but not limited to, radio communications with Maintenance / Engineering personnel.

Cockpit Voice Recorder

Any incident requiring a report to NTSB, as defined in Section 1 of the Flight Operations Manual, and which results in termination of the flight, requires deactivation of the CVR upon termination of the flight to preserve the recorded information. This is accomplished by pulling the circuit breaker labeled **COCKPIT VOICE RECORDER** located on the upper EPC at F-06 or F-04. This will be noted in the Aircraft Maintenance Log.

Example: CVR deactivated because of reportable incident.

Ground Proximity Warning System

The Ground Proximity Warning System may be deactivated for approved emergency / abnormal procedures where the use of flaps at less than normal landing flap positions specified. A logbook entry is required.

Section 3 - Abnormal Procedures

Abnormal procedures are presented in expanded format grouped by aircraft system. It is not necessary to read the expanded verbiage aloud when performing the checklist unless clarification is desired. Checklist titles will reflect the annunciator light or abnormal condition.

Section 4 - Normal Procedures

This section is intended as a training and reference section. Checklists are presented in normal flight order and are followed by expanded versions. Additional procedures and information are presented as necessary.

Operating procedures defined in this section are intended to conform with the objectives of the company which are to place safety, comfort, schedule reliability and economy in their proper perspective. Conscientious adherence to these procedures is expected.

The NORMAL CHECKLIST is used as a verification to ensure that certain critical or essential steps of the preceding procedure have been accomplished. The EXPANDED CHECKLISTS of this section serve the dual purpose of defining the procedure to be accomplished for each phase of flight and providing expanded notes appropriate to checklist accomplishment. Certain items in the expanded sections may be annotated "flow" after the challenge statement. These are items which are accomplished during the procedure, but are not rechecked during the reading of the checklist. The procedure defined for each phase of flight will be accomplished by recall (flow) prior to the reading of the applicable checklist. In all cases the checklist will be read from the printed checklist card. At no time is the use of a checklist from memory acceptable.

Section 5 - Performance

This section is also organized by phase of flight (takeoff, enroute, and landing) and within these phases further divided into "normal" and "abnormal" sections. Most data are presented in tabular form and pilots may interpolate as necessary.

CHECKLIST FORMATTING

General Checklist Flow

Checklists will be read from top-to-bottom, left-to-right. Careful attention must be paid to indentation so that only the appropriate items are performed. You may be required to "skip" downward over nonapplicable steps or to move downward to a given location in the checklist. You will not be directed to go upward in the checklist (although you may have occasion to reenter a checklist if conditions change). You may be directed to cross reference another checklist. If a checklist is "branched" (by an OR arrow), there will be more than one ending to that checklist. Checklists must be continued until the flight crew reaches an end-of-procedure symbol (four centered asterisks).

Challenge and Response

Checklist challenges are presented on the left with responses on the right in capital letters. A dotted line will separate challenges and responses.

Challenge .... RESPONSE

A comma or ampersand (&) in a response indicates a combined response where more than one item must be verified to indicate compliance with the challenge.

Challenge ....RESPONSE A, RESPONSE B

A slash (/) between multiple responses indicates a choice of responses where only one of the choices is appropriate.

Challenge ....RESPONSE A / RESPONSE B

Dual response checklist steps require both the Captain and First Officer to respond to a given challenge. Dual response checklist steps are indicated by C+F in the center of the line.

O_2 Mask, Regulator ....C+F............................CKD, SET, 100%

<u>Note</u>: Emergency and Abnormal checklists may still indicate dual response items in the previous format (C, F), on the response side of the checklist step, and not in red. These will be updated in normal revision cycles.

Oxygen ....CHECKED, SET, 100% (C, F)

Conditional (IF) Statements

In situations where particular steps within a procedure need be performed only if a qualifying condition exists, these steps will be preceded by an IF statement. This device indicates that the person reading the checklist must determine if the condition applies and if so, perform the items immediately below. Multiple steps may be contained in a single-line box to visually group the conditional items. If the condition does not apply, the steps immediately below the IF statement (including all steps contained in a single-line box) should be skipped.

IF Condition A Applies:

Perform.. THIS ITEM

IF Condition B Applies:

Perform.. THIS ITEM

OR Arrows

This device connects conditional items or groups of items which are mutually exclusive. This will indicate to the pilot that only one of the connected procedures should be performed and all others ignored. This device in effect "branches" the checklist and will result with more than one ending to the procedure.

IF Condition A Applies:

Perform.. THIS ITEM

OR

* * * *

IF Condition B Applies:

Perform.. THIS ITEM

* * * *

Continue Checklist At ... Statements

If it is necessary to move from one point in a checklist, skip over one or more steps, and re-enter the checklist at another point further down the checklist, this device may be used. You would proceed from that point downward until encountering the appropriate numeric symbol which will be found on the left side of the margin.

IF Condition A Applies:

> **Perform .... THIS ITEM**
>
> **Perform .... THIS ITEM**
>
> **IF** Condition C Applies:
>
> Continue Checklist at ❶
>
> **IF** Condition D Applies:
>
> Checklist is Complete.
>
> * * * *

IF Condition B Applies:

❶ **Perform............ THIS ITEM**

* * * *

The presence of the ❶ next to the above step does not indicate that this step is only to be performed if Condition C applies. Note that this item would be accomplished whether Condition C or Condition B applies.

Phase Lines

A dashed line on either side of a condition statement in a procedure indicates that the crew may delay the performance of the procedure at that point. This is normally used to provide better "pacing" of a procedure. The crewmember reading the checklist is responsible for ensuring that the checklist is resumed at the appropriate time.

- - - - - BEFORE LANDING - - - - -

Cross Referencing

When a cross reference to another checklist is made it will be done in the following manner for normal, abnormal, and emergency checklists:

Refer to AFTER TAKEOFF CHECKLIST, Section 4.

Refer to ABNORMAL FLAP LANDING CHECKLIST, Section 3.

Refer to **ENGINE FAILURE CHECKLIST**, Section 2.

Continued Checklists

If a checklist or procedure is continued on the back of the page or on the next page, the word "Continued" will be printed centered in parenthesis at the bottom of the page.

(Continued)

Notes, Cautions, and Warnings

Notes, Cautions, and Warnings will be presented in the following format:

Note: Information requiring special emphasis.

Caution: Instruction concerning a hazard that if ignored could result in damage to an aircraft component or system.

WARNING: Instruction concerning a hazard that if ignored could result in loss of aircraft control, injury, or loss of life.

Action Specific Words

Certain words are used throughout this manual to indicate whether a procedure must be performed exactly as described at all times or if some discretion is allowed. These words are defined below for the purposes of Continental Airlines Flight Manuals. These definitions may differ slightly from certain dictionary definitions, however every attempt has been made to use these terms consistently as detailed.

The words "shall", "must", and "will" indicate procedures to be performed exactly as detailed. Deviations will be made only in situations equating to the use of pilot's emergency authority.

The word / phrase "should" and "strongly recommended" indicate procedures normally performed exactly as detailed. Deviation will be made only in unique situations where a pilot's best judgment indicates a different course of action. Such deviations would be very rare and briefed to all flight crewmembers.

The word "may" indicates procedures expected to be performed as detailed under most situations. While deviations are not limited to unique circumstances as above, use of these procedures are encouraged in the interest of standardization among flight crewmembers.

Crewmember Abbreviations

Abbreviations may be used to indicate the designated crewmember(s) in regular text or on checklist steps. The following abbreviations will be used:

Captain	-	Capt
First Officer	-	F/O
Pilot Flying	-	PF
Pilot Monitoring	-	PM
Captain and First Officer		C+F

Note: The term Pilot Not Flying (PNF) is being replaced by Pilot Monitoring (PM). The term PNF will be replaced in normal revision cycles with PM.

End-of-Procedure Asterisks

Four centered, bold asterisks indicate the end of an emergency or abnormal checklist.

*** * * ***

No checklist will be announced as "complete" until reaching this symbol. Care must be taken when a checklist is branched by the use of OR arrows as it may not be immediately apparent where the end of this branch of the checklist is located.

REQUEST FOR FEEDBACK

This Flight Manual is the result of the combined efforts of Flight Standards and Flight Operations. All flight crews are encouraged to comment on the contents of this manual, since its sole purpose is to provide you, the Flight Crew, with an accurate and effective tool to better help you do your job.

Suggestions, critiques, comments and corrections should be in writing and addressed to the Lead Line Check Airman in your crew base or to the respective Fleet Manager in Flight Standards. The boardmail address for each crew base is the three letter identifier of the base followed by the letters CP (i.e. IAHCP). The boardmail address for each fleet manager is IAHPS.

Your input is both desired and encouraged. All Flight Manuals are designed to be “living” documents, readily adaptable to new and better ideas, and easily revised.

LIST OF EFFECTIVE PAGES

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TOC-2	12/01/00				
* 1	01/01/02				
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6	12/01/00				
7	12/01/00				
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15	12/01/00				
16	12/01/00				
17	12/01/00				
18	12/01/00				
* LEP-1	01/01/02				
* LEP-2	01/01/02				

FAA APPROVED

DON KLOS
Principal Operations Inspector

* Asterisk indicates page(s) revised or added by the current revision.

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LIMITATIONS AND OPERATING PARAMETERS

TABLE OF CONTENTS

The information contained in this section meets or exceeds all requirements of the FAA approved Airplane Flight Manual (AFM). Both the AFM and Continental Airlines limitations are identified as "Limitations."

The label ■ designates a Continental limitation.

Flight crews are responsible for committing all information labeled "Limitations" to memory.

Additional "Operating Parameters" have been included in this section as a convenient reference. Flight crews are expected to have a working knowledge of these "operating parameters." Working knowledge means the ability to recall most of the operating parameters without reference to the flight manual.

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GENERAL LIMITATIONS

1. The MD-80 airplanes are certified in the transport category (FAR 25) and are eligible for the following types of operation when the required equipment is installed and approved in accordance with the applicable FARs.
    - Visual Flight (VFR)
    - Instrument Flight (IFR)
    - MD-80 airplanes are Category C for instrument approaches except for circling which is category D.
    - Night Flight
    - Icing Conditions
2. Minimum Flight Crew:
    - Captain and First Officer
3. Instrument limit markings:
    - Maximum and minimum limits.............................. red radial line
    - Precautionary ranges.. yellow arc
    - Normal operating ranges...green arc
4. This aircraft must be operated in compliance with the limitations contained in this section.

OPERATING LIMITS / PARAMETERS

Limitations

1. Runway slope.. +1.7 % to -2.0%
2. Maximum operating altitude .... 37,000 feet
3. Maximum takeoff and landing altitude.............................. 8,500 feet
4. Minimum takeoff and landing altitude .... -1,000 feet
5. Maximum takeoff and landing temperatures:

   Below 2,525 feet .... +50° C
   From 2,525 feet to 8,500 feet... STD +40° C

6. Minimum takeoff and landing temperature............................. -54° C
7. Maximum enroute temperature .... STD +35° C
8. Minimum enroute temperature .... -76° C
9. Maximum airspeed: Vmo..340 KIAS
   Mmo .... mach .84
10. Max turbulent air speed - Vb...........................285 KIAS / mach .79
11. Design maneuvering speed - Va ....260 KIAS
12. The maximum operating limit speed (Vmo/Mmo) may not be deliberately exceeded in any regime of flight (climb, cruise, or descent).
13. Flight load acceleration limits:

    Flaps up ....+2.5 G to -1.0 G
    Flaps down.. +2.0 G to 0.0 G

14. Maximum Takeoff/Landing Tailwind Component.............. 10 knots
15. Additional landing crosswind limitations:

    Manual rudder .... 25 knots
    Autoland.. 15 knots
    Restricted rudder travel .... 12 knots
    Instrument approach at or below 2400 RVR .... 10 knots

(Continued)

16. Maximum headwind for CAT II approach..........................20 knots
17. Maximum standing water, slush, or wet snow:

    Takeoff .... 1/2 inch
    Landing .... 1 inch

18. Maximum dry snow (takeoff or landing) .... 4 inches
19. Takeoff with Windshear Warning Alert active is not authorized.

Operating Parameters

1. Maximum Demonstrated Takeoff/Landing Crosswind Component:

    Dry Runway...30 knots
    Wet Runway...20 knots
    Icy Runway ....12 knots

2. Required runway lengths for LAHSO:

    Elevation < 2,000 ft...7100 ft.
    Elevation ≥ 2,000 ft...7700 ft.

GROSS WEIGHT AND C.G. LIMITATIONS

1. Gross weights:

	802-812 816-843 871 878-879 883-884 892-895	872-875	870	876, 877 885-891	801 813-815	880-882
Maximum Ramp	150,500	150,500	148,000	148,000	148,000	143,000
Maximum Takeoff	149,500	149,500	147,000	147,000	147,000	142,000
Maximum Landing	130,000	130,000	130,000	128,000	128,000	128,000
Maximum Zero Fuel	122,000	118,000	120,000	120,000	118,000	120,000

2. Maximum takeoff and landing weights may be further restricted by runway selection, weather conditions, abnormal aircraft configurations, minimum equipment list, configuration deviation list, center of gravity limits, and fuel density.

3. The airplane configuration specified in Section 4 of this manual for various flight profiles is the configuration on which the allowable weights shown in the airport analysis section of the Weight and Balance manual are based. The prescribed configuration must be used to assure the aircraft performance requirements are met.

4. Compliance with the center of gravity limits is assured by operation under an approved load planning system.

5. If landing weight exceeds the values prescribed by Quick Turn Around Weight Limits chart, examination of the wheel thermal plugs and a waiting period of 27 minutes is required before a subsequent takeoff unless procedures are followed using the brake temperature monitoring system or the pyrometer measuring system.

DC-9-82 Quick Turn Around Weight Limits

LBS X 1,000
Landing Flap 28°, Slats Extended

AMB	Pressure Altitude Ft.								
TEMP F	0	1000	2000	3000	4000	5000	6000	7000	8000
-10	ML	ML	ML	ML	ML	ML	ML	ML	ML
0	ML	ML	ML	ML	ML	ML	ML	ML	145.8
10	ML	ML	ML	ML	ML	ML	ML	ML	144.1
20	ML	ML	ML	ML	ML	ML	ML	145.2	142.5
30	ML	ML	ML	ML	ML	ML	ML	143.7	141.1
40	ML	ML	ML	ML	ML	ML	145.1	142.4	139.8
50	ML	ML	ML	ML	ML	ML	143.5	140.9	138.3
60	ML	ML	ML	ML	ML	144.8	142.0	139.4	136.8
70	ML	ML	ML	ML	ML	143.5	140.7	138.1	135.6
80	ML	ML	ML	ML	144.9	142.2	139.4	136.9	134.4
90	ML	ML	ML	ML	143.6	140.8	138.2	135.7	133.2
100	ML	ML	ML	144.9	142.3	139.5	137.0	134.5	132.0
110	ML	ML	ML	143.7	141.0	138.2	135.8	133.3	130.8
120	ML	ML	145.0	142.5	139.8	137.0	134.6	132.1	129.6

ML = Maximum Structural Landing Weight; wind and slope corrections do not apply.

Runway Slope Adjustments: Add 1500 lbs. per 1% uphill slope.
Subtract 2000 lbs. per 1% downhill slope.

Wind Adjustments: Add 300 lbs. per knot headwind.
Subtract 1200 lbs. per knot tailwind.

Note: If landing weight exceeds chart values, a waiting period of 27 minutes is required before making a subsequent take-off.

Structural weight limitations must be observed.

Example:
Flaps: 28 degrees
Pressure Alt: 5000 feet
OAT: 90 degrees F
Wind: 8 knot tailwind
RW Slope: - 1%

Quick turn around weight limit: 140,800 lbs. minus 9600 lbs. (tailwind), minus 2000 lbs. (RW slope) equals 129,200 lbs.

DC-9-82 Quick Turn Around Weight Limits
LBS X 1,000
Landing Flap 40°, Slats Extended

AMB TEMP F	Pressure Altitude Ft.								
	0	1000	2000	3000	4000	5000	6000	7000	8000
-10	ML	ML	ML	ML	ML	ML	ML	ML	ML
0	ML	ML	ML	ML	ML	ML	ML	ML	ML
10	ML	ML	ML	ML	ML	ML	ML	ML	ML
20	ML	ML	ML	ML	ML	ML	ML	ML	ML
30	ML	ML	ML	ML	ML	ML	ML	ML	ML
40	ML	ML	ML	ML	ML	ML	ML	ML	ML
50	ML	ML	ML	ML	ML	ML	ML	ML	145.9
60	ML	ML	ML	ML	ML	ML	ML	ML	144.5
70	ML	ML	ML	ML	ML	ML	ML	145.8	143.0
80	ML	ML	ML	ML	ML	ML	ML	144.5	141.6
90	ML	ML	ML	ML	ML	ML	145.8	143.2	140.5
100	ML	ML	ML	ML	ML	ML	144.5	142.0	139.1
110	ML	ML	ML	ML	ML	145.9	143.2	140.5	138.0
120	ML	ML	ML	ML	ML	144.7	142.0	139.0	136.8

ML = Maximum Structural Landing Weight; wind and slope corrections do not apply.

Runway Slope Adjustments: Add 1500 lbs. per 1% uphill slope.
Subtract 2000 lbs. per 1% downhill slope.

Wind Adjustments: Add 300 lbs. per knot headwind.
Subtract 1200 lbs. per knot tailwind.

Note: If landing weight exceeds chart values, a waiting period of 27 minutes is required before making a subsequent take-off.

Structural weight limitations must be observed.

SYSTEM LIMITATIONS AND OPERATING PARAMETERS

Air Conditioning / Pressurization / Pneumatics

Limitations:

1. Maximum cabin differential pressure .... 8.07 psi
2. Maximum relief valve differential pressure .... 8.32 psi
3. The air conditioning shutoff switch must be in AUTO for all takeoffs.
4. If the air conditioning shutoff switch is inoperative:

   Both air conditioning systems must be turned off for takeoff.

   At least one air conditioning system must be turned on as soon as obstacle clearance is ensured but not below 400 feet or flap retraction (whichever is higher).
5. Takeoff and land unpressurized when using manual pressurization control.

Operating Parameters:

1. Takeoff and land unpressurized.
2. Normal maximum cabin differential pressure................ 7.77 ± .3 psi
3. Supply air pressure maximum regulating .... 27 ± 2 psi
4. High pressure bleed regulating (air conditioning).............. 21 ± 2 psi
5. The cabin altitude warning light activates
   at a cabin altitude of...9,500 (+500-0) feet

APU

Limitations

1. Maximum continuous EGT..677° C
2. Maximum transient overload EGT ....710° C
3. Maximum starting EGT (for 30 seconds).....................................760° C
4. Maximum RPM..110%
5. APU generator AC loadmeter maximum load:

   Ground operation 1.25
   Inflight below 25,000 feet...1.0
   Inflight at and above 25,000 feet 0.7
6. The APU bleed air switch must be off for all inflight operations.
7. When starting engines with the APU supplying pneumatic pressure, the respective air conditioning supply switch must be off.
8. Do not operate the APU at altitudes above ....35,000 feet

Operating Parameters

1. APU fuel consumption..350 pph
2. APU starter duty cycle: Two consecutive start attempts (maximum of 90 seconds each) followed by 5 minutes off, then a third attempt (maximum of 90 seconds) followed by 60 minutes off.
3. Following a self-initiated (automatic) shutdown of the APU, it is recommended that no attempts be made to restart the APU until the cause of the automatic shutdown has been determined and corrected.

Autopilot

Limitations:

1. Minimum altitude to engage autopilot on departure: ...1,000 feet AGL
2. Minimum altitude with autopilot engaged on approach:

   Visual Approach..500 feet AGL
   Non-precision approach.................................. 50 feet below MDA
   ILS coupled approach using ILS mode........................ 70 feet AGL
   ILS coupled approach using Autoland mode .... 50 feet AGL

3. The autopilot must be disconnected if an engine fails when the autopilot is engaged in takeoff mode. The autopilot may be reengaged after the aircraft is retrimmed.
4. Do not use the autopilot on final approach (past the FAF) when operating single engine.
5. Do not initiate or continue a missed approach with a failed engine when the autopilot is engaged.
6. Do not conduct an ILS coupled (or autoland) approach if the autopilot **AP TRIM** light is on in excess of 3 seconds after the airplane is stabilized and tracking the glideslope.
7. When using the autopilot, the Captain or the First Officer must be in his/her seat with the safety belt fastened.
8. The autoland system is limited to the following:

   headwind.. 25 knots
   crosswind .... 15 knots
   tailwind.. 10 knots

9. The autoland preflight test must be completed prior to any flight on any DFGC to be used for an autoland approach.

(Continued)

10. Do not conduct autoland operations if:

    Align (**ALN**) mode is not annunciated on the FMA by 100 feet radio altimeter.

    Either engines becomes inoperative at an altitude greater than 50 feet above the runway.

    Auto ground spoilers are not armed and operational.

    Any unusual control position or other abnormal condition exists in manual flight control system.

    RUDDER CONTROL MANUAL is annunciated.

11. The accuracy of the Performance Management System (PMS) has not been demonstrated. Therefore, airplane range calculations and fuel management must not be predicted on its use.

Autothrottles

Limitations

Aircraft 870, 880, 882, & 885 only: The autothrottles must be disengaged during approach before reaching 50 feet AGL.

Electrical

Limitations:

1. No load battery voltage... 25 volts
   (Battery must be fully charged before leaving the gate.)

Operating Parameters:

Note: Where applicable, a "/" separates normal from allowable ranges. Allowable ranges should not be exceeded and sustained operation at these limits is not recommended.

Normal / Allowable

1. AC volts (Engines, APU & External power).....................115±3 / ±8
2. AC frequencies: Engines & External Power....................400±4 / ±20
   APU ....400+20-10 / ±20
3. AC loadmeters: Engine:........................over 0 to under 1.0 / 0 to 1.0
   APU -on ground: .... over 0 to 1.25
   APU -inflight below 25,000 feet: .... over 0 to 1.0
   APU -inflight 25,000 feet & above:...... over 0 to 0.7

   Generator overload ratings
   for short time operation: .....1.5 for 5 minutes, over 1.5 for 5 seconds
4. DC bus volts: ....26±2 / ±4
5. DC loadmeters: .... some load / 0 to 1.0
   No more than 0.3 difference
6. Battery volts charging:...29-34 / 25-37.5
   emergency power on:........................ not less than 25
7. Battery amps charging:....................................... 0 to 65 to the left
   emergency power on:..................10 to 50 to the right
8. CSD oil - outlet temperature (°C)...................................0-146 / 163
   If rise exceeds yellow radial (11.2°C), record in maintenance log.

Flight Controls

Limitations:

1. Slat speed limits (.57 mach or)
   - mid position .... 280 KIAS
   - fully extended .... 240 KIAS
2. If the **AUTO SLAT FAIL** light is on or the auto slat extend system is inoperative, limit speed to 240 KIAS unless the flap/slat handle is **UP/RET.** If this light is on and the slats are retracted, reduce speed to 240 KIAS before extending slats.
3. The auto slat extend system must be operative for all flights.
4. Slats must be extended to either mid or full position for takeoff.
5. Flap speed limits (.57 mach or)

For models 81/82	0-13°	280 KIAS
	15-20°	240 KIAS
	21-25°	220 KIAS
	26-30°	200 KIAS
	31-40°	195 KIAS
For model 83	0-13°	280 KIAS
	15-20°	240 KIAS
	21-25°	220 KIAS
	26-30°	205 KIAS
	31-40°	200 KIAS

6. Do not use flap settings between 13° and 15°.
7. Speed brakes must only be used with zero flaps (slats extended or retracted).
8. Do not move spoiler/speeedbrake lever to ground spoiler position in flight.
9. Do not extend landing gear with speedbrakes deployed.
10. Do not arm the auto ground spoilers prior to gear extension.
11. The **RUDDER TRAVEL UNRESTRICTED** light must be on for takeoff.

(Continued)

12. If the **RUDDER TRAVEL UNRESTRICTED** light stays on above 180 KIAS (200 KIAS model 83), for all operations above 180 (200) KIAS, either the right engine hydraulic pump must be on LOW and the auxiliary hydraulic pump and power transfer unit must be OFF, or the rudder power lever must be in the MANUAL position.
13. Takeoff is not authorized with manual rudder.
14. Do not attempt an approach or missed approach from a speed of less than 135 KIAS when the **RUDDER CONTROL MANUAL** light is on.
15. If the mach trim compensator becomes inoperative or malfunctions during flight, remove any trim that the system may be supplying by placing the mach trim compensator switch to the OVRD position. Observe the speed limitation of Mmo = .78 mach.
16. Dual prestall stick shakers and supplementary stall recognition system (SSRS) must be operative for all flight conditions.
17. Maximum altitude is 28,000 feet with yaw damper inoperative.

Operating Parameters:

1. Speed brakes speed range .... Vmo/Mmo to 220 KIAS
2. Do not use speed brakes below 2000 feet AGL or with landing gear extended.
3. The **RUDDER TRAVEL UNRESTRICTED** light should be out by 181 KIAS (201 KIAS model 83) on takeoff and should be on by 144 KIAS (165 KIAS model 83) for landing.
4. Stall warning margin is 105% Vs minimum (SSRS activation at Vs).
5. Full application of rudder and aileron controls should be confined to speeds below Va.

Fuel

Limitations:

1. Maximum lateral fuel imbalance .... 1500 pounds

   Maximum fuel imbalance between auxiliary fuel tanks, if installed, shall not exceed 400 lbs.

2. Minimum fuel for takeoff .... 7500 pounds (2400 pounds each main tank including test flight)

3. Minimum fuel for go around (in each main tank) .... 1000 pounds

4. Fuel grade is Pratt & Whitney Spec. 522 (as revised) including JP1, JP4, and JP5 fuels conforming to this specification.

5. Jet A, A1, and JP5 are considered normal fuel. JP4 may be used after coordination with system control.

6. Fuel density is limited from 6.3 to 7.1 pounds per gallon.

7. If main wing tanks are full, additional fuel may be added to the center tank until full and then equally to the auxiliary tanks to attain maximum ramp weight.

   Prior to engine start on any flight where center tank fuel is present and will be needed for that route segment, the center tank fuel pumps must be individually checked to verify pump operation. This must be accomplished by observing that both inlet fuel pressure low lights extinguish when each individual center tank pump is activated.

8. If main wing tanks are not full, then fuel may be added to the center tank until full and then equally to the auxiliary tanks. However, this requires that the maximum zero fuel weight be reduced by the amount of fuel in the center and auxiliary tanks.

   The zero fuel weight restriction above may be relaxed if the following Limited Fuel Loading Schedule is used: If total fuel in the main wing tanks does not exceed 10,500 lbs, then fuel may be added to the center wing tank until full and then equally to the auxiliary tanks. The total fuel in the center wing tank and auxiliary tanks, if installed, shall not exceed 24,500 lbs. The maximum zero fuel weight for this loading schedule is 97,500 lbs.

9. Fuel may be loaded into the center wing tank for ballast purposes.
   - The center tank quantity indicator must be operational.
   - Placard must be installed adjacent to center fuel tank pump switches stating the amount of ballast and prohibiting its use.
   - The maximum allowable zero fuel weight must be reduced by the amount of ballast fuel. Zero fuel weight input to the digital fuel quantity gauge should not include the weight of ballast fuel.
   - Ballast fuel is unusable, and completion of flight, including reserve fuel, must not require the use of ballast fuel.
   - If auxiliary tanks are installed, auxiliary tank fuel is not transferable or useable. The auxiliary tank pumps must be deactivated by placing in-op rings on the circuit breakers.
10. For all takeoffs and landings, two pumps must be operating in each main tank unless extra reserve fuel is loaded to compensate for an inoperative pump as follows:

    580 lbs each affected main with an inoperative forward pump
    330 lbs each affected main with an inoperative aft pump

    All auxiliary tank fuel pumps must be off for takeoffs and landings.
11. After takeoff, center wing tank and auxiliary tanks, if installed, shall be emptied prior to using main tank fuel. If auxiliary tanks are installed, no more than 8,505 lbs of center wing fuel may be used prior to transferring all auxiliary fuel to the center wing tank.

Operating Parameters:

1. Useable fuel:
   Main tanks (each) .... 1,383 gallons (approximately 9,266 lbs)
   Center tank .... 3,074 gallons (approximately 20,596 lbs)
   Total .... 5,840 gallons (approximately 39,128 lbs)
2. Auxiliary tanks:
   Forward auxiliary.................. 565 gallons (approximately 3,785 lbs)
   Aft auxiliary............................ 565 gallons(approximately 3,785 lbs)
   Total ....1,130 gallons (approximately 7,571 lbs
3. Use of auxiliary fuel tanks is currently not authorized.

Hydraulics / Landing Gear / Brakes

Limitations

1. Except as noted in the MEL, the following hydraulic pumps must be operating for all takeoffs and landings:

   Both engine driven pumps.. HIGH
   Auxiliary pump.. ON
   Transfer pump (power transfer unit).................................... ON

2. Hydraulic pressures:

   Engine driven pumps (High) . 3000 psi (+100-200), (+200 allowable)
   Engine driven pumps (Low) .. 1500 psi (+100-200), (+200 allowable)
   Auxiliary pump .... 3000 psi (+100-200), (+200 allowable)
   Transfer pump .... 2000 - 3000 psi to either system

3. Minimum hydraulic quantity
   for dispatch (per system) .... 4.25 quarts

4. Landing gear retraction speed .... 250 KIAS

5. Landing gear extension / extended speed........300 KIAS or .70 mach

6. The antiskid must be operative for takeoff.

7. Do not use autobrakes if either hydraulic system fails.

Operating Parameters

1. Gear retraction time .... 8.5 seconds

2. Gear extension time .... 15 seconds

3. Gear free-fall time (flaps retracted, speed 165 KIAS) ....25 seconds

4. Useable brake pressure .... 700-3000 psi

5. Minimum parking brake pressure (assures 8 hours).....1400-1700 psi

6. Tire pressures:

   Cold .... 178-185 psi
   Hot...250 psi max

(Continued)

7. Gear load limit (sink rate):

   At max takeoff weight ....360 fpm
   At max landing weight ....600 fpm

8. Do not takeoff or land if brake temperature exceeds ....205° C

9. Do not set parking brake if brake temperature exceeds ....300° C

10. The use of the **MAX** setting for the autobrakes is prohibited for normal landings on a dry runway.

Ice and Rain Protection

Limitations:

1. The windshield heat must be on and checked for all flight operations except as follows:

   Inoperative windshield heat limits (below 10,000 feet)
   Center or side windshield ....315 KIAS

   Cracked windshield limits (below 10,000 feet)
   Outer panel (center or side)...315 KIAS
   Inner panel (center or side)..235 KIAS

   Do not operate windshield heat if the windshield is cracked.

   There are no speed restrictions above 10,000 feet and there are no restrictions on the clearview or eyebrow windows.

2. During takeoff, engine anti-ice must be turned on if icing conditions exist or are anticipated.

3. Ice on upper wing surface:

<u>Caution</u>: Ice shedding from the wing upper surface during takeoff can cause severe damage to one or both engines leading to surge, vibration, and complete thrust loss. The formation of ice can occur on wing surfaces during exposure of the airplane to normal icing conditions. Clear ice can also occur on the wing upper surfaces when cold-soaked fuel is in the main wing fuel tanks, and the airplane is exposed to conditions of high humidity, rain, drizzle, or fog at ambient temperatures well above freezing. Often the ice accumulation is clear and difficult to detect visually. The ice forms most frequently on the inboard, aft corner of the main wing tanks.

Aircraft <u>Without</u> Operational Upper Wing Anti-Ice System

<u>Caution:</u> The wing upper surfaces must be physically checked for ice prior to all departures. Takeoff may not be initiated unless the flight crew verifies that a visual check and a physical (hands-on) check of the wing upper surfaces have been accomplished, and that the wing is clear of ice accumulation.

On aircraft equipped with the tuft and triangular decal assemblies, installed in accordance with DAC SB 30-59, the physical check may be made by assuring that all installed tufts move freely.

(Continued)

On aircraft equipped with the painted ice protection triangle the physical check may be made by assuring that the rough-smooth-rough contrast is felt with the ice wand as it is rubbed across the painted ice protection triangle.

Note: This limitation does not relieve the requirement that aircraft surfaces are free of frost, snow, and ice accumulation, as required by FAR's 91.527 and 121.629.

Aircraft With Operational Upper Wing Anti-Ice System

The flight crew must observe the **WING ICE ALERT** annunciator light and the **WING HTR INOP** annunciator light to confirm that they are extinguished, prior to departure from the gate or parking area.

Confirmation that both the **WING ICE ALERT** annunciator light and the **WING HTR INOP** annunciator light are extinguished prior to departure from the gate or parking area has been approved as an Alternate Means of Compliance to AD 2001-06-16.

If this Alternate Means of Compliance cannot be accomplished, a physical check (as described above) must be performed prior to departure from the gate or parking area.

Caution: The system provides a localized protection against the clear ice engine ingestion problem addressed by AD 2001-06-16. During winter operations, this limitation does not relieve the requirement that aircraft surfaces are free of frost, snow, and ice accumulation as required by FAR 91.527 and FAR 121.629. Normal winter operations procedures should be followed whenever required by prevailing conditions.

Note: Refer to Section 4 UPPER WING CLEAR ICE AD 2001-06-16 for appropriate inspection procedures.

Operating Parameters:

1. Minimum ice protection pressure .... 20 psi (**ICE PROTECT TEMP LOW** light out)
2. When operating (inflight) in icing conditions, maintain a minimum of 1.2 EPR.
3. Engine anti-ice should be used during ground operation if the OAT/RAT is less than 6°C (42°F) and visible moisture is present or the dewpoint and OAT/RAT are within 3°C (5°F) of each other.

4. Engine anti-ice should be used during flight when the RAT is less than 6°C and visible moisture is present or if ice buildup occurs on the windshield wipers or edges of the windshield.
5. Inflight, engine ignition will be selected prior to turning on engine anti-ice. When the engines have stabilized, ignition may be turned off.
6. Airfoil anti-ice is not used for takeoff. The airport analysis data is based on airfoil anti-ice off until reaching 800 feet AGL or single engine acceleration altitude, whichever is higher.
7. Airfoil anti-ice should be used during flight when the RAT is less than 6°C and visible moisture is present or if ice buildup occurs on the windshield wipers or edges of the windshield.
8. Airfoil anti-ice must be used during flight whenever engine anti-ice is selected (except during takeoff).
9. Tail de-ice must be used each 20 minutes during continuous icing.
10. Tail de-ice must be used prior to turning off ice protection.
11. When in icing conditions, tail de-ice must be selected one minute prior to selection of landing flaps.
12. Prior to takeoff or approach, if indicated fuel temperature is 0°C or less, fuel heat should be turned on for one cycle. The **L & R FUEL HEAT ON** lights must be off during takeoff, landing, and go-around. If the **FUEL FILTER PRES DROP** light comes on during other phases of flight, use the fuel heat as required.
13. Do not operate windshield wipers on dry glass.
14. Do not apply rain repellant to dry glass.

Instrumentation / Navigation / Communication

Limitations:

1. If the overspeed warning system malfunctions during flight by sounding earlier than scheduled, the airplane is to be operated at speeds below the point at which the warning horn sounds if the system is operating. If the overspeed warning system activates below .79 mach, deactivate the system by pulling the circuit breaker and observe the following speed limitations:

   Vmo .... 325 KIAS
   Mmo .... 0.79 mach

   In the event the system is deactivated, carefully monitor mach/airspeed indicators. When circuit breaker is pulled, aural warnings for engine fire and horizontal stabilizer position are also inoperative.

2. Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with TCAS II resolution advisory (RA).

3. The flight crew must observe during AHRS ground alignment that the aircraft remains stationary until the attitude and heading flags are out of view. If the airplane is moved during the final phase of ground alignment, the AHRS may align incorrectly with no apparent indication. A new ground alignment must be initiated if the aircraft has moved during the alignment cycle.

4. Manual switching to the alternate static system is prohibited for Reduced Vertical Separation Minimums (RVSM) operation.

Operating Parameters:

1. Maximum tolerance between Captain and First Officer altimeters:

   sea level .... 60 feet
   25,000 .... 100 feet
   35,000 .... 120 feet

2. Maximum tolerance between Captain and First Officer mach/airspeed indicators:

   80-149 knots .... 4 knots
   150-249 knots .... 6 knots
   250-350 knots .... 10 knots
   mach indicator .... .02 mach

Miscellaneous

Limitations:

1. The emergency exit lights must be armed for all flights.
2. On passenger flights, the evacuation slide bar must be inserted in the floor fittings after the door is closed and prior to departure from the gate and remain in position until arrival at the gate.
3. The emergency operating handle on the aft pressure bulkhead door must be exposed and the normal operating handle covered when the aircraft moves from the departure gate. Both handles must remain in this position until just before the aircraft stops moving at the arrival gate.
4. The aircraft must land at the nearest suitable airport within 60 minutes after the activation of BTL 1 of the Cargo Detection Suppression system for a cargo fire warning.

Operating Parameters:

1. Wing landing light extension speed................................Vmo / Mmo
2. Wing landing light motors should be allowed to cool for 1 1/2 minutes after initial extension or retraction and 3 1/2 minutes after each subsequent extension or retraction.
3. Wing landing lights should not be operated in still air for periods of over 10 minutes.

Oxygen

Operating Parameters:

1. Minimum oxygen pressures for dispatch:
   Flight deck portable cylinder .... 1620 psi
   Flight attendant portable cylinder .... 1500 psi
2. Normal minimum oxygen pressure for dispatch:
   Cockpit crew cylinder.. 1300 psi

   For dispatch with less than the normal oxygen pressure for the cockpit crew cylinder, refer to the chart in this section.
3. For flights above 25,000 feet, flight attendants must conduct the passenger oxygen briefing.

Crew Oxygen Cylinder Pressure Required For Dispatch To 10,000 Ft Or Higher

Note: The cylinder pressure obtained from this table will provide oxygen to the Captain, First Officer, and Observer (if onboard) for use only during the unpressurized flight following a decompression. The unpressurized flight time includes a 17 second delay following decompression, a descent of 10 minutes or less to 14,000 feet and the remaining flight at 14,000 feet to the destination.

Note: Oxygen usage is based on oxygen regulator at 100% during descent and NORMAL at 14,000 feet.

MAXIMUM POSSIBLE UNPRESSURIZED FLIGHT TIME IN MINUTES	CREW OXYGEN - MINIMUM CYLINDER PRESSURE REQUIRED - PSIG	
	2 ACTIVE CREW MEMBERS AND ONE OBSERVER	2 ACTIVE CREW MEMBERS
120	1300	890
110	1210	830
100	1120	770
90	1030	710
80	940	640
70	840	580
60	750	540
50	650	540
40	550	540
30	540	540

Power Plant

Limitations

1. EGT / Time limits:

   Starting - ground (momentary) .... 475°C
   Starting - flight (momentary)... 625°C
   Idle (continuous) .... 480°C
   Acceleration (2 minutes) .... 630°C
   Takeoff (5 minutes)... 625°C
   Max. climb / Max. continuous (continuous)...................... 580°C

2. Oil limits:

   Normal pressure... 40-55 psi
   Normal maximum temperature .... 135°C
   Max temp for 15 minutes .... 165°C
   Undesirable oil pressure .... 35-40 psi
   (Tolerated only for completion of flight)
   Unsafe oil pressure.. below 35 psi

3. Rotor speeds:

   Max N_1 – 217.. 99.2%
   Max N_1 – 217A... 101.6%
   Max N_2 .... 102.5%

4. Reverse thrust:

   Inflight use of reverse thrust is prohibited.

   Reverse thrust is limited to max continuous thrust except in an emergency situation (when up to takeoff EPR is authorized).

(Continued)

5. The following limitations are applicable when the airplane is using reverse thrust for powerback:

   Do not apply more than 1.3 EPR during powerback. (Thrust values in excess of 1.2 EPR should be limited to a momentary power application to initiate powerback.)

   Ramp slope limit range is +1% to -2%.

   Thrust reversers on both engines must be operating.

   Application of brakes while backing is prohibited.

   Powerback is not authorized when ice, snow, or slush is on the ramp, or during periods of heavy rain.

6. Engine synchronization must be off below..................1500 feet AGL (Operate in cruise flight only.)

7. The automatic reserve thrust (ART) system must be off when using the Takeoff Flex mode of the thrust rating indicator.

8. Autothrottles must be disconnected if engine surge (stall) is detected during takeoff.

9. The minimum altitude for thrust cutback during takeoff is 500 feet AGL.

10. The engine ignition must be turned to OVRD, SYS A or SYS B, or GRD START & CONTIN for takeoff or landing in standing water or slush.

Operating Parameters

1. Ignition duty:

   4 position switch (SYS A, SYS B, BOTH, OVRD)

   Normally, 10 minutes on, 10 minutes off.
   May be used in 10 minute alternating cycles.

   2 position switch (OVRD, GND START & CONT)

   Override - 2 min on, 3 min off, 2 min on, 23 min off.
   Ground start and continuous - no duty cycle.

(Continued)

2. Engine starter duty cycle:

Standard	Alternate
90 seconds on*	90 seconds on*
5 minutes off	10 minutes off
30 seconds on	60 seconds on
5 minutes off	10 minutes off
30 seconds on	60 seconds on
Sequence may continue	Sequence may continue

* May consist of 3 normal start cycles of 30 seconds each with engine allowed to stop turning between starts.

3. Reduced EPR takeoff is not authorized under the following conditions:

   Auto ground spoilers inoperative (landing mode)
   Inboard ground spoilers system inoperative
   Right engine hydraulic pump inoperative
   Approach idle control system fails to high idle
   The ART switch in **AUTO**
   219 + 217 Engine intermix
   Low altimeter setting (less than 29.72)
   After application of de-ice / anti-ice fluid
   Reported or suspected windshear
   Standing water, slush, snow, or ice on runway
   Combination of wet runway and tailwind.

4. An entry should be made in the maintenance log if oil consumption reaches 1 quart or more per hour.

LIST OF EFFECTIVE PAGES

	PAGE	DATE
	TOC-1	01/01/00
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*	LEP-2	12/01/00

FAA APPROVED

DON KLOS
Principal Operations Inspector

* Asterisk indicates page(s) revised or added by the current revision.

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EMERGENCY PROCEDURES

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GENERAL

ENGINE FAILURE / FIRE / SEVERE DAMAGE / INFLIGHT SHUTDOWN CHECKLIST

Fire Warning Bell (If Applicable)...SILENCE

Autothrottles ....DISENGAGED

Throttle (Affected Engine)..CLOSED

IF Engine Fire Or Severe Damage Is Suspected:

> **IF** ENG FIRE Light Is Out After 10 Seconds And Severe Damage Is Not Suspected:
>
> Test fire warning system. Continue idle engine operation at Captain's discretion.
>
> **OR**
>
> * * * *
>
> **IF** ENG FIRE Light Is On Or Severe Damage Is Suspected**:**
>
> **FUEL Lever (Affected Engine)....................................... OFF**
>
> **ENG FIRE Handle**
> **(Affected Engine) ....PULL AND ROTATE TO AGENT DISCH 1 OR 2**
>
> Check respective AGENT LOW Light is on.
>
> **IF** Fire Persists After 30 Seconds:
>
> **ENG FIRE Handle**
> **(Affected Engine) .... ROTATE TO DISCHARGE REMAINING AGENT**
>
> Test fire warning system. Continue checklist at ❶

IF Engine Failure Or Inflight Shutdown:

Note: Consider operating engine at idle thrust for two minutes for precautionary shutdowns.

FUEL Lever (Affected Engine)...OFF

❶ **ENG IGN Switch... AS REQUIRED**

OVRD position should not be used because it would operate igniters in the shutdown engine.

APU ....START

(Continued)

FUEL X-FEED Lever, Boost Pumps
(If No Center Wing Fuel)..ON, PUMPS SET

PNEU X-FEED VALVE Lever (Affected Engine).........................CLOSE

AUX & TRANS HYD PUMP Switches .... AS REQUIRED

AIR CONDITIONING SUPPLY Switch (Affected Engine).............. OFF

AIR COND SHUTOFF Switch..OVRD

ENG SYNC Selector .... OFF

APU Bus Switch (Affected side) ....ON

IF Driftdown is Required:

Refer to **DRIFTDOWN PROCEDURE**.

IF Engine Restart is to be Attempted:

Refer to **INFLIGHT ENGINE START CHECKLIST**.

IF After Takeoff or Missed Approach:

Accomplish the After Takeoff checklist.

Refer to **ONE ENGINE INOPERATIVE APPROACH AND LANDING CHECKLIST**.

* * * *

ENGINE FAILURE / FIRE / SEVERE DAMAGE / INFLIGHT SHUTDOWN EXPANDED CHECKLIST

This procedure is to be used for engine failure, engine fire, engine severe damage (including separation), or shut down for precautionary reasons.

Note: A fire warning may or may not appear with severe engine damage or separation. Indications of severe damage may include airplane vibration and, on the affected side, N_1 and/or N_2 tachometers indicating 0%, rapid loss of hydraulic pressure and sudden loss of generator power.

Fire Warning Bell (If Applicable) .... SILENCE

The PM should silence the bell as soon as possible.

Autothrottles .... DISENGAGED

This action prevents undesired autothrottle activity.

Throttle (Affected Engine).. CLOSED

IF Engine Fire Or Severe Damage Is Suspected:

IF **ENG FIRE** Light Is Out After 10 Seconds And Severe Damage Is Not Suspected:

Test the fire warning system. A valid test with no other indication of a fire indicates a possible engine bleed air leak. Continue idle engine operation at Captain's discretion.

OR

* * * *

IF **ENG FIRE** Light Is On Or Severe Damage Is Suspected:

FUEL Lever (Affected Engine) .... OFF

Note: This action must be verified by the other pilot.

ENG FIRE Handle
(Affected Engine)..............................PULL AND ROTATE TO AGENT DISCH 1 OR 2

Note: This action must be verified by the other pilot.

(Continued)

Pull the appropriate ENG FIRE handle to the full aft stop and rotate simultaneously to discharge a bottle. A slight increase in force will be felt during the last ¼ inch of aft travel. The handle load should not be relaxed until the respective AGENT LOW light is on. Start a clock for timing.

IF Fire Persists after 30 Seconds:

ENG FIRE Handle
(Affected Engine) .... ROTATE TO DISCHARGE REMAINING AGENT

If fire light extinguishes during this procedure, it is recommended that a fire warning system test be conducted to verify fire detection system is functioning normally.

Continue checklist at ❶

IF Engine Failure <u>Or</u> Inflight Shutdown:

<u>Note</u>: Consider operating engine at idle thrust for two minutes for precautionary shutdowns.

FUEL Lever (Affected Engine)... OFF

<u>Note</u>: This action must be verified by the other pilot.

❶ **ENG IGN Switch.. AS REQUIRED**

OVRD position should not be used because it would operate igniters in the shut down engine.

APU .... START

Move APU master switch to start and release with RPM indication. Continue checklist while APU is starting.

FUEL X-FEED Lever, Boost Pumps
(If No Center Wing Fuel)...ON, PUMPS SET

Normally, if center tank fuel is available and the pumps are on, no action is required. If center tank fuel is not available, fuel imbalance is likely to occur. Move the FUEL X-FEED lever to on and turn off boost pumps for the appropriate main tank. Monitor fuel balance carefully and crossfeed as required to maintain lateral balance within 1500 lbs.

(Continued)

PNEU X-FEED VALVE Lever (Affected Engine)..........................CLOSE

AUX & TRANS HYD PUMP Switches .... AS REQUIRED

AIR CONDITIONING SUPPLY Switch (Affected Engine)................OFF

If this air conditioning pack is required for pressurization, and there was no indication of fire or severe damage associated with the failed engine, leave switch in ON and move both PNEU X-FEED VALVE levers to open.

AIR COND SHUTOFF Switch... OVRD

This allows TRI to display MCT.

ENG SYNC Selector ....OFF

APU Bus Switch (Affected Side)..ON

Check APU generator volts and frequency. If good, place the APU bus switch for the side with the failed engine to ON. This procedure retains the protection of the AC X-tie lockout system.

Note: Coordinate any procedure requiring an engine shutdown with ATC as soon as possible.

Note: Restricted rudder may result after applying maximum rudder due to asymmetric thrust. If **RUDDER TRAVEL UNRESTRICTED** light does not come on during deceleration, momentarily centering rudder pedals and rudder trim may allow rudder throw limiter to return to speed-scheduled position.

IF Driftdown is Required:

Refer to **DRIFTDOWN PROCEDURE**.

IF Engine Restart is to be Attempted:

Refer to **INFLIGHT ENGINE START CHECKLIST**.

IF After Takeoff or Missed Approach:

Accomplish the After Takeoff checklist.

Refer to **ONE ENGINE INOPERATIVE APPROACH AND LANDING CHECKLIST**.

(Continued)

Note: Engines that have windmilled as a result of shutdown inflight will require an inspection. Airworthiness of the engine and action to be taken will be governed by the inflight report. Make the following logbook entries, as time and conditions permit:

1. Windmill RPM
2. Windmill time
3. Windmill oil pressure
4. Length of time engine windmilled without oil pressure
5. Oil pressure at time of shutdown

* * * *

ENGINE FAILURE AFTER V1 PROCEDURE

PILOT FLYING (PF)	PILOT MONITORING (PM)
"POWER LOSS" is called by the first pilot detecting engine failure.	
Maintain directional control, rotate to takeoff pitch attitude of approximately 13° after V_R speed is attained.	Call "ROTATE" at V_R. Call "POSITIVE RATE" when a positive rate of climb is indicated.
Call "POSITIVE RATE, GEAR UP, CHECK MAX POWER" when a positive rate of climb is indicated. Maintain wings level and adjust pitch to maintain V_2. Avoid following FD pitch commands until 200' AGL.	Position the landing gear handle UP on command. If ART switch is in AUTO: Check ART light is on and engine EPR at limit. If ART switch is OFF: Push GA on the TRI and advance throttle to the GA EPR limit.
* Climb at V_2, limit bank angle to 15°. (Bank angle up to 25° may be used if required for special departure procedure.)	Monitor engine, flight instruments, and flight path control.
Call "HEADING SELECT" at 400 feet AGL if a turn is required. (Turn may be started as low as 50 feet AGL if required for special departure procedure)	Select correct heading and pull HDG knob into heading select.
** At flap retraction altitude: Call "ALTITUDE HOLD, SPEED SINGLE ENGINE CLIMB" Follow FD and accelerate in level flight.	Push ALT HOLD button on FGS panel. Set speed bug to slat retract speed plus twenty knots.
At flap retract speed: Call "FLAPS UP" At slat retract speed: Call "SLATS RETRACT"	Move flap/slat handle to retract flaps and slats at appropriate speeds.

(Continued)

PILOT FLYING (PF)	PILOT MONITORING (PM)
At single engine climb speed: Call "IAS, OVERRIDE, MCT" Follow FD and trim aircraft as required.	At single engine climb speed: Push IAS button on FGS panel, Move AIR COND SHUTOFF switch to OVRD, Push MCT button on TRI and check correct EPR is set. Disengage autothrottles.
If in icing conditions, airfoil anti-ice may be turned on at this time.	
Call for the **ENGINE FAILURE / FIRE CHECKLIST.** If desired, Call "AUTOPILOT ON"	Engage the autopilot and complete the **ENGINE FAILURE / FIRE CHECKLIST** on command.
Determine the next course of action.	Advise ATC of the Captain's intentions.

Note: If a fire is indicated, the **ENGINE FAILURE/FIRE CHECKLIST** should be called for by the PF and initiated by the PM after flap retraction.

* If an engine failure occurs prior to V_2, maintain V_2 up to the altitude required for obstacle clearance. If an engine failure occurs after V_2 but less than V_2+10 knots, maintain the speed reached at the time of the engine failure. If an engine failure occurs at a speed higher than V_2+10 knots with the flaps at takeoff setting, increase pitch attitude to reduce speed to and maintain V_2+10 knots until clear of obstacles. Flight directors driven by -930 and above computers will supply pitch commands to maintain the above engine failure speeds.

Note: Flight directors driven by -904 or -906 computers will supply pitch commands to maintain V_2+10 knots regardless of speed at the time of engine failure. If an engine fails during takeoff, disregard the pitch commands and maintain the appropriate engine failure speed (described above) by reference to the airspeed indicator. Following erroneous pitch commands may result in a flight path below the minimum required to provide obstacle clearance.

(Continued)

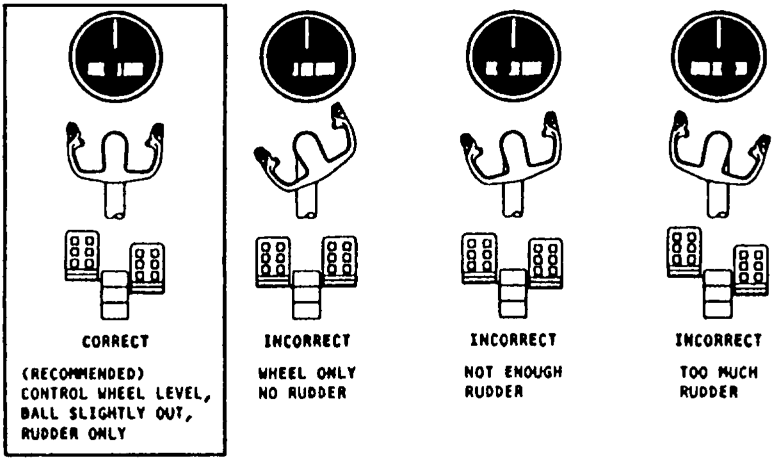
** Normally, flap retraction after an engine failure occurs at 800 feet AGL. Obstacle clearance requirements may define non-standard flap retraction altitudes. If non-standard altitudes are required, they will be noted on the JEPP 10-7 page.

Note: When making a reduced thrust takeoff, all performance requirements are met with reduced thrust. If desired, the operating engine may be left at reduced thrust for climbout.

Rotation And Initial Climb (Single Engine)

If engine failure occurs after V_1 during takeoff roll, the PF should apply rudder as required to keep the aircraft tracking straight ahead on the runway. The amount of rudder required to track straight ahead will be very close to the amount of rudder needed to maintain wings level after rotation and during initial climbout. After V_R speed is attained rotate the aircraft, using normal rate of rotation, to approximately 13° of pitch. Gear retraction will not be initiated until a positive rate of climb has been verified on the IVSI and altimeter and called by either pilot. Avoid pumping the elevator - establish an attitude and check the speed trend. Avoid following flight director pitch commands below 200 feet AGL as this may lead to oscillation in pitch attitude.

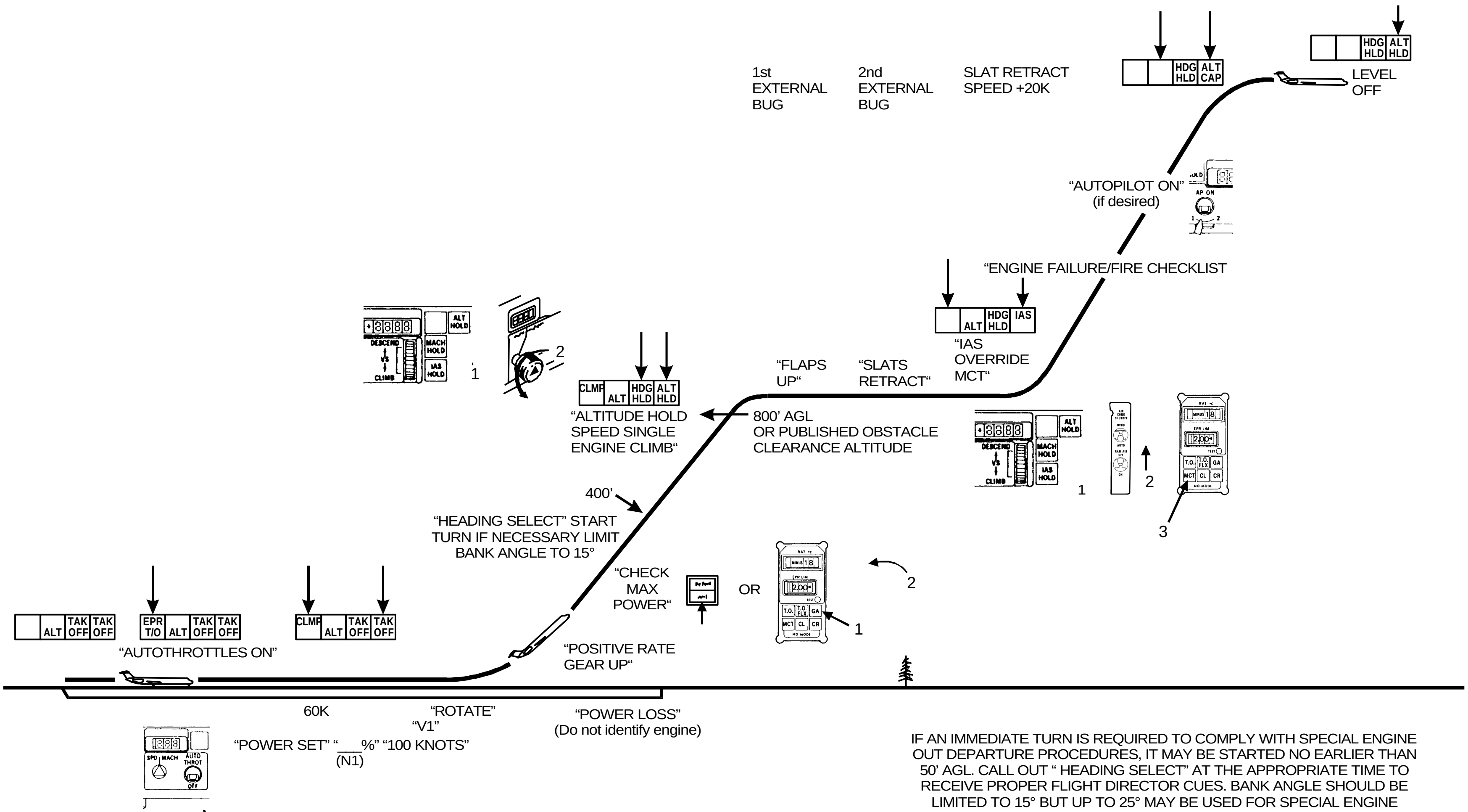
Rudder should be used to hold wings level and maintain a constant heading. Avoid rapid or large movements of the rudder. The delay between a rudder input and change in aircraft motion can lead to oscillation in roll. The control wheel should be centered except when making small inputs to correct bank angle or heading. Rudder trim should be used as required but do not allow trimming the aircraft to distract from maintaining proper aircraft control, especially during the first 200 feet of climb.



Engine No. 2 Inoperative

After cleanup and acceleration, the climbout is made at single engine climb speed until pattern altitude or enroute climb clear of all obstructions. Single engine climb speed is below maneuvering speed and bank angle should be limited to 15°. Once level at pattern or enroute altitude (and clear of all obstructions), a maneuvering speed should be attained to restore normal maneuvering ability.

* * * *



IF AN IMMEDIATE TURN IS REQUIRED TO COMPLY WITH SPECIAL ENGINE OUT DEPARTURE PROCEDURES, IT MAY BE STARTED NO EARLIER THAN 50' AGL. CALL OUT " HEADING SELECT" AT THE APPROPRIATE TIME TO RECEIVE PROPER FLIGHT DIRECTOR CUES. BANK ANGLE SHOULD BE LIMITED TO 15° BUT UP TO 25° MAY BE USED FOR SPECIAL ENGINE OUT DEPARTURE PROCEDURE.

If "TAKEOFF FLEX" is used then assumed temperature will show in the bottom of the throttle window of the FMA before and after autothrottles are selected "EPR" will show in the top of the throttle window of the FMA after autothrottles are selected.

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Engine Failure After Takeoff V1 Profile

Engine Failure After Takeoff V1 Profile

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REVERSER DEPLOYED OR REVERSE THRUST / UNLOCK LIGHT ON INFLIGHT

IMMEDIATE ACTION

Autothrottles .... DISENGAGED
Throttle (Affected Engine) .... IDLE

SECONDARY ACTION

Reverse Thrust Lever...................... DOWN (FORWARD THRUST)

Note: Reverser may not stow above 200 KIAS. Throttle should be left in idle position until reverser is stowed.

ENG HYD Pump Switch (Affected Side) .... HI

Associated REVERSER ACCUM SHUTOFF Circuit Breaker (S28 or T28).......................... PULL FOR 3 SECONDS AND RESET

IF Aircraft is Buffeting or Yawing (Reverser Deployed):

FUEL Lever (Affected Engine).. OFF

Refer to **ENGINE INFLIGHT SHUTDOWN** checklist. Go-around on approach is not recommended due to extra drage of deployed reverser.

OR

* * * *

IF Aircraft Behavior is Normal (Reverser Stowed):

Adjust throttles as required. Monitor engine operation.

* * * *

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TWO ENGINE FLAMEOUT CHECKLIST

IMMEDIATE ACTION

EMER PWR Switch...ON
ENG IGN Switch .... OVRD

SECONDARY ACTION

CABIN ALT Control Lever..................................MANUAL (DOWN)

IF Aircraft Altitude is Above 10,000 Feet MSL:

Outflow Valve Position Indicator........................ VALVE CLOSE

Oxygen Masks, Regulators.. ON, 100%

Airspeed ....MINIMUM MANEUVERING (NOT LESS THAN 170 KIAS)

Throttles .... IDLE

ENG Anti-Ice Switches ....ON

BATT Switch.. ON & LOCKED

START PUMP Switch...ON

Fuel Boost Pump Switches .... ALL ON

GEN Switches...OFF

ENG HYD PUMP Switches ....OFF

FUEL Levers ....ON

FUEL X-FEED Lever ....OFF

IF Neither Engine Starts:

Note: If two engine flameout was caused by fuel starvation in left and right main tanks with fuel in center wing tank, optimum attitude for scavenging fuel out of the right main tank for APU or right engine is 0° pitch and 1.5° right wing up.

APU MASTER Switch .... START, RELEASE

Note: Attempt APU start regardless of altitude and airspeed.

(Continued)

IF APU Starts**:**

L And R APU BUS Switches..ON

AUX & TRANS HYD PUMP Switches............................ON

Continue engine start attempts.

IF One or Both Engines Start:

GEN Switch (Operating Engines)...ON

ENG HYD PUMP Switch (Operating Engines) .... HI

AUX & TRANS HYD PUMP Switches ....ON

CABIN ALT Control Lever .... AUTO (UP)

START PUMP Switch...OFF

OR

ENG Anti-Ice Switches .... AS REQUIRED

ENG IGN Switch.. AS REQUIRED

Note: Continue engine and/or APU start attempts until at least two are running.

Land at nearest suitable airport. Refer to **ENGINE FAILURE** and **ONE ENGINE INOPERATIVE APPROACH AND LANDING** checklist, this section, if required.

* * * *

IF Neither Engine Starts:

ENG HYD PUMP Switches .... HI

Continue glide at minimum maneuver speed for configuration. Keep track of altitude and time to go prior to landing. Notify ATC and consider their recommendations in choosing a landing point.

Continue attempts to start an engine or the APU as long as possible without jeopardizing the landing.

Direct Flight Attendants to prepare for crash landing and estimate time remaining.

Depressurize cabin manually and lock cabin alt control wheel in the full aft (open) position prior to landing.

(Continued)

Optimum configuration for final approach will be gear down (gear up for ditching) and flaps 28° with an airspeed of 28°/LND V_{REF} plus 30 to 40 KIAS. Establish this configuration and speed early enough to become familiar with the descent rate. Adjust flight path to the touchdown location as required to maintain the airspeed/descent rate. Airspeed should be 28°/LND V_{REF} plus 30 to 40 KIAS all the way down to the landing spot. The excess airspeed will be used to arrest descent rate during roundout prior to touchdown.

Refer to **EMERGENCY (OFF RUNWAY) LANDING CHECKLIST** or **DITCHING CHECKLIST**, this section, if time permits.

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TWO ENGINE FLAMEOUT EXPANDED CHECKLIST

This procedure is to be used if thrust or throttle response is lost from both engines at any speed or altitude in the aircraft's operating envelope. The probability of a successful start is improved at altitudes below 24,000 feet and speeds between 180 and 320 KIAS.

During descent, this condition may first be indicated by illumination of the **GEN OFF** or **OIL PRESS LOW** lights. If these lights illuminate, check N2 and EGT to verify engine operation.

IMMEDIATE ACTION

EMER PWR Switch .... ON
ENG IGN Switch .... OVRD

The immediate action items should be accomplished expeditiously to effect an immediate restart before the engines have spooled down completely. If this emergency is the result of flight in areas of heavy/extreme precipitation, the engines may not start until after leaving the precipitation. Repeated attempts at restarting the engines may be necessary once clear of heavy rain, sleet, or hail.

SECONDARY ACTION

CABIN ALT Control Lever..MANUAL (DOWN)

This locks the outflow valve in position for manual operation.

IF Aircraft Altitude is Above 10,000 Feet MSL:

Outflow Valve Position Indicator............................... VALVE CLOSE

Push down and roll the outflow valve full forward.

Oxygen Masks, Regulators .... ON, 100%

Prepare for the cabin pressure to rise above 10,000 feet.

Airspeed ....MINIMUM MANEUVERING (NOT LESS THAN 170 KIAS)

Throttles.. IDLE

ENG Anti-Ice Switches ....ON

BATT Switch .... ON & LOCKED

(Continued)

START PUMP Switch..ON

Fuel Boost Pump Switches .... ALL ON

GEN Switches... OFF

ENG HYD PUMP Switches .... OFF

FUEL Levers..ON

FUEL X-FEED Lever .... OFF

IF Neither Engine Starts:

Note: If two engine flameout was caused by fuel starvation in left and right main tanks with fuel in center wing tank, optimum attitude for scavenging fuel out of the right main tank for APU or right engine is 0° pitch and 1.5° right wing up.

APU MASTER Switch .... START, RELEASE

Note: Attempt APU start regardless of altitude and airspeed.

IF APU Starts:

L and R APU BUS Switches..ON

AUX & TRANS HYD PUMP Switches...........................ON

Continue engine start attempts.

IF One or Both Engines Start:

GEN Switch (Operating Engines)..ON

ENG HYD PUMP Switch (Operating Engines) .... HI

AUX & TRANS HYD PUMP Switches ....ON

CABIN ALT Control Lever .... AUTO (UP)

OR

START PUMP Switch... OFF

ENG Anti-Ice Switches .... AS REQUIRED

ENG IGN Switch.. AS REQUIRED

Note: Continue engine and / or APU start attempts until at least two are running (two engines or one engine and the APU). This will provide two generators for electrical power.

(Continued)

Land at nearest suitable airport. Refer to **ENGINE FAILURE** and **ONE ENGINE INOPERATIVE APPROACH AND LANDING** checklist, this section, if required.

* * * *

IF Neither Engine Starts :

ENG HYD PUMP Switches .... HI

Continue glide at minimum maneuver speed for configuration. Keep track of altitude and time to go prior to landing. Notify ATC and consider their recommendations in choosing a landing point.

Continue attempts to start an engine or the APU as long as possible without jeopardizing the landing.

Direct Flight Attendants to prepare for crash landing and estimate time remaining.

Depressurize cabin manually and lock cabin aft control wheel in the full aft (open) position prior to landing.

Optimum configuration for final approach will be gear down (gear up for ditching) and flaps 28° with an airspeed of 28°/LND V_{REF} plus 30 to 40 KIAS. Establish this configuration and speed early enough to become familiar with the descent rate. Adjust flight path to the touchdown location as required to maintain the airspeed/descent rate. Airspeed should be 28°/LND V_{REF} plus 30 to 40 KIAS all the way down to the landing spot. The excess airspeed will be used to arrest descent rate during roundout prior to touchdown.

Refer to **EMERGENCY (OFF RUNWAY) LANDING CHECKLIST** or **DITCHING CHECKLIST**, this section, if time permits.

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UNCONTROLLABLE ENGINE OPERATION AT HIGH THRUST

IMMEDIATE ACTION

Fuel Lever (Affected Engine) ....OFF

SECONDARY ACTION

WARNING: Flight crews should be prepared to recognize and respond to this condition immediately due to the potential hazard encountered during engine start, close proximity to gates or other aircraft, operation on contaminated surfaces, landing and reverse thrust operations.

Note: The JT8D engine fuel control unit uses a speed signal from the N_2 rotor (along with other inputs) to regulate the engine thrust setting. In the event the speed signal from the N_2 rotor is lost, the fuel control unit is designed to set engine power at 90% to 95% N_2 regardless of throttle position. This ensures the engine will deliver high power (and not revert to low power) during critical phases of flight.

If the N_2 signal is lost during high power operation, the engine will remain at high power. If the N_2 signal is lost during lower power operation, an uncommanded increase to high power will occur. In all cases, movement of the throttle will have no effect on engine operation. When this occurs, power can only be reduced by moving the FUEL lever to OFF or pulling the ENG FIRE handle to shutdown the engine.

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INFLIGHT ENGINE START CHECKLIST

If not previously accomplished, complete the **ENGINE FAILURE/FIRE CHECKLIST**, this section, before attempting a restart. Evaluate engine indications for evidence of damage which would preclude a restart attempt.

Note: Normal relight area is below 24,000 feet and between 180 and 320 KIAS.

Throttle (Affected Engine)..CLOSED

ENG FIRE Handle (Affected Engine).................. FULL FORWARD

Engine GEN Sw (Affected Side)..OFF

ENG HYD PUMP Sw (Affected Side)..OFF

ENG Anti-Ice Switch (Affected Engine)..ON

Main Tank Boost Pump Switches...............BOTH ON, INLET FUEL (Affected Engine) PRESS LOW LIGHT OFF

Airspeed ....180 - 320 KIAS

Oil Pressure...INDICATING

ENG IGN Switch.. OVRD

FUEL Lever ....ON

Note: Depending upon altitude, fuel flow and EGT indications may indicate lower values during airstarts.

IF Engine EGT and RPM Rise Do Not Occur Within 20 Seconds:

FUEL Lever..OFF

Note: If start is not successful with initial EGT above 100° C, allow EGT to cool below 100° C before attempting a second start. If second start attempt is unsuccessful, further start attempts are not recommended.

(Continued)

IF Engine Starts:

- - - - - AFTER ENGINE IS STABILIZED - - - - -

ENG IGN Switch.. AS REQUIRED

OR

ENG Anti-Ice Switch.. AS REQUIRED

Hyd, Elec, Fuel, Pneu, & Air Cond Systems................. NORMAL

* * * *

IF Engine Does Not Start:

FUEL Lever... OFF

ENG IGN Switch.. AS REQUIRED

ENG Anti-Ice Switch.. OFF

FUEL X-FEED Lever, Boost Pumps
(If No Center Wing Fuel) ....ON, PUMPS SET

* * * *

DRIFTDOWN PROCEDURE

An engine failure or shutdown during climbout or cruise over several of our routes requires use of this driftdown procedure to minimize altitude loss and assure terrain clearance.

Throttle (Operating Engine).. MCT POWER

Autopilot..DISENGAGE

Aircraft .... RE-TRIM FOR ASYMMETRIC THRUST

Autopilot... RE-ENGAGE

Decelerate in level flight until appropriate speed is attained. FGS IAS Hold mode may be used to hold speed during descent.

Speed .... ABOVE FL 180 =GW + 120 KIAS
BELOW FL 180 =GW + 80 KIAS

Note: GW + 80 KIAS is below clean maneuvering airspeed. Limit bank angle to 15° or less.

Descent .... BEGIN

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ONE ENGINE INOPERATIVE APPROACH AND LANDING CHECKLIST

Plan a flaps 28° landing with final approach flown at V_{REF} + 10 for go-around capability. After **ENGINE FAILURE/FIRE CHECKLIST** is complete, use both throttles together for the remainder of the flight.

Note: All of the following checklists should be accomplished whenever returning for an engine out landing.

- - - - -IN-RANGE CHECKLIST - - - - -

Hydraulics..C+F............ ON & HI, CHECKED

WARNING: Hydraulic pumps must be set to ON & HI for the landing gear and flaps to function normally.

Altimeters..C+F.................................____SET

FUEL Boost Pumps, Quantity ....#___ON, CHECKED

Maintain lateral fuel balance by crossfeeding as required.

Landing Data, Bugs ....C+F..................... CHECKED, SET

Target speed will be flaps 28° V_{REF} plus wind additive (minimum 10 knots for go-around capability). The wind additive is ½ steady state wind, plus all the gust, not to exceed an additive of 20 knots.

SEAT BELTS Switch...ON

Pressurization & Anti-Ice..SET

Approach Briefing, Harness.. COMPLETE, ON

A normal approach briefing should be accomplished as early as practical. The autopilot will not be used for approach with an engine out and use of autothrottles is not recommended. Avoid getting low on short final.

When landing is assured, the rudder trim must be centered (no later than nose gear touchdown). After spoiler deployment and nose gear touchdown, deploy both engine reversers and use reverse thrust cautiously. Directional control should be maintained with rudder and differential braking, not by use of asymmetric reverse thrust. If directional control problems arise, return throttles to forward idle.

(Continued)

Go-Around Procedure..REVIEW

Note: Recommend coordinating straight ahead or simplified climb out instructions in the event of missed approach.

Accomplish a normal flaps 15° go-around except:

- In Mexico City or similar high altitude airports, use flaps 11°.
- Climb at go-around speed on speed cards to 800 feet or obstacle clearance height and perform acceleration and cleanup as described in **GO-AROUND (ONE ENGINE INOP) PROCEDURE**.

- - - - - APPROACH CHECKLIST - - - - -

Altimeters & Bugs..............................C+F .... SET

Radios, Course .... IDENTIFIED, INBOUND

VOR/ADF & Marker Switches .... SET

- - - - - WHEN CLEARED FOR THE APPROACH - - - - -

Boost Pumps, FUEL X-FEED Lever .... PUMPS ON, X-FEED OFF

AIR COND SHUTOFF Switch...AUTO

TRI ....GA

- - - - - LANDING CHECKLIST - - - - -

Gear...C+F ....DOWN, 3 GREEN

Ignition .... BOTH / CONTIN

Spoilers, Autobrake System............... LT OUT & ARM, ARM / DISARM

Flaps, Slats ....C+F .... 28°, LAND

Annunciator Panel, Cabin PA ....CHECKED, COMPLETED

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ONE ENGINE INOPERATIVE APPROACH AND LANDING EXPANDED CHECKLIST

Plan a flaps 28° landing with final approach flown at V_{REF} + 10 for go-around capability. After **ENGINE FAILURE/FIRE CHECKLIST** is complete, use both throttles together for the remainder of the flight. This facilitates TOGA button actuation for go-around, deployment of thrust reversers after landing, and spoiler lever retraction if rejected landing is made after touchdown with left engine inoperative.

Note: All of the following checklists should be accomplished whenever returning for an engine out landing.

- - - - -IN-RANGE CHECKLIST - - - - -

Hydraulics..C+F............ON & HI, CHECKED

WARNING: Hydraulic pumps must be set to ON & HI for the landing gear and flaps to function normally.

Altimeters..C+F.................................____SET

FUEL Boost Pumps, Quantity ....#___ON, CHECKED

Maintain lateral fuel balance by crossfeeding as required.

Landing Data, Bugs ....C+F..................... CHECKED, SET

Target speed will be flaps 28° V_{REF} plus wind additive (minimum 10 knots for go-around capability). The wind additive is ½ steady state wind, plus all the gust, not to exceed an additive of 20 knots.

Example: Reported wind 16 gusting 20, target setting is V_{REF} + 12 knots. Reported wind calm, minimum target setting is V_{REF} + 10.

SEAT BELTS Switch..ON

Pressurization & Anti-Ice...SET

Approach Briefing, Harness... COMPLETE, ON

A normal approach briefing should be accomplished as early as practical. The approach itself should be thoroughly reviewed covering courses, frequencies, ADF/VOR switches, altitudes, minimums, timing, and missed approach procedures.

(Continued)

The autopilot will not be used for approach with an engine out. Use of autothrottles is not recommended. ILS configuration: Gear at one dot, flaps 28° at glide path intercept. Non-Precision configuration: gear at approximately 1NM prior to FAF, flaps 28° crossing the FAF. Avoid getting low on short final.

When landing is assured, the rudder trim must be centered (no later than nose gear touchdown). After spoiler deployment and nose gear touchdown, deploy both engine reversers and use reverse thrust cautiously. Directional control should be maintained with rudder and differential braking, not by use of asymmetric reverse thrust. If directional control problems arise, return throttles to forward idle.

Go-Around Procedure..REVIEW

Note: Recommend coordinating straight ahead or simplified climb out instructions in the event of missed approach.

Push throttles forward to get GA power and push TOGA buttons. Apply rudder to keep wings level and raise pitch to follow flight director pitch commands (approximately 13° pitch).

Callouts: "FLAPS 15, CHECK MAX POWER"
"POSITIVE RATE, GEAR UP"

Accomplish a normal flaps 15° go-around except:

- In Mexico City or similar high altitude, airports use flaps 11°.
- Climb at go-around speed on speed cards to 800 feet or obstacle clearance height and perform acceleration and cleanup the same as for **GO-AROUND (ONE ENGINE INOP) PROCEDURE**.

- - - - - APPROACH CHECKLIST - - - - -

Altimeters & Bugs..............................C+F ....____SET

Radios, Course .... IDENTIFIED, INBOUND

VOR/ADF & Marker Switches .... SET

(Continued)

- - - - - WHEN CLEARED FOR THE APPROACH - - - - -

Boost Pumps, FUEL X-FEED Lever .... PUMPS ON, X-FEED OFF

AIR COND SHUTOFF Switch .... AUTO

This will shut down the operating air conditioning pack and allow selection of GA on the TRI.

TRI .... GA

- - - - - LANDING CHECKLIST - - - - -

Gear .... C+F .... DOWN, 3 GREEN

Ignition .... BOTH / CONTIN

This will prevent operation of igniters in the shut down engine.

Spoilers, Autobrake System .... LT OUT & ARM, ARM / DISARM

Flaps, Slats .... C+F .... 28°, LAND

Do not select flaps 40° for landing.

Annunciator, Panel Cabin PA .... CHECKED, COMPLETED

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ONE ENGINE INOPERATIVE APPROACH AND LANDING PROCEDURE

Thorough planning is the key to a safe, unhurried, professional approach. Complete the approach preparations before arrival in the terminal area.

Adequate thrust and normal maneuvering margins are available if the approach is flown as illustrated. Good speed control is mandatory. Allowing airspeed to decrease below that recommended increases drag and could result in inadequate thrust for altitude control. Keep the rudder in trim at all times.

Note: The use of autothrottles is not recommended during one engine inoperative approaches and missed approaches.

ILS - One Engine Inoperative

Recommend trimming the aircraft carefully at flaps 15° maneuver speed to achieve a stable condition prior to landing gear extension. The autopilot will be disconnected prior to glideslope intercept. Landing gear should be extended and LANDING CHECKLIST called for when the glideslope indicator is at one dot below glideslope. At glideslope intercept extend flaps to 28° and slow to target speed (no less than V_{REF} 28° /LAND + 10 knots). Adjust rudder trim as required for approach configuration.

When control wheel is centered, the aircraft should hold heading and have no tendency to roll. If this is not the case, adjust rudder and/or rudder trim as required. Use small control wheel inputs to follow the flight director commands. When stable on final approach, recommend a quick mental review of actions for a missed approach and reminder to PNF to center rudder trim for landing.

When maneuvering visually on short final during a low visibility approach, monitor glideslope or VASI to assure a safe landing. The rudder trim must be centered prior to nose gear touchdown.

Go-Around (One Engine Inop)

PILOT FLYING (PF)	PILOT NOT FLYING (PNF)
Simultaneously apply GA thrust, push TOGA buttons, Call "FLAPS 15° , * CHECK MAX POWER" Manually rotate to F/D pitch command of approximately 13° . Apply rudder to keep wings level.	Move flap/slat handle to 15° detent. Push GA on the TRI if necessary and advance throttle to the GA EPR limit. Monitor engine, instruments, and flight path control.
Call "POSITIVE RATE, GEAR UP, ALTITUDE ARM" when a positive rate of climb is indicated. Maintain wings level and adjust pitch to maintain go-around speed.	Position the landing gear handle UP on command. Pull ALT knob to arm altitude. Monitor engine, instruments, and flight path control.
Climb at Go Around Speed for 28° land from speed cards. Limit bank angle to 15°. (Bank angle up to 25° may be used if required for special procedure.)	Monitor engine, flight instruments, and flight path control. Advise ATC of missed approach.
Call "HEADING SELECT" at 400 feet AGL if a turn is required. (Turn may be started as low as 50 feet AGL if required for special procedure.)	Select correct heading and pull HDG knob into heading select.
At flap retraction altitude: Call "ALTITUDE HOLD, SPEED SINGLE ENGINE CLIMB" Follow FD and accelerate in level flight.	Push ALT HOLD button on FGS panel. Set speed bug to 0°/TO maneuver speed plus twenty-five (25) knots.
At flap retract speed: Call "FLAPS UP" At slat retract speed: Call "SLATS RETRACT"	Move flap/slat handle to retract flaps and slats at appropriate speeds.
(Continued)	

* In Mexico City or similar high altitude airports, use flaps 11°.

PILOT FLYING (PF)	PILOT MONITORING (PM)
At single engine climb speed: Call “IAS, OVERRIDE, MCT” Follow FD and trim aircraft as required.	At single engine climb speed: push IAS button on FGS panel, move AIR COND SHUTOFF switch to OVRD, push MCT button on TRI and check correct EPR is set. Disengage autothrottles.
Call for the AFTER TAKEOFF CHECKLIST. If desired, Call “AUTOPILOT ON”	Engage the autopilot and complete the AFTER TAKEOFF CHECKLIST.
Determine the next course of action.	Advise ATC of the Captain’s intentions.

Pay special attention to fuel crossfeeding requirements when accomplishing the AFTER TAKEOFF CHECKLIST. If returning for another approach, reaccomplish the **ONE ENGINE INOPERATIVE APPROACH AND LANDING CHECKLIST**.

After cleanup and acceleration, the climbout is made at single engine climb speed until pattern altitude or enroute climb clear of all obstructions. Single engine climb speed is below maneuvering speed and bank angle should be limited to 15°. Once level at pattern or enroute altitude (and clear of all obstructions), a maneuvering speed should be attained to restore normal maneuvering ability.

Non-Precision Approach One Engine Inoperative

A non-precision approach with one engine inoperative will be flown using standard constant-rate-descent non-precision approach procedures (see Non-Precision Approaches, Section 4) with the following additions:

- Final approach will be flown with flaps at 28° and target speed at 28° / LND V_{ref} plus wind additive (minimum 10 knots for go-around capability).
- Recommend trimming the aircraft carefully at flaps 15° maneuver speed to achieve a stable condition prior to landing gear extension.
- The autopilot will be disconnected prior to FAF.
- Approximately one mile prior to the FAF call out “GEAR DOWN, LANDING CHECKLIST”. PM extends the landing gear.

- Crossing the FAF, call out "VERTICAL SPEED XXX DOWN, FLAPS 28, TARGET". PM sets the calculated vertical speed down with the pitch control wheel, extends the flaps to 28°, and sets the speed bug to target.
- Adjust rudder trim as required for approach configuration. When control wheel is centered, the aircraft should hold heading and have no tendency to roll. If this is not the case, adjust rudder and/or rudder trim as required. Use small control wheel inputs to follow the flight director commands.
- When stable on final approach, recommend a quick mental review of actions for a missed approach at DDA and reminder to PM to center rudder trim for landing.
- When maneuvering visually on short final during a low visibility approach, monitor altitude over the approach lights and/or VASI to assure a safe landing. The rudder trim must be centered prior to nose gear touchdown.

Engine Failure on Final Approach

If an engine should fail on final approach, the crew has two options: continue the approach in the one engine inoperative landing configuration or execute a missed approach. The Captain's decision of which option to exercise should be made immediately. The Captain's decision should consider the type of approach being flown, the point in the approach where the engine failure occurred, surface conditions, and the increase in stopping distance due to flaps and target speed. If the decision is made to go-around, perform the maneuver as described above in **GO-AROUND (ONE ENGINE INOP).**

In The One Engine Inoperative Landing Configuration

PILOT FLYING (PF)	PILOT MONITORING (PM)
Call "FLAPS 28 , SPEED"	° Set speed bug to 28° $_{REF}$ plus wind additive (minimum 10 knots for go-around capability).
Adjust rudder trim if time permits.	Monitor engine, instruments, and flight path control.
Avoid getting low and slow on approach, make normal landing.	Assure rudder trim is centered prior to nose gear touchdown.

ENGINE/APU FIRE ON GROUND CHECKLIST

IF Engine Fire:

Fire Warning Bell..SILENCE

FUEL Lever (Affected Engine) .... OFF

ENG FIRE Handle.....................................PULL & ROTATE TO
(Affected Engine) AGENT DISCH 1 AND 2

IF APU Fire:

APU FIRE CONT Switch .... OFF & AGENT ARM

Note: If APU does not shut down, pull **APU CONTROL** circuit breaker on the overhead bus.

APU FIRE AGENT Switch 1..DISCH

APU FIRE AGENT Switch 2..DISCH

APU MASTER Switch.. OFF

Caution: Do not use the aft emergency escape slide to evacuate passengers if an APU fire is suspected.

IF A Potential For Evacuation Exists:

Parking Brake...SET

Tower/Ground...CONTACT

EMER PWR Switch... ON

Flaps .... 28°

Spoilers ....RETRACTED

CAB ALT Control Wheel, Lever.........................FULL AFT (OPEN)
LOCKED DOWN

(Continued)

IF Evacuation is Confirmed Necessary:

FUEL Levers .... OFF

Passenger Evacuation................ "EASY VICTOR, EASY VICTOR"

EMER LTS Switch .... ON

BATT Switch... OFF

ENG Fire Handles...PULL

- - - - - CREW EVACUATION DUTIES - - - - -

Captain: Assist Flight Attendants in forward cabin entry area. Open galley service door if unopened. Ensure all passengers and crew have evacuated the aircraft.

F/O: Deplane with cockpit fire extinguisher and release tail cone exit if unopened. Assist passenger evacuation at wing edge and direct passengers to assembly point.

Observer: If qualified, assist Flight Attendants in passenger evacuation.

* * * *

ENGINE/APU FIRE ON GROUND EXPANDED CHECKLIST

IF Engine Fire:

Fire Warning Bell .... SILENCE

The F/O should silence the bell as soon as possible.

FUEL Lever (Affected Engine) .... OFF

ENG FIRE Handle .... PULL & ROTATE TO
(Affected Engine) AGENT DISCH 1 AND 2

Pull the appropriate ENG FIRE handle to the full aft stop and rotate left, then right to discharge both bottles. A slight increase in force will be felt during the last ¼ inch of aft travel. The handle load should not be relaxed until the respective **AGENT LOW** Light is on.

IF APU Fire:

APU FIRE CONT Switch .... OFF & AGENT ARM

Note: If APU does not shut down pull APU CONTROL circuit breaker on the overhead bus.

APU FIRE AGENT Switch 1 .... DISCH

Observe **AGENT LOW** illuminate (requires right DC bus).

APU FIRE AGENT Switch 2 .... DISCH

APU MASTER Switch .... OFF

Caution: Do not use the aft emergency escape slide to evacuate passengers if an APU fire is suspected.

If fire light extinguishes during this procedure, it is recommended that fire warning system test be conducted to verify fire detection systems functioning normally. Assure crash/fire/rescue coverage for taxiing.

IF A Potential For Evacuation Exists:

Parking Brake .... SET

Tower / Ground .... CONTACT

Advise tower and/or ground crew of abnormal airplane conditions, possibility of evacuation, and planned evacuation routes.

(Continued)

EMER PWR Switch .... **ON**

This assures an uninterrupted power source for the Captain's evacuation PA through the handset.

Flaps .... **28°**

This aids in overwing passenger evacuation.

Spoilers .... **RETRACTED**

This lowers the spoiler panels to prevent interference with passenger evacuation.

CAB ALT Control Wheel, Lever .... **FULL AFT (OPEN), LOCKED DOWN**

This insures aircraft is depressurized for operation of exits.

IF Evacuation is Confirmed Necessary:

FUEL Levers .... **OFF**

Passenger Evacuation .... **"EASY VIC TOR, EASY VICTOR"**

Note: If evacuation routes must be restricted, advise Flight Attendants of the correct routes prior to Easy Victor call.

The Captain shall order the evacuation in the following manner: "THIS IS THE CAPTAIN (state the useable exits) EASY VICTOR, EASY VICTOR".

EMER LTS Switch .... **ON**

BATT Switch .... **OFF**

ENG Fire Handles .... **PULL**

- - - - - CREW EVACUATION DUTIES - - - - -

Captain: Assist Flight Attendants in forward cabin entry area. Open galley service door if unopened. Ensure all passengers and crew have evacuated the aircraft.

F/O: Deplane with cockpit fire extinguisher and release tail cone exit if unopened. Assist passenger evacuation at wing edge and direct passengers to assembly point.

Observer: If qualified, assist Flight Attendants in passenger evacuation.

* * * *

REJECTED TAKEOFF CHECKLIST

Tower/Ground..NOTIFY

Passenger PA..........................."REMAIN SEATED, REMAIN SEATED"

IF Takeoff Rejected for Engine Fire:

Fire Warning Bell...SILENCE

FUEL Lever (Affected Engine) ....OFF

ENG FIRE Handle ....PULL & ROTATE TO
(Affected Engine) AGENT DISCH 1 AND 2

IF Takeoff Rejected for APU Fire:

APU FIRE CONT Switch .... OFF & AGENT ARM

Note: If APU does not shut down pull APU CONTROL circuit breaker on the overhead bus.

APU FIRE AGENT Switch 1.. DISCH

APU FIRE AGENT Switch 2.. DISCH

APU MASTER Switch ....OFF

Caution: Do not use the aft emergency escape slide to evacuate passengers if an APU fire is suspected.

IF Potential For Evacuation Exists:

Parking Brake.. SET

Tower / Ground ....CONTACT

EMER PWR Switch ....ON

Flaps .... 28°

Spoilers ....RETRACTED

CAB ALT Control Wheel, Lever ....FULL AFT (OPEN),
LOCKED DOWN

(Continued)

IF Evacuation Is Confirmed Necessary:

FUEL Levers .... OFF
Passenger Evacuation..... "EASY VICTOR, EASY VICTOR"

EMER LTS Switch .... ON
BATT Switch.. OFF
ENG Fire Handles...PULL

- - - - - CREW EVACUATION DUTIES - - - - -

Captain: Assist Flight Attendants in forward cabin entry area. Open galley service door if unopened. Ensure all passengers and crew have evacuated the aircraft.

OR

F/O: Deplane with cockpit fire extinguisher and release tail cone exit if unopened. Assist passenger evacuation at wing edge and direct passengers to assembly point.

Observer: If qualified, assist Flight Attendants in passenger evacuation.

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IF Evacuation Is Not Necessary:

EMER PWR Switch.. OFF
Continue at ❶

IF Emergency Evacuation Is Not Required:

❶ Identify malfunction and accomplish appropriate checklist, as required.

(Continued)

- - - - - AFTER PROBLEM IS STABILIZED - - - - -

Captain should make a "reassurance PA" to the passengers. Do not taxi until the Flight Attendants verify all passengers are seated and all doors/exits are closed.

After Landing Checklist .... ACCOMPLISH

Note: If tire damage is suspected, do not retract flaps.

Note: Prior to subsequent takeoff, re-accomplish all normal departure checklists beginning with the BEFORE START checklist.

Brake Temperatures .... MONITOR

Note: Do not set parking brake if temperature is above 300°C.

IF Above 205°C But Less Than 400°C (305°C for MD-83):

Allow brakes to cool until temperature is below 205°C before next takeoff.

OR

* * * *

IF Above 400°C (305°C for MD-83) And/Or **OVHT** Light Is On:

WARNING: Keep all personnel clear of main landing gear. If a 400°C (305°C for MD-83) temperature exists for approximately 5 minutes, wheel fuse plugs may activate and deflate the tires. Brakes, wheels, and tires will require maintenance inspection before next flight.

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REJECTED TAKEOFF EXPANDED CHECKLIST

Tower/Ground..NOTIFY

PASSENGER PA ...."REMAIN SEATED, REMAIN SEATED"

Advise passengers to remain seated unless immediate evacuation is required.

IF Takeoff Rejected for Engine Fire:

Fire Warning Bell...SILENCE

The F/O should silence the bell as soon as possible.

FUEL Lever (Affected Engine)...OFF

ENG FIRE Handle....................................PULL & ROTATE TO
(Affected Engine) AGENT DISCH 1 AND 2

Pull the appropriate ENG FIRE handle to the full aft stop and rotate left, then right to discharge both bottles. A slight increase in force will be felt during the last ¼ inch of aft travel. The handle load should not be relaxed until the respective **AGENT LOW** Light is on.

IF Takeoff Rejected for APU Fire:

APU FIRE CONT Switch ....OFF & AGENT ARM

Note: If APU does not shutdown, pull APU CONTROL circuit breaker on the overhead bus.

APU FIRE AGENT Switch 1... DISCH

Observe **AGENT LOW** illuminate (requires right DC bus).

APU FIRE AGENT Switch 2... DISCH

APU MASTER Switch ....OFF

Caution: Do not use the aft emergency escape slide to evacuate passengers if an APU fire is suspected.

If fire light extinguishes during this procedure, it is recommended that a fire warning system test be conducted to verify fire detection system is functioning normally. Assure crash/fire/rescue coverage for taxiing.

(Continued)

IF Potential For Evacuation Exists:

Parking Brake..**SET**

Tower/Ground..**CONTACT**

Advise tower and/or ground crew of abnormal airplane conditions, possibility of evacuation, and planned evacuation routes.

EMER PWR Switch..**ON**

This assures uninterrupted power source for the Captain's evacuation PA through the handset.

Flaps..**28°**

This aids in overwing passenger evacuation.

Spoilers..**RETRACTED**

This lowers the spoiler panels to prevent interference with passenger evacuation.

CAB ALT Control Wheel, Lever.................**FULL AFT (OPEN), LOCKED DOWN**

This insures aircraft is depressurized for operation of exits.

IF Evacuation is Confirmed Necessary:

FUEL Levers..**OFF**

Passenger Evacuation....**"EASY VICTOR, EASY VICTOR"**

Note: If evacuation routes must be restricted, advise Flight Attendants of the correct routes prior to Easy Victor call.

OR

The Captain shall order the evacuation in the following manner: "THIS IS THE CAPTAIN (state the useable exits) EASY VICTOR, EASY VICTOR".

EMER LTS Switch..**ON**

BATT Switch..**OFF**

ENG Fire Handles..**PULL**

(Continued)

- - - - - CREW EVACUATION DUTIES - - - - -

Captain: Assist Flight Attendants in forward cabin entry area. Open galley service door if unopened. Ensure all passengers and crew have evacuated the aircraft.

F/O: Deplane with cockpit fire extinguisher and release tail cone exit if unopened. Assist passenger evacuation at wing edge and direct passengers to assembly point.

Observer: If qualified, assist Flight Attendants in passenger evacuation.

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IF Evacuation is Not Necessary:

EMER PWR Switch.. OFF

Continue at ❶

IF Emergency Evacuation Is Not Required:

❶ Identify malfunction and accomplish appropriate checklist, as required.

- - - - - AFTER PROBLEM IS STABILIZED - - - - -

Captain should make a "reassurance PA" to the passengers. Do not taxi until the Flight Attendants verify all passengers are seated and all doors/exits are closed.

After Landing Checklist ....ACCOMPLISH

Note: If tire damage is suspected, do not retract flaps.

Note: Prior to subsequent takeoff, re-accomplish all normal departure checklists beginning with the BEFORE START checklist.

Brake Temperatures..MONITOR

Note: Do not set parking brake if temperature is above 300°C.

IF Above 205°C But Less Than 400°C (305°C for MD-83):

Allow brakes to cool until temperature is below 205°C before next takeoff.

OR

* * * *

IF Above 400°C (305°C for MD-83) And/Or **OVHT** Light Is On:

WARNING: Keep all personnel clear of main landing gear. If a 400°C (305°C for MD-83) temperature exists for approximately 5 minutes, wheel fuse plugs may activate and deflate the tires. Brakes, wheels, and tires will require maintenance inspection before next flight.

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REJECTED TAKEOFF PROCEDURE

A Rejected Takeoff (RTO) is a maneuver performed during the takeoff roll to expeditiously stop the aircraft on the runway.

The Captain is responsible for making the rejected takeoff decision and performing the rejected takeoff maneuver. The First Officer must monitor all takeoffs for any abnormality which might be cause for rejecting a takeoff, and be prepared to act in the event the Captain becomes incapacitated.

The rejected takeoff decision must be made, and (if rejecting) the rejected takeoff maneuver initiated, before reaching V_1. The following table lists reject criteria for the low speed portion (below 100 knots) and high speed portion (above 100 knots) of takeoff roll.

REJECTED TAKEOFF CONSIDERATIONS	
BELOW 100 KNOTS	**ABOVE 100 KNOTS**
Engine Failure/Fire Unsafe Configuration Unsafe/Unable to Fly Cabin Smoke/Fire System Failure Unusual Noise or Vibration Tire Failure Abnormal Acceleration Windshear Warning	Engine Failure Unsafe Configuration Unsafe/Unable to Fly • Maximum braking required to a full stop • The aircraft will remain on the runway until completion of the **REJECTED TAKEOFF CHECKLIST**

When the First Officer is making the takeoff, (s)he will place both hands on the yoke after initially setting takeoff power. The Captain will then place his/her hand on the throttles and will be prepared to perform the rejected takeoff maneuver, if required.

During the takeoff roll, the PM should monitor all instruments and call out any abnormality which might be cause for rejecting a takeoff. Above 100 knots, it is recommended to call out only “POWER LOSS” for an engine failure, or call an abnormality that would render the aircraft unsafe for flight.

If the Captain initiates a reject, (s)he will clearly and loudly announce, “REJECT”. In the event of a rejected takeoff, the First Officer will relinquish control of the aircraft to the Captain as soon as (s)he hears the “REJECT” callout. The First Officer will call out “SPOILERS”, as soon as (s)he realizes the Captain is performing a rejected takeoff, to insure that the spoilers are deployed.

(Continued)

The First Officer should push the control column slightly forward of its neutral position to aid in keeping the nosewheel firmly on the ground (avoid placing the column full forward where excessive down elevator will reduce the weight on the main gear) and ensure that proper aileron control input is maintained. As soon as conditions permit, the First Officer should notify ATC of the rejected takeoff, and make a "REMAIN SEATED" announcement to the cabin.

Low Speed Reject

Prior to reaching 100 knots, it is both logical and appropriate for the Captain to reject for the low speed items in the above table. If the reject is initiated prior to 100 knots, the Captain should close the throttles, use manual braking (avoid unnecessary use of autobraking in the T.O. mode), ensure ground spoiler deployment, and use reverse thrust as necessary to bring the aircraft to a stop.

Note: Autobraking will commence with deployment of the spoilers. Below approximately 70 KIAS minimum braking is applied, above this speed maximum braking is applied with no time delay. Pilot takeover of braking occurs when the brake pedals are depressed beyond 25% travel, or either throttle is advanced beyond 22° travel.

High Speed Reject

As speed increases above 100 knots and approaches V_1 on a runway limited takeoff, the reject maneuver becomes more critical. The Captain should limit his/her reject options to engine failure, unsafe configuration, or any adverse condition significantly affecting the safety of flight.

Caution: Rejecting above 100 knots can be far more hazardous than continuing the takeoff if the aircraft is capable of safe flight.

WARNING: On a wet or slippery runway, or takeoff at or near maximum runway limit weight, a rejected takeoff at or near V_1 will require MAXIMUM use of all deceleration devices until reaching a full stop.

Spoilers must be deployed. Autobrakes (if installed) should be allowed to stop the aircraft. If autobrakes are not installed (or inadvertently disconnected) brakes should be applied manually to maximum possible brake pedal deflection. Reverse thrust should be applied up to takeoff EPR if directional control and runway conditions warrant.

Caution: Reverse thrust at high EPR settings can "blank out" the rudder significantly reducing rudder effectiveness. Should directional control become a problem, reduce reverse thrust to reverse idle (or forward idle if required), regain directional control, and re-apply reverse thrust as necessary.

Maintain directional control with nose wheel steering supplemented if necessary by differential braking. Do not use differential reverse thrust to maintain directional control.

REJECTED TAKEOFF MANEUVER	
Captain	**First Officer**
Call "REJECT," take control of aircraft (if necessary).	Relinquish control of aircraft (if necessary) and call "SPOILERS".
WITHOUT AUTOBRAKES Throttles .... CLOSED Autothrottles .... DISCONNECT Brakes .... APPLY Spoilers .... UP, AFT, & UP Reverse Thrust .... APPLY WITH AUTOBRAKES Throttles .... CLOSED Reverse Thrust .... APPLY Spoilers ..... CHECK DEPLOYED If not deployed, Captain should manually move the spoiler handle aft and up to lock. Autobraking .... CONFIRM	Confirm both engines are at idle (spooled down) or in reverse. If an engine remains at high forward thrust it must be shut down with the fuel lever. Hold forward pressure on the control column and ensure proper aileron control input is maintained. Confirm spoilers are deployed. Advise ATC of the reject.
Call for **REJECTED TAKEOFF CHECKLIST** after aircraft is stopped. Coordinate actions of ATC, Emergency Response Teams, Flight Attendants, and Passengers.	Make "REMAIN SEATED" PA and accomplish **REJECTED TAKEOFF CHECKLIST** after aircraft is stopped.

(Continued)

If the takeoff is rejected above 100 knots, the aircraft will remain on the runway until the completion of the **REJECTED TAKEOFF CHECKLIST**. If the Captain determines that the situation requires an evacuation, the Captain will:

- Call for the **EVACUATION CHECKLIST** (the evacuation checklist is "built in" to the rejected takeoff checklist. It is not necessary to refer to the separate emergency evacuation checklist).
- Make the “EASY VICTOR, EASY VICTOR” command when appropriate.
- Ensure the checklist has been completed.

* * * *

ELECTRICAL FIRE / SMOKE OF UNKNOWN ORIGIN CHECKLIST

Caution: After completing this procedure, if it has not or cannot be visibly verified that the source of the smoke has been eliminated, land immediately at the nearest suitable airport even though the smoke may be dissipating.

Oxygen Masks and Goggles .... ON, 100%, EMERGENCY

Note: Use emergency position of oxygen regulator as required to keep mask and goggles clear of smoke.

RADIO RACK Switch .... VENTURI

CABIN ALT Control Lever .... DOWN, MANUAL

EMER PWR Switch .... ON, CHECK

IF Emergency Power Check Is Abnormal:

Continue checklist at ❶

IF Emergency Power Check Is Normal:

L & R GEN and APU L & R BUS Switches .... OFF

IF Smoke Decreases:

OR

IF Nearest Suitable Airport is Within 30 Minutes:

Proceed directly to airport and land. Refer to **FLIGHT ON EMERGENCY POWER CHECKLIST**, this section.

Caution: Depressurize cabin prior to landing. Manual pressurization control forces may be high, apply force as required.

OR

* * * *

IF Nearest Suitable Airport Not Within 30 Minutes:

AC & DC BUS X-TIE Switches .... OPEN

R GEN AND APU R BUS Switches ..... ON, CHECK

(Continued)

IF Smoke Does Not Reappear:

EMER PWR Switch ....OFF

DFGC 2 may be used. Land as soon as practicable.

* * * *

OR

IF Smoke Reappears:

L GEN AND APU L BUS Switches...........ON, CHECK

R GEN AND APU R BUS Switches ....OFF

EMER PWR Switch ....OFF

Land as soon as practicable.

* * * *

IF Smoke Increases Or Persists :

L & R GEN Switches ....ON, CHECK

❶ **CABIN ALT Control Lever ....AUTO**

EMER LTS Switch.. OFF

Pull the following circuit breakers:

Overhead Panel, Battery Direct Bus:

Charger & Transfer Relay	C-16(or 15)
Battery Relay	C-17(or 16)
Emergency Inverter	C-18(or 17)

Upper & Lower EPC (behind Captain):

Alternate Emer AC Bus Feed	K-07
Emer AC Bus Feed	L-08
DC Transfer Bus Feed	N-36
Emergency DC Bus Feed	N-37

EMER PWR Switch .... OFF

BATT Switch.. OFF

Note: APU, if running, will shut down.

BATTERY CHARGER Circuit Breaker .... PULL
(Left Console, Upper Left Corner)

(Continued)

IF Smoke Increases Or Persists:

Reset the following circuit breakers:

Alternate Emer AC Bus Feed	K-07
Emer AC Bus Feed	L-08
DC Transfer Bus Feed	N-36
Emergency DC Bus Feed	N-37

Captain's flight instruments will be restored. Land as soon as possible.

* * * *

OR

IF Smoke Decreases:

DC TRANSFER BUS FEED Circuit Breaker............RESET

IF Smoke Does Not Reappear:

Land as soon as practicable.

* * * *

OR

IF Smoke Reappears:

DC TRANSFER BUS FEED Circuit Breaker....... PULL

Reset the following circuit breakers:

Alternate Emer AC Bus Feed	K-07
Emer AC Bus Feed	L-08
Emergency DC Bus Feed	N-37

EMER LTS Switch... ARM

Land as soon as practicable.

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ELECTRICAL FIRE / SMOKE OF UNKNOWN ORIGIN EXPANDED CHECKLIST

Caution: After completing this procedure, if it has not or cannot be visibly verified that the source of the smoke has been eliminated, land immediately at the nearest suitable airport even though the smoke may be dissipating.

Oxygen Masks and Goggles............................ON, 100%, EMERGENCY

Don oxygen mask and assure tight fit to prevent inhalation of toxic fumes. If required, don goggles and fit loosely to allow some oxygen flow through them for smoke removal.

Note: Use emergency position of oxygen regulator as required to keep mask and goggles clear of smoke.

RADIO RACK Switch .... VENTURI

This will open venturi valve and assure an effective path for smoke removal when normal electrical power is removed.

CABIN ALT Control Lever... DOWN, MANUAL

Cabin pressure must be maintained manually when normal electrical power is removed. Considerable force may be required to move the outflow valve with the manual control.

EMER PWR Switch...ON, CHECK

Check for normal emergency power check indications of: battery voltage and amperage; EMER PWR IN USE light on, AC & DC EMER BUS OFF lights off; and operation of Captain's flight instruments.

IF Emergency Power Check Is Abnormal:

Continue checklist at ❶

IF Emergency Power Check Is Normal:

L & R GEN and APU L & R BUS Switches .... OFF

This removes power from all buses except the Battery Direct, Battery, DC Transfer, and Emergency AC & DC busses. AC manual temperature control must be used. Engines are suction feeding, make slow and deliberate throttle movements.

(Continued)

IF Smoke Decreases:

Problem is in the normal AC & DC power system.

IF Nearest Suitable Airport is Within 30 Minutes:

Proceed directly to airport and land. Refer to **FLIGHT ON EMERGENCY POWER CHECKLIST**, this section.

Caution: Depressurize cabin prior to landing. Manual pressurization control forces may be high, apply force as required.

* * * *

OR

IF Nearest Suitable Airport Not Within 30 Minutes:

AC & DC BUS X-TIE Switches .... OPEN

R GEN AND APU R BUS Switches .... ON, CHECK

IF Smoke Does Not Reappear:

EMER PWR Switch .... OFF

DFGC 2 may be used. Land as soon as practicable.

* * * *

OR

IF Smoke Reappears:

L GEN AND APU L BUS Switches.. ON, CHECK

R GEN AND APU R BUS Switches .... OFF

EMER PWR Switch .... OFF

Land as soon as practicable.

* * * *

OR

IF Smoke Increases Or Persists:

Problem is in the Battery Direct, Battery, DC Transfer, or Emergency AC & DC busses.

(Continued)

L & R GEN Switches .... ON, CHECK

This re-establishes normal electrical power.

❶ **CABIN ALT Control Lever .... AUTO**

EMER LTS Switch .... OFF

This will prevent unnecessary activation of the emergency exit lights during the next checklist steps.

The next steps will remove power from the Battery Direct, Battery, DC Transfer, and Emergency AC & DC busses.

Pull the following circuit breakers:

Overhead Panel, Battery Direct Bus:

Charger & Transfer Relay	C-16 (or 15)
Battery Relay	C-17 (or 16)
Emergency Inverter	C-18 (or 17)

Upper & Lower EPC (behind Captain):

Alternate Emer AC Bus Feed	K-07
Emer AC Bus Feed	L-08
DC Transfer Bus Feed	N-36
Emergency DC Bus Feed	N-37

EMER PWR Switch .... OFF

BATT Switch .... OFF

Note: APU, if running, will shut down.

BATTERY CHARGER Circuit Breaker .... PULL
(Left Console, Upper Left Corner)

IF Smoke Increases Or Persists:

Reset the following circuit breakers:

Alternate Emer AC Bus Feed	K-07
Emer AC Bus Feed	L-08
DC Transfer Bus Feed	N-36
Emergency DC Bus Feed	N-37

OR

Captain's flight instruments will be restored. Land as soon as possible.

* * * *

(Continued)

IF Smoke Decreases:

DC TRANSFER BUS FEED Circuit Breaker.................. RESET

IF Smoke Does Not Reappear:

Land as soon as practicable.

OR

* * * *

IF Smoke Reappears:

DC TRANSFER BUS FEED Circuit Breaker............. PULL

Reset the following circuit breakers:

Alternate Emer AC Bus Feed	K-07
Emer AC Bus Feed	L-08
Emergency DC Bus Feed	N-37

EMER LTS Switch... ARM

Land as soon as practicable.

* * * *

AIR CONDITIONING SMOKE CHECKLIST

Oxygen Masks and Goggles.............................ON, 100%, EMERGENCY

Note: Use emergency position of oxygen regulator as required to keep mask and goggles clear of smoke.

Caution: The passenger oxygen system will not prevent smoke inhalation by passengers and should not be used except in case of a loss of cabin pressurization.

Note: If airfoil ice protection is required, close one Pneu X-Feed Valve before performing this procedure. If smoke continues after performing this procedure, re-open this Pneu X-Feed Valve, close the other Pneu X-Feed Valve, and repeat the procedure.

IF Smoke Source Is In Cockpit:

L AIR CONDITIONING SUPPLY Switch.............................OFF

IF Smoke Stops:

Continue flight with L AIR CONDITIONING SUPPLY Switch off.

* * * *

OR

IF Smoke Continues:

L AIR CONDITIONING SUPPLY Switch...................AUTO

R AIR CONDITIONING SUPPLY Switch......................OFF

* * * *

OR

IF Smoke Source Is In Cabin:

RECIRCULATING FAN CONTROL
Circuit Breaker (Upper EPC J07) .... PULL

IF Smoke Stops:

Continue flight with RECIRCULATING FAN CONTROL circuit breaker pulled.

* * * *

OR

IF Smoke Continues:

R AIR CONDITIONING SUPPLY Switch......................OFF

Continue flight with R AIR CONDITIONING SUPPLY switch off.

* * * *

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AIR CONDITIONING SMOKE EXPANDED CHECKLIST

Oxygen Masks and Goggles......................ON, 100%, EMERGENCY

Don oxygen mask and assure tight fit to prevent inhalation of toxic fumes. If required, don goggles and fit loosely to allow some oxygen flow through them for smoke removal.

Note: Use emergency position of oxygen regulator as required to keep mask and goggles clear of smoke.

Caution: The passenger oxygen system will not prevent smoke inhalation by passengers and should not be used except in case of a loss of cabin pressurization.

Note: If airfoil ice protection is required, close one Pneu X-Feed Valve before performing this procedure. If smoke continues after performing this procedure, re-open this Pneu X-Feed Valve, close the other Pneu X-Feed Valve, and repeat the procedure.

IF Smoke Source Is In Cockpit:

L AIR CONDITIONING SUPPLY Switch............................OFF

IF Smoke Stops:

Continue flight with L AIR CONDITIONING SUPPLY Switch off.

OR

* * * *

OR

IF Smoke Continues:

L AIR CONDITIONING SUPPLY Switch..................AUTO

R AIR CONDITIONING SUPPLY Switch......................OFF

* * * *

IF Smoke Source Is In Cabin:

RECIRCULATING FAN CONTROL
Circuit Breaker (Upper EPC J07) .... PULL

(Continued)

IF Smoke Stops:

Continue flight with RECIRCULATING FAN CONTROL circuit breaker pulled.

OR

* * * *

IF Smoke Continues:

R AIR CONDITIONING SUPPLY Switch....................... OFF

Continue flight with R AIR CONDITIONING SUPPLY Switch off.

* * * *

COCKPIT SMOKE REMOVAL (UNPRESSURIZED FLIGHT) CHECKLIST

The aircraft must be unpressurized before accomplishing this procedure.

Oxygen Masks and Goggles..............................ON, 100%, EMERGENCY

Don oxygen mask and assure tight fit to prevent inhalation of toxic fumes. If required, don goggles and fit loosely to allow some oxygen flow through them for smoke removal.

Note: Use emergency position of oxygen regulator as required to keep mask and goggles clear of smoke.

Airspeed ....REDUCE TO 165 KIAS

Configure as required for gross weight.

RAM AIR Switch..ON

Either Cockpit Clearview Window ....1/2 TO 2/3 OPEN

Caution: The noise level with the window open will make communications difficult and may prevent the crew from hearing the landing gear warning horn.

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CARGO FIRE INFLIGHT

BTL 1 PUSH TO DISCHARGE Switch..PUSH

Note the time. Second halon bottle must be discharged after 15 minutes. Verify **BTL 1** and appropriate **FWD/MID/AFT** green squib lights extinguish, indicating they have fired. Verify **BTL 1 DSCH** light illuminates after 30 seconds, indicating the bottle has discharged.

WARNING: Start diversion immediately to land at nearest suitable airport and evacuate aircraft. Do not delay. The aircraft must land at the nearest suitable airport within 60 minutes after the activation of BTL 1 when accomplishing the **CARGO FIRE INFLIGHT** procedure.

- - - - - - AFTER 15 MINUTES **- - - - -**

BTL 2 PUSH TO DISCHARGE Switch..PUSH

Verify the **BTL 2** green squib light extinguishes, indicating it has fired. **BTL 2 DSCH** light illuminates after approximately 45 minutes, indicating the bottle has discharged.

Note: Fire suppression will last 60 minutes. Maneuvering the aircraft, acceleration or deceleration, changing the pitch angle, rolling or yawing movements and the like will cause the extinguishant to move inside the cargo compartment. Within limits, frequent movement of the agent may help keep it mixed and evenly distributed, especially if flight must be continued beyond 60 minutes.

WARNING: Do not open the affected cargo compartment door until ground emergency personnel and equipment are prepared to fight the cargo compartment fire.

* * * *

CARGO FIRE ON GROUND

TOWER / GROUND ....CALL FOR FIRE EQUIPMENT

PARKING BRAKE ....SET

Passengers & Cabin Crew .... EVACUATE

IF Affected Cargo Door is Open:

Ground Personnel ....REMOVE FROM COMPARTMENT

Affected Cargo Door ....CLOSE

BTL 1 PUSH TO DISCHARGE Switch...PUSH

Verify **BTL 1** and appropriate **FWD/MID/AFT** green squib lights extinguish, indicating they have fired. Verify **BTL 1 DSCH** light illuminates after 30 seconds, indicating the bottle has discharged.

- - - - - - AFTER 30 SECONDS **- - - - -**

IF Fire Equipment Has Not Arrived:

BTL 2 PUSH TO DISCHARGE Switch....................................PUSH

Verify the **BTL 2** green squib light extinguishes, indicating it has fired. Fire suppression will last 60 minutes.

WARNING: Do not open the affected cargo compartment door until ground emergency personnel and equipment are prepared to fight the cargo compartment fire.

Cockpit Crew .... EVACUATE

* * * *

CABIN SMOKE / FUME REMOVAL CHECKLIST

WARNING: Do not perform this checklist if there is an active fire in the aircraft. Increased cabin airflow could make the fire worse. Land as soon as possible at the nearest suitable airport.

Caution: If the need to clear the cabin of toxic smoke/fumes is urgent, perform this checklist or land as soon as possible at the nearest suitable airport, whichever provides quickest cabin ventilation.

Note: F/O should accomplish those checklist steps which occur in the cabin.

Oxygen Masks and Goggles......................ON, 100%, EMERGENCY

Note: Use emergency position of oxygen regulator as required to keep mask and goggles clear of smoke.

Caution: The passenger oxygen system will not prevent smoke inhalation by passengers and should not be used except in case of a loss of cabin pressurization.

Combat the smoke or fume source locally if practical.

Cockpit Air Outlets..ALL FULL OPEN

NO SMOK, SEAT BELT Switches ....ON

Descent To 9000 FT (Terrain Permitting)................................START

CABIN PRESSURE LDG ALT Sel Knob ....LDG ALT 10,000 FT

CABIN PRESSURE RATE LIMIT Knob ....MAX RATE

- - - - - WHEN AIRCRAFT IS BELOW 10,000 FT - - - - -

CABIN ALT Control Lever, Wheel ....MAN, DEPRESSURIZED (VALVE OPEN)

Airspeed (Flaps & Slats as required)..........................160 to 250 KIAS

Right Forward Service Door Girt Bar .... DISENGAGE, STOW

Loose Items Within 3 Feet Of The Door.................................... STOW

Passengers ....SEAT BELTS FASTENED

Right Forward Service Door... UNLATCHED

Note: High handle loads are required to unlatch the door. When unlatched, allow door to seek its own position against airstream. The door will remain centered over the opening.

(Continued)

Passenger Aft Entrance Door .... UNLOCK, OPEN

Caution: Do not use emergency exit handle to open aft entrance door, as this action unlocks latches, jettisons tail cone, and inflates escape slide.

Note: Position moveable headrest to up position, covering emergency exit handle. Use normal handle to open, moderately high handle loads are required to unlock door. Door will open inward and airflow will sweep smoke forward.

IF Smoke/Fumes Are Eliminated:

Right Forward Service Door .... CLOSE, LATCH

Note: It may be necessary to pull aft edge of door inward slightly to engage latch properly.

Right Forward Service Door Girt Bar........................... ENGAGE

OR

Passenger Aft Entrance Door............................. CLOSE, LATCH

Note: Position moveable headrest to down position, exposing the emergency exit handle.

* * * *

IF Smoke/Fumes Are Not Eliminated:

Land as soon as practical. Determine advisability and capability of closing right forward service door and engaging girt bar. If unsuccessful, plan to use other passenger exits in event emergency evacuation is required.

* * * *

CABIN SMOKE/FUME REMOVAL EXPANDED CHECKLIST

WARNING: Do not perform this checklist if there is an active fire in the aircraft. Increased cabin airflow could make the fire worse. Land as soon as possible at the nearest suitable airport.

Caution: If the need to clear the cabin of toxic smoke/fumes is urgent, perform this checklist or land as soon as possible at the nearest suitable airport, whichever provides quickest cabin ventilation.

Note: F/O should accomplish those checklist steps which occur in the cabin.

Oxygen Masks and Goggles......................ON, 100%, EMERGENCY

Don oxygen mask and assure tight fit to prevent inhalation of toxic fumes. If required, don goggles and fit loosely to allow some oxygen flow through them for smoke removal.

Note: Use emergency position of oxygen regulator as required to keep mask and goggles clear of smoke.

Caution: The passenger oxygen system will not prevent smoke inhalation by passengers and should not be used except in case of a loss of cabin pressurization.

Combat the smoke or fume source locally if practical.

Cockpit Air Outlets..ALL FULL OPEN

NO SMOK, SEAT BELT Switches ....ON

Descent To 9000 FT (Terrain Permitting)................................START

CABIN PRESSURE LDG ALT Sel Knob ....LDG ALT 10,000 FT

CABIN PRESSURE RATE LIMIT Knob........................MAX RATE

- - - - - WHEN AIRCRAFT IS BELOW 10,000 FT - - - - -

CABIN ALT Control Lever, Wheel ....MAN, DEPRESSURIZED (VALVE OPEN)

Airspeed (Flaps & Slats as required)..........................160 to 250 KIAS

Right Forward Service Door Girt Bar .... DISENGAGE, STOW

Loose Items Within 3 Feet Of The Door.................................... STOW

Passengers .... SEAT BELTS FASTENED

(Continued)

Right Forward Service Door.. UNLATCHED

Note: High handle loads are required to unlatch the door. When unlatched, allow door to seek its own position against airstream. The door will remain centered over the opening.

Passenger Aft Entrance Door .... UNLOCK, OPEN

Caution: Do not use emergency exit handle to open aft entrance door, as this action unlocks latches, jettisons tail cone, and inflates escape slide.

Note: Position moveable headrest to up position, covering emergency exit handle. Use normal handle to open, moderately high handle loads are required to unlock door. Door will open inward and airflow will sweep smoke forward.

IF Smoke/Fumes Are Eliminated:

Right Forward Service Door.............................. CLOSE, LATCH

Note: It may be necessary to pull aft edge of door inward slightly to engage latch properly.

OR

Right Forward Service Door Girt Bar........................... ENGAGE

Passenger Aft Entrance Door............................. CLOSE, LATCH

Note: Position moveable headrest to down position, exposing the emergency exit handle.

* * * *

IF Smoke/Fumes Are Not Eliminated:

Land as soon as practical. Determine advisability and capability of closing right forward service door and engaging girt bar. If unsuccessful, plan to use other passenger exits in event emergency evacuation is required.

* * * *

(Continued)

LAVATORY SMOKE DETECTOR ACTIVATION

Lavatory smoke detector activation is alerted to the Cabin and Cockpit crew by a constant sounding of the cabin chime.

WARNING: Treat all lavatory smoke detector activations as possible fires.

Dispatch a flight attendant with a fire extinguisher to:

Locate the correct lavatory and perform a visual inspection;

Notify the Captain immediately if fire or smoke are present;

Fight the fire if necessary.

IF Smoke/Fire Exists:

NO SMOK, SEAT BELT Switches ....ON

Lavatory Circuit Breakers.. PULL

Toilet Flushing Motors:	Left Console, Lower Right Corner
Mirror Lights:	Left Console, Lower Middle
Water Heaters:	X-28, X-29, Z-28
Razor Outlets:	L-06, L-07

OR

Call System Circuit Breaker (P-37 or P-38)........................ PULL

If the source of the smoke/fire cannot be extinguished, declare an emergency, land at the nearest suitable airfield, and accomplish an emergency evacuation if required.

* * * *

IF Smoke/Fire Does Not Exist (False Activation):

Call System Circuit Breaker.................................PULL, WAIT 2
(P-37 or P-38) MINUTES, RESET

IF Warning Recurs:

Smoke Detector (Affected Unit)..................... DISCONNECT

Some aircraft have a red guarded Smoke Detector switch for each lavatory located at the adjacent Flight Attendant panel. Move the switch to the OFF position.

(Continued)

If the red guarded smoke detector switch is not installed, locate the smoke detector unit under the sink area or in a compartment between the sink and toilet. Disconnect the cannon plug located on the smoke detector.

The affected lavatory must be locked and not used for the remainder of the flight. Make a logbook entry.

* * * *

APU FIRE (INFLIGHT) CHECKLIST

APU FIRE CONT Switch .... OFF & AGENT ARM

Note: If APU does not shut down, pull APU CONTROL circuit breaker (overhead panel - battery bus).

APU FIRE AGENT Switch 1 OR 2 ....DISCH

Check respective **AGENT LOW** light is on.

IF APU FIRE Light Is On After 30 Seconds:

Remaining APU FIRE AGENT Switch ....DISCH

APU MASTER Switch ....OFF

APU CONTROL Circuit Breaker (Battery Bus).............................. PULL

APU FIRE CONT Switch .... NORM

APU DOORS Switch..AUTO

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APU FIRE (INFLIGHT)
EXPANDED CHECKLIST

APU FIRE CONT Switch .... OFF & AGENT ARM

Shuts off APU and completes circuit to APU fire agent switches.

Note: If APU does not shut down, pull APU CONTROL circuit breaker (overhead panel - battery bus).

APU FIRE AGENT Switch 1 OR 2 ....DISCH

Check respective **AGENT LOW** light is on. Requires normal power.

IF **APU FIRE** Light Is On After 30 Seconds:

Remaining APU FIRE AGENT Switch ....DISCH

APU MASTER Switch .... OFF

This will assure fuel is not sent to the APU after the next step.

APU CONTROL Circuit Breaker (Battery Bus)............................... PULL

This will prevent inadvertent starting of the APU.

APU FIRE CONT Switch .... NORM

This will prevent inadvertent discharge of remaining fire agent.

APU DOORS Switch..AUTO

This closes the APU doors.

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LOSS OF PRESSURIZATION / RAPID DECOMPRESSION / EMERGENCY DESCENT CHECKLIST

IMMEDIATE ACTION

Oxygen Masks, Regulators....................ON, 100%
Crew Communications....................ESTABLISHED
NO SMOK, SEAT BELTS switches....................ON

SECONDARY ACTION

PNF accomplish or verify and advise when completed:

CABIN ALT Control
Lever, Wheel....................LOCKED DOWN, FULL FORWARD

Note: Manual control forces may be high. Apply force as required.

PNEU X-FEED VALVE Levers....................CLOSE

AIR CONDITIONING SUPPLY Switches....................AUTO

RADIO RACK Switch....................FAN

IF Cabin Altitude Is Below 14,000 Feet and Controllable:

CABIN ALT Control Lever, Wheel....................AS REQUIRED

Return cabin pressure to that appropriate for flight altitude. Descend as necessary to maintain cabin altitude below 14,000 feet.

* * * *

OR

IF Cabin Altitude Is At Or Above 14,000 Feet Or Not Controllable:

Perform an emergency descent. Advise F/A's as soon as possible.

Throttles....................CLOSED

Speedbrakes....................EXTEND

Structural Integrity....................DETERMINE

Descent Speed....................ESTABLISH

No Structural Damage/No Turbulence: .80-.82M/320-340 KIAS
Structural Damage or Turbulence: .75-.79M/275-285 KIAS

(Continued)

ATC .... ADVISE

Set transponder to 7700 if no contact with ATC.

PAX OXY MASK Switch .... EJECT

Level off Altitude.. SET & ARM

Level off altitude should be a maximum of 14,000 feet or MEA, whichever is higher.

Altimeters.. SET

PA .... ADVISE F/A'S OF SITUATION

- - - - - AFTER LEVEL OFF - - - - -

Speed brakes ....RETRACTED

Crew Oxygen Regulators .... AS REQUIRED

Flight crew must use oxygen when cabin altitude is above 10,000 feet. To conserve oxygen, position **NORMAL/100%** selector to **NORMAL**.

PA .... ADVISE F/A'S OXYGEN NO LONGER REQUIRED

* * * *

LOSS OF PRESSURIZATION / RAPID DECOMPRESSION / EMERGENCY DESCENT EXPANDED CHECKLIST

A rapid loss of cabin pressure, or control of pressurization at flight altitudes above 14,000 feet MSL can quickly lead to a situation requiring an immediate descent to a safe cabin altitude. Indications of a pressurization problem: pressure changes sensed by the pilots ears, **FLOW** light on, climb rate on cabin climb gauge, and increasing cab alt pointer/decreasing diff press pointer. The **CABIN ALT** light, 5 second warning horn, and **MASTER WARNING** lights will alert the flight crew when the cabin altitude exceeds 10,000 feet. On some aircraft, a voice warning will alternate with the warning horn.

IMMEDIATE ACTION

Oxygen Masks, Regulators...ON, 100%
Crew Communications .... ESTABLISHED

Check BOOM / MASK switch to MASK. Use RADIO / INT switch or select INT on audio control panel and use control wheel mic switch to establish cockpit communications. Turn cockpit speakers volume up as required. VHF-1 must be selected to talk to ATC. PA's may be made with the NORMAL / MASK PA switch.

NO SMOK, SEAT BELTS Switches... ON

The AUTO feature (if selected) should turn these signs on if the cabin pressure exceeds 10,000 feet. These switches will be set to ON to assure passengers are seated and smoking materials are extinguished prior to oxygen use.

SECONDARY ACTION

PNF accomplish or verify and advise when completed:

CABIN ALT Control
Lever, Wheel..LOCKED DOWN, FULL FORWARD

Place the cabin altitude controller lever in manual (down) position. Depress and rotate the cabin altitude control wheel forward. Release the wheel when the indicator is at full forward (valve close) position.

Note: Manual control forces may be high. Apply force as required.

(Continued)

PNEU X-FEED VALVE Levers ....CLOSE

This action will minimize the amount of ducting that is pressurized.

AIR CONDITIONING SUPPLY Switches................................AUTO

Provides more pneumatic pressure than HP BLD OFF position.

RADIO RACK Switch ....FAN

Less pneumatic pressure required than VENTURI position.

IF Cabin Altitude Is <u>Below</u> 14,000 Feet and Controllable:

CABIN ALT Control Lever, Wheel.................... AS REQUIRED

Return cabin pressure to that appropriate for flight altitude. If system is borderline, descend as necessary to maintain cabin altitude below 14,000 feet.

OR

* * * *

IF Cabin Altitude Is <u>At Or Above</u> 14,000 Feet Or Not Controllable:

Perform an emergency descent. Advise F/A's as soon as possible.

Throttles ....CLOSED

<u>Note</u>: Autopilot and autothrottles may be used for emergency descent.

Speedbrakes ....EXTEND

Extend speed brakes fully.

Structural Integrity ....DETERMINE

It may be difficult, or impossible, to accurately determine the structural condition of the aircraft. Definite indications of structural compromise include explosion, cargo door light on, and cabin door or window failure.

Descent Speed...ESTABLISH

No Structural Damage/No Turbulence:..80-.82M/320-340 KIAS
Structural Damage or Turbulence: .75-.79M/275-285 KIAS

(Continued)

ATC .... ADVISE

The PNF will advise ATC of the emergency and the beginning of the emergency descent. It is not necessary to delay descent until receiving clearance from ATC. Set transponder to 7700 if no contact with ATC.

PAX OXY MASK Switch.. EJECT

This will back up the automatic system to assure signal is sent to deploy passenger masks. Do not hold in EJECT more than 5 seconds.

Level off Altitude.. SET & ARM

Level off altitude should be a maximum of 14,000 feet or MEA, whichever is higher. Further descent to 10,000 feet or below should be considered if weather, terrain, and fuel permit.

Altimeters .... SET

Set to a local setting below 18,000 feet.

PA .... ADVISE F/A'S OF SITUATION

Advise Flight Attendants they need to be on oxygen until advised otherwise.

- - - - - AFTER LEVEL OFF - - - - -

Speedbrakes ....RETRACTED

Crew Oxygen Regulators .... AS REQUIRED

Flight crew must use oxygen when cabin altitude is above 10,000 feet. To conserve oxygen, position NORMAL / 100% selector to NORMAL.

PA .... ADVISE F/A'S OXYGEN NO LONGER REQUIRED

The new course of action is based on weather, oxygen, fuel remaining, and available airports.

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EMERGENCY DESCENT PROCEDURE

General Considerations

This maneuver is used to bring the aircraft down smoothly to a safe cabin altitude in the minimum time with the least passenger discomfort. It is intended as a specialized case to cover an uncontrollable loss of cabin pressurization. Use of the autopilot is recommended. When it is used for other than pressurization problems or contamination of cabin atmosphere, the oxygen procedures may be omitted.

Don oxygen masks and establish crew communication at the first indication of a loss of cabin pressurization. Verify that cabin pressure is uncontrollable and attempt to determine if there is structural damage. If structural damage is confirmed or suspected, limit airspeed in the descent to current speed or less. If conditions permit, the cabin crew will be advised, on the PA system, of impending rapid descent.

All immediate action items are to be accomplished by memory. Either pilot will call out any items not completed. Perform the entry procedure deliberately and methodically. Do not be distracted from flying the aircraft.

Emergency Descent Maneuver

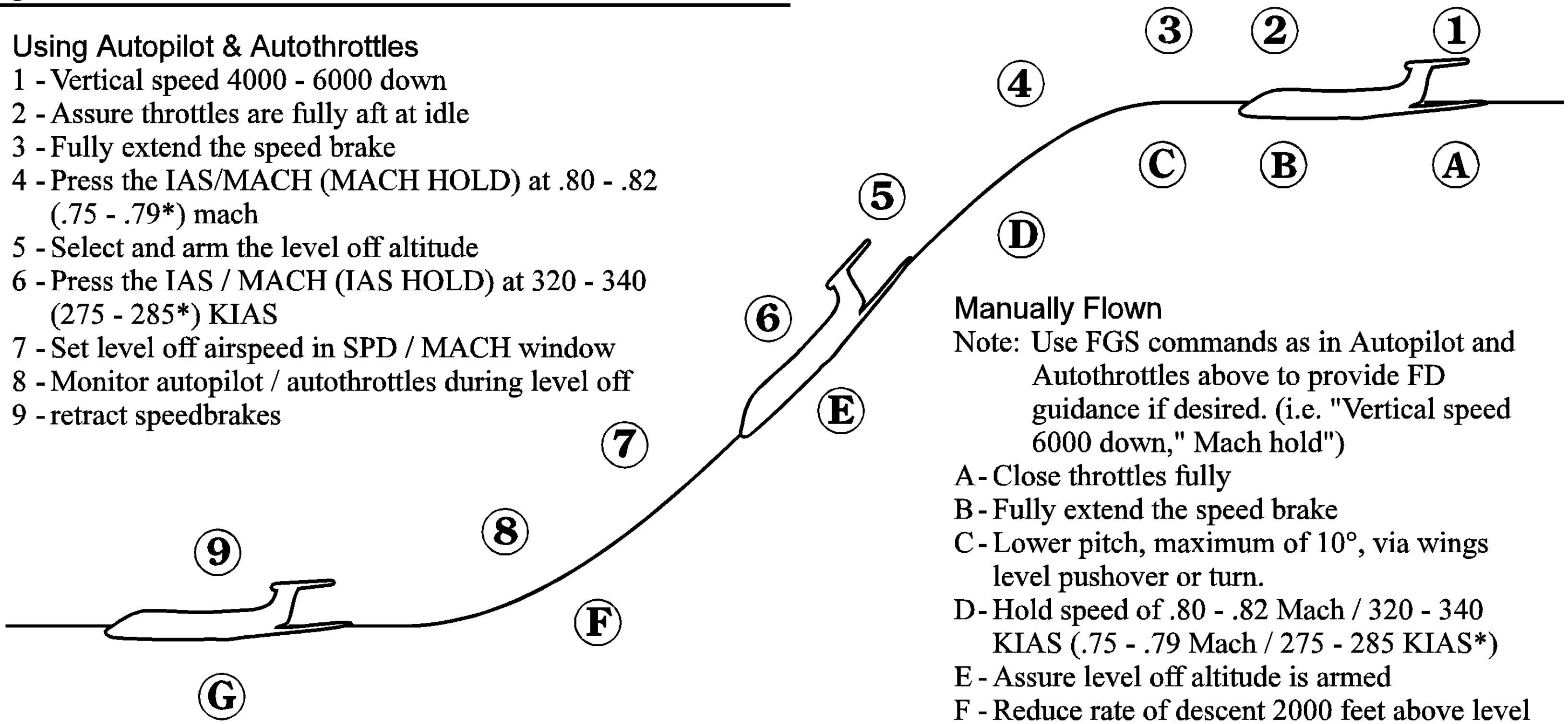
Using Autopilot and Autothrottles

- Rotate the vertical speed wheel to 4000-6000 FPM down.
- Assure throttles are fully aft at idle.
- Fully extend the speed brakes.
- Press the IAS / MACH (MACH HOLD on some aircraft) button when .80-.82 (.75-.79 turbulent air or structural damage) mach is reached.
- Select and arm the level off altitude.
- Press the IAS / MACH (IAS HOLD on some aircraft) button when 320-340 (275-285 turbulent air or structural damage) KIAS is reached (approximately FL 270).
- Set desired level off airspeed into SPD/MACH window.
- Monitor autopilot / autothrottles during level off.
- Retract speedbrakes prior to reaching minimum maneuver speed.

Manually Flown

- Use FGS commands as above to provide FD guidance, if desired. (i.e. “Vertical speed 6000 down”, “Mach hold”).
- Close throttles fully.
- Fully extend the speed brakes.
- Lower pitch to maximum of 10° via wings level pushover or turn.
- Hold speed of .80-.82 Mach/320-340 KIAS (.75-.79 Mach/275-285 KIAS turbulent air or structural damage).
- Assure level off altitude is armed.
- Start reducing rate of descent 2000 feet above level off.
- Retract speed brakes prior to reaching minimum maneuver speed.

(Continued)



Using Autopilot & Autothrottles

1 - Vertical speed 4000 - 6000 down
2 - Assure throttles are fully aft at idle
3 - Fully extend the speed brake
4 - Press the IAS/MACH (MACH HOLD) at .80 - .82 (.75 - .79*) mach
5 - Select and arm the level off altitude
6 - Press the IAS / MACH (IAS HOLD) at 320 - 340 (275 - 285*) KIAS
7 - Set level off airspeed in SPD / MACH window
8 - Monitor autopilot / autothrottles during level off
9 - retract speedbrakes

Manually Flown

Note: Use FGS commands as in Autopilot and Autothrottles above to provide FD guidance if desired. (i.e. "Vertical speed 6000 down," Mach hold")

A - Close throttles fully
B - Fully extend the speed brake
C - Lower pitch, maximum of 10°, via wings level pushover or turn.
D - Hold speed of .80 - .82 Mach / 320 - 340 KIAS (.75 - .79 Mach / 275 - 285 KIAS*)
E - Assure level off altitude is armed
F - Reduce rate of descent 2000 feet above level off
G - Retract speedbrakes

* Descent speed for turbulent air or structural damage

Emergency Descent Profile

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LOSS OF ALL GENERATORS CHECKLIST

EMER PWR Switch..ON

IF Both Engines Have Flamed Out:

IGN Switch .... OVRD

OR Refer to **TWO ENGINE FLAMEOUT**, This Section.

* * * *

IF Both Engines Have Not Flamed Out:

Thunderstorm Lights, Clock...................................... ON, START

Battery Switch...CHECK ON

CABIN ALT Control Lever ....LOCKED DOWN

CKPT & CABIN TEMP Selectors................................ MANUAL

AC BUS X-TIE Switch..OPEN

GALLEY Switch ....OFF

L (or APU) GEN, Then
R (or APU) GEN Switches .... RESET, CHECK, ON (IF NORMAL)

Note: A generator must be reset only once for a given fault.

IF All Generators Fail to Reset:

L & R GEN Switches...OFF

IF APU Is Available For Windmill Start:

APU FIRE CONT Switch.................................... NORM

OR

APU AIR Switch ....OFF

APU MASTER Switch...OFF

APU DOORS Switch ....AUTO

START PUMP Switch ....ON

APU MASTER Switch...... START, RELEASE TO RUN

(Continued)

APU PWR AVAIL Light .... ON

APU L & R BUS Switches (One At a Time) .... ON

IF APU Generator Operation Is Normal:

OR Continue checklist at ❶

IF All Generators Remain Inoperative:

Refer to **FLIGHT ON EMERGENCY POWER**, this section.

* * * *

IF Either Or Both Generators Reset:

AC BUS X-TIE Switch .... AUTO

❶ **EMER PWR Switch .... OFF**

CABIN ALT Control Lever .... AUTO

CKPT & CABIN TEMP Selectors .... AUTO

IF APU Is Available But Not In Operation:

APU .... START

APU PWR AVAIL Light .... ON

APU L & R BUS Switches (One At a Time) .... ON

GALLEY Switch (If Electrical Load Permits) .... ON

IF Only One Generator Is Operating:

Prior to landing,

GALLEY Switch .... OFF

One AIR CONDITIONING SUPPLY Switch .... OFF

* * * *

LOSS OF ALL GENERATORS EXPANDED CHECKLIST

EMER PWR Switch..ON

Note: If emergency power does not come on, reset the Battery Direct bus circuit breaker by pulling up on the door/handle located on the lower left of center pedestal.

The Captain must fly the aircraft due to loss of the First Officers' instruments. Autopilot and stabilizer trim are inoperative.

The cockpit indication of loss of all generators closely resembles a two engine flameout. Immediately verify both engines (N_1 & N_2) are operating normally.

IF Both Engines Have Flamed Out:

IGN Switch .... OVRD

Refer to **TWO ENGINE FLAMEOUT**, this section.

OR

* * * *

IF Both Engines Have Not Flamed Out:

Note: If landing is imminent (time does not allow completion of this checklist), proceed direction to **FLIGHT ON EMERGENCY POWER**, this section.

Thunderstorm Lights, Clock..................................... ON, START

Provides maximum cockpit lighting. If desired, light intensity can be controlled by small flood lights knob. Keep track of time on emergency power (good for approximately 30 minutes).

Battery Switch...CHECK ON

CABIN ALT Control Lever ....LOCKED DOWN

Cabin pressure must be controlled manually.

CKPT & CABIN TEMP Selectors............................... MANUAL

Cockpit & cabin temperature must be controlled manually.

AC BUS X-TIE Switch...OPEN

Prevents connecting excessive load to one generator.

(Continued)

Galley Switch...OFF

Reduces load on electrical system.

L (or APU) GEN, Then
R (or APU) GEN Switches ....RESET, CHECK, ON (IF NORMAL)

Move indicator selector to AC VOLT/FREQ. If voltage and frequency are within normal range, move L GEN (or APU L BUS) switch to ON. Attempt to reset R GEN or APU GEN in same manner.

Note: A generator must be reset only once for a given fault. If fault trips generator after reset, fault should be located and corrected before attempting to place generator on its bus again.

IF All Generators Fail to Reset:

L & R GEN Switches...OFF

IF APU Is Available For Windmill Start:

APU FIRE CONT Switch..................................... NORM

APU AIR Switch...OFF

APU MASTER Switch...OFF

OR

APU DOORS Switch ....AUTO

START PUMP Switch ....ON

APU MASTER Switch...... START, RELEASE TO RUN

APU PWR AVAIL Light..ON

APU L & R BUS Switches (One At a Time)...............ON

IF APU Generator Operation is Normal:

OR Continue checklist at ❶

IF All Generators Remain Inoperative:

Refer to **FLIGHT ON EMERGENCY POWER**, this section.

* * * *

(Continued)

IF Either Or Both Generators Reset:

AC BUS X-TIE Switch..AUTO

If certain electrical faults are suspected or indicated (i.e., **GENERATOR FEEDER FAULT** or **AC CROSSTIE LOCKOUT** light on), consideration should be given to leaving this switch in OPEN and not connecting one generator to both left and right AC busses.

❶ **EMER PWR Switch .... OFF**

CABIN ALT Control Level..AUTO

CKPT & CABIN TEMP Selectors..AUTO

IF APU is Available But Not In Operation:

APU...START

APU PWR AVAIL Light...ON

APU L & R BUS Switches (One At a Time).......................ON

If an electrical fault is suspected or indicated on a bus (i.e., **AC CROSSTIE LOCKOUT** light on), consideration should be given to leaving the APU BUS switch for that side off.

GALLEY Switch (If Electrical Load Permits)..........................ON

IF Only One Generator Is Operating:

Prior to landing,

GALLEY Switch ....OFF

Reduces electrical loads for landing.

One AIR CONDITIONING SUPPLY Switch .... OFF

Keeps ground blower from overloading generator after landing.

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FLIGHT ON EMERGENCY POWER CHECKLIST

Battery Power .... CONSERVE IF ABLE

If in VMC, consider turning emergency power off.

Range...DETERMINE

All fuel in center tank (and aux tanks if installed), is unusable.

Nearest Suitable Airport...DETERMINE

Land at nearest suitable airport. Battery power is good for approximately 30 minutes if batteries are fully charged.

Aircraft Systems Status ....REVIEW

All fuel boost pumps are inoperative.
Horizontal stabilizer is inoperative.
Auto-pressurization in inoperative. Cabin pressure must be manually controlled. Depressurize aircraft prior to landing.
Ice protection: Captains pitot heat is operative. Windshield defog and anti-ice are inoperative, engine anti-ice valves will be in position at time of power loss, airfoil ice protection will be inoperative.
VHF Comm & Nav 1 are operative.
Flight director is inoperative, but command bar remains in view.
Flaps will operate, but indicators are inoperative.
Slats will not extend beyond mid-sealed. (If fully extended at time of power loss, they will remain fully extended). Auto-Slat system and slat position lights are inoperative. Landing gear will operate normally, but indicator lights are inoperative.
Auto ground spoilers are inoperative. Spoilers must be manually deployed.
Anti-skid system is inoperative. Brakes must be manually applied.

Refer to **AIRCRAFT SYSTEMS STATUS DURING FLIGHT ON EMERGENCY POWER**, this section, if time permits.

Pressurization..MANUALLY CONTROL

Manually descend cabin pressurization to equal traffic pattern altitude.

- - - - IN RANGE - - - -

Altimeters..................................C+F .... _____SET

(Continued)

IF Flaps are at 28° or 40° And The Aircraft Is On Speed and Trimmed:
Land with selected flaps.
Continue checklist at ❶

IF Flaps Are At Any Other Setting Or The Aircraft is Not Trimmed:

Land with flaps 15°. Vref is 15°/T.O. maneuver speed increased by increment from the following table.

Note: Use takeoff C.G. if landing C.G. is unknown.

		STABILIZER ANGLE IN DEGREES										
		AND			ANU							
		2	1	0	1	2	3	4	5	6	7	8
C	-.8	40	35	30	25	21	17	14	10	7	4	2
G	0	40	34	29	24	20	16	13	9	6	3	0
%	5	32	27	22	18	14	10	7	4	1	0	0
M	10	24	19	15	11	7	4	1	0	0	0	0
A	15	17	12	8	4	1	0	0	0	0	0	0
C	20	8	4	0	0	0	0	0	0	0	0	0
		SPEED INCREMENT IN KNOTS										

❶ **IF** Icing Conditions Are Encountered For More Than 2 Minutes:

Add 5 knots to all minimum maneuvering speeds. Do not extend flaps beyond 28° / EXT as a decrease in aircraft controllability may result.

Note: If on final approach with flaps 40° / EXT and aircraft in trim at time of electrical loss, flaps may be left at 40°.

Landing Data, Bugs .... C+F......................... CHECKED, SET

CAB ALT Control
Lever, Wheel..LOCKED DOWN
FULLY AFT (OPEN)

Approach Briefing, Harness..COMPLETE, ON

- - - - - APPROACH - - - - -

Altimeters & Bugs.......................... C+F.. SET

VHF NAV-1 Radio, Course .... C+F.......................... I.D., INBOUND

(Continued)

- - - - - LANDING - - - - -

Gear Lever .... C+F.. DOWN

Check nose gear indicator is elevated.

Ignition .... OVRD

Flap / Slat Handle .... C+F..........LANDING FLAP SETTING

Do not reduce approach thrust until landing flare has been initiated and sink rate has been reduced. After main gear touchdown, manually deploy ground spoilers. After nose wheel touchdown, use reverse thrust and manual braking as required.

Annunciator Panel, Cabin PA ....CHECKED, COMPLETED

- - - - - 30 SECONDS PRIOR TO TOUCHDOWN - - - - -

EMER LTS Switch ....ON

* * * *

AIRCRAFT SYSTEMS STATUS DURING FLIGHT ON EMERGENCY POWER	
AIR CONDITIONING / PRESSURIZATION	
OPERATIVE PNEU press gauge / manual temp control / manual press control / air cond flow control valves / air cond regulator valves / max press relief valves / 8th stage bleed air / cabin altimeter/ max diff press gauge / cabin climb ind	INOPERATIVE augmentation valves / AIR COND SHUTOFF system / radio rack fans / ram air valve / cabin press warning light & horn / primary & standby pressurization systems / FLOW light / transfer lockout / auto temp control
APU	
OPERATIVE APU control / door control / fire warning / EGT / oil pressure / oil temp	INOPERATIVE
ELECTRICAL	
OPERATIVE AC EMER bus / DC EMER bus / DC transfer bus* / battery bus* / battery direct bus (* BATT switch must be on)	INOPERATIVE L&R GEN bus / L&R AC bus / L&R DC bus / ground service bus
FIRE WARNING & PROTECTION	
OPERATIVE all fire detection, warning & extinguishing	INOPERATIVE agent low lights
FLIGHT CONTROLS / AUTOFLIGHT	
OPERATIVE primary flight controls / OVRD function of mach trim / flaps / slats (mid only) / speed brakes / ground spoilers (manual only) / aileron & rudder trim	INOPERATIVE stabilizer trim / autopilot trim / stall warning / stick pusher / airspeed warning / flap & slat indicator lights / auto ground spoilers / yaw damper / mach trim / autopilot / autothrotles / autoland
FUEL	
OPERATIVE main tank fuel (suction feed) / DC start pump / crossfeed lever	INOPERATIVE all AC boost pumps / fuel heat / center & aux tank fuel / all fuel gauges & lights
HYDRAULICS / LANDING GEAR / BRAKES	
OPERATIVE engine hyd pumps HI press only / transfer pump (if on at time of electrical power loss) / landing gear with normal extension / nose gear indicator / manual brakes	INOPERATIVE aux hyd pump / transfer pump (if off at time of electrical power loss) / all hyd gauges & lights / landing gear lights & warning horn / anti-skid / autobrakes

(Continued)

AIRCRAFT SYSTEMS STATUS DURING FLIGHT ON EMERGENCY POWER	
ICE & RAIN PROTECTION	
OPERATIVE	INOPERATIVE
Capt pitot heat / engine anti-ice if on at time of electrical power loss	all pitot & vane heaters except Capt / engine anti-ice if off at time of electrical power loss / windshield anti-fog & anti-ice / airfoil anti-ice
INSTRUMENTS / NAVIGATION / COMMUNICATION	
OPERATIVE	INOPERATIVE
Capt HSI, ADI, altimeter, IVSI, airspeed, mach / FO RMI / DG-1 / VG-1 / air data computer-1 / VHF NAV-1 / VHF COMM-1 / glideslope-1 / flight interphone / PA / MAG compass / standby ADI / compass, radio nav, aux vert gyro switching (if installed) / autopilot & autothrottle OFF lights / master warning & caution lights	Capt RMI / FO HSI, ADI, altimeter, IVSI, airspeed, mach / DG-2 / VG-2 / air data computer-2 / VHF NAV-2 / VHF COMM-2&3 / glideslope-2 / ADF-1&2 / DFGC-1&2 / flight directors / all ATS & FGS functions / both FMA's / all digital lights / altitude alert lights & aural warning / DME / PMS / marker beacon / SELCAL / transponder / flight recorder / radar / TCAS / CVR
MISCELLANEOUS	
OPERATIVE	INOPERATIVE
thunderstorm & flood lights / cabin standby lights / emergency exit lights /	normal cockpit lights / normal cabin lights / NO SMOK & SEAT BELTS lights / external aircraft lights, landing lights
POWERPLANT	
OPERATIVE	INOPERATIVE
N1 & N2 RPM / EGT / oil press low lights / pneu press gauge / DC start pump / start valves / ignition / thrust reversers/ ART system & lights	TRI / EPR gauges / oil quantity, temp and press gauges / fuel gauges / hydraulic gauges & lights / thrust reverser indicating lights

SPOILER FLOAT CHECKLIST

IF Rapid Roll Rate Develops During Extension of Flaps Beyond 28°:

FLAP/SLAT Handle ....RETRACT TO 28 / EXT

Adjust speed as required.

* * * *

RUNAWAY STABILIZER CHECKLIST

Caution: A runaway trim condition resulting in the stabilizer trimming to the full NOSE UP position may require establishing a steep bank angle to control pitch.

Caution: Avoid manual pitch inputs until the autopilot is disconnected.

Note: Extended trim operation may result in trim motor thermal shutdown. Trim motor operation may return after sufficient cooling period.

IMMEDIATE ACTION

Autopilot .... DISCONNECT

Control Wheel Trim Switches .... TRIM OPPOSITE DIRECTION OF RUNAWAY

Note: Do not oppose runaway using LONG TRIM handles.

SECONDARY ACTION

IF LONG TRIM Indicator Movement Stops Or Continues Runaway:

STABILIZER TRIM (Red Guarded) Switch .... STOP

ALT LONG TRIM Switch .... RETRIM

OR

PRIMARY LONGITUDINAL TRIM
Circuit Breakers - Left Generator Bus - Row 4 .... PULL

Continue flight using alternate trim system. Autopilot is available.

* * * *

IF LONG TRIM Indicator Movement Reverses:

AUTOPILOT AND ALTERNATE
LONGITUDINAL TRIM Circuit Breakers
D-09,10,11 (D-04, 05, 06/08, 09, 10/10, 11, 12) .... PULL

Continue flight using primary trim system. Autopilot is available, but autotrim function is inoperative. After trimming, autopilot may be engaged, but should be disconnected / retrimmed periodically as needed.

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RUNAWAY STABILIZER EXPANDED CHECKLIST

Caution: A runaway trim condition resulting in the stabilizer trimming to the full NOSE UP position may require establishing a steep bank angle to control pitch.

Caution: Avoid manual pitch inputs until the autopilot is disconnected.

Note: Extended trim operation may result in trim motor thermal shutdown. Trim motor operation may return after sufficient cooling period.

IMMEDIATE ACTION

Autopilot ....DISCONNECT

Control Wheel Trim Switches ....TRIM OPPOSITE DIRECTION OF RUNAWAY

Note: Do not oppose runaway using LONG TRIM handles.

SECONDARY ACTION

IF LONG TRIM Indicator Movement Stops or Continues Runaway:

STABILIZER TRIM (Red Guarded) Switch ....STOP

This switch interrupts power to the primary motor brake release and applies the brake. It does not interrupt electrical power to the primary trim motor and does not affect the alternate trim brake or motor. If the runaway was caused by the primary system, movement of the stabilizer will stop because the motor is not capable of overcoming the brake.

OR

ALT LONG TRIM Switch .... RETRIM

PRIMARY LONGITUDINAL TRIM
Circuit Breakers - Left Generator Bus - Row 4 .... PULL

This will prevent the primary trim motor from overheating. Continue flight using alternate trim system. Autopilot is available.

* * * *

IF LONG TRIM Indicator Movement Reverses:

AUTOPILOT AND ALTERNATE
LONGITUDINAL TRIM Circuit Breakers
D-09,10,11 (D-04, 05, 06/08, 09, 10/10, 11, 12) .... PULL

(Continued)

If trim runaway occurs when autopilot is engaged, the malfunction may be caused by the autopilot trim coupler.

Continue flight using primary trim system. Autopilot is available, but autotrim function is inoperative. After trimming, autopilot may be engaged, but should be disconnected / retrimmed periodically as needed.

* * * *

TAIL COMPT TEMP HIGH LIGHT ON CHECKLIST

PNEU X-FEED VALVE Levers ....CLOSED

AIR FOIL Anti-Ice Switch(es)...OFF

AIR CONDITIONING SUPPLY Switches.....................HP BLD OFF

Caution: If icing conditions are encountered with wing anti-ice off in excess of 2 minutes, refer to AIRFOIL ICE PROTECTION INOPERATIVE, Section 3.

IF Light is Out (After 2 Minutes) And Airfoil Anti-ice is Not Required:

OR

* * * *

IF Landing is Imminent (5 Minutes From Touchdown):

Continue approach. Use minimum power settings if light is on.

OR

* * * *

IF Light Remains On (After 2 Minutes) Or Airfoil Anti-ice Required:

Left Throttle .... IDLE

IF TAIL COMPT TEMP HIGH Light Is Off Within 2 Minutes:

L AIR CONDITIONING SUPPLY Switch............... OFF

Left Throttle.................................... RESTORE POWER

IF TAIL COMPT TEMP HIGH Light Remains Off:

R AIR CONDITIONING SUPPLY Switch.....AUTO

IF TAIL COMPT TEMP HIGH Light Remains Off:

Restore airfoil ice protection from right engine if desired. If TAIL COMPT TEMP HIGH light comes on again, move AIR FOIL Anti-Ice switch(es) to off and avoid icing areas.

OR

* * * *

OR

IF TAIL COMPT TEMP HIGH Light Comes On:

R AIR CONDITIONING SUPPLY Switch............................HP BLD OFF

L AIR CONDITIONING SUPPLY Sw.....AUTO

Restore airfoil ice protection from left engine if desired.

OR

* * * *

(Continued)

IF TAIL COMPT TEMP HIGH Light Comes On:

Left Throttle .... **IDLE**

Continue at reduced thrust setting necessary to keep light off.

R AIR CONDITIONING SUPPLY Switch ..... **AUTO**

Restore airfoil ice protection from right engine if desired. If TAIL COMPT TEMP HIGH light comes on again, move AIR FOIL Anti-Ice switch(es) to off and avoid icing areas.

* * * *

IF TAIL COMPT TEMP HIGH Light Is On After 2 Minutes:

Left Throttle .... **RESTORE POWER**

Right Throttle .... **IDLE**

IF TAIL COMPT TEMP HIGH Light Is Off Within 2 Minutes:

R AIR CONDITIONING SUPPLY Switch .... **OFF**

Right Throttle .... **RESTORE POWER**

IF TAIL COMPT TEMP HIGH Light Remains Off:

Continue operation with right system off and isolated.

OR

OR

L AIR CONDITIONING SUPPLY Switch ....**AUTO**

Restore airfoil ice protection from left engine if desired.

* * * *

IF TAIL COMPT TEMP HIGH Light Comes On:

Right Throttle .... **IDLE**

Continue at reduced thrust setting necessary to keep light out.

L AIR CONDITIONING SUPPLY Switch ....**AUTO**

Restore airfoil ice protection from left engine if desired.

* * * *

(Continued)

IF **TAIL COMPT TEMP HIGH** Light Is On After 2 Minutes:

Right Throttle..RESTORE POWER

Land at nearest suitable airport.

Note: In order to maintain cabin pressurization during descent, it may be necessary to carry higher than normal power settings.

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TAIL COMPT TEMP HIGH LIGHT ON EXPANDED CHECKLIST

PNEU X-FEED VALVE Levers .... CLOSED

Isolates pneumatic crossfeed duct to prevent flow of air into the ice protection manifold.

AIR FOIL Anti-Ice Switch(es) .... OFF

Prevents ice protection open signals to the augmentation valves.

AIR CONDITIONING SUPPLY Switches..................... HP BLD OFF

Signals both augmentation valves to close and prevents flow of 13th stage high pressure bleed air from the engines.

Caution: If icing conditions are encountered with wing anti-ice off in excess of 2 minutes, refer to AIRFOIL ICE PROTECTION INOPERATIVE, Section 3.

IF Light is Out (After 2 Minutes) and Airfoil Anti-ice is Not Required:

* * * *

OR

IF Landing is Imminent (5 Minutes From Touchdown):

Continue approach. Use minimum power settings if light is on.

* * * *

OR

IF Light Remains On (After 2 Minutes) or Airfoil Anti-ice Required:

Left Throttle .... IDLE

IF TAIL COMPT TEMP HIGH Light Is Off Within 2 Minutes:

L AIR CONDITIONING SUPPLY Switch................. OFF

Left Throttle .... RESTORE POWER

IF TAIL COMPT TEMP HIGH Light Remains Off:

R AIR CONDITIONING SUPPLY Switch ..... AUTO

IF TAIL COMPT TEMP HIGH Light Remains Off:

Restore airfoil ice protection from right engine if desired. If TAIL COMPT TEMP HIGH light comes on again, move AIR FOIL Anti-Ice switch(es) to off and avoid icing areas.

* * * *

OR

OR

OR

(Continued)

IF TAIL COMPT TEMP HIGH Light Comes On:

R AIR CONDITIONING SUPPLY Switch .... HP BLD OFF

L AIR CONDITIONING SUPPLY Switch .... AUTO

Restore airfoil ice protection from left engine if desired.

* * * *

IF TAIL COMPT TEMP HIGH Light Comes On:

Left Throttle .... IDLE

Continue at reduced thrust setting necessary to keep light off.

R AIR CONDITIONING SUPPLY Switch .... AUTO

Restore airfoil ice protection from right engine if desired. If TAIL COMPT TEMP HIGH light comes on again, move AIR FOIL Anti-Ice switch(es) to off and avoid icing areas.

* * * *

IF TAIL COMPT TEMP HIGH Light Is On After 2 Minutes:

Left Throttle .... RESTORE POWER

Right Throttle .... IDLE

Allow up to 2 minutes for light to go out.

(Continued)

IF TAIL COMPT TEMP HIGH Light Is Off Within 2 Minutes:

R AIR CONDITIONING SUPPLY Switch......................OFF

Right Throttle..RESTORE POWER

IF TAIL COMPT TEMP HIGH Light Remains Off:

Continue operation with right system off and isolated.

L AIR CONDITIONING SUPPLY Switch............AUTO

Restore airfoil ice protection from left engine if desired.

OR

* * * *

OR

IF TAIL COMPT TEMP HIGH Light Comes On:

Right Throttle.. IDLE

Continue at reduced thrust setting necessary to keep light out.

L AIR CONDITIONING SUPPLY Switch............AUTO

Restore airfoil ice protection from left engine if desired.

* * * *

IF TAIL COMPT TEMP HIGH Light Is On After 2 Minutes:

Right Throttle..RESTORE POWER

Land at nearest suitable airport.

Note: In order to maintain cabin pressurization during descent, it may be necessary to carry higher than normal power settings.

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PLANNED EVACUATION (LAND) CHECKLIST

This checklist should be accomplished prior to any landing where a definite potential for passenger evacuation is recognized.

- Accomplish normal IN-RANGE, APPROACH, LANDING, and EMERGENCY / ABNORMAL checklists appropriate to situation.

Flight Attendants .... ALERT

T - Type of emergency; E - Evacuation necessary?
S - Signals for brace & evacuation; T - Time available.

ATC And Company...NOTIFY

Evacuation Routes...DETERMINE

Cockpit Loose Gear .... SECURE

Cockpit Door ....SECURE OPEN

- - - - - BELOW 5,000 FEET - - - - -

AIR CONDITIONING SUPPLY Switches.....................................OFF

Cabin Pressurization.......................... DEPRESSURIZE MANUALLY

- - - - - WHEN AIRCRAFT IS DEPRESSURIZED - - - - -

CAB ALT Control Wheel, Lever ....FULL AFT (OPEN), LOCKED DOWN

- - - - - 30 SECONDS PRIOR TO TOUCHDOWN - - - - -

EMER LTS Switch ....ON

Alerting PA By PNF..................................."BRACE FOR IMPACT"

EMER PWR Switch...ON

(Continued)

- - - - - AFTER AIRCRAFT IS STOPPED - - - - -

Parking Brake .... SET

Flaps .... 28°/LND

Spoilers .... RETRACTED

Need For Evacuation .... EVALUATE

IF Evacuation Not Necessary:

PASSENGER PA ......"REMAIN SEATED, REMAIN SEATED"

EMER PWR Switch .... OFF

OR

EMER LTS Switch .... ARM

* * * *

IF Evacuation Is Necessary:

Tower/Ground .... NOTIFY

FUEL Levers .... OFF

Passenger Evacuation.......... "EASY VICTOR, EASY VICTOR"

Note: If evacuation routes must be restricted, advise Flight Attendants of the correct routes prior to Easy Victor call.

ENG Fire Handles .... PULL

If required, discharge fire agent.

BATT Switch .... OFF

- - - - - CREW EVACUATION DUTIES - - - - -

Captain: Assist Flight Attendants in forward cabin entry area. Open galley service door if unopened. Ensure all passengers and crew have evacuated the aircraft.

F/O: Deplane with cockpit fire extinguisher and release tail cone exit if unopened. Assist passenger evacuation at wing edge and direct passengers to assembly point.

Observer: If qualified, assist Flight Attendants in passenger evacuation.

* * * *

PLANNED EVACUATION (LAND) EXPANDED CHECKLIST

This checklist should be accomplished prior to any landing where a definite potential for passenger evacuation is recognized. This procedure is based on the experience of others, but it is impossible to include all possible variables. Any time the situation demands a deviation from the established procedure, crew members should use their best judgment and act accordingly.

The primary exit route for the cockpit crew is through the passenger cabin, assisting as necessary, and exiting down one of the evacuation slides.

The secondary evacuation route is through cockpit windows. It is not intended that crew members assume unnecessary risks. When all efforts to aid passengers have been expended, the crew should act in the best interests of personal safety.

- Accomplish normal IN-RANGE, APPROACH, LANDING, and EMERGENCY/ABNORMAL checklists appropriate to situation.

Flight Attendants .... ALERT

T	- Type of emergency;	E	- Evacuation necessary?
S	- Signals for brace & evacuation;	T	- Time available.

ATC And Company..NOTIFY

Evacuation Routes..DETERMINE

Any known or potential reasons for limiting exit routes should be analyzed. Advise Flight Attendants of any decisions.

Cockpit Loose Gear .... SECURE

Jumpseat rider should be seated in cabin if possible.

Cockpit Door ....SECURE OPEN

(Continued)

- - - - - BELOW 5,000 FEET - - - - -

AIR CONDITIONING SUPPLY Switches.................................... OFF

Eliminates source of pressurized air so cabin can be completely depressurized to allow opening of aircraft doors and exits. Placing the switches off one at a time will reduce the severity of the pressure surge experienced by the passengers. After stable, cabin should climb at approximately 1,000 FPM.

Cabin Pressurization......................... DEPRESSURIZE MANUALLY

If the preceding step does not depressurize the aircraft completely, move the CABIN ALT control lever down to manual and adjust the control wheel toward VALVE OPEN (climb) until the desired climb rate commensurate with the situation is achieved.

- - - - - WHEN AIRCRAFT IS DEPRESSURIZED - - - - -

CAB ALT Control Wheel, Lever .... FULL AFT (OPEN), LOCKED DOWN

Ensures cabin will remain unpressurized for emergency exit opening after landing.

- - - - - 30 SECONDS PRIOR TO TOUCHDOWN - - - - -

EMER LTS Switch .... ON

Alerting PA By PNF.................................... "BRACE FOR IMPACT"

EMER PWR Switch.. ON

Ensures an uninterrupted power source for making PA's.

- - - - - AFTER AIRCRAFT IS STOPPED - - - - -

Parking Brake.. SET

Flaps .... 28°/LND

Optimum setting for overwing evacuation.

Spoilers .... RETRACTED

Prevents spoiler interference with overwing evacuation

Need For Evacuation .... EVALUATE

(Continued)

IF Evacuation Not Necessary:

PASSENGER PA......"REMAIN SEATED, REMAIN SEATED"

EMER PWR Switch .... OFF

EMER LTS Switch .... ARM

OR

* * * *

IF Evacuation Is Necessary:

Tower / Ground .... NOTIFY

FUEL Levers .... OFF

Passenger Evacuation.......... "EASY VICTOR, EASY VICTOR"

Note: If evacuation routes must be restricted, advise Flight Attendants of the correct routes prior to Easy Victor call.

The Captain shall order the evacuation in the following manner: "THIS IS THE CAPTAIN (state the useable exits).EASY VICTOR, EASY VICTOR."

ENG Fire Handles .... PULL

If required, discharge fire agent.

BATT Switch .... OFF

- - - - - CREW EVACUATION DUTIES - - - - -

Captain: Assist Flight Attendants in forward cabin entry area. Open galley service door if unopened. Ensure all passengers and crew have evacuated the aircraft.

F/O: Deplane with cockpit fire extinguisher and release tail cone exit if unopened. Assist passenger evacuation at wing edge and direct passengers to assembly point.

Observer: If qualified, assist Flight Attendants in passenger evacuation.

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EMERGENCY EVACUATION CHECKLIST

Parking Brake..........SET

Tower / Ground..........CONTACT

EMER PWR Switch..........ON

Flaps..........28°

Spoilers..........RETRACTED

CAB ALT Control Wheel, Lever..........FULL AFT (OPEN), LOCKED DOWN

IF Evacuation is Confirmed Necessary:

FUEL Levers..........OFF

Passenger Evacuation..........“EASY VICTOR, EASY VICTOR”

EMER LTS Switch..........ON

BATT Switch..........OFF

ENG Fire Handles..........PULL

- - - - - CREW EVACUATION DUTIES - - - - -

Captain: Assist Flight Attendants in forward cabin entry area. Open galley service door if unopened. Ensure all passengers and crew have evacuated the aircraft.

F/O: Deplane with cockpit fire extinguisher and release tail cone exit if unopened. Assist passenger evacuation at wing edge and direct passengers to assembly point.

Observer: If qualified, assist Flight Attendants in passenger evacuation.

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EMERGENCY EVACUATION EXPANDED CHECKLIST

Parking Brake..SET

Tower / Ground...CONTACT

Advise tower and/or ground crew of abnormal airplane conditions, possibility of evacuation, and planned evacuation routes.

EMER PWR Switch.. ON

This assures an uninterrupted power source for the Captain's evacuation PA through the handset.

Flaps .... 28°

This aids in overwing passenger evacuation.

Spoilers ....RETRACTED

This lowers the spoiler panels to prevent interference with passenger evacuation.

CAB ALT Control Wheel, Lever .... FULL AFT (OPEN), LOCKED DOWN

This insures aircraft is depressurized for operation of exits.

IF Evacuation is Confirmed Necessary:

FUEL Levers .... OFF

Passenger Evacuation................"EASY VICTOR, EASY VICTOR"

Note: If evacuation routes must be restricted, advise Flight Attendants of the correct routes prior to Easy Victor call. The Captain shall order the evacuation in the following manner:

"THIS IS THE CAPTAIN (state the useable exits).EASY VICTOR, EASY VICTOR".

EMER LTS Switch .... ON

BATT Switch.. OFF

ENG Fire Handles..PULL

(Continued)

- - - - - CREW EVACUATION DUTIES - - - - -

Captain:	Assist Flight Attendants in forward cabin entry area. Open galley service door if unopened. Ensure all passengers and crew have evacuated the aircraft.
F/O:	Deplane with cockpit fire extinguisher and release tail cone exit if unopened. Assist passenger evacuation at wing edge and direct passengers to assembly point.
Observer:	If qualified, assist Flight Attendants in passenger evacuation.

* * * *

EMERGENCY EVACUATION PROCEDURE

The Emergency Evacuation Checklist should be used in any situation where the Captain feels the potential for evacuation exists. Initiating the checklist does not indicate that an evacuation will occur, it merely sets in motion a procedure which will prepare the aircraft for orderly evacuation of all passengers and crew immediately after the ultimate decision to evacuate is made by the Captain. The F/O's primary responsibility is to configure the aircraft so that if the Captain decides to evacuate, the aircraft is immediately ready.

The checklist and aircraft evacuation placard indicate a two-step procedure. The upper portion of the checklist (those steps above the statement "If Evacuation is Confirmed Necessary") defines the preparation and decision making steps. Duties normally performed by the Captain are listed first, followed by F/O duties. A blank line separates the steps. These steps should be performed essentially simultaneously and by reference to the placard and flow if applicable. The lower portion of the checklist defines the steps to be performed if the Captain has made a decision to evacuate the aircraft. The steps normally performed by the Captain are listed first and the F/O steps printed following a blank line.

Once the aircraft is at a complete stop, the Captain will set the parking brake and call for the Emergency Evacuation Checklist. The Captain should then communicate with whomever he feels may be able to offer information which will aid in the evacuation decision, i.e. ATC, ground vehicles, and cabin crew. The F/O should take the initiative to configure the aircraft and begin the checklist even if the Captain neglects to call for the Evacuation Checklist. These steps are "transparent" to passengers and cabin crew and should not create a potential for an uncommanded evacuation.

While the Captain is making the evacuation decision, the F/O will quickly perform or verify the steps of the checklist down to the statement "If Evacuation is Confirmed Necessary", by flow and/or reference to the evacuation placard. At this time the checklist should be paused and the F/O should direct his/her attention to the Captain to be ready to proceed with the course of action decided by the Captain. If the Captain decides an evacuation is required, he/she will position the FUEL levers to OFF and order the evacuation by using the PA. When the F/O notes the Captain's decision by verbal confirmation from the Captain or by observing the evacuation command, he/she will continue the final steps of the checklist by Challenge / Response.

(Continued)

If the Captain decides not to evacuate the aircraft the F/O will await further direction by the Captain. A “REMAIN SEATED” command and PA announcement to inform and calm the passengers should be given by the Captain or his designee.

Ground Cabin Smoke/Fume Removal Procedure

Malfunctioning air conditioning systems, hot engine starts, or sources external to the aircraft can produce smoke/fumes in the cabin which, while uncomfortable, are not particularly hazardous. If the source of the smoke/fumes is eliminated, these situations can best be resolved by ventilating the aircraft. An emergency evacuation in these situations poses an unnecessary threat to the safety of the customers and crew.

The source of the smoke/fumes must be eliminated either by discontinuing use of the malfunctioning system, or by moving the aircraft away from any external source. Prior to performing the procedure, the Captain must be certain that no additional smoke/fumes will enter the cabin and that the aircraft is off an active runway and stopped.

If the Captain elects to open a portion of the main cabin doors to ventilate the aircraft, the evacuation slides for those doors must be disarmed prior to opening. No more than 50% of the available slides will be disarmed, and no more than 50% of the emergency exits will be opened. On the MD-80, the forward galley door and the aft galley door should be opened for ventilation.

A Cabin crewmember will remain stationed at the opened door to ensure that no egress is attempted. If the EASY VICTOR command is given, the crewmember will close the cabin door, rearm the slide, and proceed with the evacuation.
All doors must be closed and slides rearmed prior to taxiing.

PARTIAL OR GEAR UP LANDING PROCEDURE

Note: This procedure is based on the assumption that all methods to extend landing gear have been unsuccessful. Any landing gear which can be extended should be extended for landing whether on a prepared surface or unprepared surface.

- Excess fuel should be burned off to decrease landing gross weight.
- Consideration should be given to the best suitable airport with adequate runway and fire fighting capability. Foaming the runway is not recommended.
- Coordinate with all ground emergency facilities. For example, the fire trucks normally operate on a common VHF frequency with the aircraft and can advise the crew of aircraft condition during landing.
- Brief crew and passengers on gear up landing and evacuation procedures. Accomplish **PLANNED EVACUATION (LAND) CHECKLIST**, this section.
- Accomplish normal IN-RANGE, APPROACH, and LANDING checklists.

- - - - - PRIOR TO APPROACH - - - - -

CAWS, SSRS-1, LDG GEAR, CABIN ALT
Circuit Breaker - Lower EPC - P-38 or P-40 .... PULL

GPWS Computer Circuit Breaker - F-20 or F-13 .... PULL

Passenger Cabin Preparation ....COMPLETE

APU Master Switch ....OFF

APU should be shut down for landing unless it is the sole source of electrical power.

Autobrakes .... DO NOT ARM OR USE FOR LANDING

IF Nose Gear Unsafe, Both Main Gear Extended:

Note: Reseat passengers aft if desired.

Configuration: Gear handle down, spoilers armed, flaps 40°

At touchdown,

PF begin actuating trim control to nose up to assist in holding the nose off runway.

PM monitor spoilers and deploy manually if necessary.

(Continued)

After touchdown,

PF should hold nose off until approximately 80 KIAS. Idle reverse thrust may be used with caution for deceleration. Under normal conditions, deployment of thrust reversers while airplane is in excess of 8° nose high attitude may result in thrust reversers striking the runway.

While elevator control is still effective, lower nose gently to runway.

Upon nose contact, use moderate braking (within limits of directional control) to stop aircraft.

After stopped,
Retract spoilers, shut down engines, turn off electrical power.

IF One Main Gear Partially Or Fully Retracted:

Note: Consideration should be given to selecting the widest runway available for landing due to possibility of severe directional control difficulties. Consider touching down on side of runway corresponding to extended main landing gear.

Configuration: Gear handle down, flaps 40°, spoilers disarmed and not used during landing.

At touchdown,
Touchdown on extended main gear. While elevator control is still effective, lower nose gear gently to runway and hold wings level with ailerons as long as possible. Maintain directional control with nosewheel steering..

When directional control is no longer effective or after stopped,
Shut down engines, turn off electrical power.

(Continued)

IF Any Other Combination Of Extended/Retracted Landing Gear:

> Note: Nosewheel will provide some additional directional control if extended. Main landing gear is designed to shear as required and will provide protection for fuselage.
>
> Configuration: Gear handle down, flaps 40°, spoilers disarmed and not used during landing.
>
> At touchdown,
>
> Touchdown on the main gear, if extended, and hold nose off as long as possible.
>
> After touchdown,
>
> Lower nose gently to runway and hold wings level with ailerons as long as possible. Maintain directional control with nosewheel steering (if available).
>
> When directional control is no longer effective or after stopped,
> Shut down engines, turn off electrical power.

Need For Evacuation .... EVALUATE

IF Evacuation Not Necessary:

PASSENGER PA....... "REMAIN SEATED, REMAIN SEATED"

OR

* * * *

IF Evacuation Is Necessary:

Refer to **EMERGENCY EVACUATION CHECKLIST**, this section.

* * * *

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EMERGENCY (OFF RUNWAY) LANDING CHECKLIST

Checklist use is based upon the recognition of conditions which preclude continuation of the flight to an engine(s) operating landing on a suitable runway. This includes powered flight to a landing not on a suitable runway and all cases of unpowered flight to a landing.

- Send distress signal
- Advise crew and passengers
- Choose landing site

IF Time Permits:

In-Range Checklist..COMPLETE

Cockpit Loose Gear .... SECURE

Cockpit Door..SECURE OPEN

Passenger Cabin Preparation ....COMPLETE

IF Engine Thrust Is Not Available:

Pattern airspeed should be 28°/LND V_{REF} plus 30 to 40 KIAS. Establish configuration and speed early enough to become familiar with the descent rate. Adjust flight path to the touchdown location as required to maintain the airspeed/descent rate. Airspeed should be 28°/LND V_{REF} plus 30 to 40 KIAS all the way down to the landing spot. The excess airspeed will be used to arrest descent rate during roundout prior to touchdown.

- - - - - BELOW 5,000 FEET - - - - -

NO SMOK, SEAT BELTS Switches..ON

AIR CONDITIONING SUPPLY Switches..OFF

Cabin Pressurization................................ DEPRESSURIZE MANUALLY

Target Speed For Flaps 28° Approach.............................. CHECK & SET

- - - - - WHEN AIRCRAFT IS DEPRESSURIZED - - - - -

CAB ALT Control Wheel, Lever ....FULL AFT (OPEN), LOCKED DOWN

Radio ....TRANSMIT FINAL POSITION

(Continued)

Seat Belt & Shoulder Harness..ON

- - - - - BEFORE LANDING - - - - -

Gear Handle.. DOWN

FLAP/SLAT Handle .... 28°/LAND

- - - - - 30 SECONDS PRIOR TO TOUCHDOWN - - - - -

EMER LTS Switch ....ON

Alerting PA By PNF .... "BRACE FOR IMPACT"

EMER PWR Switch..ON

- - - - - AFTER AIRCRAFT IS STOPPED - - - - -

Parking Brake... SET

Spoilers...RETRACTED

FUEL Levers..OFF

Command Evacuation......................."EASY VICTOR, EASY VICTOR"

ENG FIRE Handles, Agent .... PULL, DISCHARGE

EMER PWR Switch..OFF

BATT Switch ....OFF

Post Landing Duties .... ACCOMPLISH

Captain: Assist Flight Attendants in forward cabin entry area. Open galley service door if unopened. Ensure all passengers and crew have evacuated the aircraft.

F/O: Deplane with cockpit fire extinguisher and release tail cone exit if unopened. Assist passenger evacuation at wing edge and direct passengers to assembly point.

Observer: If qualified, assist Flight Attendants in passenger evacuation.

* * * *

EMERGENCY (OFF RUNWAY) LANDING EXPANDED CHECKLIST

Checklist use is based upon the recognition of conditions which preclude continuation of the flight to an engine(s) operating landing on a suitable runway. This includes powered flight to a landing not on a suitable runway and all cases of unpowered flight to a landing.

- Send distress signal.

  On command, First Officer will transmit MAYDAY message, including position, course, speed altitude, situation, intention, time and position of intended touchdown, and type of airplane. Set transponder code 7700 and consider ATC recommendation, if available, for landing site.

- Advise crew and passengers.

  At a minimum, make a quick PA. As time permits, review **PLANNED EVACUATION (LAND) CHECKLIST**, this section.

- Choose landing site.

  Every attempt should be made to reach a runway where emergency services are available. If engine thrust is not available, this checklist should be accomplished even though an attempt to land on a suitable runway is being made.

IF Time Permits:

In-Range Checklist..COMPLETE

Pressurization should be set to descend to pattern altitude to facilitate depressurization prior to landing.

Cockpit Loose Gear .... SECURE

Cockpit Door..SECURE OPEN

Jumpseat rider should be seated in cabin if possible.

Passenger Cabin Preparation ....COMPLETE

(Continued)

IF Engine Thrust Is Not Available:

Pattern airspeed should be 28°/LND V_{REF} plus 30 to 40 KIAS. Establish configuration and speed early enough to become familiar with the descent rate. Adjust flight path to the touchdown location as required to maintain the airspeed/descent rate. Airspeed should be 28°/LND V_{REF} plus 30 to 40 KIAS all the way down to the landing spot. The excess airspeed will be used to arrest descent rate during roundout prior to touchdown.

- - - - - BELOW 5,000 FEET - - - - -

NO SMOK, SEAT BELTS Switches .... ON

AIR CONDITIONING SUPPLY Switches .... OFF

Eliminates source of pressurized air so cabin can be completely depressurized to allow opening of aircraft doors and exits. Placing the switches off one at a time will reduce the severity of the pressure surge experienced by the passengers. After stable, cabin should climb at approximately 1,000 FPM.

Cabin Pressurization .... DEPRESSURIZE MANUALLY

If the preceding step does not depressurize the aircraft completely, move the CABIN PRESS control lever down to manual and adjust the control wheel toward DECR (valve open) until the desired climb rate commensurate with the situation is achieved.

Target Speed For Flaps 28° Approach .... CHECK & SET

Use normal wind additive to 28°/EXT V_{REF} unless single-engine.

- - - - - WHEN AIRCRAFT IS DEPRESSURIZED - - - - -

CAB ALT Control Wheel, Lever .... FULL AFT (OPEN), LOCKED DOWN

Ensures cabin will remain unpressurized for emergency exit opening after landing.

Radio .... TRANSMIT FINAL POSITION

Seat Belt & Shoulder Harness .... ON

(Continued)

- - - - - BEFORE LANDING - - - - -

Gear Handle.. DOWN

FLAP / SLAT Handle ....28° / LND

Flaps 28° provides the best lift/drag ratio and is the best selection for crash landing. Approach body angle will be slightly higher than that for flaps 40°. The flaps are designed to absorb impact, and if necessary, tear away without damaging the wing fuel tanks.

- - - - - 30 SECONDS PRIOR TO TOUCHDOWN - - - - -

EMER LTS Switch ....ON

Alerting PA By PNF ...."BRACE FOR IMPACT"

EMER PWR Switch..ON

- - - - - AFTER AIRCRAFT IS STOPPED - - - - -

Parking Brake.. SET

Spoilers..RETRACTED

FUEL Levers.. OFF

Provides positive shutdown of engines.

Command Evacuation........................"EASY VICTOR, EASY VICTOR"

ENG FIRE Handles, Agent .... PULL, DISCHARGE

Closes fuel valves at wings to prevent discharge of fuel from ruptured fuel lines and assures engines are off.

EMER PWR Switch.. OFF

Removes electrical power to prevent source of ignition.

BATT Switch .... OFF

Removes electrical power to prevent source of ignition.

Post Landing Duties .... ACCOMPLISH

Captain: Assist Flight Attendants in forward cabin entry area. Open galley service door if unopened. Ensure all passengers and crew have evacuated the aircraft.

(Continued)

F/O:	Deplane with cockpit fire extinguisher and release tail cone exit if unopened. Assist passenger evacuation at wing edge and direct passengers to assembly point.
Observer:	If qualified, assist Flight Attendants in passenger evacuation.

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DITCHING CHECKLIST

Checklist use is based upon the recognition of conditions which preclude continuation of the flight to a suitable landing, requiring airplane ditching and evacuation.

- Send distress signal.
- Advise crew and passengers.
- Burn off fuel as required.
- Accomplish **IN-RANGE** checklist.
- Choose ditching site. Plan to touchdown on upwind side and parallel to waves or swells if possible. Refer to **DITCHING PROCEDURE**, This Section if time permits.

- - - - - BELOW 5,000 FEET - - - - -

NO SMOK, SEAT BELTS Switches..ON

AIR CONDITIONING SUPPLY Switches...OFF

Cabin Pressurization................................ DEPRESSURIZE MANUALLY

APU MASTER Switch..OFF

CAWS, SSRS-1 LDG GEAR, CABIN ALT
Circuit Breaker - Lower EPC P-38 or P-40...................................... PULL

GPWS Computer Circuit Breaker - F-20 or F-13 .... PULL

Passenger Cabin Preparation ....COMPLETE

Target Speed For Flaps 28° Approach.............................. CHECK & SET

- - - - - WHEN AIRCRAFT IS DEPRESSURIZED - - - - -

CAB ALT Control Wheel, Lever .... FULL FORWARD
(CLOSED), LOCKED DOWN

RADIO RACK Switch ....FAN

Cockpit Loose Gear .... SECURE

Cockpit Door...SECURE OPEN

Life Vests..ON

(Continued)

Seat Belt & Shoulder Harness .... ON

Radio .... TRANSMIT FINAL POSITION

- - - - - BEFORE LANDING - - - - -

Gear Handle .... UP

FLAP / SLAT Handle .... 28° / LAND

- - - - - 30 SECONDS PRIOR TO TOUCHDOWN - - - - -

EMER LTS Switch .... ON

Alerting PA By PNF .... "BRACE FOR IMPACT"

EMER PWR Switch .... ON

- Maintain airspeed at bug and 200 - 300 FPM descent rate.
- To accomplish flare, rotate smoothly to touchdown attitude maintaining airspeed and rate of descent with thrust. After touchdown, reduce thrust to idle.

- - - - - ON THE WATER - - - - -

FUEL Levers .... OFF

ENG FIRE Handles, Agent .... PULL, DISCHARGE

Command Evacuation .... "EASY VICTOR, EASY VICTOR"

Post Landing Duties .... ACCOMPLISH

Captain: Proceed to forward cabin area. Evaluate escape potential. Supervise and assist cabin crew in evacuation of aircraft. Board and take command of any raft, if available.

First Officer: Proceed to cabin area. Evaluate escape potential. Assist Captain and cabin crew in evacuation of aircraft. Board and take command of any raft, if available.

* * * *

DITCHING EXPANDED CHECKLIST

Checklist use is based upon the recognition of conditions which preclude continuation of the flight to a suitable landing, requiring airplane ditching, and evacuation.

- Send distress signal

  On command, First Officer will transmit MAYDAY message, including position, course, speed, altitude, situation, intention, time, and position of intended touchdown, type of airplane, and request "ASR" intercept using prevailing air to ground frequency. Set transponder code 7700 and, if able, provide Captain course to nearest ship or landfall.

- Advise crew and passengers.

  Seat passengers as far forward as possible. After ditching, airplane assumes a slight taildown attitude (floor angle not more than 5° nose up). At high gross weights, wings will be awash, while at lower gross weights, the upper wing surface will be clear of water. The aft cabin and aft service doors should not be used for evacuation. If life rafts are on board, the door slides should be disarmed. Life rafts are to be launched at the main cabin door and the overwing exits if conditions permit. If no life rafts are on board, ensure Flight Attendants are prepared to use the evacuation slides as substitutes. The aft service door girt bar should be disengaged so the slide can be brought forward after airplane stops.

- Burn off fuel as required.

  Consider burning fuel off to reduce gross weight prior to ditching. This will provide greater buoyancy and a slower landing speed. Ensure enough fuel is retained to operate engines through the search for a good landing spot, approach, flare, and touchdown.

- Accomplish IN-RANGE checklist. Pressurization should be set to descend to pattern altitude (2,000 to 3,000 feet) to facilitate depressurization prior to landing.

- Choose ditching site. Plan to touchdown on upwind side and parallel to waves or swells if possible. Refer to **DITCHING PROCEDURE**, this section for more guidance.

(Continued)

- - - - - BELOW 5,000 FEET - - - - -

NO SMOK, SEAT BELTS Switches..ON

AIR CONDITIONING SUPPLY Switches..OFF

Eliminates source of pressurized air so cabin can be completely depressurized to allow opening of aircraft doors and exits. Placing the switches off one at a time will reduce the severity of the pressure surge experienced by the passengers. After stable, cabin should climb at approximately 1,000 FPM.

Cabin Pressurization................................DEPRESSURIZE MANUALLY

If the preceding step does not depressurize the aircraft completely, move the CABIN ALT control lever down to manual and adjust the control wheel toward VALVE OPEN (climb) until the desired climb rate commensurate with the situation is achieved.

APU MASTER Switch..OFF

Closes the fuel valve and the APU doors.

CAWS, SSRS-1 LDG GEAR, CABIN ALT
Circuit Breaker - Lower EPC P-38 or P-40.. PULL

Prevents warning horn with gear retracted and landing flaps.

GPWS Computer Circuit Breaker - F-20 or F-13 .... PULL

Prevents nuisance warning on final approach.

Passenger Cabin Preparation ....COMPLETE

Verify passenger cabin preparations for ditching are complete. All available food, fluids, flashlights, first aid kits, and other emergency equipment confirmed ready for evacuation. If no life rafts are on board, ensure Flight Attendants are prepared to use the evacuation slides as substitutes. The aft service door girt bar should be disengaged so the slide can be brought forward after airplane stops. Passengers should be seated with life vests and seat belts on (life vests not inflated).

Target Speed For Flaps 28° Approach..............................CHECK & SET

(Continued)

- - - - - WHEN AIRCRAFT IS DEPRESSURIZED - - - - -

CAB ALT Control Wheel, Lever .... FULL FORWARD (CLOSED), LOCKED DOWN

Closes outflow openings to provide a smoother fuselage surface for touchdown and to reduce the rate of water entry into the fuselage.

RADIO RACK Switch ....FAN

Closes venturi to reduce the rate of water entry into the fuselage.

Cockpit Loose Gear .... SECURE

Cockpit Door...SECURE OPEN

Life Vests..ON

Don vests, but do not inflate until after exit from aircraft.

Seat Belt & Shoulder Harness ....ON

Radio ....TRANSMIT FINAL POSITION

Transmit all information pertaining to: final ditching position, weather and sea conditions, rescue instructions if a ship or other rescue unit is standing by and any other necessary information.

- - - - - BEFORE LANDING - - - - -

Gear Handle..UP

FLAP/SLAT Handle .... 28°/LAND

Flaps 28° provides the best lift/drag ratio and is the best selection for ditching. Approach body angle will be slightly higher than that for flaps 40°. The flaps are designed to absorb impact, and if necessary, tear away without damaging the wing fuel tanks.

(Continued)

- - - - - 30 SECONDS PRIOR TO TOUCHDOWN - - - - -

EMER LTS Switch .... ON

Alerting PA By PNF .... "BRACE FOR IMPACT"

EMER PWR Switch.. ON

- Maintain airspeed at bug and 200 - 300 FPM descent rate.
- To accomplish flare, rotate smoothly to touchdown attitude maintaining airspeed and rate of descent with thrust. After touchdown, reduce thrust to idle.

- - - - - ON THE WATER - - - - -

FUEL Levers.. OFF

Provides positive shutdown of engines.

ENG FIRE Handles, Agent ....PULL, DISCHARGE

Closes fuel valves at wings to prevent discharge of fuel from ruptured fuel lines and assures engines are off.

Command Evacuation...................... "EASY VICTOR, EASY VICTOR"

Post Landing Duties ....ACCOMPLISH

Captain: Proceed to forward cabin area. Evaluate escape potential. Supervise and assist cabin crew in evacuation of aircraft. Board and take command of any raft, if available.

First Officer: Proceed to cabin area. Evaluate escape potential. Assist Captain and cabin crew in evacuation of aircraft. Board and take command of any raft, if available.

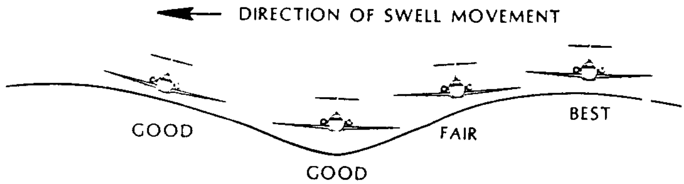
The aircraft may remain afloat indefinitely if fuel load is minimal and no serious damage was sustained during landing.

* * * *

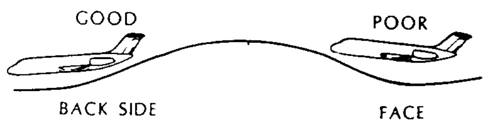
DITCHING PROCEDURE

It is extremely dangerous to land into the wind without regard to swell systems. Touchdown should be made parallel to the largest swell system, crabbing into the wind as required until the flare. If a smaller secondary swell system is present, attempt to touchdown on the back side of a secondary swell while remaining parallel to the larger swell system. Avoid touching down into the "face" of a swell.

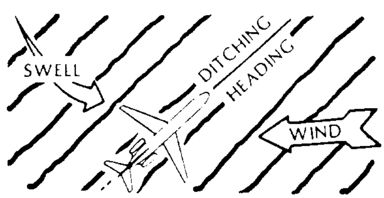
Avoid landing in areas where the seas are short and rough. This is indicated by whitecaps and shadows appearing close together. Select an area (only about 500 feet is needed) where the shadows and whitecaps are not so numerous. Touchdown should be at the lowest speed and rate of descent which permit safe handling and optimum nose-up attitude upon impact. Keep wings parallel with the surface, not with the horizon.



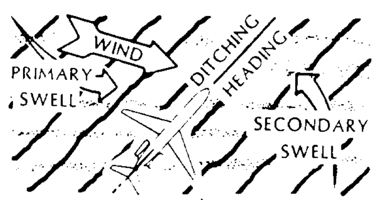
Landing parallel to the major swell



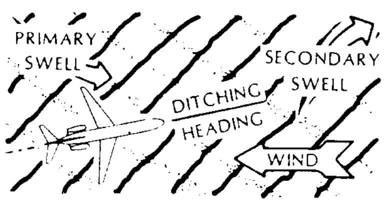
Landing on the face and back of swell



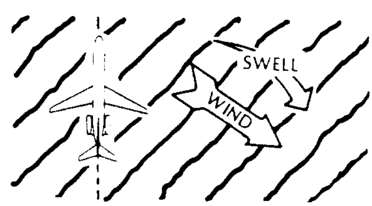
Single Swell System - Wind 15 knots



Double Swell System-Wind 15 knots



Double Swell System-Wind 30 knots



Wind-50 knots

MD-80 FLIGHT ATTENDANTS RESPONSIBILITIES:

LAND EMERGENCY

F/A	JUMPSEAT	EMER. & NORMAL DEMO	BRIEF ABAs	COMM. EVAC.
FSM/FFA	Fwd jumpseat aircraft left (Aircraft right if no F/A D)	P. A.	2 for Main Cabin Door (2 for Fwd Galley Door if no F/A D)	Main Cabin Door (Fwd Galley Door if no F/A D)
F/A B	Aft Jumpseat, Aircraft left	First Row First Class	3 for each Window exit (12 total)	Tailcone exit (Window exit)
F/A C	Galley fold down jumpseat	First row coach*	2 for Aft Galley Door, 2 for Tail Cone exit	Aft Galley Door
ABOVE FLIGHT ATTENDANTS ARE MINIMUM CREW				
F/A D	Fwd jumpseat aircraft right	Mid Cabin Coach	2 for Fwd Galley Door	Fwd Galley Door
F/A E	Aft jumpseat, aircraft right	Assist as needed	Assist as Needed	Assist as needed

DITCHING EMERGENCY

F/A	JUMPSEAT	EMER. & NORMAL DEMO	BRIEF ABAs	COMM. EVAC.
FSM/FFA	Fwd jumpseat aircraft left (Aircraft right if no F/A D)	P. A.	2 for Main Cabin Door (2 for Fwd Galley Door if no F/A D)	Main Cabin Door (Fwd Galley Door if no F/A D)
F/A B	Aft jumpseat, aircraft left	First Row First Class	3 for each Window exit (12 total)	Overwing exits
F/A C	Galley fold down jumpseat	First row coach*	1 each for Aft Galley Door and Tail Cone exit to block exits	Block aft exits, direct to Window exits
ABOVE FLIGHT ATTENDANTS ARE MINIMUM CREW				
F/A D	Fwd jumpseat aircraft right	Mid Cabin Coach	2 for Fwd Galley Door	Fwd Galley Door
F/A E	Aft jumpseat, aircraft right	Assist as needed	Assist as Needed	Assist as needed

*Note: Brief customers seated aft of Coach galley aircraft left.

General

Emergency equipment includes the escape lines, escape slides, megaphones, first-aid kits, oxygen, portable fire extinguishers, fire axe, and emergency flashlights. In addition, the seat cushions are used as flotation devices, and have straps installed on them to facilitate use. Some aircraft are equipped with life vests and life rafts.

Emergency Exits

Exits in order of preference are: Forward passenger door, galley service door, overwing emergency exits, tail cone, and clear view window. Type of emergency would dictate which exit should be used.

Forward Passenger Door Exit

Located on the left-hand side, forward of the passenger compartment. Open by pulling handle to the right and latching in the complete, open position.

Inflatable Slides - With door closed, pull bar to floor and manually lock into floor brackets. When aircraft has come to a complete stop, open door completely and latch open. Pull the red handle on the right side of the slide support and have passengers Sit and Slide. If the slide will not inflate, deploy manually and utilize it as a non-inflatable slide. When door opens, slide will drop. Send two assistants down to hold the slide and then have remaining passengers sit and slide.

Note: The red manual inflation handle on the escape slides at all cabin doors must always be visible and never be wrapped around or folded under the girt material.

Forward Galley Service Door Exit

Located on the right-hand side forward of the passenger compartment. Open by pulling handle to the left and pushing the door open completely and latched.

Inflatable Slide - Operation same as the one on the forward passenger door.

(Continued)

Overwing Exits

Two located on each side of the cabin.

Operation - Pull the upper handle to release the latch. Lift the window upward and in. Place the forward window in the row forward of the window exit. Place the aft window in the row aft of the window exit.

Escape Lines - Accesible when window is removed. One end is anchored to the window jamb. The free end is used to facilitate egress over the wing. If the free end has a hook, it should be attached to a ring on the top surface of the wing.

Blind knobs - Located on the overhead rack to indicate the location of the overwing exits in case of complete cabin blackout during an emergency.

Rear Galley Service Door

Located on left rear fuselage just forward of the left engine. Open by pulling the handle to the right and latching in the complete open position.

Inflatable Slide - Operation is the same as the forward cabin door.

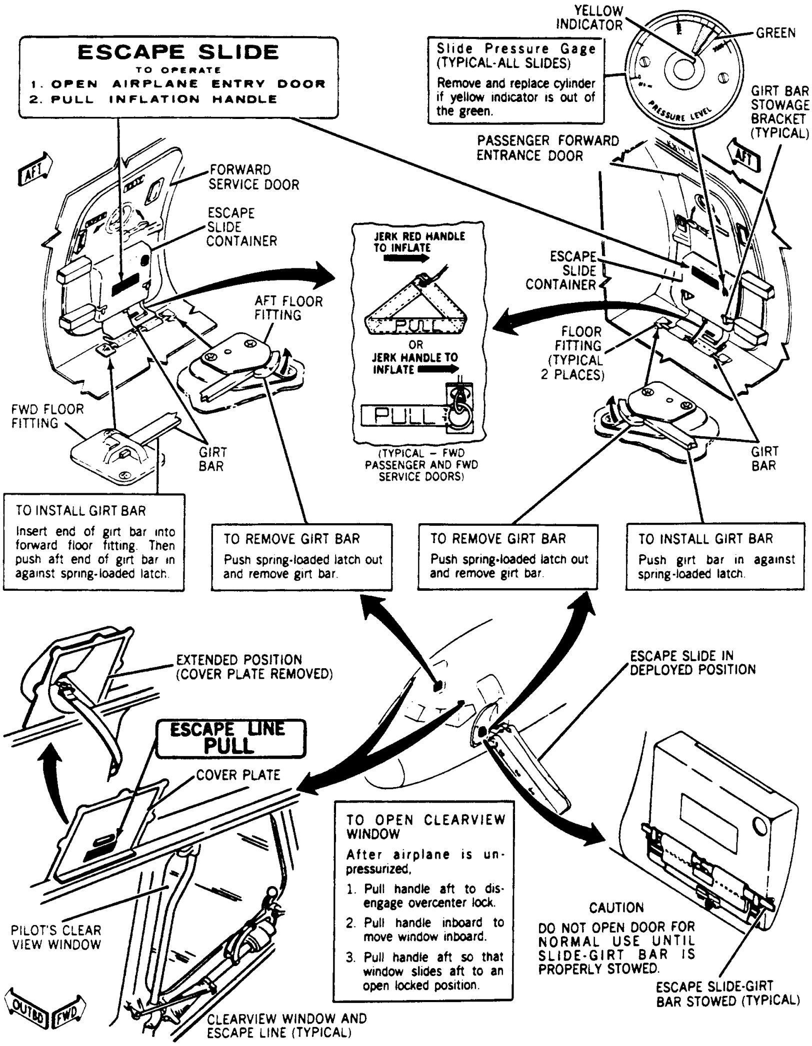
Aft Cabin Door / Tail Cone Exit

Operation - Remove cover and rotate aft cabin door emergency exit handle clockwise to unlatch and open door. Opening door causes tailcone to be jettisoned and deploys evacuation slide. A backup tailcone jettison handle is located on the aircraft left side just forward of the jettisonable section. Pulling on this handle will also jettison the tailcone and deploy the evacuation slide. There is also a backup release handle on the evacuation slide which, when lifted, will manually deploy the evacuation slide and inflate it. There is also a manual inflation handle for the evacuation slide adjacent to the girt bar.

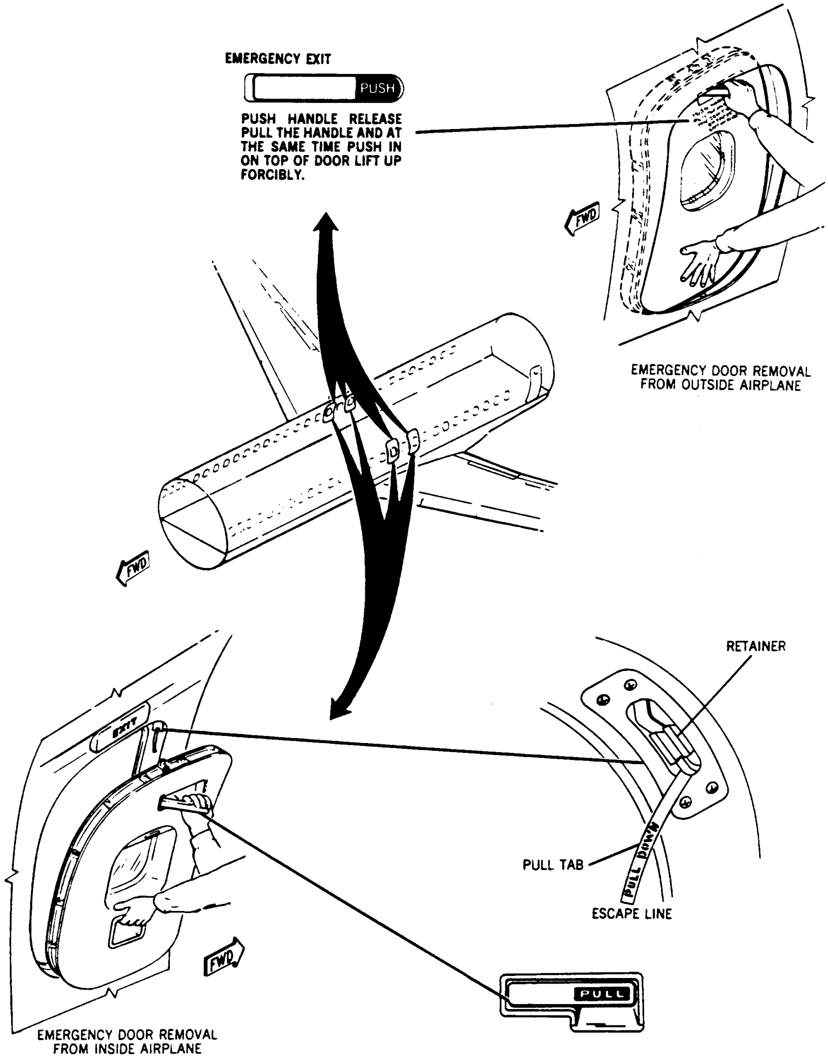
Note: The aft ventral stairway must be lowered by use of the exterior control due to removal of the interior control handle.

Clear View Window Exit

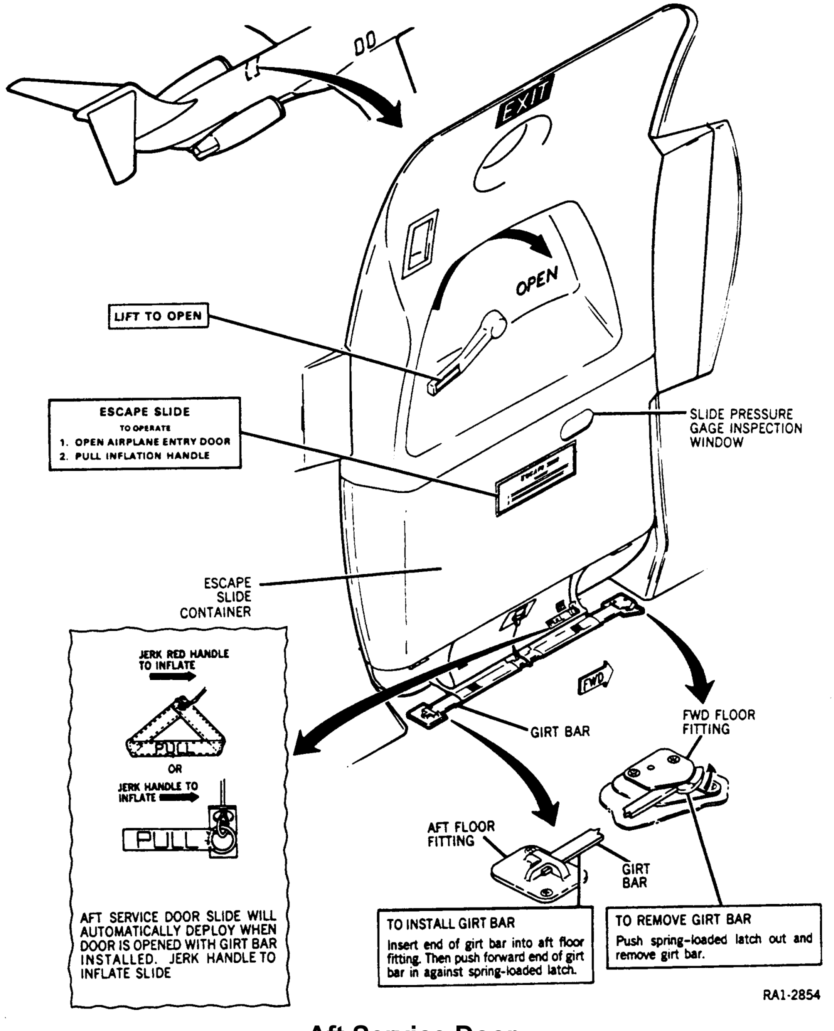
Clear view window exits are located on each side of the cockpit and operated by pulling handle aft to disengage the over-center lock, pulling handle inboard to free the window, and then pulling handle aft to an open, locked position. An escape line is located above each clear view window.



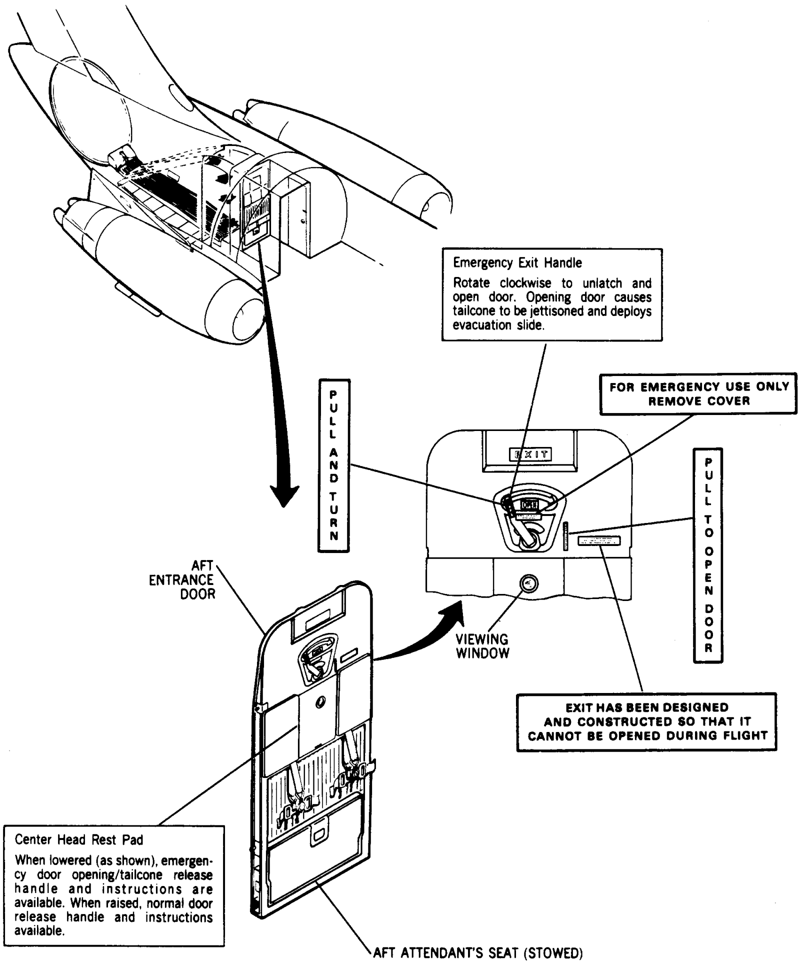
Passenger Forward Entrance and Forward Service Door



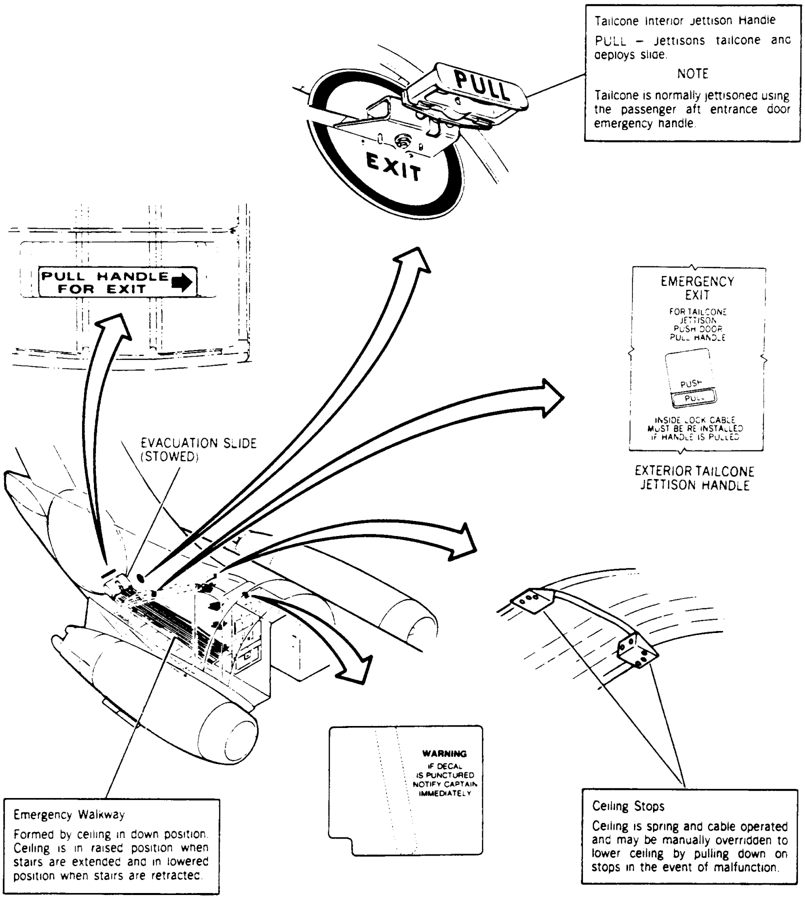
Overwing Emergency Exit Door



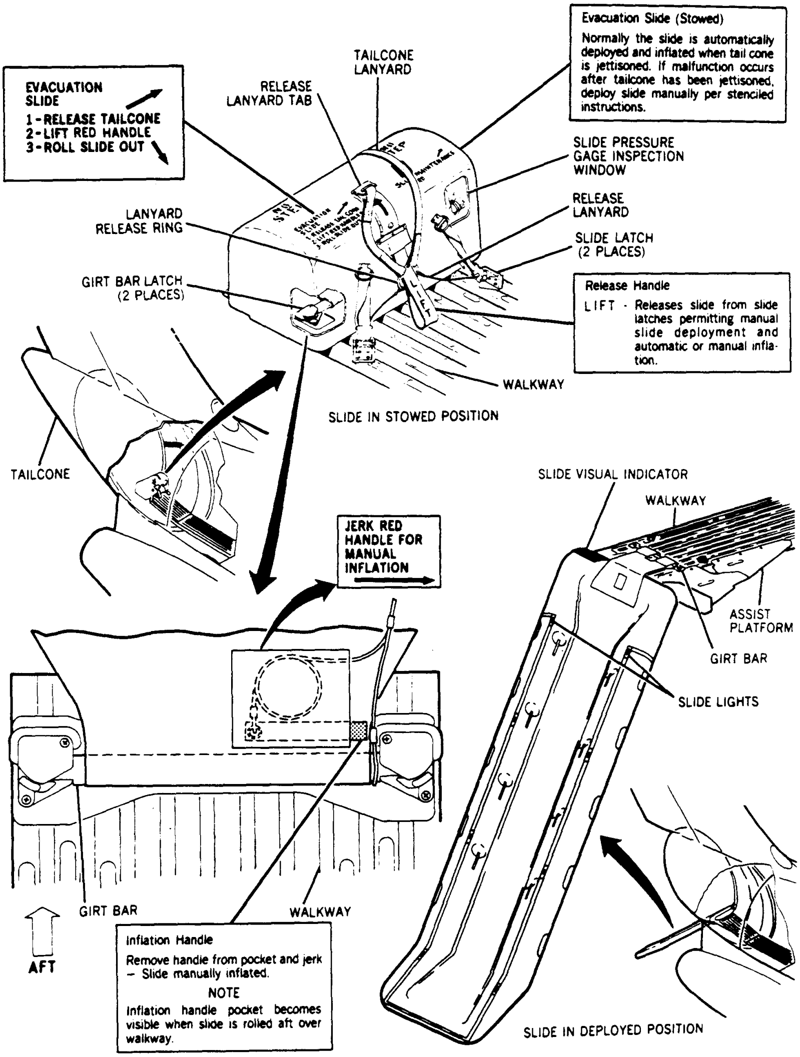
Aft Service Door



Aft Cabin Door



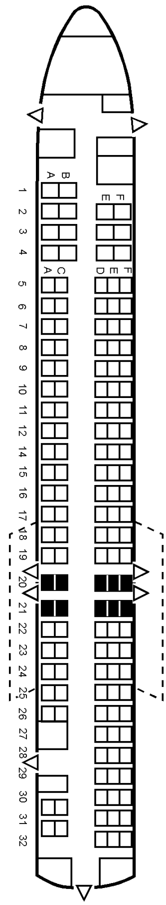
Tailcone Jettison / Walkway



Tailcone Slide

COCKPIT
Fire Ax
Portable Oxygen Bottle
Emergency Light Switch
Crew Life Vests (3)
Halon Fire Extinguisher
Emergency Medical Kit
Protective Breathing Equipment
Crew Smoke Goggles
Escape Lines

FORWARD JUMPSEAT
Attendant Life Vests (2)
Emergency Light Switch
Walk Around Light Pack



1L
MAIN CABIN DOOR

1R
FORWARD GALLEY DOOR

ACROSS FROM JUMPSEAT
Emergency Flash Lights (2)

FIRST CLASS CLOSET
First Aid Kit
Halon Fire Extinguisher
Megaphone
Protective Breathing Equipment
Portable Oxygen Bottles (2)
Spare Life Vests (6)

WINDOW EXIT
WINDOW EXIT

WINDOW EXIT
WINDOW EXIT

2L
AFT GALLEY DOOR

GALLEY FOLD DOWN JUMPSEAT
Attendant Life Vest
Emergency Flashlight

AFT OVERHEAD BIN
Spare Life Vests (6)

BEHIND LAST ROW OF SEATS
Barrier Strap
First Aid Kit
Halon Fire Extinguisher
Protective Breathing Equipment
Megaphone

BEHIND LAST ROW OF SEATS
Water Fire Extinguisher
Protective Breathing Equipment
Portable Oxygen Bottles (2)

MD80EEL

TAIL CONE EXIT
AFT DOUBLE JUMPSEAT
Attendant Life Vests (2)
Emergency Flashlights (2)

MD-80 EMERGENCY EQUIPMENT LOCATION

Emergency Flashlight

The emergency flashlight system is a self-powered, high-intensity, waterproof flashlight. The flashlight does not have an external on-off switch, instead the light turns on automatically when it is removed from its bracket. Since the flashlight is not equipped with a battery charger, a monitoring circuit on the light employs a light-emitting diode for visual indication of battery condition. The led will flash intermittently indicating satisfactory battery power for flashlight operation.

A nylon cord lanyard is coiled in the recess at the endcap of the light. The mounting bracket is designed so that the light, when properly installed, is fully seated in the bracket clip and the flashlight led is visible. The flashlight is deactivated when properly installed and will turn on automatically when removed from the bracket. A plastic shield is installed with the bracket. In case of emergency, the shield is removed by pulling the strap, breaking the perforated tabs, allowing the user access to the light.

Removal /Insertion of Handlight

If a shield is installed, it must first be removed by pulling the red removal strap, breaking the shields away from the bracket. The handlight is removed from the bracket by grasping the handle of the unit and pulling the bottom end of the handlight body firmly out of the retaining clip at the base of the retention bracket.

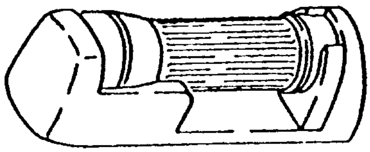
The handlight is properly returned to the bracket by first orienting the “fins” on the handlight body toward the slotted recesses in the bracket, with the LED facing away from the bracket. The head end of the bottom of the handlight is firmly snapped into the retaining clips on the bottom of the bracket. Failure to properly secure the handlight in the retention bracket will result in depletion of the battery within four hours.

Monitoring Circuit

The electronic monitoring circuit incorporated in the handlight body provides a constant indication of battery pack readiness and lamp integrity through a flashing light-emitting diode (LED) located on the head of the handlight. The LED continues to flash at intervals of 3-6 seconds until the battery pack reaches a cut-off voltage of approximately 6.75 volts or until the lamp filament is broken. Battery pack or lamp replacement is indicated when the LED flash interval increases to beyond 10 seconds or dims to the point that it is not easily detected in ambient light conditions.

Activation

The handlight is turned on automatically when removed from the retention bracket, and turned off automatically when properly returned to the bracket.



Emergency Medical Kit

The emergency medical kit contains equipment for use in the diagnosis and treatment of medical emergencies that might occur during flight. The contents of this kit are of a clinical nature and are to be used by a medical practitioner only.

The kit is located in the cockpit, in a metal case on the bulkhead behind the First Officer. The kit will be sealed in shrink wrap, or the latch on the metal case may be secured with a lead seal. If the seal is broken, the kit must be checked to ensure that it is complete or replaced with a fresh kit and the case resealed. The case will also have the expiration date of the kit attached. This should be checked to ensure that the kit is current.

The emergency medical kits will be supplied with dual quantities of depletable items. This permits the aircraft to continue to a station where the kit can be replaced in the event that it has been necessary to use it.

The kit contains a form to be completed by the medical practitioner who used the emergency medical kit.

Escape Path Aisle Lighting System

The floor proximity emergency escape path lighting system operates in conjunction with the existing emergency light system. The escape path and exit indicators are designed to motivate the passengers to quickly locate the nearest exit during emergency evacuations when low visibility conditions exist in the cabin. The system includes special cues for overwing exit locations and one-way egress routes. Input power is provided by two 6.0-volt battery packs activated in conjunction with the existing aircraft emergency lighting system.

The floor level light tracks are installed on the right side of the aisle if facing forward. The lights are clear and spaced at 20-inch intervals. Opposite each overwing exit are four red lights spaced at four-inch intervals to identify these exits. The last two lights in the track at either end of the cabin are red and spaced four inches apart. The light track on the catwalk in the tailcone has the lights installed on the right edge when facing aft there is also a spotlight illuminating the slide release handle.

In the forward entrance area under the flight attendant jumpseat headrest is a floodlight. This light is positioned to provide required passenger entrance way lighting between the end of the floor track to the two forward doors.

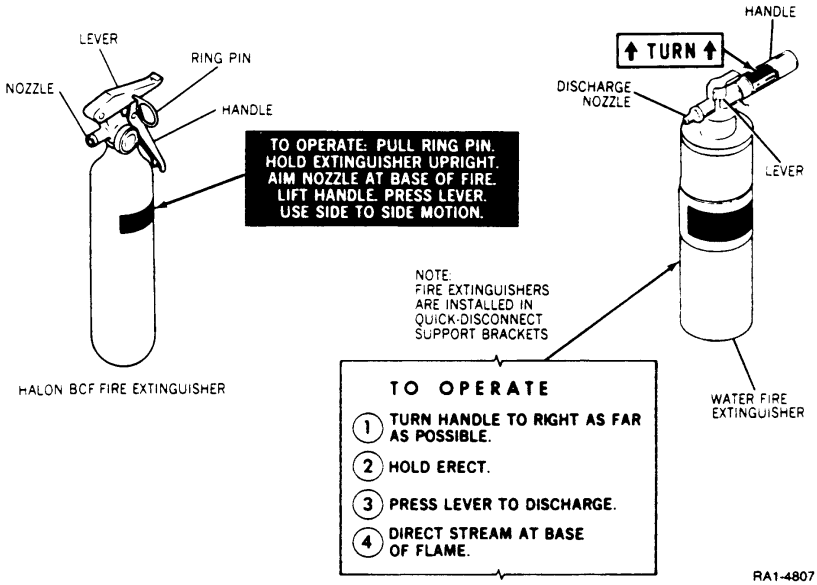
Adjacent to each overwing emergency exit is an exit identifier sign with an arrow pointing to the exit.

The exit signs with arrows for the forward doors are to the right of the passenger entrance and to the right of the forward service door.

The exit identifier sign for the aft door is located to the right of the door when facing aft, below the flight attendant panel.

The battery packs are located in the forward cabin overhead drop down panel and the aft cabin overhead left lavatory drop down panel.

Fire Extinguishers



Life Rafts - Currently Not Installed

Life Vests

Life vests for the flight crew are orange in color and stowed in pockets on the back of the seat. The observer's vest is stowed in the pocket on the back of the captain's seat.

Passenger life vests are yellow in color and are stowed under the passenger's seat.

Cabin attendant vests are orange and are stowed in compartments adjacent to their seats. Spare life vests are located:

- In the forward right-hand overhead bin.
- In the aft left-hand overhead bin.

Instructions for donning are printed on the vest.

Each vest is normally inflated by pulling on tagged cable ends which release CO_2 cartridges. However, the vest can also be inflated by oral tubes attached to the vest.

Lavatory Fire Extinguishers

Heat activated fire extinguishers for each disposed receptacle located within the lavatory have been installed. The built-in fire extinguisher will discharge automatically into each disposed receptacle upon occurrence of a fire in the receptacle.

Lavatory Smoke Detectors

Smoke detector units are installed in each lavatory. The units measure 4 x 6 inches and are usually mounted below the vanity behind the access door; hence out of view to the passenger. A test switch located adjacent to each detector will provide a confidence check. This test is the responsibility of maintenance and is not required to be checked by the crew.

Only a 4-7% smoke concentration will activate the aural and visual alarm system. The detector uses a photo electron device to pick up the smoke obscuration. The percentage of smoke concentration necessary to activate the alarm is dependent on the efficiency of the lav ventilation system. Based on an average ventilation system, a cigarette smoker will probably activate the alarm system.

The aural alarm consists of the cabin chimes sounding every 4 seconds (15 pulses per minute); and the visual component consists of the amber call light stations or locations. Both aural and visual alarms remain active until the smoke concentration is reduced below alarm level, or the detector canon plug is removed, or the call system circuit breaker is pulled.
The smoke detector is wired through the call system electrical system. Therefore, the call system and smoke detector are located on a single circuit breaker.

The smoke detector system is completely separate from the fire extinguisher system (when installed). An aircraft may be legally dispatched provided either the detector or the extinguisher system is working properly. Check the MEL.
In the event of a false warning, the preferred method to deactivate the malfunctioning unit would be to disconnect the canon plug, and then block that lavatory. Pulling the circuit breaker would deactivate all or several detectors and the call system.

Protective Breathing Equipment

General Description

The PBASCo protective breathing equipment (PBE) is a closed circuit breathing apparatus designed to help protect the wearer's eyes and respiratory tract in an irrespirable atmosphere by isolating the breathing functions from the environment.

The PBE is a hood device which completely encloses the head of the wearer and seals at the neck with a thin elastic membrane. The chemical air regeneration system is based on the use of potassium superoxide (KO_2). It is silently and reliably powered by the exhalation of the wearer into an oronasal mask cone located within the hood.

The hood encloses the head of the wearer and is sealed to the wearer by the neckseal. The enclosed volume of the hood represents approximately 8 liters available rebreathing volume. The oronasal mask serves to direct the exhaled breath containing CO_2 and water vapor back through the KO_2 bed where excess moisture and CO_2 are removed, and drier oxygen is added for return into the hood volume. Inhalation is accomplished directly from the interior of the hood through the inhalation valve located on the oronasal mask. A relief valve located at the back of the hood is used to prevent buildup of excessive pressure within the hood, and to provide emergency pressure relief in the event of a sudden reduction in cabin pressure. The chlorate starter candle mounted on the bottom of the KO_2 canister discharges directly into the canister.

The chlorate starter candle is designed to deliver a fixed volume of approximately 8 liters of oxygen over a short duration of less than 20 seconds. It is contained in a small stainless steel cylinder affixed to the base of the KO_2 canister. The discharge is directed into the interior of the KO_2 canister. The chlorate candle is initiated by a spring loaded plunger striking a small percussion primer when the lanyard attached to the hood adjustment strap is pulled.

Following actuation, the hood will inflate over a 15-20 second period. After this period, the starter candle will cease flowing and the only sound will be slight rustling of the fabric on each inhalation and exhalation. Dependent upon breathing rate, there will be a slight exhalation resistance as the exhaled breath is forced through the KO_2 canister. Heat is produced by both the chemical air regeneration process and transfer of body heat during the rebreathing cycle. Heat buildup within the hood is normal and is dependent upon the amount of work performed.

(Continued)

There should be no irritating or strong unusual odors within the hood. The equipment is designed to accommodate the requirements of the most demanding situations. It is optimized to provide a minimum of 15 minutes duration for the heaviest workload (duration is 15 to 30 minutes depending on users work rate). IF the PBE is worn to exhaustion of the chemical regeneration system, this will be evidenced by a gradual reduction in the expanded volume of the hood until the point that the hood is collapsed tightly around the head at the end of a full inhalation. At this point, the wearer should immediately retire to a safe breathing area clear of flame and toxic fumes and remove the device.

Operation

Remove the aluminized vacuum sealed pouch from the protective canister. Tear open the pouch and don the hood.

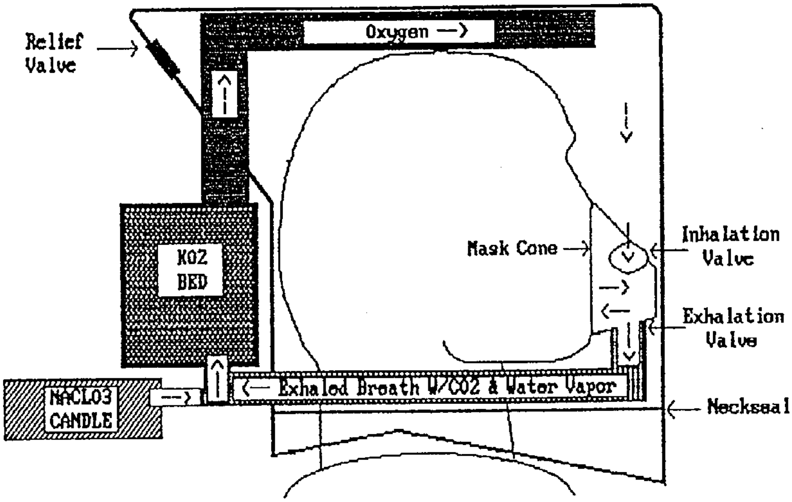
Pull the adjustment straps to secure the hood. This motion automatically activates the chemical oxygen system by removing a lanyard pin from the chemical canister located at the back of the hood.

The generated oxygen will inflate the hood, providing the initial breathing atmosphere. Pull the straps again if actuation fails. (The hood will continue to function, although the initial breathing atmosphere is not available. Stick fingers under the neckseal to allow a lung inhalation to enable breathing until the chemical regeneration system begins producing a surplus of oxygen.)

The initial generated oxygen inflates the hood, providing breathable atmosphere. As the wearer begins to breathe normally, the exhaled breath is directed through the chemical canister, which removes water vapor, carbon dioxide, and adds oxygen before the gas is returned to the interior of the hood for inhalation.

Excessive leakage of the oral/nasal cone or the neckseal may result in excessive build up of carbon dioxide. Signs of excessive build up are: rapid or labored breathing, moisture or fogging on the visor, strong irritating odors, and eye or respiratory tract discomfort. In this instance, move away from immediate contact with the fire, open flame/toxic fumes, and remove the hood. Don an alternate hood if required.

(Continued)


Relief Valve
Oxygen —>
KO2 BED
NACLO3 CANDLE
Mask Cone
Inhalation Valve
Exhalation Valve
<— Exhaled Breath W/CO2 & Water Vapor
Neckseal

METHODIKAL EMERGENCIES (PROGRESSIVE FAILURES)

Many Methodikal Emergencies (Progressive Failures) in the MD-80 have started with a generator failure. A generator failure will place a severe load on the generator's constant speed drive, causing fluctuating and eventually destructive vibration. This vibration will lead to a hydraulic pump failure. Failure of either the generator drive or the hydraulic pump will almost certainly result in a catastrophic failure of the engine accessory drive case. This failure might cause the engine to explode.

Caution must be exercised under these circumstances because of the reduced hydraulic flight control availability which causes longitudinal yaw and vertical pitch flight control problems. Whenever possible, avoid clouds because of electrical power failure and the loss of the Captain's flight instrument computer and radio. Land as soon as practical at a CAL Primary Maintenance Airport. The following must be considered:

- Long enough runways because of limited flight control capability and almost certain hydraulic brake failure upon landing.
- Crash, fire and rescue assistance availability.
- An airport where major generator, hydraulic pump or engine change capability exists; specifically, LAX, DEN, IAH or ORD.

Caution: Do not let the emergency progress long enough to prevent making a safe landing. On-time performance to scheduled destination must be sacrificed for safety, so land as soon as practicable.

The flight crew can expect any or all of the methodikal emergencies to progressively develop in the following manner:

Series Of Rings..METHODIKAL CHECKLIST

Overhead Speakers...OFF

Headsets ....ON

D. C. X-Tie ....OPEN

Left Generator .... OFF (MASTER CAUTION & AMBER LIGHTS)

Generator failed, however safe airplane flying time limited to 1 hour on 1 generator.

(Continued)

Avoid weather conditions. Critical safety of flight instruments, radios and electrical sub-systems will be inoperative at this time.

Request any clearance to descend to MEA, or 10,000 feet. Advise ATC to notify CAL dispatch of Delta One Emergency (ELECTRICAL Δ #1)

At MEA, Or 10,000 Feet Airspeed .... REDUCE: 230 KIAS

Flap Lever ....15° / TAKEOFF

Monitor right engine for vibration. If generator bearing failure is the cause, or additional engine trouble develops:

No. 2 Throttle .... REDUCE POWER

Note: When the throttle is moved toward the closed position. A steady warning horn will sound. Maintain enough power from affected engine to sustain flight.

(Engine Δ #2)

Call ATC. Declare a Delta Two Emergency. Request CAL Dispatch be advised. Monitor cabin pressure control. Right engine delta three compressor flow control valve may not remain controllable. Cabin altitude and temperature control may vary. Attempt manual mode of operation for pressurization.

(Environment Δ #3)

Caution: Longitudinal yaw, Vertical pitch or Dutch roll problems may result from a combination of asymmetrical engine power and limited hydraulic power.

Use normal in-range approach and landing checklists.

APU Air Switch .... OFF

APU .... START

Left APU Bus Switch .... ON

Note: APU blue power in use lights on the indicators 15 minutes maximum.

(Continued)

Captain may exercise emergency authority to operate engine at power setting required to effect a safe landing.

Failed Engine .... THROTTLE, AS NECESSARY

Gear Down .... 3 GREEN

Flaps .... 28°

The stall warning horn will be activated on the Delta Four final approach at approximately 5 knots above irreversible flight control stall. Exercise extreme caution down to touchdown.

(Flight Controls Δ #4)

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LIST OF EFFECTIVE PAGES

PAGE	DATE	PAGE	DATE	PAGE	DATE
TOC-1	05/15/95	* 28	12/01/00		
TOC-2	05/15/95	29	08/01/98	61	05/15/95
TOC-3	01/01/00	30	05/15/95	62	05/15/95
TOC-4	05/15/95			63	05/15/95
		31	08/01/98	64	05/15/95
1	08/01/98	* 32	12/01/00	65	05/15/95
2	08/01/98	* 33	12/01/00	66	05/15/95
3	08/01/98	34	05/15/95	67	05/15/95
4	08/01/98	35	05/15/95	68	05/15/95
* 5	12/01/00	36	01/01/00	68A	08/01/98
6	05/15/95	37	01/01/00	68B	08/01/98
7	08/01/98	38	01/01/00	69	08/01/98
8	08/01/98	* 39	12/01/00	70	08/01/98
9	05/15/95	40	01/01/97		
10	05/15/95			71	08/01/98
		* 41	12/01/00	72	08/01/98
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13	01/01/97	* 44	12/01/00	* 75	12/01/00
14	05/15/95	45	08/01/98	76	05/15/95
15	05/15/95	46	05/15/95	* 77	12/01/00
16	01/01/97	* 47	12/01/00	78	05/15/95
17	05/15/95	48	01/01/97	79	05/15/95
18	05/15/95	49	08/01/98	80	05/15/95
19	05/15/95	50	01/01/97		
20	05/01/96			81	05/15/95
		51	08/01/98	82	05/15/95
21	01/01/97	52	05/15/95	83	05/15/95
22	05/15/95	53	01/01/00		
22-A	01/01/00	54	05/15/95		
22-B	01/01/00	55	01/01/97		
* 23	12/01/00	56	05/15/95		
24	05/15/95	57	05/15/95		
* 25	12/01/00	58	05/15/95		
26	05/15/95	* 59	12/01/00		
27	08/01/98	60	01/01/97		

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ABNORMAL PROCEDURES

TABLE OF CONTENTS

AIR CONDITIONING / PRESSURIZATION

APU

AUTOPILOT

ELECTRICAL

FIRE WARNING & PROTECTION

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FUEL

HYDRAULICS

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INSTRUMENTS / NAVIGATION / COMMUNICATION

LANDING GEAR / BRAKES

MISCELLANEOUS

OXYGEN

POWER PLANT

CIRCUIT BREAKER GUIDE

INTENTIONALLY LEFT BLANK

AIR CONDITIONING / PRESSURIZATION

AIR COND SUPPLY TEMP HI LIGHT ON

IF There are Two Airfoil Anti-ice Switches:

AIRFOIL ICE PROTECT Switch (Affected System) .... OFF

PNEU X-FEED VALVE Lever (Affected System) .... CLOSED

Note: With CL selected in TRI, **NO MODE** light will come on and EPR LIM flag will come into view. Selecting MCT or CR will cause **NO MODE** light to go off and will remove EPR LIM flag.

AIR COND SUPPLY Switch (Affected System) ..... HP BLEED OFF

- - - - - AFTER ONE MINUTE- - - - -

IF Light Extinguishes:

Continue flight in established configuration.

OR

* * * *

IF Light Remains On:

Continue flight in established configuration.

AIR CONDITIONING PRESS Gauge....................... MONITOR

IF AIR CONDITIONING PRESS Gauge Goes To Zero:

This confirms pack overheat and automatic shutdown.

RADIO RACK Switch.. FAN

AIR CONDITIONING SUPPLY Switch .... OFF

Note: Monitor cabin pressure. It may be necessary to advance the throttles to maintain normal cabin pressure.

* * * *

AUTOMATIC PRESSURIZATION FUNCTIONING IMPROPERLY OR INOPERATIVE DURING FLIGHT

System Selector Switch ....STDBY

IF Pressurization Functions Normally:

Continue the flight in Standby.

OR

* * * *

IF Pressurization Continues to Malfunction:

CABIN ALT Control Lever .... MANUAL

CABIN ALT Control Wheel .... ATTEMPT TO MOVE

IF Cabin Altitude Control Lever and Indicator Move:

Proceed to MANUAL PRESSURIZATION CONTROL CHECKLIST, This Section.

OR

* * * *

IF Cabin Altitude Control Lever and Indicator Are Jammed:

RADIO RACK Switch ....FAN

NO SMOK Sign...ON

- - - - - WHEN TERRAIN AND CONDITIONS PERMIT - - - - -

Descent to below 10,000 feet .... INITIATE

AIR CONDITIONING SUPPLY Switch ....ONE OFF

Maintain a comfortable cabin rate of descent by varying throttle position on side of operating air conditioning system.

- - - - - WHEN BELOW 10,000 FEET - - - - -

AIR CONDITIONING SUPPLY Switch ....BOTH OFF

Cabin altitude may be below sea level.

(Continued)

WHEN CABIN ALTITUDE IS 2000 FEET ABOVE
- - - - - DESTINATION ALTITUDE - - - - -

Descent, Approach, and Landing.............................. CONTINUE

Ram Air Switch .... ON

Cabin altitude and airplane altitude will descend at same rate.

- - - - - AFTER LANDING - - - - -

Clearview Window(s) .... OPEN

Air conditioning may be resumed for passenger comfort.

Note: Do not close clearview windows after restarting air conditioning systems.

* * * *

CABIN ALTIMETER OR CABIN DIFF PRESSURE INDICATOR INOPERATIVE

Note: If the cabin altimeter or the cabin differential pressure indicator is inoperative, use the following table and procedures.

Altitude	Pressure (psi)	Altitude	Pressure (psi)
0000	14.70	18000	7.33
1000	14.17	19000	6.93
2000	13.67	20000	6.75
3000	13.26	21000	6.47
4000	12.71	22000	6.20
5000	12.23	23000	5.94
6000	11.58	24000	5.69
7000	11.34	25000	5.45
8000	10.91	26000	5.22
9000	10.51	27000	4.99
10000	10.11	28000	4.77
11000	9.72	29000	4.55
12000	9.35	31000	4.17
13000	8.98	33000	3.80
14000	8.63	35000	3.46
15000	8.29	37000	3.15
16000	7.97		
17000	7.63		

IF Cabin Altimeter Is Inoperative:

1. Note aircraft altitude and read ambient pressure from Table.
2. Read indicated cabin differential on gauge.
3. Add indicated cabin differential to ambient pressure from Table.
4. Re-enter table with this sum and read proper cabin altitude.

IF Differential Pressure Indicator is Inoperative:

1. Note aircraft altitude and read ambient pressure from Table.
2. Read indicated cabin altitude on gauge.
3. Note ambient pressure for indicated cabin altitude from Table.
4. Subtract ambient pressure for indicated cabin altitude (item 3) from ambient pressure for aircraft altitude (item 1) to get proper cabin differential pressure.

* * * *

DISPATCH FOR FLIGHT WITH AIR CONDITIONING SHUTOFF INOPERATIVE

Note: One or both air conditioning packs may be used as required during ground operation.

- - - - - BEFORE TAKEOFF- - - - -

AIR COND SHUTOFF Switch... OVRD

AIR CONDITIONING SUPPLY Switches...............................BOTH OFF

CABIN ALT Control Lever..................................POSITION AND LOCK

Position the Cabin Press Control lever opposite the 40 flap setting and lock in manual mode.

Note: Add .02 EPR to the takeoff EPR gauge settings.

- - - - - AFTER TAKEOFF- - - - -

AIR CONDITIONING SUPPLY Switch.......................................ONE ON

Do not select ON until complete flap retraction or a minimum altitude of 400 feet.

CABIN PRESS Controller..AUTO

Remaining AIR CONDITIONING SUPPLY Switch.............................ON

Caution: If an engine fails enroute, both air conditioning packs must be turned off prior to landing. If an engine fails after the landing gear extension, turn off both packs immediately.

* * * *

DISPATCH FOR FLIGHT WITH ONE PACK INOPERATIVE

Inoperative AIR COND SUPPLY Switch .... OFF

AUTOTHROTTLE Switch .... OFF

AIR COND SHUTOFF Switch .... AUTO

Takeoff EPR Setting .... ADJUST

Add .02 EPR to the takeoff EPR setting of the engine with the inoperative pack. TRC (if installed) will provide EPR setting for engine with operative pack. If ART is selected, use normal EPR settings; if ART is OFF, use maximum EPR settings.

Cruise Altitude/Fuel Consumption .... RECOMPUTE

Limit flight altitude to 25,000 feet pressurized or 10,000 feet unpressurized.

NO SMOK Sign .... ON

No smoking is allowed on ground or in flight with one pack inoperative.

Note: Reference MEL for a both-packs-off option.

* * * *

DISPATCH FOR FLIGHT UNPRESSURIZED

Note: Ram air system must be operable if either pack is inoperative.

CABIN ALT Control Lever .... MANUAL

Outflow Valve Position Indicator .... VALVE OPEN

Push and rotate the cabin altitude control wheel until the valve position indicator moves to the full aft position. The indicator should remain in this position throughout the flight.

Cabin Pressurization Control CB
(H-2, J-2, U-22, W-22) .... PULL

Flight Altitude .... LIMIT TO 10,000 FEET

Note: At altitudes above 9,500 feet, expect **CABIN PRESS** and **MASTER WARNING** lights to come on. On aircraft with voice, expect aural warning and horn to sound.

* * * *

FLOW LIGHT ON

Note: **FLOW** light may come on during unpressurized flight or unpressurized ground operation. This is normal.

Throttles (If At Low Power Setting)..ADVANCE

IF Light Remains On And Cabin Continues To Depressurize:

Descend to an altitude where normal pressurization can be maintained.

* * * *

MAINTAINING CABIN DIFFERENTIAL PRESSURE DURING IDLE DESCENT WITH ONE HIGH PRESSURE BLEED

IF Operating On Both Packs:

PNEU X-FEED Levers...BOTH OPEN

OR

* * * *

IF Operating On One Pack:

Throttle (Engine Supplying Bleed Air).... SLOWLY ADVANCE

Slowly advance throttle until **AIR COND SUPPLY PRESS** gauge indicator ceases to rise (approximately 21 psi). Adjust as required.

- - - - - WHEN BELOW 15,000 FEET- - - - -

Throttle... IDLE

* * * *

MANUAL PRESSURIZATION CONTROL

- - - - - PRIOR TO START- - - - -

Cabin Press Control CB (H-2, J-2, U-22, W-22) .... PULL

CABIN ALT Control Lever.......................................MANUAL LOCKED

CABIN ALT Control Wheel........................... FULL AFT, VALVE OPEN

Check manual operation of cabin altitude control wheel and indicator prior to placing SUPPLY switches to on by manually rotating wheel and indicator to full VALVE CLOSE (forward) position and return to full VALVE OPEN (aft) position.

Altitude Schedule ....REVIEW

Determine the planned cabin altitude at the flight planned cruise altitude using the Altitude Schedule placard.

AIR CONDITIONING SUPPLY Switches........................ AS REQUIRED

Use normal air conditioning procedures.

- - - - - AFTER TAKEOFF- - - - -

CABIN ALT Control Wheel.............ROTATE TO 1/3 VALVE CLOSED

As soon as practical after takeoff, push in and rotate the wheel forward to position the position indicator 1/3 of the quadrant toward VALVE CLOSE and lock.

- - - - - DURING CLIMB, CRUISE, DESCENT- - - - -

CABIN ALT Control Wheel... AS REQUIRED

Push in and rotate the pressure control wheel to maintain desired rate of climb (approximately 500 fpm), cruise (zero rate of change), and descent (approximately 300-400 fpm).

Note: The control wheel settings require constant attention and frequent resetting. Make all throttle movements slowly and coordinate the throttle movement with the pilot working the cabin altitude control wheel.

(Continued)

- - - - - LANDING- - - - -

When cabin altitude is 2000 feet above destination field elevation:

CABIN ALT Control Wheel........................... FULL AFT, VALVE OPEN

Maintain cabin rate at zero until cabin altitude equals airplane altitude. Slowly move CABIN ALT control wheel to position outflow valve position indicator to VALVE OPEN. Wheel and indicator should remain in this position for remainder of flight.

Note: During approach and landing, cabin altitude will decrease at same rate as airplane altitude.

* * * *

RADIO FAN OFF LIGHT ON

Radio Fan CB's (H and J4, 5, 6) ....RESET IF TRIPPED

IF Radio Fan CB's Are Not Tripped Or Will Not Reset:

RADIO RACK Switch .... VENTURI

Note: Consider descending if live cargo on board. If operating on one pack and not able to hold the desired differential pressure, the RADIO RACK switch may be returned to FAN.

- - - - - AFTER LANDING - - - - -

RADIO FAN OFF light will come on.

Electrical Power...REDUCE

Prolonged use of airplane electrical systems for ground operations will cause overheating of radio and electronic equipment. Turn off all unnecessary radio and electronic equipment.

* * * *

SUPPLY PRESSURE DROPS RAPIDLY TO ZERO

Note: This could indicate that one of the protective overheat switches has closed and shutdown the system.

AIR CONDITIONING SUPPLY Switch (Affected System)....... OFF

Allow sufficient time for cooling.

Applicable TEMP CONTROL VALVE Indicator........... OBSERVE

IF Indicates in HOT Range:

Temperature Selector (Affected System)..................... COOLER

IF Indicates in COLD Range:

Temperature Selector (Affected System)....................WARMER

AIR CONDITIONING SUPPLY Switch (Affected System)....AUTO

IF Supply Pressure Remains at Zero:

AIR CONDITIONING SUPPLY Switch (Affected System) .... OFF

OR

Pack is inoperative.

* * * *

IF Supply Pressure Increasing:

Temperature Selector (Affected System)............... AS DESIRED

Rotate TEMP selector to desired position. Monitor VALVE position indicator for response. If no response is observed, take over manual operation of system.

* * * *

TRANSFER LOCKOUT AND STANDBY ON LIGHTS ON

Note: In flight, do not push to reset the **TRANSFER LOCKOUT** and **STDBY ON** lights if both are on.

STDBY ON light indicates that pressurization has automatically transferred to standby mode.

TRANSFER LOCKOUT light indicates that the pressurization automatic transfer feature is locked out.

System Selector Switch ....STDBY THEN PRIMARY

IF The **STDBY ON** Light Remains On:

Do not reset the lights. No further action is required. Continue the flight on the standby system. The pressurization system is now limited to one system with no standby capability.

* * * *

OR

IF The **STDBY ON** Light Is Out:

TRANSFER LOCKOUT Light .... PUSH TO RESET

IF The **TRANSFER LOCKOUT** Light Remains On:

No further action is required. The pressurization system is now limited to one system with no standby capability.

* * * *

OR

IF The **TRANSFER LOCKOUT** Light Is Out:

Continue normal operations.

* * * *

TRANSFER LOCKOUT LIGHT ON

System Selector Switch ....STDBY THEN PRIMARY

TRANSFER LOCKOUT Light .... PUSH TO RESET

IF TRANSFER LOCKOUT Light Is Out:

Continue normal operation.

* * * *

OR

IF TRANSFER LOCKOUT Light Is Still On:

No further action is required. Pressurization system is now limited to one normal system with no standby capability.

* * * *

APU NO ROTATION, NO START, HUNG START

IF APU PERCENT RPM Gauge Indicates No Rotation:

DC VOLTS / AMPS Meter ....CHECK

IF Less Than 22 Volts (After Applying APU Starter Load):

Discontinue start attempt. Contact maintenance.

OR

* * * *

IF More Than 22 Volts (After Applying APU Starter Load):

APU MASTER Switch ....OFF

APU CONTROL CB (Battery Bus)......RESET IF TRIPPED

APU DOOR CONTROL CB (U39).......RESET IF TRIPPED

GEAR HDL RELEASE Button ....CHECK

IF GEAR HDL RELEASE Button is Retracted:

Call maintenance. Retracted button indicates an extended nose strut and failure of ground shift mechanism to go into ground mode.

OR

* * * *

OR

IF GEAR HDL RELEASE Button is Extended:

APU MASTER SWITCH..ON

IF APU Doors Are Open:

Attempt another start.

OR

* * * *

IF APU Doors Are Closed:

APU DOORS Switch........NON-RAM 24 SECONDS MINIMUM, THEN OFF

Attempt another start

Note: After APU shutdown, move APU DOORS doors switch to AUTO to close APU doors.

* * * *

IF APU PERCENT RPM Gauge Stabilized Less Than Idle RPM (No Start or Hung Start):

APU MASTER Switch .... OFF

Applicable Fuel Pump Switch .... ON

- - - - AFTER REQUIRED COOLING TIME- - - - -

Attempt a second start. If start not successful, call maintenance.

* * * *

APU EGT HIGH

Note: This procedure is to be used when no-load idle EGT is stabilized considerably above idle values (200-400°C) when APU AIR switch is on and all pneumatic powered systems are off.

Normally, idle EGT will rise momentarily when APU bleed air valve is opened until pneumatic ducting is pressurized, then return to original no-load value.

If EGT remains high, the most probable cause is a pneumatic duct leak.

APU AIR Switch .... OFF

APU MASTER Switch .... OFF

Call maintenance.

* * * *

APU GEN OFF LIGHT ON

Note: It is normal for this light to be on when the APU generator is available but not in use. This checklist should be accomplished if the **APU GEN OFF** light illuminates while attempting to use APU generator power.

APU BUS Switches...OFF

APU GEN Switch...RESET

Note: A generator must be reset only once for a given fault. If fault trips generator after reset, fault should be located and corrected before attempting to place generator on its bus again.

IF APU Volts & Frequency are Not Within Allowable Limits:

Generator capability is lost.

OR

* * * *

IF APU Volts & Frequency Are Within Allowable Limits:

Note: If APU generator is the only power source, move GALLEY switch to OFF before energizing generator buses.

APU BUS Switches..ON (ONE AT A TIME)

IF APU Volts & Frequency Are Zero or **APU GEN OFF** Light is On:

Generator capability is lost.

OR

APU BUS Switches...OFF

* * * *

IF APU Volts & Frequency Are Normal and **APU GEN OFF** Light is Off:

Continue normal operation.

* * * *

APU OIL PRESS LOW AND / OR APU OIL TEMP HIGH LIGHT(S) ON

APU FIRE CONT Switch .... OFF & AGENT ARM

APU AIR Switch .... OFF

APU DOORS Switch...AUTO

APU MASTER Switch .... OFF

APU FIRE CONT Switch .... NORMAL

* * * *

APU WILL NOT SHUT DOWN

Caution: Except in an emergency, do not shut down APU by moving APU FIRE CONTROL switch to OFF & AGENT ARM, BATT switch to OFF, or pulling **APU CONTROL** circuit breaker, without first allowing a 60 second cool-down with bleed air off.

FIRE CONT Switch... OFF & AGENT ARM

- - - - - AFTER APU SHUTS DOWN- - - - -

FIRE CONT Switch.. NORMAL

Caution: The APU Fire Control switch must be moved to NORM to disarm the cockpit and external APU panel fire agent discharge circuits.

* * * *

APU WINDMILL START

Note: Successful windmill starts are not likely above 24,000 feet. Aircraft speed envelope for windmill start is 230-340 KIAS (.70 mach). Higher speeds will give a higher probability of successful start.

Windmill start is improbable with cold soak exceeding ½ hour.

The following procedure assumes a failure of both engine driven generators.

Battery Switch .... ON

APU FIRE CONT Switch .... NORM

APU AIR Switch .... OFF

APU MASTER Switch .... OFF

AC CROSSTIE Switch .... OPEN

APU DOORS Switch .... AUTO

START PUMP Switch .... ON

APU MASTER Switch .... START, RELEASE TO RUN

APU OIL PRESS LOW Light ....OFF (AT OR PRIOR TO 95% RPM)

- - - - - AFTER START- - - - -

Note: Multiple start attempts are acceptable, if required. BATT switch must be left in ON to sustain APU operation.

APU BUS Switches .... ON (ONE AT A TIME)

AC CROSSTIE Switch .... AUTO

Fuel Boost Pumps .... VERIFY ON

START PUMP Switch .... OFF

* * * *

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AUTOPILOT

AP TRIM LIGHT STAYS ON

Autopilot...DISENGAGE

Alternate Trim C/Bs (D 9, 10, 11) ....RESET IF TRIPPED

Note: Do not conduct an ILS-coupled approach or autoland if the AP Trim light is on in excess of three seconds, in a stabilized configuration, while tracking the glideslope.

* * * *

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ELECTRICAL

AC CROSSTIE LOCKOUT LIGHT ON ONLY

Note: Use this procedure for only the AC Crosstie Lockout light illuminated.

IF Aircraft Is On The Ground:

AC Crosstie Relay .... RESET

The AC Crosstie Reset switch is located behind the Captain's seat on some aircraft, or in the E & E Compartment on the other aircraft.

OR

IF Unable To Access The Reset Switch:

Electrical Power .... OFF

Remove all electrical power from the aircraft.

Electrical Power .... RESTORE

IF Light Is Still Illuminated:

Contact Maintenance.

* * * *

IF Aircraft Is In The Air:

APU.. START

L And R APU Bus Switch .... ON

This will provide backup power in the event of a generator failure.

Caution: No other action is authorized.

* * * *

AC CROSSTIE LOCKOUT, AC BUS OFF (L OR R)
GEN OFF (L, R, OR APU), AND DC BUS OFF
LIGHTS ON
GEN FEEDER FAULT (L, R, OR APU)
LIGHT MAY ALSO BE ON

Fuel Boost Pump Switches .... ALL ON

DC BUS X-TIE Switch ....CLOSE

Monitor DC LOAD meters.

Affected Engine (or APU)
GEN Switch.. RESET, OFF (OR NORM)

IF AC Volts / Frequency Are Within Allowable Limits:

> **GEN (or APU BUS) Switch .... ON**
>
> **IF** AC Load Is Within Allowable Limits:
>
> **DC BUS X-TIE Switch .... OPEN**
>
> Monitor system, all busses restored.
>
> Note: AC crosstie relay will remain locked open until reset on the ground. APU generator, if available, may be selected as backup.
>
> **OR**
>
> * * * *
>
> **IF** AC Load Is Not Within Allowable Limits:
>
> Continue checklist at ❶

IF AC Volts / Frequency Are Not Within Allowable Limits:

❶ **GEN (or APU BUS) Switch.. OFF**

Generator cannot be used. Do not attempt further resets.

APU Generator Availability .... DETERMINE

Note: Prior to starting APU, verify APU L/R BUS switches are in OFF. If right generator bus is not powered, battery charger will be inoperative. More than one APU start attempt will reduce battery power and result in less than 30 minutes of emergency power if all AC power is lost.

(Continued)

IF APU Generator Is Available (AC Volts / Freq Within Limits):

> **APU Bus Switch (Affected Side) ....ON**
>
> **IF** AC Load Is Within Allowable Limits:
>
> **DC BUS X-TIE Switch .... OPEN**
>
> Monitor system, all busses restored.
>
> Note: AC crosstie relay will remain locked open until reset on the ground.
>
> * * * *
>
> **OR**
>
> **IF** AC Load Is Not Within Allowable Limits:
>
> Generator bus cannot be restored. Reset APU generator if required. Select APU BUS switch to provide backup for the operating system.
>
> Continue checklist at ❷

IF APU Generator Is Not Available:

❷ Continue flight with affected system inoperative.

IF There is Fuel Remaining in the Center Tank:

Main Tank Boost Pump
Switches (One at a Time) .... OFF

- - - - WHEN CENTER TANK INDICATES 500 LBS - - - -

Main Tank Boost Pump Switches .... ALL ON

Note: Remaining center tank fuel may be used by leaving tank pump switches in one main tank OFF. When center tank indicates zero or **INLET FUEL PRESS LOW** light is on, move main tank pump switches for that tank back to ON.

* * * *

AC EMER BUS OFF LIGHT ON

IF Phase Of Flight Is Critical And Captain's Flight Instruments Are Inoperative:

EMER PWR Switch ....ON

Caution: With EMER PWR switch in ON, battery cannot be relied upon for more than 30 minutes. Use emergency power only as required.

Use emergency power as long as phase of flight is critical, then turn emergency power off.

IF Captain's Flight Instruments Not Restored:

EMER PWR Switch ....OFF

- - - - - PHASE OF FLIGHT IS NOT CRITICAL - - - - -

IF Captain's Flight Instruments Are Normal:

EMERGENCY AC BUS SENSING
CB (Overhead Panel) ....RESET IF TRIPPED

OR

* * * *

IF Captain's Flight Instrument Flags Are In View:

EMER AC BUS FEED CB (K-7)
AND ALTERNATE
EMER AC BUS FEED CB (L-8) ....CHECK

IF Both CB's Are Tripped Or ALTERNATE EMER AC BUS FEED CB Has Tripped:

ALTERNATE EMER AC BUS FEED CB
(L-8) (One Time Only) ....RESET

Caution: If circuit breaker will not reset or trips again, do not reset EMER AC BUS FEED circuit breaker and do not move EMER PWR switch to ON.

OR

IF ALTERNATE EMER AC BUS FEED CB Resets:

Do not reset EMER AC BUS FEED CB (if tripped).

OR

* * * *

(Continued)

IF ALTERNATE EMER AC BUS FEED CB Will Not Reset Or Trips Again:

EMER PWR Switch .... OFF

Continue flight with affected instruments inoperative. Refer to emergency AC bus portion of overhead circuit breaker panel to determine affected circuits.

* * * *

IF ALTERNATE EMER AC BUS FEED CB Has Not Tripped:

Continue flight with affected instruments inoperative. Refer to emergency AC bus portion of overhead circuit breaker panel to determine affected circuits.

At Captain's discretion:

EMER PWR Switch .... ON

IF **EMER AC BUS OFF** Light Is Off:

Use emergency power only as required.

Caution: With EMER PWR switch in ON, battery cannot be relied upon for more than 30 minutes.

Note: Flight instruments may take up to 3 minutes to erect before flags disappear. Fly airplane with wings straight and level.

Note: Battery charger will not operate while EMER PWR switch is ON.

OR

* * * *

IF **EMER AC BUS OFF** Light is On:

EMER PWR Switch .... OFF

Continue flight with affected instruments inoperative.

* * * *

CIRCUIT BREAKER(S) OUT

WARNING: Resetting of any tripped fuel boost pump, fuel quantity indication system, or lavatory flush motor circuit breaker is prohibited.

Caution: Indiscriminate pulling or resetting of circuit breakers for systems or components may cause unanticipated results because of systems interrelationships.

Note: A circuit breaker found in the **out position** may be the result of:

- Tripped condition due to electrical fault.
- Inadvertent pulling by contact/catching with an object.
- Intentional pulling during mx/ops procedure and failure to reset.

IF Prior to Block Out:

A circuit breaker that is found in the out position (not known whether it tripped or was pulled) may be reset one time, unless:

- There is reason to believe that it tripped due to electrical fault.
- The crew heard the CB pop or observed a change in the associated aircraft system/warning light which was previously normal but is now unpowered as a result of the CB being out.
- There is a previous logbook entry about the same CB being tripped in the previous 3 days.
- There is associated electrical smoke/smell, or evidence of overheating of any aircraft system.

If any of the above conditions exist, the crew should not reset the CB. Enter the findings in the logbook and call maintenance.

IF After Block Out but Prior to Takeoff:

Any circuit breaker that is confirmed to have tripped, should not be reset by the crew. The crew can continue the flight with the CB left in the tripped mode provided the affected system is not required as per the MEL, and all appropriate MEL procedures are complied with. Also there must be no electrical smoke/smell, or evidence of overheating of any aircraft system. In all cases a logbook entry is required.

IF After Takeoff but Prior to Block In:

One reset of a tripped circuit breaker may be attempted after a cooling period of approximately two minutes if called for by an emergency /abnormal checklist, or unless, in the judgement of the Captain, resetting the CB is necessary for the safe completion of the flight. If the circuit breaker trips again, do not attempt another reset. In all cases a logbook entry is required.

(Continued)

All tripped circuit breakers, whether reset or not, must be written up in the aircraft logbook. The entry should include:

1. Name and location of the CB.
2. Z -time when trip occurred (if known).
3. Phase of flight, altitude/airspeed, etc, when trip occurred.
4. Weather conditions if appropriate.
5. Any pilot action that occurred prior or during the trip sequence.
6. Attempted reset and results.

IF Generator Bus Circuit Breaker(s) Tripped (35 or 50 amp):

Note: When APU is operating in flight, only the APU BUS switch on the affected side should be on.

AC BUS X-TIE Switch .... OPEN

Pull circuit breakers for all three phases of the particular load. After cooling period reset all three circuit breakers simultaneously.

IF Reset is Unsuccessful:

Pull circuit breakers for all three phases of the particular load.

* * * *

OR

IF Reset is Successful:

AC BUS X-TIE Switch .... AUTO

* * * *

OR

IF Other Than Generator Bus Circuit Breaker(s) Tripped:

IF The Particular Load Has Switch Control:

Turn the switch off for the cooling period. Turn switch back on after resetting circuit breaker(s).

IF The Particular Load Has Three Phase Circuit Breakers:

Pull circuit breakers for all three phases of the particular load. After cooling period, reset all three circuit breakers simultaneously.

IF Reset Is Unsuccessful:

Do not attempt another reset. If applicable, pull circuit breakers for all three phases of the particular load.

* * * *

CSD OIL LIGHT ON

Associated GEN OFF Light and
CSD Oil OUTLET TEMP Gauge...CHECK

IF GEN OFF Light Is Off and CSD Oil OUTLET TEMP Is In Yellow Band:

Refer to CSD OIL OUTLET TEMP HIGH, this section.

OR

* * * *

IF GEN OFF Light Is On Or CSD Oil OUTLET TEMP Is At/Above Red Limit:

GEN Switch (Affected System)...OFF

Utilize APU generator if available. Continue checklist at ❶

IF GEN OFF Light Is Out And CSD Oil OUTLET TEMP Is Normal:

APU Generator Availability ....DETERMINE

IF APU Generator Is Not Available:

Continue operation of engine generator (with CSD OIL light on) at Captain's discretion.

OR

* * * *

IF APU Generator Is Available:

APU BUS Switch (Engine With CSD OIL Light On) .....ON

GEN Switch (Affected System).....................................OFF

❶ **Caution**: Next switch action is irrevocable. Make certain switch selected is for malfunctioning CSD.

Note: CSD disconnect can be confirmed by observing AC volts and frequency below scale. CSD disconnect may cause temporary loss of associated AHRS unit. Realignment in flight will require 45 seconds.

(Continued)

CSD Disconnect Switch (Affected System)
(Hold for three seconds) ....DISC

Note: If remaining engine generator should fail, APU generator will crosstie. If this occurs, move remaining APU switch to ON.

IF Only One Generator (Engine or APU) Is Operating:

- - - - - PRIOR TO LANDING - - - - -

One AIR CONDITIONING SUPPLY Switch......... OFF

GALLEY Switch .... OFF

* * * *

CSD OIL OUTLET TEMP HIGH

CSD Oil OUTLET TEMP Gauge and Frequency Of Affected Generator..CHECK

IF Temperature Remains in Caution (Yellow) Zone and Frequency Is Within Limits:

Monitor temperature and frequency.

OR

* * * *

IF Temperature Increases Steadily Toward Danger (Red) Zone <u>Or</u> Frequency Is Out Of Limits Or Fluctuating:

GEN Switch (Affected System) .... OFF

IF Temperature Stabilizes Below Danger Zone And Frequency Is Within Limits:

Continue operation with GEN switch off. Utilize APU generator if available.

OR

* * * *

IF Temperature Increases And Stabilizes In Danger (Red) Zone <u>Or</u> Frequency Is Out Of Limits:

Continue checklist at ❶

OR

IF Temperature Increases And Stabilizes In Danger (Red) Zone <u>Or</u> Frequency Is Out Of Limits:

GEN Switch (Affected System) .... OFF

❶ **<u>Caution</u>**: Next switch action is irrevocable. Make certain switch selected is for malfunctioning CSD.

<u>Note</u>: CSD disconnect can be confirmed by observing AC volts and frequency below scale. CSD disconnect may cause temporary loss of associated AHRS unit. Realignment in flight will require 45 seconds.

(Continued)

CSD Disconnect Switch (Affected System)
(Hold for three seconds)..DISC

Utilize APU generator if available.

IF APU Generator is Available:

APU BUS Switch (Affected Side)......................................ON

Note: If Remaining engine generator should fail, APU generator will crosstie. If this occurs, move remaining APU switch to ON.

IF Only One Generator (Engine or APU) is Operating:

- - - - - PRIOR TO LANDING - - - - -

One AIR CONDITIONING SUPPLY Switch......... OFF

GALLEY Switch .... OFF

* * * *

CSD OIL PRESS LOW LIGHT ON

IF GEN OFF Light Is On:

GEN Switch (Affected System) .... OFF

Utilize APU generator if available. Continue checklist at ❶.

OR

IF GEN OFF Light Is Out:

APU Generator Availability .... DETERMINE

IF APU Generator Is Not Available:

Continue operation of engine generator at Captain's discretion.

* * * *

OR

IF APU Generator Is Available:

APU BUS Switch
(Engine With CSD OIL PRESS LOW Light On)............ ON

GEN Switch (Affected System) .... OFF

❶ <u>**Caution**</u>: Next switch action is irrevocable. Make certain switch selected is for malfunctioning CSD.

<u>Note</u>: CSD disconnect can be confirmed by observing AC volts and frequency below scale. CSD disconnect may cause temporary loss of associated AHRS unit. Realignment in flight will require 45 seconds.

CSD Disconnect Switch (Affected System)
(Hold for three seconds) ....DISC

<u>Note</u>: If remaining engine generator should fail, APU generator will crosstie. If this occurs, move remaining APU switch to ON.

IF Only One Generator (Engine or APU) is Operating:

- - - - - PRIOR TO LANDING - - - - -

One AIR CONDITIONING SUPPLY Switch......... OFF

GALLEY Switch .... OFF

* * * *

DC BUS OFF LIGHT ON

IF DC Load Meters Indications are Normal:

DC BUS OFF SENSING
Circuit Breaker (R-23)................................RESET IF TRIPPED

If DC BUS OFF Light remains on, sensing circuit is faulty.

* * * *

OR

IF DC Load Meters Indications are Abnormal:

Affected T/R Circuit Breakers ....CHECK

Left T/R #1:	K-1, 2, 3	Left T/R #2:	K-4, 5, 6
Right T/R #1:	L-1, 2, 3	Right T/R #2:	Ground Service Bus upper left corner

IF Tripped:

T/R #1 <u>OR</u> T/R #2 Circuit Breakers.......................... RESET

If circuit breakers will not reset, try resetting circuit breakers for other T/R. If second T/R circuit breakers will not reset, continue with affected equipment inoperative.

<u>Caution</u>: Do not attempt to move DC BUS X-TIE switch to CLOSE if T/R circuit breakers cannot be reset.

* * * *

OR

IF Not tripped:

DC BUS X-TIE Switch (If desired)............................CLOSE

Monitor DC load meters of operative T/Rs.

* * * *

DC EMER BUS OFF LIGHT ON

Note: Continue with affected equipment inoperative until time is available to complete this procedure.

IF CAPT PITOT HEATER CURRENT Is Normal:

Emergency DC Bus Sensing Circuit Breaker (Overhead Panel B-11 or 12) ....RESET IF TRIPPED

Note: **DC EMER BUS OFF** light may be illuminated by a malfunctioning sensing circuit or by a tripped circuit breaker. Resetting this circuit breaker may restore normal operation.

* * * *

OR

IF CAPT PITOT HEATER CURRENT Is Not Normal:

EMERGENCY DC BUS FEED Circuit Breaker (N-37)...CHECK

IF Tripped:

Reset circuit breaker one time only.

Caution: If circuit breaker will not reset, or trips again, do not move EMER PWR switch to ON; a bus fault may exist.

* * * *

OR

IF Not Tripped:

Continue operation with affected circuits inoperative. At Captain's discretion:

EMER PWR Switch ....ON

Note: Operation with EMER PWR switch in ON will power emergency AC bus and emergency DC bus. With BATT switch in ON, DC transfer bus is powered regardless of EMER PWR switch position. Battery, if fully charged, will supply power for certain emergency equipment for approximately 30 minutes. Only equipment essential for safe flight should be used.

* * * *

DC TRANSFER BUS OFF LIGHT ON

IF Standby Attitude Indicator Power Off Flag Is Not In View:

DC Transfer Bus Sensing
Circuit Breaker (X-37)................................RESET IF TRIPPED

Note: DC TRANSFER BUS OFF light may be illuminated by a malfunctioning sensing circuit or by a tripped circuit breaker. Resetting this circuit breaker may restore normal operation.

OR

* * * *

IF Standby Attitude Indicator Power Off Flag Is In View:

DC TRANSFER BUS FEED
Circuit Breaker (N-36)..CHECK

IF Tripped:

Reset circuit breaker one time only.

If circuit breaker will not reset, or trips again, continue operation with affected equipment inoperative. Land at nearest suitable airport.

OR

* * * *

IF Not Tripped:

Land at nearest suitable airport.

- - - - - APPROXIMATELY 30 MINUTES PRIOR - - - - -
TO GATE ARRIVAL

DC TRANSFER BUS FEED
Circuit Breaker (N-36).. PULL

CHARGER & TRANSFER RELAY CONTROL
Circuit Breaker (N-38).. PULL

Battery should restore power to DC transfer bus. Battery charger will be inoperative.

Note: Battery is time limited at 45 amperes for 30 minutes.

* * * *

GEN OFF LIGHT ON

Note: This procedure addresses loss of generator due to action of fault protection.

Check CSD oil outlet temperature and for illumination of CSD OIL or CSD OIL PRESS LOW light for affected generator.

IF CSD OIL / CSD OIL PRESS LOW Light is On Or CSD Oil Outlet Temperature Is High:

Proceed to either CSD OIL LIGHT ON, CSD OIL PRESS LOW LIGHT ON, or CSD OIL OUTLET TEMP HIGH checklist this section, as appropriate. Do not continue this checklist.

OR

* * * *

IF CSD OIL / CSD OIL PRESS LOW Light is Not On And CSD Oil Outlet Temperature Is Normal:

GEN Switch (Affected System) ....RESET, OFF

Note: A generator must be reset only once for a given fault. If fault trips generator after reset, fault should be located and corrected before attempting to place generator on its bus again.

AC Volts / Frequency (Affected System) ....CHECK

IF Within Allowable Limits:

GEN Switch (Affected System) ....ON

AC Volts / Freq / Load (Affected System) ....CHECK

IF Within Allowable Limits:

Monitor system. Consider starting APU for use as backup.

OR

* * * *

IF Not Within Allowable Limits Or Will Not Stay On Line:

GEN Switch (Affected System)............................. OFF

Continue checklist at ❶

(Continued)

IF Not Within Allowable Limits:

❶ Note: All busses will be powered through AC crosstie relay.

IF APU Generator Is Available:

APU L Or R Bus Switch
(Side With Inoperative Generator) ....ON

Note: The AC loadmeter for operating engine generator should decrease and APU generator loadmeter should increase as AC crosstie relay automatically opened.

OR

Note: While airborne, if operating engine generator should fail, APU generator will crosstie. If this occurs, move remaining APU bus switch to ON. Verify one AIR CONDITIONING SUPPLY switch and GALLEY switch are in OFF before landing.

* * * *

IF APU Generator Is Not Available:

Monitor load of operating engine generator.

- - - - - PRIOR TO LANDING - - - - -

One AIR CONDITIONING SUPPLY Switch........... OFF

GALLEY Switch .... OFF

* * * *

INTERMITTENT AC POWER INTERRUPTIONS

Note: This condition may be characterized by a loud buzzing / chattering sound from the EPC and any combination of random circuit breaker trips, inappropriate CAWS messages, loss of some flight instruments, flashing cockpit annunciators, and loss of left or right AC bus(es).

Caution: Review CIRCUIT BREAKER(S) TRIPPED, this section prior to resetting any circuit breakers.

AC BUS X-TIE Switch ....OPEN

IF Left And/Or Right **GEN OFF** Light Is On:

GEN Switch (Affected System) .... RESET, OFF

Note: A generator must be reset only once for a given fault. If a fault trips the generator after reset, the fault should be located and corrected before attempting to place the generator on its bus again.

IF AC Volts/Frequency Of Affected System Are Within Allowable Limits:

GEN Switch (Affected System) .... ON

IF AC Volts/Frequency/Load Are Within Allowable Limits:

Circuit Breaker(s) ....RESET IF TRIPPED

OR

* * * *

IF Generator Re-trips Or AC Volts/Frequency/Load Are Not Within Allowable Limits:

Continue checklist at ❶

IF AC Volts/Frequency Of Affected System Are Not Within Allowable Limits:

❶ **GEN Switch (Affected System) ....OFF**

DC X-TIE Switch .... CLOSE

Continue checklist at ❷

IF Left And Right **GEN OFF** Lights Are Off:

❷ **Circuit Breaker(s)..RESET IF TRIPPED**

(Continued)

IF APU Generator Is Available (Volts / Frequency within limits):

Note: Prior to starting APU, verify APU L/R BUS switches are in OFF.

APU BUS Switch (Affected Side)..ON

Note: During approach, verify GALLEY switch is OFF then move other APU BUS switch to ON (or both APU BUS switches to ON if operating with two engine generators).

IF APU Generator Is Not Available and Only One Engine Generator Is Operating:

Land at nearest suitable airport.

Caution: Do not return AC BUS X-TIE switch to AUTO.

* * * *

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FIRE WARNING AND PROTECTION

FIRE DETECTOR LOOP LIGHT ON AND LOOP A OR B LIGHT ON WITHOUT FIRE WARNING

FIRE DETECTOR Circuit
Breakers (W-35 to W-42)..................................RESET IF TRIPPED

LOOPS Selector Switch
(Affected System)........................... SET TO LOOP NOT LIGHTED

Move appropriate LOOPS switch from BOTH toward **LOOP** light not on.

LOOPS A or B TEST Button (Selected System).......................PUSH

When testing a single loop, all 3 loop lights for the selected system and the **FIRE DETECTOR LOOP** light should illuminate. For an engine loop, only the ENG FIRE handle associated with the affected system should illuminate (APU fire warning light and master warning light will not illuminate). For an APU loop, the APU fire warning light and master warning light should illuminate (ENG FIRE handles will not illuminate). Aural warning should occur in engine loop test but not on APU loop test.

IF Test Is Normal:

Release LOOPS TEST button. No further action required. Continue flight with switch in LOOPS position successfully tested.

Detection system is now limited to single loop but retains normal warning capacity.

* * * *

OR

IF Test Is Not Normal:

Release LOOPS TEST button.

LOOPS Switch
(Affected System)........ SET TO OPPOSITE LOOP POSITION

Move LOOPS switch toward **LOOP** light that was on. If fire warning is now received, refer to **ENGINE FAILURE / FIRE / SEVERE DAMAGE / INFLIGHT SHUTDOWN** or **APU FIRE**, section 2.

* * * *

FIRE WARNING TEST INOPERATIVE

Note: **ENG FIRE** handle lights and bell, vocal warning, and/or **APU FIRE** lights fail to operate during test. One **LOOP** light fails to come on during test.

FIRE DETECTOR Circuit Breakers (W-35 to W-42)....................................RESET IF TRIPPED

LOOPS Selector Switch.................. OPPOSITE FROM INOP LOOP

LOOP A And B TEST Buttons... PUSH

IF Test Is Normal:

Dispatch with single loop system.

* * * *

OR

IF Test Is Not Normal:

Contact maintenance.

* * * *

SMOKE DET LOOP LIGHT ON

CARGO DETECTION SUPPRESSION
Panel TEST Switch .... PRESS FOR 3-5 SECONDS AND RELEASE

Normal test indications while switch is depressed:

- Aural warning plus Master Caution & Warning lights are on.
- Annunciator panel **SMOKE DET LOOP** & **CARGO FIRE** lights are on.
- **BTL 1** & **BTL 2 DSCH** lights are off.
- All **DET** lights are on.
  - **DET** light on means that loop is operational.
  - **DET** light off means that loop is inoperative.
- All other Cargo Detection Suppression Panel lights are on.

Caution: If both **DET** lights for a cargo bay do not illuminate during test, no cargo fire detection for that bay is available.

IF On Ground:

Return to gate and contact maintenance.

OR

* * * *

IF Inflight:

Caution: If the Cargo Fire Detection and Suppression System for a bay containing cargo malfunctions, consider landing at the nearest suitable airport.

IF Both Loops In A Cargo Bay Are Inoperative:

Continue the flight at Captain's discretion.

IF Discharge of A Halon Bottle Into Compartment Is Desired:

ARM Switch .... ROTATE TO AFFECTED CARGO BAY

BTL 1 PUSH TO DISCHARGE Switch .... PUSH

OR

* * * *

IF At Least One Loop In Each Cargo Bay Is Operative:

CARGO DETECTION SUPPRESSION Panel .... OBSERVE

IF A Loop **FAIL** Light Is On:

The system has automatically switched to single loop mode.

IF A Loop **DET** Light Is On:

The system has malfunctioned.

Continue flight and write up in logbook.

* * * *

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FLIGHT CONTROLS

ABNORMAL FLAP LANDING

Note: Use this checklist for landing with flaps not in the normal landing range.

Note: If there is no hydraulic pressure available, refer to LANDING WITH NO HYDRAULIC PRESSURE, this section.

Note: Use longest available runway commensurate with conditions (wet or dry, crosswind, etc.)

Gross Weight............................REDUCE TO LOWEST PRACTICABLE

Approach Speeds......................DETERMINE FOR LANDING WEIGHT

Refer to V-SPEEDS FOR ABNORMAL LANDINGS in Section 5 for the appropriate Vref speed. If landing with flaps up, do not make wind corrections to the Vref speed.

Plan a wide pattern and longer than normal final approach for speed stabilization. Maintain a descent gradient of not less than 2.5°.

GND PROX WARN Switch.. OVRD

Landing Gear...EXTEND

Gear Lights ....3 GREEN

Anti-Skid... ARM

IAS...ESTABLISH

Fly maneuver speed until on final, then disconnect autothrottles and slow to approach speed. Avoid excessive flare, make positive gear touchdown to avoid float.

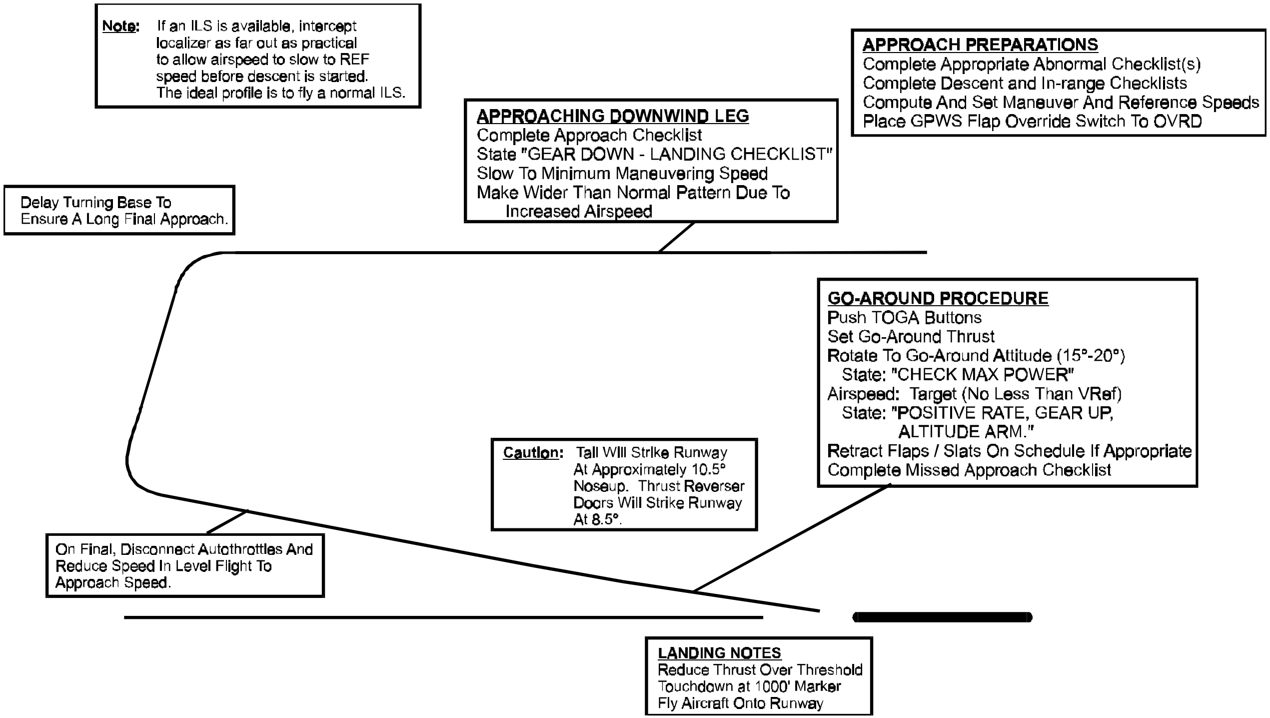
Note: Be aware of body angle. Tail will strike runway at approximately 11.5° (10.5° on heavy or hard landing).

On touchdown, take positive action to lower nose gear to runway and apply brakes smoothly to full pedal.

Throttles...REVERSE THRUST

Use normal reverse thrust procedures. Do not use asymmetric reverse thrust to maintain directional control. Rudder control and differential braking should be used as required for directional control.

* * * *



ABNORMAL FLAP LANDING PROFILE

AIRCRAFT OSCILLATING OR DISPLACED IN YAW

DFGC 1-2 Switch .... SELECT OTHER POSITION

IF Airplane Flight Condition Is Normal:

Autopilot / Autothrottles .... AS REQUIRED

* * * *

OR

IF Airplane Flight Condition Is Abnormal:

RUD HYD CONT Lever ....MAN

<u>**WARNING:**</u> Rudder will revert to manual. Minimum approach speed is 135 KIAS until landing is assured.

YAW DAMP Switch... OFF

<u>Note</u>: The autopilot must be disengaged to deactivate the yaw damp system.

- - - - - AFTER CONDITION IS CORRECTED - - - - -

YAW DAMP Switch... ON

IF Airplane Control Is Normal:

Continue flight with RUD HYD CONT lever in MAN.

* * * *

OR

IF Airplane Control Is Abnormal:

YAW DAMP Switch...OVRD

<u>Note</u>: With YAW DAMP switch in OVRD, actuator is deactivated, making yaw damper inoperative even with autopilot engaged.

If required, RUD HYD CONT lever may be returned to PWR. Verify rudder pedals and trim are centered prior to moving lever.

If aircraft exhibits abnormal motions (due to lack of yaw damping), descend to FL280 or below and recalculate fuel requirements.

Autopilot / Autothrottles.............................. AS REQUIRED

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AUTO SLAT FAIL LIGHT ON

The AUTO SLAT FAIL light on indicates failure of one or both stall warning systems.

Note: One operable system is capable of providing auto slats. With a dual system failure, the pilot can still extend slats to at least MID SEALED position. Full extension may be possible depending on which system component has failed.

Slat Extension...MAX 240 KTS

Do not extend the slats until below 240 KIAS, as slats may extend to full position.

* * * *

AUTO SPOILER DO NOT USE LIGHT ON OR UNABLE TO ARM AUTO SPOILERS

IF Before Takeoff And Aircraft Has Autobrakes:

Verify takeoff and landing weight penalties are applied.

Do not arm spoilers or autobrakes.

If takeoff is rejected, spoilers should be extended manually by squeezing spoiler lever, lifting up, and pulling fully aft into latch.

Normal anti-skid braking is available.

* * * *

OR

IF On Approach (All Aircraft):

Add 470 feet to the landing distance on a dry runway (540 feet on a wet runway).

Do not arm spoilers or autobrakes before landing.

Make normal approach and landing.

- - - - - AFTER LANDING - - - - -

Spoiler Lever...UP, AFT, UP

* * * *

MACH TRIM INOPERATIVE

Note: Failure of the mach trim compensator is confirmed by the mach trim indicator failing to extend, retract, or is oscillating.

MACH TRIM COMP Switch .... OVRD

IF Mach Trim Indicator Does Not Retract:

MACH TRIM OVERRIDE
Circuit Breaker (X-33)...................................PULL AND RESET

IF Mach Trim Indicator Does Not Retract:

MACH TRIM COMP Switch ....VERIFY OVRD

MACH TRIM OVERRIDE
Circuit Breaker (X-33).. PULL

Note: This action prevents inadvertent retraction.

Continue checklist at ❶

IF Mach Trim Compensator is Retracted:

❶ Observe mach speed limitation of .78. Retrim as required. Use normal landing techniques.

* * * *

OVERSPEED WARNING MALFUNCTION

Note: The overspeed warning will sound normally if Vmo/Mmo is exceeded or if slats are extended above 280 KIAS.

IF System Activates At/Above .79 Mach / 325 KIAS:

Slow to below speed at which warning sounds.

OR

* * * *

IF System Activates Below .79 Mach / 325 KIAS And Slats Are Retracted:

CAWS Overspeed, Eng Fire, Horiz Stab CB (U 31)........... PULL

Caution: With this CB pulled, in addition to overspeed warning, engine fire and horizontal stabilizer aural warnings are disabled.

Observe the following speed limits:

Below 25,300 feet, Vmo .... 325 KIAS
Above 25,300 feet, Mmo .... 0.79 mach

Caution: If the system is deactivated, carefully monitor airspeed/mach indicators.

* * * *

RUDDER CONTROL MANUAL LIGHT ON

IF On Ground:

Maintenance action required.

* * * *

OR

IF In Flight:

RUD HYD CONT Lever .... **MAN**

Continue operating in manual mode.

WARNING: Minimum approach speed is 135 KIAS until landing is assured.

IF Right Hydraulic Pressure And/Or Quantity is Low:

Refer to HYD PRESS LOW LIGHT(S) ON or HYDRAULIC QUANTITY LOSS, this section.

* * * *

RUDDER TRAVEL UNRESTRICTED LIGHT ON ABOVE 200 KNOTS IAS

RUD HYD CONT Lever.. MAN

- - - - - DURING APPROACH WHEN BELOW 181 KIAS - - - - -

RUD HYD CONT Lever..PWR

* * * *

RUDDER TRAVEL UNRESTRICTED LIGHT NOT ON FOR LANDING

Note: The light should come on between 165 and 144 KIAS.

If **RUDDER TRAVEL UNRESTRICTED** light does not come on during deceleration, momentarily centering rudder petals and rudder trim may restore unrestricted rudder.

Annuciator Panel ....TEST

IF Light Tests Normal:

Note: Two main areas of concern with rudder restricted are crosswind landing capability and controllability with asymmetric thrust. The following restrictions assume rudder is limited to maximum restriction.

Target Speed ....V_{REF} + 5, MIN 135 KIAS

Maintain a minimum of 135 KIAS until landing is assured.

Crosswind Limit.. 12 KTS.

Go Around Speed..MINIMUM OF 135 KIAS

Caution: During an engine out go around, it may require up to 8 degrees of bank in the direction of the good engine to maintain a constant heading.

* * * *

SLAT DISAGREE LIGHT ON

Caution: Do not move flap/slat handle until a safe altitude and airspeed have been attained.

Caution: Do not use the autothrottle or speed command system as speed schedules may not be valid.

Note: SLAT DISAGREE light indicates either asymmetric slats, disagreement between slat position and slat handle position, or indicator malfunction. The autopilot should be disconnected when determining whether an actual asymmetric slat condition exists. If no asymmetry is noted when hand flying the aircraft, land with flaps 28° or 40° as directed by this checklist.

Note: If slat asymmetry is indicated at any time by lateral trim change, return flap/slat handle to the last position where slats were symmetric. Do not exceed 240 KIAS / .57 Mach for the remainder of the flight. Land with the most flaps that can be extended while retaining a symmetric slat condition.

IF AUTO SLAT Light is On:

Airspeed.. 240 KIAS MAX

IF After Takeoff:

FLAP / SLAT Handle .... UP / RET

IF On Approach For Landing:

FLAP / SLAT Handle.................................. 15° / T.O. EXT

IF **AUTO SLAT** Light Is Off:

Continue normal operation

* * * *

OR

IF **AUTO SLAT** Light Is On:

Do not exceed 240 KIAS / .57 MACH

* * * *

OR

IF AUTO SLAT Light is Off:

IF SLAT DISAGREE Light On and Stays On During Retraction:

Do not exceed 240 KIAS / .57 Mach (fully extended slat limit speed). Extend flaps/slats as required for a normal landing.

(Continued)

IF SLAT DISAGREE Light On And Stays On During Extension From UP/RET To 0°/TO Or 11°/TO And No Asymmetric Condition Exists:

Note: If asymmetric condition developed, return flap/slat handle to UP/RET and refer to ABNORMAL FLAP LANDING, this Section.

Airspeed .... 240 KIAS MAX

Flap / Slat Handle.. 15°/TO

IF SLAT DISAGREE Light is Off:

Plan landing using normal flap/slat setting and speeds.

* * * *

OR

IF SLAT DISAGREE Light Is On.

Plan landing with flaps 28° or 40° and use slats retracted Vref speed. Refer to V-SPEEDS FOR ABNORMAL LANDINGS, section 5.

* * * *

OR

IF SLAT DISAGREE Light On And Stays On During Extension From 0°/TO Or 11°/TO To 15°/TO And No Asymmetric Condition Exists:

Plan landing with flaps 28° or 40° and use slats retracted Vref speed. Refer to V-SPEEDS FOR ABNORMAL LANDINGS, Section 5.

Note: If asymmetric condition developed, return flap/slat handle to 11°/TO. If condition is symmetric, land with 11°/TO. Refer to ABNORMAL FLAP LANDING, this section. If 11°/TO is not symmetric, return flap/slat handle to 0°/TO or UP/RET to achieve a symmetric condition. Refer to ABNORMAL FLAP LANDING, this Section.

* * * *

SPOILER PANEL STUCK IN EXTENDED POSITION

IF Time Permits:

Determine which wing has extended spoiler panel by control input required to maintain wings level. Make a visual inspection if possible.

Note: Outboard panel .... RIGHT HYDRAULIC SYSTEM
Inboard panel .... LEFT HYDRAULIC SYSTEM

Associated Hydraulic System .... PRESSURIZED

Speed Brake Lever .... CYCLE

IF Panel Does Not Retract:

Associated Eng Hyd Pump.................................. OFF

TRANS Hyd Pump.. OFF

AUX Hyd Pump (If Outboard Panel).......................... OFF

Speed Brake Lever.. CYCLE

Cycle lever to depressurize hydraulic system.

IF Panel Retracts:

- Continue the flight with the affected system unpressurized.
- Plan approach and landing with remaining system operating.
- When extending slats, move directly to 15/T.O. EXT.
- Spoilers may be armed for landing.
- Do not use autobrakes (if installed).
- Anticipate a longer landing roll due to loss of 1/3 spoilers.
- If right system affected, proceed to **ALTERNATE GEAR EXTENSION CHECKLIST**, this section. Rudder will revert to manual (maintain a minimum of 135 KIAS until landing is assured).

OR

* * * *

IF Panel Does Not Retract:

Continue at ❶

(Continued)

❶ **IF** Time Does Not Permit and/or Panel Remains Extended:

Hydraulic Pumps .... ON, HI, HI, ON

Aileron / Rudder Trim .... AS REQUIRED

Trim aircraft using aileron trim and control wheel displacement. Approximately 100 degrees of control wheel angle is available. Expect to use full aileron trim and up to 70 degrees of control wheel angle at approach speed. Some rudder trim may be required to counteract spoiler drag and aileron trim.

Landing Flaps, Speed ....28°, 28 REF + 10

Note: Spoilers may be armed for landing.

* * * *

SPOILER / SPEED BRAKE LEVER NOT FULLY DISARMED

Note: This could be caused by failure of ground spoiler actuator to retract. Red arming placard is partially exposed until ground spoiler actuator is retracted.

IF Autobrakes Installed:

Spoiler / Speed Brake Lever .... SQUEEZE, OBSERVE

Squeeze lever to retract ground spoiler actuator. Observe position of lever.

IF Lever Fully Disarmed:

Continue normal operation.

* * * *

OR

IF Lever Not Fully Disarmed (All Airplanes):

Caution: If speedbrake lever is not fully down, the speedbrake aft stop and intermediate notches will not be engaged. Caution should be exercised to ensure lever is not inadvertently moved to full aft position as this would permit speedbrakes to extend to full, 60 degree position.

When speedbrakes are required, pull lever UP and AFT to approximate speedbrake stop position. Lever must be held in this position as long as speedbrakes are required.

* * * *

STABILIZER INOPERATIVE

STABILIZER TRIM (Red Guarded) Switch..........................NORM

Primary Longitudinal Trim /
Autopilot & Alternate Longitudinal
Trim Circuit Breakers.....................................RESET IF TRIPPED

EPC D-9,10,11 G-22,23 / L GEN BUS Row 4

Autopilot.. OFF

IF Primary Trim is Normal:

Continue normal operation.

OR

* * * *

IF Alternate Trim is Normal:

Allow for slower trim rate. Autopilot may be used, as desired.

OR

* * * *

IF Neither Trim System Operates:

Consider stabilizer jammed.

IF Flaps are At 28° or 40° and the Aircraft Is On Speed and Trimmed:

Land with selected flaps.

OR

* * * *

IF Flaps are At Any Other Setting Or the Aircraft is Not Trimmed:

Land with flaps 15°. Vref is 15°/T.O. maneuver speed increased by increment from the following table.

(Continued)

Note: Use takeoff C.G. if landing C.G. is unknown:

		STABILIZER ANGLE IN DEGREES										
		AND			ANU							
		2	1	0	1	2	3	4	5	6	7	8
C	-.8	40	35	30	25	21	17	14	10	7	4	2
G	0	40	34	29	24	20	16	13	9	6	3	0
%	5	32	27	22	18	14	10	7	4	1	0	0
M	10	24	19	15	11	7	4	1	0	0	0	0
A	15	17	12	8	4	1	0	0	0	0	0	0
C	20	8	4	0	0	0	0	0	0	0	0	0
		SPEED INCREMENT IN KNOTS										

GND PROX WARN Switch..OVRD

During landing flare, do not reduce approach thrust until landing flare has been initiated and sink rate has been reduced.

* * * *

STALL INDICATION FAILURE LIGHT ON

Note: One stick shaker or stall recognition system may be activated.

IF Stall Warning Indications Are Active:

Airspeed and Attitude..CHECK

Ensure that airspeed and attitude are adequate for existing configuration.

STALL TEST Switch...SYS 1 OR SYS 2

Moving the STALL TEST switch to SYS 1 or SYS 2 will dim the **STALL** lights.

OR

CAPTAIN And FIRST OFFICER STALL WARNING Circuit Breakers (X & Z-23).......................PULL OPEN

STALL TEST Switch..OFF

CAPTAIN And FIRST OFFICER STALL WARNING Circuit Breakers (X & Z-23)..................................RESET ONE AT A TIME

Identify and isolate the malfunctioning system. Leave the circuit breaker pulled for the malfunctioning system. Confirm operation of the working system by testing. Continue flight with remaining system operating.

* * * *

IF Stall Warning Indications Are Not Active:

Both Systems ....TEST

IF One System Test Is Unsuccessful:

CAPTAIN Or FIRST OFFICER STALL WARNING Circuit Breaker (X Or Z-23) (Affected System)..................................PULL OPEN

Continue flight with the failed system deactivated.

* * * *

OR

IF Both Systems Test Successful:

Continue normal operation. A false indication has occurred.

* * * *

STICK SHAKER ON (OTHER STALL INDICATIONS NOT ACTIVE)

CAPTAIN'S and FIRST OFFICER'S STALL WARNING Circuit Breakers (X & Z-23)............................PULL OPEN

CAPTAIN'S STALL WARNING Circuit Breaker (X-23)........... RESET

IF Stick Shaker is Off:

Continue normal operation.

OR

* * * *

IF Stick Shaker is On:

CAPTAIN'S STALL WARNING Circuit Breaker (X-23) ....PULL OPEN

FIRST OFFICER'S STALL WARNING Circuit Breaker (Z-23)... RESET

UNSCHEDULED AUTOMATIC SLAT EXTENSION

Note: Automatic slat extension will occur only if FLAP/SLAT handle is at settings from 0° / T.O. to 13° / T.O. EXT.

Caution: Do not exceed 240 KIAS (fully extended slat limit speed). Do not move FLAP/SLAT handle until safe altitude has been attained.

IF After Takeoff:

FLAP / SLAT Handle ....UP / RET

IF On Approach For Landing:

FLAP / SLAT Handle .... 15° / T.O. EXT

IF SLAT AUTO / DISAGREE Lights Are Off:

Continue normal operation.

OR

* * * *

IF SLAT AUTO / DISAGREE Lights Are On:

Do not exceed 240 KIAS.

* * * *

FUEL

AUX FUEL PUMP PRESS LOW LIGHT ON WITH FUEL REMAINING IN AUX TANK

AUX TRANS Pump Switches (Affected Tank) .... BOTH AUTO

IF Fuel Transfer is Normal:

Resume normal operation.

OR

* * * *

IF Fuel Transfer is Not Normal:

AUX TRANS Pump Switches (Affected Tank)... HOLD IN TEST

IF Fuel Transfer is Normal:

Continue to hold switches in TEST until tank is empty.

OR

* * * *

IF Fuel Transfer is Not Normal:

IF FWD AUX Tank is Affected:

The remaining fuel in the forward aux tank is unusable. If CG at takeoff was 7% MAC or more, all aft aux fuel may be used if needed using normal speeds and configurations. If CG at takeoff was less than 7% MAC and aft aux fuel must be used, land with flaps 40° and increase approach and landing speeds by 10 KIAS.

OR

* * * *

IF AFT AUX Tank is Affected:

The remaining fuel in aft aux tank is unusable. Fuel in forward aux tank may be used if required to complete the flight.

* * * *

AUX TANK - PREMATURE TRANSFER OF FUEL

AUX TRANS Pump Switches .... OFF

- - WHEN CENTER TANK QUANTITY DEPLETES TO 13,000 LBS - -

AUX TRANS Pump Switches ....AUTO

Note: Do not allow fuel quantity in center tank to go above 20,500 lbs.

- - - WHEN AUX FUEL PUMP PRESS LOW LIGHT COMES ON - - -

AUX TRANS Pump Switches .... OFF

* * * *

CENTER FUEL TANK DOES NOT FEED

FUEL X-FEED Lever .... OFF

Center Tank Boost Pump Switches .... BOTH ON

Main Tank Boost Pump Switches .... ALL ON

IF Fuel Feeds From Center Tank:

Continue normal operation.

* * * *

OR

IF Fuel Still Does Not Feed From Center Tank:

Boost Pump Switches In One Main Tank .... BOTH OFF

IF Inlet Fuel Pressure Low Light Is On:

Assume center (and aux, if installed) tank fuel is unavailable. Plan remainder of flight using main tanks only.

Main Tank Boost Pump Switches .... ALL ON

Center Tank Boost Pump Switches .... BOTH OFF

* * * *

OR

IF Inlet Fuel Pressure Low Light Is Off:

Boost Pump Switches in Other Main Tank .... BOTH OFF

Verify that center tank fuel quantity is decreasing.

- - - - - WHEN CENTER TANK INDICATES 500 LBS - - - - -

Main Tank Boost Pump Switches .... ALL ON

Note: If required, remaining center tank fuel may be used by operating center tank pump to supply one engine. Remaining engine should be operated using its associated main tank pumps. Monitor fuel quality and maintain fuel distribution within maximum lateral limits.

* * * *

CROSSFEED OPERATION TO CORRECT MAIN TANK IMBALANCE

FUEL Boost Pumps (Main Tank With Greater Quantity).....................ON

FUEL X-FEED Lever ....ON

FUEL Boost Pumps (Opposite Main Tank) ....BOTH OFF

Center Tank FUEL Boost Pumps...BOTH OFF

Caution: Monitor fuel quantity in order to remain within lateral fuel balance limits and to avoid fuel depletion which could result in a two engine flame-out.

Note: If unable to correct imbalance condition by crossfeed operation, refer to FUEL LEAK, this section.

- - - - - WHEN MAIN TANKS ARE BALANCED - - - - -

Left & Right Main Tank
FUEL Boost Pumps.. BOTH ON
IN EACH MAIN TANK

Center Tank FUEL Boost Pumps....................................... AS REQUIRED

FUEL X-FEED Lever ....OFF

* * * *

FUEL FILTER PRESS DROP LIGHT ON

Note: Fuel heat switches should be off for takeoff, final approach, and go-around.

IF On Ground:

Maintenance action required.

OR

* * * *

IF In Flight:

IF Fuel Temperature at/above 15°C:

Light may be due to fuel filter clogging by solid contaminants other than ice. Continued engine operation is permissible if engine oil temperature is maintained within normal limits.

OR

Caution: If both **L** and **R FUEL FILTER PRESS** DROP lights are illuminated, consider possibility of fuel contamination and land at nearest suitable airport.

* * * *

IF Fuel Temperature below 15°C:

Fuel Heat Switches .... BOTH MOMENTARILY ON

Observe both **FUEL HEAT** lights come on and remain on for approximately 1 minute.

- - - - - AFTER ONE MINUTE - - - - -

IF **FUEL FILTER PRESS DROP** Light Remains Out:

Continue normal operation.

OR

* * * *

IF **FUEL FILTER PRESS DROP** Light Remains On:

Repeat procedure. Fuel heat applications may be repeated if required. Do not exceed engine oil temperature limitations.

* * * *

FUEL FLOW INOPERATIVE OR READS HIGH

IF Fuel Flow Inoperative:

Fuel Flow C/B's (K&L 27)............................RESET IF TRIPPED

* * * *

OR

IF Fuel Flow Reads High:

Throttle (Affected Engine)... IDLE

Note: Idle fuel flow varies from about 800 PPH at 20,000 feet to 600 PPH at 35,000 feet.

IF Fuel Flow Responds And Other Indications Are Normal, But Idle Fuel Flow Is Higher Than Normal:

Fuel Quality and Fuel Consumed .... CHECK

Verify that no fuel leak exists.

IF Fuel Consumed Is Not Normal:

Assume a fuel leak exists. Shut down engine, refer to **ENGINE INFLIGHT SHUTDOWN** checklist, Section 2.

* * * *

OR

IF Fuel Consumed Is Normal:

Resume normal fuel management.

* * * *

OR

IF Fuel Flow Responds, Other Indications Are Normal, And Idle Fuel Flow Is Normal:

Monitor fuel usage to confirm normal consumption and distribution.

* * * *

FUEL HEAT ON LIGHTS FAIL TO GO OFF AFTER ONE MINUTE

Fuel Heat Timer CB's (K & L 29).. PULL

Monitor engine oil temperature.

* * * *

FUEL LEAK

Note: Fuel leak may be indicated by main tank imbalance and/or L or R INLET FUEL PRESS LOW light on, significant differences between fuel quantity decrease and fuel used or uncommanded filling of a tank.

Fuel Boost Pump Switches (Tank With Greater Quantity)............ON

Fuel Boost Pump Switches (Tank With Lesser Quantity).............OFF

IF There Is An Uncommanded Filling of a Tank (Tank Quantity Increasing/Decreasing at Other Than Normal Rate):

Fuel X-FEED Lever.. AS REQUIRED

Move the FUEL X FEED lever to ON (as required) and move fuel boost pump switches for supplying tank(s) to ON intermittently as required to make fuel available and to maintain balance.

Note: Maintaining 2500 lbs in right main tank will minimize chance of left engine drawing air (if it is on suction feed).

Land at nearest suitable airport.

* * * *

OR

IF Fuel is Going Overboard (Difference Between Fuel Quantity Decrease and Fuel Used):

Fuel X-feed Lever...OFF

Land at nearest suitable airport.

IF There Is A Failure of Engine Using Suction Feed **OR** Fuel Continues To Go Overboard AND Fuel Leak Is Not In The Wing AND Fuel Needed To Land Is Critical:

Throttle (Affected Engine).. IDLE

Fuel Lever (Affected Engine)..OFF

**ENG FIRE Handle
(Affected Engine)........................PULL (DO NOT ROTATE)**

Fuel X FEED Lever....................................... AS REQUIRED

Move the FUEL X FEED lever to ON (as required) and move fuel boost pump switches for supplying tank(s) to ON intermittently as required to make fuel available and to maintain balance.

* * * *

FUEL TANK QUANTITY INDICATOR INOPERATIVE / ERRONEOUS

Note: Individual tank reading and the totalizer are allowed an error of ± 100 lbs each.

After the center tank quantity is depleted, it is normal for 50 lbs to reappear during cruise or descent. Readings in excess of 100 lbs should be reported to maintenance.

Test / Channel Selector Knob ....OTHER CHANNEL

Rotate the TEST button on the digital fuel quantity display to the other channel (A or B).

IF Fuel Tank Quantity Is Normal:

Continue flight with the operating system.

* * * *

OR

IF Fuel Tank Quantity Is Abnormal:

Fuel Quantity Power Transfer
CB (J24) ....RESET IF TRIPPED

Note: Operative fuel quantity indicators may be used with engine fuel consumed indicators for determining fuel remaining.

* * * *

GROUND FUEL TRANSFER

Note: This procedure is used to correct a main tank fuel imbalance and assumes AC power is available.

Coordinate with ground crew for operation of defueling and fill valves.

Fuel Boost Pumps (In Tank With Excessive Fuel) ....ON

All Other Boost Pumps ....OFF

IF Transfer Is From Left Main Tank:

FUEL X-FEED Lever ....ON

Request ground crew to open defueling valve and fill valve (for tank to be filled).

- - - - - WHEN TANK LEVELS ARE AS DESIRED- - - - -

Fuel Boost Pump Switches ....OFF

FUEL X-FEED Lever ....OFF

Request ground crew to close defueling and fill valves.

* * * *

INLET FUEL PRESS LOW LIGHT ON

Note: When operating on suction feed, **INLET FUEL PRESS LOW** light will remain on. Under all fuel temperature conditions, suction feed capacity is enhanced with an increase in fuel flow. If required, descents should be made at a higher engine power and with speed brakes extended.

Note: When using kerosene, engines will operate on suction feed throughout airplane operating envelope.

Both Fuel Boost Pumps (Affected Tank) .... CONFIRM ON

IF Light Is Out:

OR

Continue normal operation.

* * * *

IF Light Remains On:

Fuel Quantity Remaining vs. Engine Consumption..........CHECK

Main Tank Balance...CHECK

IF Quantity vs. Consumption Is Not Normal and/or Main Tank Lateral Unbalance Condition Exists:

OR

Refer to **FUEL LEAK CHECKLIST**, this section.

* * * *

IF Quantity vs. Consumption Is Normal and There Is No Main Tank Lateral Imbalance:

Monitor engine operation and fuel management closely.

* * * *

MINIMUM FUEL APPROACH

Note: This procedure is used if less than 1000 lbs. in each main fuel tank.

IF Time Permits:

Verify operation of Aft Main Tank Boost Pumps.

Aft Boost Pump Switches (Both Main Tanks)..................................ON

Fwd Boost Pump Switches (Both Main Tanks).............................OFF

Ctr Boost Pump Switches..BOTH OFF

If neither **L** or **R INLET FUEL PRESS LOW** light comes on, both aft pumps are operating.

Note: If both main tank aft boost pumps are inoperative, go around is not recommended.

- - - - - PRIOR TO APPROACH- - - - -

All Operable Fuel Boost Pump Switches..ON

Engine Fuel X Feed Lever ....ON

Engine Ignition..ON

Note: If go-around is required, avoid sustained nose up attitude in excess of 10 degrees.

A go-around is not recommended with less than 500 lbs in each main tank.

* * * *

HYDRAULICS

ENGINE HYDRAULIC PUMP FAILS TO HI (3000 PSI)

Note: Allow sufficient time for system pressure to decrease from 3000 to 1500 psi after selecting LOW.

Affected Hyd Pump Control
C/B (S or T 27) .... RESET IF TRIPPED

IF The Affected Hyd System Returns To 1500 PSI:

Resume normal operation.

OR

* * * *

IF The Affected Hyd System Remains At 3000 PSI:

Eng Hyd Pump (affected system).. HIGH

Continue flight with the pump switch in HIGH.

* * * *

HYD PRESS LOW LIGHT(S) ON

TRANS HYD PUMP Switch..OFF

IF Quantity Is Low Or Decreasing:

Refer to **HYDRAULIC QUANTITY LOSS**, this section.

OR

* * * *

IF Quantity Is Not Low Or Decreasing:

Rudder..VERIFY NEUTRAL

Rudder Trim .... VERIFY ZERO

ENG HYD PUMP Switch (Affected Side) .... HI

IF Right Hydraulic System:

AUX HYD PUMP Switch..ON

IF Quantity Is Abnormally High:

Note: Loss of hydraulic fluid may result in an increasing quantity indication on the affected side due to foaming.

Caution: Do not operate transfer pump or both systems may lose hydraulic pressure. Several minutes and/or descent to FL300 or below may be required to regain hydraulic pressure in an operating system after the TRANS HYD PUMP switch is moved to OFF.

Wait several minutes at FL300 or below for system to stabilize.

IF Quantity Is Low Or Abnormally High:

Refer to **HYDRAULIC QUANTITY LOSS**, this section.

OR

* * * *

IF Quantity Is Normal:

Continue at ❶

(Continued)

IF Quantity Is Normal:

❶ **IF** Pressure is Normal:

If the **HYD PRESS LOW** light is on, spoiler / speed brake efficiency will be reduced.

OR

* * * *

IF Pressure is Low:

Use TRANS HYD PUMP for approach and landing as required.

Caution: If operating hydraulic system pressure is lost when TRANS HYD PUMP switch is moved ON, move TRANS HYD PUMP switch to OFF. Several minutes may be required for the operating hydraulic system to regain pressure.

IF Affected Hydraulic System Cannot Be Pressurized:

Continue flight with the affected hydraulic system inoperative. Refer to **INOPERATIVE EQUIPMENT WITH HYDRAULIC FAILURE** following this checklist.

Note: When extending slats slow to clean minimum maneuver speed or 240 KIAS, whichever is less. Move FLAPS/SLAT handle directly to 15° detent.

Note: Nosewheel steering in direction of operating system will be restricted.

Note: Do not arm autobrake system (if installed).

IF Right Hydraulic System Cannot Be Pressurized:

WARNING: Rudder will revert to manual. Minimum approach speed is 135 KIAS until landing is assured.

Refer to **ALTERNATE GEAR EXTENSION WITH RIGHT HYDRAULIC FAILURE**, this section.

* * * *

Inoperative Equipment With Hydraulic Failure

Left System No Pressure

- Left brake system (accumulator pressure available)
- Left nosewheel steering actuator
- Reverser (accumulator pressure available)
- Flap outboard cylinders
- Inboard spoilers
- Elevator augmentor (accumulator pressure available)

Right System No Pressure

- Right brake system (accumulator pressure available)
- Right nosewheel steering actuator
- Reverser (accumulator pressure available)
- Flap inboard cylinders
- Outboard spoilers
- Powered rudder (manual only)
- Hydraulic landing gear extension (must use emergency gear extension lever to freefall gear)

HYDRAULIC QUANTITY LOSS

TRANS HYD PUMP Switch .... OFF

ENG HYD PUMP Switch (Affected System) .... OFF

IF Right System Affected:

AUX HYD PUMP Switch .... OFF

WARNING: Certain hydraulic leaks can produce toxic smoke in the cabin. If smoke is encountered, turn the AIR CONDITIONING SUPPLY switch on the affected side to OFF.

IF Both Hydraulic Quantities Deplete to Zero:

Proceed to **LANDING WITH NO HYDRAULIC PRESSURE** this section.

OR

* * * *

IF One System Remains:

Note: Use affected system for approach and landing if any quantity remains. If loss is in right system and AUX HYD PUMP was not operating when hydraulic loss occurred, it would be preferable to operate this pump only.

Note: When extending slats on a single hydraulic system, slow to clean minimum maneuver speed or 240 KIAS, whichever is less. Move FLAP/SLAT handle directly to 15° detent.

Note: Nosewheel steering in direction of operating system will be restricted.

Note: Do not arm autobrake system (if installed).

IF Right System Is Unpressurized:

RUD HYD CONT Lever ....MAN

WARNING: Rudder will revert to manual. Minimum approach speed is 135 KIAS until landing is assured.

Refer to **ALTERNATE GEAR EXTENSION WITH RIGHT HYDRAULIC FAILURE**, this section.

Accomplish normal approach and landing. Refer to **INOPERATIVE EQUIPMENT WITH HYDRAULIC FAILURE** preceding this checklist.

* * * *

HYD TEMP HI LIGHT ON

TRANS HYD PUMP Switch.. OFF

ENG HYD PUMP Switch (Affected System) .... OFF

AUX HYD PUMP Switch (If Right System) .... OFF

- - - - - PRIOR TO APPROACH AND LANDING - - - - -

Hydraulic Pumps (Affected System).. ON

* * * *

LANDING WITH NO HYDRAULIC PRESSURE

Note: If flaps and/or slats are extended, they will tend to remain in their last selected position.

Note: Use longest available runway commensurate with conditions (wet or dry, crosswind, etc.)

Note: Speedbrakes/spoilers and nosewheel steering are not available. Rudder will revert to manual. Reverse thrust, anti-skid braking and elevator augmentation are available from accumulator pressure. In order to preserve maximum accumulator capacity, do not depress brake pedals prior to touchdown.

Note: Autobrakes (if installed) should not be armed for landing.

Gross Weight............................REDUCE TO LOWEST PRACTICABLE

Approach Speeds......................DETERMINE FOR LANDING WEIGHT

IF Flaps/Slats Are Not In Normal Landing Range:

Refer to V-SPEEDS FOR ABNORMAL LANDINGS in Section 5 for the appropriate Vref speed. If landing with flaps up, do not make wind corrections to the Vref speed.

Plan a wide pattern and longer than normal final approach for speed stabilization. Maintain a descent gradient of not less than 2.5°.

TRANS, AUX, & Both ENG HYD Pumps .... OFF

RUD HYD CONT Lever.. MAN

Note: The rudder will revert to manual. Maintain minimum approach speed of 135 KIAS until landing assured.

ANTI-SKID Switch .... ARM

GND PROX WARN Switch.. OVRD

Landing Gear Handle .... DOWN

Emergency Gear Extension Lever..................PULL FULL UP & LATCH

Gear Lights .... 3 GREEN

Note: It may be necessary to slow to approach speed to allow nose gear to latch down.

(Continued)

GEAR DOOR OPEN Light...ON

IAS...ESTABLISH

Fly maneuver speed until on final, then slow to approach speed. Avoid excessive flare, make positive gear touchdown to avoid float.

Note: Be aware of body angle. Tail will strike runway at approximately 11.5° (10.5° heavy or hard landing).

Lower nose immediately after main gear touchdown. After nose gear contact, apply down elevator and apply brakes smoothly to full pedal.

Throttles..IDLE REVERSE THRUST DETENT

Set thrust symmetrically to idle reverse thrust. Do not use asymmetric reverse thrust to maintain directional control. Rudder and differential braking should be used to maintain directional control. Increase reverse thrust above idle reverse only if necessary for runway length considerations. Apply the reverse thrust smoothly and symmetrically.

Caution: Increasing amounts of reverse thrust significantly reduce rudder effectiveness. If directional control cannot be maintained, reduce thrust to idle reverse.

Apply steady symmetrical brake pedal force to the mechanical stops after nosewheel touchdown to minimize accumulator pressure loss. As rudder control deteriorates with lower speed, use differential braking for directional control only as necessary.

Maintain maximum possible braking to a complete stop. Turn antiskid off and set parking brake before releasing pedals. Do not attempt to taxi. Before moving airplane, ensure gear safety pins have been installed and manually close main gear doors in order to minimize door damage.

* * * *

LANDING GEAR / BRAKES

ALTERNATE GEAR EXTENSION WITH RIGHT HYDRAULIC FAILURE

Note: Use this checklist after completing the appropriate abnormal checklist.

Landing Gear Handle .... DOWN

Emergency Gear Extension Handle ......PULL FULL UP & LATCH

WARNING: Rudder will revert to manual. Minimum approach speed is 135 KIAS until landing is assured.

Note: It may be necessary to configure and slow to 28 / REF speed to allow the nose gear to latch down.

IF Gear Is Not Down and Locked (One or More Red Lights):

Landing Gear Downlocks ....CHECK

Refer to VISUAL CHECK OF LANDING GEAR DOWNLOCKS, this section.

IF Any Gear Is Not Down and Locked:

Refer to PARTIAL OR GEAR UP LANDING PROCEDURE, Section 2.

OR

* * * *

IF All Gear Are Down and Locked

Continue checklist at ❶

IF Gear Is Down and Locked (Three Green Lights):

❶ **Caution:** Do not stow emergency gear extension lever until malfunction has been corrected or until gear door hydraulic bypass lever has been pulled.

Note: Gear doors will remain open and the **GEAR DOOR OPEN** light will remain on.

Note: Nosewheel steering to the left is restricted.

Note: Minimize landing rollout and stop airplane on runway. Install gear safety pins and close main gear doors before taxi in.

* * * *

BRAKE OVERHEAT LIGHT ON

Note: Brake OVHT light comes on when any one brake temperature exceeds 400°C (305° some airplanes) and goes off when brakes cool to 360°C (260° on some airplanes).

IF In Flight :

Flight Conditions permitting, extend landing gear until brake OVHT light goes off. If condition does not change after 10 minutes, assume an indication fault. Brakes, wheels, and tires will require inspection before next flight.

OR

* * * *

IF On Ground:

Stop airplane as soon as practical. Do not set parking brake. Brakes, wheels, and tires will require inspection before next flight.

WARNING: Ground crew must remain clear of main gear. Fuse plugs may melt. If brake temperature exceeds gage limit, loss of braking may result.

* * * *

GEAR DOOR OPEN LIGHT REMAINS ON WITH LANDING GEAR EXTENDED

Note: This procedure assumes hydraulic pressure is normal and gear handle is down.

Gear Doors .... VISUALLY CHECK

Refer to VISUAL CHECK OF LANDING GEAR DOWNLOCKS, this section, for help in door inspection.

IF Doors Are Verified Closed:

Assume indicator malfunction. Make a normal landing.

* * * *

OR

IF Door(s) Open or Unable To Verify Doors Closed:

Emergency Gear Extension Lever .... PULL FULL UP & LATCH

Caution: Do not stow emergency gear extension lever until malfunction has been corrected.

Note: Gear doors will remain open and **GEAR DOOR OPEN** light will be on.

Note: Nosewheel steering to the left is restricted.

Note: Minimize landing rollout and stop airplane on runway. Install gear safety pins and close main gear doors before taxi in.

* * * *

INBD AND / OR OUTBD ANTI-SKID LIGHT(S) ON

Anti-Skid Switch .... OFF THEN ARM

IF All Lights Are Off:

Anti-Skid System .... TEST

IF Any Light(s) Remain On Or Anti-Skid System Test is Abnormal:

Auto Brake Selector .... OFF

Landing Flaps (if not restricted to 28°) .... 40°

OR

- Make normal landing.
- Carefully modulate brakes as if in full manual brake landing.
- Apply reverse thrust as required.

* * * *

IF All Lights Are Off:

Make a normal landing.

* * * *

LANDING GEAR HANDLE JAMMED IN UP POSITION

Emergency Gear Extension Lever........PULL FULL UP & LATCH

Note: It may be necessary to decrease airspeed to flaps 28°/EXT Vref to allow the nose gear to latch down. Observe gear extension and full down speed of 300 KIAS or Mach .70.

Gear Lights ....3 GREEN

Landing Gear Handle..................................TRY TO MOVE DOWN

IF Gear Handle Moves Down:

Stow emergency gear extension lever to allow gear doors to close.

OR

* * * *

IF Gear Handle Will Not Move Down:

Caution: Do not stow emergency gear extension lever until malfunction has been corrected.

Note: Gear doors will remain open and **GEAR DOOR OPEN** light will be on.

Note: Nosewheel steering to the left is restricted.

Note: Minimize landing rollout and stop airplane on runway. Install gear safety pins and close main gear doors before taxi in.

* * * *

LANDING GEAR HANDLE UNABLE TO RAISE AFTER TAKEOFF

Using normal force, attempt to turn nosewheel steering wheel to left or right.

IF Wheel Does Not Turn and Index Is Centered:

GEAR HDL REL Button....................................PUSH AND HOLD

GEAR Handle ....UP

OR

* * * *

IF Wheel Is Steerable or Index is Not Centered:

GEAR Handle .... DO NOT RAISE

<u>Caution</u>: Do not retract gear. Nosewheel may not remain centered and damage may occur if gear is retracted. Do not exceed 300 KIAS / .70 Mach.

GROUND CONTROL RELAY
Circuit Breakers (K & L 33) .... PULL

- - - - - BEFORE LANDING - - - - -

CABIN ALT Control Lever .... MANUAL

SPD BRK Lever ....DISARMED

<u>Note</u>: With SPD BRK lever disarmed, ground spoilers must be extended manually during landing. Add 470 feet to landing distance on dry runway (540 feet on wet runway).

AUTO BRAKE Selector (If Installed).. OFF

- - - - AFTER TOUCHDOWN - - - - -

Ground Spoilers .... MANUALLY EXTEND

- - - - - DURING TAXI - - - - -

GROUND CONTROL RELAY
Circuit Breakers (K & L 33) .... RESET

* * * *

PARKING BRAKE ON LIGHT ON (INFLIGHT, GEAR DOWN)

Rudder Pedal Brakes..DEPRESS

IF **PARKING BRAKE ON** Light Is Off:

Resume normal operation.

* * * *

OR

IF **PARKING BRAKE ON** Light Remains On:

Assume anti-skid is inoperative. Refer to Section 5, Performance, to determine additional stopping distance with anti-skid inoperative. Do not use autobrakes. Make normal landing and modulate brakes as in a full manual brake landing.

* * * *

UNSAFE GEAR LIGHT IN CRUISE, GEAR HANDLE UP

Airspeed .... MAX 230 KIAS

Spoiler / Speedbrake Lever .... VERIFY DISARMED

Caution: If spoiler/speedbrake lever cannot be disarmed, speedbrake stop and intermediate notches will not be engaged. Caution should be exercised to ensure lever is not inadvertently moved to full aft position as this would permit speedbrakes to full 60° position.

Caution: If damage to landing gear is suspected or if previous gear malfunction has been indicated, do not recycle gear as this may cause further damage and make it impossible to re-extend gear.

ALL HYD PUMPS Switches.. ON, HI

GEAR Handle .... DOWN

Move GEAR handle to DOWN and observe gear lights are green and **GEAR DOOR OPEN** light is off.

GEAR Handle ....UP

IF Gear Lights And **GEAR DOOR OPEN** Light Are All Off:

Reconfigure hydraulic pump switches for cruise.

* * * *

OR

IF Any Gear Light(s) Or **GEAR DOOR OPEN** Light Is On:

Continue flight without exceeding landing gear extension speed of 300 KIAS / .70 Mach. Leave GEAR handle in UP and operate with both ENG HYD PUMPS switches in HI, TRANS pump switch in ON, and AUX pump switch as required.

Note: Check operation of electrical circuits. Inoperative automatic pressurization, and takeoff warning after flap retraction indicate ground shift mechanism is in ground mode.

(Continued)

IF Ground Shift Mechanism Is In Flight Mode:

Continue flight without exceeding 300 KIAS / .70 Mach.

OR

* * * *

IF Ground Shift Mechanism Is In Ground Mode:

LEFT & RIGHT GROUND CONTROL RELAY Circuit Breakers (K-33 & L-33)............................ PULL

Caution: To prevent premature system actuation, such as automatic spoiler deployment, do not reset GROUND CONTROL RELAY circuit breakers until after landing.

- - - - - BEFORE LANDING - - - - -

CABIN ALT Control Lever / Outflow Valve....................................MANUAL / VALVE OPEN

Spoilers / Autobrakes .... DISARMED / OFF

Spoilers must be extended manually for landing. Add 470 feet to landing distance on dry runway (540 feet on wet runway). Do not use autobrakes for landing.

After landing, reset the GROUND CONTROL RELAY circuit breakers to regain ground mode.

* * * *

UNSAFE GEAR, GEAR HANDLE DOWN

AUX & R ENG HYD Pumps ....ON, HI

IF Right Hydraulic Pressure And/Or Quantity Are Not Normal:

Refer to **HYDRAULIC QUANTITY LOSS or HYD PRESS LOW LIGHT ON**, this section.

OR

* * * *

IF Right Hydraulic Pressure And Quantity Are Normal:

IF Only Nose Gear Indicates Unsafe:

> **IF** NLG IND Pin is Extended:
> Continue Normal operation
>
> **OR**
>
> * * * *
>
> **IF** **NLG IND** Pin is Retracted:
> Continue Checklist at ❶.

❶ **Emergency Gear Extension Lever..PULL FULL UP & LATCH**

Note: It may be necessary to slow to flaps 28/EXT V_{REF} speed to allow nose gear to latch down.

IF Nose Gear Indicates Unsafe:

Attempt to turn nosewheel steering tiller. This may dislodge a jammed nosegear and allow it to extend.

IF Any Gear Indicates Unsafe:

> **Landing Gear Downlocks .... CHECK**
>
> Refer to **VISUAL CHECK OF LANDING GEAR DOWNLOCKS**, this section.
>
> **IF** Any Gear Is Not Down And Locked:
>
> **Emergency Gear Extension Lever...........STOW**
>
> Refer to **PARTIAL OR GEAR UP LANDING PROCEDURE**, Section 2.
>
> **OR**
>
> * * * *
>
> **IF** All Gear Are Down And Locked:
> Continue checklist at .

(Continued)

IF All Gear Indicate Down and Locked:

❷ **Emergency Gear Extension Lever .... STOW**

Note: Returning emergency gear extension lever to stowed position will allow gear doors to close. Stow lever by pressing to left at base of hold open arm. It will be necessary to unload arm by holding up on lever.

IF **GEAR** Lights are Green and **GEAR DOOR OPEN** Light Is Off:

Continue normal operation.

OR

* * * *

IF Any **GEAR** Light is Red or **GEAR DOOR OPEN** Light Is On:

Emergency Gear Extension Lever .... PULL FULL UP & LATCH

Caution: Do not stow emergency gear extension lever until malfunction has been corrected.

Note: Gear doors will remain open and the **GEAR DOOR OPEN** Light will be on.

Note: Nosewheel steering to the left is restricted.

Note: Minimize landing rollout and stop airplane on runway. Install gear safety pins and close main gear doors before taxi.

* * * *

VISUAL CHECK OF LANDING GEAR DOWNLOCKS

IF Checking Nose Gear:

Verify the nose gear downlock indicator on the center pedestal is extended approximately ¼ inch.

OR

* * * *

IF Checking Main Gear:

Depressurize aircraft to below 1 psid.

Note: Periscope cover may be removed at maximum differential pressure, but considerable airflow and noise will result. Periscope is located left of center, opposite the third window aft of the second overwing exit.

Raise carpet over periscope.

Remove cover and dust cap.

Turn on wheel well lights. (Switch is spring loaded and located adjacent to periscope.)

Align periscope with index mark to view main gear downlock indicator (orange stripe on black background).

Rotate periscope approximately 180° and align other index mark to view opposite gear downlock indicator.

Note: Periscope may be removed to clean mirrors.

* * * *

ICE AND RAIN PROTECTION

AIRFOIL ICE PROTECTION INOPERATIVE

If unable to avoid icing conditions, use the following procedures:

- - - - - PRIOR TO FINAL APPROACH - - - - -

Add 5 knots to all minimum maneuvering speeds. Do not extend flaps beyond 28° which may result in a decrease in airplane controllability.

- - - - - FOR FINAL APPROACH AND LANDING - - - - -

Flaps / Slats ....28 / EXT

Speed ....V_{REF} FOR 28 / EXT + 5 KNOTS

- - - - - IF GO-AROUND IS INITIATED - - - -

Flaps / Slats ....RETRACT TO 15 / EXT

Speed ....MAINTAIN

Assure adequate airspeed because of possible ice accumulations.

Note: Do not use 0/EXT through 13/EXT for maneuvering or go-around when wing icing is present or suspected due to possible adverse characteristics.

* * * *

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AIRFOIL ICE PROT PRESS ABNORMAL LIGHT ON

IF On Ground:

PNEU X-FEED VALVE Levers.......................................CLOSE

APU AIR Switch... OFF

OR

* * * *

IF In Flight:

IF AIR FOIL Anti-Ice Switch(es) Off:

PNEU X-FEED VALVE Levers................................CLOSE

Note: With switch(es) off, light on indicates failure of ice protection pressure regulator to shut off.

OR

* * * *

IF AIR FOIL Anti-Ice Switch(es) On:

PNEU X-FEED VALVE Levers...................VERIFY OPEN

PNEU PRESS Gauge.................................... ABOVE 22 PSI

SUPPLY AIR PRESS REG VALVE
Circuit Breaker (N-21)........................RESET IF TRIPPED

IF **AIRFOIL ICE PROT PRESS ABNORMAL** Light Is Off:

Continue normal operation.

OR

* * * *

IF **AIRFOIL ICE PROT PRESS ABNORMAL** Light Is On:

Avoid icing areas. If unable to avoid icing areas, refer to AIRFOIL ICE PROTECTION INOPERATIVE, this section.

IF Light is Off in Tail Mode but On in Wing Mode:

Tail Mode may be used, do not operate in Wing Mode.

IF Light is Off in Wing Mode but On in Tail mode:

Wing mode may be used, do not operate in Tail mode.

IF Light is On In Both Modes:

AIR FOIL Anti-Ice Switch(es).......................... OFF

PNEU X-FEED VALVE Levers ....CLOSE

* * * *

CABIN PRESSURE SURGING WITH AIRFOIL ICE PROTECTION ON

Note: This indicates a leak from wing anti-ice duct into pressurized area.

AIR FOIL Anti-Ice Switch(es).. OFF

PNEU X-FEED VALVE Levers ....CLOSE

If unable to avoid icing areas, refer to AIRFOIL ICE PROTECTION INOPERATIVE, this section.

Note: Difficulty may be encountered in maintaining cabin differential pressure due to pressurization loss through the ruptured duct.

* * * *

ENG VALVE LIGHT(S) ON

Note: Indicates one or more of the engine anti-ice valves is not in agreement with the ENG anti-ice switch position.

ANTI-ICING VALVE C/Bs
(K-30, 31, 32 / L-30, 31, 32) ....RESET IF TRIPPED

ENG Anti-Ice Switch (Affected System)...........................RECYCLE

IF ENG Anti-Ice Switch Is On and **ENG VALVE** Light Is On:

IGN Selector Switch..A OR B

Depart icing area as soon as possible. Maintain engine operation at desired thrust level. Minimize throttle movement until clear of icing area. Make a logbook entry.

OR

* * * *

IF ENG Anti-Ice Switch Is Off and **ENG VALVE** Light Is On:

Make a logbook entry.

* * * *

ICE PROTECT SUPPLY PRESS HI LIGHT ON

PNEU X-FEED VALVE Levers .... MOVE TOWARD CLOSE

PNEU PRESS Gauge .... OBSERVE

When PNEU PRESS gauge reads approximately 22 psi, stop moving PNEU X-FEED VALVE levers. Readjust when power, speed, or altitude is changed.

* * * *

ICE PROTECT TEMP HIGH LIGHT ON

<u>Caution</u>: **ICE PROTECT TEMP HI** annunciation may indicate failure of a pneumatic augmentation valve in the open position. If this valve is failed in the open position, the start valve may be blown open during high engine power settings leading to starter failure. If **START VALVE OPEN** light illuminates inflight, refer to START VALVE OPEN LIGHT ON IN FLIGHT checklist.

PNEU X-FEED VALVE Lever (Affected System)..................... CLOSED

<u>Note</u>: Closing affected system PNEU X-FEED VALVE lever deactivates temperature control of associated augmentation valve. Augmentation valve is now controlled by associated air conditioning system pressure demands.

IF There Are Two Airfoil Anti-Ice Switches:

AIR FOIL Anti-Ice Switch (Affected System)............................. OFF

<u>Note</u>: Moving AIR FOIL Anti-Ice switch to OFF deactivates temperature control of associated augmentation valve. Augmentation valve is now controlled by associated air conditioning system pressure demands.

* * * *

ICE PROTECT TEMP LOW LIGHT ON

PNEU X-FEED VALVE Lever (Affected System)........................... OPEN

Note: If at low engine power, advance power.

ICE PROTECT AUGMENT VALVE Circuit Breaker (M & N-23) .... RESET IF TRIPPED

IF Unable To Correct Condition:

PNEU X-FEED VALVE Lever (Affected System).............. CLOSED

IF There Are Two Airfoil Anti-Ice Switches:

AIR FOIL Anti-Ice Switch (Affected System)...................... OFF

* * * *

PITOT / STALL HEATER OFF LIGHT ON

Verify METER SEL & HEAT selector is not in OFF.

Failed Unit.. DETERMINE

Rotate METER SEL & HEAT selector and check for heater current. If any unit indicates no heater current, crosscheck appropriate instruments for valid indications.

Note: If in icing conditions, airspeed and mach may be restored by moving CADC selector to BOTH ON 1 or BOTH ON 2 as appropriate.

Note: AHRS 1 and/or 2 may revert to basic mode whenever erroneous airspeed inputs are received from either CADC.

Applicable Circuit Breakers...................................RESET IF TRIPPED

CAPTAIN'S PITOT HEATER	- Overhead Panel	C-12
PITOT HEATER AUX	- Lower EPC	M-28
PITOT HEATER F/O	- Lower EPC	N-28
RUDDER Q LIMITER	- Lower EPC	Z-30
L/R STALL PROBE (AOA)	- Lower EPC	X-22, Z-22

Caution: A tripped circuit breaker may be reset only once. If a circuit breaker trips after it has been reset, the cause should be determined and corrected before attempting a subsequent reset.

IF **PITOT/STALL HEATER OFF** Light Remains On:

Depart icing area.

* * * *

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SEVERE RAIN / ICE / TURBULENCE

ENG IGN Selector ....SYS A OR SYS B / GRD START & CONTIN

PNEU X-FEED VALVE Levers ....OPEN

ENG / AIR FOIL Anti-Ice Switches.................................. AS REQUIRED

Note: Engine and airfoil anti-ice systems should be off if RAT is above 6°C or no icing is encountered or anticipated. Reduced engine bleeds will increase engine flameout margin during periods of heavy water ingestion.

APU .... START, BUS SWITCHES ON

TURB Mode Button.. PUSH

Turn off flashing red throttle lights by pushing ATS disconnect button on throttle. If autothrottles do not disengage, move AUTO THROT switch to OFF and push TURB mode again. Verify YAW DAMP switch is in ON.

During an extreme turbulence encounter, fly attitude indicator as primary pitch reference. Sacrifice altitude to maintain attitude. Descend if necessary to improve buffet margin. Do not chase airspeed.

ENG SYNC Selector ....OFF

Airspeed .... MONITOR

Recommended turbulence penetration airspeed is 275 to 285 KIAS or Mach .75 to .79 (whichever is lower). At 10,000 feet and below, minimum recommended speed is 250 KIAS or minimum maneuvering whichever is greater. Do not fly less than minimum maneuvering speed for existing configuration.

When flying in PERF mode, disengage when turbulence exceeds moderate, then fly to recommended speed schedule.

Throttles... SET

Note: Use speedbrakes to slow if necessary. Adjust throttles only as necessary to avoid excessive airspeed variations. Use smooth power changes and maintain thrust as high as practicable. Do not chase airspeed.

(Continued)

If throttles are at idle when extreme precipitation is encountered, N2 should be monitored for spool-down below idle RPM (**GEN OFF** light may come on). Delay throttle advance as long as possible and, when necessary, very slowly advance one throttle at a time while monitoring N2 for response. If no response is noted, return throttle to idle and wait for indications of spool-up to idle RPM.

During the unavoidable encounter of exceptionally severe icing conditions (those that occur on an infrequent basis), it is desirable to maintain a minimum of 70% N1. Necessary thrust reductions below this level should be limited in duration with a maximum of one minute but to not less than 55% N1. A minimum of 70% N1 should be maintained following re-acceleration for at least one minute and preferably longer before reducing thrust again.

The left and right windshields consist of primary and secondary de-ice areas. Under severe icing conditions, the secondary de-ice areas may not completely de-ice. Due to the geometry of these windshields, the heat flow to the secondary de-ice area is not adequate to remove the ice.

Increased engine vibration during low thrust operation in severe icing conditions, with or without engine anti-ice, may be due to fan blade icing. This is especially suspect if more than one engine experiences higher than normal vibration levels. If fan blade icing is suspected, verify ENG IGN selector is in SYS A, SYS B, or GRD START & CONTIN. If engine anti-ice is off, reduce thrust (one engine at a time) to idle and turn on engine anti-ice. Accelerate affected engine to 70% N1 while closing monitoring engine instruments (especially EGT) for any abnormalities. If vibration decreases (indicating ice removal), resume normal operation for existing conditions. If vibration does not decrease after one minute, consider engine shutdown.

* * * *

TAIL DE-ICE INOPERATIVE

Note: **TAIL DE-ICE ON** light does not come on when TAIL DE-ICE is selected.

If unable to avoid icing conditions, use the following procedures:

- - - - - PRIOR TO FINAL APPROACH - - - - -

Add 5 knots to all minimum maneuvering speeds. Do not extend flaps beyond 28° which may result in a decrease in airplane controllability.

- - - - - FOR FINAL APPROACH AND LANDING - - - - -

Flaps / Slats ....28 / EXT

Speed ....V_{REF} FOR 28 / EXT + 5 KNOTS

- - - - - IF GO-AROUND IS INITIATED - - - -

Flaps / Slats ....RETRACT TO 15 / EXT

Speed ....APPROPRIATE MANEUVER SPEED FOR 15° / EXT + 5 KNOTS

Note: If approach climb limited, consider using 11° / EXT.

* * * *

TAIL DE-ICE ON LIGHT GOES OFF IMMEDIATELY AFTER TAIL DE-ICE IS ACTIVATED

When tail de-ice is required, push and hold TAIL de-ice button in for 2½ minutes.

* * * *

TAIL DE-ICE ON LIGHT ON CONTINUOUSLY

WING & TAIL VALVES C/B (M-24)............................PULL OPEN

Note: Opening this circuit breaker will cause the wing anti-ice valve to open and the tail anti-ice valve to close.

IF **AIRFOIL ICE PROT PRESS ABNORMAL** Light Comes On:

When tail de-ice is required, reset WING & TAIL VALVES C/B for 2.5 minutes. Observe **AIRFOIL ICE PROT PRESS ABNORMAL** light goes off. After 2.5 minutes, pull C/B. Repeat as required.

OR

* * * *

IF **AIRFOIL ICE PROT PRESS ABNORMAL** Light Remains Off:

AIR FOIL Anti-Ice Switch(es)..OFF

PNEU X-FEED VALVE Levers..CLOSE

Avoid icing areas. If unable to avoid icing areas, refer to AIRFOIL ICE PROTECTION INOPERATIVE, this section.

* * * *

WINDSHIELD CRACKED OR HEAT INOPERATIVE

IF Windshield is Cracked:

IF Outer Glass (Pane) is Cracked:

Pull respective WINDSHIELD ANTI-ICE C/B:

Left X-24 / Center X-25 / Right Z-24

Limit airspeed below 10,000 feet to 315 KIAS.

* * * *

OR

IF Inner Glass (Pane) is Cracked:

If applicable, pull respective WINDSHIELD ANTI-ICE C/B:

Left X-24 / Center X-25 / Right Z-24

Pull respective ANTI-FOG C/B:

Capt F/O & Ctr X-26 / Clearview & Eyebrow Z-26

Limit airspeed below 10,000 feet to 235 KIAS.

* * * *

OR

IF Windshield Is Not Cracked:

Note: Ice buildup at the edges of windshields is not a positive indication of inoperative windshield heat. The left and right windshields consist of primary and secondary de-ice areas. Under severe icing conditions, the secondary de-ice area may not completely de-ice. Due to the geometry of these windshields, the heat flow to the secondary de-ice area is not adequate to remove the ice.

WINDSHIELD ANTI-ICE
& ANTI-FOG C/B'S ....RESET IF TRIPPED

Anti-Ice: X-24, X-25, Z-24 / Anti-Fog: X-26, Z-26

IF Windshield Anti-Ice Is Inoperative:

Limit speed below 10,000 feet to 315 KIAS.

* * * *

WING ANTI-ICE ON LIGHT IS OFF WITH AIR FOIL ANTI-ICE SWITCH(ES) ON

AIRFOIL ADVISORY & PRESSURE ABNORMAL CAUTION C/B (M-21)................RESET IF TRIPPED

PNEU X-FEED VALVE Levers ....CLOSE

IF AIRFOIL ICE PROT PRESS ABNORMAL Light Remains Off:

Confirms inoperative anti-ice system. Avoid icing areas.

AIR FOIL Anti-Ice Switch(es)...OFF

OR

If unable to avoid icing areas, refer to AIRFOIL ICE PROTECTION INOPERATIVE, this section.

* * * *

IF AIRFOIL ICE PROT PRESS ABNORMAL Light Comes On:

PNEU X-FEED VALVE Levers..OPEN

- - - - - AFTER ONE MINUTE - - - - -

IF AIRFOIL ICE PROT PRESS ABNORMAL Light Remains On:

AIR FOIL Anti-Ice Switch(es)..OFF

PNEU X-FEED VALVE Levers.................................CLOSE

OR

Avoid icing areas. If unable to avoid icing areas, refer to AIRFOIL ICE PROTECTION INOPERATIVE, this section.

* * * *

IF AIRFOIL ICE PROT PRESS ABNORMAL Light Is Off:

Confirms WING ANTI-ICE ON light circuit malfunction. Continue normal operation.

* * * *

WING HTR INOP LIGHT ON

Circuit Breaker H-26 UPPER WING ANTI-ICE............................PULL

This will remove all power to the Upper Wing Anti-Ice system, allowing the system to reset when repowered.

- - - - - AFTER TWO MINUTES - - - - -

Circuit Breaker H-26 UPPER WING ANTI-ICE......................... RESET

- - - - - AFTER TWO MINUTES - - - - -

IF WING HTR INOP Light Is ON:

Circuit Breaker H-26 UPPER WING ANTI-ICE.....................PULL

The system is inoperative.

* * * *

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AHRS ALIGNMENT / REALIGNMENT ON THE GROUND

Alignment occurs automatically whenever AC bus power is applied to AHRS. Alignment is complete when attitude and heading flags are removed from view. A new alignment is started whenever a power interrupt occurs.

Caution: During AHRS ground alignment, flight crew must assure airplane remains stationary until attitude and heading flags are out of view. If airplane is moved during final phase of ground alignment cycle, AHRS may align incorrectly with no apparent indication. Subsequent flight with an improper alignment may result in large errors in pitch, roll, and heading information..

The following steps will initiate a new AHRS ground alignment sequence into NORMAL mode without interrupting power to the cabin area.

GROUND SERVICE ELEC PWR (APU/EXT) Switch........................ON

AC BUS X-TIE Switch .... OPEN

Right Bus Power Switch
(APU / EXT PWR / R GEN)... OFF

Left Bus Power Switch
(APU / EXT PWR / R GEN).............................. CYCLE OFF THEN ON

Right Bus Power Switch
(APU / EXT PWR R GEN)..ON

Note: Left and Right Bus switches must be turned on within 10 seconds of each other to prevent AHRS reversion to BASIC mode.

AC BUS X-TIE Switch ....AUTO

GROUND SERVICE ELEC PWR (APU / EXT) Switch................... OFF

* * * *

TOTAL AHRS FAILURE

If AHRS fails to automatically align after one minute:

AHRS-1 C/B OVHD B-05
AHRS-1 & 2 C/Bs EPC F-2 & 15 ....OPEN & RESET

Open C/Bs, wait 5 seconds, then reset C/Bs. Aircraft must remain strait and level at a constant airspeed until attitude and heading flag are out of view, approximately 55 seconds.

* * * *

AIRSPEED UNRELIABLE / LOSS OF RADOME

Use this procedure anytime the airspeed system becomes inoperative or erroneous airspeed is suspected, with or without loss of radome.

Unreliable airspeed indications may result from blocking or freezing of the pitot system, or loss of part or all of the radome.

As soon as airspeed is determined to be unreliable, no difficulties in aircraft control should be encountered as long as pitch attitude and power settings are used as the primary reference and indicated airspeed readings are disregarded.

Note: If it can be determined that no significant wing leading edge damage (resulting in increased stall speeds) has occurred and the Speed Command system is operable, the Flight Crew may elect to use Speed Command during terminal area flight and final approach.

Information for pitch attitude flying is contained in the following tables which are based on standard day temperatures for the given altitude. Linear interpolation for the target pitch attitude corresponding to the appropriate gross weight is permissible. The terminal area and final approach speeds contain an arbitrary margin to account for hail damage to the wing leading edges. The increased final approach speeds should be taken into account when determining landing field requirement.

Effects of Nose Radome Loss or Damage

Disrupts airflow over pitot tubes which may cause erroneous indicated airspeed/mach, overspeed warning, and improper function of systems that use air data inputs. Examples are autothrottle speed mode and autopilot IAS/Mach hold functions. The noise level will increase and low frequency buffeting may occur, but there is only a relatively small loss in aircraft performance. The buffeting is distinguishable from stall buffet in that it does not change greatly with changes in speed or attitude. No significant change will occur in aircraft handling characteristics, stall, or buffet onset speeds due to radome damage.

Effects of Hail Damage And Lightning Strike

Engine inlet damage may cause erroneous EPR indications. Wing leading edge damage may cause an increase in airplane stall speeds and degraded handling characteristics at or near stall (certain types of damage can cause airplane stall prior to stall warning). Angle of attack sensor damage will invalidate stall warning or Speed Command functions.

-217 MAX CLIMB			SPEED 1.5 VS + 10 FLY TO PITCH ATTITUDE		FLAPS / SLATS 0 / RET	
ALTITUDE (FT)	WEIGHT (1000 LB.)	TARGET PITCH ATTITUDE (DEG)	APPROX N1 RPM REQUIRED (%)	APPROX AIRSPEED (KIAS)	APPROX RATE OF CLIMB (FPM)	STD TAT (°C)
0	80	20.1	85.3	194	5662	19.9
	120	12.8	85.5	235	3811	22.2
	160	9.3	85.4	270	2681	24.5
5,000	80	17.7	86.3	194	5230	10.8
	120	11.4	86.4	235	3476	13.5
	160	8.4	86.4	270	2420	16.2
10,000	80	15.2	87.1	194	4650	1.8
	120	9.8	87.2	235	3003	5.0
	160	7.3	87.2	270	2022	8.1
15,000	80	12.8	87.9	195	4019	-6.9
	120	8.4	88.1	237	2518	-3.3
	160	6.3	88.0	273	1595	0.4

CHANGE TO N1 RPM, PITCH ATTITUDE, AND RATE OF CLIMB DUE TO DIFFERENCE BETWEEN INDICATED TAT AND STD TAT

Subtract the STD TAT presented above from the indicated TAT to calculate ΔTAT

	ALTITUDE (FT)	ΔTAT IN °C				
		-20	-10	0	+10	+20
ΔN1 (%)	S.L.	+1.8	+0.9	0	+0.2	+0.8
	15,000	+3.5	+2.0	0	-2.8	+0.5
ΔPITCH (DEG)	S.L.	+2.0	+1.2	0	-0.7	-1.0
	15,000	+1.2	+0.5	0	-0.2	-0.1
ΔCLIMB (FPM)	S.L.	+700	+400	0	-200	-500
	15,000	+500	+200	0	-100	-100

-217A MAX CLIMB		SPEED 1.5 VS + 10 FLY TO PITCH ATTITUDE			FLAPS / SLATS 0 / RET	
ALTITUDE (FT)	WEIGHT (1000 LB.)	TARGET PITCH ATTITUDE (DEG)	APPROX N1 RPM REQUIRED (%)	APPROX AIRSPEED (KIAS)	APPROX RATE OF CLIMB (FPM)	STD TAT (°C)
0	80	20.1	85.7	194	5660	19.9
	120	12.7	85.5	235	3798	22.2
	160	9.3	85.5	270	2684	24.5
5,000	80	17.7	86.3	194	5223	10.8
	120	11.3	86.4	235	3470	13.5
	160	8.4	86.4	270	2419	16.2
10,000	80	15.2	87.2	194	4676	1.8
	120	9.8	87.3	235	3018	5.0
	160	7.3	87.3	270	2030	8.1
15,000	80	12.9	88.4	195	4076	-6.9
	120	8.4	88.2	237	2528	-3.3
	160	8.3	88.1	273	1605	0.4

CHANGE TO N1 RPM, PITCH ATTITUDE, AND RATE OF CLIMB DUE TO DIFFERENCE BETWEEN INDICATED TAT AND STD TAT

Subtract the STD TAT presented above from the indicated TAT to calculate ΔTAT

	ALTITUDE (FT)	ΔTAT IN °C				
		-20	-10	0	+10	+20
ΔN1 (%)	S.L.	+1.8	+1.4	0	-0.2	+1.2
	15,000	+2.2	+0.6	0	-2.6	+1.2
ΔPITCH (DEG)	S.L.	+2.1	+1.5	0	-1.0	-1.0
	15,000	+1.0	+0.5	0	-0.6	-0.4
ΔCLIMB (FPM)	S.L.	+740	+500	0	-240	-260
	15,000	+300	+250	0	-230	-220

-217 & -217A CRUISE		ADJUST POWER TO MAINTAIN PITCH ATTITUDE, LEVEL FLIGHT			FLAPS / SLATS 0 / RET	
ALTITUDE (FT)	WEIGHT (1000 LB.)	TARGET PITCH ATTITUDE (DEG)	APPROX N1 RPM REQUIRED (%)	APPROX AIRSPEED (KIAS)	APPROX RATE OF DESCENT (FPM)	STD TAT (°C)
20,000	80 120 160	0.6 1.9 3.3	71.8 73.8 77.5	285	0	-5.5
25,000	80 120 160	0.6 2.0 3.4	74.4 77.0 80.5	285	0	-12.3
30,000	80 120 160	0.7 2.1 3.6	77.1 79.9 84.6	285	0	-18.5
35,000	80 120	1.2 2.8	78.2 84.5	268 .79M	0	-27.5
-217 &-217A DESCENT		FLY TO PITCH ATTITUDE			**FLAPS / SLATS 0 / RET**	
10,000	80 120 160	-4.8 -2.2 -0.3	IDLE THRUST	285	3031 2283 1974	9.4
20,000	80 120 160	-4.2 -1.7 0.1	IDLE THRUST	285	3200 2426 2144	-5.5
30,000	80 120 160	-3.5 -1.1 0.7	IDLE THRUST	285	3273 2509 2239	-18.4

CHANGE TO N1 RPM AND RATE OF DESCENT DUE TO DIFFERENCE BETWEEN INDICATED TAT AND STD TAT

Subtract the STD TAT presented above from the indicated TAT to calculate ΔTAT

	ΔTAT IN °C				
	-20	-10	0	+10	+20
ΔN1 RPM (%)	-3.2	-1.8	0	+1.8	+3.2
Δ DESCENT (FPM)	-100	-50	0	+50	+100

ALTITUDE (FT)	WEIGHT (1000 LB.)	TARGET PITCH ATTITUDE (DEG)	APPROX N1 RPM REQUIRED (%)	APPROX AIRSPEED (KIAS)	APPROX RATE OF DESCENT (FPM)	STD TAT (°C)
217 & -217A HOLDING — ADJUST POWER TO MAINTAIN PITCH ATTITUDE, LEVEL FLIGHT						**FLAPS / SLATS 0 / RET**
10,000	80 120 160	4.1 4.1 4.1	56.4 64.5 70.3	184 225 260	0 0 0	1.2 4.2 7.2
-217 &-217A TERMINAL AREA FLIGHT — ADJUST POWER TO MAINTAIN PITCH ATTITUDE, LEVEL FLIGHT						**PATTERN ALTITUDE**
0/RET	80 120 160	4.1 4.1 4.1	50.3 59.0 65.1	184 225 260	0 0 0	19.4 21.6 23.8
15/EXT	80 120 160	8.3 8.3 8.3	53.4 62.4 68.6	123 151 174	0 0 0	17.0 18.0 19.0
28/EXT	80 120 160	6.8 6.8 6.8	58.2 66.6 72.7	115 141 162	0 0 0	16.8 17.7 18.6
-217 & -217A FINAL APPROACH			BASED ON 3° GLIDESLOPE. ADJUST POWER TO MAINTAIN PITCH ATTITUDE. FLY GLIDE SLOPE OR IF NOT AVAILABLE, FLY TO RATE OF DESCENT			
40/EXT	80 120 160	2.2 2.2 2.2	51.9 61.1 67.1	111 136 157	600 735 849	16.7 17.5 18.4

CHANGE TO N1 RPM AND RATE OF DESCENT
DUE TO DIFFERENCE BETWEEN INDICATED TAT AND STD TAT

Subtract the STD TAT presented above from the indicated TAT to calculate ∆TAT

	∆TAT IN °C				
	-20	-10	0	+10	+20
∆N1 RPM (%)	-2.2	-1.2	0	+1.0	+2.2
∆ DESCENT (FPM)	-25	-20	0	+20	+25

-217 GO-AROUND			SPEED V2 + 20 FLY TO PITCH ATTITUDE			FLAPS / SLATS 15 / EXT
ALTITUDE (FT)	WEIGHT (1000 LB.)	TARGET PITCH ATTITUDE (DEG)	APPROX N1 RPM REQUIRED (%)	APPROX AIRSPEED (KIAS)	APPROX RATE OF CLIMB (FPM)	STD TAT (°C)
0	80 120 160	23.8 18.7 14.8	91.9 92.0 92.2	148 157 179	5727 3255 2333	17.9 18.2 19.2
5,000	80 120 160	22.0 16.6 12.3	94.2 94.4 94.6	140 157 179	4590 2882 1996	8.1 8.9 10.0
10,000	80 120 160	19.6 14.1 11.4	92.9 93.0 93.1	132 157 179	3645 2271 1447	-1.7 -0.4 0.9

CHANGE TO N1 RPM, PITCH ATTITUDE, AND RATE OF CLIMB DUE TO DIFFERENCE BETWEEN INDICATED TAT AND STD TAT

Subtract the STD TAT presented above from the indicated TAT to calculate ΔTAT

	ALTITUDE	ΔTAT IN °C				
	(FT)	-20	-10	0	+10	+20
ΔN1 (%)	S.L. 5,000 10,000	-3.2 -1.2 -0.2	-2.0 -1.2 -0.2	0 0 0	+1.2 +1.5 +1.5	+3.0 +0.5 +0.6
Δ PITCH (DEG)	S.L. 5,000 10,000	+0.5 +0.5 +0.5	+0.3 +0.3 +0.3	+0.0 +0.0 +0.0	-0.2 -0.2 -0.2	-0.6 -0.6 -0.2
Δ CLIMB (FPM)	S.L. 5,000 10,000	-110 +40 +100	-60 -20 +80	0 0 0	+60 +60 +20	-80 -80 +60

-217A GO-AROUND			**SPEED V2 + 20** FLY TO PITCH ATTITUDE		**FLAPS / SLATS 15 / EXT**	
ALTITUDE (FT)	WEIGHT (1000 LB.)	TARGET PITCH ATTITUDE (DEG)	APPROX N1 RPM REQUIRED (%)	APPROX AIRSPEED (KIAS)	APPROX RATE OF CLIMB (FPM)	STD TAT (°C)
0	80	24.1	92.0	146	5240	17.8
	120	18.6	92.1	157	3268	18.3
	160	14.8	92.3	179	2340	19.2
5,000	80	22.6	95.8	139	4713	8.1
	120	16.9	96.0	157	2989	8.9
	160	13.5	96.2	179	2082	10.0
10,000	80	19.9	93.9	132	3709	-1.7
	120	14.2	94.3	157	2345	-0.4
	160	11.5	94.5	179	1516	0.9

CHANGE TO N1 RPM, PITCH ATTITUDE, AND RATE OF CLIMB DUE TO DIFFERENCE BETWEEN INDICATED TAT AND STD TAT

Subtract the STD TAT presented above from the indicated TAT to calculate ΔTAT

	ALTITUDE	ΔTAT IN °C				
	(FT)	-20	-10	0	+10	+20
ΔN1 (%)	S.L.	-3.2	-1.6	0	+1.6	+0.6
	5,000	-3.4	-1.7	0	+1.4	+0.2
	10,000	-3.8	-1.8	0	+1.6	+3.4
Δ PITCH (DEG)	S.L.	0	0	0	0	-0.6
	5,000	0	0	0	0	-0.6
	10,000	0	0	0	0	0
Δ CLIMB (FPM)	S.L.	-120	-60	0	+60	-80
	5,000	-120	-60	0	+60	-120
	10,000	-80	-60	0	+60	+80

CADC FAILURE

Note: After failure of one or both CADCs, AHRS 1 and 2 will revert to basic mode. It may require up to 5 minutes for system to revert.

Failure of the No. 1 CADC will be indicated by the following flags in the Captain's instruments:

- Mach Off Flag
- A/S Flag
- Altimeter Off Flag
- Vertical Speed Off Flag
- GPWS Light On
- Auto Slat Fail Light On

Failure of the No. 2 CADC will be indicated by the following flags in the First Officer's instruments:

- Mach Off Flag
- A/S Flag
- Altimeter Off Flag
- Vertical Speed Off Flag
- Auto Slat Fail Light On

CADC Selector... BOTH ON 1 OR BOTH ON 2

Select unaffected system.

Transponder...SELECT OPERABLE CADC

* * * *

DIGITAL LIGHTS BLANKOUT / FAILURE

IF Digital Lights Blankout (Indicated by No Lights Illuminated):

Digital Light Rheostats.. FULL BRIGHT

Autopilot Disconnect Button .... PRESS TWO TIMES

- - - - - WAIT 10 SECONDS THEN - - - - -

Digital Lights CBs.......................................RESET IF TRIPPED

Digital Display CBs (N-32, N-33, N-34)
Captain's Digital Display CB (M-32)
DFGS Light Control CB (L-16)

OR

Digital Flight Guidance CBs..................................PULL FOR 10 SECONDS AND RESET

Note: Yaw damper will be off while C/Bs are pulled.

DFGS (C-1, C-2, C-3, C-4)
DFGS (C-10, C-11, C-12, C-13)
DFGS (C-17, C-18, C-19)
DFGS 2 (D-8) DFGS 1 (D-19)
DFGS (E-8, E-9) DFGS (E-20, E-21)

* * * *

IF Digital Lights Failure (Indicated by a starburst or 8's pattern):

Note: The affected displays will be fuel quantity, flight guidance control panel, VHF nav control panels, and FMAs.

This indicates a short-to-ground failure of the ANNUN/DIGITAL LTS test button.

Warning Light and Test CB (N-34).................................... PULL

* * * *

GPWS FAIL LIGHT ON

Circuit Breakers .... RESET IF TRIPPED

GPWS (F-20, G-20)
Radio Altimeter (F-3, F-17)
Air Data Computer (C-1, F-12)

IF GPWS Light Remains On:

GPWS Switch .... OVERRIDE

Consider the GPWS unreliable/inoperative.

* * * *

FLIGHT RECORDER OFF LIGHT ON

Note: Verify that the parking brake is not on.

CB's (B-7, C-14, F-21, G-21) .... RESET IF TRIPPED

IF Light Remains On:

Consider the flight recorder inoperative. Refer to the MEL for dispatch requirements.

* * * *

MISCELLANEOUS

TAILCONE LIGHT ON

Note: Indicates tailcone has separated, or misalignment of cable assembly switches.

IF Light Comes On While On The Ground:

Notify ground control that tailcone may have deployed on taxiway or runway. Return to gate for maintenance corrective action.

OR

* * * *

IF Light Comes On After Takeoff During Initial Climb:

Notify the tower that tailcone may be on runway. Weather permitting, return for landing.

Note: If the tailcone has not deployed, advise tower and be aware it may separate from aircraft on touchdown and rollout below 80 knots.

OR

* * * *

IF Light Comes On While Enroute:

Note position when light came on. Make a visual inspection of the tailcone through the viewport in the aft cabin door. Indications of tailcone separation are:

Obvious light visible through viewport.
Some increase in noise level in tail area.
Slight buffeting or vibration in tail area.

Notify ATC if tailcone has separated.

Note: If the tailcone has not deployed, advise tower and be aware it may separate from aircraft on touchdown and rollout below 80 knots.

* * * *

CARGO DOOR LIGHT ON

IF Light Comes On While On The Ground:

Ground personnel may visually confirm door is closed and locked. Refer to MEL 52-6.

OR

* * * *

IF Light Comes On While Airborne:

IF Aircraft Pressurization is Normal:

Continue to destination.

OR

* * * *

IF Aircraft Pressurization is Not Normal:

Refer to **LOSS OF PRESSURIZATION** checklist, Section 2.

* * * *

OXYGEN

FAILURE OF AUTOMATIC OXYGEN MASK PRESENTATION

IF Cabin Oxygen Masks Presentation Does Not Occur Automatically At A Cabin Altitude of Approximately 14,000 feet:

PASS OXY MASK Switch.........EJECT (5 SECONDS MAXIMUM)

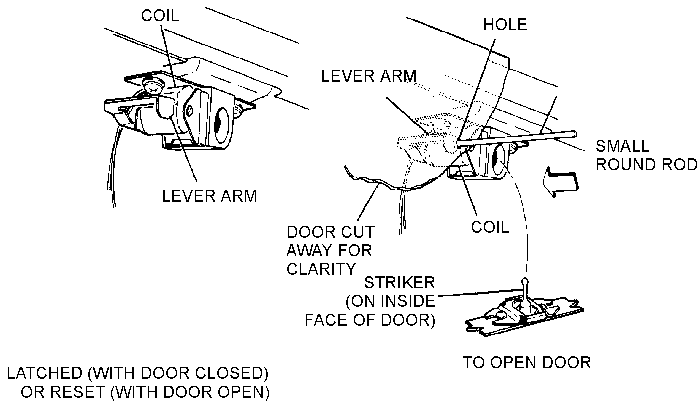
CABIN OXYGEN ON Annunciator Light.................... VERIFY ON

If **CABIN OXYGEN ON** light does not come on, refer to **MANUAL OPERATION OF OXYGEN MASK COMPARTMENT DOORS** checklist, this section.

* * * *

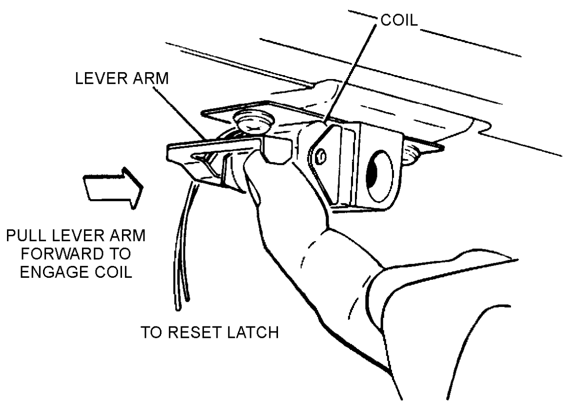
MANUAL OPERATION OF OXYGEN MASK COMPARTMENT DOORS

The illustration below shows how to manually open the oxygen compartment doors.



MD801702

The illustration below shows how to reset the latch on an oxygen compartment door so that it can be reclosed following an inadvertent opening, where the unit has not been activated and the masks are still stowed.



MD801702a

PASSENGER OXYGEN GENERATOR HEAT

Passenger oxygen generator heat shields and passenger oxygen masks and hoses may be damaged when they come in contact with hot oxygen generator.

After automatic or manual deployment of oxygen masks and oxygen generator activation, do not restow the oxygen masks and close the compartment door when oxygen is no longer needed. The oxygen generator can create surface temperatures up to 500°F after being activated. Therefore, caution must be exercised around newly discharged generators.

If it is desired, the hanging oxygen masks from a discharged oxygen generator can be moved out of the passengers way by placing the masks in overhead baggage bins and closing the baggage doors on the hoses.

* * * *

SUPPLEMENTAL OR FIRST AID OXYGEN FOR PASSENGERS

Four portable oxygen cylinders and continuous flow masks are located in the passenger compartment. Each cylinder has two continuous flow outlets: one is low (2.0 liters per hour) with a full cylinder duration of 60 minutes and one is high (4.0 liters per hour) with a full cylinder duration of 30 minutes. The mask hose must be connected to the respective outlet and the shutoff valve opened to supply oxygen to the mask.

* * * *

UNWANTED OXYGEN MASK PRESENTATION / ACTIVATION

NO SMOK Switch ....ON

Make an appropriate announcement to the passengers and crew that the use of oxygen is not required at this time.

IF Oxygen Unit in Cabin Has Opened and Activated:

Reseat affected passengers in seats with normal (closed) oxygen units. If unable to reseat passengers, the flight is limited to 25,000 feet or below unless passenger can be supplied with portable oxygen and instructed in its use. With portable oxygen supplied to the affected passengers, the flight is restricted to 30,000 feet or below. Portable oxygen must be removed when descending below 14,000 feet.

IF Oxygen Unit in Cabin Has Opened But Masks Remain Stowed (Not Activated):

A crewmember may reset the door latch and close the unit door using MANUAL OPERATION OF OXYGEN MASK COMPARTMENT DOORS CHECKLIST, this section. If the doors cannot be reset and closed and passengers cannot be moved to unaffected locations, the flight should be conducted at 30,000 feet or below. If circumstances such as passenger safety, fuel remaining, low altitude fuel burnoff, or weather indicate the use of higher altitudes, the Captain may exercise his authority to use a higher altitude.

IF Oxygen Unit Has Deployed in a Lavatory:

Lock the lavatory door above 25,000 feet if the unit is activated. If unit opened but masks remain stowed, a crewmember may reset the door latch and close the unit door using the MANUAL OPERATION OF OXYGEN MASK COMPARTMENT DOORS CHECKLIST, this section.

Logbook.. DOCUMENT DISCREPANCY

* * * *

POWER PLANT

BATTERY START

Wheels .... CHOCKED

Parking Brake .... SET

Note: The brake pressure gauges and the PARKING BRAKE ON annunciator light are not powered.

Circuit Breakers .... CHECKED

Engine Sync (If Installed) .... OFF

AC & DC BUS X-TIE Switches .... OPEN

Galley Power .... OFF

NO SMOK & SEAT BELTS Switches .... ON

Fuel Boost Pumps .... ON

Turn on all pumps in tanks containing fuel.

Pitot & Windshield Heat .... ON

Packs .... OFF

Beacon / Position Lights .... ON

Throttles .... IDLE

FUEL Levers .... OFF

FUEL X-FEED Lever .... OFF

CABIN ALT Control Lever .... AUTO, VALVE OPEN

PNEU X-FEED VALVE Levers .... OPEN

Hydraulic Pumps .... OFF, HI, HI, OFF

BATT Switch .... ON & LOCKED

Generators .... RESET & ON

Annunciator Panel .... CHECKED

Verify DC TRANSFER BUS OFF light is off and all other lights are normal.

Fire Control Panel .... CHECKED

Perform a fire detection system check. The AGENT LOW lights are not powered.

(Continued)

EMER PWR Switch..ON

Verify that the EMER PWR IN USE light is on and the AC EMER BUS OFF and DC EMER BUS OFF lights are out. Check the DC volts indicate 25 volts minimum.

PNEU PRESS Gauge ....CHECK

Start Pump Switch ....ON

ENG IGN Switch .... SYS A OR SYS B / GRD START & CONTIN

Right Engine .... START

Notes: The following engine instruments will be operative during start: OIL PRESS LOW light, N1, EGT, and N2.

The following engine instruments will be inoperative during start until the generator comes on line: Oil Pressure, Oil Quantity, Oil Temperature, EPR, and Fuel Flow indicators; START VALVE OPEN, OIL STRAINER CLOGGING, and INLET FUEL PRESS LOW lights.

After releasing the start switch, it can be determined that the start valve has closed by observing pneumatic pressure return to its original value.

- - - - - AFTER ENGINE STARTED - - - - -

EMER PWR Switch... OFF

AC Bus X-TIE Switch..AUTO

Start Pump Switch .... OFF

TRANS and AUX Hydraulic Pumps ....ON

Left Engine... CROSSBLEED START

Refer to CROSSBLEED START checklist, this section.

After Start Checklist..ACCOMPLISH

Receiving Aircraft Checklist ....ACCOMPLISH

* * * *

BUDDY START

This procedure is only to be used to dispatch an aircraft to a base where repairs can be made.

In the event the engine cannot be started due to an inoperative APU, and a ground air source is not available, this procedure may be used. This procedure utilizes high pressure air from a "donor" aircraft to start the engine of a "recipient" aircraft. This procedure requires a flight crew in the cockpit of any aircraft if passengers are on board and a mechanic on the ground interphone at each aircraft.

- - - - - POSITIONING OF AIRCRAFT - - - - -

Position donor aircraft wingtip-to-wingtip on either side of recipient aircraft.

Caution: When positioning aircraft, do not taxi closer than 10 feet wingtip-to-wingtip and use a wingwalker and signal agent. Jet blast areas must be taken into consideration to make certain that no damage will result when using high power for engine starting. EXTREME CAUTION must be exercised during departure taxiing by the first aircraft as an immediate hard turn could result in aircraft contact. If possible, taxi straight ahead one aircraft length before turning.

- - - - - HOOKUP PROCEDURES - - - - -

Only maintenance personnel will install and remove the air supply hose between each aircraft.

Required equipment:

- Air hose with proper connection (minimum of 125 feet).
- Two ground intercom headsets and mikes with extensions that will reach from the E&E compartment to the tail.
- Wheel chocks for the main gear of both aircraft.

- - - - - COMMUNICATION PROCEDURES - - - - -

Both aircraft will use the #1 VHF transceiver. Maintenance personnel will connect their headsets into the #1 VHF jackbox in the E&E compartment and select the #1 VHF transceiver so that each aircraft and each person stationed on the ground will hear the other's conversation and will be able to talk to each aircraft. The appropriate company VHF frequency shall be used.

(Continued)

- - - - - PRIOR TO BUDDY START - - - - -

RECIPIENT AIRCRAFT:

Main Wheel..CHOCKED

Battery Start Checklist..REVIEW

If GPU available, accomplish appropriate checklist.

BATT Switch & EMER PWR Switch ....ON

Accomplish applicable items on the BEFORE START Checklist, Sect. 4.

DC Start Pump..ON

Communications..CHECK

DONOR AIRCRAFT:

Main Wheel..CHOCKED

Before Start Checklist .... ACCOMPLISH

Right Engine ....START

AUX Hydraulic Pump...ON

APU Bleed Air Switch ....OFF

Right PNEU X-FEED VALVE Lever..OPEN

Left PNEU X-FEED VALVE Lever ....CLOSED

Communications..CHECK

<u>Caution:</u> APU may be used as the source of air only if no other air source is available.

(Continued)

----- START SEQUENCE -----

RECIPIENT AIRCRAFT	DONOR AIRCRAFT
Start right engine by operating Start Switch, call "AIR ON."	
	Advance power to maintain 40 psi on pneumatic gauge.
At 40% N2 release Start Switch, call "AIR OFF."	
	Reduce power to idle.
When engine is stabilized, call "START COMPLETED." Close right crossfeed valve.	
	Close right crossfeed valve and open left crossfeed valve.

Note: **OIL PRESSURE LOW** light, N_1, EGT, and N_2 will be operative during start. Immediately after generator comes on line, check that start valve open light is out.

* * * *

CROSSBLEED START

Ramp Area .... CLEAR

Taxi away from the terminal on one engine, clear the area, then make the crossbleed start.

Parking Brake..SET

PNEU X-FEED VALVE Levers .... BOTH OPEN

Operating Engine Throttle ....ADVANCE

Advance the throttle to obtain necessary pneumatic pressure for starting.

Opposite Engine.. START

Using normal starting procedures start non-operating engine. At starter release, reduce throttle to idle on operating engine.

* * * *

ENGINE CLEARING PROCEDURE

FUEL Lever .... OFF

Throttle .... IDLE

N_2 .... ZERO

Indicates rotation has ceased.

IF Aircraft 870 Or 872-879:

ENG IGN Switch .... OFF

IF Other than aircraft 870 Or 872-879:

ENG IGN Switch .... SYS A, SYS B, or BOTH

START Switch .... ON, HOLD FOR 20 SECONDS, OFF

* * * *

HOT START

Note: Fuel flow above 1100 pph. may indicate an impending hot start. If initial fuel flow is high, monitor EGT closely.

FUEL Lever .... OFF

ENG START Switch .... HOLD FOR 10 TO 15 SECONDS

Caution: If start switch has been prematurely released, do not reposition to on. Refer to ENGINE CLEARING PROCEDURE, this section.

ENG START Switch .... OFF

ENG IGN Switch .... OFF

Note: Do not attempt restart until maintenance inspection completed. Note maximum EGT during start.

* * * *

HUNG START

Note: This condition is indicated when engine does not continue acceleration to idle.

ENG HYD PUMP Switch (Affected Engine)................................OFF

- - - - - WAIT FOR 30 SECONDS - - - - -

Throttle (Affected Engine)........................ADVANCE ABOVE IDLE

IF Engine Does Not Accelerate to Idle Within 2 Minutes After Fuel On:

Engine...SHUTDOWN

Note: Refer to ENGINE CLEARING PROCEDURE CHECKLIST, this section.

* * * *

OR

IF Engine Does Accelerate to Idle Within 2 Minutes After Fuel On And Indications Are Normal:

ENG HYD PUMP Switch (Affected Engine)............................HI

Engine Indications.. OBSERVE

IF Engine Indications Are Abnormal:

Engine...SHUTDOWN

Note: Refer to ENGINE CLEARING PROCEDURE CHECKLIST, this section.

* * * *

OR

IF Engine Indications Are Normal:

Continue with normal operations.

* * * *

NO EGT DURING START

IF EGT Does Not Rise Within 20 Seconds After Fuel Lever Is Placed To On:

FUEL Lever .... OFF

ENG START Switch .... HOLD FOR 10 TO 15 SECONDS

Caution: If start switch has been prematurely released, do not reposition to on. Refer to ENGINE CLEARING PROCEDURE CHECKLIST, this section.

Engine Ignition CBs (K26, L26) ....RESET IF TRIPPED

EGT CBs (Emer DC Bus B15, C15)...................RESET IF TRIPPED

IF Ignition switch has SYS A and SYS B Position:

ENG IGN Switch.........................SELECT OPPOSITE SYSTEM

IF Ignition switch has GRND START & CONTIN position:

ENG IGN Switch...............LEAVE IN GRD START & CONTIN

- - - - - AFTER N2 CEASES ROTATION - - - - -

Attempt another start.

IF No Rise Within 20 Seconds of Fuel Lever On:

Discontinue start. Maintenance is required.

* * * *

NO N1 ROTATION

Discontinue start. (No N1 rotation indicates possible N1 rotor seizure.)

IF Able to Confirm N1 Rotation with Ground Crew:

Proceed with engine start using N2 and remaining engine indications.

* * * *

OR

IF No N1 Rotation:

Maintenance action is required.

* * * *

NO N2 ROTATION

Start Valve Open Light.. VERIFY ON

N2 Rotation ....CONFIRM

Monitor N1, oil pressure, hydraulic pressure for rise to confirm that the N2 rotor is free.

IF N2 Rotation Is Confirmed:

At 5% N1..FUEL LEVER ON

At 12-20% N1..START SWITCH OFF

Refer to MEL for dispatch requirements.

* * * *

OR

IF No N2 Rotation:

Discontinue start. Maintenance action is required.

* * * *

NO OIL PRESSURE RISE DURING START

Discontinue start.

Engine Oil Pressure CBs (A1 or A10) ....RESET IF TRIPPED

IF CBs Tripped and Reset:

Attempt a second start.

* * * *

OR

IF CBs Not Tripped or Will Not Reset:

Maintenance action is required.

* * * *

OIL PRESS LOW LIGHT ON AFTER GROUND START

Oil Pressure Gauge ....CHECK

IF Below 40 psi:

Shut down engine. Maintenance action is required.

OR

* * * *

IF At or Above 40 psi:

With normal pressure, regardless of light condition (on or off), continue operation. Monitor oil quantity, pressure, and temperature indications.

* * * *

START VALVE DOES NOT OPEN

DC TX Bus CB's U41 & U42..................................RESET IF TRIPPED

Note: CB may be labeled ENG START VALVE or ENGINE IGNITION.

IF Ignition Switch is A/B/BOTH/OVRD type:

Attempt start using opposite (SYS A or SYS B) ignition position.

Confirm adequate pneumatic pressure is available. If unable to open start valve electrically, refer to **START VALVE MANUAL OPERATION**, this section.

* * * *

START VALVE MANUAL OPERATION

Accomplish BEFORE START CHECKLIST.

Request Maintenance to go on interphone at the affected engine. Establish interphone communication and have maintenance verify that the start valve is closed. When ready to start:

PNEU X-FEED Valve Lever (Affected Engine)........................ OPEN

Start Valve.............................DIRECT MAINTENANCE TO OPEN

- - - - AT 20% N2 - - - -

FUEL Lever (Affected Engine).. ON

- - - - AT 35% N2 - - - -

PNEU X-FEED Valve Lever (Affected Engine)......................CLOSE

Start Valve.......................... DIRECT MAINTENANCE TO CLOSE

Start Valve........................VERIFY CLOSED BY MAINTENANCE

PNEU X-FEED Valve Lever (Affected Engine)........................ OPEN

IF Start Valve Re-Opens (Verified by Maintenance):

PNEU X-FEED Valve Lever (Affected Engine)..............CLOSE

FUEL Lever (Affected Engine)... OFF

Maintenance action is required.

* * * *

OR

IF Start Valve Remains Closed (Verified by Maintenance):

PNEU X-FEED VALVE (Affected Engine)....... AS REQUIRED

Continue normal operation.

* * * *

START VALVE OPEN LIGHT STAYS ON AFTER START

Note: If this light comes on during flight, refer to START VALVE OPEN LIGHT ON INFLIGHT CHECKLIST, this section.

PNEU X-FEED VALVE Lever (Affected Engine).........................CLOSE

Closing pneumatic crossfeed valve isolates engine from opposite engine or APU pneumatic supply.

FUEL Lever (Affected Engine) .... OFF

ENG IGN Switch .... OFF

Caution: Shutdown should be complete prior to ground personnel approaching the engine.

Maintenance action is required. If necessary, refer to START VALVE MANUAL OPERATION, this section.

* * * *

AUTOMATIC RESERVE THRUST INOPERATIVE

ART Switch...OFF

With flaps extended and both engines operating, the **ART INOP** annunciator light will be on for taxi and takeoff.

Takeoff Data ....RECOMPUTE

Caution: If ART is placarded inop or off, a flex takeoff should be made if authorized. If a flex takeoff is not authorized, a maximum rated thrust takeoff (20,850 lbs) must be made. The combination of an assumed temperature of (00) and the takeoff flex button depressed with ART off or inoperative is not authorized.

Note: With the ART switch off, the TRI will display maximum thrust (20,850 lbs/eng) in the EPR window when T.O. is selected. Operation of the aircraft at maximum thrust is legal and safe but it contributes to accelerated engine wear. If the only option available is to make a takeoff at maximum thrust with the T.O. button on the TRI depressed, document the use of maximum thrust in the maintenance logbook (i.e., “Max Thrust Takeoff/ART Inop Flt 447, DEN”).

In the event of an engine failure, maximum thrust (20,850 lbs) can be obtained by depressing the G.A. button on the thrust rating computer (TRI) and manually advancing the throttles to the value displayed on the TRI.

The autothrottles will advance automatically to the G.A. setting when in the flight mode and the TRI is selected to G/A.

* * * *

EGT INOPERATIVE OR READS HIGH

Thrust..REDUCE

Engine Instruments..MONITOR

IF EGT Constant and All Other Indications Decrease:

Assume EGT circuit malfunction.

OR

* * * *

IF EGT Exceeds 630°C and Cannot be Decreased:

Shut down engine.

OR

* * * *

IF EGT Exceeds 630°C (but not over 645°C) and Thrust Reduction Decreases EGT to below 625°C with other indications normal:

Continued engine operation permissible. Record discrepancy of over limit and time.

OR

* * * *

IF EGT has exceeded 645°C:

A precautionary engine shutdown should be accomplished at Captain's discretion.

* * * *

ENGINE SURGING OR POPPING IN FORWARD THRUST

Caution: Avoid operating an engine in a persistent surging condition by reducing thrust to a point where surge condition is cleared. Multiple surges can cause compressor damage and possible engine failure. If both engines are surging, reduce thrust on one engine at a time.

Note: For any loss of thrust during takeoff, **ENGINE FAILURE AFTER V1** profile should be flown until reaching a safe altitude, or until obstacle clearance is assured. In the event of dual engine surging, both engines may be reduced to CLIMB thrust at or above 400 feet AGL.

Autothrottles... OFF

Thrust (Affected Engine(s)) ....MINIMUM FOR SAFE FLIGHT

IF Surging or Popping Continues:

IF Both Engines Are Surging:
Operate at minimum thrust for safe flight.

* * * *

OR

IF Only One Engine is Surging:

Shut down affected engine. Normally an engine should not be restarted if it was shut down because of surging or popping. However, at Captain's discretion, a restart may be attempted if engine is critical for sustained safe flight. In this case, engine operation should be carefully monitored after restart and for remainder of flight to ensure that surging or popping has not resulted in engine damage.

* * * *

OR

IF Surging or Popping Stops:

ENG IGN Switch..................A OR B / GRD START & CONTIN

Engine Anti-Ice Switches ....ON

PNEU X-FEED Valve Lever (Affected Engine(s)) ....OPEN

Air Foil Anti-Ice Switch(es) ....ON

Throttle (Affected Engine(s))............SLOWLY ADVANCE (TO MAINTAIN SAFE FLIGHT)

(Continued)

IF No Surging or Popping:

Continue operation.

OR

* * * *

IF Surging or Popping Returns:

Engine Anti-Ice Switch (Affected Engine(s)) .... OFF

Note: Under certain conditions, moving affected engine anti-ice switch to OFF will minimize possibility of surging or popping. This will cause **NO MODE** light on the TRI to come on, which may be disregarded due to the abnormal bleed configuration.

Operate the engine(s) below level that causes surging or popping and avoid icing conditions.

* * * *

EPR ERRATIC OR FIXED

Note: This condition may occur due to icing or EPR indicator malfunction.

IF In Icing Conditions:

ENG IGN Switch..SYS A OR SYS B / GRD START & CONTIN

Engine Anti-Ice Switches ....ON

EPR Gauge and Engine Parameters ....CHECK

IF Normal:

Continue operation.

* * * *

OR

IF Abnormal:

Continue at ❶

OR

IF Not In Icing Conditions:

❶ **Throttle..ADJUST**

N1, EGT, N2, Fuel Flow...CHECK

IF Normal Response and EPR is Erratic:

Assume EPR circuit malfunction and use N1 for power setting.

* * * *

OR

IF Normal Response and EPR is Fixed:

EPR CB's (K25 & L 25).........................RESET IF TRIPPED

IF EPR Remains Fixed:

Use N1 for power setting.

* * * *

N1 AND / OR N2 OVERSPEED

Thrust (Affected Engine) ....REDUCE

IF N1 Has Exceeded 99.2% (-217) [101.6% (-217A)] But Not Over 102.8% and/or N2 Has Exceeded 102.5% But Not Over 103.5% and All Engine Indicators Are Normal:

Continue engine operation and record RPM above maximum limit in logbook.

* * * *

OR

IF N1 Has Exceeded 102.8% and/or N2 Has Exceeded 103.5%:

A precautionary engine shutdown should be accomplished at Captain's discretion. Record RPM overshoot in logbook.

* * * *

OIL PRESSURE LOW LIGHT ON AND / OR OIL PRESSURE LOW

Note: Oil pressure between 35 and 40 PSI is not desirable and should be tolerated only for completion of flight, preferably at a reduced thrust setting to as low a level a flight conditions permit.

Thrust (Affected Engine) ....REDUCE

IF **OIL PRESS LOW** Light is On:

IF OIL PRESS, OIL TEMP, and OIL QUANTITY Are Normal:

Continue normal engine operation.

* * * *

OR

IF OIL PRESS, OIL TEMP, or OIL QUANTITY Are Abnormal:

Shut down engine. Refer to **ENGINE INFLIGHT SHUTDOWN CHECKLIST**.

* * * *

OR

IF **OIL PRESS LOW** Light is Off, but OIL PRESS Gauge Indicates below 35 PSI:

IF OIL TEMP and OIL QUANTITY Are Normal:

Continue normal engine operation.

* * * *

OR

IF OIL TEMP or OIL QUANTITY Are Abnormal:

Shut down engine. Refer to **ENGINE INFLIGHT SHUTDOWN CHECKLIST**.

* * * *

OIL PRESSURE HIGH

Thrust (Affected Engine) ....REDUCE

IF Oil Pressure Above 55 psi and Other Indications Normal:

Reduce thrust for completion of flight. Normal engine operation may be maintained if flight conditions require.

* * * *

OR

IF Oil Pressure Above 55 psi and Oil Quantity Increases Above Normal Range:

Shut down the engine.

* * * *

OIL QUANTITY DECREASING OR INCREASING

Note: Oil consumption should not exceed 1 qt per hour. Consumption in excess of this should be noted in the logbook.

Note: Increasing oil quantity may indicate a leak in the fuel/oil cooler. If oil quantity increases above normal, observe oil pressure and fuel flow. Shutdown engine if oil pressure exceeds 55 psi.

IF Oil Quantity Increasing:

IF Oil Pressure and Fuel Flow Are Normal:

Continue normal operation.

OR

* * * *

OR

IF Oil Pressure Above 55 psi:

Shut down the engine.

* * * *

IF Oil Quantity Decreasing:

IF Oil Pressure and Temperature Are Normal:

Anticipate engine oil pump cavitation or oil pressure loss.

OR

* * * *

IF Oil Pressure Is Fluctuating:

Continue operation at reduced thrust.

IF Oil Pressure Loss Is Experienced:

Shut down the engine.

* * * *

OIL STRAINER CLOGGING LIGHT ON

IF Inflight:

Thrust (Affected Engine) ....REDUCE

IF Light Goes Out:

Continue operation with thrust reduced at or below setting necessary to keep light off.

* * * *

OR

IF Light Remains On:

Shut down the engine or reduce thrust to minimum required to sustain flight until landing.

* * * *

OR

IF On Ground:

Note: This light may come on due to contaminants in the filter, cold viscous oil, or a combination of both.

IF Oil Temperature Is Above 25°C:

Shut down the engine. Filter should be serviced immediately.

* * * *

OR

IF Oil Temperature Is At or Below 25°C:

Wait 5 minutes to allow the engine to warm up.

IF Light Goes Out:

Continue normal operation.

* * * *

OR

IF Light Remains On:

Shut down the engine. Maintenance action is required.

* * * *

OIL TEMPERATURE HIGH

IF Oil Temperature Approaching Limits:

Thrust (Affected Engine) .... INCREASE

Note: An increase in oil temperature can be associated with reduced thrust. Increasing thrust will increase fuel flow and may provide greater cooling of the oil. Oil temperature stabilization may take several minutes following thrust changes.

IF Oil Temperature Exceeds 135°C For More Than 15 minutes Or Exceeds 165°C At Any Time:

Shut down the engine.

* * * *

REVERSER INTERLOCK WILL NOT RELEASE, OR REVERSER LEVER RETURNS TO REDUCED THRUST

Affected Reverser .... FWD IDLE

Use unaffected thrust reverser as necessary for deceleration within limits of directional controlability

* * * *

REVERSER ACCUMULATOR LOW LIGHT ON IN FLIGHT

ENG HYD PUMP Switch (Affected System) .... HI

Reverser Accum Shut-Off
CB (S28 or T28) .... PULL FOR 3 SECONDS AND RESET

Note: Pulling CB for not more than 3 seconds should charge accumulator. Accomplish one time only.

IF Light Off and Stays Off for 5 Minutes or Longer With No Decrease of Associated Hydraulic Fluid Quantity:

Continue normal operation.

OR

* * * *

IF Light Comes On Again Within 5 Minutes or Hydraulic Fluid Quantity Decreases:

Continued flight is permissible.

- - - - - AFTER LANDING - - - - -

With nose gear on the runway, apply down elevator and reverse thrust to idle detent. After reverse thrust is verified, gradually increase reverse thrust as required.

Note: If difficulty is experienced maintaining directional control during reverse thrust, reduce reverse thrust as required.

Do not attempt to maintain directional control with asymmetric thrust.

Affected reverser may not extend and hydraulic supply may be subject to quantity loss.

* * * *

START VALVE OPEN LIGHT ON IN FLIGHT

Throttle (Affected Engine)... IDLE

PNEU X-FEED Valve Lever (Affected Engine)......................... CLOSED

PNEU X-FEED Valve Lever (Unaffected Engine).......... AS REQUIRED

AIR CONDITIONING SUPPLY
Switch (Affected Engine).. HP BLEED OFF

AIR CONDITIONING SUPPLY
Switch (Unaffected Engine).. AUTO

IF Airfoil Anti-Ice System Has Two Switches:

Airfoil Anti-Ice Switch (Affected Engine).................................. OFF

START Switch (Affected Engine) .... OFF

Engine Start Valve CBs (U41, U42) .... PULL

WARNING: START VALVE OPEN annunciation inflight could indicate failure of a pneumatic augmentation valve in the open position. (High pressure bleed air can blow the start valve open even though it is commanded closed by the start switch.) “Free wheeling” of the start valve by unregulated high pressure bleed air will cause the start valve to fail in approximately 1 minute and 15 seconds. Uncontained start valve failure (burst) could lead to engine fire (particularly on the right engine) or severe damage.

Note: Continue normal engine operation at Captain’s discretion. Monitor engine parameters (EPR, N1, EGT, N2, oil pressure/temperature, fuel flow, etc.) for indications of an engine fire or severe damage.

With both crossfeeds closed, pneumatic pressure can be verified using air conditioning gauges. For anti-ice capability, open pneumatic crossfeed of unaffected engine as necessary.

* * * *

VOLCANIC ASH PROCEDURES

Airborne weather radar is not designed to detect volcanic dust and can not be relied on for avoidance.

Initial engine indications will be a decrease of N1, N2, EPR, and fuel flow and an increase in EGT. Engine surges and flameout may also occur.

Flight deck indications may appear as smoke/dust and an acrid odor similar to electrical smoke. St. Elmos fire may be visible in the windshields.

During prolonged exposure to ash laden air, use the crew oxygen system at 100%. Manual deployment of passenger oxygen masks is not recommended if the cabin pressure is normal.

Note: This procedure is intended to maximize engine surge protection and to decrease EGT. Lower EGT will minimize accumulation of volcanic material on the turbine vanes.

Depart the area by the shortest route. This may be an immediate descending 180 degree turn. Consider starting the APU to power the electrical system in the event of multiple engine loss.

ENG IGN Switch .... SYS A OR SYS B / GRD START & CONTIN

Autothrottles .... DISENGAGE

Throttles (Terrain Permitting) .... RETARD TO IDLE OR AS LOW AS PRACTICAL

Immediately advise ATC of descent, review driftdown charts if applicable, and determine the MEA.

Airfoil & Engine Anti-Ice .... ON

AIR CONDITIONING SUPPLY Switches .... AUTO

EGT .... MONITOR

Should EGT exceed limits, perform **INFLIGHT ENGINE SHUTDOWN CHECKLIST**, Section 2. Engine may be restarted if needed for safety of flight.

Airspeed and Pitch Attitude .... MONITOR

Airspeed indications may be erratic and unreliable or a complete loss of airspeed may occur. Refer to applicable abnormal procedure.

(Continued)

Restart engines as required using published procedures. If an engine fails to start, repeated attempts should be made immediately. A successful start may not be possible until clear of volcanic ash and within relight envelope. Engines are slow to accelerate at high altitudes. This should not be interpreted as failure to start. Avoid rapid thrust lever movement.

A precautionary landing should be made if damage has occurred to the airplane or abnormal engine operation was observed. Land at the nearest suitable airport.

The abrasive effects of volcanic ash on windshields and landing lights may decrease visibility for approach and landing.

* * * *

CIRCUIT BREAKER GUIDE

This listing is in alphabetical order and uses a letter code for the particular panel a circuit breaker is located on. Use the diagrams at the end of the listing to identify and locate the panels. If you don't find a circuit breaker in the standard location, you will find it in the alternate location.

Note: @ - There is No Row or Column information.
~ - CB is not currently installed in the CAL Fleet.

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
AC 115 Volt 400 Cycle Util Outlet	C	ROW 6	
AC 115 Volt E/E Comp Utility	C	ROW 6	
AC Bus Left ∅A	L	ROW 5	
AC Bus Left ∅A	L	ROW 6	
AC Bus Left ∅B	L	ROW 5	
AC Bus Left ∅B	L	ROW 6	
AC Bus Left ∅C	L	ROW 5	
AC Bus Left ∅C	L	ROW 6	
AC Bus Right ∅A	M	ROW 5	
AC Bus Right ∅A	M	ROW 6	
AC Bus Right ∅B	M	ROW 5	
AC Bus Right ∅B	M	ROW 6	
AC Bus Right ∅C	M	ROW 5	
AC Bus Right ∅C	M	ROW 6	
AC Bus Sensing Left ∅A	L	ROW 7	
AC Bus Sensing Left ∅B	L	ROW 7	
AC Bus Sensing Left ∅C	L	ROW 7	
AC Bus Sensing Right ∅A	M	ROW 7	
AC Bus Sensing Right ∅B	M	ROW 7	
AC Bus Sensing Right ∅C	M	ROW 7	
AC Voltmeter Left	G	@	
AC Voltmeter Right	G	@	
ACARS	E	F-18	D-11 F-11
ACARS	E	G-18	E-11 G-11
ACARS Memory & Clock	O	B-18	B-17
Actr & Apu DP Control	A	@	
ADF-1	E	C-15	C-14
ADF-1	E	E-17	E-18,19,20
ADF-1X	E	F-24	F-26
ADF-2	E	C-06	
ADF-2	E	E-05	E-03,04
ADF-2X	E	D-12	
ADI Radio Capt's	E	C-16	C-15
ADI Radio F/O's	E	C-09	C-07
Aft Cargo, Tail, SP & WW Light	C	ROW 3	
Aft SP Wheel Well & Tail Comp	U	@	

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
AHRS Basic Annunciation	O	C-11	
AHRS Ground Control Relays	E	F-08	
AHRS-1	E	F-15	
AHRS-1	O	B-05	
AHRS-2	E	F-02	
Air Conditioning Auto Shut Off	E	U-28	
Air Conditioning Flow Cont Valve Left	O	C-13	C-12
Air Conditioning Flow Cont Valve Right	O	C-14	C-13
Air Conditioning Reg Valve Ground	E	U-27	
Air Conditioning Regulator Valve Left	O	B-13	B-12
Air Conditioning Regulator Valve Right	O	B-14	B-13
Air Conditioning Turbine Nozzle Cont	E	X-34	
Air Data Computer-1	O	C-01	C-02
Air Data Computer-2	E	F-12	F-07
Air Data Switching Unit	O	C-08	
Airfoil Adv & Press High Caut	E	M-21	
Airfoil Ice Protection Auto	E	N-29	
Airfoil Ice Protection Left Control	E	M-30	
Airfoil Ice Protection Right Control	E	N-30	
Airfoil Ice Protection Tail De-Ice Timer	E	N-31	
Airfone AC -∅A	E	F-23	
Airfone AC -∅B	E	F-24	
Airfone AC -∅C	E	F-25	
Airfone DC	E	G-09	E-23
Airfone Phase ABC	E	F-24	D-22 F-23
Alternate Thunderstorm	E	W-28	
Altimeter Capt's	O	A-03	A-02
Altimeter F/O	E	B-01	
Altitude Alert Capt's	E	G-15	G-11
Altitude Alert F/O	E	G-02	
Altitude Bias Control Left	E	U-24	
Altitude Bias Control Right	E	W-24	
Angle Of Attack Vane Heater Right	E	Z-22	
Angle of Attack Vane Htr Left	E	X-22	
Anti Skid Inboard Power	E	P-40	P-37
Anti Skid Outboard Power	E	R-40	R-37
Anti Skid Test	E	A-12	A-11
Anti Skid Test	E	R-41	R-38
Anti-ice Valve Caution Left	E	S-37	
Anti-ice Valve Caution Right	E	T-37	
Anti-ice Valve Left Engine Left Valve	E	K-31	
Anti-ice Valve Left Engine Right Valve	E	K-32	
Anti-ice Valve Right Engine Left Valve	E	L-31	
Anti-ice Valve Right Engine Right Valve	E	L-32	
Anticollison Lower	E	K-11	
Anticollison Upper	E	L-11	
Approach Idle Control	E	S-40	S-38
APU AC Voltmeter	F	@	

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
APU Control	O	B-21	B-20
APU Door Control	E	U-39	
APU Exhaust Temp	O	B-19	B-18
APU Fire Control Aural Warning	E	W-33	
APU Fire Warning Horn	E	W-34	
APU Generator Control	E	U-36	
APU Oil Press & Temp Caut	E	X-35	
APU Power ∅A	A	@	
APU Power ∅B	A	@	
APU Power ∅C	A	@	
APU Start Advisory	O	B-19	
APU Starter	B	@	
ART Inop Warning Light	E	U-32	
ART Solenoid & Cont Eng Left	E	X-32	
ART Solenoid & Cont Eng Right	E	Z-32	
ART Status Lights	E	W-32	
ATC-1 / Mode S #1	E	D-13	D-12,15,17
ATC-1 / Fail Annunciator	E	E-13	E-12,15,17
ATC-1	O	B-07	
ATC-2 / Mode S #2	E	D-01	D-02
ATC-2 / Antenna Switch	E	E-01	E-02
ATC-2	O	A-09	
Auto Brake Annunciator	E	R-30	
Auto Brake System	E	P-30	
Auto Pilot & Alternate Long Trim ∅A	E	D-09	D-04,08,10
Auto Pilot & Alternate Long Trim ∅B	E	D-10	D-05,09,11
Auto Pilot & Alternate Long Trim ∅C	E	D-11	D-06,10,12
Auto Throttle-1	E	D-18	D-14,19,20,21
Auto Throttle-1	E	E-18	E-14,19,20,21
Auto Throttle-2	E	D-06	D-05,07
Auto Throttle-2	E	E-06	E-05,07
Autoland Light Retract	E	M-35	M-32,34
Autopilot-1	E	E-24	E-17,18,19
Autopilot-2	E	E-12	E-06,09,11
Aux Hyd Pump Control Right	E	H-17	H-24
Aux Hyd Pump Right ∅A ∅B ∅C	L	ROW 8	
Aux Vertical Gyro	O	C-01	C-02
Auxiliary Vertical Gyro	E	F-01	F-08
Ballast Cabin Lights	W	@	
Ballast Cabin Lights	W	@	
Battery Ammeter	B	@	
Battery Charger ∅A ∅B ∅C	C	ROW 2	
Battery Direct Bus Feed	B	@	
Battery Relay	O	C-17	C-16
Bleed Air Filter	E	U-25	
Brake Temp Indicator	E	P-25	
Cabin Lights Lower	W	@	

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
Cabin Lights Lower	W	@	
Cabin Lights Upper	W	@	
Cabin Lights Upper	W	@	
Cabin Low Pressure Warning	E	W-21	
Cabin Oxygen Advisory	E	U-30	
Cabin Pressure Chime	E	P-23	P-26
Cabin Pressure Control-1	E	H-02	
Cabin Pressure Control-1	E	U-22	
Cabin Pressure Control-2	E	J-02	
Cabin Pressure Control-2	E	W-22	
Cabin Standby Lights	O	A-13	A-12
Cabin Temp	E	W-27	
CADC Switched Light	E	G-17	
Call System / Lavatory Smoke Detector	E	P-37	P-38
Capt & F/O White Flood Lt	O	A-15	A-14
Capt's RMI	O	~	
Captain's Compass Both on 1	E	C-05	C-08
Captains Inst Panel	E	K-15	
Cargo Compartment Heater ∅A	E	J-12	
Cargo Compartment Heater ∅B	E	J-13	
Cargo Compartment Heater ∅C	E	J-14	
Cargo Compartment Heater Fan ∅A	E	H-12	
Cargo Compartment Heater Fan ∅B	E	H-13	
Cargo Compartment Heater Fan ∅C	E	H-14	
Cargo Lights Aft	U	@	
Cargo Lights Fwd	U	@	
CAWS Fail Ann	E	R-37	R-40
CAWS Overspeed Eng Fire Hor Stab	E	U-31	
CAWS SSRS-1 Landing Gear	E	P-38	P-40
CAWS SSRS-2 Altitude Alert	E	R-38	R-41
Charger & Transfer Bus Grd Interlock	C	ROW 1	
Charger & Transfer Relay	O	C-16	C-15
Charger & Transfer Relay Control	E	N-38	
Cockpit Door Unlock	E	P-24	
Cockpit Over Head White Flood	E	M-33	M-31
Cockpit Sterile Light	E	M-34	
Cockpit White Flood Lights	E	Z-39	
Comparator Monitor-1	E	D-19	D-12,13,14
Comparator Monitor-1	E	E-19	E-12,13,14
Comparator Monitor-2	E	D-07	D-06,08
Comparator Monitor-2	E	E-07	E-06,08
Compass Both On 2 F/O's	O	B-02	B-03
Compass Captain's	E	F-08	F-06
Compass Double Pointer	E	B-09	B-08
Compass F/O's	O	B-06	B-05
Compass Servo Ampl Capt	E	F-07	F-05
Compass Servo Ampl F/O's	O	B-07	B-06

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
Compass Single Pointer	O	A-07	A-06
Compass Switching	O	A-09	A-07,10,11
Course & Heading F/O's	E	B-04	
Cowl Anti-ice Valve Left	E	K-30	
Cowl Anti-ice Valve Right	E	L-30	
CSD Disc Left	E	T-26	
CSD Disc Right	E	S-26	
CSD Oil Press Low Caut Left	E	S-24	
CSD Oil Press Low Caut Right	E	T-24	
CSD Oil Temp Left	E	S-25	
CSD Oil Temp Right	E	T-25	
DC Bus Cross Tie Control	O	B-11	B-10
DC Bus Off Caution	E	X-36	
DC Bus Off Sensing	E	R-23	
DC Tranfer Bus Out Light	O	C-20	C-19
DC Transfer Bus Feed (Battery)	B	@	
DC Transfer Bus Feed	E	N-36	
DC Transfer Bus Sensing	E	X-37	
DC Voltmeter Left	E	P-22	
DC Voltmeter Right	E	R-22	
Dead Bus & Ac Bus Warning Left	E	X-40	
Dead Bus & AC Bus Warning Right	E	X-39	
DFGS Auto Pilot & Auto Throt. Off Lights	E	W-31	
DFGS Auto Pilot & Auto Throt. Off Lights	E	Z-31	
DFGS Light Control	E	L-16	
Digital Aids Recorder & MCU	E	F-14	
Digital Display Captain	E	M-32	M-30
Digital Display Center	E	N-32	N-30
Digital Display F/O's	E	N-33	N-31
Digital Display Warning Light & Test	E	N-34	N-32
Digital FGS Alpha-1	E	C-12	C-11
Digital FGS Alpha-2	E	C-03	
Digital FGS Flap Position-1	E	C-13	C-12
Digital FGS Flap Position-2	E	C-04	
Digital FGS Switch A	E	C-17	C-16
Digital FGS Switch B	E	C-18	C-17
Digital FGS Switch C	E	C-19	C-18
Digital FGS-1	E	C-01	
Digital FGS-1	E	C-10	C-09
Digital FGS-1	E	D-20	D-13,14,15
Digital FGS-1	E	E-09	E-08,10
Digital FGS-1	E	E-20	E-13,14,15
Digital FGS-2	E	C-02	
Digital FGS-2	E	C-11	C-10
Digital FGS-2	E	D-08	D-07,09
Digital FGS-2	E	E-08	E-07,09
Digital FGS-2	E	E-21	E-14,15,16
DME-1	E	D-14	D-15,16

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
DME-2	E	D-02	D-01
Door Warning	E	R-24	
Drain Mast Heater Aft	E	Z-27	
Drain Mast Heater Fwd	E	X-27	
Drain Valve Power	C	ROW 4	
Electronic Clock	E	~	
Electronic Clock Battery	O	~	
Elevator Power On Advisory	E	P-27	
Emergency AC Bus Feed	E	K-07	
Emergency AC Bus Feed Alternate	E	L-08	
Emergency AC Bus Out Light	O	C-21	C-20
Emergency AC Bus Sensing	O	C-07	C-06
Emergency Bus Warning Lt Prot. Relay	E	Z-40	
Emergency DC Bus Feed	E	N-37	
Emergency DC Bus Out Light	O	C-19	C-18
Emergency DC Bus Sensing	O	B-12	B-11
Emergency Inverter	O	C-18	C-17
Emergency Lights Charging	E	Z-37	
Emergency Lt Arm & Charge	O	A-14	A-13
Emergency Nav Inst Transformer	O	C-04	C-03
Emergency Power In Use Light	O	A-12	A-11
Engine Exhaust Temp Left	O	B-15	B-14
Engine Exhaust Temp Right	O	C-15	C-14
Engine Ignition Left	E	K-26	
Engine Ignition Right	E	L-26	
Engine oil pressure left	E	A-10	A-09
Engine oil pressure right	E	A-01	
Engine Start Pump	E	U-40	
Engine Start Valve Left	E	U-42	
Engine Start Valve Left & Right	E	U-42	
Engine Start Valve Right	E	U-41	
Engine Sync	E	T-40	T-38
Engine Vibration Monitor	E	T-39	
Entrance Stair Control Fwd	E	Z-36	
Entrance Stair Control Fwd	O	A-16	A-15
External Power Cart	P	@	
External Power Control ∅A	A	@	
External Power Control ∅B	A	@	
External Power Control ∅C	A	@	
External Power Indicator	P	@	
External Power ∅A	A	@	
External Power ∅A	P	@	
External Power ∅A	P	@	
External Power ∅B	A	@	
External Power ∅B	P	@	
External Power ∅B	P	@	
External Power ∅C	A	@	

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
External Power ∅C	P	@	
External Power ∅C	P	@	
External Power Relays	E	X-38	
External Power Relays	P	@	
F G Status & Maintenance Panel	E	G-25	G-19
F/Mid Cargo, Tail, SP, & WW Light	C	ROW 3	
F/O's RMI	O	A-06	B-02
Fasten Seat Belt	X	@	
Fasten Seat Belt	Y	@	
Fill Drain Valve Control	E	Z-33	
Fill/Vent Valve Power	C	ROW 5	
Fire Detectors Left Engine Loop A	E	W-39	
Fire Detectors Left Engine Loop B	E	W-40	
Fire Detectors Right Engine Loop A	E	W-37	
Fire Detectors Right Engine Loop B	E	W-38	
Fire Detectors APU Loop A	E	W-35	
Fire Detectors APU Loop B	E	W-36	
Fire Extinguisher Agent Low Press Caut	E	R-26	T-41
Fire Extinguisher Control Bottle 1	E	X-41	
Fire Extinguisher Control Bottle 2	E	X-42	
Fire Warning Aural	E	W-41	
Fire Warning Lights	E	W-42	
Flap Position Left	E	A-11	A-10
Flap Position Right	E	A-02	
Flight Interphone-1	O	A-10	A-09
Flight Interphone-2	E	T-42	
Flight Recorder	E	B-07	
Flight Recorder	E	C-14	C-13
Flight Recorder	E	F-21	F-14
Flight Recorder	E	G-21	G-14
Floor & Circuit Breaker Panel Lights	A	@	
Fuel Boost Pump Aft Left ∅A	E	H-23	H-21
Fuel Boost Pump Aft Left ∅B	E	H-23	H-22
Fuel Boost Pump Aft Left ∅C	E	H-23	
Fuel Boost Pump Aft Right ∅A	E	J-19	J-15
Fuel Boost Pump Aft Right ∅B	E	J-19	J-16
Fuel Boost Pump Aft Right ∅C	E	J-19	J-17
Fuel Boost Pump Center Aft ∅A	E	J-21	J-18
Fuel Boost Pump Center Aft ∅B	E	J-21	J-19
Fuel Boost Pump Center Aft ∅C	E	J-21	J-20
Fuel Boost Pump Center Fwd ∅A	E	H-21	H-18
Fuel Boost Pump Center Fwd ∅B	E	H-21	H-19
Fuel Boost Pump Center Fwd ∅C	E	H-21	H-20
Fuel Boost Pump Fwd Left ∅A	E	J-23	J-21
Fuel Boost Pump Fwd Left ∅B	E	J-23	J-22
Fuel Boost Pump Fwd Left ∅C	E	J-23	
Fuel Boost Pump Fwd Right ∅A	E	H-19	H-15

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
Fuel Boost Pump Fwd Right ∅B	E	H-19	H-16
Fuel Boost Pump Fwd Right ∅C	E	H-19	H-17
Fuel Filter Pressure Drop Caution Left	E	S-35	
Fuel Filter Pressure Drop Caution Right	E	T-35	
Fuel Flow Left	E	K-27	
Fuel Flow Right	E	L-27	
Fuel Heat Control Left	E	K-28	
Fuel Heat Control Right	E	L-28	
Fuel Heat On Advisory Left	E	S-36	
Fuel Heat On Advisory Right	E	T-36	
Fuel Heat Timer Left	E	K-29	
Fuel Heat Timer Right	E	L-29	
Fuel Pump Pressure Low Fwd & Aft Aux	E	S-42	
Fuel Qty Power Transfer	E	J-17	J-24
Fuel Temp Left	E	S-34	
Fuel Temp Right	E	T-34	
Fuel Tranfer A Control Aux Tank	E	S-38	
Fuel Tranfer B Control Aux Tank	E	T-38	
Fuel Transfer Pump A Aft Aux	E	J-25	
Fuel Transfer Pump A Fwd Aux	E	H-25	
Fuel Transfer Pump B Aft Aux	E	H-27	
Fuel Transfer Pump B Fwd Aux	E	J-27	
Fwd Pass Entrance Stair Light	C	ROW 2	
Fwd Service Panel & Mid Cargo	U	@	
Galley Area Work Lights	C	ROW 3	
Galley Control	E	L-04	
Galley Drain Mast Heater Aft	E	N-27	
Galley Drain Mast Heater Fwd	E	M-27	
Galley-1 Power ∅A	L	ROW 1	
Galley-1 Power ∅B	L	ROW 1	
Galley-1 Power ∅C	L	ROW 1	
Galley-2 Power ∅A	M	ROW 1	
Galley-2 Power ∅B	M	ROW 1	
Galley-2 Power ∅C	M	ROW 1	
Galley-3 Power ∅A	M	ROW 2	
Galley-3 Power ∅B	M	ROW 2	
Galley-3 Power ∅C	M	ROW 2	
Galley-4 Power ∅A	L	ROW 2	
Galley-4 Power ∅B	L	ROW 2	
Galley-4 Power ∅C	L	ROW 2	
Generator Control Left	E	U-38	
Generator Control Right	E	U-37	
Glareshield Panels Lights	R	@	
Glide Slope-1	O	B-10	B-09
Glide Slope-2	E	G-03	
Ground Control Relay Left	E	K-33	
Ground Control Relay Right	E	L-33	

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
Ground Flood Light Left	C	ROW 1	
Ground Flood Light Right	C	ROW 1	
Ground Prox Warning Computer	E	F-20	F-13
Ground Prox Warning Lights	E	G-20	G-13
Ground Refueling	E	Z-38	
Ground Refueling	O	B-16	B-15
Ground Service Bus Control	E	L-05	
Ground Service Bus Power ∅A	M	ROW 4	
Ground Service Bus Power ∅B	M	ROW 4	
Ground Service Bus Power ∅C	M	ROW 4	
Heads Up Display	E	~	
Heads Up Display	E	~	
Heat Exchanger Cooling Fan Control Left	E	H-11	
Heat Exchanger Cooling Fan Control Right	E	J-11	
Heat Exchanger Cooling Fan Left ∅A	L	ROW 3	
Heat Exchanger Cooling Fan Left ∅B	L	ROW 3	
Heat Exchanger Cooling Fan Left ∅C	L	ROW 3	
Heat Exchanger Cooling Fan Right ∅A	M	ROW 3	
Heat Exchanger Cooling Fan Right ∅B	M	ROW 3	
Heat Exchanger Cooling Fan Right ∅C	M	ROW 3	
HF Comm-1	E	E-15	E-16,17,18
HF Comm-1 ∅A	E	D-15	D-16,17,18
HF Comm-1 ∅B	E	D-16	D-17,18,19
HF Comm-1 ∅C	E	D-17	D-18,19,20
HF Comm-2	E	E-03	E-05
HF Comm-2 ∅A	E	D-03	
HF Comm-2 ∅B	E	D-04	
HF Comm-2 ∅C	E	D-05	
Horizon Display Capt's	O	B-03	B-02
Horizon Display F/O's	E	C-07	C-05,08
HSI & Heading Capt's	O	A-01	
Hyd Brake Pressure Left	E	B-11	B-10
Hyd Brake Pressure Right	E	A-04	
Hyd Oil Quantity Left	E	B-12	B-11
Hyd Oil Quantity Right	E	A-05	
Hyd Power Transfer Unit Control	E	R-27	
Hyd Pressure Low Caut Left	E	P-28	
Hyd Pressure Low Caut Right	E	R-28	
Hyd Pump Control Left	E	S-27	
Hyd Pump Control Right	E	T-27	
Hyd System Pressure Left	E	B-10	B-09
Hyd System Pressure Right	E	A-03	
Hyd Temp High Caut Left	E	P-29	
Hyd Temp High Caut Right	E	R-29	
Ice Protection Aug Valve Left	E	M-23	
Ice Protection Aug Valve Right	E	N-23	

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
Inlet Fuel Press Low Caut Left	E	S-33	
Inlet Fuel Press Low Caut Right	E	T-33	
Inst Cooling Fan	E	H-08	
Inst Panel Fluorescent	E	L-18	
Inst Panel Lights Capt	S	@	
Inst Panel Lights Capt	S	@	
Inst Panel Lights Captain	S	@	
Inst Panel Lights Center	E	K-18	
Inst Panel Lights Center	S	@	
Inst Panel Lights Center	S	@	
Inst Panel Lights Center	S	@	
Inst Panel Lights F/O	E	L-17	
Inst Panel Lights F/O	R	@	
Inst Panel Lights F/O	R	@	
Inst Panel Lights F/O	R	@	
Inst Panel Lights Pedestal	S	@	
Inst Panel Lights Pedestal	S	@	
Inst Vibrator	E	P-31	
Inst XFMR Left	E	K-09	
Inst XFMR Right	E	L-09	
Landing Gear Warning	E	P-26	S-42
Lav Mirror Lights Fwd Left	C	ROW 4	
Lav Mirror Lights Left Aft	C	ROW 6	
Lav Water Heater Aft Left	E	X-28	
Lav Water Heater Aft Right	E	Z-28	
Lav Water Heater Fwd Left	E	X-29	
Lavatory mirror light aft right	C	ROW 5	
Logo Lights Left	E	K-24	
Logo Lights Right	E	L-24	
Mach Speed Indicator Capt's	O	A-05	A-04
Mach Speed Indicator F/O	E	B-03	
Mach Trim Inop Yaw Damper Off	E	U-33	
Mach Trim Override	E	X-33	
Mach Trim-1	E	G-26	G-20
Mach Trim-2	E	G-12	E-01
Map & Briefcase Light	E	W-29	
Marker Beacon	E	G-06	
Master Caution	E	Z-42	
Master Warning	E	Z-41	
Misc Aft Lt	Z	@	
Misc Cabin & Lav Lights Fwd	C	ROW 6	
Misc Cabin & Lav QCC Lt Aft	C	ROW 6	
Misc Fwd Cabin Lights	W	@	
Misc Fwd Cabin Lights	W	@	
Nav Inst Tranformer-1	E	F-16	F-10
Nav Inst Transformer-2	E	F-13	F-02,08
Nav Switching	O	C-08	C-10
No Smoking	X	@	

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
No Smoking	Y	@	
Nose Gear Landing & Taxi Lt Left	E	K-14	
Nose Gear Landing & Taxi Lt Right	E	L-14	
Oil Pressure Low Caut Left	E	U-35	
Oil Pressure Low Caut Right	E	U-34	
Oil Quantity Left	E	S-21	
Oil Quantity Right	E	T-21	
Oil Strainer Clog Caut Left	E	S-23	
Oil Strainer Clog Caut Right	E	T-23	
Oil Temp Left	E	S-22	
Oil Temp Right	E	T-22	
Omega - 1	O	A-02	
Omega Nav	E	F-11	F-20,25
Omega Nav Transfer	O	C-09	C-10
Omega-2	E	B-08	
Omega-2	E	F-11	
Overhead Panel Aft Lights	E	H-29	
Overhead Panel Aft Lights	E	H-30	
Overhead Panel Aft Lights	E	J-29	
Overhead Panel Aft Lights	E	K-17	
Overhead Panel Fwd Lights	E	J-30	
Overhead Panel Fwd Lights	E	J-31	
Overhead Panel Fwd Lights	E	J-32	
Overhead Panel Fwd Lights	E	K-16	
Parking Brake Control	E	M-36	
Passenger Address	E	F-22	F-15
Passenger Address	O	A-08	
Passenger Music	E	F-19	F-12
Passenger Music	E	G-19	G-12
Passenger Oxygen Control	E	P-32	P-39
Passenger Oxygen Control Alternate	E	R-32	R-39
Passenger Oxygen Release	E	K-34	
Passenger Oxygen Release Alternate	E	L-34	
Passenger Reading Aft	E	K-22	
Passenger Reading Cabin Light	W	@	
Passenger Reading Cabin Light	W	@	
Passenger Reading Cabin Light	W	@	
Passenger Reading Cabin Light	W	@	
Passenger Reading Cabin Light	W	@	
Passenger Reading Cabin Light	W	@	
Passenger Reading Center	E	K-21	
Passenger Reading Fwd	E	K-20	
Passenger Warning Signs	E	K-23	
Passenger Warning Signs	E	W-30	
Pedestal Lights	E	K-19	
Performance Management System	E	F-10	
Performance Mgt Lights	E	G-10	
Performance Mgt Sys Data Loader	E	F-09	

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
Pitot Heater Advisory	E	M-29	
Pitot Heater Aux	E	M-28	
Pitot Heater Captain's	O	C-12	C-11
Pitot Heater F/O	E	N-28	
Pneu Pressure	O	B-01	
Position Lights	C	ROW 2	
Potable Water Heater	P	@	
Potable Water Heater	P	@	
Pressure Ratio Left	E	K-25	
Pressure Ratio Right	E	L-25	
Primary Long Trim Brake	E	G-23	G-16
Primary Long Trim Control	E	G-22	G-15
Primary Long Trim ∅A	L	ROW 4	
Primary Long Trim ∅B	L	ROW 4	
Primary Long Trim ∅C	L	ROW 4	
Proximity Switch Control Left	E	P-39	P-32
Proximity Switch Control Right	E	R-39	R-32
RA/VSI #1 - TCAS	O	C-02	
RA/VSI #2 - TCAS	E	D-12	F-10
Radio Altimeter-1	E	F-17	F-11
Radio Altimeter-2	E	F-03	
Radio DC Bus Feed Left	E	P-21	
Radio DC Bus Feed Right	E	R-21	
Radio Rack Fan Caution	E	U-29	
Radio Rack Fan ∅A	E	H-04	
Radio Rack Fan ∅B	E	H-05	
Radio Rack Fan ∅C	E	H-06	
Radio Rack Fan Standby ∅A	E	J-04	
Radio Rack Fan Standby ∅B	E	J-05	
Radio Rack Fan Standby ∅C	E	J-06	
Radio Rack Fan Venturi	E	H-03	
Rain Repellant Left	E	M-26	
Rain Repellant Right	E	N-26	
Ram Air Exhaust Control Actuator	E	H-09	
Ram Air Temp & Probe Heater	E	Z-29	
Ram Air Valve	E	J-03	
Razor Outlet	W	@	
Razor Outlet Fwd	E	L-06	
Razor Outlet Left	Z	@	
Razor Outlet Right	Z	@	
Razor Outlets Aft	E	L-07	
Razor Outlets Fwd & Aft	E	L-06	
Reading Lights Left	Y	@	
Reading Lights Left	Y	@	
Reading Lights Left	Y	@	
Reading Lights Left	Z	@	
Reading Lights Left	Z	@	

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
Reading Lights Right	Y	@	
Reading Lights Right	Y	@	
Reading Lights Right	Y	@	
Reading Lights Right	Z	@	
Reading Lights Right	Z	@	
Reading Lights Right	Z	@	
Recirculating Fan Control	E	J-07	
Recirculating Fan ∅A	E	J-08	
Recirculating Fan ∅B	E	J-09	
Recirculating Fan ∅C	E	J-10	
Reverse Thrust Advisory Left	E	S-31	
Reverse Thrust Advisory Right	E	T-31	
Reverser Accum Low Caut Left	E	S-29	
Reverser Accum Low Caut Right	E	T-29	
Reverser Accum Shut Off Left	E	S-28	
Reverser Accum Shut Off Right	E	T-28	
Reverser Unlock Advisory Left	E	S-30	
Reverser Unlock Advisory Right	E	T-30	
Rudder Control Manual Advisory	E	R-33	
Rudder Q Limiter Heater	E	Z-30	
Rudder Travel Unrestricted Advisory	E	W-25	
Selcal-1	E	G-14	G-10
Selcal-2	E	G-01	
Service Interphone	E	G-08	G-07
Sidewall Light Control Lower	C	ROW 2	
Sidewall Light Control Upper	C	ROW 1	
Sidewall Lights Lower Left	C	ROW 2	
Sidewall Lights Lower Right	C	ROW 2	
Sidewall Lights Upper Left	C	ROW 1	
Sidewall Lights Upper Right	C	ROW 1	
Slat Extend Failure Advisory	E	R-36	
Smoke Det PNLS	E	S-42	T-41
SMOKE A LOOP	E	T-41	T-40
SMOKE B LOOP	E	S-41	S-40
Spare Ann Lights Test	E	N-35	N-33
Spoiler Control	E	P-33	P-30
Spoiler Control	E	X-30	
Spoiler Deployed Indicator	E	R-31	
Spoiler Flap Extend Advisory	E	P-34	P-35
Stab Motion Indicator	E	G-24	G-18
Stair Carriage Motor-1	E	Z-34	
Stair Carriage Motor-1	O	A-17	A-16
Stair Carriage Motor-2	E	Z-35	
Stair Carriage Motor-2	O	A-18	A-17
Stall Warning & Auto Slat-1	E	P-35	P-34
Stall Warning & Auto Slat-2	E	R-35	R-34
Stall Warning Alpha Flap-1	E	A-13	A-12
Stall Warning Alpha Flap-2	E	A-09	A-08

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
Stall Warning Captain	E	X-23	
Stall Warning F/O's	E	Z-23	
Stall Warning Failure Advisory	E	P-36	
Standby Control	E	H-07	
Standby Horizon Indicator	E	X-31	
Standby Horizon Light Control	E	E-16	E-19 G-22
Start Valve Open Advsy Left	E	S-32	
Start Valve Open Advsy Right	E	T-32	
Static Port Heater Left	E	X-21	
Static Port Heater Right	E	Z-21	
Strobe	E	K-10	
Supply Air High Press Aug Valve Left	E	U-23	
Supply Air High Press Aug Valve Right	E	W-23	
Supply Air Press Reg Valve	E	N-21	
Supply Air Pressure Left	E	B-14	B-13
Supply Air Pressure Right	E	A-07	
Supply Air Temp & Press High Left	E	M-22	
Supply Air Temp & Press High Right	E	N-22	
Supply Air Temp High Caut Left	E	U-26	
Supply Air Temp High Caut Right	E	W-26	
Tail Compt Temp High Warning	E	N-24	
TAS & Static Air Temp	E	B-06	
Taxi Speed	E	R-34	R-35
TCAS Processor - Main Power	E	D-21	
TCAS Mode S #1	E	D-13	D-12,15,17
TCAS Mode S #2	E	D-1	D-02
TCAS RA/VSI #1	O	C-02	
TCAS RA/VSI #2	E	D-12	F-11
TCAS ATC Antenna Switch	E	E-01	E-02
TCAS ATC Fail Annunciator	E	E-13	E-12,15,17
Temp Control Cabin	E	J-01	
Temp Control Cabin Manual	O	C-06	C-05
Temp Control Cockpit	E	H-01	
Temp Control Cockpit Manual	O	C-05	C-04
Temp Control Valve Posn Left	E	B-13	B-12
Temp Control Valve Posn Right	E	A-06	
Toilet Flushing Aft Left ∅A	C	ROW 4	
Toilet Flushing Aft Left ∅B	C	ROW 5	
Toilet Flushing Aft Left ∅C	C	ROW 6	
Toilet Flushing Aft Right ∅A	C	ROW 4	
Toilet Flushing Aft Right ∅B	C	ROW 5	
Toilet Flushing Aft Right ∅C	C	ROW 6	
Toilet Flushing Fwd Left ∅A	C	ROW 4	
Toilet Flushing Fwd Left ∅B	C	ROW 5	
Toilet Flushing Fwd Left ∅C	C	ROW 6	
Transformer Rectifier Power ∅A	C	ROW 1	
Transformer Rectifier Power ∅B	C	ROW 2	

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
Transformer Rectifier Power ∅C	C	ROW 3	
Transformer Rectifier-1 Left ∅A	E	K-01	
Transformer Rectifier-1 Left ∅B	E	K-02	
Transformer Rectifier-1 Left ∅C	E	K-03	
Transformer Rectifier-1 Right ∅A	E	L-01	
Transformer Rectifier-1 Right ∅B	E	L-02	
Transformer Rectifier-1 Right ∅C	E	L-03	
Transformer Rectifier-2 Left ∅A	E	K-04	
Transformer Rectifier-2 Left ∅B	E	K-05	
Transformer Rectifier-2 Left ∅C	E	K-06	
Vertical Gyro 1	E	F-15	F-16
Vertical Gyro Switching	O	C-09	C-11
Vertical Gyro-1	O	B-05	B-04
Vertical Gyro-2	E	F-02	F-01
Vertical Speed Indicator Capt's	O	A-06	A-05
Vertical Speed Indicator F/O	E	B-02	
VHF Comm-1	O	B-08	B-07
VHF COMM-2	E	G-05	
VHF Nav Comm-3	E	G-16	G-22,23
VHF Nav-1	O	A-04	A-03
VHF Nav-1	O	B-09	B-08
VHF Nav-2	E	B-05	
VHF Nav-2	E	G-07	G-04
Voice Recorder Cockpit	E	F-06	F-04
Volt/Ammeter	B	@	
Warning Light Dimming	E	R-25	
Water Quantity	C	ROW 4	
Water System Freeze Protection Aft	C	ROW 5	
Water System Freeze Protection Aft	V	@	
Water System Freeze Protection Fwd	C	ROW 4	
Water System Freeze Protection Fwd	V	@	
Weather Radar Indicator	E	F-04	D-03
Weather Radar Transceiver	E	F-05	D-04 E-03
Wheel Well & Fwd Access Compt Light	A	@	
Wheel Well Overheat	E	U-21	
Wheel Well Serv Lt & Util Out	C	ROW 3	
Window Anti-fog Capt F/O & Ctr	E	X-26	
Window Anti-Fog Clearview & Eyebrow	E	Z-26	
Window Anti-fog Control	E	Z-25	
Windshear Annunciator	E	E-4	
Windshield Anti-ice Center	E	X-25	
Windshield Anti-ice Left	E	X-24	
Windshield Anti-Ice Right	E	Z-24	
Windshield Wiper Left	E	M-25	
Windshield Wiper Right	E	N-25	
Wing & Nacelle Flood Lights	C	ROW 3	

CIRCUIT BREAKER	PANEL	STANDARD	ALTERNATE
Wing & Tail Valves	E	M-24	
Wing Landing Left	E	K-12	
Wing Landing Lt Cont Left	E	K-13	
Wing Landing Lt Cont Right	E	L-13	
Wing Landing Right	E	L-12	
Yaw Damper-1	E	G-27	G-21
Yaw Damper-2	E	G-13	E-04,05,06

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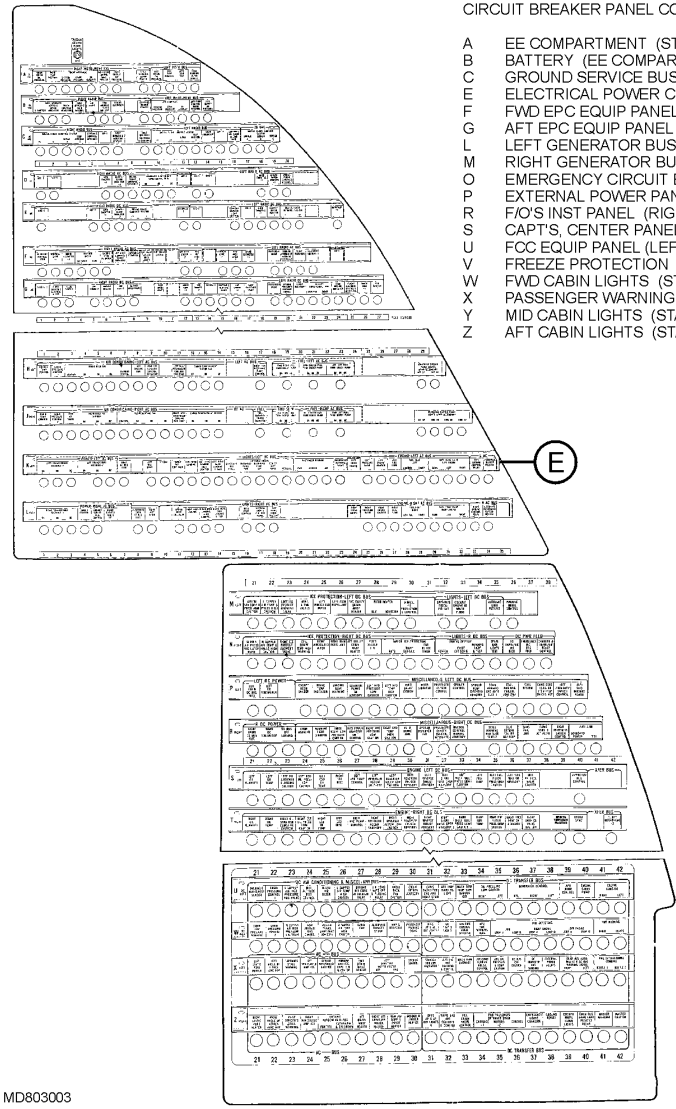
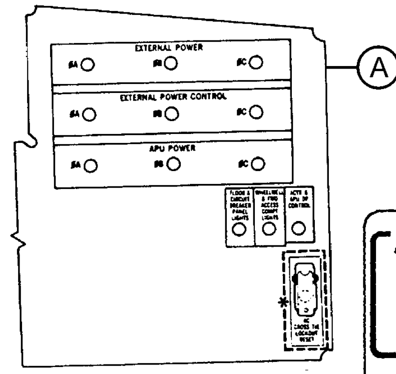
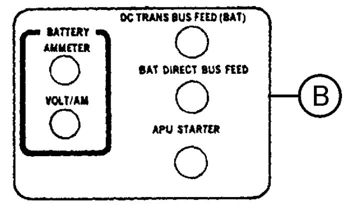
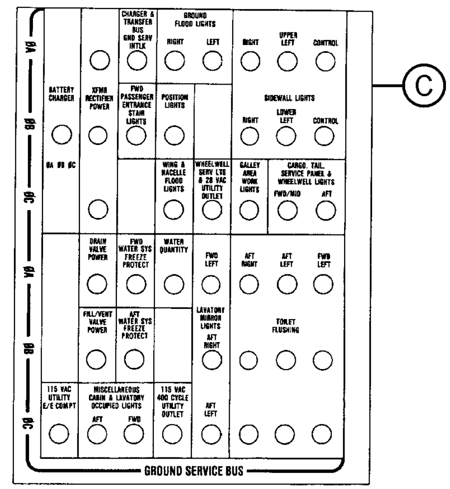
CIRCUIT BREAKER PANEL CODE, NAME AND LOCATION

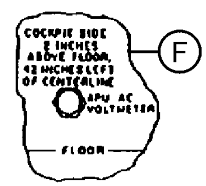
A EE COMPARTMENT (STA-154 UPPER LEFT)
B BATTERY (EE COMPARTMENT STA-134)
C GROUND SERVICE BUS (LEFT CONSOLE)
E ELECTRICAL POWER CENTER (BEHIND CAPTAIN'S SEAT)
F FWD EPC EQUIP PANEL (BEHIND EPC CO PANEL, LOW)
G AFT EPC EQUIP PANEL (CABIN SIDE EPC EQUIP PANEL, LOW)
L LEFT GENERATOR BUS (EPC)
M RIGHT GENERATOR BUS (EPC)
O EMERGENCY CIRCUIT BREAKER PANEL (OVERHEAD)
P EXTERNAL POWER PANEL (STA-100 LEFT SIDE)
R F/O'S INST PANEL (RIGHT FWD CONSOLE)
S CAPT'S, CENTER PANEL & PEDESTAL (L FWD CONSOLE)
U FCC EQUIP PANEL (LEFT TUNNEL STA-400)
V FREEZE PROTECTION (NOSE WHEEL WELL STA-95)
W FWD CABIN LIGHTS (STA 222 CENTER CEILING)
X PASSENGER WARNING SIGNS (STA 253 RIGHT CEILING)
Y MID CABIN LIGHTS (STA 886 RIGHT CEILING)
Z AFT CABIN LIGHTS (STA 1320 LEFT LAV CEILING)











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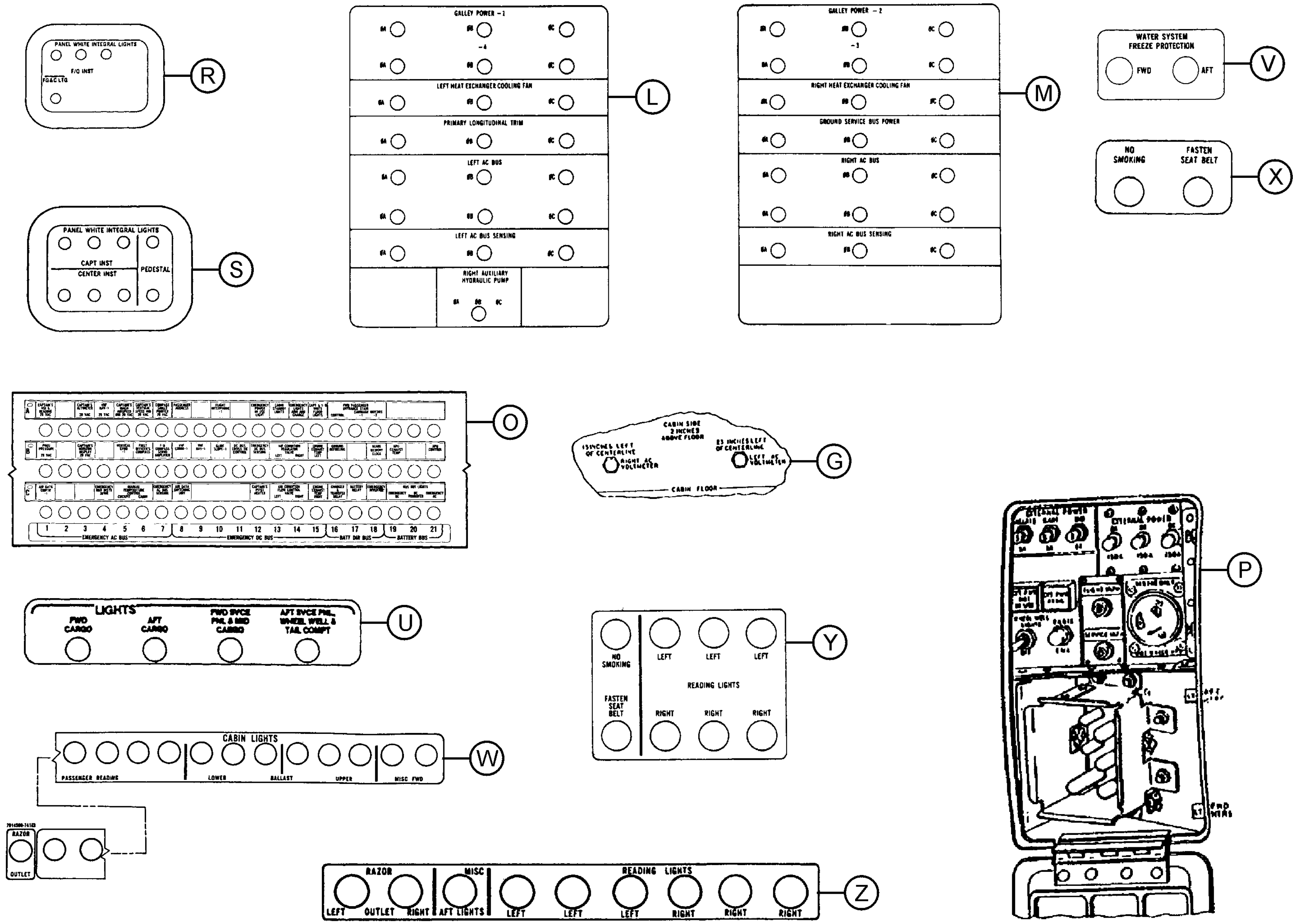
R
PANEL WHITE INTEGRAL LIGHTS
F/O INST
S
PANEL WHITE INTEGRAL LIGHTS
CAPT INST
CENTER INST
PEDESTAL
L
GALLEY POWER – 1
LEFT HEAT EXCHANGER COOLING FAN
PRIMARY LONGITUDINAL TRIM
LEFT AC BUS
LEFT AC BUS SENSING
RIGHT AUXILIARY HYDRAULIC PUMP
M
GALLEY POWER – 2
RIGHT HEAT EXCHANGER COOLING FAN
GROUND SERVICE BUS POWER
RIGHT AC BUS
RIGHT AC BUS SENSING
V
WATER SYSTEM FREEZE PROTECTION
FWD
AFT
X
NO SMOKING
FASTEN SEAT BELT
O
EMERGENCY AC BUS
EMERGENCY DC BUS
BATT DIR BUS
BATTERY BUS
G
CABIN SIDE 2 INCHES ABOVE FLOOR
RIGHT AC VOLTMETER
LEFT AC VOLTMETER
CABIN FLOOR
P
U
LIGHTS
FWD CARGO
AFT CARGO
FWD SVCE PNL & MID CARGO
AFT SVCE PNL, WHEEL WELL & TAIL COMPT
Y
NO SMOKING
FASTEN SEAT BELT
LEFT
READING LIGHTS
RIGHT
W
CABIN LIGHTS
PASSENGER READING
LOWER
BALLAST
UPPER
MISC FWD
RAZOR
OUTLET
Z
RAZOR
MISC
READING LIGHTS
LEFT
OUTLET
RIGHT
AFT LIGHTS

MD803004

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NORMAL PROCEDURES

TABLE OF CONTENTS

ADVERSE WEATHER

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STANDARD CALLOUTS

The following chart identifies the standard callouts required during flight, both instrument (IMC) and visual (VMC). Altitude callouts above 100 feet AGL are made with reference to the barometric altimeters. Callouts at or below 100 feet AGL are made with reference to radar altimeters. During the final approach segment, the PM will monitor the instruments and call out significant deviations from the intended target airspeed, approach course, glideslope, and sink rate. The PM will also monitor instruments for warning flags and call out any flag in view. If the designated crewmember is distracted at the time a standard callout is required, the other pilot will make the call.

Note: For specific calls relating to flight guidance, see the applicable procedure.

<table>
<tr><th colspan="2">CONDITION/LOCATION</th><th>CALLOUT</th></tr>
<tr><td>Takeoff</td><td>Initial Power Set
Takeoff Power Set

100 Knots

V_1, V_R

Positive Rate of Climb</td><td>PF: “AUTOTHROTTLES ON”
PF: “CHECK POWER”
PM: “POWER SET ___%”

PM: “100 KNOTS”

PM: “V_1, ROTATE”

PF or PM: “POSITIVE RATE”
PF: “GEAR UP”</td></tr>
<tr><td>Climb
And
Descent</td><td>Passing Transition Altitude

1000 Feet Above or Below Assigned Altitude</td><td>PM: “_____ FEET _____ SET”

PM: State Actual Altitude For Assigned Altitude, i.e., “SIX THOUSAND FOR SEVEN THOUSAND.”</td></tr>
<tr><td>Approach
(Except
Monitored)</td><td>1000 Feet ATDZ
500 Feet ATDZ
400 Feet ATDZ
300 Feet ATDZ
200 Feet ATDZ
100 Feet ATDZ</td><td>PM: “1000” FEET
“500”
“400”
“300”
“200”
“100”</td></tr>
<tr><td>IMC
(Except
Monitored)</td><td>100 Feet Prior to DA(H)/DDA

Reaching DA(H)/DDA

Approach Lights Or Runway In Sight</td><td>PM: “APPROACHING MINIMUMS”

PM: “MINIMUMS”

PM: “APPROACH LIGHTS IN SIGHT”
“RUNWAY IN SIGHT”</td></tr>
<tr><td>Non-Precision</td><td>Map</td><td>PM: “MISSED APPROACH POINT”</td></tr>
<tr><td>Monitored
Approach</td><td>1000 Feet ATDZ
500 Feet ATDZ
400 Feet ATDZ
300 Feet ATDZ
100 Feet Prior to DA(H) /DDA

Landing

Go-Around</td><td>CAPT: “1000” FEET
“500”
“400”
“300”
CAPT: “APPROACHING MINIMUMS, I’M GOING HEADS UP”

CAPTAIN: “I HAVE THE AIRCRAFT”

F/O: “MINIMUMS, GOING AROUND”</td></tr>
<tr><td>All IMC Approaches</td><td rowspan="2">50 Feet
30 Feet
20 Feet
10 Feet</td><td rowspan="2">PM: “50...30...20...10”</td></tr>
<tr><td>Visual Approaches At Captain’s Discretion</td></tr>
<tr><td>Landing Roll</td><td>80 Knots</td><td>PM: “80 KNOTS”</td></tr>
</table>

SAFETY INSPECTIONS

Exterior Safety Inspection

An Exterior Safety Inspection will be conducted on all originating flights and crew changes by either the Captain or the First Officer.

Surfaces and Chocks..CHECK

Visually check that all moveable surfaces are clear and the chocks are in place.

Maintenance Status / Log book ....CHECK

Verify maintenance status is acceptable for flight and ensure agreement with authorized dispatch deviations if required.

Cockpit Safety Inspection

A Cockpit safety inspection will be conducted from memory by either the Captain or First Officer on any originating flight or crew change prior to establishing electrical power. If both AC and DC electrical systems are already powered when the crew arrives at the aircraft, this inspection may be omitted.

Battery Switch.. ON

Volt / Freq Selector.. BATT VOLT

Verify that the battery voltage is 25 volts or higher.

Caution: If the battery voltage is less than 25 volts, move BATT switch to OFF. Battery must replaced.

Landing Gear Handle.. DOWN

Flap/Slat Handle .... UP / RETRACT

Speed Brake Handle ....STOWED

AUX Hydraulic Pump Switch... OFF

Radar Switch... OFF

EXTERNAL POWER / EXTERNAL AIR

External Power Check

Battery Switch..ON/LOCKED

Pull and move the battery switch to ON and rotate it to the horizontal/locked position. With the battery switch OFF, only the battery direct bus is powered. Turning the battery switch ON powers the battery bus, DC transfer bus, and battery direct bus.

AC Volt / Freq Selector .... BATT VOLT

Verify that the battery voltage is 25 volts or higher.

<u>Caution</u>: If the battery voltage is less than 25 volts, move BATT switch to OFF. Battery must be replaced.

Ext Pwr Available Lights .... ON

The blue lights indicate external power is available.

Voltage/Freq...CHECKED

Rotate the VOLT/FREQ selector to EXT PWR and check for the following tolerances:

Normal 115 $\pm$ 3V and 400 $\pm$ 4 CPS.

Allowable 115 $\pm$ 8V and 400 $\pm$ 20 CPS.

<u>Caution</u>: There is no system protection beyond listed tolerances. Therefore, electrical system damage may occur if these limits are exceeded.

EXT PWR BUS Switches .... ON

Place left external power switch to ON. Confirm **AC EMERGENCY BUS OFF** and **DC EMERGENCY BUS OFF** annunciator panel lights are extinguished. Place right external power switch to ON. Confirm that the following annunciator panel lights are extinguished: **L AC BUS OFF**, **R AC BUS OFF**, **DC BUS OFF**.

AHRS Equipped Aircraft

When power is first applied to aircraft equipped with the Altitude and Heading Reference System (AHRS), the AHRS goes through an alignment similar to an inertial reference system. It will take 45 seconds to complete the automatic alignment. During this period, the attitude and heading fail flags will be in view and the ADI spheres will be rotated.

Caution: During the 45 second automatic alignment mode (if the flags are in view and the ADI spheres are rotated), the aircraft **MUST NOT BE MOVED**. If the aircraft is moved or bumped (by the jetway, a service truck, or the tow bar connected to a tug), you MUST power down and restart the 45 second alignment mode. Wind buffet, passenger loading, and cargo loading will not appreciably affect the alignment process.

At the end of the 45 second period, the flags will be removed, the ADI spheres will be erected, and the AHRS will align in the normal mode.

Ground Ventilation

Note: This procedure may be used to provide ambient air ventilation when pneumatic air is not available.

Cabin ALT Control Lever..AUTO
Outflow Valve Position Indicator...OPEN
Right Air Conditioning Supply Switch ....AUTO OR HP BLEED OFF
Ram Air Switch..ON

Using Ground Preconditioned Air

The passenger cabin and flight deck may be air conditioned by attaching a preconditioned air source to the Ground Conditioned Air Service Connect located on the underside of the fuselage just right of the ventral stairs. This preconditioned air is routed directly into the supply duct manifold through the mixing chamber and into the cabin and flight deck, provided the RAM AIR switch is OFF. The flight crew has no control over the temperature or volume of this preconditioned air.

Using External Pneumatic Air

The passenger cabin and flight deck may be air conditioned by attaching a pneumatic air cart or other source of air to the Ground Pneumatic Connect located on the underside of the fuselage just left of the ventral stairs.

Cabin ALT Control Level ....AUTO/VALVE OPEN
Pneumatic Crossfeed Levers .... OPEN
Air Cond Supply Switches.................................AUTO OR HP BLEED OFF
Ckpt/Cabin Temp Selectors ....AUTO

APU POWER / APU AIR

Starting

Battery Volts ....CHECK

Rotate the meter selector to BATT VOLT and verify battery voltage is 25 volts or higher.

Caution: If battery voltage is less than 25 volts, move BATT switch to OFF. Battery must be replaced.

Battery Switch...ON/LOCKED

Pull and move the battery switch to ON and rotate it to the horizontal/locked position. The APU control circuits, starter motor, and fire warning circuits are now powered.

Fire Control Panel ....CHECK

Check that both fire shutoff handles are full forward. Depress both Loop A and Loop B test buttons. Listen for a steady fire warning bell and check for 14 warning lights activated: A red light in each engine fire shutoff handle, both red **MASTER WARNING** lights, both **MASTER CAUTION** lights, the **FIRE DETECTOR LOOP** light, and the **APU FIRE** light on the annunciator panel and all six loop detector lights on the overhead panel. Push fire bell OFF button to silence bell. This test is valid for APU and engine fire protection.

Note: On some aircraft the **MASTER CAUTION** lights will not illuminate during fire warning test.

APU Master Switch .... OFF

APU Air Switch... OFF

The bleed air switch should remain off until APU attains stabilized idle RPM.

Fire Control Switch ....NORMAL

The APU fire control switch is wired in series with the APU master switch and must be in the NORM position to effect an APU start.

APU Bus Switches... OFF

One Center or Right Main Tank FUEL Boost Pump .... ON

If center tank quantity is below 800 lbs., avoid operating the APU with the center boost pumps on and main boost pumps off. Air may be ingested into the APU fuel line preventing APU start or causing APU flameout.

Start Pump (If no AC power available) .... ON

APU Master Switch ....START, RELEASE

Hold the APU Master Switch in the START position until observing the initial rise in RPM and then release the switch to the RUN position. Confirm the APU **OIL PRESS LOW** light illuminates at initiation of start and extinguishes prior to 95% RPM. If RPM does not indicate rotation, or EGT does not rise within 20 seconds, or RPM stabilizes at less than idle RPM, move the APU Master Switch to OFF and refer to the APU NO ROTATION / NO START / HUNG START checklist in Section 3.

Start Pump (After AC Fuel Pump On) .... OFF

Note: If operating only on ground service bus power, the right aft AC boost pump should be used.

Note: The DC start pump has no provision for cooling and should not be used for extended periods of time.

APU Electric Power

Volts/Freqs..CHECKED

This check is necessary to determine the operating status of the APU generator. It will be necessary to place the volts/freq. switch in the APU position for this test. If voltage and frequency are not indicated momentarily, place the APU generator switch to RESET. If generator voltage and frequency are abnormal, determine whether generator or APU is at fault by checking APU RPM indicator for normal indication. If the generator is operating normally, the blue power available lights will be on.

APU BUS Switches .... ON

Place the left APU power switch to ON. Confirm **AC EMERGENCY BUS OFF** and **DC EMERGENCY BUS OFF** annunciator panel lights are extinguished. Place the right APU power switch to ON. Confirm that the following annunciator panel lights are extinguished: **L AC BUS OFF**, **R AC BUS OFF**, **DC BUS OFF**. Check the **APU POWER IN USE** light comes on.

Using APU For Air Conditioning

APU Air Switch...AS REQUIRED

Note: If cabin temperature is 75°F or higher, move APU air switch to AIR COND COLDER. If cabin temperature is below 75°F, move the APU switch to ON.

Air Conditioning Supply Switches.. HP BLD OFF

Note: Due to high electrical starting loads of the heat exchanger cooling fans, pack switches should be turned on one at a time.

Note: When using APU generator for electrical power, two air conditioning units on may exceed 100% limit of APU generator.

Note: If AIR CONDITIONING PRESS gauges indicate less than 12 psi, operate only one air conditioning system.

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PREFLIGHT INSPECTIONS

General

Before accepting an aircraft, a thorough exterior and interior check should be made including both flight deck and cabin areas. The responsibility for these checks rests with the Captain. However, the Captain may delegate this duty to the First Officer. The cabin inspection may be delegated to a Flight Attendant.

A complete exterior inspection will be accomplished on each origination flight or crew change. Subsequent inspections are to be performed at each station in accordance with the EXTERIOR INSPECTION - THROUGH FLIGHT procedure, this section.

Upon arrival at the aircraft, the following procedures are normally accomplished in the designated order:

1. Exterior Safety Inspection
2. Cockpit Safety Inspection (if required)
3. Establish Electrical Power (AC and DC)
4. Establish Air Conditioning (if required)
5. Cockpit Inspection
6. Cabin Inspection (if required)
7. Exterior Inspection
8. First Flight of the Day or Receiving Aircraft Procedure/Checklist

When operationally efficient during crew changes, the exterior inspection may be accomplished while waiting for passengers and crew to deplane. When this is done, the requirements of the exterior inspection preamble still apply except that the parking brake may not be set and the hydraulic and fuel systems may not be pressurized.

Cockpit Inspection

The COCKPIT INSPECTION will generally be performed by the first crewmember to enter the flight deck. This is a "stand-up" check of circuit breakers, safety items, publications, and expendables (hydraulic fluid, engine oil, oxygen) and panels which can not easily be checked when seated.

Aft Overhead Panel .... CHECK

Check that the ground service electrical panel and maintenance interphone switches are off. The observer's oxygen regulator should be selected ON/100%. Fire detector system LOOP switches to BOTH.

Circuit Breakers.. CHECK

Verify that the circuit breakers on the overhead panel, EPC, and Captain's and First Officer's consoles are set.

Crash Ax.. CHECK

Escape Rope (Left).. CHECK

Spare Bulbs.. CHECK

Smoke Goggles (Left).. CHECK

Headset (Left).. CHECK

Flight Deck Portable Oxygen Bottle.. CHECK

Verify 1620 psi minimum.

Engine Oil Quantities .... CHECK

Hydraulic Quantities .... CHECK

Publications (QRH's, Checklists, Speed Cards, etc.) .... CHECK

Smoke Goggles (Right) .... CHECK

Headset (Right) .... CHECK

Escape Rope (Right) .... CHECK

Emergency Medical Kit.. CHECK

Verify seal is intact.

Protective Breathing Equipment (PBE).. CHECK

Crew Oxygen Bottle.. CHECK

Verify 1300 psi minimum and supply valve open.

Fire Extinguisher .... CHECK

ACM O_2 Mask.. CHECK

Verify mask is connected and stowed. Test of mask not required.

Gear Pins (3).. ON BOARD

Aircraft Logbook .... CHECK

Ensure the logbook is onboard, that all discrepancies have been cleared, and that the first flight of the day "R'qd A/C Checks" are signed off.

Cabin Inspection

The First Officer will ascertain from the FSM or First Flight Attendant that a thorough inspection of the cabin including all emergency equipment, cabin furnishings, and emergency exits has been accomplished. On through flights when the crew keeps the same aircraft, the cabin inspection is not required. To avoid passenger inconvenience, the cabin check is not required when crew changes are scheduled on a through flight.

Exterior Inspection

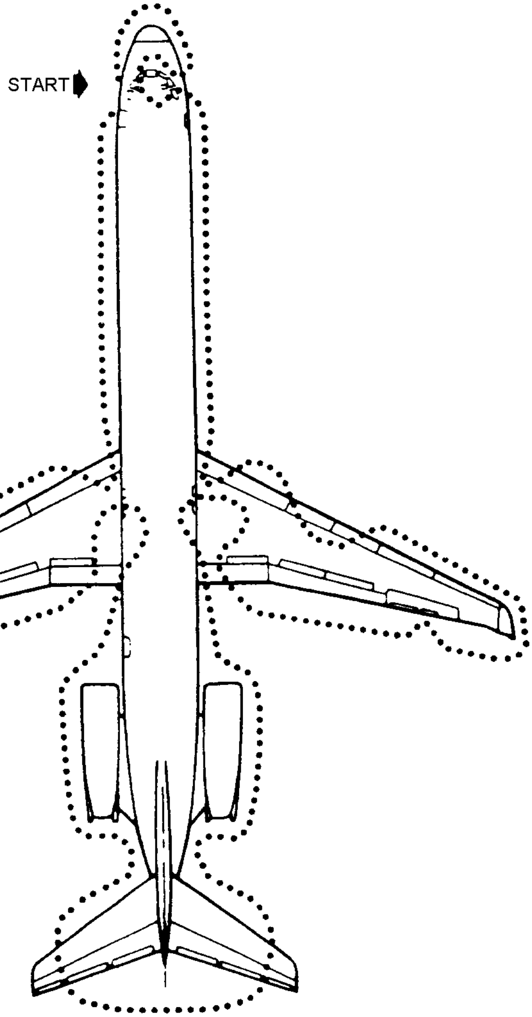
Caution: Aircraft that are exposed to high-sustained winds, or wind gusts, greater than 75 MPH (approximately 65 knots) are susceptible to elevator damage and/or jamming. Aircraft suspected to have been subjected to these conditions must have visual and physical inspections (moving the surfaces by hand) of all flight controls and an operational check of these systems.

The exterior inspection may be conducted by either the Captain or First Officer. If practical, prior to conducting the exterior inspection, the aircraft will be configured as follows: parking brake set, fuel system pressurized, hydraulic system pressurized, and position lights on.

The recommended sequence is to start at the forward fuselage and proceed in a clockwise direction. Observe the condition of all surfaces, fuselage, empennage, wings, windows, antennas, flight controls, engines, and cowlings. Check particularly for damage, fluid leakage, proper position, and security of access panels. Verify that crew, passenger, and cargo doors which are not in use are closed and the door handles recessed. Check all external lights are clean with undamaged lenses. Check operation of navigation/position lights.

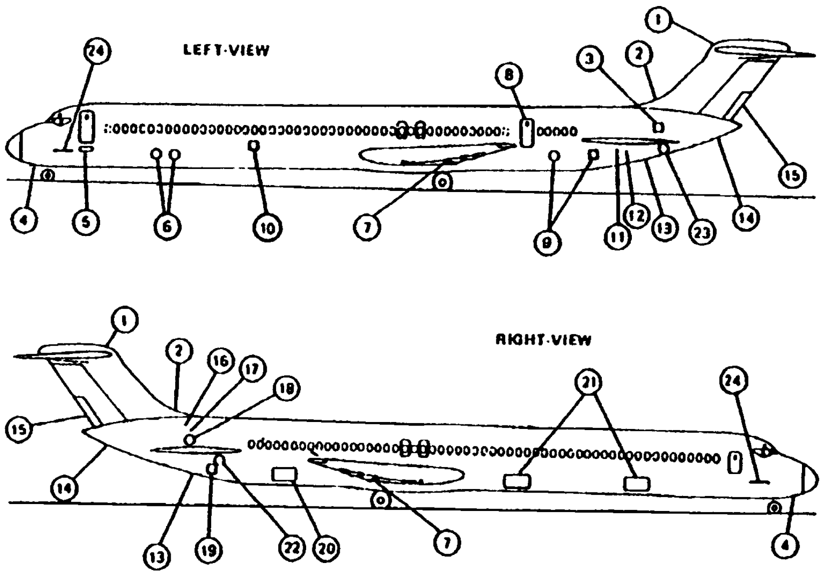
Check potable water and lavatory fill and drain areas for leakage. If evidence of leakage is found, notify maintenance.

Note: If evidence of fluid leakage or stains is noted at the lavatory service panel, maintenance must verify if a leak exists before departure. If a leak is present, repairs must be made or the affected lavatory must be drained and placarded inoperative.



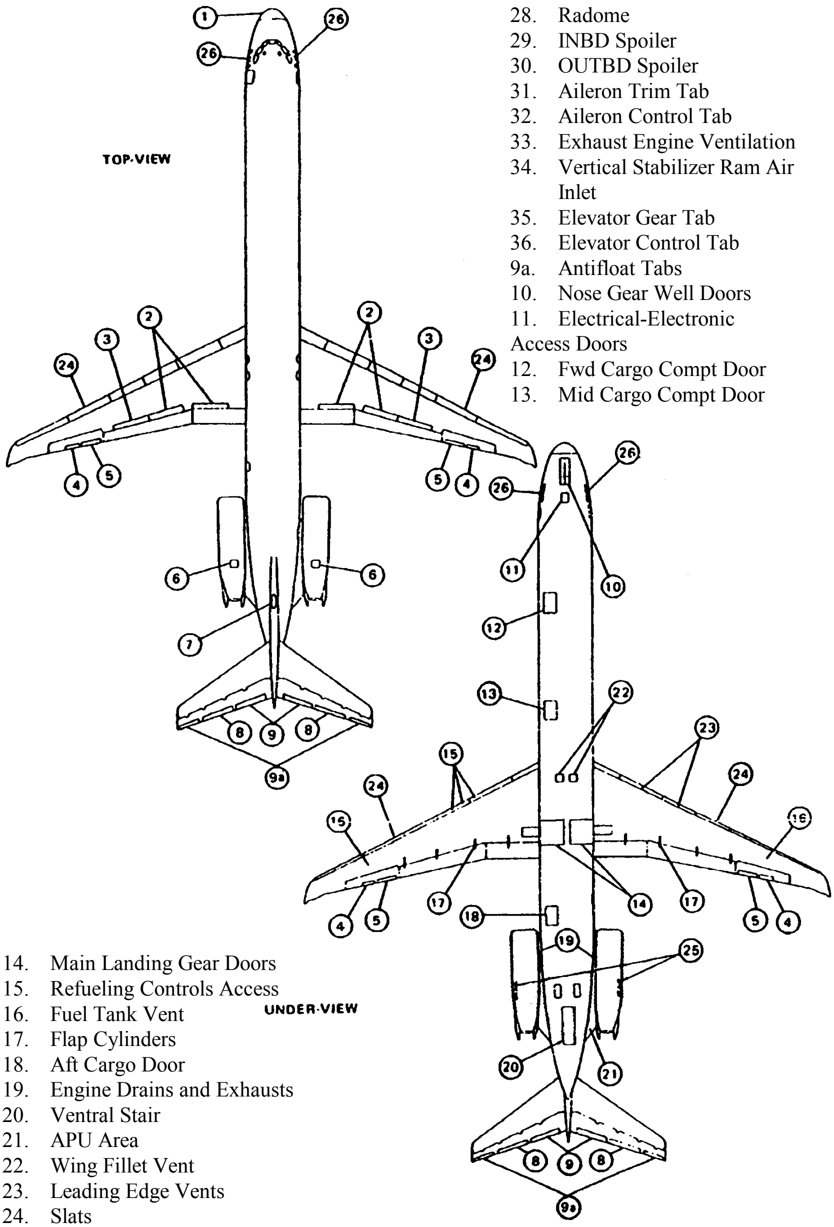
Exterior Inspection

1. Horizontal Stabilizer Trim Motor Access
2. Ventral Stabilizer Ram Air Inlet
3. Left Heat Exchanger Cooling Air Outlet
4. Nose Wheel Well Doors
5. Stairway Access Door
6. Cabin Pressure Relief Valves
7. Flap-Operating Cylinders
8. Aft Service Door
9. Cabin Pressure Outlet Assembly
10. Water Service Panel Access
11. LH Engine Reverser Cont Valve and Accumulator Gauge
12. Tail Compartment Temperature Vent
13. APU Access Doors
14. Tail Compartment Access Door
15. Rudder Tab
16. APU Exhaust Cooling Inlet
17. Air Cond Heat Exchanger Cooling Air Outlet
18. APU Exhaust
19. RH Engine Reverser Cont Valve and Accumulator Gauge
20. Rear Cargo Door
21. FWD and Mid Cargo Doors
22. APU Compartment Ventilation Exhaust
23. Pneumatic Service Door
24. Strakes



External Component Locations
(Sheet 1)

28. Radome
29. INBD Spoiler
30. OUTBD Spoiler
31. Aileron Trim Tab
32. Aileron Control Tab
33. Exhaust Engine Ventilation
34. Vertical Stabilizer Ram Air Inlet
35. Elevator Gear Tab
36. Elevator Control Tab
9a. Antifloat Tabs
10. Nose Gear Well Doors
11. Electrical-Electronic Access Doors
12. Fwd Cargo Compt Door
13. Mid Cargo Compt Door



14. Main Landing Gear Doors
15. Refueling Controls Access
16. Fuel Tank Vent
17. Flap Cylinders
18. Aft Cargo Door
19. Engine Drains and Exhausts
20. Ventral Stair
21. APU Area
22. Wing Fillet Vent
23. Leading Edge Vents
24. Slats
25. Cowl Strakes
26. Strakes

External Component Locations (Sheet 2)

Note: During the course of the following inspection, the response "CHECK" indicates that the general condition, position, and overall appearance of the item should be examined.

Left Forward Fuselage

Stairwell Door and Release Handle..........FLUSH
Strake..........CHECK
External Power Receptacle..........CB's CHECK, WHEEL WELL LIGHT ON
Stall Warning Vane..........CHECK

Nose Section

Windshield Wipers and Windshield..........CHECK
Rain Repellent Tubes..........CHECK
Left, Right, Center Pitot Tubes..........CHECK, COVERS REMOVED
Radome..........CHECK, (2) FASTENERS DOWN AND LOCKED
Forward Nose Gear Doors..........CLOSED AND LATCHED
Nose Landing and Taxi Lights..........LENS/FILAMENT CONDITION
Steering Bypass Control..........AS REQUIRED
Nose Gear Safety Pin..........REMOVED
Hydraulic Lines..........CHECK, NO LEAKS
Forward Accessory Compartment Door..........CLOSED AND LATCHED
Nose Gear Tires and Wheels..........INFLATION AND CONDITION
Nose Gear Strut..........INFLATION NORMAL, NO LEAKS
Fixed Nose Gear Doors..........SECURE
Ground Shift Linkage..........CONNECTED AND SECURE
Spray Deflector..........SECURE
Electrical Compartment Door..........CLOSED AND LATCHED

Right Forward Fuselage

Stall Warning Vane..........CHECK
RAT Probe..........CHECK
Strake..........CHECK
Oxygen Blowout Disc..........GREEN DISC IN PLACE
Forward Service Door..........AS REQUIRED
Forward Cargo Door / Light..........CHECK
Alternate Static Port..........CLEAR
Ground Floodlight..........CHECK

Static Port Cluster (4)....................CLEAR
Mid Cargo Door / Light....................CHECK
Wing Leading Edge Floodlight....................CHECK
Brake Cooling Inlet....................CLEAR
Underside of Fuselage (Oil or Fuel Leakage)....................CHECK
Gear Door Hydraulic Bypass Lever....................FLUSH

Right Wing

Wing Inboard Upper Surface....................FREE OF ICE
Vertical Fin Ram Air Inlet (View Over Wing)....................CLEAR
Slats....................CHECK POSITION AND CONDITION
Fuel Dripless Sticks............ACCESS DOORS CLOSED AND LATCHED
Vortilon....................CHECK
Defueling Access Panel....................CLOSED AND LATCHED
Refueling Access Panel....................CLOSED AND LATCHED
Underside of Wing (Fuel Leakage)....................CHECK
Left Main and Center Tank Fuel Vent....................CLEAR
Tip Ram Air Vent....................CLEAR
Position / Strobe Lights....................CHECK
Wing Landing Light....................CHECK, RETRACTED
Static Dischargers....................CHECK
Anti-Collision Light (Top of Fuselage)....................CHECK
Aileron....................FULL THROW, CHECK
Aileron Trim and Control Tabs....................CHECK, NO LOOSENESS
Fuel Tank Cap....................SECURE (IF VISIBLE)
Spoiler Panels....................DOWN AND FAIRED
Flap Fairing....................ATTACHMENT, NO LEAKS
Overwing Emergency Exits....................FLUSH

Right Main Gear And Wheel Well

Tires and Wheels....................INFLATION AND CONDITION
Outboard Gear Door....................CHECK, SECURE
Brakes....................NO LEAKS, HOSE CONNECTIONS GOOD, WEAR INDICATOR CHECK
Strut....................INFLATION NORMAL, NO LEAKS
Shimmy Damper....................SERVICED, SECURE
Spray Deflector....................CHECK, SECURE
Gear Alignment Marks & Spotlight....................VISIBLE, ON
Gear Pin....................REMOVED
Wheel Well Hydraulic Lines & Electrical Conduit....................CHECK
Spoiler Bypass Handle....................SPOILER ON POSITION

Inboard Wheel Well Door .... CHECK, SECURE
Fuel Shroud Drains...CHECK FOR FUEL
Anti-Collision Light (Bottom of Fuselage)....................................... CHECK
Underside of Fuselage... CHECK

Right Aft Fuselage

Aft Cargo Door / Light.. CHECK
Engine Nacelle Floodlight .... CHECK
APU Compartment Ventilation Outlet ....CLEAR
Tail Compartment Temperature Vent ....CLEAR
Thrust Reverser Control Valve Access Door.............................. LATCHED
Aft Fuel Shroud Drain Mast .... CLEAR, NO DRIPS
Conditioned Air Ground Connection Door ....SECURE
Elevator Hydraulic Accumulator Access ....SECURE

Right Engine

Engine Pylon Ram Air Vent...CLEAR
Engine Oil and Starter Valve Access Doors ....SECURE
Engine Inlet ....CLEAR
Bullet & PT2 Probe .... CHECK
Engine Cowling Latches (4) ....SECURE
Nacelle Fairing Doors ....CLOSED AND LATCHED
CSD Oil Access Door ....SECURE
Nacelle Strake... CHECK
Leakage Check .... NO DRIPS
Engine Exhaust ....CLEAR
Thrust Reverser ....STOWED
APU Exhaust Duct Cooling Inlet...CLEAR
Air Conditioning Heat Exchanger Outlet...CLEAR
APU Exhaust Outlet ....CLEAR

Empennage

Stab Trim Motor Access Cover ....CLOSED AND LATCHED
(Top of Fin Fairing on Vertical Stabilizer)
Rudder Restrictor Pitot Tube ....COVER REMOVED
Elevator, Stabilizer, Rudder, and Tabs.. CHECK
Static Dischargers .... CHECK

Tail Cone Section

Tail Cone ....SECURE

Static Discharger.. CHECK
Tail Cone Access Panel.. CHECK
Tail Cone External Release ....STOWED

Left Aft Fuselage

Tail Compartment Access Door..AS REQUIRED
APU Fire Panel ....CLOSED AND LATCHED
Pneumatic Air Ground Connection Door ....SECURE
Stairway Control Access Door...SECURE
Tail Bumper and Strike Indicator ....HORIZONTAL
APU Access Doors...CLOSED AND LATCHED
Aft Fuel Shroud Drain Mast .... CLEAR, NO DRIPS
Tail Compartment Temperature Vent ....CLEAR
Thrust Reverser Control Valve Access Door.............................. LATCHED
Galley Drain Mast..CLEAR
Aft Lavatory Service Door .... CLOSED, NO LEAKS
Cabin Pressure Outlet Assembly ....CLEAR AND OPEN
Aft Service Door...AS REQUIRED

Left Main Gear and Wheel Well

Inspect all items as listed under Right Main Gear and Wheel Well.

Left Engine

Inspect all items as listed under Right Engine.

Left Wing

Inspect all items as listed under Right Wing **with the exception of Fueling Panels.**

Left Forward Fuselage

Brake Cooling Inlet...CLEAR
Wing Leading Edge Floodlight .... CHECK
Static Port Cluster ....CLEAR
Potable Water Service Panel...............................CHECK, DOOR SECURE
Ground Floodlight .... CHECK
Alternate Static Port...CLEAR
Underside of Fuselage... CHECK
Cabin Pressure Relief Valves (2) ....CLEAR
Cabin Pressure Relief Valve Static Ports (2) ....CLEAR
Radio Rack Venturi Outlet ....CLEAR

Underside of Fuselage.. CHECK
Cabin Pressure Relief Valves (2) .... CLEAR
Cabin Pressure Relief Valve Static Ports (2) .... CLEAR
Radio Rack Venturi Outlet .... CLEAR
Forward Lavatory Service Door .... CLOSED, NO LEAKS
External Power Service Door....................... WHEEL WELL LIGHT OFF,
DOOR CLOSED AND LATCHED
(If APPROPRIATE)

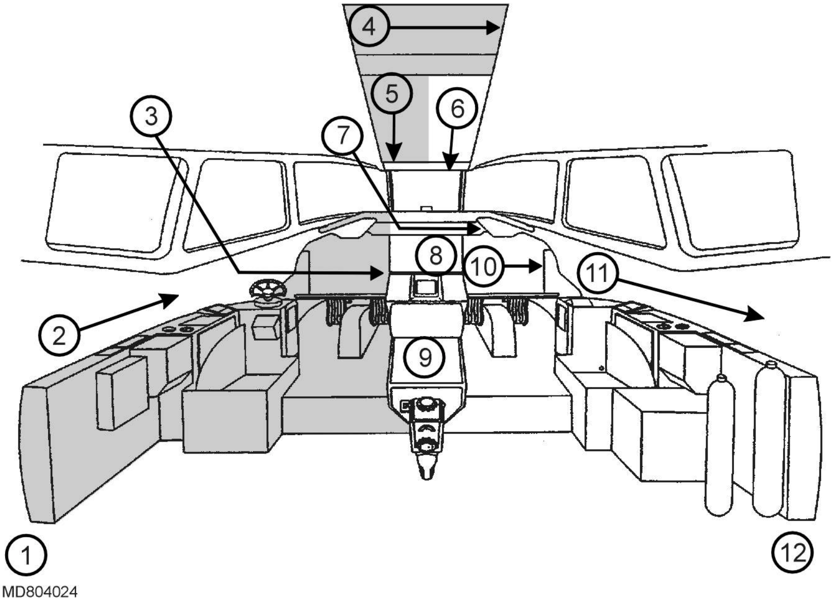
Exterior Inspection - Through Flight

Make an exterior inspection with emphasis on tire condition and engines. Parking brake, hydraulic, and fuel systems may be off / unpressurized.

Nose Gear, Wheels and Tires .... CHECK
Right Main Gear, Wheels and Tires.. CHECK
Right Engine and Cowl.. CHECK
Left Engine and Cowl .... CHECK
Aft Toilet Service Door.. CHECK
Left Main Gear, Wheels and Tires .... CHECK
Potable Water Service Panel... CHECK
Forward Toilet Service Door .... CHECK
Flight Controls .... CHECK
General Structural Integrity (Visual) .... CHECK

Check fuselage, wings, and empennage for damage (bird strikes), missing panels, and ice formation.

PANEL SCAN

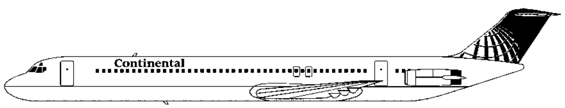


CAPTAIN	FIRST OFFICER
1. LEFT AFT WALL	6. RIGHT OVERHEAD PANEL
2. LEFT SIDE WALL	7. GLARESHIELD
3. LEFT INSTRUMENT PANEL	8. CENTER INST PANEL
4. AFT OVERHEAD PANEL	9. PEDESTAL
5. LEFT OVERHEAD PANEL	10. RIGHT INST PANEL
	11. RIGHT SIDE WALL
	12. RIGHT AFT WALL

Legend: The numbers indicate the sequence of the panel scan flow for the accomplishment of the First Flight of Day and Receiving Aircraft checks.

Shaded area defines the Captain's area of responsibility and the unshaded area defines the First Officer's area of responsibility.

MD-80 NORMAL CHECKLIST



RECEIVING

F/O | **Capt**

C'pit Inspect, Gear Pins .... C+F ...... COMP, ON BRD
O2 Mask, Regulator.................. C+F ...... CKD, SET, 100%
Fuel System, Counters..................................CKD, RESET
Air Cond, Pressn .... CKD, SET
Flt Guidance .... CKD, SET
Flt Instr, Altimeters.................. C+F .... CKD, ___ SET
Engine Instruments ....CKD
ACARS... INITIALIZED
T/O Warning, Throttles .... CKD, CLOSED
Trim Tabs .... ZERO
Parking Brake, Press, Temps .... OFF / SET, CKD

BEFORE START

F/O | * PRIOR TO AIRCRAFT MOVEMENT | **Capt**

* Upper Wing Anti-Ice................LTS OUT / INSP COMP
* Flt Papers, ZFW, Log Book...........CKD, SET, ON BRD
* Fuel & Pumps.... ___GATE FUEL,___ ON BRD, 4/6 ON
* Pitot Heat & Ignition............. ® ....ON
* Seat Belt & Beacon ....ON
* Hydraulics ....ON & HI, CKD

- - - - - WHEN CLEARED TO START - - - - -

Galley Pwr & Packs .... ® ....OFF
PNEU X-Feeds, Pressure ...... ® ....OPEN, CKD

® Right pack & x-feed only

AFTER START

F/O | **Capt**

Electrical System .... ® .... CKD
Galley Power, Ignition .... ® .... ON, OFF
Engine A/I, Fuel Heat.. OFF / ON
Packs & Air Cond Shutoff Sw ... ® ....AUTO
Door Lts...OUT
Hydraulics .... ® .... ON & HI, CKD
Cockpit Door, Sterile Light ....LOCKED, ON

TAXI

F/O | **F/O**

Flaps, Slats ....C+F.................. ___º, T/O
Flt Controls ....C+F........................... CKD
T/O Data, Bugs & Trim ....C+F..................CKD, SET
ABS & Spoilers .... ARMED
T/O Warning.............................C+F........................... CKD
Flt Guidance & TRI .... ® ....SET
T/O Briefing, Harness......................... COMPLETED, ON

If Eng Restart........Reaccomplish ® Items (F/O responds)

BEFORE TAKEOFF

F/O | **F/O**

Cabin PA .... COMPLETED
APU Air, Pneu X-Feeds ....OFF, CLOSED
Ignition .... OVRD / CONTIN
Annunciator Panel & Brake Temps .... CKD
TCAS ....TARA

AFTER TAKEOFF

PM	PM
Gear	UP, LTS OUT
Flaps, Slats .... [AS REQ]	UP, LTS OUT, STOWED
Ignition	ON / OFF
Fuel Feed .... CK/BAL	CENTER / MAIN
Hydraulics .... [AS REQ]	OFF & LO
Spoilers, ABS	DISARMED, OFF

[AS REQ] on Missed Approach

IN RANGE

PM	PM
Hydraulics .... C+F	ON & HI, CKD
Altimeters .... C+F	___ SET
Landing Data, Bugs, TRI .... C+F	CKD, SET, GA
SEAT BELTS Switch	ON
Pressurization & Anti-Ice	SET
App Briefing, Harness	COMPLETE, ON

APPROACH

PM	PM
Altimeters & Bugs .... C+F	SET
Radios, Course	I.D., INBOUND
VOR/ADF & Marker Sw	SET

LANDING

PM	PM
Gear .... C+F	DOWN, 3 GREEN
Ignition	OVRD / CONTIN
Spoilers, ABS .... LT OUT & ARM	ARM / DISARM
Flaps, Slats .... C+F	28 / 40°, LAND
Annunciator Panel, Cabin PA	CKD, COMPLETED

AFTER LANDING

F/O (SILENT)	F/O
Pitot Heat & Ignition,	OFF
Ice Protection, Ext Lts	AS REQ
Flaps	15°
Radar, TCAS	OFF, STBY
Spoilers, ABS	RETRACTED, OFF

PARKING

F/O	Capt
Flaps, Slats	UP, LTS OUT
Seat Belt & Sterile Cockpit Lts	OFF
Fuel Levers & Beacon	OFF
Parking Brake	SET / OFF
Hydraulics, Boost Pumps	SET
Logbook & ACARS	COMPLETED

TERMINATION

Either Pilot	Either Pilot
Battery Charger	CKD
Galley Power & Windshield Heat	OFF
Packs	OFF
Flt Directors & Ext Lts	OFF
Cabin Altitude Controller	AUTO / MAN CLOSED
Cockpit & Emergency Exit Lts	OFF
GND Service Elect Panel	APU / EXT PWR / OFF
APU Panel	SET
Boost Pumps	OFF / ONE ON
Battery	ON (APU PWR) / OFF

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MD-80 FIRST FLIGHT OF DAY CHECKLIST

F/O Challenge		Capt Respond
Cockpit Inspection, Gear Pins	C+F	COMPLETE, ON BOARD
Oxygen Mask, Regulator	C+F	CHECKED, SET, 100%
Voice Recorder		CHECKED
Electrical Panel, Emergency Power		CHECKED, OFF
Fuel System, Counters		CHECKED, RESET
Ice Protection Panel		CHECKED, SET
Emergency Exit Lights		ARM
Flight Recorder		SET
Cargo Detection Suppression Panel		CHECKED
Ground Prox		CHECKED, NORM
Anti-Skid		CHECKED, ARM
Stall & Airspeed Warnings		CHECKED
Yaw Damper		ON
Air Conditioning, Pressurization		CHECKED, SET
Annunciator & Digital Lights		CHECKED
Flight Guidance		CHECKED, SET
Fire Control Panel		CHECKED
Flight Instruments, Altimeters	C+F	CHECKED, ___ SET
Engine Instruments		CHECKED
Gear Lever, Horn, Lights		DOWN, CHECKED, 3 GREEN
Hydraulic System		CHECKED
Radar		CHECKED, OFF
Transponder, TCAS		CHECKED, STBY
ACARS		INITIALIZED
Stabilizer		CHECKED
Rudder Control		POWER
Takeoff Warning, Throttles		CHECKED, CLOSED
Fuel Levers		OFF
Cabin Altitude Controller		CHECKED, AUTO
Flaps, Slats		WITH GAUGES
Trim Tabs		ZERO
Parking Brake, Pressure, Temperatures		OFF / SET, CHECKED

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M&E: 00-0703-3-1656

Abbreviations are used on the normal checklists to fit the smaller format. The following table is provided for clarification.

NORMAL CHECKLIST ABBREVIATIONS	
Abbreviation	**Word(s)**
ABS	**Auto Brake System**
Air Cond	**Air Conditioning**
App Briefing	**Approach Briefing**
AS REQ	**As Required**
BRD	**Board**
C'pit Inspect	**Cockpit Inspection**
CKD	**Checked**
COMP	**Complete**
Engine A/I	**Engine Anti-ice**
Ext	**Exterior, External**
Flt	**Flight**
Insp	**Inspection**
Instr	**Instruments**
I.D.	**Identified**
LTS, LT	**Lights, Light**
O2 Mask	**Oxygen Mask**
PA	**Passenger Announcement**
Pneu X-Feeds	**Pneumatic Crossfeeds**
Press, Pressn	**Pressure, Pressurization**
STBY	**Standby**
Sw	**Switch**
Temps	**Temperatures**
T/O	**Takeoff**
ZFW	**Zero Fuel Weight**

FIRST FLIGHT OF DAY CHECKLIST & RECEIVING AIRCRAFT CHECKLIST

The following checklists and amplified text define the procedures to be conducted prior to each flight. The amplified text for each step of the procedure contains one part titled FIRST FLIGHT OF DAY and a second part titled OTHER FLIGHTS.

The procedure titled FIRST FLIGHT OF DAY must be accomplished prior to the first flight of each calendar day. The FIRST FLIGHT OF DAY procedure requires extensive checking of aircraft systems and verification of proper switch positions.

The procedure titled OTHER FLIGHTS must be accomplished prior to all flights other than the first flight of each calendar day. The OTHER FLIGHTS procedure requires minimal checking of aircraft systems but complete verification of proper switch position. The OTHER FLIGHTS procedure may vary if there is a crew change.

The panels should be scanned in the sequence shown in the PANEL SCAN DIAGRAM and the checks should be performed as described in this section. The Captain and First Officer will normally accomplish the items in their designated areas of responsibility. If the need arises, either crewmember may accomplish the items in both areas of responsibility.

Note: Steps marked (FLOW) are accomplished as part of the procedure but are not included as Challenge and Response items on the FIRST FLIGHT OF DAY or RECEIVING AIRCRAFT checklists.
Steps marked (FFOD) are accomplished as part of the procedure and are included as Challenge and Response items on the FIRST FLIGHT OF DAY checklist, but not the RECEIVING AIRCRAFT checklist.

The first crew to accept an aircraft on each calendar day will perform the FIRST FLIGHT OF DAY procedures, accomplish the FIRST FLIGHT OF DAY checklist, and make a date entry for “R’qrd A/C Checks” in the Required Flight Crew Entry section of the aircraft logbook.

If a Flight Crew arrives at an aircraft and a “R’qrd A/C Checks” date entry for the current calendar day is not present, that Flight Crew will perform the FIRST FLIGHT OF DAY procedures, accomplish the FIRST FLIGHT OF DAY checklist, and make a date entry for “R'qrd A/C Checks”.

If a Flight Crew arrives at an aircraft and a “R’qrd A/C Checks” date entry for the current calendar day is present, that Flight Crew will perform the OTHER FLIGHTS procedures and accomplish the RECEIVING AIRCRAFT checklist.

The appropriate checklist shall be read after the actions outlined in the procedures have been accomplished and at a time when there are no distractions in the flight deck. It is not necessary to perform the RECEIVING AIRCRAFT checklist prior to a flight if the FIRST FLIGHT OF DAY checklist has been accomplished for that flight.

After any maintenance is performed, the affected system(s) should be checked as described in the FIRST FLIGHT OF DAY procedure. After any maintenance is performed in the flight deck, a scan to verify proper position of all flight deck panels, switches, levers, and equipment should be accomplished.

F/O CHALLENGE	FIRST FLIGHT OF DAY	CAPT RESPOND
Cockpit Inspection, Gear Pins	**C+F**	**COMPLETE, ON BOARD**
Oxygen Mask, Regulator	**C+F**	**CHECKED, SET, 100%**
Voice Recorder		**CHECKED**
Electrical Panel, Emergency Power		**CHECKED, OFF**
Fuel System, Counters		**CHECKED, RESET**
Ice Protection Panel		**CHECKED, SET**
Emergency Exit Lights		**ARM**
Flight Recorder		**SET**
Cargo Detection Suppression Panel		**CHECKED**
Ground Prox		**CHECKED, NORM**
Anti-Skid		**CHECKED, ARM**
Stall & Airspeed Warnings		**CHECKED**
Yaw Damper		**ON**
Air Conditioning, Pressurization		**CHECKED, SET**
Annunciator & Digital Lights		**CHECKED**
Flight Guidance		**CHECKED, SET**
Fire Control Panel		**CHECKED**
Flight Instruments, Altimeters	**C+F**	**CHECKED, ___ SET**
Engine Instruments		**CHECKED**
Gear Lever, Horn, Lights		**DOWN, CHECKED, 3 GREEN**
Hydraulic System		**CHECKED**
Radar		**CHECKED, OFF**
Transponder, TCAS		**CHECKED, STBY**
ACARS		**INITIALIZED**
Stabilizer		**CHECKED**
Rudder Control		**POWER**
Takeoff Warning, Throttles		**CHECKED, CLOSED**
Fuel Levers		**OFF**
Cabin Altitude Controller		**CHECKED, AUTO**
Flaps, Slats		**WITH GAUGES**
Trim Tabs		**ZERO**
Parking Brake, Pressure, Temperatures		**OFF / SET, CHECKED**

F/O CHALLENGE	RECEIVING AIRCRAFT CAPT RESPOND
Cockpit Inspection, Gear Pins .... C+F	**COMPLETE, ON BOARD**
Oxygen Mask, Regulator.................. C+F	**CHECKED, SET, 100%**
Fuel System, Counters	**CHECKED, RESET**
Air Conditioning, Pressurization.......................................	**CHECKED, SET**
Flight Guidance...	**CHECKED, SET**
Flight Instruments, Altimeters.......... C+F	**CHECKED, ___ SET**
Engine Instruments...	**CHECKED**
ACARS	**INITIALIZED**
Takeoff Warning, Throttles	**CHECKED, CLOSED**
Trim Tabs	**ZERO**
Parking Brake, Pressure, Temperatures................	**OFF / SET, CHECKED**

F/O Challenge **Capt Respond**

Cockpit Inspection, Gear Pins .... C+F ....COMPLETE, ON BOARD

FIRST FLIGHT OF DAY

Ensure that all items on the COCKPIT INSPECTION have been checked. Verify that all (3) gear pins are on board.

OTHER FLIGHTS

If the flight deck has not been under the constant supervision of a flight crew member, accomplish same as FIRST FLIGHT OF DAY.

If the flight deck has been under the constant supervision of a flight crew member, only the following items must be checked:

- Flight Deck Portable Oxygen bottle is 1620 psi minimum
- Crew Oxygen bottle is 1300 psi minimum
- Engine oil and hydraulic fluid quantities are adequate
- Gear pins (3) are on board
- Aircraft logbook is signed off for "R'qrd A/C Checks" and all discrepancies cleared.

Oxygen Mask, Regulator.................. C+F ....CHECKED, SET, 100%

FIRST FLIGHT OF DAY

Crew Oxygen and Mask Check:

- Supply Toggle should be lockwired in the ON position.
- With diluter control in 100% OXYGEN position, remove the oxygen mask from the overhead hanger and inhale several times and note that oxygen **FLOW** blinker is operating. Indicated pressure on crews demand regulator should continue to indicate 50 to 75 PSIG (normal range).
- Leave diluter control in 100%.

- Test mask/normal/emergency control NORMAL POSITION

Note: To test mask and hose assembly for possible leaks, fit mask assembly to face and move TEST MASK/NORMAL/EMERGENCY control to TEST MASK position.

Interphone Check:

Verify Boom/Mask switch on jack panel is in mask. Make a test call with mask on interphone and verify transmission through flight deck speakers. Return mask to overhead hanger.

OTHER FLIGHTS

Crew Change

Same as FIRST FLIGHT OF DAY

No Crew Change

Check Supply Toggle in ON position, Diluter control in 100% OXYGEN position, and indicated pressure of 50 to 75 PSIG.

CADC, Flight Director Selectors (FLOW) ....NORMAL

FIRST FLIGHT OF DAY

Verify that the CADC selector and the flight director selector are in the NORMAL position. Check that the amber **CADC** and **FD** lights on the Captain's and First Officer's instrument panels are extinguished.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Voice Recorder (FFOD) ....CHECKED

FIRST FLIGHT OF DAY

Push the test button and hold for five seconds. Observe meter needle remains in green band the entire time test button is depressed. (On CVRs with a white band: momentarily push test button and observe meter needle deflects twice into white band, and drops back again.). With headset on and plugged into voice recorder test monitor jack, speak in a conversational tone and listen for same words played back after a short delay.

OTHER FLIGHTS

No test is necessary.

Electrical Panel, Emergency Power (FFOD)....................CHECKED, OFF

FIRST FLIGHT OF DAY

- CSD disconnects normal, capped, and safety wired.
- Move engine generator switches to RESET and ON.
- EXT PWR and APU bus switches as required.
- AC and DC BUS X-TIE switches AUTO and OPEN.
- Galley power on, if required. Galley power off greatly reduces electrical load on the APU allowing it to deliver more pneumatic power for air conditioning.
- Transformer rectifier indications normal.
- Battery switch ON and locked.

Emergency Power Check

Note: The emergency electrical power check may be accomplished any time the BATT switch is on and right AC bus or ground service bus is energized.

Verify meter selector is in BATT VOLT and rotate EMER PWR switch to ON. Observe **EMER PWR IN USE** light comes on and **AC EMER BUS OFF** and **DC EMER BUS OFF** lights remain off. Check for the following items:

- HEADING and ATT flags on Captain's instruments not in view.
- OFF flag in F/O's RMI not in view.
- Comm 1 and Nav 1 radios are powered.
- Battery voltage is 25 volts or higher.

Caution: If battery voltage is less than 25 volts, move BATT switch to OFF. Battery must be replaced.

Rotate meter selector to BATT AMP and observe 10 to 50 amps to the right. Rotate EMER PWR switch to OFF and observe EMER PWR IN USE light is off and verify battery amperage is charging in a pulsing mode to the left.

Caution: If the battery amperage indicates a steady mode to the left, it may be that the battery has not had sufficient time to charge. The crew may continue the checklists through AFTER START but may not move the aircraft from the gate until all the requirements of the emergency power check are met. An indication of continuous charging must be corrected prior to gate departure.

Note: The meter selector switch should be in BATT AMP (except when checking other selected sources) to allow continuous monitoring of battery and battery charger.

Emergency Power Transfer Relay Check

Start with all busses powered from either the APU or external power. The bus switches for only one source of power (APU or EXT PWR) may be on, the other bus switches must be off.

- Turn the appropriate APU or EXT PWR L BUS switch off and verify the **AC EMER BUS OFF** and **DC EMER BUS OFF** lights are out.
- Turn the appropriate APU or EXT PWR L BUS switch back on.
- Turn the appropriate APU or EXT PWR R BUS switch off and verify the **AC EMER BUS OFF** and **DE EMER BUS OFF** lights are out.
- Turn the appropriate APU or EXT PWR R BUS switch back on.

OTHER FLIGHTS

- CSD disconnects normal, capped, and safety wired.
- Generator switches ON.
- AC and DC BUS X-TIE switches AUTO and OPEN.
- Battery switch ON and locked.
- Battery voltage is 25 volts or higher.

Caution: If battery voltage is less than 25 volts, move BATT switch to OFF. Battery must be replaced.

APU Panel (FLOW)..CHECKED

FIRST FLIGHT OF DAY

- FIRE AGENT switches OFF
- FIRE CONT switch NORM
- DOORS switch AUTO

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Engine Start Panel (FLOW) ....CHECKED

FIRST FLIGHT OF DAY

- The start pump switch should be Off.
- The ignition switch should be Off.
- The fuel heat switches should be Off.
- Both engine start switches should be Off and guarded.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Fuel System, Counters .... CHECKED, RESET

FIRST FLIGHT OF DAY

Boost Pumps and Crossfeed

To check the fuel boost pumps, the engine fire shutoff handles must be in the full forward position and the fuel crossfeed lever should be Off. Check the pumps one at a time (including the DC start pump), noting that the applicable **L** or **R INLET FUEL PRESS LOW** light goes out when each pump is selected. Verify that the master caution light illuminates each time a fuel boost pump is turned off and the corresponding **INLET FUEL PRESS LOW** light illuminates. Checking the center wing fuel boost pumps should cause both the **L** and **R INLET FUEL PRESS LOW** lights to go out. (Assuming fuel is available in the center tank)

To check the fuel crossfeed, turn on one wing boost pump and open the fuel X-feed. Note that both **FUEL INLET PRESS LOW** lights are out. Close the fuel X-feed. If APU is operating, leave a center or right tank fuel boost pump operating after completion of the fuel boost check.

On aircraft with usable fuel in auxiliary tanks, check the fuel transfer pumps by moving (one at a time) the FWD and AFT AUX TRANS switches to TEST. Note applicable **AUX FUEL PUMP PRESS LOW** light comes on momentarily then goes off. Failure of light to go off indicates a faulty pump. Do not hold switches in TEST for extended periods of time since fuel is being transferred into center tank during the test. Switches should remain in OFF after check is complete.

Note: All auxiliary tank fuel transfer pumps must be off for takeoffs and landings.

Fuel Quantity Indicators and Counters

Push the TEST button and observe L Main, R Main, and Ctr tank readouts change to 3000 lbs and the total fuel quantity readout indicates 9000 lbs (aircraft with aux tanks: 15,000 lbs) and the Gross Weight readout displays the zero fuel weight plus 9000 lbs (aircraft with aux tanks: 15,000 lbs). Release the TEST button and observe the readouts return to the pre-test values. Rotate the TEST button to the untested channel (A or B) and repeat the test. If all 9s appear in any tank readout window, a tank indicator malfunction has occurred and maintenance is required.

The individual tank quantity indicators should be added and compared with the total fuel indication to confirm that the totalizer is summing properly. Individual fuel tanks may disagree during the test by ± 100 lbs. The totalizer must be ± 100 lbs.

Momentarily move the fuel used reset switch to reset and observe that the fuel used counters reset to zero.

Ensure proper amount of fuel is on board using the fuel slip procedures described in the Operations Manual.

OTHER FLIGHTS

If center tank fuel is present and will be needed for that route segment, the center tank fuel pumps must be individually checked to verify pump operation. This must be accomplished by observing that both **INLET FUEL PRESSURE LOW** lights extinguish when each individual center tank is activated. Ensure fuel crossfeed lever is off.

Momentarily move the fuel used reset switch to reset and observe that the fuel used counters reset to zero.

Ensure proper amount of fuel is on board using the fuel slip procedures described in the Operations manual.

Ice Protection Panel (FFOD) ....CHECKED, SET

FIRST FLIGHT OF DAY

Windshield Anti-Ice and Anti-Fog

Move the windshield anti-ice switch to ON. This will provide anti-icing protection for the Captain's, center, and First Officer's windshields. Normal operation of this system can be verified by leaving the anti-fog switch OFF and making a "Hand Feel" check of the three windshields. If the windshields have been cold soaked, they may require up to 30 minutes to warm up completely. If defogging becomes necessary after the "Hand Feel" check, turn the anti-fog switch ON. Anti-fog prevention and condensation removal will be provided for the windshields, clearview, and overhead windows. After completing the check, turn anti-fog switch OFF. The anti-ice switch will remain ON.

Engine Anti-Ice Switches

Verify that both engine anti-ice switches are OFF and that the **L** and **R ENGINE ANTI-ICE** annunciator lights (blue) are out.

Airfoil Anti-Ice Switches

Verify that the airfoil anti-ice switch(es) is OFF and that the **WING ANTI-ICE** and **TAIL DE-ICE** annunciator lights (blue) are out.

Pitot, Static, and Probe Heat

All positions of the METER SEL & HEAT selector control, except RAT PROBE, should be individually checked for a meter reading to indicate a normal circuit. All heaters, except RAT probe are turned on as soon as the METER SEL & HEAT selector control is moved out of the OFF position. The RAT probe is not heated on the ground. The **PITOT/STALL HEATER OFF** annunciator light should be on when the control selector is returned to the OFF position.

Ice Protection Annunciator Panel Lights

Verify that all the lights on the ice protection section of the annunciator panel are out.

OTHER FLIGHTS

- Pitot heat switch OFF
- Engine and airfoil anti-ice switches OFF
- Windshield anti-fog switch OFF
- Windshield anti-ice switch ON

Emergency Exit Lights (FFOD).. ARM

FIRST FLIGHT OF DAY

Place the EMER LTS switch to the ARM position. Verify the **EMER LIGHT NOT ARMED** annunciator light is out. In the ARM position, a failure of the DC emergency bus will automatically turn the cabin emergency lights on.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

No Smoke, Seat Belt Signs (FLOW)..ON, OFF

FIRST FLIGHT OF DAY

The **NO SMOKING** sign will remain on for all flights except for charters where the customer has elected to allow smoking. The gate agent will inform the flight crew if smoking is allowed. On these flights the **NO SMOKING** sign can be turned off anytime after takeoff. The **NO SMOKING** sign should be cycled OFF and back to ON approximately 10 minutes prior to landing to advise the Flight Attendants to begin their final cabin cleanup.

The seat belt sign will remain on until the Captain feels it is safe for passenger movement. During cruise flight, the seat belt switch should normally be in the AUTO position.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Flight Recorder (FFOD)..SET

FIRST FLIGHT OF DAY

- Move the flight recorder switch to the GND TEST position. Verify that the **FLT RECORDER OFF** light on the annunciator panel is out. The **FDAU** (Flight Data Acquisition Unit) light and the **DFDR** (Digital Flight Data Recorder) light on the flight data entry panel (FDEP) may illuminate momentarily when the GND TEST mode is selected. If either light remains on, a failure is indicated.
- Set the flight number, date, and leg number in the numerical display. Press the INSR button to insert the data.
- Return the flight recorder switch to the NORM position and verify that the guard is closed.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Cargo Detection Suppression Panel (FFOD)..............................CHECKED

FIRST FLIGHT OF DAY

Verify the **MASTER CAUTION** and **MASTER WARNING** lights are off, the ARM switch is set to AUTO, and that all panel lights are out. (If a **DSCH** light is on, the halon bottle is empty.) Press and hold the TEST switch. Within 3 seconds the aural warning horn should sound and the following lights should illuminate:

MASTER WARNING and **MASTER CAUTION** lights.
Annunciator panel **SMOKE DET LOOP** & **CARGO FIRE** lights.
All Cargo Detection Suppression panel lights (except the two **DSCH** lights, which are checked with the ANNUN/DIGITAL LTS TEST switch).
The aural warning may be silenced during the test by pressing the HORN RESET button.

Release the test switch and verify all lights are out.

OTHER FLIGHTS

Crew Change

Same as FIRST FLIGHT OF DAY

No crew Change

Verify the ARM switch is set to AUTO and that all panel lights are out.

Engine Sync (FLOW) ....OFF

FIRST FLIGHT OF DAY

Verify ENG SYNC switch is in OFF.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Ground Prox (FFOD) .... CHECKED, NORM

FIRST FLIGHT OF DAY

Open the guard and move the GND PROX WARN switch to TEST and observe **GPWS**, **BELOW G/S** and **GPWS FAIL** lights come on accompanied by the aural "Whooping" sound and the vocal commands "PULL UP" and "GLIDESLOPE." Return the switch to the normal position and close the guard.

OTHER FLIGHTS

Verify GND PROX WARN switch is in NORM.

Anti-Skid (FFOD) .... CHECKED, ARM

FIRST FLIGHT OF DAY

The anti-skid may be tested with the parking brake either on or off. Move the anti-skid switch to ARM, check anti-skid lights are off. Hold the TEST CKT switch to TEST and observe all anti-skid lights come on. Release the TEST CKT switch and observe all lights go out.

Note: If any anti-skid light(s) do not come on, or fail to go out after test, release the TEST CKT switch and move the anti-skid switch to OFF. Pull and reset the anti-skid test circuit breakers (A-13, R-38) and return the anti-skid switch to ARM. Re-test the system.

OTHER FLIGHTS

Verify ANTI-SKID switch is in ARM.

Stall & Airspeed Warnings (FFOD)..CHECKED

FIRST FLIGHT OF DAY

Move the stall test switch to SYS 1 and observe stick shakers on both control columns operate, both intermittent stall warning lights and both stick pusher **PUSH TO INHIBIT** lights on the glareshield come on and the intermittent audible stall recognition signal sounds.

Move the stall test switch to SYS 2 and observe the same indications. Move the stall test switch to OFF. Both stall warning systems must be operative for dispatch.

Hold the MAX SPD WARN TEST switch to SYS 1 and verify the audio clacker sounds. Release to OFF and verify that the clacker is silent. Hold the switch to SYS 2 and repeat the test.

OTHER FLIGHTS

Verify STALL TEST and MAX SPD WARN TEST switches are in OFF.

Yaw Damper (FFOD) .... ON

FIRST FLIGHT OF DAY

Verify the yaw damp switch is in ON, and observe the **YAW DAMP OFF** annunciator panel light is out.

OTHER FLIGHTS

Verify the YAW DAMP switch is in ON.

Mach Trim Comp (FLOW)... NORMAL

FIRST FLIGHT OF DAY

Verify the Mach Trim Comp switch is in NORM, and observe the Mach Trim indicator on F/O's column is retracted. Observe the **MACH TRIM INOP** light is out.

OTHER FLIGHTS

Verify the MACH TRIM COMP switch is in NORM.

Air Conditioning, Pressurization....................................... CHECKED, SET

FIRST FLIGHT OF DAY

Air Conditioning Panel

Move the TEMP SEL switch to both CABIN SPLY and CABIN to verify the temperature is acceptable. Leave the selector in the CABIN position for periodic review of the cabin air temperature.

Verify the CKPT TEMP and CABIN TEMP control selectors are in AUTO and set to provide the desired temperature. (Set to approximately the one o'clock position.)

Verify the Radio rack switch is in FAN and observe the **RADIO FAN OFF** light is out.

Caution: Animals and other live cargo may only be carried if the radio rack fans are operative, and should never be loaded in the aft baggage compartments.

Refer to Using APU For Air Conditioning, this Section, for procedures.

Cabin Pressure Controller

Verify system selector switch is in primary and **STBY ON** and **TRANSFER LOCKOUT** lights are out.

Note: If **STBY ON** and **TRANSFER LOCKOUT** lights are on, move system selector switch to STBY, then back to PRIMARY and push to reset **TRANSFER LOCKOUT** switchlight. If both lights come back on, or remain on, only single system automatic operation is available for dispatch.

The primary and standby systems are powered by separate electrical buses. Due to electrical transients during engine start, and when performing electrical system check, **STBY ON** and **TRANSFER LOCKOUT** lights may come on. Move system selector switch to STBY, then back to PRIMARY, and push to reset **TRANSFER LOCKOUT** switch-light.

Rotate the Ldg Alt knob to set destination field altitude. (If desired, departure field elevation may be left as Ldg Alt setting until cruise altitude is reached. Ldg Alt must be set to destination field altitude no later than top of descent). Rotate Landing Baro selector knob to set destination barometric pressure. Set rate limit control knob to the index mark for normal operation. If destination barometric setting is not known, it can be set later prior to landing. Press to test the amber **FLOW** light.

Ram Air Switch

Verify the ram air switch is in the desired position, (normally OFF). If the ram air system is to be used, move the ram air switch to ON and place the right pack switch to HP BLEED OFF or AUTO. Normally the ram air switch remains off.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Annunciator & Digital Lights (FFOD)..CHECKED

FIRST FLIGHT OF DAY

Push and hold the ANNUN/DIGITAL LTS TEST button and verify that all annunciator panel lights (including blank positions), master caution, master warning, all annunciators and segmented filament readouts on the glareshield, Captain's, First Officer's center, upper, overhead instrument panels, and center pedestal come on. All lights on the comparator monitor/flight mode annunciator should be on. A sunburst display on the FMAs indicates that the unit is functioning properly. Blue **FD** annunciator light may not be installed on some aircraft.

Note: The following lights will not test when the ANNUN/DIGITAL LTS TEST button is depressed: The **WING ICE ALERT** and **WING HTR INOP** lights, the six fire detector loop lights on the aft overhead panel, the Captain's and First Officer's marker beacon lights, the **FLOW** light on the pressurization control panel, the lights on the flight recorder panel, the **EXT PWR** (blue) lights on the ground service electrical power panel and on the electrical panel and the brake temperature overheat light.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Exterior Lights (FLOW) ....CHECKED

FIRST FLIGHT OF DAY

Verify the wing landing lights are retracted to avoid damage from ground equipment. The **POS / STROBE** lights switch should be set to BOTH. All other lights should be OFF except at night the **LOGO** light should be ON and the **WING / NACL** lights should be set at R ONLY.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Flight Guidance...CHECKED, SET

FIRST FLIGHT OF DAY

- Move both FD switches to FD; observe FMAs display **HDG HLD** and **ALT HLD** and the flight director V-command bars come into view and are centered.

  Note: If the FMAs remain blank, verify the Instr Panel Lts Digital switches are On. If the FMAs are still blank, momentarily push the autopilot disconnect button and wait approximately 10 seconds for the flight guidance computer to reset. Pull the digital flight guidance circuit breakers for 10 seconds and reset. After 10 seconds, if the FMAs are still blank, call maintenance.

- Spd/Mach Readout

  Push the Spd/Mach select knob full in and set desired cruise Mach. Push Spd/Mach knob full in again and release so speed will be primary in readout. Set V_2 in the speed select when takeoff data is received by pushing the select knob to the first detent and setting airspeed for V_2.

- Auto throttle switch.

  Verify the auto throttle switch is in OFF.

- Autoland Preflight Test

  If the use of autoland for approach is anticipated, an autoland availability test must be completed. The autoland test may be performed only with the airplane on the ground.

  Turn both VHF Nav radios to a non-local ILS frequency. Push the autoland button and observe the following:

  1. The FMA will display **AUTO LND-PRE-FLT-TEST**.

2. The **NO AUTOLAND** legend will flash continuously.
3. The radio altimeters, ADIs and ILS indication display self-test functions. (ILS test-up/left-down/right).
4. After approximately 50 seconds, flight mode annunciator goes blank or reverts to previous display and **NO AUTOLAND** legend light goes out indicating a valid test.
5. Move DFGC 1-2 switch to the opposite position and repeat the test.

Note: If test is invalid, the **NO AUTOLAND** legend light remains on until the RESET button is pushed.

- HDG Readout/Bank Angle

  Rotate the HDG control knob until the runway magnetic heading or first turn after takeoff is set in readout.

  Set bank limit selector to 15 degrees.

- Autopilot Switch

  Verify the autopilot switch is in OFF.

- The DFGC 1-2 switch should be 1 if the Captain is flying or 2 if the First Officer is flying.

- Altitude Readout/Altitude Alert

  To test the altitude alert system, place the DFGS selector switch to position one. Set altitude preselect 1,000 ft. above field elevation, then slowly rotate the baro set knob on the Captain's/First Officer's altimeter towards the altitude shown in the preselect window. At approximately 750 ft. altitude difference, the advisory light will illuminate.

  Note: If the preselect readout was previously set to 1,000 ft. above field elevation, the preselect knob must be rotated away from and back to the desired altitude to arm the mode.

  When within 250 ft. of selected altitude, the steady amber light will go out and capture mode will be annunciated. Continue to rotate until 250 ft. off captured altitude and observe flashing amber and aural tone.

  Place the DFGS selector switch to position two and repeat the above procedure using the First Officer's altimeter.

  Reset current altimeter setting and verify field elevation. Rotate the altitude select knob until the desired altitude is set in the altitude select indicator. Pull indicator selector knob out and observe ALT in the arm annunciator.

- VHF Navigation Radios

  Prior to the first flight of the day, accomplish the following check at stations where a VOT signal is available. Select the VOT frequency on both VOR receivers. Set RMI selector switches to VOR position. Select either 180 or 360 in each CDI course window.

  Check that the VOR pointers point to 180 degrees. Check that the course arrow indicates the same course as selected in the window.

  The To-From arrow, should show **TO** with 180 selected, **FROM** with 360 set in the window. The course deviation indicators should be centered.

  If necessary, rotate the appropriate course knob to center the course deviation indicator. Check that the error is within VOT check tolerances, plus or minus 4 degrees, and Captain's and First Officer's indicators are within four degrees of each other.

  The initial VHF Nav frequency and initial course may be set at this time if the ATC clearance has been received.

OTHER FLIGHTS

- Perform Autoland Preflight Test as described above if necessary.
- Verify bank angle selector is set to 15°.
- Set departure initial altitude, heading, course, and VHF frequencies.

Fire Control Panel (FFOD)..CHECKED

FIRST FLIGHT OF DAY

(If this step was previously accomplished, it may be omitted at this point.)

Verify that both the **MASTER CAUTION** and **MASTER WARNING** lights are OFF. Check both fire shutoff handles are full forward. Simultaneously depress both Loop A and Loop B test buttons. A steady fire warning bell should sound and 14 warning/caution lights should illuminate. (A red light in each fire shutoff handle, two red **MASTER WARNING** lights, two **MASTER CAUTION** lights, the **FIRE DETECTOR LOOP** light, **APU FIRE** light, and six loop detector lights.) The bell may be silenced during the test by pressing the FIRE BELL OFF button.. Verify **AGENT LOW** lights are out (tested during the annunciator/digital light test).

Note: On some aircraft the **MASTER CAUTION** lights will not illuminate during the fire warning test.

OTHER FLIGHTS

No test is necessary.

Art Switch (FLOW)..AUTO

FIRST FLIGHT OF DAY

Verify ART switch is in AUTO.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Flight Instruments, Altimeters..............C+F.............CHECKED, ____SET

FIRST FLIGHT OF DAY

- Altimeters

  Rotate the BARO set knob until desired setting is in the MB/IN HG readouts. Check the indicated altitude is approximately correct relative to field elevation. The Captain's, First Officer's, and standby altimeters should indicate within 60 feet of each other and ± 30 feet of field elevation. (Add 5 feet to field elevation for aircraft location). The barometric altimeter internal bug may be set to single engine acceleration altitude.

- Standby Horizon Indicator

  Observe that the warning flag is out of view. Pull the knob to cage the indicator, then release. A 3° error in pitch or roll is not acceptable.

- Mach/Airspeed Indicators

  Observe the indicator for normal indications. Normal, static indications at sea level are: airspeed pointer approximately zero. VMO pointer approximately 340 knots. Mach readout window should display 0.150. No flags visible.

- ADIs

  Push the ADI test button. Observe that the ADI indicates a climbing right turn. Approximately 10 degrees of pitch, 20 degrees of bank, and **ATT** flag in view. Release the test button and verify that the ADI returns to its pre-test position. Crosscheck the slip indicators for agreement.

- Radio Altimeters

  Observe **DH** lights are out. Push and hold the SET TEST knob. Observe height scale indicates 40 feet, warning flag drops into view, and both **DH** lights are on. Release knob and observe pre-test position. On the ground, the Captain's and First Officer's radio altimeters must indicate within 10 feet of each other.

  Note: **DH** lights (on some aircraft) are inhibited below 10 feet RA.

If **LOC TRK** or **G/S TRK** is annunciated in the FMA, the associated radio altimeter test is inhibited. Move the applicable FD switch to OFF and back to FD to enable the test function.

- Marker Beacon Lights
  Press to test each light individually, adjust brightness as required.
- RMIs

  Observe warning flags are out of view. Synchronize the compass system by observing the polarity indicated by each **SYNC** annunciator indicating in the mid position.
- HSIs

  Observe warning flags are out of view. Verify the opposite HSI indicates the same heading.
- Vertical Speed Indicators

  Observe off flag is not in view and pointer is indicating approximately zero.
- Standby Altimeter/Airspeed Indicator

  Rotate the baro set knob until desired settings are in MB/IN HG readouts, observe indications are normal. Observe airspeed indicator for normal indication.
- Standby Compass

  Check standby compass indication to be within 10 degrees of other compasses.
- Clocks

  Check and set the clocks to universal coordinated time.

OTHER FLIGHTS

- Verify altimeter settings are current. The barometric altimeter internal bug may be set to single engine acceleration altitude.
- Verify ADIs and standby horizon are erect and level.
- Verify no warning flags appear in flight instruments.

TRI (FLOW) .... CHECKED

FIRST FLIGHT OF DAY

Push the test button and observe **PLUS 12** is displayed in the RAT readout and **2.04** is displayed in EPR LIM readout. All lights, including the **NO MODE** light should be out. Release the test button, the thrust rating indicator will display the ambient temperature, the EPR will display a fail flag and 2.00 EPR. The mode selector lights will be out and the **NO MODE** light will be on. Push the T.O. button and observe the **NO MODE** light goes out, T.O. button light is on, and a valid EPR is displayed.

Note: For JT8D-217 engines, a valid TRI test should indicate + 12° and 1.94 EPR.

Note: The thrust rating indicator will display **NO MODE** for the following reasons:

- Initial power turn on.
- Power interrupts greater than 200 milliseconds.
- DFGS detected failure of computation or input sensor.
- Mode mismatch.

The **NO MODE** annunciation will be accompanied by the value 2.00 displayed in the EPR Lim readout with the flag in view.

OTHER FLIGHTS
No test is necessary.

Engine Reverse Thrust Lights (FLOW)..OUT

FIRST FLIGHT OF DAY
Check both **ENG REVERSE THRUST** lights and both **REVERSE UNLOCK** lights are out. All engine reverse levers must be fully down. However, if the systems have been depressurized by the maintenance crew, the **REVERSE ACCUMULATOR LOW** lights may be on and hydraulic pressure must be provided to recharge the accumulators.

Caution: If **ENG REVERSE THRUST** or **REVERSE UNLOCK** lights are on, the reversers could be extended. Therefore, it is necessary to obtain ground clearance before pressurizing the hydraulic system.

OTHER FLIGHTS
Same as FIRST FLIGHT OF DAY.

Engine Instruments .... CHECKED

FIRST FLIGHT OF DAY

Check EPR, N_1, EGT, N_2, oil pressure, and oil temperature gauges for normal, static indications.

Check oil quantity. It is recommended to have at least 5 quarts before starting and at least 12 quarts when engines stabilize at idle RPM. After the engine has operated at idle for a short period of time, the oil quantity should indicate 12 quarts minimum to 16 quarts maximum. If during engine start, the oil quantity reads in excess of 16 quarts, the engine should be shut down and checked for either over servicing or a faulty quantity gauge.

OTHER FLIGHTS
Same as FIRST FLIGHT OF DAY.

Gear Lever, Horn, Lights (FFOD) .... DOWN, CHECKED, 3 GREEN

FIRST FLIGHT OF DAY
The landing gear handle can be pulled aft while in the DOWN position. This will turn off the green lights, turn on the red lights, and if either throttle is at idle, the horn will sound. The GEAR HORN OFF button can then be pushed to check the silencing circuit provided the flaps are not extended beyond the takeoff position. When the landing gear handle is released into the DOWN detent notch, the red lights will go out and the green lights will come on.

Note: If the aural warning does not sound during the test, continue holding out and down on the landing gear handle while advancing the throttles to the takeoff position and returning them to the idle stop. The aural warning should sound when the throttles are returned to the idle stop.

WARNING: If the red and green landing gear position lights are on simultaneously, ensure that the gear handle is down and the landing gear area is clear before turning on the auxiliary hydraulic pump.

OTHER FLIGHTS
No test is necessary.

Hydraulic System (FFOD) .... CHECKED

FIRST FLIGHT OF DAY

Note: Before beginning the check of the hydraulic system, verify that the flap/slat handle is in the UP/RETR detent and that the handle is in agreement with gauge. If the handle is in any other position, contact the ground crew for clearance before moving the handle or pressurizing the hydraulic system.

- Momentarily move the AUX HYD PUMP switch to OVRD and observe the right HYD PRESS gauge indicates a pressure increase. Move the AUX HYD PUMP switch to ON and observe the HYD PRESS gauge indicates between 2800 and 3200 PSI and the **R HYD PRESS LOW** light is off.
- Move the TRANS pump switch to ON, observe the left HYD PRESS gauge indicates above 2000 PSI and the **L HYD PRESS LOW** light is off.

  Note: If either **HYD PRESS LOW** light is on with normal system pressure, check the respective spoiler bypass valve is set to SPOILER ON position.

  Note: If either **HYD TEMP HI** light is on, call maintenance.
- Check **RUDDER CONTROL MANUAL** light is out.
- Check hydraulic fluid quantities indicate an adequate supply of fluid (4.25 qts minimum).
- Move AUX and TRANS pump switches to OFF and verify ENG hydraulic pump switches are in HI.

OTHER FLIGHTS

- Check hydraulic fluid quantities indicate an adequate supply of fluid (4.25 quarts minimum).

Static Selectors (FLOW) .... NORMAL

FIRST FLIGHT OF DAY

Verify STATIC AIR switches are in NORM.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Radar (FFOD)..CHECKED, OFF

FIRST FLIGHT OF DAY

Set the radar system controls as follows:

- Antenna Stab Switch (If installed).. ON
- Gain.. AUTO
- Range Control.. 40
- Brightness... AS DESIRED
- Mode selector ....TEST

Note: May have to press TCAS button to bring up radar test display.

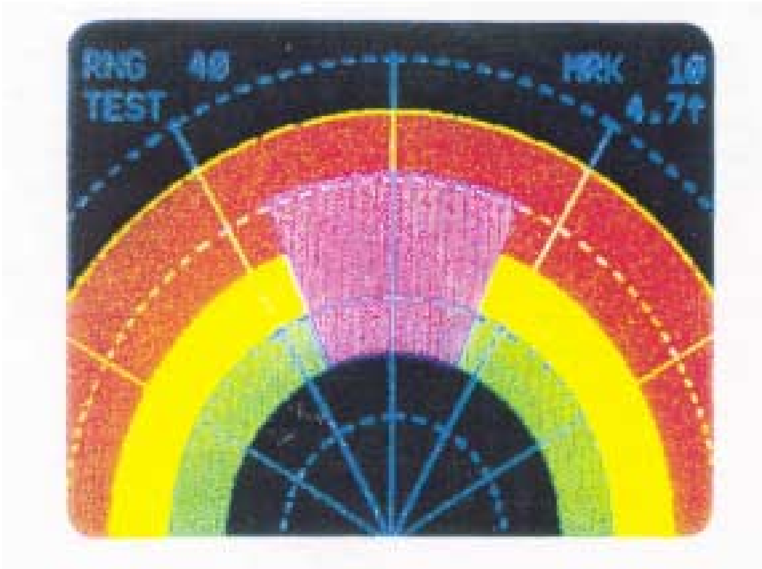
Predictive Windshear System: Verify the following indications occur.

<table>
<tr><th>Test Pattern Timing</th><th>First 2 Seconds</th><th colspan="2">10 Seconds</th><th></th></tr>
<tr><th>Presentation</th><th>Initial Indication</th><th>Normal Indication</th><th colspan="2">Failure</th></tr>
<tr><td>Caution</td><td>ON</td><td>OFF</td><td colspan="2">OFF</td></tr>
<tr><td>W/S Fail</td><td>ON</td><td>OFF</td><td colspan="2">ON</td></tr>
<tr><td rowspan="2">W/S Warning</td><td rowspan="2">OFF</td><td rowspan="2">ON</td><td>Internal</td><td>External</td></tr>
<tr><td>OFF</td><td>ON</td></tr>
<tr><td>Aural</td><td>Chime</td><td>“GO AROUND, WINDSHEAR AHEAD; WINDSHEAR AHEAD, WINDSHEAR AHEAD”</td><td>None</td><td>“GO AROUND, WINDSHEAR AHEAD; WINDSHEAR AHEAD, WINDSHEAR AHEAD”</td></tr>
<tr><td>Display</td><td>Test Pattern</td><td>Test Pattern</td><td>RT Fault</td><td>Test Pattern with Label EXT W/S FAULT (Unless Radar Failure)</td></tr>
<tr><td>(Upper Left Corner)</td><td>NO W/S Displayed</td><td>NO W/S Extinguished</td><td colspan="2">NO W/S Remains Displayed</td></tr>
<tr><td colspan="5">PREDICTIVE WINDSHEAR SYSTEM TEST</td></tr>
</table>

Weather Radar: Observe test pattern as depicted on page 47. System failure is indicated by the absence of a test pattern and the presence of a fault annunciation. Turn Mode selector off at completion of test.

OTHER FLIGHTS

If use of the radar for weather avoidance is anticipated, a test should be performed.

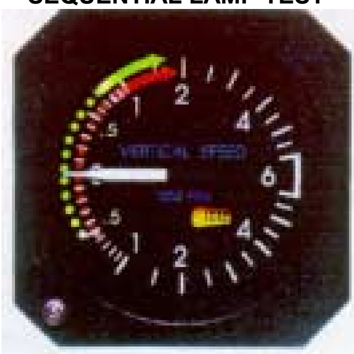


WEATHER RADAR TEST PATTERN

.

TCAS DISPLAY TEST PATTERN

SEQUENTIAL LAMP TEST



FIXED TEST COMMAND

Transponder, TCAS (FFOD)..CHECKED, STBY

FIRST FLIGHT OF DAY

Rotate the spring-loaded function selector switch to the TEST position for one second and then release the switch. Refer to pictures on page 48.

The following should occur:

- A test pattern will be displayed on the radar CRT that allows verification of each type of intruder symbol that can be displayed. During the test, the word **TEST** is displayed in the lower left corner of the display. The following symbols should be observed:
- A resolution advisory (red square) will appear at 3 o'clock, range of two miles, 1000 feet below and flying level.
- A traffic advisory (yellow circle) will appear at 9 o'clock, range of two miles, 200 feet below and climbing.
- Proximity traffic (solid white diamond) will appear at 1 o'clock, range 3.6 miles, 200 feet above and descending.
- Non-threat traffic (open white diamond) will appear at 11 o'clock, range of 3.6 miles flying level 1000 feet above.

On the RA/VSI, during the first few seconds of the test, the RA/VSI red and green circumference light (the climb/descent indicators) illuminate sequentially. The TCAS flag is in view throughout the test period. After the sequential lamp test, the red and green climb/descent lights display a fixed test command similar to a representative Resolution Advisory throughout the remainder of the system test. Should a VSI failure be detected at any time, the VSI flag will appear.

At the conclusion of a successful self-test, a synthesized voice announces: "TCAS SYSTEM TEST OK." Should a failure be detected during self-test, the TA display indicates the failed system component, and the audio message says: "TCAS SYSTEM TEST FAIL."

Note: Press TCAS button to regain display range marks, if desired.

Assure that the selectors are set as follows:

- Function Selector...STBY
- TCAS Range Selector... 5 MILES
- Transponder Code Selector ....AS REQUIRED
- Relative Altitude Selector... AS DESIRED
- Transponder Selector............................. ATC 1 (CAPT FLYING) OR ATC 2 (F/O FLYING)

WARNING: Failure to return the transponder to STBY after landing or selecting any mode except STBY prior to leaving the ramp area allows the radar to operate in the windshear mode creating a radiation hazard to personnel on the ground. The RDR-4B radiation hazard area extends 13.4 feet from the radar antenna in a 120 degree arc left and right of the aircraft centerline. This hazard exists even if the radar mode is selected OFF or TEST.

OTHER FLIGHTS

No test is required.

ACARS .... INITIALIZED

FIRST FLIGHT OF DAY

Press LINK TEST key to test system and receive clock update. Verify the correct time is set in ACARS. Initialize ACARS for the planned flight. Refer to ACARS Procedures, this section.

OTHER FLIGHTS

Initialize ACARS for the planned flight.

Stabilizer (FFOD) .... CHECKED

FIRST FLIGHT OF DAY

While observing the stabilizer indicator, hold Captain's wheel left trim switch to nose-up and then down momentarily.

Caution: Do not hold single switch position longer than 3 seconds.

The stabilizer indicator should not move and the aural signal should not sound. Repeat this check, using Captain's right trim wheel switch. The stabilizer should not move and aural signal not sound. (This check may be accomplished from the First Officer's wheel trim switches. Only one check is necessary).

Operate both Captain's wheel switches in the nose-up and then nose-down directions and note corresponding direction of stabilizer indicator movement and audible tone.

Operate both First Officer's wheel switches and check stabilizer indicator movement and audible tone. (Moving either set of switches opposite to a set of operating switches will stop the stabilizer movement). This is not a required test. If test is used, do not exceed 3-second limit.

Operate both longitudinal trim handles in same direction and check for corresponding indicator movement and audible tone. Release handles to neutral.

Operate both ALT LONG TRIM switches and check for direction of travel. Observe that the alternate trim stops moving when the alternate trim switches are released.

While observing the horizontal trim indicator, momentarily operate each ALT LONG TRIM switch individually to NOSE UP and NOSE DN. Observe that the stabilizer does not move, and that the aural warning does not sound when only one switch is moved in either direction. If the stabilizer moves with just one switch activated, there is a malfunction in the alternate trim switch and maintenance action is required before flight.

Note: To obtain maximum service life, do not maintain switch positions longer than necessary to check response. If there is no response, release switches and determine cause. Should any switch or control hesitate or stick in returning to neutral, it should be corrected before flight. Any time the longitudinal trim handles, dual longitudinal trim (wheel) switches, or alternate longitudinal trim (secondary) controls are used, they should be operated to their fully deflected position to assure both motor and brake circuits are actuated.

OTHER FLIGHTS

No test is required.

Spoilers (FLOW).. RETRACTED

FIRST FLIGHT OF DAY

Verify spoiler handle is retracted. Normally, one-half of the red arming band should be visible when the handle is retracted.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Rudder Control (FFOD) .... POWER

FIRST FLIGHT OF DAY

Verify rudder hydraulic control lever is in POWER position. The **RUDDER CONTROL MANUAL** annunciator light should be off with normal hydraulic pressure on the right system.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Takeoff Warning, Throttles .... CHECKED, CLOSED

FIRST FLIGHT OF DAY

Throttles should be advanced to check freedom of movement and the takeoff warning horn, then returned to the closed position.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Fuel Levers (FFOD).. OFF

FIRST FLIGHT OF DAY

Levers should be OFF to prevent any premature fuel flow or fuel lever controlled ignition.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Cabin Altitude Controller (FFOD)................................CHECKED, AUTO

FIRST FLIGHT OF DAY

In the AUTO position, the cabin pressure controller indicator should be in the aft position. Place the cabin pressure controller lever in the manual (down) position, depress fully, and turn the cabin altitude control wheel/lever forward and check for freedom of motion over the full range of travel. Release the wheel when the indicator is at the full forward position, place the controller lever in AUTO position, and check that the indicator returns to the full aft position.

OTHER FLIGHTS

Verify the cabin altitude control lever is in the AUTO position and the cabin pressure controller indicator is in the aft position.

Flaps, Slats (FFOD) .... WITH GAUGES

FIRST FLIGHT OF DAY

The flaps/slats lever should be full forward and both flap indicator pointers should be at full up. (No more than one needle width split between indicator needles). The **TAKEOFF**, **DISAGREE**, **AUTO**, and **LAND** lights on the slat position indicator should all be off. Verify that the **AUTO-SLAT FAIL** light is off.

Note: If the flap/slat handle is in any other position than UP/RETR, contact ground crew for clearance before moving the handle.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Communications Panel (FLOW) ....CHECKED, SET

FIRST FLIGHT OF DAY

A functional check of the communications panel should be accomplished. The flight deck interphone system should be checked and set for flight.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Trim Tabs ....ZERO

Caution: Do not hang plastic trash bags from rudder or aileron trim knobs. Plastic material can work into the trim mechanism and break it.

FIRST FLIGHT OF DAY

Verify rudder and aileron trim control knobs are at or near zero trim position.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

PMS (If Installed) (FLOW)..CHECKED, SET

FIRST FLIGHT OF DAY

- Observe **PMS** light is out.
- Push the Plan key. Observe the plan page is displayed.
- Enter the aircraft gross weight into the scratch pad area and push line select key 1 to enter data.
- Enter the fuel load into the scratch pad area and push line select key 2 to enter data.
- Enter the trip distance (shown on the computer flight plan) into the scratch pad area. Push line select key 3 to enter data.
- Using the slew switch, select Plan-Crz page.
- Enter planned cruise altitude(s) into scratch pad area. Push line select key 1 to enter data.
- Enter the flight plan average head/tail wind component into the scratch pad area. Use a Minus sign prefix for headwinds and a Plus sign prefix for tailwinds. Push line select key 2 to enter data.
- Enter the forecast static air temperature into the scratch pad area. Push line select key 3 to enter data.
- Push Vert Wpts key and observe the vertical waypoint page is displayed. Vertical waypoints include speed change point (250 KIAS at 10,000 ft. MSL), armed altitudes (on the DFGS), top of climb, start of step climb, top of descent, and bottom of descent.
- If desired, enter indicated airspeed, wind direction/velocity, and temperature expected at the waypoint. Push line select key 2 to enter data.
- Press the Climb button.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Autobrake Selector (if installed) (FLOW) .... OFF

FIRST FLIGHT OF DAY

With selector in the off position, ABS is inoperative. Manual braking is available. Observe the ARM/DISARM switch is DISARM. (Switch is magnetically held in ARM position).

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Stabilizer Brake Switch (FLOW) .... CAPPED

FIRST FLIGHT OF DAY

The stabilizer brake switch should be guarded in the NORMAL position and safety wired.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

Parking Brake, Pressure, Temperatures...............OFF / SET, CHECKED

FIRST FLIGHT OF DAY

Observe the **OVHT** light is out. Verify the brake temperature selector is in ALL. Push the brake temperature test button and observe the brake temp gauge indicates between 425 and 475 degrees centigrade and the **OVHT** light comes on. Release the brake temperature test button and observe the brake temp gauge indication returns to the pretest valve and the **OVHT** light goes out.

Set parking brake, preferably after aircraft is fueled (minimizes load on brakes and gear). Check brake pressure available is 1400-1700 psi.

OTHER FLIGHTS

Observe the **OVHT** light is out. Set parking brake, preferably after aircraft is fueled (minimizes load on brakes and gear). Check brake pressure available is 1400-1700 psi.

Crew Baggage (FLOW)..IDENT, SECURED

FIRST FLIGHT OF DAY

In accordance with FAR 121.576, each item of crew baggage carried in the flight deck must be secured.

OTHER FLIGHTS

Same as FIRST FLIGHT OF DAY.

BEFORE START CHECKLIST

The Capt will call for the BEFORE START CHECKLIST after all cabin doors are closed, all passengers are seated, and carry-on luggage is properly stowed. If a pushback is required, the checklist asterixed items will be completed prior to aircraft movement (down to the line). When engine start clearance is received, he/she will call for the rest of the checklist (below the line) and the appropriate engine to be started. In the event a pushback is not required, the entire checklist (above and below the line) will be completed prior to engine start.

BEFORE START

F/O CHALLENGE	* Prior to Aircraft Movement	CAPT RESPOND
* Upper Wing Anti-Ice		LIGHTS OUT / INSPECTION COMPLETE
* Flight Papers, ZFW, Logbook		CHECKED, SET, ON BOARD
* Fuel & Pumps		____GATE FUEL, ___ ON BOARD, 4/6 ON
* Pitot Heat & Ignition	®	ON
* Seat Belt & Beacon		ON
* Hydraulics		ON & HI, CHECKED
	---- WHEN CLEARED TO START ------	
Galley Power & Packs	®	OFF
PNEU X-Feeds, Pressure	®	OPEN, CHECKED
	®	Right pack/x-feed only

<u>**F/O Challenge**</u> *** Prior to Aircraft Movement** <u>**Capt Respond**</u>

*** Upper Wing Anti-Ice.........LIGHTS OUT / INSPECTION COMPLETE**

Press to test the **WING ICE ALERT** and **WING HTR INOP** lights. Lights should illuminate when pressed, and extinguish when released.

If the UWAI system is not installed, inoperative, or a light remains on after test, ensure the wing ice inspection is completed and signed off in the aircraft logbook.

*** Flight Papers, ZFW, Logbook.................CHECKED, SET, ON BOARD**

This step normally accomplished by the Capt. Verify that the dispatch release, flight plan, pre-departure clearance (if applicable), fuel slip, accuload, and logbook are checked and on board. The Captain may elect to pushback/start engines when assured that the final weight and balance is forthcoming.

Fuel slip and accuload procedures are discussed in the operations manual.

Push the ZFW knob on the fuel quantity display and rotate in the direction required to set the calculated zero fuel weight. Release the ZFW knob and the ZFW and fuel quantity will add up to the aircraft gross weight.

Ensure the logbook has no open writeups, the wing ice inspection is signed off (if required), and the "First Flight of the Day" checks are signed off with the appropriate date on the "R'qrd A/C Checks" line.

*** Fuel & Pumps ....____GATE FUEL, ____ON BOARD, 4/6 ON**

This step normally accomplished by the Capt. Check the fuel on board against the dispatch release, fuel slip, and accuload. Turn on both boost pumps in each wing tank and observe that both **INLET FUEL PRESS** annunciator lights are extinguished. If the center tank contains useable fuel, turn on both center tank boost pumps and leave them on until center fuel tank has been emptied.

Note: All auxiliary tank fuel transfer pumps must be off for takeoffs and landings.

*** Pitot Heat & Ignition ....® .... ON**

This step normally accomplished by the Capt (F/O on restart). Place METER SEL & HEAT switcht to CAPT position. Place IGN switch to SYS A going away from origination airport and SYS B coming back (GRD START & CONTIN on some aircraft).

*** Seat Belt & Beacon.. ON**

This step normally accomplished by the Capt. Turn the SEAT BELTS and ANTI COLLISION switches to ON.

*** Hydraulics..ON & HI, CHECKED**

This step normally accomplished by the F/O. Auxiliary and transfer hydraulic pumps are selected ON, engine driven hydraulic pumps remain in HIGH, to provide maximum system hydraulic pressure for braking during the pushback and engine start procedure.

- - - - - WHEN CLEARED TO START - - - - -

Galley Power & Packs........................® .... OFF

This step normally accomplished by the Capt (F/O on restart). Turn galley power and air conditioning packs off (right pack only for restart). After starting one engine, the pack for that engine may be turned on after the engine is stabilized and the PNEU X-FEED valve closed.

PNEU X-Feeds, Pressure ....® ....OPEN, CHECKED

This step is normally accomplished by the Capt (F/O on restart). Open both X-feeds (right X-feed only for restart). Pneumatic pressure should indicate 36 psi minimum at sea level minus 1 psi for each 1,000 feet above sea level.

® Engine Restart items: These must be accomplished prior to restarting the right engine following single engine taxi.

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GATE DEPARTURE PROCEDURES

Aircraft Walkaround Verification For All Departures

A member of the ground crew must verify that all aircraft doors and access panels are properly closed and secured prior to all departures. The Lead or Safety Agent should state to the flight crew over interphone: "Walkaround complete: All doors and access panels secure; Ready for pushback/Cleared for engine start". If the crew does not receive this verification, a challenge should be made to the headset operator prior to aircraft movement or engine start. If headset communication is not available, person to person contact must be made with the Lead or Safety Agent.

Push Back Gate Departure

The Captain will normally handle intercom communications and brakes. The First Officer will normally handle clearance delivery, flow control, ground control, and company communications.

If headset communication is not possible, the marshaller and Captain should agree on procedures and signals to be used. Engine start during pushback is not authorized unless normal headset communication is available.

After the tractor and tow bar have been connected and clearance obtained, give push-out signal to tractor operator. Headset operator must accompany tractor and aircraft during pushout to observe for possible safety hazards. Tractor operator is responsible to observe headset operator and aircraft for signals or possible safety hazards. After tractor and tow bar are clear of aircraft, proceed as in Taxi-Out Gate procedure.

Powerback Gate Departure

Powerback is authorized only at specified gates at selected airports. These are listed in the Operations Manual.

Powerback is not authorized if:

- A reverser or reverse light on an engine is inoperative.
- There is ice, snow, slush, or heavy rain.
- Signalman's wands are not available.
- There is any aircraft movement at adjacent gates.

All powerback operations will be conducted with two engines. If powerback cannot be accomplished for any reason, notify ground crew <u>as soon as possible</u>.

After engines are stabilized at idle, advise the headset operator that they are cleared to disconnect the headset. The Captain should now observe the signalman in front of the aircraft.

Note: If difficulty starting the aircraft rolling backwards is encountered or expected due to flat spots on tires, hot weather, high gross weight etc., it is recommended that the aircraft be moved forward slightly (2-3 feet) using forward thrust prior to initiating the powerback procedure. There will be no signal from the signalman for this slight forward movement; however, when practical, the Captain should coordinate ahead of time with the headset operator or signalman when there is no headset operator.

WARNING: Do not use brakes while the airplane is moving rearward. If brakes are inadvertently applied while in rearward motion and aircraft starts to tip, move throttles into forward thrust immediately. If the nosewheel lifts off the ground, maintenance inspection is required.

Caution: In event of thrust reverser failure while in reverse, use necessary forward thrust on other engine to stop rearward motion.

- Leave flaps retracted until powerback is completed and aircraft has taxied away from the ramp.
- Thrust reversers on both engines must be operative.
- Do not apply more than 1.3 EPR during reverse taxi. Thrust values in excess of 1.2 EPR should be limited to momentary power application as necessary to powerback operations.

When powerback is planned, the crew should be ready to start engines three (3) minutes prior to scheduled departure time. Coordination of multiple powerback operations and on time block out may require the engines to be started early. When ready to commence the powerback, the Captain will signal the signalman by turning the taxi light on and then off. When the area is clear, the signalman will initiate powerback by giving the powerback signal. If slight forward movement is planned, apply enough forward thrust to move the aircraft forward approximately 2-3 feet, then close the throttles, and position the reverse levers to the reverse idle detent. After the reverse lights illuminate, place heels on the floor and apply reverse thrust to start the aircraft rolling. If slight forward movement is not planned, position the reverse levers to the reverse idle detent.

The Captain should continuously observe the signalman while the other crewmember monitors the engine instruments and advise if the EPR exceeds 1.3. Excessive speed can be reduced by placing the engines in forward thrust. Minor tracking adjustments and turns will be made with the nose gear steering wheel.

Upon receipt of the standard forward movement signal from the signalman, come out of reverse and apply slight forward thrust, allowing the aircraft to roll forward. Using standard signals, either stop the aircraft or continue to taxi. After powerback is complete, proceed as in Taxi-Out Gate procedure.

Taxi-Out Gate

Once the headset is removed, the headset operator shall position himself between the aircraft and the terminal building in full view of the flight deck. This could be on the left or right side of the aircraft, depending on the direction of aircraft movement.

When the Captain is ready to taxi and has received clearance to do so, he will indicate this to the headset operator/safety person by flashing the nose gear taxi light on.

The headset operator/safety person shall ascertain that the area is clear to taxi and the "Clear to Taxi" salute shall be given to the flight deck. The Captain will acknowledge receipt of this salute by turning the nosegear taxi light off. As the aircraft departs, the headset operator/safety person will give the "End of Ground Guidance" signal.

Note: In order to avoid confusion during night operations, the Captain should leave the taxi light off for 1-2 seconds before turning it back on for use during taxi operations.

Note: The aircraft will not be taxied away from a gate (or pushback position), unless the marshaller gives the proper signal that the aircraft is cleared to taxi. Should, for some reason, the marshaller not be visible, or leave his position on the ramp, the aircraft will not taxi. Call the station on company radio and have the marshaller return and give taxi clearance.

Note: Headset operator is responsible to ensure the aircraft, personnel, and equipment are clear from injury or damage from jet blast before taxi-out signals are given to aircraft. High lift trucks at gates immediately behind must be lowered before aircraft taxis out.

ENGINE START PROCEDURE

Note: The Engine Start Procedure is a coordinated effort with both the Captain and the F/O participating in engine start. The Engine Start Procedure shall be used when starting engines at the gate, during pushback or whenever both engines have been shut down. The F/O will accomplish engine start when it is required during aircraft taxi. Refer to Engine Restart Procedure.

CAPTAIN	FIRST OFFICER
Call for BEFORE START checklist and accomplish assigned steps.	Accomplished assigned step and read BEFORE START checklist.
Announce "STARTING ENGINE NO. ____."	Position start switch to ON and hold.
Verify increase in N_2.	
	Verify oil pressure and announce "OIL PRESSURE" when observed.
Verify N_1 rotation prior to positioning fuel lever to on.	
At max motoring RPM (no N_2 RPM change for 5 seconds) position fuel lever to on. 20% N_2 RPM is desired, 15% N_2 RPM is minimum.	
Verify fuel flow and EGT indication. Monitor engine start time as described in **BURNER CAN STRESS DETECTION**, this section.	
	At 40% N_2 release engine start switch - verify start valve closes and report "START VALVE CLOSED."
Monitor N_1, N_2, EGT, fuel flow and oil pressure for normal indications as the engine accelerates and stabilizes at idle.	
If an uncommanded acceleration to high thrust occurs, the engine must be shut down with the fuel lever.	

Refer to Engine Start Notes for detailed engine start guidance.

ENGINE START NOTES

Communication with Ground Crew During Engine Start

Headset communication with the ground crew should be maintained during engine start. If headset communication is not available the Captain and ground crew should use hand signals as described in the Ops Manual.

The Captain should request clearance from the ground crew prior to starting an engine. The Captain should advise the ground crew when they are clear to disconnect external power and/or air.

The Captain should not clear the ground crew to disconnect the headset or depart the area until all engine starts are complete. This provides quick response in the event of an engine start malfunction.

Normal Engine Start

Note: Normally both engines will be started prior to taxi. If necessary to maintain MIN FUEL for departure, the right engine may be shut down during taxi. Refer to Single Engine Taxi, this section.

Starting Sequence .... Engine #1, Then #2

Engine Start Switch.. Engaged

Note: The pilot must hold the start switch in the ON position until 40% N_2 RPM. Then, release the start switch and close the guard. Observe that the pneumatic pressure increases and the start valve open light extinguishes.

Note: On some aircraft, the start switch has a ground start position and when engaged remains in the ground start position. On these aircraft, positively ensure that the start switch is positioned to OFF at 40% N_2.

N_2 RPM... Rotation Checked

Oil Pressure.. Rising

N_1 RPM... Rotation Checked

Fuel Lever .... On at Max Motoring, 20% N_2 RPM Desired, 15% Minimum

Note: Move fuel lever on when N_2 tach indicates max motoring RPM (Max motoring RPM is defined as no N_2 RPM change for 5 seconds) and N_1 RPM indicates positive rotation, will improve the probability of a good start.

Note: Guard fuel lever until engine is stabilized at idle RPM & EGT.

Initial Fuel Flow..Approximately 800 PPH

EGT ....Rising (475 Max)

Note: Monitor engine start time as described in **BURNER CAN STRESS DETECTION**, this section. Continue to monitor EGT until N_2 is stabilized at or 50%.

Start Switch (at 40% N_2).. Release to Off

Note: If the start valve light fails to go out, close respective Eng Pneu X-feed, place the FUEL lever to OFF, and refer to Section 3.

Oil Pressure Low Light... Out

Idle Stabilized - Observe the Following:

- N_1 .... 22-30%
- N_2 .... 50-61%
- EGT.....................................300°C to 480°C Max (420°C-Bleeds Off)
- Fuel Flow.. 600-1100 PPH
- Oil Pressure ....40-55 PSI

Caution: If engine does not accelerate to idle RPM within 120 seconds after start lever on, terminate engine start and initiate maintenance investigation for "Slow to Start."

Note: After starting the -219 engine, if N_2 stabilizes below 50% or EGT continues to rise, either add power momentarily to 65% N_2 (while monitoring EGT) and return to idle (this will close the 13th stage bleed valve) or adjust power as required to maintain N_2 at or slightly above 50%.

Note: Engine must be stabilized at idle before moving the respective pack switch to AUTO.

External Power & Air, APU

Ensure removal of any external connections prior to taxi. If the APU has been used for air conditioning, APU bleed air must be turned off before takeoff. Use of APU in flight is restricted to electrical output only. If take-off is to be made in rain or with water or slush on the runway, the APU should remain on for takeoff with the LEFT and RIGHT APU BUS switches ON. Otherwise, the APU should be turned off.

Burner Can Stress Detection

JT8D-217/217A engines may experience burner can stress which could lead to combustion chamber separation or severe burn through. The following guideline is provided to help Flight Crews detect burner can distress.

- During engine start: time from start of EGT rise until the engine first reaches the normal N_2 idle RPM range should not exceed 40 seconds. A starting time in excess of 40 seconds should not be considered normal and should be written up in the aircraft logbook.

This guideline is not an operational limit and is only intended to trigger maintenance action. The Captain shall use his/her discretion in deciding if a flight should continue if an engine does not perform within the above guideline.

Crossbleed Start

Refer to Powerplant Abnormal Procedures.

Starting Windmilling Engines

Starting in a tailwind is usually successful using normal starting procedures. An exceptionally strong tailwind (in excess of approximately 20 knots) may prevent positive N_1 rotation at a max motoring RPM of 15% to 20% N_2. In this condition the Captain should do one of the following:

- Have the aircraft towed into a position (headwind or crosswind) in which the N_1 rotation stops or is in the correct direction.

  OR

- Have the ground crew verify that both engines are clear of personnel and equipment, then deploy both engine reversers. After approximately two minutes, have the ground crew verify zero N_1 rotation. Prior to starting an engine, verify the reverser is stowed and latched.

Engine Warm-up

Engines shutdown for two hours or less do not require warm-up time prior to takeoff. Engines shutdown for more than two hours should be warmed up (normal taxi operation) for up to 5 minutes prior to takeoff. This will minimize any adverse thermal stresses on the engines. When taxi time is less than 5 minutes, it is not necessary to delay takeoff for warm-up as long as the engines are started at the gate.

Engine Compressor Stall

The compressor stall of an engine is not normal at any time in either forward or reverse thrust. Compressor stalls indicate a malfunction of the engine, such as blade damage or a fuel control unit error, and should be written up in the aircraft logbook.

AFTER START CHECKLIST

The Captain will call for the AFTER START CHECKLIST after the engine(s) have reached a stabilized idle and the headset operator has been cleared to disconnect. The AFTER START CHECKLIST will be completed prior to releasing the brakes for taxi.

F/O CHALLENGE	AFTER START	CAPTAIN RESPOND
Electrical System	®	**CHECKED**
Galley Power, Ignition	®	**ON, OFF**
Engine Anti-Ice, Fuel Heat		**OFF/ON**
Packs & Air Cond Shutoff Sw	®	**AUTO**
Door Lights		**OUT**
Hydraulics	®	**ON & HI, CHECKED**
Cockpit Door, Sterile Light		**LOCKED, ON**
® Engine Restart Items		

F/O CHALLENGE **CAPT RESPOND**

Electrical System................................ ® ....CHECKED

Check both AC generators for allowable voltage and frequency. Return the VOLT/FREQ selector to the BATT AMP position. Scan the AC load meters for proper indications. Verify that all DC load meters indicate some load. Verify that both **CSD OIL** annunciator lights are out and that both CSD oil temperatures are below the yellow band.

If right Engine Restart: only check of right generator/CSD is necessary.

Note: The AC crosstie check is required on the First Flight of the Day only. All electrical buses must be powered by the engine driven generators. If external or APU electrical power is connected, the EXT PWR and APU L and R BUS power switches must be off. The AC X-TIE switch must be in AUTO.

AC Crosstie Check:

L Gen Switch...OFF

Move L GEN switch to OFF. Observe left AC load meter indicates zero and right AC load meter indicates approximately double. Observe **L GEN OFF** light is on, and all **BUS OFF** lights remain out.

L Gen Switch .... ON

Move L GEN switch to ON, observe left AC load meter indication increases, and right AC load meter indication decreases, both showing some load. All electrical system warning and caution annunciators should be off.

R Gen Switch .... OFF

Move R GEN switch to OFF. Observe right AC load meter indicates zero and left AC load meter indicates approximately double. Observe **R GEN OFF** light is on, and all **BUS OFF** lights remain out.

R Gen Switch .... ON

Move R GEN switch to ON. Observe right AC load meter indication increases and left AC load meter indication decreases, both showing some load. All electrical system warning and caution annunciators should be off.

Galley Power, Ignition .... ® .... ON, OFF

Engine Anti-Ice, Fuel Heat .... OFF/ON

Note: Anti-ice should be used during ground operation if outside air temperature is less than 6°C (42°F) and visible moisture is present or dewpoint and outside air temperature are within 3°C (5°F) of each other.

Caution: During ground operation at temperatures below 6°C (42°F) and simultaneous high moisture conditions (rain, sleet, snow or fog), run each engine to as high a thrust as practical (70% N_1 for a minimum of 15 seconds is desired, however, an alternate thrust setting of 60% N_1 for a minimum of 40 seconds is acceptable) every 10 minutes. Prior to takeoff under these conditions, perform an engine run-up as above and observe that EPR, RPM, and EGT indicate normal engine operation.

When icing conditions exist, engine anti-ice will be used for ground operation as well as takeoff. Always check N_1 for a minimum of approximately 90% RPM to assure takeoff power is set. The TRI will automatically adjust the EPR for ice protection. The value displayed on the TRI should be used for all power settings.

Fuel heat will be used by momentary actuation of the L and R FUEL HEAT switches if the indicated fuel temperature is 0°C (32°F) or below. Repeat as necessary. Both fuel heat switches and indicating lights must be Off/Out prior to takeoff.

Packs & Air Cond Shutoff Sw .... ® ....AUTO

Individually move each air conditioning supply switch to AUTO checking the respective AC load meter for an indication of ground blower operation.

If right Engine Restart: only check of right system is necessary.

Note: If the ambient temperature is high, it may be desirable to taxi with the APU supplying one air conditioning system. The left X-Feed valve should be open and the right X-Feed valve closed. This will lessen the need to advance throttles for increased engine bleed air, and reduce brake usage to control taxi speed. When the APU is supplying only bleed air (APU gen off), it can deliver appreciably more air than an idling engine.

Place the air conditioning shutoff switch to AUTO. This will arm the air conditioning circuit so that if an engine failure during takeoff is sensed by the differential pressure switch, both air conditioning packs will be turned off.

Door Lights...OUT

All fuselage doors must be closed prior to powerback and/or taxi. Momentarily press ANNUN/DIGITAL LTS test button to assure door lights work.

Hydraulics .... ® .... ON & HI, CHECKED

The operation of the engine driven hydraulic pumps should be checked. Check that the hydraulic quantities are at the same level as when the receiving aircraft hydraulic check was performed. Check both hydraulic pressure indicators are in the 3000 PSI green arc. Verify that the left and right **HYD PRESS LOW** lights and the left and right **HYD TEMP HI** lights are out. Turn off aux and transfer pump switches and confirm left and right pressure remains at 3000 PSI. Move both engine driven pumps to low and then back to high noting a momentary drop in pressure and a return to 3000 PSI. Return the aux and transfer switches to on.

If right Engine Restart: only check of right engine pump is necessary.

Cockpit Door, Sterile Light .... LOCKED, ON

Verify the flight deck door is closed and locked and secondary mechanical lock is engaged. Pull the door to the closed position and rotate the LOCK-UNLOCK knob to the LOCK position. Lower the safety bar to the latch position and insert locking pin into clevis as shown in the SAFETY BAR OPERATION placard. Make sure the guide pin engages the clip. This is normally accomplished before engine start, but must be completed prior to aircraft movement under its own power.

The sterile cockpit environment exists while the aircraft is moving under its own power and continues until the aircraft has climbed through 10,000 feet. During that time, activities in the flight deck not required for the safe operation of the aircraft are prohibited. (These include logbook entries, PAs, non-essential conversation, etc.) If the light is not installed or inoperative, one chime may be used to signal the end of the sterile period to the flight attendants. Increased traffic vigilance should be maintained through 18,000 feet.

® Engine Restart Items: these must be accomplished after restarting the right engine following single engine taxi.

SINGLE ENGINE TAXI

Note: Single engine taxi is not authorized:

- During conditions of reduced traction for taxi such as standing water, slush, snow, or ice on the field.
- When engine anti-ice is required for takeoff.
- At high gross weights which would require excessive thrust from one engine for taxi.

Normally both engines will be started prior to taxi. If necessary to maintain MIN FUEL for departure, the right engine may be shut down during taxi.

The Captain should consider many factors including aircraft weight, taxiway congestion, proximity to structures, taxiway slope, length of taxi to the runway, etc. Single engine taxi on congested ramps and taxiways is not recommended due to potential jet blast hazards. Exercise caution when resuming taxi after stopping, due to the increased power required to start aircraft rolling.

RECOMMENDED SINGLE ENGINE TAXI PROCEDURE	
APU	OPERATING
APU R GEN BUS Sw	ON
APU AIR Sw	ON
R Air Conditioning Supply Sw	HP BLD OFF
Air Cond Shutoff Sw	OVRD
R Engine FUEL Lever	OFF
L PNEU X-Feed	CLOSED
R PNEU X-Feed	OPEN

Normally, the APU should be providing electrical power and air for single engine taxi. At high ambient temperatures, the APU must be operating and used for air conditioning. Single engine taxi with the APU off requires careful planning. Selection of a crossbleed start area should be carefully coordinated because of increased jet blast.

The **FLIGHT RECORDER OFF** light will be illuminated during single engine taxi or when the parking brakes are set. The **ART INOP** annunciator light will be on during single engine taxi.

The engine should be started prior to takeoff with sufficient time to allow accomplishment of Engine Restart items and adequate warm-up time if required.

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ENGINE RESTART PROCEDURE

Note: This procedure is to be used when restarting the right engine following single engine taxi. Whenever both engines have been shut down, such as during icepad de-icing, the engines should be started using the Engine Start Procedure, this section.

FIRST OFFICER
Perform Engine Restart ® items of BEFORE START checklist
Position R START switch to ON and hold.
Verify increase in N_2.
Verify oil pressure and announce "OIL PRESSURE" when observed.
Verify N_1 rotation prior to positioning fuel lever to on.
At max motoring RPM (no N_2 RPM change for 5 seconds) position fuel lever to on. 20% N_2 RPM is desired, 15% N_2 RPM is minimum.
Verify fuel flow and EGT indication. Monitor engine start time as described in **BURNER CAN STRESS DETECTION**, this section.
At 40% N_2 release engine start switch - verify start valve closes and report "START VALVE CLOSED."
Monitor N_1, N_2, EGT, fuel flow and oil pressure for normal indications as the engine accelerates and stabilizes at idle.
Perform Engine Restart ® items in the AFTER START and TAXI checklists. Announce "Engine Restart Items Complete"

Refer to Engine Start Notes for detailed engine start guidance.

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TAXI CHECKLIST

After the AFTER START CHECKLIST is complete, and the Captain is confident that the area around the aircraft is clear, he/she will call "FLAPS ____, TAXI CLEARANCE". The First Officer will select the required flaps and obtain a taxi clearance.

When clear of congestion, the First Officer may initiate the checks associated with the taxi procedure. The Captain will call for the TAXI CHECKLIST at an appropriate time.

Caution: Outside vigilance during taxi is the responsibility of both pilots. Prior to aircraft movement or flap movement, both pilots should verify that the aircraft is clear of all obstacles.

F/O CHALLENGE	TAXI	F/O RESPOND
Flaps, Slats	**C+F**	**___°, TAKEOFF**
Flight Controls	**C+F**	**CHECKED**
Takeoff Data, Bugs & Trim	**C+F**	**CHECKED, SET**
ABS & Spoilers		**ARMED**
Takeoff Warning	**C+F**	**CHECKED**
Flight Guidance & TRI	**®**	**SET**
Takeoff Briefing, Harness		**COMPLETED, ON**
® Engine Restart Items		

F/O CHALLENGE **F/O RESPOND**

Flaps, Slats.......................................C+F.......................... ___°, TAKEOFF

The flap takeoff selector wheel should be in the stowed position for 11° or 15° flap takeoffs. When departing with other flap settings, rotate the flap takeoff selector wheel until the required degrees of flaps are indicated.

Note: Flap settings between 13 and 15 degrees are designated, "Do Not Use," and will not be selected for takeoff.

Move the flap/slat handle to the appropriate detent. Observe the slat **TAKEOFF** light is on, **SLAT DISAGREE**, **AUTO SLAT**, and **SLAT LAND** lights are out and flap position pointers indicate the required flap setting.

Note: When extending the flaps to a dial-a flap detent, if the detent is passed, the flap/slat handle must be retracted beyond the detent and re-extended to the takeoff detent.

On the ground, it is normal for the **AUTO SLAT** light to come on momentarily when the flap/slat handle is moved from up/ret to any setting commanding a mid-slat position. The **AUTO SLAT** light comes on to indicate slats have momentarily moved to the fully extended position during a self test of the system. The **AUTO SLAT FAIL** light will come on to indicate system failure.

Flight Controls .... C+F ....CHECKED

Ailerons/Spoilers Check

Roll the control wheel full left while observing a dip and recovery on both hydraulic pressure gauges. Confirm **SPOILER DEPLOYED** light is on. Dips and recoveries verify that spoiler panels are extended on the left wing. Roll the control wheel back to the centered position observing another dip and recovery on both hydraulic pressure gauges to verify spoiler panel retraction and **SPOILER DEPLOYED** light is out. Accomplish the same check of the spoilers on the right side. On some aircraft, it may be necessary to move the auxiliary hydraulic pump switch off momentarily to verify Dip and Recovery.

Rudder Check

The Captain will operate the rudder to check for freedom of travel. Hold the nosewheel steering while performing this check to maintain directional control if in motion, or to prevent scuffing the nosewheel tires if parked. A dip and recovery may be noted on the right system hydraulic pressure gauge.

Elevator Power Check

This is a check to determine that the elevator controls are free and normal. It also exercises the hydraulic components of the elevator control system with hydraulic pumps operating to check for leaks. Occasionally, in gusty, quartering or tail winds, the elevator and control tabs may assume an asymmetric position fully against the mechanical stops. If this occurs, the control columns will be blocked. This condition is not abnormal, but will require that the checkout be delayed until the direction or velocity of the airplane with respect to the wind is changed. After heading the airplane into the wind (or taxiing fast enough to cancel any tail wind component), apply pull force to the control column until it moves to the full AFT position. Forces required may be as high as 85 pounds. Determine that the **ELEVATOR PWR ON** light is out. Then, apply full nose down push force to activate the elevator augmentation system. **ELEVATOR PWR ON** light should come on during this part of check.

Takeoff Data, Bugs, & Trim .... C+F ....CHECKED, SET

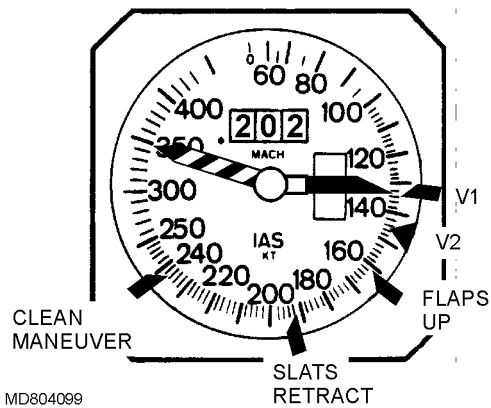
The items in this checklist step should be accomplished as soon as the information is available, normally prior to leaving the gate. Even if accomplished earlier, these items will be re-checked during taxi. Readout of the V-speeds need only be accomplished once.

Review

Review the takeoff data for the correct aircraft number, runway(s), temperature, flap setting, power setting, reduced EPR (if applicable), and verify the correct codes are shown.

Airspeed Bugs

The four airspeed bugs on the outer portion of the airspeed indicator should be set at V_1, flap retract, slat retract and clean minimum maneuver speeds. Cross checking these bugs is difficult. The First Officer should call out the four speeds and the Captain should confirm that his airspeed bugs agree. The internal airspeed command bug should be set to V_2 speed.



ART Switch, Assumed Temperature, TRI

REDUCED THRUST (FLEX T.O.)

Rotate the assumed temperature thumb wheels to the computed assumed temperature in centigrade. Move ART switch to OFF. Push the T.O. FLX button on the TRI.

NORMAL THRUST

Verify ART switch in AUTO. Push the T.O. button on the TRI. Assumed temperature thumb wheels should be set to 00.

MAXIMUM THRUST

Rotate the assumed temperature thumb wheels to 00. Move ART switch to OFF. Push the T.O. button on the TRI. (This setting is used only when ART system is inoperative and a reduced thrust takeoff is not authorized. Logbook entry required.)

Observe the TRI EPR LIM readout shows the EPR allowable for takeoff. Observe the EPR maximum limit indexes on the respective EPR gauges are driven to the same setting as in the EPR LIM readout.

Note: If the EPR maximum limit index bugs have not driven to the EPR limit or thrust computer EPR Lim readout is not in tolerance, set the EPR limit manually on the EPR gauge(s) by pulling EPR set knob (which exposes an upper readout on EPR gauge). Rotate set knob to set desired EPR limit in the upper readout and observe maximum limit index(es) indicate the same as the readout.

TO Cond Display

Rotate the C.G. thumbwheel until the computed C.G. is set in the C. G. readout.

Rotate the flap thumbwheel until the planned takeoff flap setting is in the flap readout. If this setting does not agree with the position of the flap/slat handle, a warning horn will sound when throttles are advanced for takeoff.

Caution: If these indicators are set incorrectly or the data is inadvertently reversed, the longitudinal trim will be incorrect for takeoff.

When the C.G. and flap wheels are positioned correctly, the longitudinal trim index will be displayed in the Long Trim readout.

Stabilizer Trim

Set the Long Trim indicator to the reading displayed in the takeoff condition display. When correctly set, the Long Trim indicator should be directly opposite the Long Trim Takeoff Position indicator. If the two indicators are not within a specified tolerance, the warning horn will sound when the throttles are advanced for takeoff.

Autobrake System & Spoilers .... ARMED

Note: This checklist step applies only to aircraft with autobrake system installed.

Lift Spoiler lever into ARM position. Rotate Auto Brake selector to T.O. and move ARM/DISARM switch to ARM. Check **AUTO SPOILER DO NOT USE** light is off.

If rejected takeoff is initiated above 70 knots (nominal) with flaps at a takeoff setting, nose wheel on ground and throttles retarded, activation of reverse thrust levers will initiate deployment of ground spoilers and full braking will be applied after spoilers are deployed. (Full braking will also occur with manual deployment of ground spoilers.) If initiation speed is less than 70 knots (nominal), automatic braking sufficient to achieve "minimum" deceleration will be applied. In this event manual braking may be required when remaining runway distance is short. Pilot takeover of the brakes is available at any time by applying the brake pedals.

Note: The actual speed switch point is nominally 70 knots ground speed. If an RTO is initiated between 65 to 75 knots, ABS may apply either minimum or maximum braking. Also between 65 and 75 knots, if an RTO is initiated when speed switches within the ABS box are in disagreement a disarm of the ABS will occur. (**ABS**, **AUTOBRAKE FAIL**, and **MASTER CAUTION** lights will illuminate).

Caution: If during a high speed taxi, above 70 knots, the spoilers are deployed, (manually or by thrust reverser, flaps in takeoff and ABS armed) maximum braking may occur.

Note: Operation of the spoilers in the rejected takeoff mode requires the following:
- Anti-skid operational and armed.
- Autobrake system operational, armed, and set to T.O.
- Spoiler system operational with spoiler lever armed.

It is Continental policy that the autobrake system (if operational) will be armed for all takeoffs in ABS equipped aircraft.

For takeoff with a non-operational autobrake system in an ABS equipped aircraft: Set autobrake selector to OFF, and do not arm the spoiler lever. If an RTO is required, the ground spoilers must be manually deployed by squeezing the spoiler lever, lifting to the ARM position, and pulling fully aft into the latch.

Note: This differs from aircraft without automatic RTO ground spoilers where the spoiler lever must be pulled up, fully aft, and up into the latch.

Takeoff Warning............................ C+F .... CHECKED

The Captain will advance both throttles momentarily to check for a takeoff warning horn.

Flight Guidance & TRI .... ® ....SET

Verify that V_2 speed is set. Verify that the initial level off altitude is selected and armed. Press either TO/GA button and confirm **TAKE-OFF**, **TAKE-OFF** annunciated in the roll and pitch windows of both FMAs.

Check that navigation equipment is operating and set for takeoff. All warning flags should be out of view.

Pitch and roll attitude information on the flight director indicator and standby horizon should reflect the aircraft attitude while taxiing.

The compass information displayed beneath the lubber line on the azimuth scale of the course indicators should agree with the opposite RMI's. Electric compasses should agree within 4° of each other and within 10° of the standby magnetic compass.

Set the course arrow and heading marker as required for the departure clearance.

Verify T.O. or T.O. FLX is selected on the TRI.

Takeoff Briefing, Harness ....COMPLETED, ON

Prior to the first leg of the trip series, the Captain will conduct a complete departure briefing. This briefing should include, but not necessarily be limited to, a review of the following areas:

- Adverse weather and adverse runway conditions
- Crew coordination in the event of a rejected takeoff
- Discussion of any unusual, non-standard, or abnormal conditions which might affect the safety of the flight
- Terrain considerations
- Determination of the transition altitude

When practical, it is recommended that as much of the takeoff briefing as possible be completed at the gate or earlier.

For subsequent flights with the same crew, the briefing may be substantially abbreviated. However, any changes or items peculiar to the specific departure should be thoroughly reviewed.

The shoulder harness must be used for takeoff.

® Engine Restart Items: These must be accomplished after restarting the right engine following single engine taxi.

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TAXI NOTES

General

Airplane response to thrust change is slow, particularly at high gross weights. Idle thrust is adequate for taxiing under most conditions. A slightly higher thrust setting is required to start taxiing. Allow time for aircraft response to each thrust change.

To initiate taxi, release brakes, smoothly increase thrust to minimum required for the airplane to roll forward (normally a maximum of 1.2 EPR) and reduce thrust to idle. Do not start a turn until sufficient forward speed has been attained to carry the airplane through the turn at idle thrust.

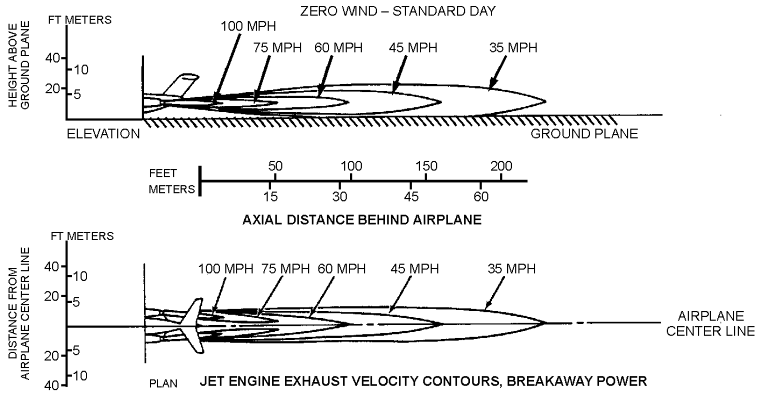
Thrust use during ground operation demands sound judgment and technique. The air blast effects from the high bypass engines at relatively low thrust can be destructive and cause injury. Avoid following other airplanes too closely. Jet blast is a major cause of foreign object damage.

The tendency is to taxi faster than desired. This is especially true during runway turnoff after landing. The appropriate taxi speed will depend on turn radius and surface condition. Nose wheel scrubbing indicates excessive steering angle and/or taxi speed for surface condition. The normal straight away taxi speed should not exceed approximately 25 knots. Speeds in excess of this, when combined with long taxi distances, cause heat buildup in tires. When approaching a turn, speed should be slowed to the appropriate speed for the conditions. On a dry surface, use approximately 8 - 12 knots.

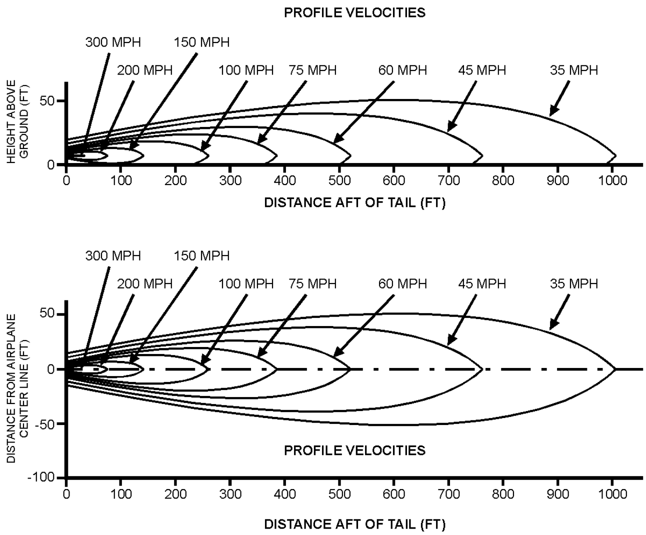
Note: To preclude engine FOD, the recommended maximum taxi speed is 20 knots.

Note: Use of reverse thrust is not authorized during taxi. At low speeds the reverse thrust can cause loose objects on the taxiway to be ingested causing FOD.

Do not be diverted from the primary task of safely taxiing the airplane. The flight crew should avoid all unnecessary activity and duties (including paperwork) that can be accomplished at another time.



JET ENGINE EXHAUST VELOCITY CONTOURS, BREAKAWAY POWER



JET ENGINE EXHAUST VELOCITY CONTOURS, TAKEOFF POWER

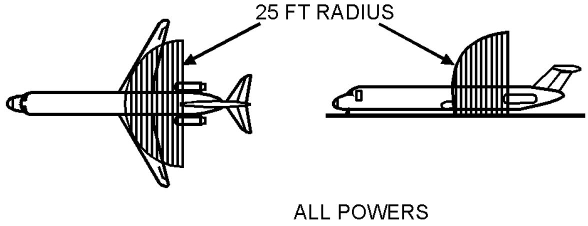
NOTES:
1. THESE CONTOURS ARE TO BE USED AS GUIDELINES ONLY SINCE OPERATIONAL ENVIRONMENT VARIES GREATLY- OPERATIONAL SAFETY ASPECTS ARE THE RESPONSIBILITY OF THE USER/PLANNER
2. ALL VELOCITY VALUES ARE STATUTE MILES PER HOUR
3. CROSSWINDS WILL HAVE CONSIDERABLE EFFECT ON CONTOURS
4. SEA LEVEL STATIC-STANDARD DAY- ZERO RAMP GRADIENT
5. BOTH ENGINES AT SAME THRUST

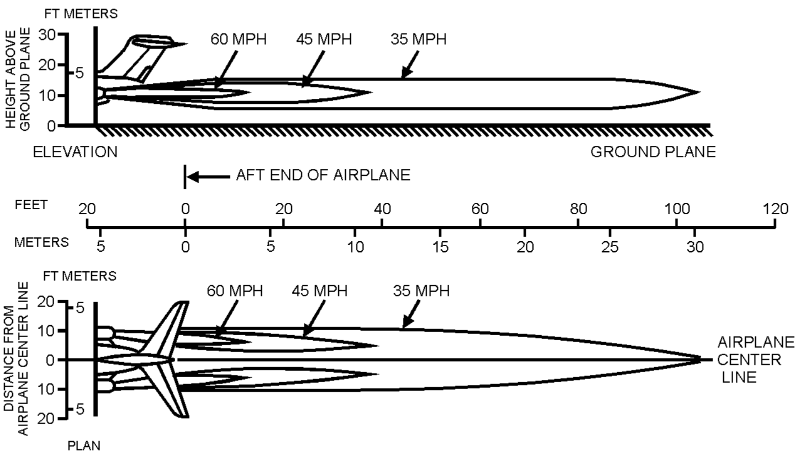
MD804082

JET ENGINE EXHAUST VELOCITY CONTOURS

ENGINE - RESTRICTED AREAS

JT80 Series 200 Engines

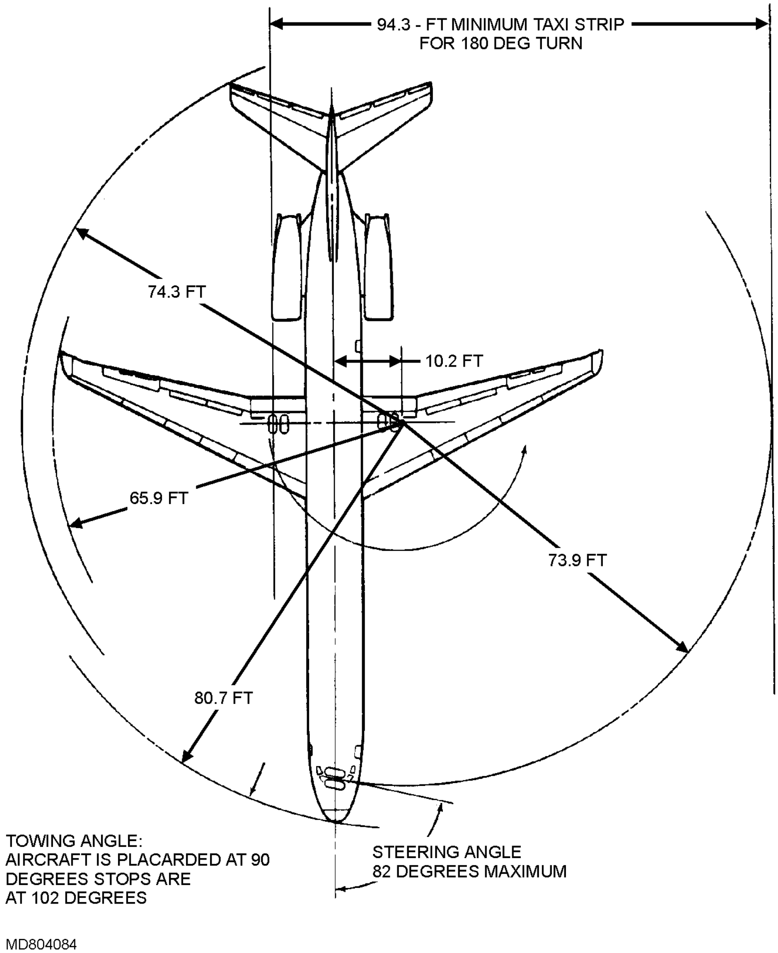




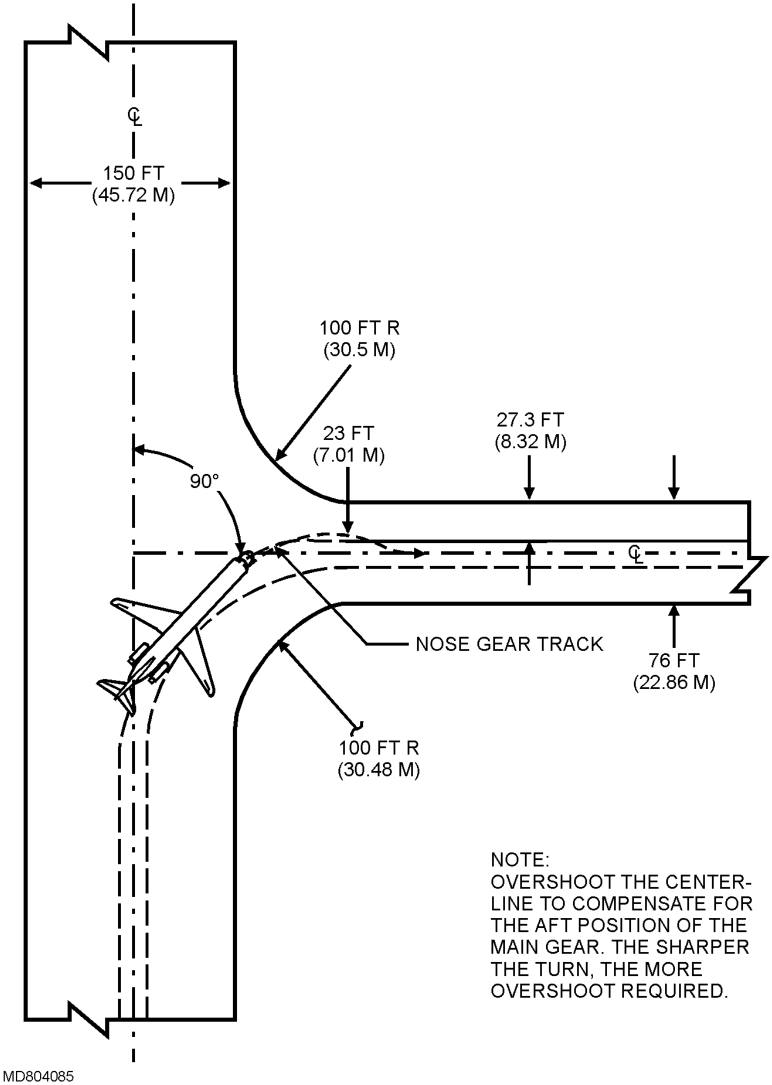
JET ENGINE EXHAUST VELOCITY CONTOURS, IDLE POWER

NOTES:
1. THESE CONTOURS ARE TO BE USED AS GUIDELINES ONLY SINCE OPERATIONAL ENVIRONMENT VARIES GREATLY- OPERATIONAL SAFETY ASPECTS ARE THE RESPONSIBILITY OF THE USER/PLANNER
2. ALL VELOCITY VALUES ARE STATUTE MILES PER HOUR
3. CROSSWINDS WILL HAVE CONSIDERABLE EFFECT ON CONTOURS
4. SEA LEVEL STATIC-STANDARD DAY- ZERO RAMP GRADIENT
5. BOTH ENGINES AT SAME THRUST

MD804083



TURNING RADII



MD-80 TAXI TURNING PATH

Tight Gate Positions

Taxiing out of tight gate positions poses a special problem in congested ramp areas because of the location of the engines and the jet blast danger area aft of the tail. Great care on the part of the Captain is necessary to avoid jet blast damage to other aircraft, ground support equipment, large windows, concourse structures, etc.

- Advance throttles to a maximum of 1.2 EPR.
- Retard the power as soon as possible after the aircraft starts to taxi.
- If tight turns are required in a restricted area, leave power on until the point where the jet blast area could cause a problem, then close throttles. This should provide sufficient momentum to sustain taxi-out of the congested area.

If this much thrust will not move the airplane in tight gate areas where there is exposure to jet blast damage, the Captain will close the throttles and request tow-out.

Nosewheel / Rudder Pedal Steering

Note: At start of taxi, allow airplane to move forward prior to initiating any maximum nosewheel turning angle. Under conditions of uneven ramp surface, positioning of nosewheels to maximum turning angle prior to forward motion can result in nosewheels being forced beyond 82° steering range causing a mechanical overcenter steering lock condition; maintenance action is then required to reposition nosewheels within normal steering envelope. This condition can also occur if nosewheels are left at maximum towing angle when terminating a towing action.

Maintain a positive pressure on the nose steering wheel in both directions to prevent the nose gear from returning to center abruptly. Straight ahead steering and large radius turns may be accomplished with rudder pedal steering only. If nose wheel “scrubbing” occurs while turning, reduce steering angle and/or taxi speed. Differential thrust may be required for heavy airplanes during tight turns but should only be used as required to maintain the desired speed in the turn. Center the nose wheel and allow the airplane to roll straight ahead to relieve stress on the main and nose gear structure prior to stopping after completing a turn. Avoid stopping the airplane in a turn as excessive thrust will be required to start taxiing again.

Brakes

Avoid riding the brakes to control taxi speed as brake heat buildup could become excessive. If taxi speed is too high, reduce speed with a steady brake application and then release brakes to allow them to cool. Continuous braking should be avoided. Allow for decreased braking effectiveness on slick surfaces.

Taxiing In Reduced Visibility

Caution must be exercised when taxiing in conditions of reduced visibility. The crew should familiarize themselves with the airport taxiways, intersecting runways, and any obstructions which may be a hazard to safety. The crew should not hesitate to discontinue taxiing if any doubt exists about the aircraft's location on the field. If the Captain does stop the aircraft, the First Officer must notify ground control so any approaching aircraft can be notified.

Outside vigilance by both crew members is paramount when taxiing in conditions of reduced visibility. If possible, checklists should be accomplished while the aircraft is not moving and the parking brake is set. While taxiing, utilize the Jeppesen airport diagrams to the maximum extent possible. If confusion exists, ask for clarification from ground control. When cleared for takeoff, ensure that the correct runway is being used.

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BEFORE TAKEOFF CHECKLIST

The Captain will call for the BEFORE TAKEOFF CHECKLIST when cleared onto the active runway. Exterior lights will be delayed until on the runway and cleared for takeoff.

F/O CHALLENGE	BEFORE TAKEOFF	F/O RESPOND
Cabin PA		**COMPLETED**
APU Air, Pneumatic X-Feeds		**OFF, CLOSED**
Ignition		**OVRD / CONTIN**
Annunciator Panel & Brake Temperatures		**CHECKED**
TCAS		**TARA**

F/O CHALLENGE **F/O RESPOND**

Cabin PA ....COMPLETED

Normally, the First Officer will make the takeoff announcement using the following phraseology:

"FLIGHT ATTENDANTS, PLEASE BE SEATED FOR DEPARTURE."

Note: On some aircraft, when either the handset or hand microphone PA is activated, both flight deck overhead speakers are muted. Special attention must be made to hear incoming radio transmissions.

APU Air, Pneumatic X-Feeds ....OFF, CLOSED

APU bleed air must be turned off before takeoff. Normally the APU should be shut down prior to takeoff. Use of APU inflight is restricted to electrical output only.

If takeoff is to be made in rain or with water or slush on the runway, the APU should remain on for takeoff with the Left and Right APU bus switches on.

Pneumatic crossfeeds must be closed for takeoff.

Ignition...OVRD / CONTIN

Note: On aircraft so equipped, select GRD START & CONTIN.

Annunciator Panel & Brake Temperatures.............................. CHECKED

The **RUDDER TRAVEL UNRESTRICTED** light must be On. All other panel lights should be out except those of an advisory nature.

Observe the brake temperature **OVHT** light is out and that all brake temperatures are below 205°C.

TCAS.. TARA

Selecting the Transponder/TCAS to any mode other than STBY activates the Predictive Windshear function of the radar.

TAKEOFF NOTES

Exterior Lights

The exterior lights will be illuminated after takeoff clearance is received as a signal to other aircraft that you have been cleared for takeoff and are beginning takeoff roll. The use of ground flood lights and/or landing lights below 18,000 ft. MSL is recommended.

Reduced Thrust Takeoff

Reduced thrust takeoffs using the Assumed Temperature method are the normal procedure whenever performance limits and noise abatement procedures permit. Reduced thrust takeoffs lower EGT which will extend engine life.

Load planning will relay the assumed temperature to the flight deck. This temperature will be the most restrictive of the runway limit or climb limit weight (line 7 of ACCULOAD) with 2000 pounds added to allow for last minute passengers and bags.

Note: By referencing the Pilot Weight Manifest ATOGW and comparing it to the ACCULOAD Runway Analysis, the crew may determine that a higher assumed temperature takeoff may be available.

Reduced takeoff thrust is to be used by Continental Airlines on all takeoffs as standard operating procedure. If conditions are encountered during the takeoff where additional thrust is desired such as a temperature inversion, windshear or engine failure, the crew should not hesitate to advance thrust.

Do not used reduced thrust under the following conditions:

- Auto ground spoilers inoperative (landing mode)
- Inboard ground spoilers system inoperative
- Right engine hydraulic pump inoperative
- Approach idle control system fails to high idle
- The ART switch in AUTO
- 219 + 217 Engine intermix
- Low altimeter setting (less than 29.72)
- After application of de-ice / anti-ice fluids
- Reported or suspected windshear
- Standing water, slush, snow, or ice on runway
- Combination of wet runway and tailwind.

Intersection Takeoff

The Runway Analysis Data section of the departure paperwork now routinely includes intersection departure data. The intersections are denoted by the runway and intersection identifier in the Takeoff Gross Weights (TGW) section, i.e. 05 H* (Runway 5 at Intersection Hotel). The * in the TGW section means there is a remark at the end of the Gross Weights section. For an intersection takeoff the remark provides you with the Runway Remaining Distance from that intersection. Runway Slope has been recalculated for each runway/intersection combination.

219 Engines & Engine Intermix: 219+217A Or 219+217

Aircraft 842, 843, 878, 879, 892, 893, 894, and 895 have 219 engines which are trimmed and operated the same as 217A engines.

219+219, or 219+217A

Power setting procedures are the same as for two 217A engines with the exception that the Denver Bump procedure is not authorized.

219+217

Denver Bump procedure not authorized. Reduced Thrust not authorized. Autothrottles must be off for takeoff. Set EPR bugs manually if required.

217 engine: Set to 217 normal or maximum EPR as required.

219 engine: □1300 Feet MSL or □-7°C:
Normal power: 217 EPR + .02
Maximum power: 217 EPR

>1300 Feet MSL and <-7°C
Ops Engineering must provide takeoff data.
Normal power: Set EPR to 2.04
Maximum power: Set EPR to 2.08

Note: When two 219 engines are installed and used at 217 thrust levels, the ART system must be turned off and Maximum power used.

Takeoff Warning Horn

The takeoff warning horn and/or vocal warning will alert the flight crew of any of the following conditions if the aircraft is on the ground and either throttle is advanced:

- Parking brakes are set
- Flap lever position does not agree with FLAP setting in TO COND display
- Slats not extended to takeoff position
- Speedbrake handle not in the retracted position
- Stabilizer setting not in agreement with LONG TRIM setting in TO COND display
- **ABS FAIL** light on or ABS not armed with AUTO BRAKE selector at TO
- Spoiler Lever not in armed position with ABS armed and AUTO BRAKE selector at TO

If the takeoff warning horn sounds when throttles are advanced for takeoff prior to reaching 100 kts., the takeoff will be rejected, unless the Captain determines that continuing the takeoff is a safer course of action under the conditions.

If takeoff is rejected, the cause of horn activation must be corrected prior to attempting another takeoff. If takeoff is continued, the cause must be determined and corrected or the flight should return to the airport of departure, unless the Captain determines a safer course of action is required.

"DENVER BUMP" TAKEOFF PROCEDURE

Note: The "Denver Bump" takeoff procedure is authorized at Denver International Airport, Denver, Colorado only. It can be performed with a tailwind (up to 10 knots) providing the appropriate performance penalty is applied.

General Description

The "Denver Bump" is a takeoff made with 217A engines set at an increased maximum takeoff thrust setting. This increased power, and Optimum takeoff flap setting, allow takeoff from Denver at high ambient temperatures and high gross weights. Denver Bump is not authorized for 219 engines derated to 217A power (Aircraft 842, 843, 878, 879, 892, 893, 895).

Crew Procedures

The "Denver Bump" is required when the code "M" appears in line 9 of the takeoff data. The flight crew will determine the Denver Bump takeoff and go-around EPR setting from the QRH or Section 5 of the Flight Manual.

- Pull out on the EPR set knobs and manually set the "Denver Bump" takeoff EPR in the upper window of both EPR gauges. The EPR set knobs will remain in manual until 1000 ft. AGL.
- Turn the ART switch off.

  Note: The **ART INOP** annunciator light will illuminate during slat/flap extension

- Do not use the autothrottles for takeoff. Takeoff thrust must be manually set to the preset value.
- At 1000 ft. AGL, reset both EPR gauges to their normal/automatic position by pressing the EPR set knobs in. Turn the autothrottle switch On. Check climb power is selected on TRI and push EPR Lim button if necessary.
- Continue with the noise abatement profile.
- Make an advisory note in the maintenance log (example: Flt 202, DEN-PHL, Denver bump thrust).

  Note: All engine parameters/limitations remain the same during the "Denver Bump" procedure.

TAKEOFF PROCEDURES

Setting Takeoff Thrust

When setting takeoff power in the MD-80, the PF should move the throttles to the vertical position to achieve a stable indication of approximately 1.4 EPR (70% - 80% N_2). If autothrottles are to be used for takeoff, the PF will call out "Autothrottles On" and the PM will move the ATS switch to AUTO THROT. The PF will follow-up the throttles to ensure symmetric thrust during engine spool-up. If autothrottles will not be used for takeoff, the PF will advance the throttles in a rapid but smooth manner to takeoff EPR making final EPR adjustments by 60 knots. In either case, the PF will call out "Check Power" and the PM will note the indicated N_1 values when takeoff power is set and call out "Power Set, ___%." (N_1 will normally range from 80% to 95% but may be as low as 75%) No adjustments should be made after 60 knots unless engine parameters are exceeded. All takeoff performance is based on having takeoff power set by 60 knots. After takeoff power is set, the Captain will guard the throttles for all takeoffs. All engine indications including EPR, RPM, fuel flow, and EGT should be monitored to determine if the engine is producing proper thrust. An iced-over PT_2 probe would result in erroneous EPR indications, with a resulting lower thrust than indicated by the EPR gauge.

Note: When temperatures are low and engine anti-ice is on for takeoff, cross check the "MINIMUM N_1 FOR TAKEOFF" chart in Section 5 or the QRH.

The PM should cross check the thrust setting annunciated in the thrust window of the FMA. Particular attention should be paid to confirming that the **CLAMP** mode is annunciated at approximately 60 knots.

If **CLAMP** is not annunciated by 60 kts, the PM will call out "NO CLAMP." The autothrottles should be disconnected with either throttle switch and the throttles set manually.

Caution: In strong headwinds, or in a combination of headwinds and a rolling takeoff, the autothrottles may clamp prematurely. Pilots should be alert to this possibility and be prepared to advance the throttles manually to the takeoff EPR limit if required.

Caution: During takeoff, the Digital Flight Guidance Computer (DFGC) engine failure logic is armed if (1) the flight director pitch axis is in takeoff mode, (2) the aircraft is above 400 feet radio altitude, and (3) both engine pressure ratios (EPR's) are below the go-around EPR limit. If the DFGC detects an EPR drop greater than or equal to 0.25 EPR and 7% N_1 from the same engine, as compared to the other engine, the engine failure logic is satisfied and the DFGC will change the Thrust Rating Indicator thrust limit to Go-Around (GA). This will cause the autothrottle system to unclamp and enter normal EPR limit (EPR LIM) mode where the throttles will maintain the higher engine EPR at the selected go-around thrust rating EPR LIM. Such an EPR and N_1 drop may also result from an engine surge (stall). Advancing thrust levers on a surging engine will hinder surge recovery and may result in eventual engine failure.

If an engine surge (stall) is detected during takeoff:

1. Disconnect autothrottles.
2. Reduce thrust on affected engine (idle if necessary).
3. Shut down the affected engine if surging and popping continues.
4. If affected engine surging or popping stops, accomplish the following:
   A. Place ignition switch to A or B (GRD START and CONTIN).
   B. Place ENG anti-ice switches to ON.
   C. Place PNEU X-FEED VALVE lever OPEN on affected side.
   D. Place AIR FOIL anti-ice switch(es) ON.
   E. Advance affected throttle slowly.
5. If engine surging or popping returns, turn the Eng anti-ice switch OFF.
6. After normal operation has been established, the autothrottles may be re-engaged.

   Note: A **NO MODE** light may be annunciated due to abnormal bleed configuration.

Takeoff Roll

As the aircraft taxis into position for takeoff, the turn should be made to align the runway centerline under the nose wheel. If this alignment is not achieved at the turn-on, the takeoff should be commenced from off center and alignment made during initial takeoff roll. The turn onto the runway should be made so as not to impose excessive side load on the gear struts.

Note: After initial alignment with the runway centerline, use of the rudder/pedal nose wheel steering is recommended.

Pilot Monitoring

- After the initial adjustment of the throttles and a cross check of the pilot's engine instruments, the PM should continue to monitor the instruments. The PM will call out "POWER SET ___%," "100 KNOTS," "V_1," "ROTATE," as they are attained. The V_1 call will be initiated approximately 5 knots prior to the actual V_1 speed and completed at the actual V_1 speed.
- The PM should call out any malfunction.

Pilot Flying

- The pilot flying should gradually relax forward pressure on the control column, so as to arrive at V_R prepared to rotate.
- At V_1, place both hands-on the control wheel. At V_R, rotate smoothly and continue rotation after lift-off to takeoff attitude. Normal rotation takes 5 to 6 seconds from start of rotation. At lift-off, the airplane will have an 8° pitch. Both early and late rotation will increase takeoff distance, thereby invalidating takeoff field length computations.
- Abrupt control application must be avoided during lift-off in order to preclude striking the tail which will occur at 10.5°. Normal rotation rate is approximately 2-3 degrees per second.

After lift-off, climb at V_2 + 10. Speeds greater than V_2 + 10 may be required to keep the pitch attitude below 20° ANU.

Crosswind Takeoff

The crosswind takeoff characteristics of the aircraft are typical of most swept-wing transports. Preset some aileron into the wind and use the rudder pedal steering for directional control. Avoid use of too much wheel throw since drag producing spoilers start extending at 5° control wheel input. Rotate normally, holding crossed controls, increasing wheel input slightly as required at rotation. After lift-off, smoothly transition to coordinated use of aileron and rudder while maintaining wings level. Remember:

1. Swept-wing, high-tail aircraft have a tendency to weathercock on the ground and to heel over at rotation.
2. Forward pressure on the yoke assists in maintaining control.
3. On slippery runways, hold the nose wheel straight with steering wheel while applying rudder for crosswind control.

Rotation and Liftoff

Because the airplane is geometrically limited, it cannot be rotated to a body angle that will prevent it from becoming airborne with takeoff thrust. Premature rotation will probably result in the airplane becoming airborne before the normal liftoff point, and at a slower than normal speed. Since this speed will be considerably below the best angle of climb speed, the initial climb profile may be greatly reduced.

The airplane has a very low angle of attack on the ground in the three-point attitude. Delaying rotation (waiting for the airplane to “Fly Itself” off the ground) will increase the liftoff distance considerably.

The airspeed indicator will lag momentarily during rotation due to the vertical movement of the static ports relative to the direction of flight as the nose is lifted.

The airplane will attain V_2 + 10 approximately 35 feet above the runway.

Gear retraction will not be initiated until a positive rate of climb has been verified on the IVSI and altimeter, and called by either pilot. Until ground effect pressure is dissipated, there may be a slight delay for these instruments to read correctly. Gear will be raised by the pilot not flying. Gear retraction temporarily increases the airplane drag while the doors are open.

Do not apply brakes after becoming airborne. Main gear braking at reduced pressure is automatically applied when the landing gear retracts and nose tires have spin brakes in the wheel well.

Maintain takeoff pitch attitude by holding the aircraft at a pitch attitude that satisfies the command bar presentation on the ADI (20° Max ANU).

The command bars are programmed to present a pitch command that results in an airspeed of V_2 + 10.

Loss of an engine at V_2 + 10 will cause a rapid decay in airspeed requiring an immediate elevator input to maintain V_2 airspeed.

Refer to Engine Failure After V_1, Section 2.

Noise Abatement

Maintain a pitch attitude to satisfy the command bars (20° Max ANU).

At 1000 feet AGL, the PF calls "HALF RATE, SPEED 250 (or SPEED TOP BUG)." The PM rolls the vertical speed wheel to approximately 1200 feet per minute and rotates the speed select knob (salmon bug) to 250 (or top bug) knots.

At flaps up speed, the PF calls "FLAPS UP, CLIMB POWER." The PM raises the flaps and presses the CL button on the TRI, verifying that the autothrottles reduce to climb power.

At slat retract speed, the PF calls "SLATS RETRACT, AFTER TAKEOFF CHECKLIST." The PM retracts the slats and completes the AFTER TAKEOFF CHECKLIST. The autopilot may be turned on at this time.

At clean maneuver speed (O/retract min. maneuvering), the PF calls "IAS HOLD." At this time, the bank angle selector may be reset to 25-30 degrees.

At 3,000 feet AGL:

> 904 Computer: Decrease rate of climb by rolling the vertical speed wheel. Push IAS HOLD button at 250 KIAS and ensure **IAS** is annunciated in the pitch window of the FMA.
>
> 906 and Subsequent Computers: Roll vertical speed wheel until **S 250** is displayed.

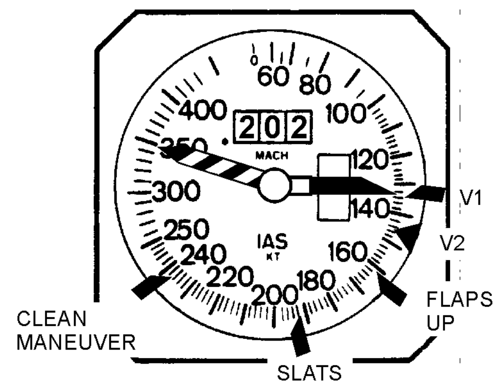
The PM will complete the AFTER TAKEOFF checklist when time and conditions permit. Do not allow accomplishment of the checklist to interfere with outside vigilance during departure.

Note: Safety is of primary concern when following the noise abatement profile. Pilot judgment will remain as the overriding factor in determining whether or not the noise abatement procedure will be strictly adhered to, based upon flight conditions encountered.

MANEUVERING

Use of Takeoff Speeds

At 1000 feet AGL on the takeoff profile, call “HALF RATE, SPEED 250” and accelerate towards the 0° FLAPS/RET maneuvering speed (clean min maneuvering) represented by the top bug. Retract the flaps and then the slats at their respective speeds.



Maneuvering Capability

The maximum angle of bank for normal operations is 30°. Maneuvering airspeed is the minimum airspeed for a particular flap/slat configuration which safely allows 30° of bank with an additional 15° of bank available before stickshaker activation.

After takeoff, with slats extended, flaps at the takeoff setting, and speed at V_2 + 10 knots or greater, 30° of bank is permitted. When flaps and slats are retracted on schedule at their respective retraction speeds, bank angle must be limited to 15° until achieving clean minimum maneuver speed. If more than 15° of bank is required during flap/slat retraction, delay flap retraction until attaining slat retract speed and delay slat retraction until attaining clean minimum maneuver speed.

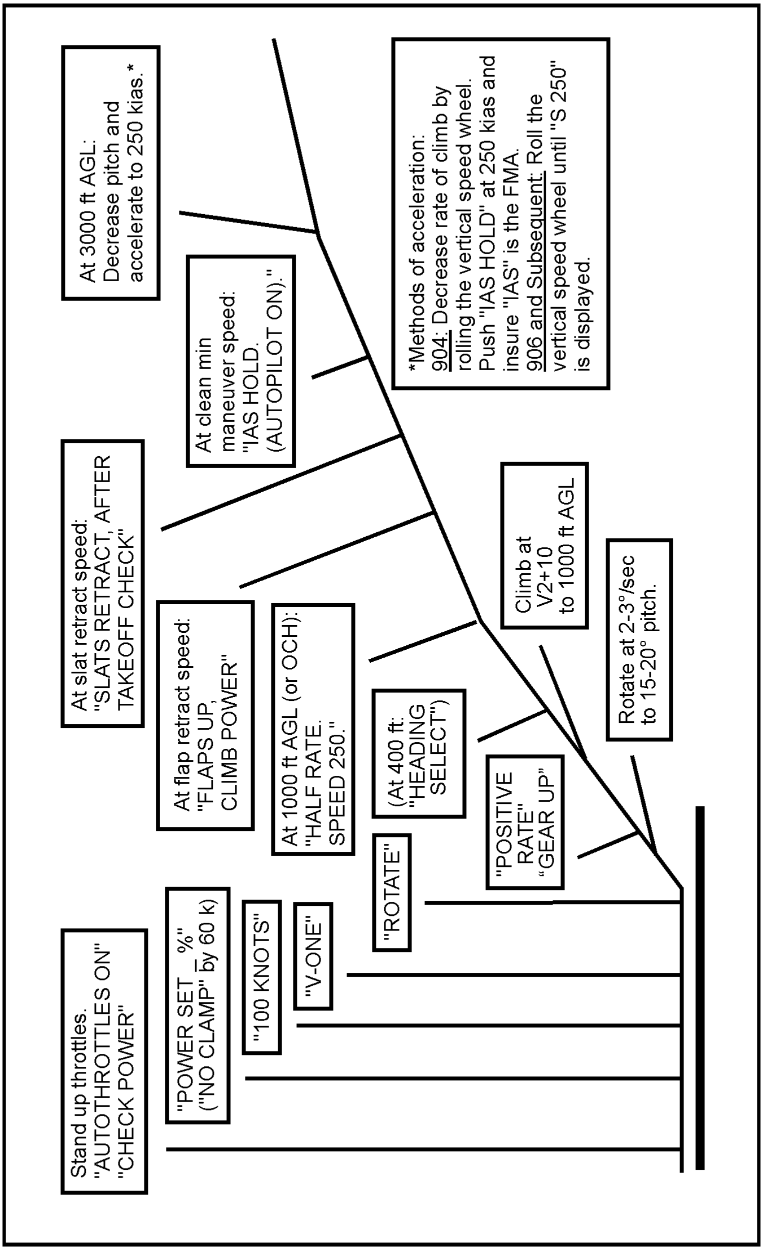
<u>Caution</u>: For after takeoff cleanup, limit bank angle to 15° until minimum maneuvering speed for the existing flap/slat configuration. With less than minimum maneuvering speed for the next configuration, delay clean-up if bank angle greater than 15° is a priority or conversely limit bank angle to 15° if acceleration is the priority.

TAKEOFF PROCEDURE CHART
STANDARD NOISE ABATEMENT PROFILE (ICAO B)

PHASE OF FLIGHT	PILOT FLYING DUTIES/CALLOUTS	PILOT MONITORING DUTIES/CALLOUTS	FMA DISPLAY	NOTES
Cleared on to active runway	(Captain) • Call for "BEFORE TAKEOFF CHECKLIST."	(First Officer) • Complete Before Takeoff Procedure and Read Checklist.	ALT, TAK OFF, TAK OFF	
Cleared for takeoff	• Advance throttles to 1.4 EPR and allow to stabilize. • Call "AUTOTHROTTLES ON." • Call "CHECK POWER."	• Monitor engine instruments. • Engage autothrottles. • Call "Power Set ___%"(N_1)	EPR T/O, ALT, TAK OFF, TAK OFF	If F/O takeoff, at "CHECK POWER" call, the Captain will assume control of the throttles.
60 knots to V_1	• Verify airspeed at 100 knots call.	• Call "100 KNOTS." • Monitor instruments and warning lights.	CLMP, ALT, TAK OFF, TAK OFF	PM call "NO CLAMP" (if reqd.)
V_1, V_R, Rotation and Liftoff	• Captain remove hand from throttles at "V_1" call. • PF place both hands on control wheel. • Rotate at V_R. • Call "POSITIVE RATE." • Call "GEAR UP."	• Call "V_1." • Call "ROTATE." • Call "POSITIVE RATE." • Retract gear on command.	CLMP, ALT, TAK OFF, TAK OFF	Call "V_1" at V_1 - 5 knots. Rotate at normal rate of 3°/second. Verify positive rate on both VSI and altimeter.
400 feet AGL	• Call "HEADING SELECT" if turn is required.	• Set/Check heading bug and pull heading select knob.	CLMP, ALT, HDG SEL, TAK OFF	Turns are not normally initiated below 400 feet AGL.
1000 feet AGL	• Call "HALF RATE, SPEED 250." • At flap retract speed, call "FLAPS UP, CLIMB POWER." • At slat retract speed, call "SLATS RETRACT, AFTER TAKEOFF CHECK." • At clean maneuvering speed, call "IAS HOLD."	• Roll the vertical speed wheel to approximately 1,200 fpm. • Rotate the speed select knob (salmon bug) to 250 knots. • Retract flaps on command and select "CL" on TRI. Verify that the autothrottles reduce to climb power. • Retract slats on command. • Complete the After Takeoff procedure and read the checklist. • Select IAS HOLD. • Bank angle may be set to 30°	CLMP, ALT, HDG SEL, TAK OFF EPR CL, ALT, HDG SEL, VERT SPD EPR CL, ALT, HDG SEL, IAS	If initial level off altitude is 3000 feet or less (in an airport traffic area), PF call "HALF RATE, SPEED TOP BUG." Autopilot will normally be engaged after slats are retracted.
3000 feet AGL	• Accelerate to 250 KIAS.	• Maintain outside vigilance.	EPR CL, ALT, HDG SEL, VERT SPD EPR CL, ALT, HDG SEL, IAS or EPR CL, ALT, HDG SEL, IAS	904 Computer: Decrease rate of climb by rolling the vert speed wheel. Push "IAS HOLD" at 250 KIAS and ensure "IAS" is annunciated. 906/Sub Computer: Roll the vert speed wheel until "S250" is displayed above the wheel.

TAKEOFF PROCEDURE CHART
ALTERNATE NOISE ABATEMENT PROFILE (ICAO A)

PHASE OF FLIGHT	PILOT FLYING DUTIES/CALLOUTS	PILOT MONITORING DUTIES/CALLOUTS	FMA DISPLAY	NOTES
Cleared on to active runway	(Captain) • Call for "BEFORE TAKEOFF CHECKLIST."	(First Officer) • Complete Before Takeoff Procedure and Read Checklist.	ALT | TAK OFF | TAK OFF	
Cleared for takeoff	• Advance throttles to 1.4 EPR and allow to stabilize. • Call "AUTOTHROTTLES ON." • Call "CHECK POWER."	• Monitor engine instruments. • Engage autothrottles. • Call "POWER SET ___%"(N_1)	EPR T/O | ALT | TAK OFF | TAK OFF	If F/O takeoff, at "CHECK POWER" call, the Captain will assume control of the throttles.
60 knots to V_1	• Verify airspeed at 100 knots call.	• Call "100 KNOTS." • Monitor instruments and warning lights.	CLMP | ALT | TAK OFF | TAK OFF	PM call "NO CLAMP" (if reqd.)
V_1, V_R, Rotation and Liftoff	• Captain remove hand from throttles at "V_1" call. • PF place both hands on control wheel. • Rotate at V_R. • Call "POSITIVE RATE." • Call "GEAR UP."	• Call "V_1." • Call "ROTATE." • Call "POSITIVE RATE." • Retract gear on command.	CLMP | ALT | TAK OFF | TAK OFF	Call "V_1" at V_1 - 5 knots. Rotate at normal rate of 3°/second. Verify positive rate on both VSI and altimeter.
400 feet AGL	• Call "HEADING SELECT" if turn is required.	• Set/Check heading bug and pull heading select knob.	CLMP | ALT | HDG SEL | TAK OFF	Turns are not normally initiated below 400 feet AGL.
1000 feet AGL (1500 AGL when compliance with ICAO A profile is required by CAL 10-7 page.)	• Call "CLIMB POWER." • Climb to 3000 feet AGL at V_2+10-25	• Select "CL" on TRI. Verify that the autothrottles reduce to climb power.	EPR CL | ALT | HDG SEL | TAK OFF	If initial altitude restriction is below 3000 feet, acceleration and flap retraction is permissible. IAS mode may be used to control speed. Autopilot may be engaged after climb power is selected.
3000 feet AGL	• Call "HALF RATE, SPEED 250." • At flap retract speed, call "FLAPS UP." • At slat retract speed, call "SLATS RETACT, AFTER TAKEOFF CHECK." • At 250 KIAS, call "IAS HOLD."	• Roll the vertical speed wheel to approximately 1,200 fpm. • Rotate the speed select knob (salmon bug) to 250 knots. • Retract flaps on command. • Retract slats on command. • Complete the After Takeoff procedure and read the checklist. • Select IAS HOLD. • Bank angle may be set to 30°. • Maintain outside vigilance.	EPR CL | ALT | HDG SEL | VERT SPD EPR CL | ALT | HDG SEL | IAS	



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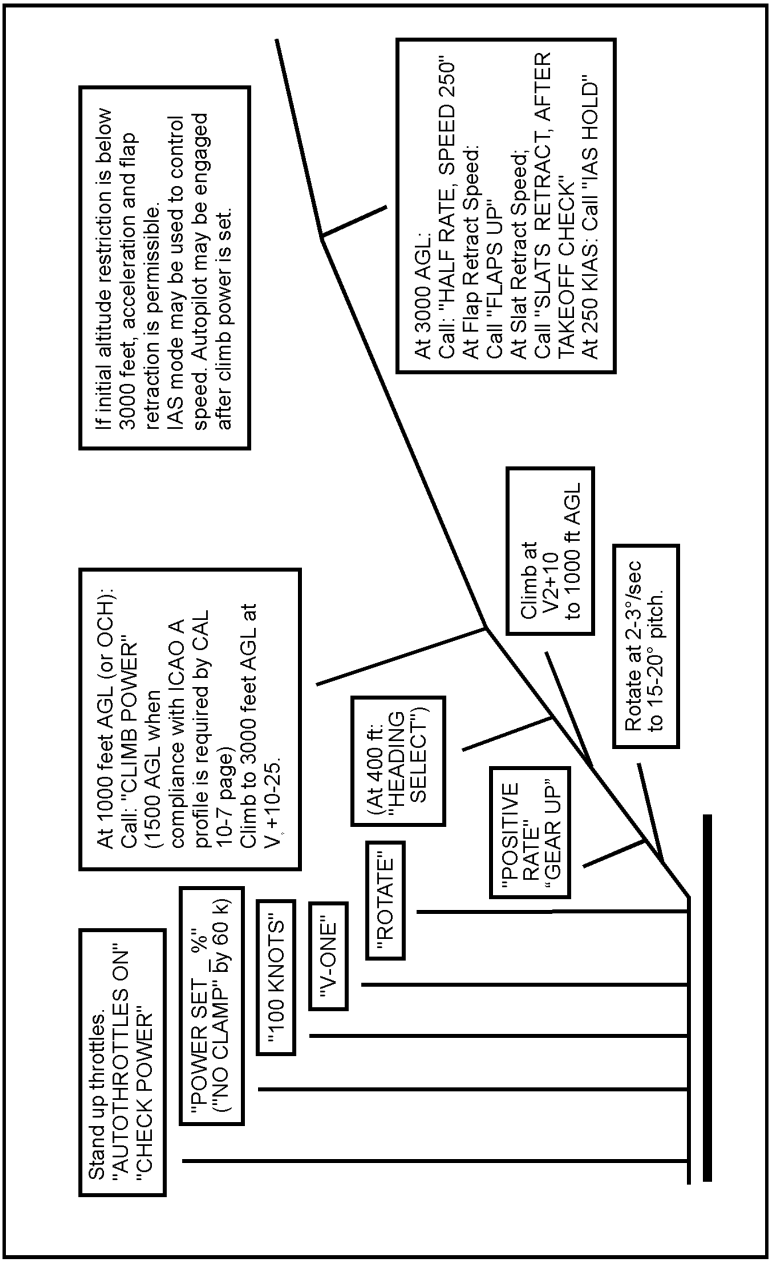
STANDARD NOISE ABATEMENT TAKEOFF PROFILE

(U. S. Distant / ICAO Profile B)



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ALTERNATE NOISE ABATEMENT TAKEOFF PROFILE

(U.S. Close-in / ICAO Profile A)

AFTER TAKEOFF CHECKLIST

The Pilot Flying will call for the AFTER TAKEOFF CHECKLIST in conjunction with the slats retract call. Do not allow the reading of the checklist to interfere with outside vigilance while departing the terminal area.

Caution: To avoid the possibility of the shoulder harness buckles snapping back and inadvertently pulling circuit breakers, hold both straps before releasing and then allow the straps to retract slowly to the stowed position.

PILOT MONITORING CHALLENGE	AFTER TAKEOFF	PILOT MONITORING RESPOND
Gear		**UP, LIGHTS OUT**
Flaps, Slats	[AS REQ]	**UP, LIGHTS OUT, STOWED**
Ignition		**ON / OFF**
Fuel Feed	**CK/BAL**	**CENTER / MAIN**
Hydraulics	[AS REQ]	**OFF & LOW**
Spoilers, Autobrake System		**DISARMED, OFF**
[AS REQ] **on Missed Approach**		

PM CHALLENGE **PM RESPOND**

Gear.. UP, LIGHTS OUT

The PM will raise the landing gear handle on command of the PF after a positive rate of climb has been verified on the IVSI & barometric altimeter, and called by either pilot. Verify that no red lights are illuminated and that the GEAR DOOR OPEN light is out.

Flaps, Slats........................... [AS REQ] .....UP, LIGHTS OUT, STOWED

At the applicable flap retraction speed, retract the flaps. Move the flap/slat handle to 0° and observe both flap position pointers start to move symmetrically toward up.

Note: If the flap pointers do not move or do not move together, return the flap/slat handle to the previous position and refer to the abnormal procedures section.

At the applicable slat retraction speed, retract the slats. Move the flap/slat handle to UP/RET and observe that all the lights on the slat position indicator panel are out. If used during takeoff, the flap takeoff selector should be rotated to the STOW position.

For missed approach, flaps and slats may be used as desired.

Ignition...ON / OFF

The ignition switch should be turned off as soon as the engines have stabilized. For optimum life of the ignition system components, the duty cycle is 10 minutes on and 10 minutes off. However, when adverse flight conditions are encountered such as ice or water ingestion, turbulence, or conditions which could result in engine flameout, it is recommended that the two halves of the 20 joule A/C ignition system should be used in alternating 10 minute periods for as long as needed to ensure against engine flameout. It should be recognized that prolonged use of the ignition system reduces its service life.

Note: On aircraft so equipped, there is no time limit for the Ground Start and Continuous position.

Fuel Feed ....CK/BAL .... CENTER / MAIN

All main tank boost pumps will be on for the duration of the fight.

If center tank fuel is available, leave both CTR tank pumps on. If auxiliary tank fuel is available, move FWD and AFT AUX TRANS switches to AUTO. Confirm center tank is feeding by observing main tank and center tank fuel quantities. If center tank is not feeding, refer to CENTER FUEL TANK DOES NOT FEED, Section 3. Check main tank balance.

When auxiliary tanks are empty move FWD and AFT AUX TRANS switches to OFF. When center tank is empty, move CTR tank pump switches to OFF.

The actual configuration will be announced in the checklist response, "FEEDING FROM THE CENTER (or MAIN) TANKS."

Hydraulics .... [AS REQ] ....OFF & LOW

After the flaps and slats are retracted, move the L & R ENG HYD PUMP switches to LOW and the AUX and TRANS HYD PUMP switches to OFF.

For missed approach, the hydraulic system may be left in ON & HI.

Spoilers, Autobrake System ....DISARM, OFF

Push Spoiler lever down to disarm position. Rotate the autobrake selector to OFF.

[AS REQ] on Missed Approach.

AFTER TAKEOFF NOTES

Close in Turn After Takeoff

Normally, a turn after takeoff should not be started until reaching 400 feet AGL, even if ATC requests a turn as soon as practical. However, a turn required for obstructions, noise abatement, or adverse conditions may be started before reaching 400 feet AGL but no lower than 50 feet AGL. The maximum bank angle after takeoff will be 15 degrees until reaching V_2 +10. At an airspeed of V_2 +10 and above, bank angles of 30° are allowable.

Autopilot / FGS / Altitude Alerting Procedures

The minimum altitude for autopilot engagement is 1000 feet AGL. Normally, the autopilot is engaged during the takeoff profile after slats are retracted. The aircraft should be trimmed at the time of engagement. The autopilot is engaged by moving the autopilot switch to ON.

The altitude alerting system shall be used during all phases of flight to assist the flight crew in altitude awareness and to prevent deviation from assigned clearances. During climb and descent, the flight crew shall set and arm the next clearance altitude in the ALT selector window. In those situations where a clearance is received containing multiple crossing restrictions, the ALT selector window will be set and armed for the next altitude restriction and reset and armed for each subsequent restriction.

While the autopilot is ON, the PF will set and arm new clearance altitudes in the ALT selector window. While the autopilot is OFF the PM will set and arm the cleared altitude in the ALT selector window. If the pilot normally expected to set and arm the altitude is distracted by other duties, it is permissible for the other pilot to set and arm the altitude. Both pilots will verbally and visually acknowledge the cleared altitude set and armed in the ALT selector window.

Operation with Autopilot Not Engaged

The PF will verbally command the PM to operate the Flight Guidance System (FGS). Examples: “Heading select 280”, “Set and arm 5,000 feet, vertical speed 1,000 feet down”, “Arm ILS’, “Bank Angle 15°, Set missed approach altitude”, etc. The PM will make the changes to the FGS as called for by the PF. The PM will set and arm the FGS for any ATC directed altitude changes and the PF will visually and verbally confirm the FGS is set and armed for the new altitude. The PM will monitor the FGS and report any discrepancies to the PF.

Example: ATC gives a clearance to climb and maintain 15,000 feet. The PM would read back the climb clearance using proper ATC procedures, set and arm the FGS for 15,000 feet, and confirm the FMA is armed for altitude. The PF will visually confirm the FGS/FMA is armed for 15,000 feet and verbally confirm by response such as:
"ONE-FIVE-THOUSAND, SET AND ARMED".

Operation with Autopilot Engaged

The PF will operate the FGS system making all FGS inputs including setting and arming altitudes. The PF will vocalize all altitude changes and may vocalize other FGS operations if desired. The PM will monitor the operation of the FGS and report any discrepancies to the PF.

Example: ATC gives a clearance to climb and maintain 15,000 feet. The PM would read back the climb clearance using proper ATC procedures, and visually confirm the FGS/FMA is armed for 15,000 feet. The PF will set and arm the FGS for 15,000 feet and verbally confirm by response such as "ONE-FIVE-THOUSAND, SET AND ARMED".

PMS Operation

After 3,000 feet AGL, push the PERF button on the flight guidance panel to activate the PMS.

Note: For PMS activation, the following conditions are required:

- Flaps less than 26°.
- TRI not in T/O, TO FLEX or GA mode.
- Flight director on or autopilot engaged.
- PMS valid and autothrottle on within 5 seconds of PERF selection.

Below 10,000 feet MSL, airspeed will be limited to 250 KIAS and figures will be in brackets. The 250 KIAS restriction can be removed by pushing "Clear" and then pushing line select key "1" two times.

Maximum climbs can be selected by slewing to the "Climb Max" page and pushing line select key "1." Non-optimum climbs can be selected by editing the speed in either the "Maximum" or "Optimum" pages. Line select key "1" must be pushed again when the light comes on to engage the mode.

At level off, the "Cruise Optimum" page is automatically displayed when approaching an "Armed" altitude. "Crz Non Opt" will result from editing the speed and pushing line select key "1" twice.

CLIMB

Unless the computer flight plan indicates otherwise, the climb speed should be 290 KIAS/.72 mach. The pilot monitoring will call 18,000 feet (20,000 in Mexico) as a reminder to reset altimeters. The PM will also call 1,000 prior to the assigned altitude in the following format, "___ thousand for ___ thousand."

It is recommended that when the AFTER TAKEOFF CHECKLIST has been completed and work load permits, the PM make a check of the overhead panel confirming:

- Annunciator Panel for normal indications.
- Normal indication of CSD outlet and rise temperature.
- Normal generator volt/freq indications and battery condition.
- Proper RAT probe heater operation.
- Proper (on schedule) operation of the pressurization system.
- Normal duct and cabin temp indications.

Sterile Cockpit Light

Sterile cockpit procedures are in effect any time the aircraft is below 10,000 feet. Once the aircraft is above 10,000 feet the flight crew should turn the Sterile Cockpit light out and cycle the No Smoking sign as a signal to the cabin crew.

FUEL MANAGEMENT

When established in cruise flight, both crewmembers shall verify that the fuel remaining on board meets or exceeds all requirements for a safe completion of the flight. This can be done by comparing FOB to the expected fuel as listed on the computer flight plan. Fuel verification will occur periodically throughout the flight. Fuel management is the joint responsibility of both the Captain and First Officer. Verbal communication concerning fuel management shall be open and ongoing throughout the flight.

If there is fuel in the Center Fuel Tank or Auxiliary Fuel Tanks, that fuel will be used first. It will be confirmed at initial level off that fuel is burning from these tanks by observing and comparing the fuel quantities in all tanks. When Center Tank/Auxiliary Tank Fuel is exhausted, the respective pumps will be turned off and fuel depletion and balance will be monitored in the main tanks.

AIR CONDITIONING PACKS

Air conditioning packs operated in AUTO mode will attempt to maintain a selected cabin temperature within the range of 65°F to 80°F. Air conditioning packs operated in MANUAL mode depend on vigilant pilot input to deliver air at a comfortable temperature.

A pack operated in MANUAL mode, left unattended, can quickly produce temperatures that result in an automatic thermal shutdown of the air conditioning pack. If the pack shutdown is followed by an idle thrust descent, cabin pressurization problems will occur.

If both packs are operated in MANUAL mode, the likelihood of a thermal shutdown increases; and the potential for both packs to experience thermal shutdown arises. Recommend that one pack be operated in AUTO mode at all times.

CRUISE

Level Off

Autothrottles Off

The airplane is climbed, leveled off at initial cruise altitude, and accelerated with Climb thrust setting to .01 Mach or more above the desired cruise. Cruise thrust is now set. The airplane will then stabilize at or very near the target Mach. Operating with the Autopilot engaged and altitude hold selected allows closer adherence to the desired performance.

Autothrottles On

It is recommended that Indicated Airspeed (IAS) be used as the cruise speed reference. Mach number is a function of OAT and variations thereof cause excessive and unnecessary throttle "hunting."

With PMS:

1. When level cruise is attained, the PMS will command an optimum Mach cruise speed. When stable, note the equivalent Indicated Airspeed (IAS) on the airspeed indicator. Enter this airspeed onto the cruise page as a non-optimum cruise IAS. Command the PMS to reference this speed for cruise. As the flight progresses, make a periodic check of the optimum Mach speed being suggested by the PMS and adjust the non-optimum IAS speed accordingly.
2. As an alternative to the PMS suggested speed, refer to the CAST charts or to the Long Range Cruise (LRC) charts found in Section 5 of this manual.

Without PMS:

1. While climbing in Mach Hold or IAS Hold, adjust the Autothrottle Speed Command to the desired cruise IAS in knots, i.e. 260.
2. Obtain the desired Long Range Cruise (LRC) IAS from the CAST Charts or from the LRC performance chart in Section 5 of this manual.
3. As Aircraft Gross Weight decreases, adjust IAS downward.

The flight crew should compare the predicted performance figures in Section 5 (IAS, EPR, N_1/N_2 and fuel flow) against actual figures as a check of true outside air temperature and airplane/engine conditions.

Trim Techniques

Note: Check fuel and engine thrust are balanced before trimming.

Autopilot Disengaged

- Set aileron and rudder trim to zero.
- Hold wings level using horizon and ADI as reference. Do not trim ailerons at this time.
- Use rudder trim to stop any turning tendency. When no turn exists, the rudder is properly trimmed.
- Use the aileron trim to remove the control wheel force required to hold the wings level.
- The aircraft is now trimmed for the configuration and speed.

Autopilot Engaged

- Set aileron and rudder trim to zero.
- Select heading hold and altitude hold.
- Use rudder trim to remove any control wheel deflection. Do not use any aileron trim.

Stabilizer Trim

- Periodically disconnect autopilot and adjust stabilizer trim if aircraft climbs or descends

Cruise Performance Economy

The dispatch computed fuel burn from departure to destination is based on certain assumed conditions, (i.e., takeoff gross weight, cruise altitude, route of flight, temperature, wind enroute, and cruise speed). The planned fuel burn can increase due to:

- A lower cruise altitude than planned.
- More than 2,000 feet above optimum altitude.
- Speed faster than planned or appreciably slower than long-range cruise if planned for long-range cruise.
- Stronger headwind component.
- Unbalanced fuel.
- Improperly trimmed airplane.
- Excessive thrust lever adjustments.

Engine Synchronization

Switch the system on (N_1 or N_2 position) only after cruise thrust has been set and the N_1 RPM have been manually adjusted to within 1% of each other.

After a reasonable length of time, determine if synchronization system is functioning properly. If not, select sync switch to OFF and disconnect autothrottles for at least 5 seconds. Reconnect throttles, adjust N_1 RPM again using a slightly different "match-up" than the first time. Select sync switch to ON (N_1 or N_2) position. Again, after allowing a reasonable length of time, determine if system is functioning properly. Several N_1 RPM adjustments may be necessary.

Prior to initiating a descent (throttles still in the cruise thrust position), switch the engine synchronization to OFF, then begin the descent. This procedure will prevent the system from driving to its limit and breaking while attempting to maintain synchronized operation as the throttles go toward the idle position. **It is extremely important that this sequence of operation be followed.** The engine sync switch is to remain off for the remainder of the flight.

Turbine Engine Monitoring Program

Continental's Flight Operations Engineering and Propulsion Engineering share engine and airframe performance data generated by the flight crews and transmitted via ACARS or T.E.M.P. log (Turbine Engine Monitoring Program). From this data, engine trend analysis and airframe performance deterioration in the form of excess drag are assessed. Appropriate maintenance action is initiated where indicated.

Amplified Procedures

On flights of one hour and over, an engine data report will be sent via ACARS or a T.E.M.P. log will be completed.

With the aircraft stabilized at the desired cruise speed, disengage the autopilot and retrim the aircraft. Re-engage the autopilot.

The autothrottles, wing anti-ice, engine anti-ice, and fuel heat must be off and the A/C allowed to stabilize for three (3) minutes prior to recording data. Do not re-adjust EPRs.

Maintain the following conditions for at least three (3) minutes.

- MACH $\pm$ .005
- ALT $\pm$ 50 ft.
- TAT $\pm$ 1°
- EPR $\pm$ 0.02

Record only the Captain's MACH, IAS, and ALT, but compare with the First Officer's instruments for allowable tolerances. If the Captain's and First Officer's flight instruments differ by the following values, an entry should be made in the maintenance log book.

- MACH ±0.010
- ALT ±100ft.
- IAS ±4K

Although these tolerances may be within maintenance manual limits, the squawks will be noted when Flight Operations Engineering prepares their quarterly cruise monitoring report and will aid in the investigation of chronic fuel burn problems.

Throttle Position Codes

#1 throttle, regardless of position, is reported as position "4".

#2 throttle position is reported relative to #1 throttle as follows:

1	=	Greater than 1 knob behind
2	=	1 knob behind
3	=	1/2 knob behind
4	=	Throttles aligned
5	=	1/2 knob ahead
6	=	1 knob ahead
7	=	Greater than 1 knob ahead

Key in the engine data in ACARS or if using the T.E.M.P. log, follow the log instructions.

When the engine data is keyed in (or the T.E.M.P. Log completed), compare the MACH, ALT, and IAS with the stabilized reading at the beginning. If any parameters have been exceeded, do not send via ACARS. (Draw a diagonal line through the T.E.M.P. Log.) Re-enter the data using stabilized conditions.

Do not log data if the flight does not reach 20,000 feet or if the cruise segment is planned for less than 15 minutes.

DESCENT NOTES

General

- Check of arrival weather, company calls, approach briefing, and setting of landing airspeed bugs should occur prior to descent.
- The engine synchronization system should be turned off prior to power reduction for descent.
- The landing airport altitude and altimeter should be set in the automatic pressurization controller at beginning of descent.
- If the use of engine/airfoil anti-ice or windshield anti-fog is anticipated, select the appropriate system(s) at beginning of descent.
- During descent, the PM will call out approaching 18,000 feet as a reminder to reset the altimeters to the area barometric pressure (and as a prompt to accomplish the IN RANGE checklist). Additionally, he will call 1000 feet above the assigned altitude.
- Fuel crossfeeding should be terminated for approach and landing.

Descent Point

Multiply altitude (in thousands) to lose by three and add ten. Example: Cruise altitude 37,000 + 37 x 3 = 111. 111 + 10 = 121 miles for a descent to a sea level airport.

A good descent profile takes into consideration many variables and can account for significant fuel savings. A normal descent is accomplished at idle thrust and planned so that power will not have to be added until on final approach.

Traffic considerations and speed control at specific airports frequently prevent execution of an ideal descent at best economy speeds. In these cases, the pilot should adjust his descent point so that an idle power descent is still accomplished.

When ATC requests descent prior to your planned descent point, adjust your rate so as to intercept the idle descent profile.

Descent planning should always include consideration of the crossing restrictions shown on the Standard Terminal Arrival (STAR) when applicable.

Descent in Moderate to Severe Precipitation

Refer to SEVERE RAIN / ICE / TURBULENCE CHECKLIST, Section 3 or QRH.

Mexico City Approach and Landing Procedures

Flight crews should check the Pilot Weight Manifest to see the landing flap setting determined by Accuload. If flaps 40° are shown, use normal procedures.

Accuload will assign the alternate landing flaps setting of 28° when required for approach climb performance. This will also be indicated by code K on line 9. When flap 28° are required for landing, flight crews should use flaps 11° for go-around (one engine or two engine).

Sterile Cockpit Light

The sterile cockpit environment begins at 10,000 feet and continues until the aircraft blocks in at the gate. During that time, activities in the flight deck not required for the safe operation of the aircraft are prohibited. The sterile cockpit light is normally turned on at or just prior to passing 10,000 feet in conjunction with cycling of the No Smoking sign approximately 10 minutes prior to landing.

PMS

At least 5 minutes prior to reaching the top of descent point, push the line select key opposite the "Bottom of Descent" and enter the VOR frequency, bearing, and distance for the waypoint into the scratch pad area. (Bearing and distance can be omitted if waypoint is a VOR station.) Push line select key "1" to enter data.

The "Des Opt" page is automatically presented. Push line select key "1" to enable the automatic descent entry profile at the top of descent point. (Exception: If a low altitude has been armed by the pilot, this function will be inhibited.) The optimum descent will include a transition to 250 KIAS at 10,000 feet MSL.

The descent page can be viewed at any time by pressing the "Des" key.

IN-RANGE CHECKLIST

The Pilot Flying should call for the IN-RANGE CHECKLIST at approximately 18,000 feet. For flights with cruise altitudes below 18,000 feet, the IN-RANGE CHECKLIST should be called for at Top of Descent.

Increased traffic vigilance should be maintained below 18,000 feet. The use of ground flood and/or landing lights is recommended below 18,000 feet.

Approximately 10 minutes before landing, the No Smoking switch should be cycled once indicating that landing is imminent.

PILOT MONITORING CHALLENGE	IN-RANGE	PILOT MONITORING RESPOND
Hydraulics	C+F	**ON & HI, CHECKED**
Altimeters	C+F	**____SET**
Landing Data, Bugs, TRI	C+F	**CHECKED, SET, GA**
SEAT BELTS Switch		**ON**
Pressurization & Anti-Ice		**SET**
Approach Briefing, Harness		**COMPLETE, ON**

PM CHALLENGE **PM RESPOND**

Hydraulics ....C+F.................. ON & HI, CHECKED

Warning: Hydraulic pumps must be set to ON & HI for the landing gear and flaps to function normally.

Place the L and R ENG HYD PUMP switches to the HI position and check both Hyd Press gauges within 3000 PSI green arc. Check both Hyd Fluid Quantity gauges for indication above red line.

Place TRANS and AUX HYD PUMP switches to ON position. This is to provide an additional source of hydraulic pressure in the event of an engine pump failure. Verify brake pressure gauges are normal.

Altimeters ....C+F..____ SET

Set barometric pressure on all altimeters.

Landing Data, Bugs, TRI .... C+F ....CHECKED, SET, GA

Determine landing speeds from the appropriate landing gross weight speed card.

MANEUVERING		
0°RET		225
0°T/O		176
11°T/O		154
15°T/O		151
28°LAND		141
LANDING		
28°LAND		131
40°LAND		127
GO-AROUND		
28°LAND	(11/15)	136
40°LAND	(15)	132
120,000		

MD804118

The target airspeed to be flown on final approach will be the flaps 40° (28°) 1.3 V_S speed (V_{REF}) from the speed card plus a wind additive. The wind additive will be:

- 1/2 the steady state wind plus all the gust factor
- a minimum of 5 knots, a maximum of 20 knots

Examples: V_{REF} is 130 and winds are 16 gusting to 20. Wind additive is 12 and target airspeed is 142.
V_{REF} is 130 and winds are calm. Wind additive is 5 and target airspeed is 135.

Airspeed callouts by the PM will be in reference to target airspeed.

The internal airspeed command bug will be set, progressively, to the desired descent, maneuvering, and approach target airspeeds. The external speed bugs will be set to 0° RET maneuvering, 0°/T.O. maneuvering, 15°/T.O. maneuvering, and 40°/LND (28°/LND) 1.3 V_S speed (V_{REF}).

Manual or Coupled Pitch Control

If autothrottles are not engaged, set airspeed command bug on target airspeed and manually adjust power to maintain that speed.

If autothrottles are engaged, the autothrottle system (ATS) will reference to alpha floor (1.3 V_S in landing configuration) or speed selected with the airspeed command bug, whichever is greater.

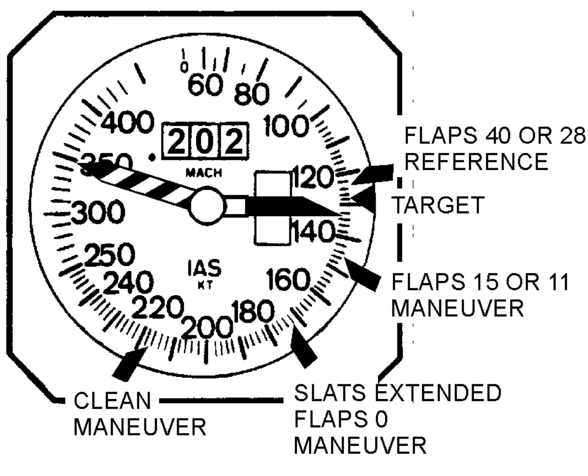
Gusty wind conditions: Set the airspeed command bug to a speed 5 knots less than target airspeed. Automatic gust protection will be provided up to a maximum of an additional 5 knots above speed selected with the airspeed command bug. If alpha speed is greater than selected speed, ALFA will display on FMA and ATS will control speed to gust integrated alpha speed.

Steady wind conditions: Set the airspeed command bug to target airspeed. (ATS does not measure steady state winds)

Autoland Pitch Control

With autoland/autothrottles engaged, set the airspeed command bug to V_{REF} + 5 regardless of gust or steady state wind conditions. When conditions require gust additives greater than 10 knots or steady state additives greater than 15, autoland operations should be discontinued.

Maintain target airspeed until initiation of flare. Increased landing distances may result when speed additives are used, depending on headwind component. This effect should be considered in respect to allowing airplane to float. Do not fail to apply appropriate deceleration for existing conditions, utilizing maximum deceleration procedures when necessary. Establish required deceleration as quickly as possible.



Landing Airspeed Bug Settings

Select GA on the TRI. Verify the limit pointers in the EPR gauges adjust to the go-around thrust limit shown on the TRI.

SEAT BELTS Switch..ON

Turn the SEAT BELTS switch to ON.

Pressurization & Anti-Ice.. SET

Verify the landing airport altitude and altimeter are set in the automatic pressurization controller. Verify engine and airfoil anti-ice on if required.

Approach Briefing, Harness..COMPLETE, ON

Normally the approach briefing should be accomplished at cruise altitude when the destination ATIS information becomes available. However, if this is impractical the crew brief will be accomplished as soon as approach information is available. The briefing should include the following items as appropriate to approach conditions.

- Weather and alternate
- Runway conditions and required lighting
- STAR, and approach chart dates.
  - Displays and automation modes
  - Frequencies / courses
  - Altitudes
- Missed approach procedures
- Engine inoperative missed approach
- Non-normal and inoperative equipment considerations
- Terrain considerations
  Consider using radar to help identify prominent terrain features.
- Transition Level
- 10-7 and 10-9 Pages

Note: The pilot who will fly the approach briefs the approach. For monitored approaches the Captain will brief the required callouts and duties associated with the specific monitored approach.

Note: For night visual approaches or visual approaches where IMC conditions may be encountered, consideration should be given to accomplish a full instrument approach briefing.

Note: It is important to note that it is the responsibility of each crew member to review and understand all procedures and phases for any approach.

WARNING: Prior to Descent into mountainous or significant terrain:

- All enroute charts, STARS, and approach charts associated with arrival will be out and available.
- The flight crew will review all grid MORA's, MEA's, MOCA's, and AMA's to include position of high terrain along the route.

The shoulder harness must be used for landing.

APPROACH CHECKLIST

The Pilot Flying will call for the APPROACH CHECKLIST no later than when on an intercept heading to the final approach course.

PILOT MONITORING CHALLENGE	APPROACH	PILOT MONITORING RESPOND
Altimeters & Bugs	**C+F**	**SET**
Radios, Course		**IDENTIFIED, INBOUND**
VOR/ADF & Marker Switches		**SET**

PM CHALLENGE **PM RESPOND**

Altimeters & Bugs............................ C+F ....SET

Check correct barometric pressure set on all altimeters. Set the altimeter bugs for instrument approaches as in the table below. Setting of the altimeter bugs is optional for VFR landings.

APPROACH TYPE:	BARO ALTIMETER REF BUG SET TO:	RADIO ALTIMETER DH INDEX SET TO:
NON-PRECISION	DDA	HAT/HAA for DDA (Optional)
CAT I ILS	DA(H)	HAT/HAA for DA(H) (Optional)
CAT II	DA(H)	RA (If applicable)

Radios, Course .... IDENTIFIED, INBOUND

All appropriate radios must be tuned and identified for the approach planned. The course arrows on the HSI should be set to the inbound course or as required by the procedure to be flown. The Pilot Monitoring must crosscheck the flying pilot's frequencies and course.

VOR/ADF & Marker Switches...SET

Turn marker switch ON if required for planned approach.

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NOTE: PAGES 123-130 ARE RESERVED FOR FUTURE REVISIONS.

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APPROACH PROCEDURES

General

The aircraft shall cross the fix or facility and fly outbound on the specified track descending as necessary to the specified altitude. If a further descent is specified after the inbound turn, this descent shall not be started until established on the inbound track ("established" is considered as being within half of the full scale deflection for the ILS and VOR, or within ± 5° of the required bearing for the NDB).

The Pilot Monitoring should be prepared, if necessary, to utilize the backup means of identifying fixes as portrayed in the profile view of the approach on the approach chart.

Stabilized Approach

The most optimum and consistent landing performance is achieved through the use of a stabilized approach. The optimum stabilized approach is defined as flight on the glidepath (visual or electronic) at a steady rate of descent, on the "target" approach speed, in the landing configuration, in trim, and with the proper thrust setting. The dynamics of flight often dictate that flight parameters will vary from optimum. However experience has shown that a stabilized approach is essential for a safe operation.

Approaches will be considered unstable, and shall result in a missed approach if:

1. The airspeed is greater than +15 knots or less than – 5 knots from target speed, OR
2. Vertical speed is greater than 1500 ft/min, OR
3. Engines are less than minimum "spool" of 55% N_1.

In VMC, these parameters must be met before reaching 500 feet above touchdown zone elevation. In IMC these parameters must be met before reaching 1000 feet above touchdown zone elevation, or a go-around will be announced by the Pilot Monitoring.

While continuing the approach (below the BOTTOM LINE altitudes stated above), it must be understood that the aircraft must be correcting and trending toward the desired stable condition. Deviations from the optimum should be called out by the Pilot Monitoring.

Maneuvering Speeds

Initial pattern entry will be in a clean configuration. Slow to clean maneuvering speed prior to entering an airport traffic area. Speed reductions below clean maneuvering speed should be accomplished by flap/slat extension. Extend the flaps/slats to the next setting prior to decelerating below the fixed maneuvering speed for the existing flap/slat setting.

Configuration changes and speed reductions should be planned in order to be at flaps 15° and speed 170 KIAS prior to turning base leg. Normally, the landing gear should not be extended until after 15° flaps have been extended. On a visual approach, final landing configuration should be established no later than 1000 feet AGL. When maneuvering with flaps 28° or flaps 40°, maintain airspeed $\geq V_{REF} + 10$.

Altitude Callouts

Altitude callouts during descent for all approaches will be made in reference to the barometric altimeter until (and including) 200 feet above the TDZE, below which the altitude callouts will be made in reference to the radio altimeter if available.

Altitude callouts on all approaches (with the exception of monitored approaches) will be done by the PM. The callouts will be:

- At 1000 feet above touchdown zone (TDZE), call out “1000 FEET.”
- At 500 feet above TDZE and at each 100 foot increment thereafter, call out altitude and any significant deviation from target airspeed or descent rate.

  Note: A significant deviation from airspeed is $\pm$ 5 knots from computed target speed. A significant deviation in vertical velocity is a descent rate of 1000 FPM or greater.
- The barometric altimeter is the reference for determining CAT I DA(H) and non-precision DDA.
- Call “APPROACHING MINIMUMS” approximately 100 feet prior to DA(H) or DDA on instrument approaches, as applicable.
- At DDA or DA(H) call “MINIMUMS.”
- During a CAT I (non-monitored approach) or Non-Precision approach, the PM will inform the PF when (s)he acquires either a portion of the approach lighting system and/or the runway by stating “APPROACH LIGHTS IN SIGHT” and/or “RUNWAY IN SIGHT” as appropriate.
- On a non-precision approach, PM calls “MISSED APPROACH POINT,” if appropriate.
- PM calls “100, 50, 30, 20, 10” from the radio altimeter (note the word “feet” is not part of the callout). The altitude calls below 100 feet are at the discretion of the PF on visual approaches.

DA(H)/DDA

Do not continue the approach below DA(H)/DDA (see Non-Precision Approaches, this section, for definition of DDA) unless the airplane is in a position from which a normal descent to the runway of intended landing can be made.

The callouts “APPROACH LIGHTS” and/or “RUNWAY IN SIGHT” are informative only. When conducting non-precision and Cat I ILS approaches, descent below the applicable DA(H)/DDA requires that one of the following visual references for the intended runway is distinctly visible and identifiable to the pilot:

- The approach light system. The pilot may not descend below 100 feet above the TDZE using the approach lights as a reference unless the red terminating bars or the red side row bars are also distinctly visible and identifiable.
- The runway end identifier lights.
- The visual approach slope indicator.
- The threshold or threshold markings or threshold lights.
- The touchdown zone or touchdown zone markings or touchdown zone lights.
- The runway or runway markings or runway lights.

On a non-precision approach the aircraft must not go below the DDA until the aircraft is in a position to continue a normal descent rate (approximates a 3° descent path) to the touchdown zone. If a VDP (visual descent point) is not published, it should be determined and planned prior to commencing the approach. Descent below DDA prior to the VDP can result in a “dragged in” approach. Descent from DDA beyond the VDP can result in a “diving” final approach

Cat II visual reference requirements are located in the Cat II portion of this section.

Monitored Approaches

A monitored approach is a procedure which allows each crewmember to concentrate on specific tasks. It utilizes the Quiet Flight Deck method which eliminates all unnecessary conversation. Any calls other than the normal Monitored Approach calls should indicate that an abnormal exists or that a performance limit was exceeded.

Using the monitored approach procedure, the First Officer is assigned the task of flying the airplane and executing the missed approach, if necessary. This allows the Captain additional time to acquire and assess visual cues prior to reaching the decision altitude.

Note: It is CAL policy that all ILS approaches to an RVR of 2400 feet or less (and all non-precision approaches to a visibility of less than 1nm or RVR 5000 feet) should be flown auto-coupled using monitored approach procedures. The maximum crosswind limit for RVR values of 2400 feet or less is 10 knots. If the autopilot is inoperative, the monitored approach procedures may be accomplished with the First Officer flying an uncoupled flight director approach down to the lowest Cat I ILS or non-precision approach minimums with all engines operating.

If an engine is inoperative, the Monitored Approach procedure is not authorized due to the need for transfer of aircraft control. In the event an engine has failed and the RVR is 2400 or less for an ILS approach (1nm/5000 RVR for non-precision), the pilot flying the approach will also make the landing.

On all monitored approaches, the F/O will brief the approach and the Captain will brief the required callouts and duties associated with the specific monitored approach.

First Officer Duties

A monitored approach is flown auto-coupled with the First Officer operating the autopilot and controlling the airspeed with the use of autothrottles, if operable. The First Officer should assume the flying responsibilities early in the approach but no later than intercept heading or, in the case of a straight in approach, 3 miles outside the outer marker.

The First Officer, upon reaching decision height (or the derived decision altitude on non-precision), will call "MINIMUMS, GOING AROUND" and execute the missed approach if the Captain has not taken control of the aircraft.

The F/O will execute a missed approach any time prior to DA(H) or DDA if directed by the Captain. If the Captain takes control of the aircraft, the First Officer will monitor the flight progress and make normal altitude calls using the barometric and radio altimeters (remain heads down at 100' and below). Any deviation from a stabilized flight path should be announced.

Captain Duties

During a monitored approach, the Captain monitors the overall approach progress. This includes supervising or monitoring the aircraft as well as the actions of the First Officer.

The Captain will make the following callouts with reference to TDZE:

- "1,000 Feet"
- "500" (If required)
- "400" (If required)
- "300" (If required)
- "200" (If required)
- At 100 feet above minimums, "APPROACHING MINIMUMS, I'M GOING HEADS UP."
- If decision is to land, "I HAVE THE AIRCRAFT."

Keeping callouts to a minimum creates a Quiet Flight Deck concept, allowing increased concentration in the DECISION REGIME.

When calling, "APPROACHING MINIMUMS, I'M GOING HEADS UP," the Captain will place his/her left hand on the yoke near the A/P disconnect button and right hand aft and below the throttles in anticipation of assuming control. Prior to or upon reaching decision altitude, if the Captain has distinctly established at least one of the required visual references, and the Captain decides a safe landing can be made, the Captain will call out, "I HAVE THE AIRCRAFT" and raise his/her right hand up pushing the First Officer's hand from the throttles. The Captain will assume control of the aircraft, continue the approach, and execute the landing. If the Captain calls, "I HAVE THE AIRCRAFT," the First Officer will monitor flight progress and make normal altitude calls using the barometric and radio altimeters (remain heads down at 100' and below). Once the Captain has assumed control of the aircraft, (s)he will execute the missed approach if the required visual references to complete the landing are lost or missed approach is required for any other reason.

If upon reaching DA(H) or DDA, the Captain has not called out, "I HAVE THE AIRCRAFT," the First Officer will execute a missed approach. The First Officer will call out, "MINIMUMS, GOING AROUND."

PRECISION APPROACHES

A precision approach is an approach where electronic glideslope information is available. On approaches which incorporate a DA(H), the aircraft is descended on the glideslope and a decision to either land or execute a missed approach must occur at or before DA(H). A decision to continue the approach below DA(H) requires adequate visual references as per this chapter, and the aircraft must be in a position to make a safe landing.

Depending on weather conditions, an ILS can be accomplished with raw data, with the flight director, or with the autopilot approach coupler.

ILS approaches in weather conditions above 2400 RVR may be hand flown or flown with the autopilot approach coupler at pilot's discretion. The flight director should be used in either case.

Note: If weather conditions are below 4000 RVR or 3/4 mile visibility, a flight director must be used or a coupled approach must be made.

ILS approaches in weather conditions reported or anticipated to be at or below 2400 RVR should be flown using Continental Airlines monitored approach procedures. If the RVR is 2400 feet or less, the flight crew will brief the category of approach having the lowest minimum for which the aircraft, ILS facility, and flight crew are capable of conducting, even if the latest reported weather would permit a category of approach that has a higher minimum. If the crew has been cleared for an approach using standard ILS procedures and weather conditions subsequently decrease below 2400 RVR, the aircraft may continue as briefed at Captain's discretion. Attempting to establish monitored approach procedures and configuration once the approach has commenced is not recommended.

ILS Mode FGS Operation

FD The FD will provide guidance commands.

AP The AP will control the airplane to automatically capture and track the localizer and glideslope.

ILS mode should be armed when the aircraft is on an intercept heading to the final approach course.

Note: If correct ILS/LOC inbound course has not been set, and a large discrepancy exists between the actual LOC inbound course and the selected course, the flight guidance system will not attempt to complete the course intercept; the airplane will fly through the localizer, wings level. In that case, **LOC CAP** may be annunciated and G/S TRK could occur, causing the airplane to begin to descend. Upon failing to attain LOC TRK and after exiting the localizer beam, the autopilot will disconnect and flight guidance will revert to **HDG HLD/VERT SPD**.

LOC CAP is displayed as the DFGS provides commands to turn on course and maneuver to localizer beam centerline. When established on localizer beam center line, **LOC TRK** is displayed.

The DFGS will capture and track the glideslope independent of localizer capture. Glideslope capture will begin immediately if capture conditions are satisfied at the time of ILS mode selection. The glideslope may be intercepted from above using a vertical path mode that provides a rate of descent (1000 to 1500 FPM) that is greater than the glideslope, or intercepted from below the glideslope using altitude hold mode.

G/S CAP is displayed as the DFGS provides commands to maneuver to glideslope beam center by establishing the airplane on a rate of descent that coincides with the glideslope. When established on glideslope beam centerline, **G/S TRK** is displayed.

To disarm the ILS mode before capture:

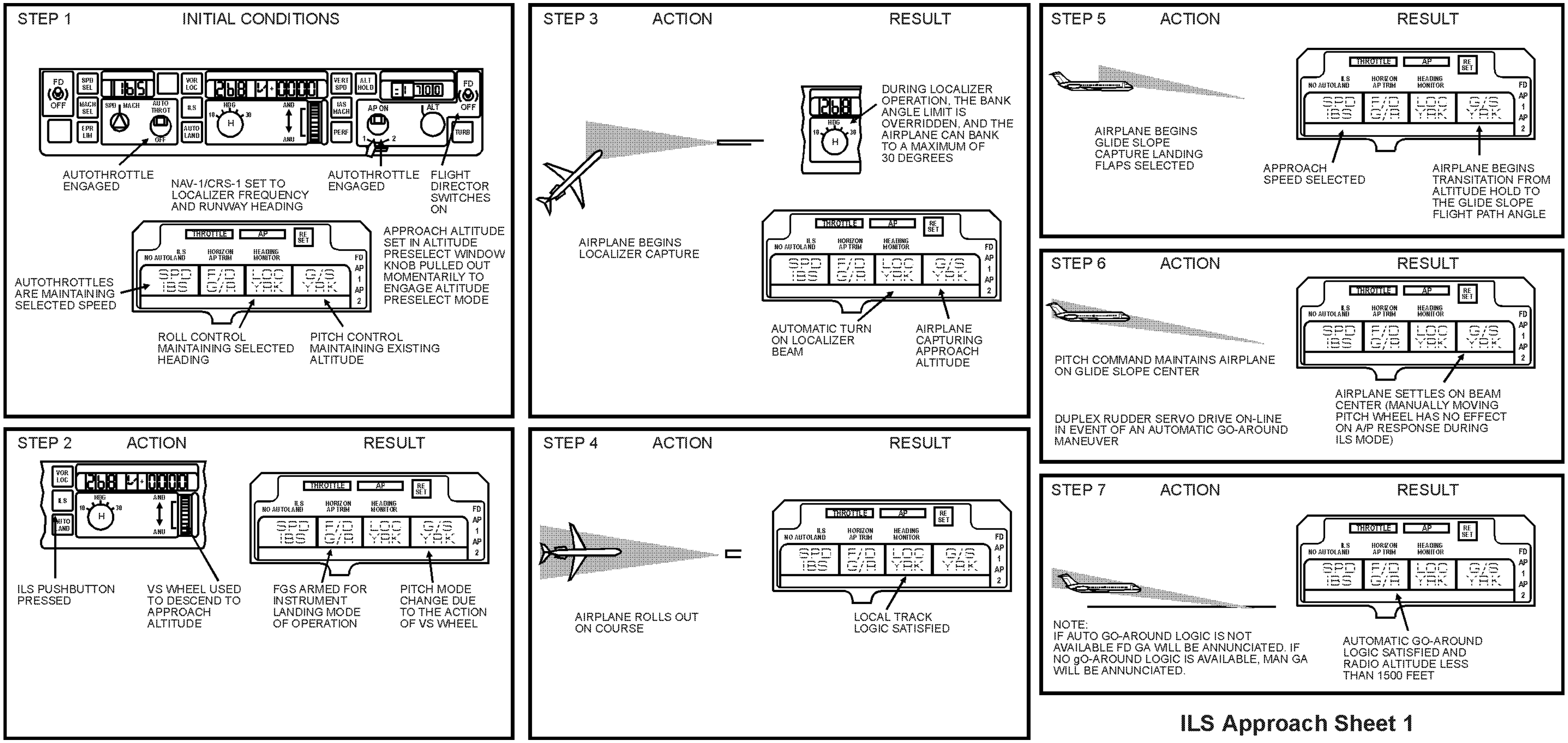
- Push HDG knob in to engage HDG HLD mode.

To disarm ILS mode after LOC or G/S Capture:

- Select another roll mode - the ILS mode will disengage and the pitch mode will revert to VERT SPD.
- Select another pitch mode - the ILS mode will disengage and the roll mode will revert to HDG HLD.

FMA Displays During ILS Mode Approach

1.	SPD 250	ILS ALT	HDG SEL	VERT SPD	Airplane is descending on intercept heading for localizer with ILS and altitude preselect armed.
2.	SPD 165	ILS	LOC CAP	ALT CAP	Localizer and altitude (preselect) capture have been initiated. Airplane is turning onto localizer and leveling out on approach altitude.
3.	SPD 165	ILS	LOC TRK	ALT HLD	Localizer and altitude capture have been completed. The airplane is tracking the localizer on a preselected altitude to intercept the glideslope.
4.	SPD 165	ILS	LOC TRK	G/S CAP	Glideslope capture has been initiated. The airplane is tracking the localizer while establishing a rate of descent to coincid with the glideslope.
5.	SPD 135	ILS	LOC TRK	G/S TRK	Glideslope capture has been completed. Landing flaps selected and appropriate speed selected. Airplane is tracking localizer and glideslope.
6.	SPD 135	AUT G/A	LOC TRK	G/S TRK	This will be the display below 1500 feet R/A if auto go-around is available.
	SPD 135	FD G/A	LOC TRK	G/S TRK	This will be the display if only flight director go-around is available.
	SPD 135	MAN G/A	LOC TRK	G/S TRK	This will be the display if neither auto or flight director is available.
7.	SPD 135	AUT G/A	LOC TRK	NO FLR	If autopilot remains engaged at 100 feet R/A, **NO FLR** is flashed in pitch FMA.
8.	RETD		LOC TRK	G/S TRK	If autothrottles remain engaged at 50 feet R/A, retard mode is initiated.



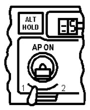
ILS Approach Sheet 1

ILS Approach Sheet 2

STEP 8

AT REQUIRED DECISION HEIGHT, FLIGHT CREW TAKES OVER MANUALLY.

ACTION

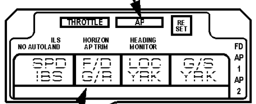


PRESSING CONTROL WHEEL AP DISCONNECT BUTTON DISENGAGES AUTOPILOT.

DUPLEX RUDDER SERVO DRIVE OFF-LINE RUDDER IN SERIES MODE.

RESULT

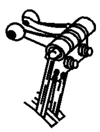
AP OFF WARNING COMES ON RED AND FLASHES. RESET BY PRESSING AP DISCONNECT BUTTON SECOND TIME.



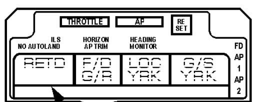
IN EVENT OF GO-AROUND MANEUVER, FLIGHT CREW MUST MANUALLY FOLLOW FLIGHT DIRECTOR PITCH AND ROLL STEERING COMMANDS.

STEP 9 ACTION RESULT

AT RETARD ALTITUDE, ATS RETD MODE ENGAGED.



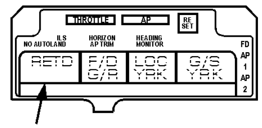
THROTTLES TOWARD AFT MECHANICAL STOP.



ATS MODE ANNUNCIATOR DISPLAYS RETARD DURING MANUAL FLARE MANEUVER.

STEP 10 ACTION RESULT

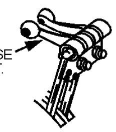
AIRPLANE TOUCHDOWN (MAIN GEAR SPIN-UP).



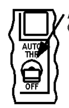
THROTTLES DRIVEN TO AFT MECHANICAL STOP (IDLE STOP POSITIONS).

STEP 11 ACTION RESULT

REVERSE THRUST.

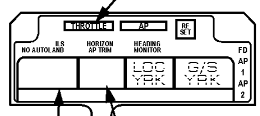


WHEN REVERSE THRUST LEVERS ARE ACTUATED. AUTOTHROTTLE AUTOMATICALLY DISENGAGES.



AUTOTHROTTLE OFF.

REVERSE THRUST INHIBITS THROTTLE OFF WARNING.

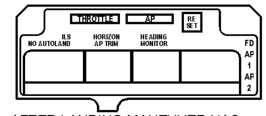


ARM WINDOW BLANK AFTER 20 SECONDS

ATS MODE ANNUNCIATOR BLANK WHEN AUTOTHROTTLE DISENGAGED.

STEP 12 ACTION RESULT

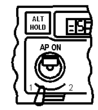
BOTH FLIGHT DIRECTOR SWITCHES PLACED OFF.



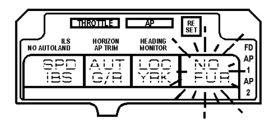
AFTER LANDING MANEUVER HAS BEEN COMPLETED, TURNING FLIGHT DIRECTOR SWITCHES OFF REVERTS MODE ANNUNCIATORS TO BLANK CONDITION, ADI PITCH AND ROLL COMMANDS BIAS OUT OF VIEW.

ABNORMAL AP ILS APPROACH CONDITION

1.

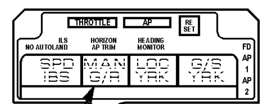


AUTOPILOT REMAINS ENGAGED BELOW REQUIRED DECISION HEIGHT.



AT 100 FEET RADIO ALTITUDE, IF AUTOPILOT REMAINS ENGAGED, NO FLR ANNUNCIATES AND FLASHES CONTINUOUSLY TO ALERT FLIGHT CREW TO ABNORMAL OPERATING CONDITIONS

2.



IF AUT G/A OR FD G/A CAPABILITY IS NOT AVAILABLE THE FMA WILL DISPLAY MAN G/A

Autoland Mode FGS Operation

Note: Autoland to touchdown is not authorized on Continental MD-80's.

General

The MD-80 has a fail-passive automatic landing system which provides aircraft control for approach and landing. The autoland functions include localizer capture, localizer track, glideslope capture, glideslope track, align, flare, retard, nose lowering, and ground rollout (on some aircraft). If a detected failure occurs, the autopilot will disconnect with appropriate warning lights indication and aural warning before the aircraft has significantly deviated from its flight path.

An autoland preflight test, which lasts about 55 seconds, must be run on any DFGC to be used for an autoland prior to that flight. If the **NO AUTOLAND** annunciator remains on after completion of the test, autoland with the respective DFGC is not available. The autoland preflight test must not be run simultaneously on two DFGC's.

Note: On AHRS equipped aircraft, during the autoland preflight test the AHRS system preflight test is conducted. This adds about 40 seconds to the test. A steady **NO AUTOLAND** message on the FMA's is normal during the AHRS preflight test, and does not indicate a failed test unless it remains on after the AHRS test is complete, and the AHRS have returned to the normal mode.

The performance of the system will vary with the quality of the ILS facility in use. Extra caution should be exercised during an approach to an unfamiliar facility. Aircraft in-flight or on the ground or ground vehicles moving or parked near the ILS runway can cause distortions of the localizer or glideslope signals. The pilot is the master monitor and progress should be continually assessed during the approach utilizing raw data and flight director displays.

Operational Description

The autoland function may be selected when the autopilot selector switch is in either position 1 or 2. Normally the autopilot selector switch should be set to the side of the pilot flying the approach (for a monitored approach this would be the First Officer's side). However if the desired DFGC is inoperative or is annunciating **NO AUTOLAND**, the approach may be accomplished with the autopilot selector switch set to the opposite position.

To arm the autoland mode:

- Set DFGC switch to position 1 or 2.
- Engage autopilot, engage autothrottles, turn Flight Directors on
- Select the localizer frequency on the respective VHF NAV control panel
- Set the inbound runway heading in the respective CRS window

Note: If correct ILS/LOC inbound course has not been set, and a large discrepancy exists between the actual LOC inbound course and the selected course, the flight guidance system will not attempt to complete the course intercept; the airplane will fly through the localizer, wings level. In that case, LOC CAP may be annunciated and G/S TRK could occur, causing the airplane to begin to descend. Upon failing to attain LOC TRK and after exiting the localizer beam, the autopilot will disconnect and flight guidance will revert to HDG HLD/ VERT SPD.

- Observe that the NO AUTOLAND light is off.

  Note: If the NO AUTOLAND light is on, move DFGC 1-2 switch to the opposite position and again observe the NO AUTOLAND light. If the NO AUTOLAND light is off, continue autoland operation. If the NO AUTOLAND light is on, autoland operation is not possible.

- Press the LAND mode select pushbutton

  Note: The second VHF NAV control panel must be set to the localizer frequency and runway CRS heading before the system will engage into the autoland mode. If the opposite VHF NAV is not being used for navigation, both VHF NAV control panels should be set up at the same time.

- Set an intercept heading (up to 90°) in the HDG readout and engage the HDG SEL mode to intercept the localizer beam. Selection of HDG HLD prior to autoland engagement will disarm the LAND mode.

The autopilot will control the airplane to capture and track the localizer. The maximum bank angle during capture is limited to 28 ± 2° and is not affected by the position of the bank angle selector. The maximum bank angle during localizer track is limited to 10 ± 1° down to 200 feet radio altitude and 5 ± 1° from 200 feet radio altitude down to touchdown during autoland operation.

The autothrottle system should be engaged in the SPEED mode. With target speed of VREF + 5 autothrottle speed selected, no gust correction is required. In the event of an autothrottle system failure, the automatic landing may be conducted with manual thrust control. The pilot should emulate, as closely as possible, the auto retard feature of the autothrottle system during the final stage of landing.

If the ILS is being tracked above 1500 feet radio altitude, the FMA pitch and roll windows will display G/S TRK and LOC TRK respectively. Selection of any other pitch or roll mode prior to autoland engagement will disarm the LND mode.

At an altitude of 1500 feet, the autopilot transitions to the autoland mode provided all monitors required for autoland are satisfied. The FMA pitch and roll windows will both display AUT LND. The series yaw damper is phased out and the parallel rudder mode engaged.

Full rudder deflection is available to the autopilot to provide sufficient control for runway alignment prior to touchdown in a crosswind. The rudder pedals are backdriven in this mode and indicate rudder control inputs from the autopilot parallel rudder servo.

Also, at 1500 feet radio altitude, the arm window annunciation of the FMA will change from **LND** to **AUT G/A** indicating that the system is armed for an automatic go-around in the event that a missed approach is required. If the auto go-around logic is not satisfied, the FMA will display **F/D G/A** indicating that the autopilot will automatically disconnect if a missed approach is initiated and flight director guidance is available for completion of the maneuver. If neither autopilot nor flight director guidance is available, the FMA displays **MAN G/A** and the pilot should be prepared to use fixed pitch attitude missed approach procedures, if required.

When AUT LND mode is engaged, all other control modes except go-around are inhibited. Once engaged, the autoland mode may be departed by pressing the TOGA button and performing a go-around or disconnecting the autopilot.

If the autoland logic has not been satisfied when the airplane descends to a radio altitude of 450 feet, the **FMA LND** armed annunciation will flash.

With DFGS (P/N 4034241-906 or equivalent) installed, if **LOC TRK** and **G/S TRK** are annunciated on the FMA but autoland logic has not been satisfied, when the airplane descends to an altitude of 1,500 feet, the **FMA LND** armed annunciation will flash.

If an autoland failure is detected or the autopilot has not engaged into the autoland mode by 300 feet radio altitude, the autopilot will disengage, the flashing red autopilot warning annunciators will illuminate, the aural warning horn sounds and the FMA pitch and roll annunciations revert **to G/S TRK** and **LOC TRK** respectively.

Verify **AUT LND** annunciated at 500 feet radio altitude.

The align mode is engaged automatically at approximately 150 feet radio altitude. Verify **ALN** annunciated on the FMA by 100 feet radio altitude. Any crab angle due to crosswind is removed and a forward slip is initiated to maintain aircraft alignment with the heading selected on the course selector. The aircraft lateral position during the align maneuver continues to be guided by the location of the localizer beam center.

The flare mode is engaged automatically at a variable radio altitude (approximately 50 feet) based on the steady state sink rate. **FLAR** will be annunciated on the FMA. The airplane pitch axis is controlled to decrease the rate of descent from the rate required to maintain the glideslope to that required for touchdown. Glideslope radio control is removed from the pitch axis during flare.

The autothrottle retard mode is initiated at approximately 50 feet radio altitude. **RETD** will be annunciated in the autothrottle window of the FMA. The throttles will be automatically retarded toward the idle position at a rate of approximately 3° per second. If the autothrottles are inoperative, begin thrust reduction at the 50 feet AGL call to achieve idle thrust at or near touchdown.

At touchdown, main wheel spin-up is sensed and causes the ground spoilers to automatically deploy, the autothrottles to rapidly retard the throttles to the idle stops, the autopilot to automatically lower the nose, and the ground rollout mode to automatically engage. **ROL OUT** will be annunciated in the pitch and roll windows of the FMA and the arm window blanks.

Verify ground spoilers are deployed. During autoland touchdowns where the aircraft bounces after touchdown, ascertain ground spoiler status. If the ground spoilers do not deploy, disengage the autopilot and fly the aircraft manually through the subsequent touchdown and rollout or go-around if necessary.

The autopilot will disengage automatically and the FD display will be biased from view five seconds after nose strut compression if the automatic ground rollout option is not installed.

For aircraft equipped with the optional rollout mode, the autopilot will remain engaged and steering control to the center of the localizer beam will be maintained by rudder and nosewheel steering.

At initiation of reverse thrust, the autothrottle engage lever drops to the OFF position. The autothrottle warning lights are not illuminated when this occurs. The autothrottle may also be disengaged by pressing the disengage button on the throttle levers or by manual placement of the engage lever to the OFF position. In both of the latter two cases, the autothrottle flashing red warning lights will be illuminated.

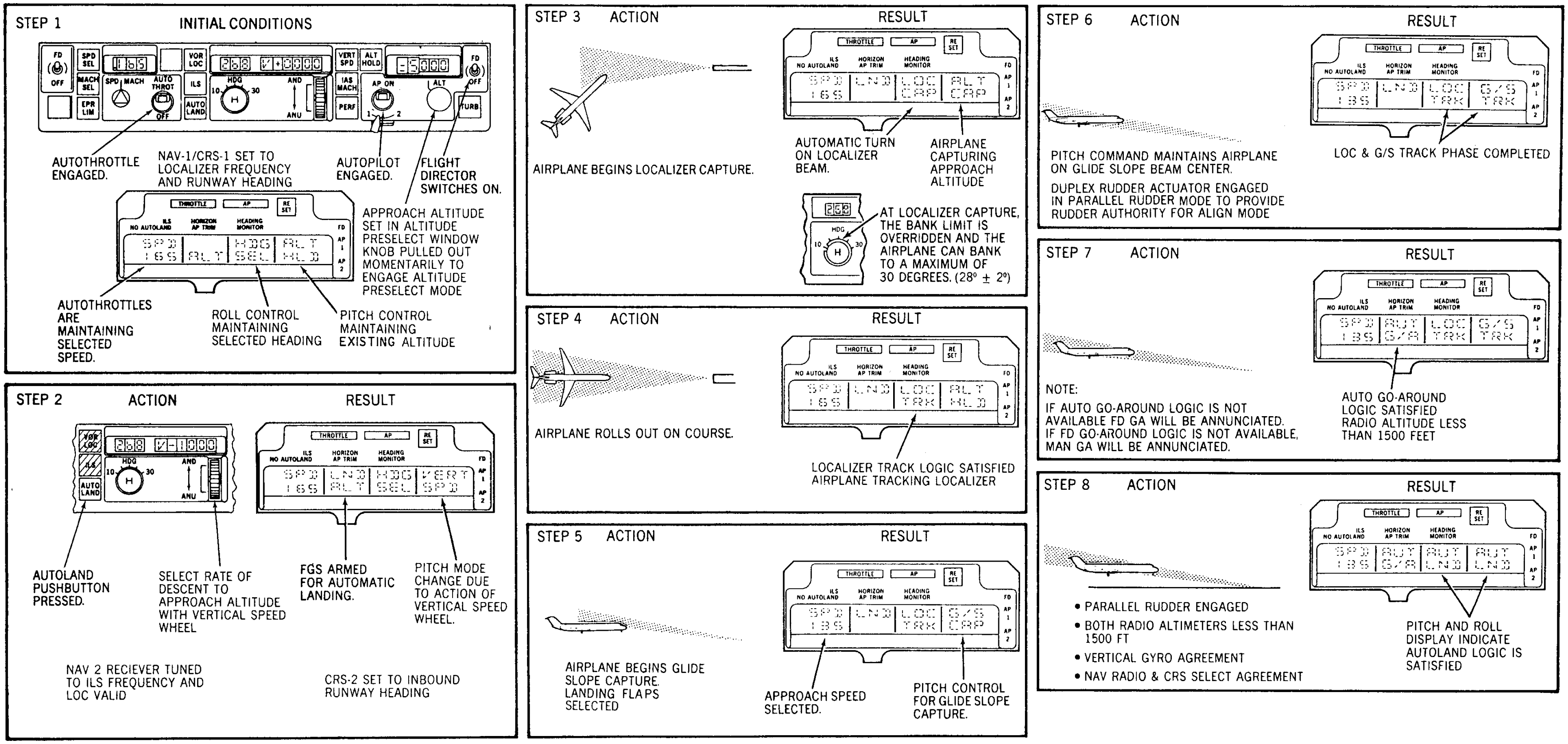
During autoland rollouts with reverse thrust greater than 1.6 EPR, the autopilot may disengage.

The autopilot should be disengaged upon the completion of ground rollout and before a turn is executed. To avoid a sudden stop, insure that the autobrakes (if installed) are disengaged prior to 20 knots. The autopilot may be disengaged by pressing the disengage button on either control wheel or by manually moving the engage lever to the OFF position. As the lever moves to OFF, the red flashing autopilot disconnect warning lights come on and the aural warning sounds. The lights and horn may be turned off by pressing the autopilot disengage button on either control wheel.

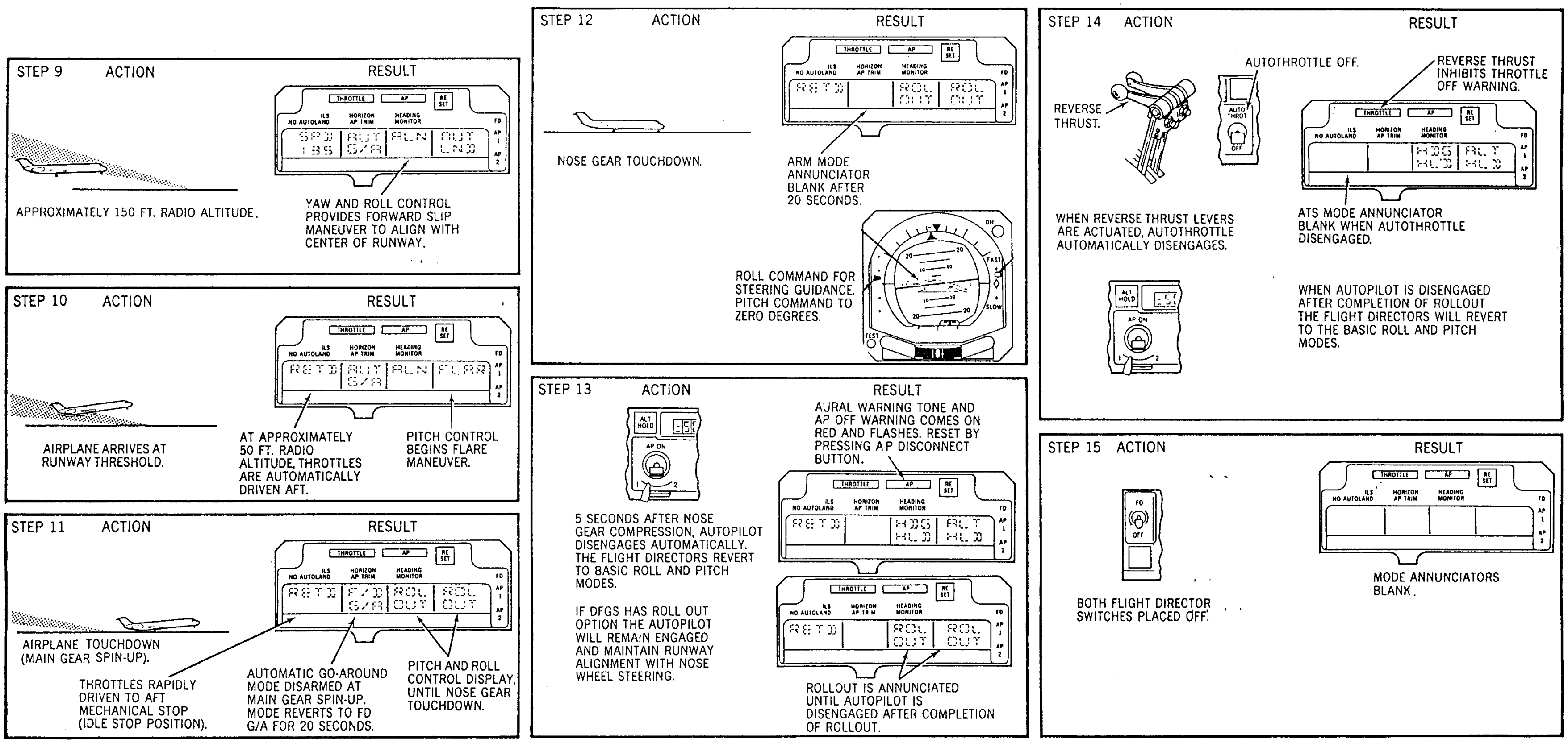
FMA Displays During Autoland Mode Approach

1.	SPD 250	LND ALT	HDG SEL	VERT SPD	Airplane is descending on intercept heading for localizer with autoland and altitude preselect armed.
2.	SPD 165	LND	LOC CAP	ALT CAP	Localizer and altitude (preselect) capture have been initiated. Airplane is turning onto localizer and leveling out on approach altitude.
3.	SPD 165	LND	LOC TRK	ALT HLD	Localizer and altitude capture have been completed. The airplane is tracking the localizer on a preselected altitude to intercept the glideslope.
4.	SPD 165	LND	LOC TRK	G/S CAP	Glideslope capture has been initiated. The airplane is tracking the localizer while establishing a rate of descent to coincide with the glideslope.
5.	SPD 135	LND	LOC TRK	G/S TRK	Glideslope capture has been completed. Landing flaps selected and appropriate speed selected. Airplane is tracking localizer and glideslope.
6.	SPD 135	AUT G/A	AUT LND	AUT LND	When both pilot's NAV and CRS are set to the ILS frequency and runway heading, all autoland monitors are satisfied, and the radio altitude is 1500 feet or less, the flight guidance system engages into autoland mode.
7.	SPD 135	AUT G/A	ALN	AUT LND	At approximately 150 feet (radio altitude), align mode is initiated and the transition from a crab angle to a forward slip begins for crosswind correction.
8.	RETD	AUT G/A	ALN	FLAR	At approximately 50 feet (radio altitude), the ATS retard mode and AP flare modes are initiated. The throttles are controlled to the retard schedule and the rate of descent is transitioned from glideslope to touchdown.

#					
9.	RETD	F/D G/A	ROL OUT	ROL OUT	At main gear wheel spin-up, rollout begins and nose lowering is initiated for nosewheel touchdown. Flight director go-around mode is armed and available for 20 seconds.
10			ROL OUT	ROL OUT	If system does not have the roll out option, the AP will disengage automatically 5 seconds after nose strut compression. The flight director will revert to basic roll and pitch mode when the autopilot disengages.


STEP 1 INITIAL CONDITIONS
AUTOTHROTTLE ENGAGED.
NAV-1/CRS-1 SET TO LOCALIZER FREQUENCY AND RUNWAY HEADING
AUTOPILOT ENGAGED.
FLIGHT DIRECTOR SWITCHES ON.
APPROACH ALTITUDE SET IN ALTITUDE PRESELECT WINDOW KNOB PULLED OUT MOMENTARILY TO ENGAGE ALTITUDE PRESELECT MODE
AUTOTHROTTLES ARE MAINTAINING SELECTED SPEED.
ROLL CONTROL MAINTAINING SELECTED HEADING
PITCH CONTROL MAINTAINING EXISTING ALTITUDE
STEP 2 ACTION RESULT
AUTOLAND PUSHBUTTON PRESSED.
SELECT RATE OF DESCENT TO APPROACH ALTITUDE WITH VERTICAL SPEED WHEEL
FGS ARMED FOR AUTOMATIC LANDING.
PITCH MODE CHANGE DUE TO ACTION OF VERTICAL SPEED WHEEL.
NAV 2 RECIEVER TUNED TO ILS FREQUENCY AND LOC VALID
CRS-2 SET TO INBOUND RUNWAY HEADING
STEP 3 ACTION RESULT
AIRPLANE BEGINS LOCALIZER CAPTURE.
AUTOMATIC TURN ON LOCALIZER BEAM.
AIRPLANE CAPTURING APPROACH ALTITUDE
AT LOCALIZER CAPTURE, THE BANK LIMIT IS OVERRIDDEN AND THE AIRPLANE CAN BANK TO A MAXIMUM OF 30 DEGREES. (28° ± 2°)
STEP 4 ACTION RESULT
AIRPLANE ROLLS OUT ON COURSE.
LOCALIZER TRACK LOGIC SATISFIED AIRPLANE TRACKING LOCALIZER
STEP 5 ACTION RESULT
AIRPLANE BEGINS GLIDE SLOPE CAPTURE. LANDING FLAPS SELECTED
APPROACH SPEED SELECTED.
PITCH CONTROL FOR GLIDE SLOPE CAPTURE.
STEP 6 ACTION RESULT
PITCH COMMAND MAINTAINS AIRPLANE ON GLIDE SLOPE BEAM CENTER.
DUPLEX RUDDER ACTUATOR ENGAGED IN PARALLEL RUDDER MODE TO PROVIDE RUDDER AUTHORITY FOR ALIGN MODE
LOC & G/S TRACK PHASE COMPLETED
STEP 7 ACTION RESULT
NOTE:
IF AUTO GO-AROUND LOGIC IS NOT AVAILABLE FD GA WILL BE ANNUNCIATED. IF FD GO-AROUND LOGIC IS NOT AVAILABLE, MAN GA WILL BE ANNUNCIATED.
AUTO GO-AROUND LOGIC SATISFIED RADIO ALTITUDE LESS THAN 1500 FEET
STEP 8 ACTION RESULT
• PARALLEL RUDDER ENGAGED
• BOTH RADIO ALTIMETERS LESS THAN 1500 FT
• VERTICAL GYRO AGREEMENT
• NAV RADIO & CRS SELECT AGREEMENT
PITCH AND ROLL DISPLAY INDICATE AUTOLAND LOGIC IS SATISFIED

Autoland Sheet 2



Autoland Approach Procedures

Note: The autopilot must be disengaged at 50 feet AGL or higher.

If autoland mode is armed but does not engage at 1500 feet AGL the flight crew should confirm that the compass headings and courses in the CRS windows are in agreement. If the autopilot will not engage in autoland mode, the flight crew may wish to cancel autoland mode and switch the autopilot back to ILS mode for a basic autopilot coupled ILS approach. This can be done by momentarily disengaging the autopilot and then re-engaging autopilot in ILS mode. Switching autopilot modes in this manner is only authorized above 1,000 feet. Once below 1,000 feet AGL the autopilot mode may not be switched.

At 500 feet AGL, the PF will announce "AUTOLAND" if the flight guidance system has engaged in autoland mode and AUT LND is annunciated correctly on the FMA. If the flight guidance system has not engaged in autoland the PF will announce "NO AUTOLAND" and "GOING AROUND" if appropriate.

Note: At 500 feet AGL: If the flight guidance system has not engaged in autoland mode and the weather conditions are CAT I or better the PF may disconnect the autopilot and manually complete the approach and landing. In weather conditions less than CAT I a go-around should be accomplished.

At 100 feet AGL (in place of the 100' call) the PM will verify ALN is annunciated correctly on the FMA and announce "ALIGN." If ALN is not annunciated by 100 feet AGL the PM will announce "NO ALIGN."

Exception: On monitored approaches the "ALIGN" or "NO ALIGN" callout will always be made by the F/O.

Note: At 100 feet AGL, if ALN is not annunciated on the FMA the PF (Capt only if weather is less than CAT I) should disconnect the autopilot and manually complete the approach and landing.

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Standard ILS Procedures

G/S Capture

The Pilot Flying should normally command "GEAR DOWN, LANDING CHECKLIST" at the first downward movement of the glideslope indicator and "FLAPS 28°" at one dot below the glideslope. At glideslope intercept the Pilot Flying should command "FLAPS 40°, TARGET."

Note: The above profile will result in glideslope intercept and aircraft configuration for landing with minimum power adjustments assuming the aircraft has all systems operating and no unusual ATC considerations exist. The Pilot Flying may modify the profile as necessary to meet the needs of the situation. (For example, extending the gear before the flaps are at 15° to decelerate the aircraft.)

Course Guidance

The final approach segment of an ILS approach begins at the point in space on the localizer course where the published glideslope intercept altitude (height) intersects the nominal glidepath. Descent on the final approach segment must never be initiated until the aircraft is within the tracking tolerance of the localizer. The ILS obstacle clearance criteria assume that the pilot does not normally deviate from the center line more than a half scale deflection (1 dot) after being established on track. Failure to remain within this tolerance, combined with failure to remain within the glideslope tolerances, could place the aircraft outside protected obstacle clearance airspace.

- Localizer deviation ± 1 dot
- Glideslope deviation ± 1 dot
- Airspeed deviation from target – 5 / +10 knots of target

Exceeding any of the above listed parameters is indicative of an unstabilized approach. Deviations from the localizer and/or glide slope parameters are acceptable only for brief periods of time, and only if positive action is being taken to correct the deviation. It is recognized that ATC instructions often necessitate airspeeds higher than optimum during the initial portions of an ILS approach. When operationally desired, higher than normal airspeeds can be flown until the aircraft is in the stabilized approach regime (preferred by 1,000 feet AGL, mandatory below 500 feet AGL). Unstabilized approaches must not be allowed to continue below 500 feet above field elevation in VMC conditions, or below 1,000 feet above field elevation in IMC conditions.

Limitations and restrictions while conducting Cat II approaches are, in many cases, more restrictive. Refer to the Monitored ILS Approach Procedures portion of this section for specific guidance.

Decision Regime

The decision regime is that portion of an approach from 500 feet above the touchdown zone to the flare. During this portion of the approach, the flight crew must continually evaluate the necessity for a missed approach.

ILS Precision Runway Monitor (PRM)

When conducting an ILS Precision Runway Monitor (PRM) approach in the MD-80, the following procedures will be utilized:

In range of the destination:

- Confirm ILS PRM procedures are in effect from the destination ATIS. Review Jeppesen PRM instructions for planned approach.
- Review any MEL/inoperative equipment that may affect the ability to accomplish the procedure. The following systems must be operational:
  - ILS (Cat I)
  - Transponder
  - Two VHF radios

When accomplishing the APPROACH CHECKLIST:

- Verify the PRM monitoring frequency is set in the #2 VHF radio. Adjust the VHF-2 volume control lever on each pilot's audio control panel to ensure transmissions will be heard.

  Note: On some aircraft the ACARS is connected to the #2 VHF radio. Select ACARS VOX mode for PRM approach in those aircraft.

- Set the TCAS selector to TA ONLY.

During the approach if a "breakout" is directed by ATC:

The PF will:

- Immediately disconnect the autopilot -- do not disconnect the autothrottles.
- **Do not push TOGA.**
- Immediately manually fly the aircraft to the assigned heading and altitude (do not descend at a rate greater than 1,000 FPM).
- Do not change aircraft configuration (gear or flaps) until after established on the new heading.
- Autopilot may be re-engaged after established on new heading.
- Aircraft may be reconfigured (gear, flaps, and speed) as desired after established on the new heading.

The PM will:

- Acknowledge ATC instructions.
- Set the directed heading and put the FGS in HDG SEL mode.
- Set and arm the directed altitude in the FGS.
- Set the FGS VERT SPD to 1,000 FPM up or down as required.
- Reconfigure the aircraft as called for by the PF.
- Change the TCAS mode back to TA/RA as appropriate.

Monitored ILS Approach Procedures

Preflight

Check the Aircraft Status Annunciator and the logbook to determine the lowest approach category the aircraft will be capable of. Perform the receiving aircraft checklist with special attention to those items and functions. which will be necessary for the category of approach planned.

Accomplish an autoland preflight test during the receiving aircraft check.

Aircraft Status Annunciator

One status annunciator will be located on the Captain's instrument panel. It will indicate the current status of the aircraft equipment as follows:

CAT II (Black) - The aircraft is authorized Cat I and Cat II approaches but not autoland to touchdown.

NOT CAT II (Red) - The aircraft is authorized Cat I approaches but not autoland to touchdown.

Note: Only qualified CAL maintenance personnel may change the status annunciator.

Enroute

The flight crew should monitor weather at the destination and determine as early as possible the approach to be flown. In addition to reviewing the approach, the flight crew should review the required equipment list for the type of approach to be flown and the Monitored Approach Briefing Guide.

Approach Minimums

LOWEST AUTHORIZED APPROACH MINIMUMS		
	Cat I	Cat II
RVR (Feet)	≥ 1800	≥ 1200
DA(H) (Feet)	Barometric Altimeter ≥ 200 feet above TDZE	Radar Altimeter ≥ 100 feet above TDZE (Or inner marker if RA not authorized)

Runway Visual Range (RVR)

- Controlling RVR - Used to determine operating minima for the approach. The flight crew is prohibited from beginning the final approach segment unless the last report indicated all controlling RVR's are at or above the minimums for the approach. All RVR transmissometer's that are controlling are required. If the flight crew receives a controlling RVR report that is below minimums after established on the final approach segment, they may continue the approach until DA(H). On a Cat I or Cat II approach, the Captain may continue below DA(H) if (s)he determines adequate visual reference for the type of approach exists.
- Advisory RVR - Does not constitute minima for the approach and provides the flight crew information only. Advisory RVR transmissometer's may or may not be required.

RVR Transmissometer Requirements		
	Cat I	Cat II
TDZ	Required & Controlling	Required & Controlling
MID	Not Required[1], Advisory	Not Required[2], Advisory
Rollout	Not Required, Advisory	Not Required[2], Advisory
1 - Cat I: MID RVR may be substituted for TDZ if TDZ is not reporting.		
2 - Cat II: If TDZ RVR is below 1600, advisory MID or Rollout RVR required.		

Localizer Tracking

Flight crews should closely monitor autoflight systems and ILS raw data during the approach to ensure proper localizer tracking. The following operating practices, when conditions permit, will significantly improve localizer tracking and provide touchdown closer to runway centerline.

- Prior to approach, check rudder and aileron trim before engaging autopilot.
- Maintain symmetrical thrust on both engines throughout the approach.
- When air traffic control will permit, intercept the localizer at an angle not greater than 45 degrees. Capture the localizer not less than 8 miles from runway threshold. Capture the localizer with flaps 15° and at a speed no greater than 170 knots. Capture the glideslope at or above 1,500 feet AGL.
- Aircraft should be stabilized on localizer and glideslope before passing outer marker or a soon as possible after passing the final approach fix.
- Monitor ILS raw data throughout the approach.

Distortion of Localizer/Glideslope Beam

If distortion or oscillation of the localizer/glideslope beam occurs, the autopilot will attempt to follow the signal resulting in undesirable aircraft response. Erratic ILS signals are easily detected by noting the raw data displays.

Note: There are restrictions on ground and air movements near Cat II/III runways during Cat II weather conditions. When weather conditions are Cat I or better the restrictions do not apply and localizer/glideslope beam distortions are more likely.

Decision Regime Performance Limits

The decision regime will be from 500 feet above the TDZE to the flare. Performance limits in the decision regime are:

- Airspeed: ±5 knots of target speed.
- Glideslope: Significant deviation not to exceed ±1 dot.
- Localizer: Cat I: 1 dot right or left of centered CDI
  Cat II: 1/3 dot right or left of centered CDI.
- Illumination or any warning/caution lights or flags not previously deemed acceptable: none allowed.

Note: To avoid distractions or potential confusion when the aircraft is below 500 feet above TDZE, any initial/new warning light or flag that comes into view in the decision regime requires a missed approach even if that warning light or flag would be acceptable under the required equipment list for the type of approach being flown. A warning light or flag that has been identified prior to the decision regime, and does not disqualify the aircraft from the approach being flown, is acceptable in the decision regime.

- Raw Data must match up with computed data.
- Rate of Descent: Maximum of 1,000 feet per minute.
- Maximum stabilized crab angle: 10°.
- GPWS activation: none allowed.

Any violation of these performance limits in the decision regime mandates an immediate go-around. Prior to the Captain taking control of the aircraft, the Captain will command and the First Officer will execute the go-around. After the Captain has taken control of the aircraft, the First Officer will advise of any deviations beyond the performance limits and the Captain will execute the go-around.

The Importance of Visual Cues

<u>Caution</u>: During low visibility or night approaches, the touchdown point may not be visible to the pilot at DA(H). Be aware of the tendency to "DUCK UNDER" the glideslope when manually controlling the aircraft during these conditions.

The autopilot should be used to the minimum authorized altitude to prevent "Duck Under." For Cat II operations, the importance of visual cues prior to and during descent below DA(H) cannot be overemphasized. A flaps 40° approach is recommended to improve the forward visual sight picture by the reduced deck angle. DA(H) is defined as a specified height above the elevation of the touchdown zone at which a decision must be made to continue the approach or to initiate a missed approach.

At DA(H) the flight crew must be satisfied that the total pattern of visual cues provides sufficient guidance to continue the approach and landing. If the aircraft is not tracking so as to remain within the lateral confines of the runway and land within the touchdown zone, the flight crew must accomplish a missed approach. If the approach is continued, it is imperative that the required visual references be continuously maintained. Flight crews should realize that visual cues can be lost after DA(H) by encountering shallow fog, snow flurries, or heavy precipitation. Whenever visual cues are lost after DA(H), the flight crew should immediately accomplish a missed approach.

Use of the landing lights is at the option of the Captain. Under certain atmospheric conditions, the use of landing lights will reduce visibility at DA(H). Flight crews may find it advantageous to delay the use of landing lights until after touchdown.

Crew Actions / Callouts

ILS Mode Monitored Approach		
	ACTION / CALLOUT	
Condition / Location	Captain	First Officer
1,000' above TDZE	"1,000"	
500' above TDZE	"500"	
400' above TDZE	"400"	
300' above TDZE (Cat II only)	"300"	
100' above DA(H)	"Approaching minimums, I'm going heads up"	Is prepared to accomplish missed approach at DA(H)
At DA(H) (Cat I - Baro Altimeter) (Cat II – Radar Altimeter or inner marker) If Captain has not taken control of the aircraft.	Monitor F/O missed approach.	"Minimums, going around" Accomplish missed approach.
At or prior to DA(H) If adequate visual reference is acquired.	"I have the aircraft" Assume control of the aircraft. Autopilot and autothrottles should be left on if operational.	Relinquish control of aircraft to Captain. Monitor flight instruments and FMA.
100' above TDZE (Radar Altimeter)		"100"
At or prior to 70' above TDZE (Radar altimeter)	Disconnect the autopilot. Autothrottles as desired.	Ensure autopilot is disconnected.
50' above TDZE 30' above TDZE 20' above TDZE 10' above TDZE (Radar altimeter)		"50" "30" "20" "10"
Aircraft deviates from centerline.	"CENTERLINE" Steer aircraft to runway centerline.	"CENTERLINE"

Autoland Mode Monitored Approach		
	ACTION / CALLOUT	
Condition / Location	Captain	First Officer
1,000' above TDZE	"1,000"	
500' above TDZE	"500"	"AUTOLAND" or: If Cat II - "NO AUTOLAND, GOING AROUND". Accomplish missed approach. If Cat I - disconnect autopilot and continue approach.
400' above TDZE	"400"	
300' above TDZE (Cat II)	"300"	
100' above DA(H)	"APPROACHING MINIMUMS, I'M GOING HEADS UP"	Prepared to accomplish missed approach at DA(H).
At DA(H) (Cat I - Baro Altimeter) (Cat II – Radar Altimeter or inner marker)	Monitor F/O missed approach.	"MINIMUMS, GOING AROUND." Accomplish missed approach.
At or prior to DA(H) If adequate visual reference is acquired.	"I HAVE THE AIRCRAFT." Assume control of the aircraft.	Relinquish control of aircraft to Captain.
100' above TDZE (Radar Altimeter)	If "NO ALIGN" is called: Disconnect autopilot and land manually if adequate visual reference is available.	Observe FMA roll window: "ALIGN" or "NO ALIGN" Monitor landing and continue callouts.

Autoland Mode Monitored Approach		
At or prior to 50' above TDZE (Radar Altimeter) If not authorized autoland-to-touchdown.	Disconnect autopilot, autothrottles as desired.	Ensure autopilot is disconnected.
50' above TDZE 30' above TDZE 20' above TDZE 10' above TDZE (Radar altimeter)		"50" "30" "20" "10"
At touchdown (If autoland-to-touchdown)	If F/O announces "NO ROLLOUT", disconnect the autopilot and control the aircraft manually.	Observe FMA roll and pitch windows, "ROLL OUT" or "NO ROLL OUT"
Aircraft deviates from centerline.	"CENTERLINE" Steer aircraft to runway centerline.	"CENTERLINE"

CAT I Monitored Approach

CAT I LOWEST AUTHORIZED DA(H): 200 feet above TDZE on barometric altimeter

CAT I MINIMUM AUTHORIZED RVR AND TRANSMISSOMETER REQUIREMENTS		
Touchdown RVR (Required) (Mid RVR may be substituted for Touchdown RVR if Touchdown RVR is not reported.)	Mid RVR (Not Required)	Rollout RVR (Not Required)
1800 (Controlling)	Not specified (Advisory)	Not specified (Advisory)

A CAT I monitored approach should be accomplished using the autopilot either in ILS mode or autoland mode. A manually flown CAT I monitored approach is authorized if the autopilot is not operational.

Adequate visual reference requirements to descend below DA(H) for a CAT I approach are previously listed in this section under the heading DA(H)/DDA.

CAT II Monitored Approach

CAT II LOWEST AUTHORIZED DA(H): 100 feet above TDZE on radar altimeter

CAT II MINIMUM AUTHORIZED RVR AND TRANSMISSOMETER REQUIREMENTS		
Touchdown RVR (Required)	Mid RVR (Mid or Rollout Required if Touchdown RVR <1600)	Rollout RVR (Mid or Rollout Required if Touchdown RVR <1600)
1200 (Controlling)	Not specified (Advisory)	Not specified (Advisory)

A CAT II monitored approach must be accomplished using the autopilot either in ILS mode or Autoland mode. A manually flown CAT II approach is not authorized. The aircraft status annunciator must indicate CAT II or CAT III Autoland status.

To commence and continue a CAT II approach to minimums, all required aircraft equipment and all required elements of the CAT II ground system must be operating.

Controlling RVR must be reported at or above minimums to commence the CAT II approach. Once established, if controlling RVR is reported below minimums, the approach may be continued to DA(H) and landing accomplished if the Captain has established sufficient visual reference with the CAT II lighting system.

Note: To continue below DA(H) on a CAT II approach, the Captain must have sufficient visual reference with the CAT II lighting system to safely continue the approach by visual reference alone.

Sufficient visual reference for a CAT II approach is based on the CAT II lighting system which consists of the following:

ALSF-1, ALSF-2, or ICAO equivalent.
High Intensity Runway Lights (HIRL).
Touchdown Zone Lights (TDZ).
Centerline Lights (CL).

The following items require a go-around from a CAT II approach:

- A failure that causes the autopilot to disconnect prior to DA(H).
- Failure of a required ground facilities component prior to DA(H).
- Failure of any required aircraft equipment prior to DA(H).
- Winds out of limits or reports of windshear greater than 10 knots.
- Exceeding a performance limit in the decision regime.
- Insufficient visual reference with the CAT II lighting system at DA(H) to safely continue the approach by visual reference alone.
- After passing DA(H): Insufficient visual reference with the CAT II lighting system, or a reduction in visual reference which prevents safely continuing the approach by visual reference alone.
- The landing cannot be safely accomplished within the touchdown zone.

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Missed Approach

If upon reaching decision height as indicated by either the baro altimeter, radio altimeter or inner marker (as appropriate), the Captain has not called out, "I HAVE THE AIRCRAFT," the First Officer will execute a missed approach and simultaneously call out, "MINIMUMS, GOING AROUND."

Should a missed approach become necessary after the Captain has called "I HAVE THE AIRCRAFT" and taken control, the Captain will fly the missed approach.

Refer to MISSED APPROACH / GO AROUND PROCEDURE, this section.

Under no circumstances will a landing be attempted after a go-around has been initiated. If unable to touchdown in the touchdown zone, go around.

Category II/Coupled Approach Aircraft Logbook Write-Ups

Whenever a CAT II/Coupled approach is unsuccessful due to equipment malfunction, a logbook entry is required. The entry should carefully explain the malfunction using the following guidelines to assist maintenance in correcting the discrepancy. Specify the following items in the aircraft logbook entry:

Which DFGS was in use
What approach mode was in use
Whether autothrottle was in use
Which ILS receiver was in use
Which RA or marker was inoperative
If yaw damper was inoperative
If pitch trim was inoperative
Altitude at disengagement
Verify all components engaged properly

MONITORED APPROACH BRIEFING GUIDE

I. CALL OUTS FOR MONITORED APPROACHES

CAPTAIN	FIRST OFFICER
"1,000", (above TDZE) "500", "400", "300" (if Cat II approach), 100 feet above DA(H): "APPROACHING MINIMUMS, I'M GOING HEADS UP" At decision to pass DA(H): "I HAVE THE AIRCRAFT"	At 500 feet (if autoland) "AUTOLAND" At DA(H) If Captain has not taken control: "MINIMUMS, GOING AROUND" "100" or "ALIGN" (if autoland) "50" "30" "20" "10"

If aircraft deviates from centerline, either pilot call "CENTERLINE"

II. APPROACH LIMITS - CAT II

PERFORMANCE LIMITS (500 Feet to Flare)	WIND LIMITS (Including Gusts)
Glideslope deviation not to exceed 1 dot. Localizer deviation not to exceed 1/3 dot. Airspeed + or - 5 kts of target speed. Maximum rate of decent is 1,000 FPM. Maximum stabilized crab angle is 10°. No new warning lights or flags allowed. Raw data must match with computed data. No GPWS activations.	Maximum headwind - 20 kts. Maximum crosswind - 10 kts. Maximum tailwind - 10 kts. No LLWAS. No reported windshear gain or loss greater than 10kts.

MANDATORY MISSED APPROACH

Below 500 Feet to Above DA(H):	Below DA(H):
Change in approach mode. Loss of a required aircraft component. Loss of a required ground component. Exceeding a performance limit.	Out of a normal landing position. Loss of required visual references. Exceeding a performance limit prior to flare. Not on the runway in the TDZ.

MISSED APPROACH PROCEDURES

If at or above DA(H) and any of the above parameters are exceeded the F/O will initiate the missed approach.

If at DA(H) the Captain has not made the "I HAVE THE AIRCRAFT" call the F/O will initiate the missed approach.

After the Captain calls "I HAVE THE AIRCRAFT" the Captain will execute the missed approach if required.

The autopilot GA mode should be used unless the autopilot has been disengaged.

- Advance throttles positively to go-around thrust while activating TOGA buttons.
- Call: "FLAPS 15, CHECK MAX POWER."
- Ensure aircraft is rotated to go-around attitude of 15° - 20° (by autopilot or manually).
- With a positive rate of climb:
  Call: "POSITIVE RATE - GEAR UP - ALTITUDE ARM."
- Climb at Go-Around speed on Landing Speed Card.
- Call: "HEADING SELECT" (when required).

Under no circumstances will a landing be attempted after a go-around is initiated.
Do not attempt go-around after reverse thrust has been initiated.

MONITORED APPROACH BRIEFING GUIDE	
III. AIRCREW / AIRPORT REQUIREMENTS FOR CAT II	
AIRCREW	AIRPORT
Flight Crew must have completed all required training.	Minimum TCH of 35 feet. Localizer & glideslope. Outer and inner marker or authorized substitute. CAT II Lighting System: ALSF-1, ALSF-2, or ICAO equivalent. High Intensity Runway Lights (HIRL). Touchdown Zone Lights (TDZ). Centerline Lights (CL). Full runway length available (reduced runway may be approved by dispatch).

TRANSMISSOMETERS		
	CAT I	CAT II
TDZ	Required & Controlling	Required & Controlling
MID	[1]Not required-Advisory	[2]Not required-Advisory
Rollout	Not required-Advisory	[2]Not required-Advisory

1- CAT I, MID RVR may be substituted for TDZ if TDZ is not reported
2- CAT II, If TDZ RVR is below 1600, an advisory MID or Rollout RVR must be reported

AUTHORIZED RVR - FEET AND METER EQUIVALENTS

Feet	300	600	700	1000	1200	1600	1800	2000	2400
Meters	90m	175m	200m	300m	350m	500m	550m	600m	720m

IV. LANDING PROCEDURES

- Proper seat height is necessary to ensure optimum flight deck cut-off angle for a visual landing. Approach lights will appear directly in front of aircraft nose in low visibility.
- Approaching DA(H) the Captain's hand should be on the throttle quadrant below the F/O's in anticipation of assuming control of the aircraft.
- To continue below DA(H), the pilot must have:

CAT I: At least one of the following visual references:
Approach light system except the pilot may not descend below 100 feet above TDZE using ALS as a reference unless red terminating bars or red side row bars are distinctly visible and identifiable) / Threshold, threshold markings or lights / REIL / VASI / Touchdown zone, touchdown zone markings or lights / Runway or runway markings / Runway lights.

CAT II: Sufficient visual reference with the CAT II lighting system to safely continue the approach by visual reference alone.

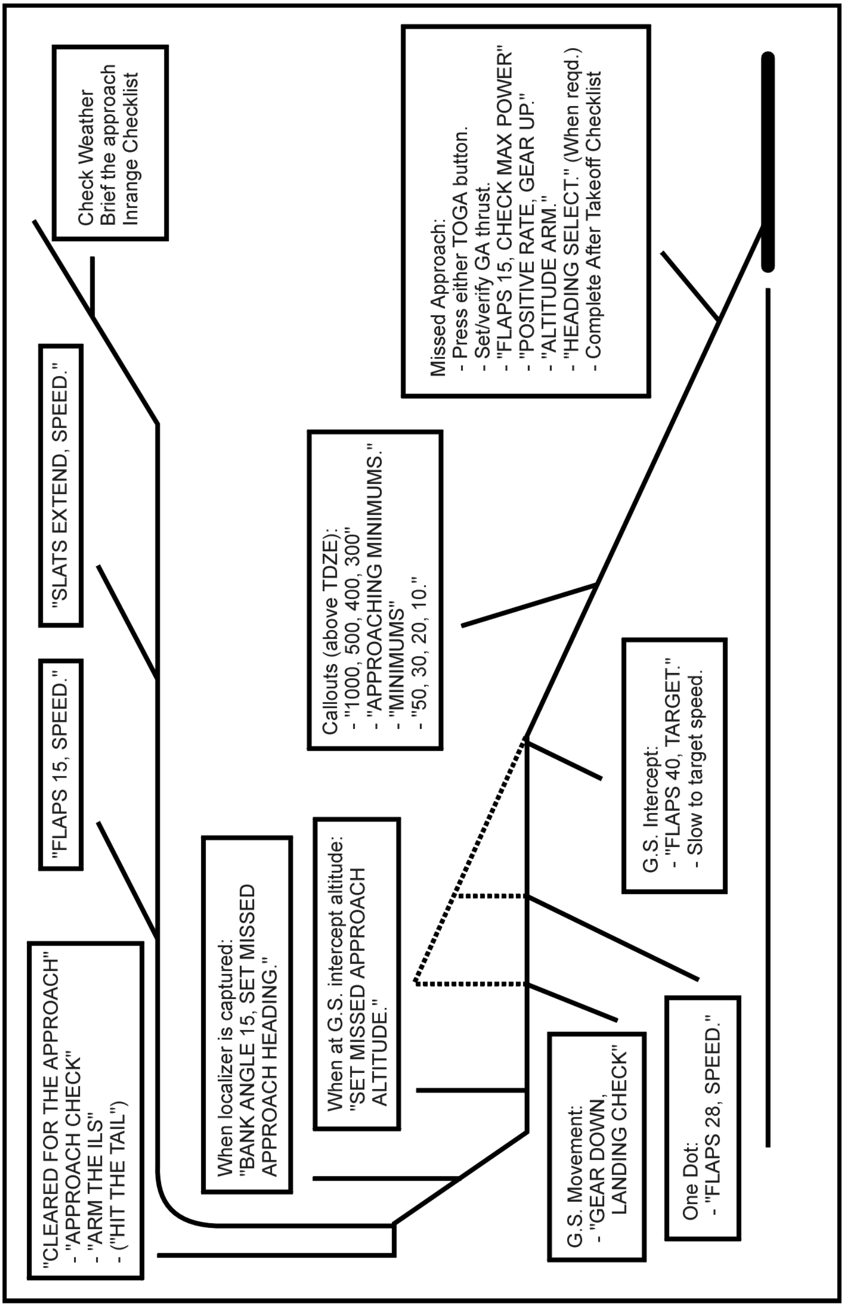
- Use of the landing lights is at the option of the Captain. It may be advantageous to delay using the landing lights until after touchdown.
- Use of the autopilot to minimum authorized altitude is advised.

REQUIRED EQUIPMENT LIST		
SYSTEM / APPROACH	CAT I FLIGHT DIRECTOR	CAT I AUTO - COUPLED
Autopilot	N/A	1
Flight Director	1[1]	ON or OFF[1, 2]
Autothrottle	ON or OFF[2]	ON or OFF[2]
Hydraulics	ON or OFF	ON or OFF
Electrical System	3 or 2 or 1 Generators	3 or 2 or 1 Generators
Yaw Damper	ON, OFF, or OVRD	ON, OFF, or OVRD
ILS Receivers	1[3]	1
Engines	2 or 1	2
Flaps / Slats	40/LD or 28/LD	40/LD or 28/LD
Auto Pitch Trim	N/A	WITH or WITHOUT[4]
Dual Vertical Gyros	2 or 1	2 or 1
Triple Vertical Gyros	3 or 2 or 1[5]	3 or 2 or 1[5]
Dual AHARS	2 or 1[6]	2 or 1[6]
DH Light	Not Required	Not Required
Autopilot Warning	N/A	2 or 1[7]
FMA	2 or 1[7]	2 or 1[7]
Radio Altimeters	2 or 1[7]	2 or 1[7]
CAWS	Not Required	Not Required
Auto Ground Spoilers	Not Required	Not Required
Slow / Fast Indicator	Not Required	Not Required
Air Data Computer	2 or 1[8]	2 or 1 or 0[8]
DFGS Computer	2 or 1	2 or 1
Auto Ground Rollout	N/A	N/A
Autobrakes	WITH or WITHOUT	WITH or WITHOUT
Windshield Wipers	WITH or WITHOUT	WITH or WITHOUT

1- FD CMD switch may be in any position.
2- Must be used if operational.
3- RADIO NAV switch (if installed) may be in any position.
4- Without APT, the aircraft must be manually trimmed and the glideslope tracked at final approach speed prior to autopilot engagement.
5- VERT GYRO switch may be in any position.
6- AHARS may be in NORMAL or BASIC mode.
7- Either side of flight deck.
8- One required if autothrottle is to be used, CADC switch may be in any position.

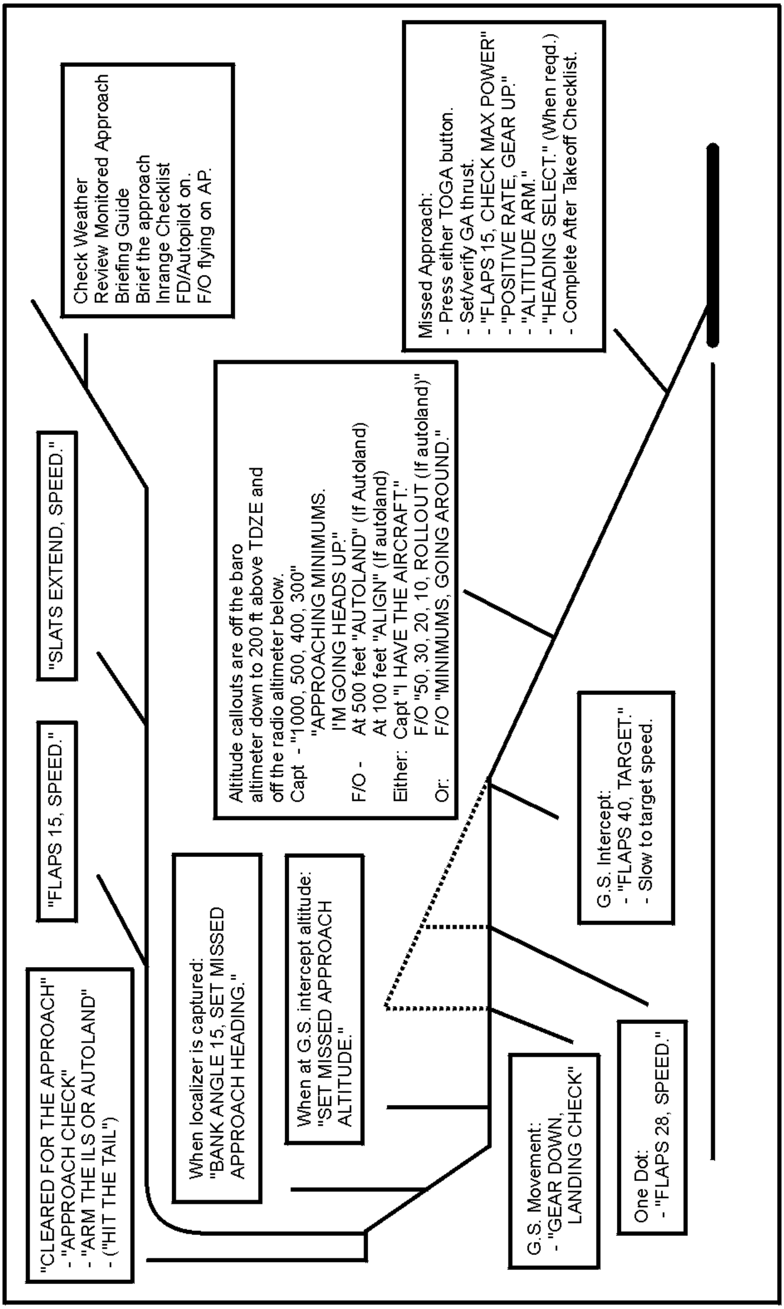
REQUIRED EQUIPMENT LIST		
SYSTEM / APPROACH	CAT II AUTO - COUPLED	AUTOLAND
Autopilot	1	1
Flight Director	2 Displays[1]	ON or OFF[1, 2]
Autothrottle	ON or OFF[2]	ON or OFF[2]
Hydraulics	ON or OFF	NORMAL
Electrical System	3 or 2 or 1 Generators	NORMAL[3]
Yaw Damper	ON, OFF, or OVRD	ON, OFF, or OVRD
ILS Receivers	2	2[4]
Engines	2	2[5]
Flaps / Slats	40/LD or 28/LD	40/LD or 28/LD
Auto Pitch Trim	WITH or WITHOUT[6]	WITH or WITHOUT[6]
Dual Vertical Gyros	2	2
Triple Vertical Gyros	3 or 2[7]	3 or 2[7]
Dual AHARS	2[8]	2[8]
DH Light	2 or 1[9]	2 or 1[9]
Autopilot Warning	2 or 1[10]	2 or 1[10]
FMA	2 or 1[10]	2 or 1[9]
Radio Altimeters	2 or 1[9]	2
CAWS	Not Required	Required
Auto Ground Spoilers	Not Required	Required
Slow / Fast Indicator	Not Required	Not Required
Air Data Computer	2 or 1 or 0[11]	2
DFGS Computer	2 or 1	2 or 1
Auto Ground Rollout	N/A	WITH or WITHOUT
Autobrakes	WITH or WITHOUT	WITH or WITHOUT
Windshield Wipers	WITH or WITHOUT[12]	WITH or WITHOUT[12]

1- FD CMD switch may be in any position.
2- Must be used if operational.
3- The APU may be used instead of one engine generator.
4- RADIO NAV switch (if installed) must be in NORM position.
5- Autoland can be completed if engine failure occurs below 50 feet.
6- Without APT, the aircraft must be manually trimmed and the glideslope tracked at final approach speed prior to autopilot engagement.
7- VERT GYRO switch may be in any position.
8- AHARS may be in NORMAL or BASIC mode.
9- F/O’s must be working for monitored approach.
10- Either side of flight deck.
11- One required if autothrottle is to be used, CADC switch may be in any position.
12- Required for CAT II when falling precipitation within 5 miles of landing field.



ILSAPPRH

ILS APPROACH PROFILE



ILSCAT2

ILS CAT II (MONITORED) APPROACH PROFILE

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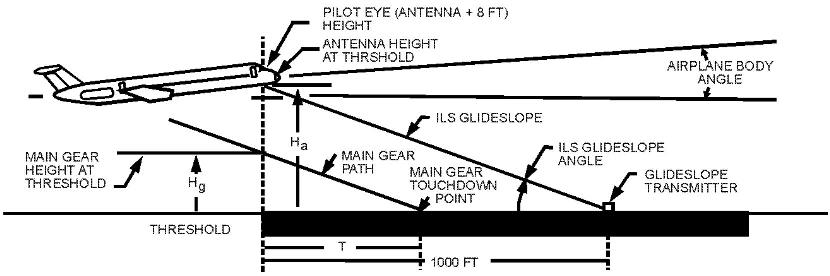
APPROACH AND LANDING
ESTIMATED ILS APPROACH

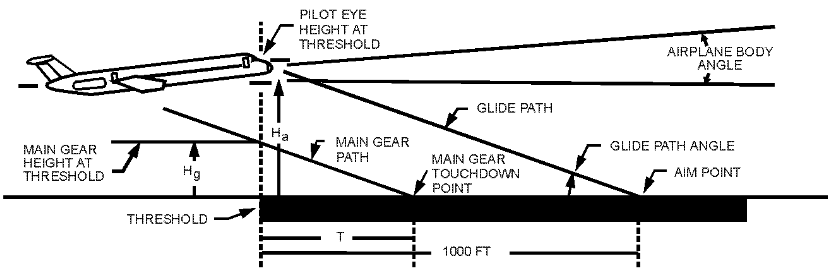
ESTIMATED TOUCHDOWN POINT (NO FLARE) ASSUMING G/S TRANSMITTER AT 1000 FT.
FLAPS 40



GLIDE PATH ANGLE (DEGREES)	ESTIMATED BODY ANGLE (DEGREES)	ANTENNA HEIGHT, H_a AT THRESHOLD (FEET)	MAIN GEAR HEIGHT, H_g AT THRESHOLD (FEET)	MAIN GEAR TOUCH-DOWN POINT. T (FEET)
2.5	3.2	44	28	649
2.75	2.95	48	33	681
3.0	2.7	52	37	708

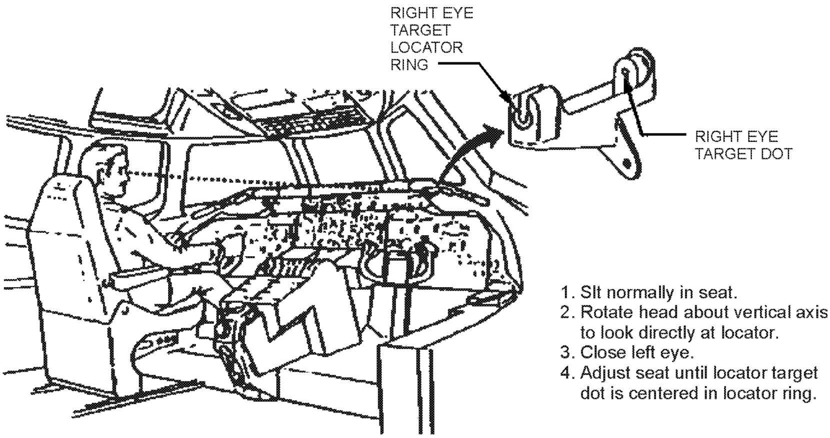
ESTIMATED VISUAL APPROACH

ESTIMATED TOUCHDOWN POINT (NO FLARE) ASSUMING AN AIM POINT OF 1000 FT.
FLAPS 40



GLIDE PATH ANGLE (DEGREES)	ESTIMATED BODY ANGLE (DEGREES)	PILOT EYE HEIGHT, H_a AT THRESHOLD (FEET)	MAIN GEAR HEIGHT, H_g AT THRESHOLD (FEET)	MAIN GEAR TOUCH-DOWN POINT. T (FEET)
2.5	3.2	43	22	503
2.75	2.95	46	27	562
3.0	2.7	52	31	591

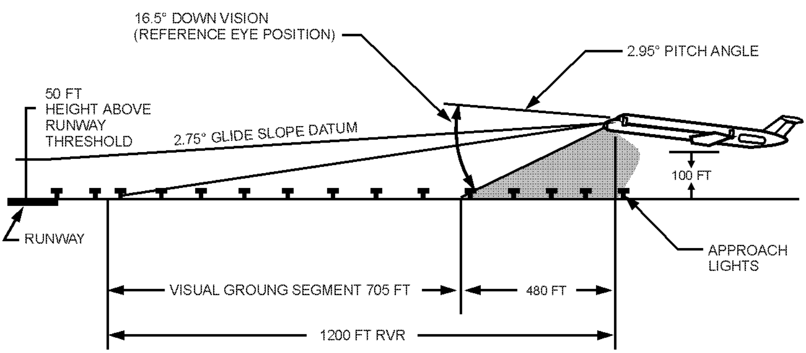
PILOT EYE LOCATOR



1. SIt normally in seat.
2. Rotate head about vertical axis to look directly at locator.
3. Close left eye.
4. Adjust seat until locator target dot is centered in locator ring.

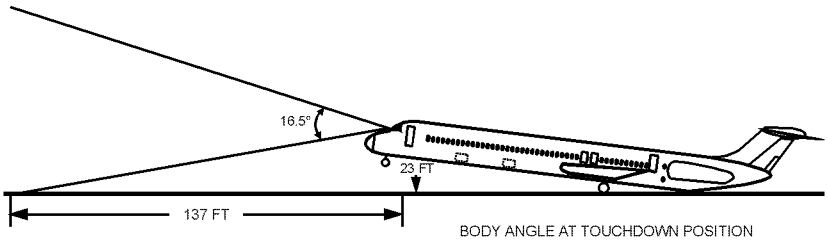
APPROACH AND LANDING VISUAL GROUND SEGMENTS

LANDING APPROACH - FLAPS 40

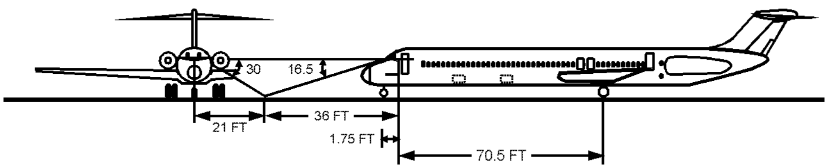


NOTE: WITH 16.5° DOWN VISION THE PILOT WILL, AT 100 FT HAVE VISUAL REFERENCE OF 6 OR 7 APPROACH LIGHTS

PILOT EYE ORIENTATION WITH GROUND



BODY ANGLE AT TOUCHDOWN POSITION
(ATTITUDE AT 7° PITCH ANGLE)



PILOT DISTANCE FROM NOSE AND MAIN
LANDING GEAR (GROUND STATIC POSITION)

NON-PRECISION APPROACHES

Note: Non-precision approaches will be flown using the autopilot (and autothrottles) if available. All non-precision approaches in visibility less than 1 nm or RVR 5000 feet flown using monitored approach procedures.

A non-precision approach is any instrument approach where electronic glideslope information is not provided. The following procedures will enhance safety by minimizing the potential for CFIT.

Constant Rate Descent

Descent on final approach will be controlled so as to emulate the constant rate descent of a normal ILS glidepath to the runway, while meeting any altitude crossing restrictions. This controlled, constant rate descent will increase safety and cause the aircraft to arrive at the Derived Descent Altitude (DDA) at the Visual Descent Point (VDP).

Derived Decision Altitude

50 feet is added to the published MDA and this altitude is used as a Derived Decision Altitude (DDA). The aircraft is descended using a constant rate of descent, and a decision to land or execute a missed approach must occur at or before the DDA. Initiating a missed approach at the DDA ensures that the aircraft will not descend below the MDA. A decision to continue the approach below DDA requires adequate visual reference (discussed under DA(H)/DDA, this section), and the aircraft must be in a position to make a safe landing.

Note: The Flight Crew must monitor their position relative to the published Missed Approach Point (MAP). In the event a missed approach is initiated prior to the MAP (most likely condition), start a climb to the appropriate altitude, but do not begin a turn until reaching the MAP.

Crew Coordination

The Flight Crew shall both calculate, and agree upon, the DDA and the vertical speed down required for a constant rate descent.

The PM should provide information and assistance allowing the PF to devote full attention to aircraft control without having to repeatedly refer to the approach plate. The PM should attempt to visually acquire the runway and provide "vectors" to align the aircraft with the extended centerline of the runway. The PM will monitor altitude and airspeed throughout the approach and during descent to the runway.

Standard Non-Precision Approach Procedures

Course Guidance

During the final approach segment of a non-precision approach PRIOR TO REACHING DDA, the following course deviation parameters apply:

- Localizer deviation: 1 dot
- VOR course deviation: 1 dot
- NDB: +/- 5 degrees on bearing pointer

Exceeding any of the above listed parameters is indicative of an unstabilized approach. Deviations from these parameters are acceptable only for brief periods of time and only if positive action is being taken to correct the deviation.

Descent Guidance

Flight crews should always calculate a VDP if one is not published on the approach plate (refer to Visual Descent Point, this section). The goal of a constant rate descent is to arrrive at DDA at the VDP.

Note: A 3° glidepath to the runway requires a descent rate of approximately 700 to 800 FPM in normal conditions. After the passing the FAF, a descent rate of 1,000 fpm should normally not be exceeded.

Note: The following are required to achieve the planned descent profile:
- Groundspeed must be calculated accurately based on target airspeed and headwind/tailwind component.
- Target airspeed must be maintained carefully on final approach.

Note: In all cases, it is the flight crew's responsibility to adjust descent rate as required to remain at or above recommended altitudes and crossing restrictions.

Approaches Without Constant Rate Descent Guidance

The approach plate provides only basic altitude and distance information. Flight crews may set vertical speed to 700 or 800 down crossing the FAF and then adjust the descent rate as required to meet crossing restrictions and arrive at DDA at the VDP.

The flight crew may also utilize the Constant Rate Descent table to calculate a more precise rate of descent for the approach. This is recommended when higher or lower than normal groundspeeds are expected, and/or when crossing restrictions may require steeper or shallower than normal rates of descent.

Approaches With Constant Rate Descent Guidance

The approach plate contains one or more of the following:

- Descent angle and rate in Conversion Table
- Timing from FAF to Descent Point in Conversion Table
- Steady descending profile line with or without a Descent Point past the FAF
- DME/Advisory Altitude Table

The flight crew should use the descent rate (for the expected groundspeed) from the Conversion Table and adjust the descent rate as required to meet crossing restrictions and/or the published Advisory Altiltude at each DME fix. If applicable, begin descent from FAF altitude after expiration of published time from FAF to Descent Point (found in the Conversion Table).

Constant Rate Descent Table

Constant Rate Descent (00)
Vertical Speed Down Required in Hundreds of Feet Per Minute

Altitude to Descend in Feet	Distance From FAF (or stepdown fix) to Threshold in NM																	
	2 nm			3 nm			4 nm			5 nm			6 nm			7 nm		
	Groundspeed			Groundspeed			Groundspeed			Groundspeed			Groundspeed			Groundspeed		
	120	140	160	120	140	160	120	140	160	120	140	160	120	140	160	120	140	160
600	6	7	9	4	5	5												
800	8	9	11	5	6	7	4	5	5									
1000				7	8	9	5	6	7	4	5	5						
1200				8	9	11	6	7	8	5	6	6	4	5	5			
1400							7	8	9	6	7	7	5	5	6	4	5	5
1600							8	9	11	6	7	9	5	6	7	5	6	6
1800										7	8	10	6	7	8	5	6	7
2000										8	9	11	7	8	9	6	7	8
2200													7	9	10	6	7	8
2400													8	9	11	7	8	9
2600																7	9	10
2800																8	9	11

Altitude: FAF (or stepdown fix, if applicable) HAT minus 50 feet for TCH.
Distance: FAF (or stepdown fix if applicable) to runway threshold.

Example: IAH VOR DME Runway 15L, winds 270/10
Gross weight 126,000 Vref 130 KIAS

From the Approach chart:
Altitude to lose: 1852 feet (1902-50)
Distance traveled: 6 nm (5.3 + .7)

From the speed cards and ATIS (or reported winds):
Target airspeed: 135 (Vref of 130 + 5 for winds)
Groundspeed: 140 (Target of 135 + 5 for tailwind component)

From the Constant Rate Descent Table:
Vertical Speed Down required for Constant Rate Descent: 700 (intersection of the 1800 FT row and the 6 NM @140 groundspeed column)

General

Cross the FAF in final landing configuration and at target airspeed. Set the calculated vertical speed down for the constant rate descent. Adjust descent rate if required to adhere to any crossing restrictions and/or Advisory Altitudes. Monitor verticall position relative to the VDP.

At 100 feet above the DDA, the PM will announce "APPROACHING MINIMUMS". At the DDA the PM will announce "MINIMUMS".

Descent below DDA requires visual conditions. Accomplish a missed approach if the required visual conditions (see DA(H)/DDA this section) do not exist, or if the airplane is not in a position to make a safe landing.

WARNING: Obstacle clearance protection is not provided when the aircraft is below MDA. Operation of the aircraft below DDA prior to reaching the Visual Descent Point (VDP), if present, or before intercepting the normal 2-1/2 to 3 degree glideslope is prohibited unless dictated by operational requirements.

If adequate visual reference (see DA(H)/DDA this section) is attained at or prior to the DDA, the PF may continue the approach. Adjust descent rate as required to maintain a normal glidepath to the runway. If a VASI is visible, adjust descent rate to intercept the VASI descent path. Ensure autopilot is disconnected after passing DDA. (No lower than 50' below MDA.)

Monitored Non-Precision Approach Procedures

Crew Actions / Callouts

Non-Precision Monitored Approach		
	ACTION / CALLOUT	
Condition / Location	Captain	First Officer
FAF to DDA	Monitor and advise F/O on aircraft altitude and position in relation to: Stepdown fixes, crossing restrictions, VDP & DDA. Monitor aircraft position relative to final approach course, advise F/O of any deviations. Make standard altitude callouts.	Adjust aircraft track as required to maintain centerline of final approach course. Adjust vertical speed as necessary to: Meet stepdown fixes, crossing restrictions, and arrive at VDP at DDA.
100' above DDA	"Approaching minimums, I'm going heads up."	Is prepared to accomplish missed approach at DDA.
At DDA (Baro Altimeter) If Captain has not taken control of the aircraft.	Monitor F/O missed approach.	"Minimums, going around" accomplish missed approach. No turns until reaching MAP.
At or prior to DDA If adequate visual reference is acquired and aircraft is in a position to make a safe landing.	"I have the aircraft." Assume control of the aircraft. Autopilot and autothrottles should be left on if operational. Adjust descent rate as required to maintain a normal glidepath to the runway.	Relinquish control of aircraft to Captain. Monitor instruments and flight path. Make standard altitude callouts.
Passing DDA	Disconnect the autopilot. Autothrottles as desired.	"Minimums"
DDA to Touchdown	Maintain normal glidepath and track to runway or go around.	Make standard altitude callouts.

Visual Descent Point

A Visual Descent Point (VDP) is a point prior to the MAP from which a normal descent (approximately 3° slope) can be made from DDA to the touchdown zone. This is about 300 feet of altitude loss for every mile traveled. VDP should be calculated prior to all non-precision approaches.

The altitude to use for VDP calculation is always the <u>DDA HAT</u>. Determine this by adding 50 feet to the published MDA HAT.

VDP calculation when DME is available:

1) Multiply .3 times the hundreds of feet of altitude in the DDA HAT. This figure is the distance in NM from the VDP to the threshold.
2) Determine the DME indication for the threshold of the runway. (Sometimes, but not always, the MAP.)
3) Add or subtract the distance from step 1) to the DME indication from step 2). The result is the DME indication for the VDP.

VDP calculation when DME is not available:

1) Determine 10% of the DDA HAT. This figure is the time in seconds from the VDP to the threshold.
2) Calculate the time to the MAP. At the expiration of MAP timing the aircraft would be over the threshold of the runway. (If the MAP point is not at the threshold, adjust the timing accordingly based on 25 seconds/NM.)
3) Subtract the step 1) time from the step 2) time. The result is the time from the FAF to the VDP.

Localizer Only, VOR or NDB

These approaches are basically the same, varying only with the type of navigation aid utilized for course guidance. The flight guidance system should be used in VOR/LOC or HDG SEL mode.

Back Course

When flying a back course approach, the published inbound ILS course is set in the course window. The localizer is extremely sensitive due to the close proximity of the localizer transmitter. Course corrections must be small. The flight guidance system may be used in HDG SEL mode only.

Airport Surveillance Radar

On an ASR approach, a controller provides guidance in azimuth only. The pilot will be advised when to commence descent to the MDA. If requested by the pilot, recommended altitudes will be given at each mile.

Procedure Turn with No Depicted FAF

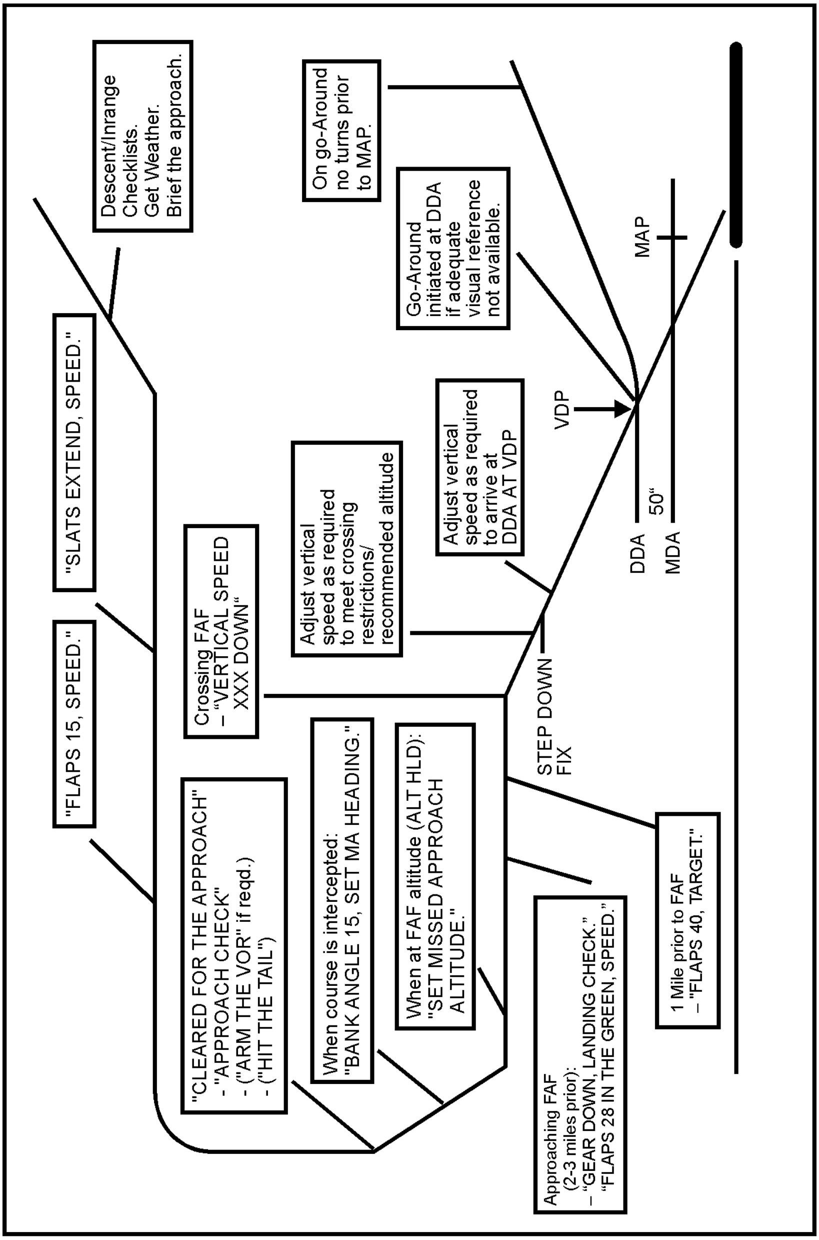
The Final Approach Point (FAP) is the point where the aircraft is established inbound on the final approach course from the procedure turn. The FAP serves as the FAF and identifies where the final approach descent may be commenced. The following guidelines should be used when flying a non-precision approach with no depicted FAF.

- Cross the VOR outbound for the procedure turn with gear down, flaps 28°, and speed at 140 KIAS. Descend as required to the procedure turn minimum altitude. Time for 2 minutes outbound.
- After two minutes are up, perform the procedure turn with a 45 second leg outbound. The aircraft should remain within 10 NM from the VOR.
- Intercept the final approach course inbound. As soon as the aircraft is established inbound on the final approach course, select flaps 40°, slow to target airspeed, and set vertical speed to 700 FPM down. (If the procedure turn minimum altitude HAT is 2000 feet AGL or higher, use 1000 FPM down.) The aircraft should arrive at DDA at a point short of a normal glidepath to the runway.
- Descent below DDA requires visual conditions. If visual conditions do not exist at DDA (no visual contact with the surface), accomplish missed approach.
- If visual conditions exist at DDA (visual contact with the surface), continue the approach for landing. If below a normal glidepath to the runway, level off by setting vertical speed to zero or using ALT HLD. The aircraft may be flown level (no more than 50 feet below DDA) until intercepting a normal glidepath to the runway.
- Execute a missed approach at the MAP if adequate visual reference is not attained, or the aircraft is not in a position to make a safe landing.

Missed Approach

Accomplish a missed approach upon arrival at the DDA if the required visual conditions do not exist for landing, or if the airplane is not in a position to accomplish a safe landing.

Do not accomplish any turns required by the missed approach procedure until after passing the MAP.


Descent/Inrange Checklists.
Get Weather.
Brief the approach.
On go-Around no turns prior to MAP.
Go-Around initiated at DDA if adequate visual reference not available.
MAP
VDP
"SLATS EXTEND, SPEED."
"FLAPS 15, SPEED."
Crossing FAF – "VERTICAL SPEED XXX DOWN"
Adjust vertical speed as required to meet crossing restrictions/ recommended altitude
Adjust vertical speed as required to arrive at DDA AT VDP
50"
DDA
MDA
STEP DOWN FIX
"CLEARED FOR THE APPROACH"
- "APPROACH CHECK"
- ("ARM THE VOR" if reqd.)
- ("HIT THE TAIL")
When course is intercepted: "BANK ANGLE 15, SET MA HEADING."
When at FAF altitude (ALT HLD): "SET MISSED APPROACH ALTITUDE."
1 Mile prior to FAF – "FLAPS 40, TARGET."
Approaching FAF (2-3 miles prior): – "GEAR DOWN, LANDING CHECK." "FLAPS 28 IN THE GREEN, SPEED."

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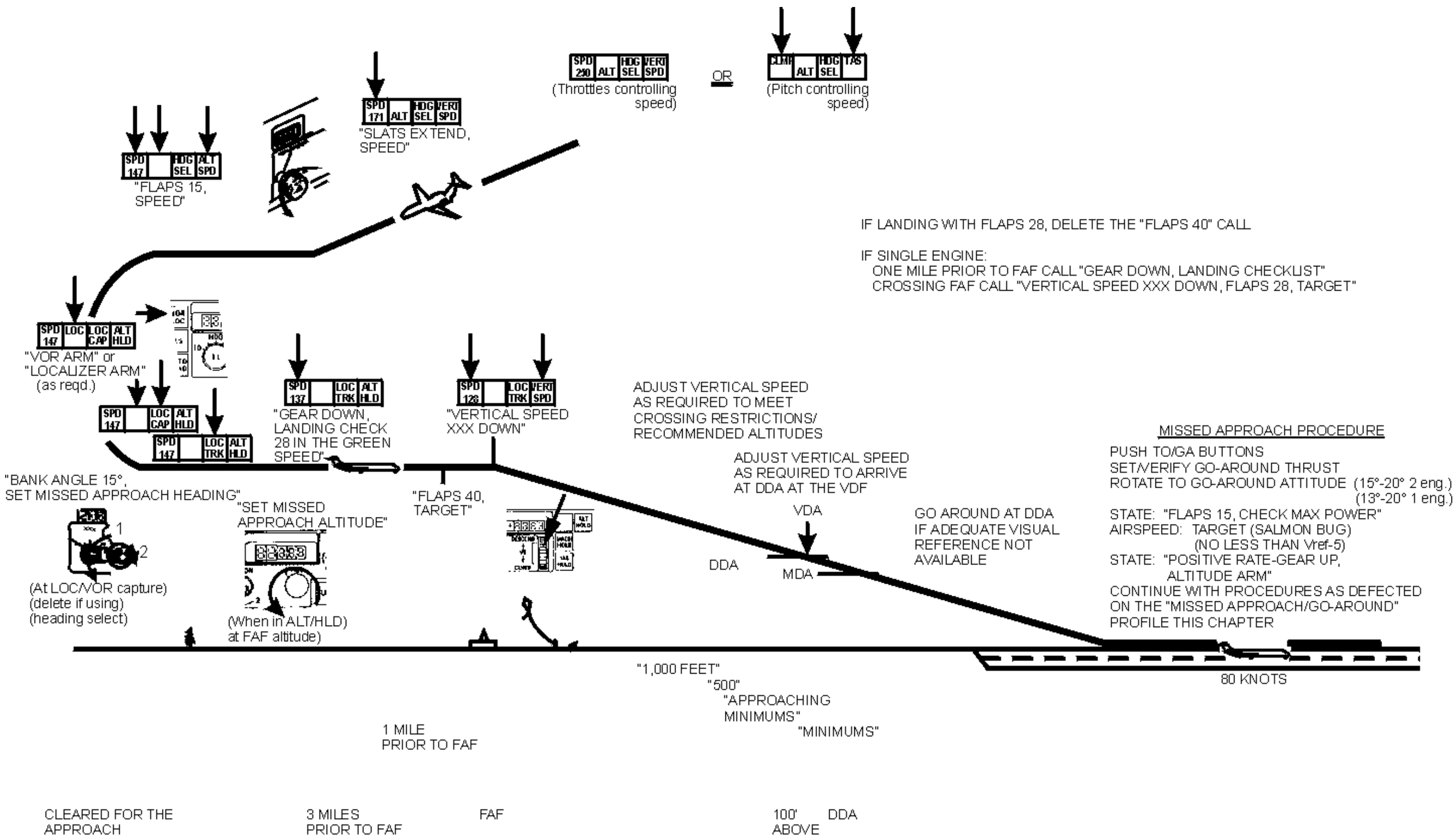

Non-Precision Approach

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CIRCLING APPROACHES

The MD-80 is considered a Category D aircraft for purposes of circling approaches.

Continental Airlines Operations Specifications prohibit circling approaches in weather conditions below 1,000' ceilings and 3 miles visibility. If a circling approach is conducted, it must be in weather conditions equal to or greater than 1,000'/3, or Category D minimums, whichever is higher; and with a minimum MDA of 1000 feet AFE or published minimums, whichever is higher.

Maintain a configuration of gear down, flaps 28/EXT at 28/EXT maneuvering speed while maneuvering at or above MDA. The 1000' MDA (or published minimums) must be maintained until in position to make a normal descent to the runway. At that time, select landing flaps and reduce speed to target. Complete the LANDING CHECKLIST.

The PNF should provide maneuvering instructions and/or monitoring of altitude and airspeed as directed by the PF. Care should be taken to avoid a situation where both pilots' attention is directed out of the cockpit. When the PF begins the visual descent to the runway, the PNF should closely monitor airspeed and rate of descent.

Due to the 1,000'/3 restriction, circling approaches are not specifically trained or checked.

VISUAL APPROACH

A visual approach is an instrument clearance, which often allows the pilot to fly a shorter approach pattern to the airport without the restrictions of an instrument approach procedure. Separation from other aircraft is the responsibility of the pilot once he reports the other aircraft in sight. Airspeed control and altitude must be monitored closely to maintain adequate separation and ensure a smooth and comfortable approach.

Often, when cleared for a visual approach, the aircraft is at a higher than optimum altitude due to ATC noise abatement or departure requirements. The pilot is responsible for adjusting the aircraft flight path, airspeed, and altitude to achieve a safe and stable visual landing. In this situation, slats, flaps, and landing gear should be used as drag devices to decrease airspeed and/or expedite descent. **Always use the ILS and any visual approach aids to maintain glidepath on final**.

Three arrival profiles (depicted in the following pages) cover most operations. The goal in all three is the same: to be stabilized in landing configuration by 1000 feet AGL on a normal glidepath to the runway.

Straight In Profile

The altitude/distance/speed/configuration gates depicted represent an optimum glidepath to the runway from 10,000 feet.

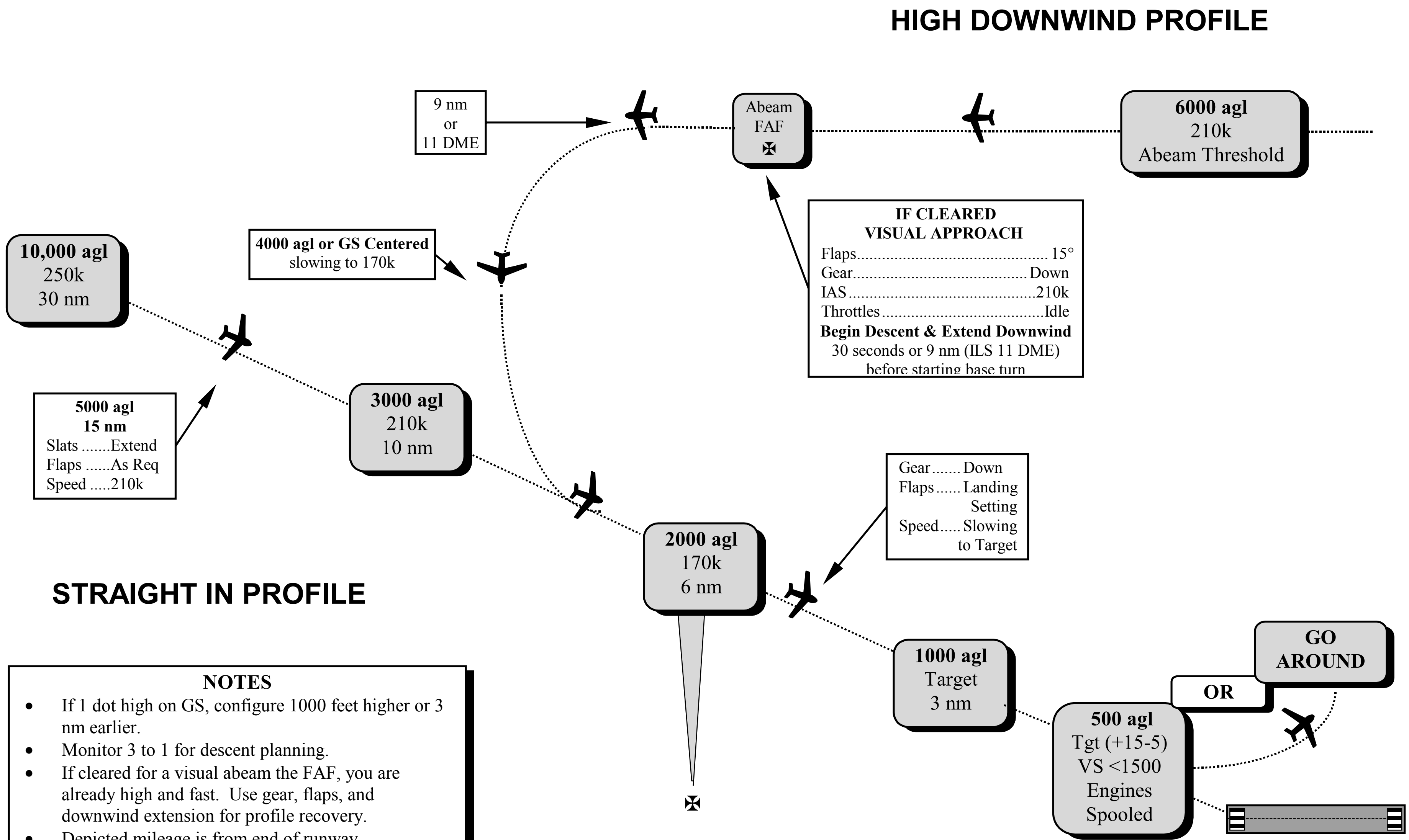
High Downwind Profile

Use gear, flaps 15, idle thrust, and extension of base turn to roll out on final intercepting the straight in glidepath and remaining arrival gates.

Standard Visual Approach (Low Downwind) Profile

Fly downwind at Glideslope Intercept Altitude (1500 feet AGL minimum). Use normal approach descent rates, stay on a normal glidepath to the runway throughout the turn to final, and roll out on final no lower than 500 feet AGL.

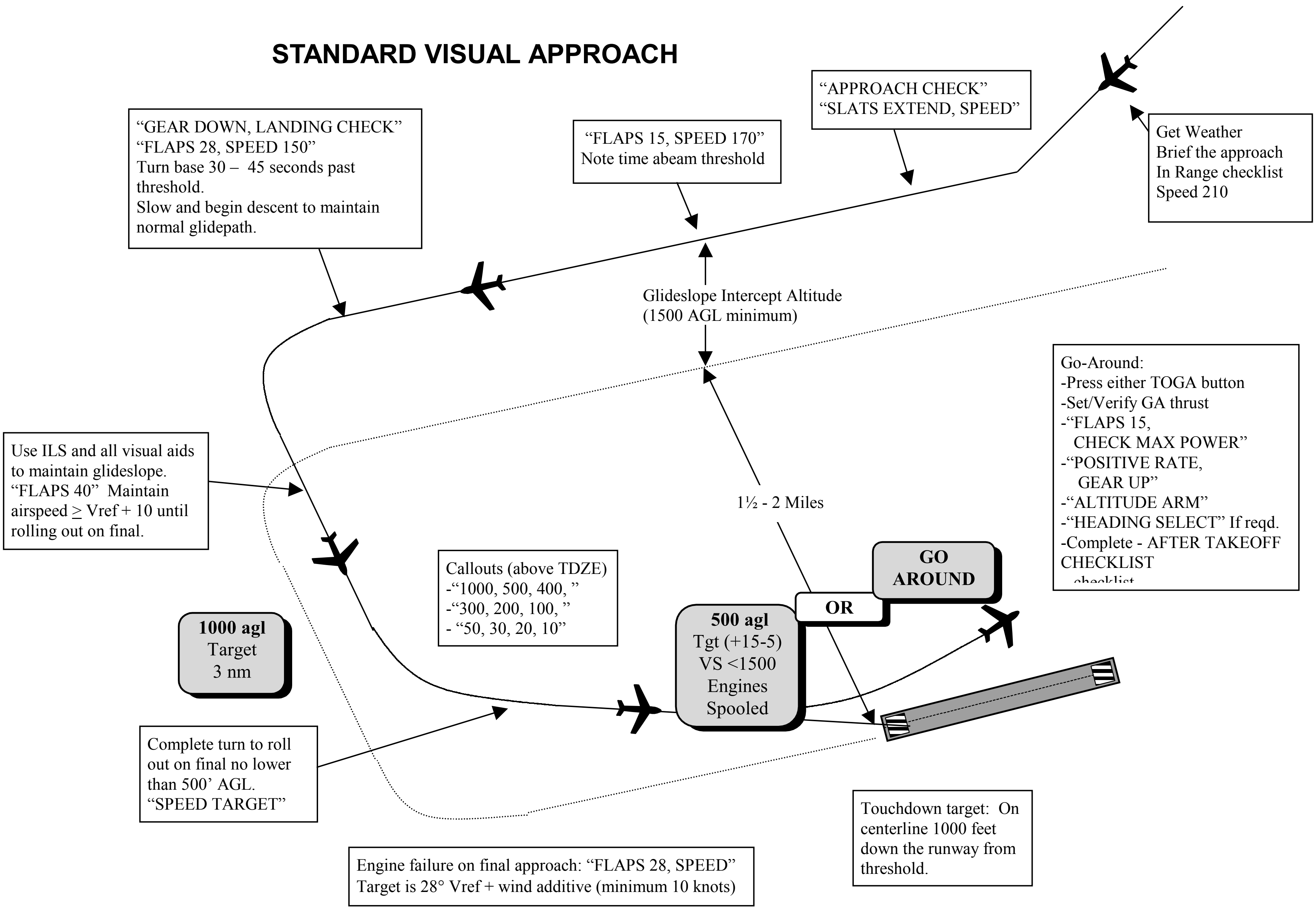
VISUAL APPROACH PLANNING & GATES



NOTES

- If 1 dot high on GS, configure 1000 feet higher or 3 nm earlier.
- Monitor 3 to 1 for descent planning.
- If cleared for a visual abeam the FAF, you are already high and fast. Use gear, flaps, and downwind extension for profile recovery.
- Depicted mileage is from end of runway.
- The ILS DME shows distance to the departure end of the runway, so add 2 nm to all mileage.
- Refer to Standard Visual Approach (Low Downwind) Profile for complete procedures.

STANDARD VISUAL APPROACH



LANDING CHECKLIST

The Pilot Flying will call for the LANDING CHECKLIST in conjunction with the "GEAR DOWN" call on all normal landings. The flaps should be in the final landing configuration prior to the completion of the last item on the checklist.

PILOT MONITORING CHALLENGE	LANDING	PILOT MONITORING RESPOND
Gear	C+F	DOWN, 3 GREEN
Ignition		OVRD / CONTIN
Spoilers, Autobrake System		LT OUT & ARM, ARM / DISARM
Flaps, Slats	C+F	28° / 40°, LAND
Annunciator Panel, Cabin PA		CHECKED, COMPLETED

PM CHALLENGE **PM RESPOND**

Gear .... C+F .... DOWN, 3 GREEN

Placing the landing gear handle to the DOWN position and in the detent will put the gear down and close the doors. The three green lights will come on indicating that all three gear overcenter links are in place. The main landing gear doors are closed and held closed by hydraulic pressure. The **GEAR DOOR OPEN** light should be out.

Ignition .... OVRD / CONTIN

Note: On aircraft configured with OVRD, OFF, GRD START & CONTIN ignition switch, use the CONTIN position.

Spoilers, Autobrake System .... LT OUT & ARM, ARM / DISARM

Check that **AUTO SPOILER DO NOT USE** annunciator light is out. Lift the spoiler lever up at the forward end of the quadrant. The lever should remain up and the red marked area at the base of the lever should be visible. If the lever cannot be lifted up high enough to remain up, the auto-extension system will not be operable. This is abnormal and the system will need to be operated according to abnormal procedures. Refer to Section 3.

Do not arm the spoilers until after the landing gear has been extended. This will preclude possible inflight ground spoiler deployment if an errant ground shift signal has been caused by a deflated nose strut during the gear extension cycle.

If used, set the autobrake selector to the desired deceleration rate (MIN, MED, or MAX). Move the ARM/DISARM switch to ARM.

Autobrake setting will vary with runway length and contamination. Set commensurate with runway length and surface conditions. (For example: Poor to nil braking action - MAX setting would be desired.)

Monitor automatic brake operation. Automatic brakes will be applied at selected rate (after a brief delay) when spoiler lever moves aft automatically or manually.

Caution: To avoid an abrupt stop, disengage autobrakes above the anti-skid cutout speed (approximately 20 knots). Gradually depress and momentarily hold the brake pedals until the ARM/DISARM switch moves to DISARM and the **ABS** light on the glareshield comes on. Thereafter, apply brakes as required to bring the airplane to a smooth stop.

Notes:
1. After landing, disengagement of autobrakes through manual brake pedal application will initiate a self-test of the autobrake system, thus it is desirable to occasionally use autobrake for landing.
2. Autobrakes may also be disarmed if a throttle is advanced or the ARM/DISARM switch is moved to DISARM.
3. If autobrakes do not function, operate brakes manually.

Flaps, Slats....................................C+F...............................28° / 40°, LAND

The use of 40° of flaps is recommended for most situations. A flaps 28° landing should be considered for the following situations.

- Gusty wind conditions
- Possibility of windshear exists
- Occational proficiency practice

Annunciator Panel, Cabin PA ....CHECKED, COMPLETED

Verify the annunciator panel displays only the lights appropriate for the landing configuration. Special attention should be given to the following:

- The **RUDDER TRAVEL UNRESTRICTED** light should be on. This indicates maximum rudder travel is available if required. If the light is not on, maintain at least 135 KIAS until landing. Crosswind is limited to 12 knots.

- All anti-skid lights should be out.
- The **AUTO-SPOILER-DO NOT USE** light should be out.
- The **ENGINE SYNC** light should be out.
- The **SPOILER/FLAP EXTENDED** light should be out.

The PM will announce on the P.A., "FLIGHT ATTENDANTS, PLEASE BE SEATED FOR ARRIVAL."

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MISSED APPROACH / GO-AROUND PROCEDURE

A missed approach / go-around will be initiated if continuation to a safe landing in the touchdown zone is not possible at DA(H) on a precision approach, at the MAP on a non-precision approach, or at any point when the pilot feels that safety may be compromised if the approach is continued. ATC may also direct the pilot to "GO-AROUND" if some conflict exists.

To execute the missed approach / go around, the pilot flying will simultaneously:

- Advance throttles positively to go-around thrust while activating the TOGA buttons.
- Call for "FLAPS 15°, CHECK MAX POWER."
- If the autopilot is engaged, ensure that the autopilot rotates the aircraft to go around attitude (15°-20°). If the autopilot is not engaged, rotate the aircraft to go around attitude using the command bars.
- With a positive rate of climb, call "POSITIVE RATE, GEAR UP, ALTITUDE ARM."
- Climb at the Go-Around speed printed on the Landing Speed Card (The flight director should provide this guidance).
- Call for "HEADING SELECT" (when required).

Turns after go-around should normally be delayed until 400 feet AGL. However, a turn may be initiated as low as 50 feet AGL. Bank angle must be limited to 15° until maneuvering speed for the configuration is attained.

If the decision has been made to depart the local area, upon reaching flap retraction altitude (normally 1000 feet AGL) reduce pitch, accelerate, and retract the flaps and slats on schedule as during a normal takeoff.

If returning for another approach, climb to the missed approach altitude at the go-around speed and consider maintaining a normal traffic pattern configuration and speed (slats extended/flaps 15 and speed 170). Use of the autopilot and autothrottles is recommended to reduce the workload and to allow both pilots to concentrate on flying the missed approach procedure or complying with ATC directives.

Accomplish the AFTER TAKEOFF CHECKLIST.

Note: A rejected landing will be accomplished using the same procedure as a missed approach / go-around. Special care should be taken not to raise the landing gear until a positive rate of climb is confirmed by reference to the IVSI and altimeter to ensure that an inadvertent touchdown is no longer a factor.

Autopilot Missed Approach

An autopilot go-around is initiated when either throttle TO/GA button is depressed with the autopilot engaged, the aircraft in flight, and the flaps extended beyond the 26 degree position. Activation of the go-around mode is indicated by annunciation on the flight mode annunciator **G/A** in both the roll and pitch mode annunciators.

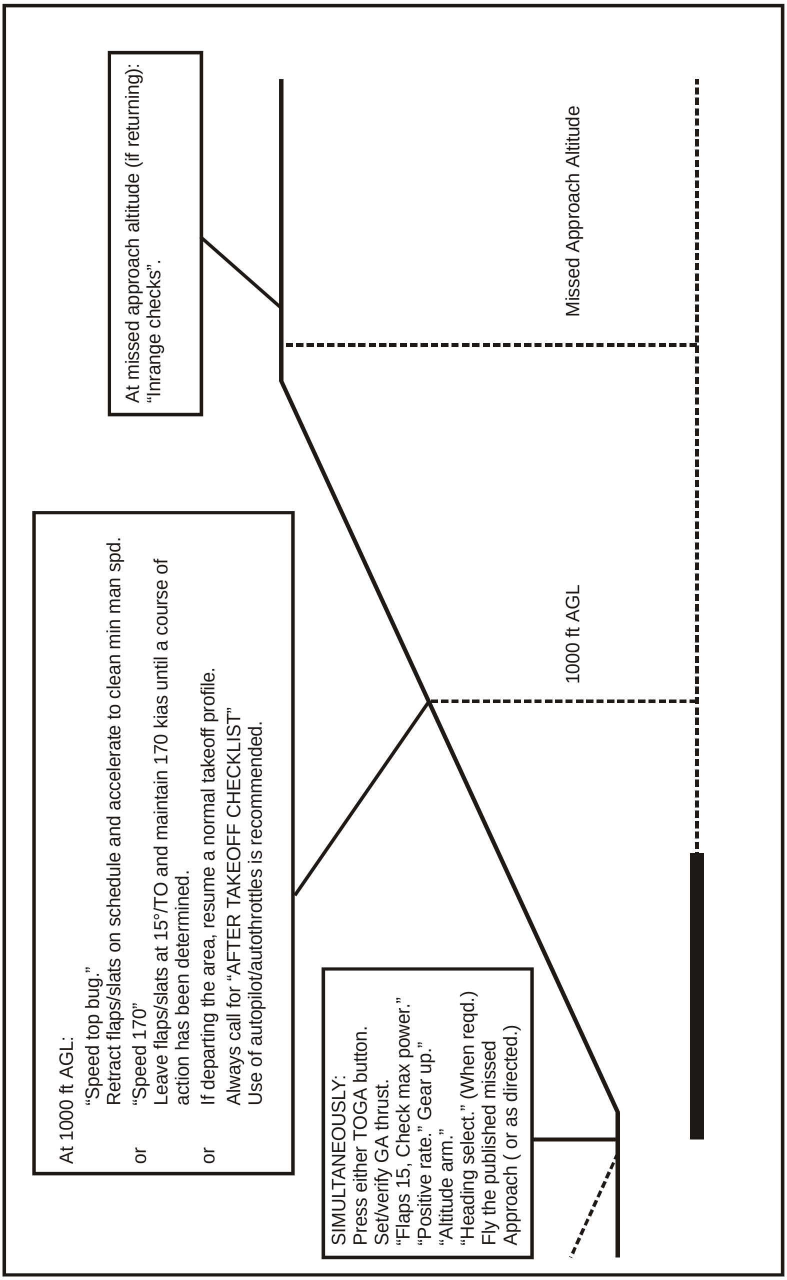
The selection of any pitch mode during autopilot go-around will result in disengagement of the autopilot go-around mode and the autopilot reverts to the selected pitch mode and heading hold mode. However, altitude preselect mode, if armed, will automatically cancel the go-around mode or the selected pitch mode at altitude capture.

During autopilot go-around, any roll mode may be selected without subsequent disruption of pitch axis control.

If runway contact is made during an autopilot go-around, the autopilot will remain engaged. The autopilot will disengage if the go-around mode is selected after runway contact is made.

The autopilot will disengage if the flaps are less than 26 degrees at go-around initiation. The autopilot may be re-engaged into go-around if the flight director pitch bar is approximately centered. If the pitch bar is not centered, the autopilot will engage into the basic mode of heading hold and vertical speed.

If an engine failure occurs during an auto go-around, disconnect the autopilot. The flight director and go-around speed schedules may continue to be utilized.



MD804MAP

MISSED APPROACH PROFILE

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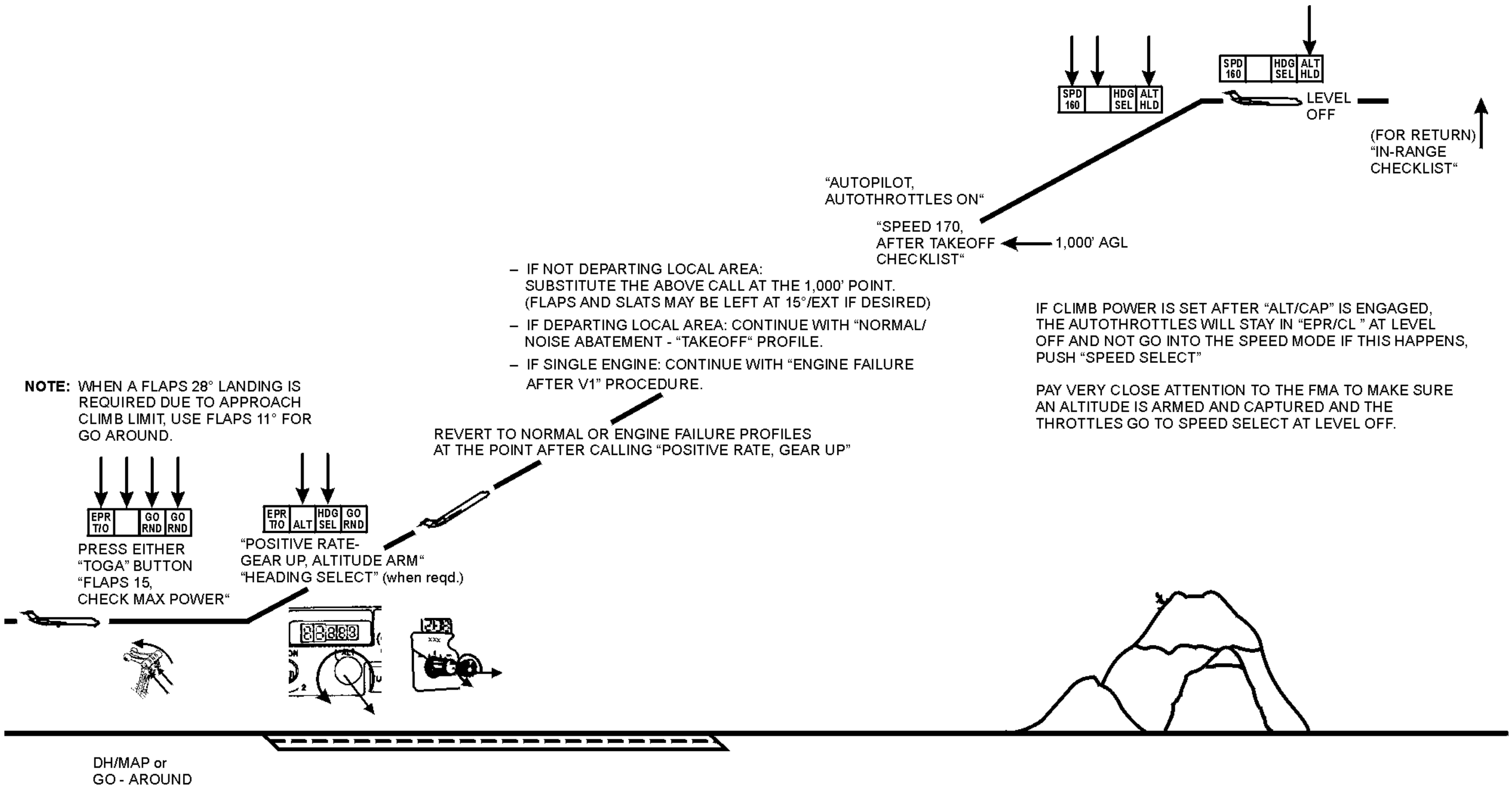

Missed Approach / Go-Around

MD804004

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LANDING PROCEDURES

Landing Flap Selection

A flaps 40° landing is recommended for most situations. A flaps 28° landing should be considered for the following situations:

- Gusty wind conditions
- Possibility of windshear exists
- Occasional proficiency practice.

Final Approach

Once landing flaps have been established, target speeds (under stable air conditions) will be V_{REF} + 5 knots. However, the decrease in wind velocity approaching the surface of the earth has the effect of a decrease in airplane velocity. Consequently, caution must be exercised to prevent airspeed bleed off and increased sink rate during the last stage of the approach.

Target approach speed is V_{REF} + 5 knots for landing in reported winds of zero to 10 knots. When landing in higher wind conditions (above 10 knots), add 1/2 the steady wind and the full value of the gust (if any). The total wind additive should not exceed 20 knots.

The pilot should aim for a constant angle relationship with the 1,000 foot mark on the runway, coordinating pitch attitude and power changes. As the end of the runway passes under the nose, maintain this stabilized attitude and power setting until the flare point is reached.

The pilot should resist the tendency to dive at the runway when breaking clear of the clouds at low altitude under instrument conditions, or as the end of the runway disappears under the nose in visual flight conditions. The high rates of sink that develop with this maneuver are not readily apparent on either the airspeed indicator or the vertical speed indicator and may not be noticed until the flare point.

Flare and Landing

During a visual approach, the main landing gear should cross the runway threshold at 50 feet. Main gear touchdown will occur just beyond 1,000 feet, assuming the glide path angle is 3 degrees. Do not deviate from the glide path, in an attempt to touchdown sooner.

Crossing the threshold, shift the visual sighting point to approximately 3/4 of the way down the runway length, while maintaining descent. This will assist in determining the flare point. Ground effect is more pronounced in the MD-80 than many other jet aircraft; therefore, a different technique is required during the final phase of the flare and touchdown. A technique which appears to offer a consistently good landing is one in which the aircraft is initially flared at 20 feet from the normal 3½° nose-up approach attitude (40°/land) to an attitude 2° to 3° higher. Ground effect is normally equal to a 200-300 FPM decrease in rate of descent. As ground effect increases, there is a slight pitch down tendency. Maintain the flare attitude with slightly increased back pressure to touchdown. The elevators are very sensitive in the flare. Avoid pumping the elevators and/or ballooning.

If the airplane nose-up attitude is excessive during landing, fuselage contact is possible. Factors resulting in excessive nose-up attitude are: early or high flare, early thrust reduction, low airspeed or rapid speed reduction during flare, or holding the airplane off the runway in an attempt to achieve a soft landing.

To avoid aft fuselage contact, fly the airplane onto the runway at the desired touchdown point. Do not hold the airplane off the runway for a soft landing. Maintain speeds specified in the flight manual.

Crosswind Landing

On final approach, establish a crab angle into the wind to hold the aircraft on the extended centerline of the runway. Maintain the crab angle until just before touchdown, then use the rudder to align the aircraft with the runway. The touchdown is made with cross-controls as necessary to track straight down the runway. Keep wings as level as possible as the wingtip will touch at an 8° bank angle. Do not hold off downwind wheels; prompt and firm runway contact will greatly assist in rollout stabilization.

Use as little aileron as possible, as over-controlling aileron with spoilers extended after touchdown can induce spoiler yaw (use of ailerons with spoilers extended cause spoiler on that wing to partially retract, with resultant possible wing lifting).

Use spoilers, brakes, and reverse as in normal landing.

Be alert for asymmetrical thrust application as it may be necessary to reduce or eliminate reversing.

Nose Landing Gear Spray Deflector Damage

The nose landing gear spray deflector can be damaged in the following situations:

- Taxiing over a chock
- Striking a taxiway light or other obstruction
- Dropping the nosewheel into a pothole.
- Taxiing or operating over a rigged military arresting cable

Damage may prevent subsequent retraction or extension of the nose gear. There are two known incidents where deflector damage caused the nosewheel to jam into the wheel well, making it impossible to extend the nose gear for landing.

When operating at airfields with arresting cables, use one of the following options if available:

- Use an alternate runway without a cable.
- Land and takeoff without rolling over a cable.
- Have the cable lowered.

If it is necessary to taxi over a rigged cable, do not allow the nosewheel to roll directly over a rubber donut supporting the cable. Taxi at the slowest possible speed to minimize damage.

If the aircraft has taxied over a rigged cable prior to takeoff, or passed over a rigged cable during takeoff, a logbook entry should be made and the nose gear spray deflector inspected after the next landing.

If the aircraft has taxied over a chock, struck an obstruction, or dropped off the prepared surface, the nose gear spray deflector should be inspected prior to flight.

Bounced Landing

In the event of a bounced landing, hold or re-establish normal landing attitude. Add thrust as necessary to control the sink rate. Do not push over, as this may cause a second bounce and possibly damage the nose gear.

Should a high hard bounce occur, initiate an immediate go-around. Apply go-around thrust and use normal go-around procedures. A second touchdown may occur during the go-around. Do not retract the landing gear until a positive rate of climb is established and called by either pilot.

Spoilers/Speedbrakes

Speedbrakes (if operational) will be armed to extend automatically. Both pilots should monitor speedbrake extension after touchdown. If automatic extension fails, the Captain should immediately extend them manually.

Note: Unless speedbrakes are raised after touchdown, braking effectiveness may be reduced initially by as much as 60% since very little weight will be on the wheels and brake application may cause rapid anti-skid modulation.

Note: When landing on wet runways under main wheel hydroplaning conditions, automatic ground spoilers will not deploy until ground shift occurs at nose wheel touchdown. However, manual ground spoilers are available at main gear touchdown.

Autobrakes

If used, set the autobrake selector to the desired deceleration rate. Autobrake setting will vary with runway length and contamination. Monitor automatic brake operation. If autobrakes do not function, operate brakes manually.

Manual Braking

Spoiler deployment and thrust reversing are most effective at the higher speeds while brakes are most effective at the lower speeds. Using brakes at the lower speeds, when runway length and surface conditions permit, will improve brake life and result in better overall performance.

Good pilot technique (a stabilized approach and landing on speed) can increase the safety factor as well as improve total brake/landing maintenance related costs.

After deploying the spoilers and with nose gear on the ground, apply wheel brakes. Make this first brake application with only light braking. Apply just enough brakes to feel their effectiveness and to check operation. On a normal landing with the touchdown near the 1,000 foot point, only light braking need be used to complete the stop.

On a wet, slippery runway, smoothly apply light to moderate brake pedal pressure immediately after nose wheel touchdown. If wheels appear to be locked, release brake pedal pressure and allow wheels to spin-up before reapplying brakes. Steadily increase brake pedal pressure to a maximum level if necessary. When applying brakes manually, apply a constant brake pedal pressure for the desired deceleration.

It is estimated that manual braking techniques frequently involve a four to five second delay between main gear touchdown and brake pedal application even when actual conditions reflect the need for a more rapid initiation of braking. This delayed braking can result in the loss of 800 to 1,000 feet of runway. Directional control requirements for crosswind conditions and low visibility may further increase the above delays as can the distraction arising from a malfunctioning reverser system.

Note: Autobrakes, if available, should be used when landing rollout distance is critical.

Thrust Reverse

WARNING: The thrust reverser buckets should never be deployed until the nose wheels are positively on the runway.

WARNING: After reverse thrust is initiated, a full stop landing must be made.

When the reverser buckets are unlocked and deployed, they swing through an arc which will cause contact with the runway at an aircraft attitude of 5 to 8.5 degrees nose up. Deployment of the reverser buckets at main gear touchdown will result in major damage to the aircraft.

When nose gear is firmly on runway, apply sufficient down elevator after nose gear contact to increase weight on the nosewheel for improved steering effectiveness (An excessive amount of down elevator will unload the main gear and reduce braking efficiency). Apply reverse thrust to idle reverse thrust detent. After reverse thrust is verified, gradually increase reverse thrust as required to no more than 1.6 EPR (1.3 EPR when operating on wet or slippery runways). At 80 knots (or higher if necessary), smoothly reduce reverse thrust and return the reverse thrust levers to forward idle thrust no later than 60 knots. In the event of an emergency, maximum available reverse thrust may be used. If difficulty in maintaining directional control is experienced during reverse thrust operation, reduce thrust as required and select forward idle, if necessary, to maintain or regain control. Do not attempt to maintain directional control by using asymmetric reverse thrust.

During reverse thrust, the engine exhaust gas is deflected by the upper reverser bucket at an angle that reduces the airflow around the vertical stabilizer and rudder. The reduction in rudder effectiveness during rollout is significant and relative to the reverse EPR applied. Certain combinations of reverse thrust and crosswind can totally blank out the rudder. When using normal or higher reverse thrust settings, maintain directional control with nose wheel steering, supplemented, if necessary, by differential braking. Do not use differential reverse thrust to maintain directional control.

The thrust reverse levers are sensitive and require careful attention during reverse thrust to minimize asymmetric reverse thrust.

When reverse thrust has been used during landing on icy, wet, or snow covered runways, an exterior inspection of the aircraft should be made, particularly in the areas of static ports, pressurization outflow valves, control surfaces, and engine inlets.

Caution: In order to minimize the possibility of FOD, do not use reverse thrust at speeds below 60 knots.

During deceleration, the pilot not flying will call "80 KNOTS." The pilot flying will smoothly reduce reverse thrust and return the reverse thrust levers to forward idle thrust no later than 60 knots.

Special Thrust Reverser Notes

Moving the thrust reverser levers to REVERSER UNLOCKED or REVERSE THRUST prior to nose wheel touchdown is prohibited.

Use of reverse thrust below 60 knots is prohibited.

The use of reverse thrust to decelerate during taxi is prohibited.

The use of asymmetric reverse thrust to maintain directional control during landing rollout is prohibited.

Increasing amounts of reverse thrust significantly reduce rudder effectiveness and, therefore, increase the need for differential braking and nose wheel steering.

If landing with one engine inoperative (wet or dry runway), deploy both reverser buckets and smoothly apply reverse thrust to the idle reverse thrust detent. After reverse thrust is verified and directional control positively established, increase reverse thrust as required.

Caution: The pilot not flying will closely monitor the initiation of reverse thrust. If the pilot landing unlocks the reverser buckets prior to positive nose wheel touchdown, the pilot not flying will immediately place his hand over the hand of the landing pilot and the reverse thrust levers and return the levers to forward idle thrust.

Caution: Do not attempt to go-around after reverse thrust has been initiated. Failure of a thrust reverser to return to the forward thrust position may prevent a successful go-around.

The pilot not flying will monitor the reverse procedure and call out only:

1. Engine(s) that fail to spool or no lights (**REVERSER UNLOCKED** and **REVERSE THRUST**).
2. EPR in excess of max allowable.
3. "80 KNOTS."

Note: If during any landing, tire damage is suspected, leave the flaps extended to prevent possible flap or engine damage. In an emergency, maximum reverse thrust, up to takeoff EPR, is authorized, however, under normal circumstances, reverse thrust use on landing will be limited to 1.6 EPR and be at forward idle thrust by no later than 60 knots.

Transfer of Aircraft Control

The Captain will assume control of the aircraft no later than when the aircraft departs the runway centerline for the purpose of exiting the runway.

AFTER LANDING CHECKLIST

The After Landing procedure is initiated by the First Officer after the aircraft has cleared the runway. When time permits, and after clearing all active runways, the Captain will call for the AFTER LANDING CHECKLIST. The First Officer will verify that all items have been accomplished, and will report "AFTER LANDING CHECKLIST COMPLETE." The First Officer will not read the challenges and responses aloud. In the event any individual item(s) are not accomplished, the First Officer will bring those items to the attention of the Captain.

F/O CHALLENGE (SILENT)	AFTER LANDING	F/O RESPOND (SILENT)
Pitot Heat & Ignition		**OFF**
Ice Protection, Exterior Lights		**AS REQUIRED**
Flaps		**15°**
Radar, TCAS		**OFF, STBY**
Spoilers, Autobrake System		**RETRACTED, OFF**

F/O CHALLENGE **F/O RESPOND**

Pitot Heat & Ignition .... OFF

Ice Protection, Exterior Lights .... AS REQUIRED

Engine anti-ice is turned off unless icing conditions exist on the ramp. If engine anti-ice is used during taxi-in, it should be turned off at engine shutdown. Airfoil anti-ice is turned off.

Landing lights should always be retracted to avoid damage by ground equipment.

Flaps .... 15°

Retract flaps to 15° for taxi-in. This will minimize FOD damage to the engines.

Radar, TCAS .... OFF, STBY

WARNING: Failure to return the transponder to STBY after landing allows the radar to operate in the windshear mode creating a radiation hazard to personnel on the ground. The RDR-4B radiation hazard area extends 13.4 feet from the radar antenna in a 120 degree arc left and right of the aircraft centerline. This hazard exists even if the radar mode is selected OFF or TEST.

Spoilers, Autobrake System .... RETRACTED, OFF

Push spoiler lever down and forward to fully retract the spoilers. Move autobrake selector off.

AFTER LANDING NOTES

Engine Shutdown After Landing

Single engine taxi-in is authorized. The Captain should consider factors such as aircraft weight, gate and ramp congestion, proximity to concourse structures, ramp/taxiway slope, and taxi time to decide whether single engine taxi-in is appropriate.

Note: Single engine taxi is not recommended during conditions of reduced traction such as standing water, slush, snow, or ice.

If a power setting of more than 1.2 EPR is required to maneuver or the ramp/taxiways are slippery, two engine taxi procedures should be used.

Notes: The left engine hydraulic pump, the auxiliary hydraulic pump, and the transfer pump must all be operative for single engine taxi.

The First Officer will monitor brake pressure and quantity.

The left engine (or APU) generator must be operative.

Pratt & Whitney advise that shutting down an engine without a cool-down period increases the potential for coke to form in the oil system. Recommend delaying engine shutdown until approximately 3 minutes after landing, or gate arrival (whichever occurs first), for engine cooling.

Do not use this procedure if the right engine has been operated above 85% N_2 for a period exceeding one (1) minute just prior to shut down. If these parameters are exceeded, operate the engine at idle for 5 minutes for temperature stabilization.

At the Captain's discretion, after consideration of ambient conditions, a single engine taxi-in without the APU may be accomplished. Prior to engine shutdown, turn off the right air conditioning pack to reduce the electrical load.

During single engine taxi-in, after the right engine is shut down, the master caution light will come on three times with the following annunciator panel lights – **R GEN OFF**, **R CSD OIL PRESS LOW**, and **R OIL PRESS LOW**. Use single engine taxi only when sufficient taxi distance to the ramp exist to allow enough time for the engine to spool down and the master caution system to be reset after the above lights come on. This ensures a valid master caution system in congested areas.

Visually check the hydraulic pressure and quantity prior to entering the ramp area for normal readings.

Note: 30 seconds after landing the **WING ICE ALERT** and **WING HTR INOP** lights will flash 12 to 15 times as part of a system self test.

Note: Two minutes after landing, the digital flight guidance system automatically initiates a power-up test to check the reliability of the software program, random access memory, processor functions, and accelerometer inputs. The test takes 8 seconds. During the test, all displays on the flight guidance control panel, except the VHF NAV, go totally blank. The Captain's FMA will display **PWR UP TEST BOX 1**. The First Officer's FMA will display **PWR UP TEST BOX 2**. The **YAW DAMP OFF** annunciator light will also illuminate during the test. Upon completion of the test, all displays revert to ambient or basic readouts.

GATE ARRIVAL PROCEDURES

Flap/Slat Retraction

Retract the flaps and slats when approaching the ramp area.

This will ensure the flaps/slats are fully retracted prior to ramp personnel approaching the aircraft, and allow the F/O to devote full attention outside as the aircraft arrives at the parking position.

Observe the flap indicators moves to 0 and that the slat **LAND**, **AUTO**, **DISAGREE**, and **TAKEOFF** lights are out.

Note: A feedback force will be felt on the flap/slat handle if it is moved to UP/RETR before the flaps are fully retracted. When the flaps reach the retracted position, a metallic "Click" sound may be heard. Do not force the flap/slat handle: wait until the flaps are up before moving the flap/slat handle to UP/RETR.

Note: In the event of heavy ice accumulation or a blown tire on landing, leave the flaps at 15° until an inspection can be made after parking.

Parking Aircraft

Upon arrival of aircraft at station, the assigned safety person will guide it to the normal parking location.

Parallel Parking

The safety person is responsible to ensure that aircraft, personnel, and equipment at gate behind are safe from injury or damage from jet blast before giving clearance signal for aircraft to taxi into forward gate. The safety person must advise high lift truck operators at immediate gate behind to lower truck bed and hold aircraft out of forward gate until bed on truck has been lowered.

J-Line Parking (Refer to Operations Manual)

The safety person will assume a position at the base of the J-Line, assisting the cockpit in aligning the nose wheel. When the aircraft is signaled to turn, the safety person will assume a position on the left side of the aircraft 45 degrees to the cockpit and walk the aircraft to its final position.

It is most important that the aircraft continue on a straight line for approximately 10 feet after the last turn is completed. This ensures that all wheels are in line and that the stress placed on the landing gear is relieved.

Nose-In Parking

Nose-In Without Mechanical Aids - The safety person will provide appropriate signals to the flight deck from a position which affords 100% visibility by the cockpit. The signals will relate solely to wheel alignment and stop. (Refer to Operations Manual)

Nose-In With Mechanical Aids - Once ramp clearance has been ascertained by either the ramp supervisor or his designated alternate, a visual signal will be activated to advise the cockpit that parking activity may commence. At no time then, will ground personnel be directly involved in the parking of the aircraft itself.

After the aircraft has come to a complete stop, an agent will insert wheel chocks firmly both fore and aft of either the inboard main wheel assemblies or the nose wheel tires. After the chocks are inserted, a hand signal will be given to the crew to release the brakes. After acknowledging “Chocks In” signal and after both engines have been shut down, complete PARKING CHECKLIST.

Note: If the APU is not available for electrical power, the left engine will remain running until external power is applied.

Brake and Tire Considerations - Quick Turnarounds

Quick turnaround is an “At the Ramp” time restriction placed on the aircraft by the manufacturer (see Limitations Section) which ensures an adequate time to absorb excessive brake heat without the possibility of having the fuse plugs release pressure during or after the subsequent takeoff. In the case of the MD-80, the applicable time period is 27 minutes (ramp time). This waiting period must elapse at the ramp if the landing weight or brake temperature exceeds a certain permissible level.

In the case of the MD-80, relief from the 27 minute turnaround time is available by two methods:

1. By reading the brake temperature gauge ten minutes after parking and verifying a temperature reading of less than 305 degrees and decreasing. There can be no artificial cooling of brakes during this period.
2. The second method for relief requires maintenance to read the brake temperature at the fuse plug by way of a pyrometer. To gain relief by this method, fifteen minutes has to elapse after parking, again without artificial cooling. After this waiting period, the temperature reading on the pyrometer cannot exceed 105 degrees C.

If either of the above two requirements are met, no waiting period or inspection is required. If they are not met, then the appropriate waiting time must elapse while at the ramp. It also must be verified that a fuse plug(s) has not melted prior to leaving the ramp.

Always refer to the limitations section and the appropriate chart(s) if it is suspected that your landing weight is <u>at or near</u> the maximum allowable for quick turnaround.

<u>Note</u>: Even though it may be permissible to leave the ramp area with brake temperatures of less than 305 degrees, the takeoff limitation of 205 degrees still applies because of braking effectiveness in the event of a rejected takeoff.

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PARKING CHECKLIST

The parking procedure is initiated as the aircraft comes to a stop at the gate or parking spot. After the procedure is complete, the Captain will call for the PARKING CHECKLIST.

F/O CHALLENGE	PARKING	CAPT RESPOND
Flaps, Slats		**UP, LIGHTS OUT**
Seat Belt & Sterile Cockpit Lights		**OFF**
Fuel Levers & Beacon		**OFF**
Parking Brake		**SET / OFF**
Hydraulics, Boost Pumps		**SET**
Logbook & ACARS		**COMPLETED**

F/O CHALLENGE **CAPT RESPOND**

Flaps, Slats....................UP, LIGHTS OUT

Observe the flap indicators indicate 0 and that the slat **LAND**, **AUTO**, **DISAGREE**, and **TAKEOFF** lights are out.

WARNING: Verbally confirm with ramp agent that all personnel are clear of the wing areas prior to moving the flap/slat handle when at the gate.

Seat Belt & Sterile Cockpit Lights....................OFF

As this action signals the release of the passengers, the seat belt sign should be turned off promptly after the aircraft comes to a complete and final stop.

Fuel Levers & Beacon....................OFF

At night, the wing/nacl flood lights may be left in the R/ONLY position to enhance ramp lighting for ground servicing.

Parking Brake....................SET / OFF

Check brake pressure available (1400 - 1700 PSI). Check both brake pedals set. It is possible to have one set and the other released.

Note: Avoid setting the parking brakes when the brake temperature gauge indicates 300° or hotter. Advise maintenance if any brake temperatures exceed 350°.

Note: When cockpit workload permits, the brake temperature selector should be cycled through all four brakes to check for a “Cold” brake. Advise maintenance if a cold/inoperative brake is suspected.

Note: After all engines are shut down and the appropriate signals have been received from ground service personnel that the wheels are chocked, release the parking brakes.

Hydraulics, Boost Pumps ....SET

ENG hydraulic pumps should be in HI, AUX and TRANS hydraulic pumps should be OFF. All fuel pump switches should be off except fuel pressure source for APU, if operating.

Logbook & ACARS ....COMPLETED

All discrepancies must be entered and signed by the Captain. Fuel on board should be entered in block 46.

The ACARS post flight report should be completed.

PARKING NOTES

Check external power voltage and frequencies prior to connecting. They should be approximately 115V, 400 CPS.

The APU will normally be shut down at all stations where external power is available, provided the cabin temperature can be maintained within comfortable limits. (Do not shut the APU down until the **EXT PWR AVAIL** light is on and the external power bus switches are on). Remember that the ventilating ram air is available with external power.

The APU should be shut down at all stations when the ground time will be in excess of one hour. It takes approximately 30 minutes to either heat or cool the aircraft after the APU has been shut down for an extended period. During ground operations under extreme weather conditions, it may be necessary to heat or cool the aircraft continuously.

Normally, the left pack will be positioned to HP BLD OFF to provide conditioned air to both cabin and cockpit.

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TERMINATION CHECKLIST

The following TERMINATION CHECKLIST will be accomplished as a READ AND DO procedure by the combined crew, or by the First Officer at the Captain's request. This checklist should be completed whenever the aircraft is to be left unattended for a significant period of time, when turning the aircraft over to maintenance or station personnel for an overnight, or when overnight at a non-maintenance station.

EITHER PILOT CHALLENGE	TERMINATION	EITHER PILOT RESPOND
Battery Charger		**CHECKED**
Galley Power & Windshield Heat		**OFF**
Packs		**OFF**
Flight Directors & Exterior Lights		**OFF**
Cabin Altitude Controller		**AUTO / MAN CLOSED**
Cockpit & Emergency Exit Lights		**OFF**
Ground Service Electrical Panel		**APU / EXT PWR / OFF**
APU Panel		**SET**
Boost Pumps		**OFF / ONE ON**
Battery Switch		**ON (APU PWR) / OFF**

EITHER PILOT CHALLENGE **EITHER PILOT RESPOND**

Battery Charger .... CHECKED

Move the Volts/Freq selector on the electrical panel to the BATT AMP position and verify that the battery charger is functioning. If inoperative, notify maintenance.

Galley Power & Windshield Heat .... OFF

Packs .... OFF

Flight Directors & Exterior Lights .... OFF

For night operation, the WING/NACL light switch may be placed in the R ONLY position to illuminate the cargo bay areas. All other lights should be retracted and off.

Cabin Altitude Controller .... AUTO / MAN CLOSED

During inclement weather, closing the cabin air outflow valve will prevent entry of rain and snow in the fuselage. To close the valve, place the cabin altitude controller lever in the manual (down) position, depress and rotate the control wheel until the indicator is at full forward position.

Cockpit & Emergency Exit Lights..OFF

Turn all cockpit and digital light controllers full counterclockwise.

Note: Do not turn emergency exit lights off until all passengers have deplaned.

The DC emergency bus must be powered to accomplish this step. Place the EMER LTS switch to the off position. The **EMER LIGHT NOT ARMED** annunciator light will illuminate. Verify that the emergency lights are disarmed by noting that the emergency lights at the top of the overhead panel are off. If normal electrical power is inadvertently turned off with the emergency lights switch in ARM, all emergency lights will come on and cannot be turned off until power is restored to the DC emergency bus. If this occurs, turn the emergency power switch on, turn the emergency light switch off, then the emergency power switch off.

Ground Service Electrical Panel........................... APU / EXT PWR / OFF

If ground service electrical power is to be used utilizing APU or external power, select the respective power source switch to on. If aircraft is to be left unpowered select both switches to off. Move the left and right APU and EXT PWR AC bus power switches to off.

APU Panel ....SET

APU air switch should be turned off. If APU electrical power is needed, leave the APU master switch on.

If APU electrical power is not needed, turn the APU master switch off. Allow the APU to decrease below 10% before turning the battery switch to off. This will provide fire detection and protection during the APU shut down process. It will take approximately 15 seconds for the APU inlet doors to fully close. Allow this time to elapse before turning the battery switch off.

Boost Pumps ....OFF / ONE ON

If APU is used for electrical power, the Right Aft Fuel Boost Pump should be left on.

Battery Switch..ON (APU PWR) / OFF

If APU is used for electrical power, the battery switch should be left on.

OVERNIGHT PARKING AT A NON-MAINTENANCE STATION

Procedures for overnighting an aircraft at a non-maintenance station are as follows:

1. When the flight crew is aware that a non-maintenance station will be used to overnight the aircraft, the last maintenance station that is passed through should be notified of any servicing or maintenance required that may affect the following morning's departure.
2. Upon termination of a flight at a non-maintenance station, the flight crew must contact Maintenance Control and advise them of any maintenance problems, or if servicing is required.
3. If high winds are forecast:
    a. Park aircraft into wind or forecast wind.
    b. Inform maintenance control of existing fuel load in the event ballast fuel is necessary.
    c. Set parking brake.

Terminal operations should provide additional securing of the aircraft which include at least closing all the doors and installing chocks.

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ACARS Procedures

LINK TEST		
Step	**Press Key**	**Reason / Action**
1	DATA MODE	ACARS must be in DATA mode for LINK TEST.
2	LINK TEST	Observe: LINK TEST key remains illuminated during test (press key again to cancel test). Other lights are illuminated momentarily. Loop back message is sent to ground station (if at gate GMT clock is updated). LINK TEST key light goes out when ground station return message is received. If CU FAIL or MU FAIL light remain on, internal failure is indicated. If SEND key remains lit, ground station has not returned the loop back message.

INITIALIZATION				
Step	**Press Key**	**Display**	**Meaning / Remarks**	**Crew Entry**
1	INTL	FLT_0000	Flight number	4 numbers (max)
2	ENT	BF_00000	Boarded fuel (gallons)	5 numbers (max)
3	ENT	FOB_000.0	Fuel on board (pounds)	4 numbers (max)
4	ENT	DEP__000	Departure station	3 alpha characters
5	ENT	DES__000	Destination	3 alpha characters
6	ENT	MONTH_00	Month	2 numbers
7	ENT	DAY___00	Day	2 numbers
8	ENT	BLANK	Done	

CLOCK MANUAL UPDATE (MISC 8)				
Step	**Press Key**	**Display**	**Meaning / Remarks**	**Crew Entry**
1	MISC	______00	Misc key lights	8
2	ENT*	GMT_XXXX	Current time in clock	Correct time: 4 numbers
3	ENT	BLANK	Done	
* To update automatically, press SEND after ENT				

DELAY AT GATE (MISC 10)				
Step	**Press Key**	**Display**	**Meaning / Remarks**	**Crew Entry**
1	MISC	______00	Misc key lights	10
2	ENT	DLA____0	Requesting delay code	1
3	ENT	ETO_0000	Estimated time off	Time: 4 numbers
4	ENT	BLANK	Send key lights	
5	SEND	BLANK	Done	

DELAY AFTER LEAVING GATE (MISC 11)				
Step	Press Key	Display	Meaning / Remarks	Crew Entry
1	MISC	______00	Misc key lights	11
2	ENT	ETO_0000	Estimated take-off time	Time: 4 numbers
3	ENT	BLANK	Send key lights	
4	SEND	BLANK	Done	

DEICING AWAY FROM THE GATE (ICE PAD) PROCEDURES				
Note: Use ICE as the destination for ACARS initialization at the gate.				
ARRIVAL AT DE-ICE LOCATION (MISC 16)				
Step	Press Key	Display	Meaning / Remarks	Crew Entry
1	MISC	______00	Misc key lights	16
2	ENT	GMT_0000	Arrival time	Time: 4 numbers
3	ENT	BLANK	Send key lights	
4	SEND	BLANK	Done	
If delay occurs at de-ice location, send Use MISC 11 Delay After Leaving Gate message.				
READY TO LEAVE DE-ICE LOCATION (MISC 17)				
Step	Press Key	Display	Meaning / Remarks	Crew Entry
1	MISC	______00	Misc key lights	17
2	ENT	GMT_0000	Time ready to leave	Time: 4 numbers
3	ENT	BLANK	Send key lights	
4	SEND	BLANK	Done	
Re-initialize ACARS with actual destination				

REVISED ETA				
Step	Press Key	Display	Meaning / Remarks	Crew Entry
1	ETA	DES__XXX	Destination	do not change
2	ENT	ETAXXXXZ	Previous ETA if entered, zeros if no entry made	4 numbers representing new ETA
3	ENT	BLANK	Send key lights	
4	SEND	BLANK	Done	

<table>
<tr><th colspan="6">ENGINE DATA (TEMP LOG)</th></tr>
<tr><th>Step</th><th>Press Key</th><th>Display</th><th>Meaning</th><th>Actual Data</th><th>Crew Entry</th></tr>
<tr><td>1</td><td>ENG</td><td>GWT_0000</td><td>Gross weight</td><td>102,000</td><td>1020</td></tr>
<tr><td>2</td><td>ENT</td><td>ALT__000</td><td>Altitude</td><td>35,000</td><td>350</td></tr>
<tr><td>3</td><td>ENT</td><td>SAT__-00</td><td>Static air temp</td><td>-44</td><td>44</td></tr>
<tr><td>4</td><td>ENT</td><td>TAT__-00</td><td>True air temp</td><td>-19</td><td>19</td></tr>
<tr><td>5</td><td>ENT</td><td>TAS__000</td><td>N/A</td><td></td><td></td></tr>
<tr><td>6</td><td>ENT</td><td>IAS__000</td><td>Indicated airspeed</td><td>249 kias</td><td>249</td></tr>
<tr><td>7</td><td>ENT</td><td>MACH_.000</td><td>Mach</td><td>.741</td><td>741</td></tr>
<tr><td>8</td><td>ENT</td><td>ISO_12_0</td><td>N/A</td><td></td><td></td></tr>
<tr><td>9</td><td>ENT</td><td>ISO_23_0</td><td>N/A</td><td></td><td></td></tr>
<tr><td>10</td><td>ENT</td><td>PAC_1__0</td><td>AC pack 1</td><td>1=on, 0=off</td><td>1 or 0</td></tr>
<tr><td>11</td><td>ENT</td><td>PAC_2__0</td><td>AC pack 2</td><td>1=on, 0=off</td><td>1 or 0</td></tr>
<tr><td>12</td><td>ENT</td><td>1EPR_000</td><td>#1 EPR</td><td>1.75</td><td>175</td></tr>
<tr><td>13</td><td>ENT</td><td>2EPR_000</td><td>#2 EPR</td><td>1.77</td><td>177</td></tr>
<tr><td>14</td><td>ENT</td><td>1N1__000</td><td>#1 N1</td><td>84.9</td><td>849</td></tr>
<tr><td>15</td><td>ENT</td><td>2N1__000</td><td>#2 N2</td><td>84.8</td><td>848</td></tr>
<tr><td>16</td><td>ENT</td><td>1EGT_000</td><td>#1 EGT</td><td>655</td><td>655</td></tr>
<tr><td>17</td><td>ENT</td><td>2EGT_000</td><td>#2 EGT</td><td>645</td><td>645</td></tr>
<tr><td>18</td><td>ENT</td><td>1N2__000</td><td>#1 N2</td><td>90.4</td><td>904</td></tr>
<tr><td>19</td><td>ENT</td><td>2N2__000</td><td>#2 N2</td><td>90.1</td><td>901</td></tr>
<tr><td>20</td><td>ENT</td><td>1FF_0000</td><td>#1 fuel flow</td><td>2400</td><td>2400</td></tr>
<tr><td>21</td><td>ENT</td><td>2FF_0000</td><td>#2 fuel flow</td><td>2380</td><td>2380</td></tr>
<tr><td>22</td><td>ENT</td><td>1TL____0</td><td>#1 throttle position</td><td>Wherever</td><td>4</td></tr>
<tr><td colspan="6">#1 throttle position is always reported as 4. #2 is reported relative to #1: 1= >1 knob aft, 2= 1 knob aft, 3= ½ knob aft, 4= aligned, 5= ½ knob fwd, 6= 1 knob fwd, 7= >1 knob fwd</td></tr>
<tr><td>23</td><td>ENT</td><td>2TL____0</td><td>#2 throttle position</td><td>Relative to #1</td><td>1-7</td></tr>
<tr><td>24</td><td>ENT</td><td>1OILP_00</td><td>#1 oil pressure</td><td>42</td><td>42</td></tr>
<tr><td>25</td><td>ENT</td><td>2OILP_00</td><td>#2 oil pressure</td><td>44</td><td>44</td></tr>
<tr><td>26</td><td>ENT</td><td>1OILT000</td><td>#1 oil temperature</td><td>115</td><td>115</td></tr>
<tr><td>27</td><td>ENT</td><td>2OILT000</td><td>#2 oil temperature</td><td>105</td><td>105</td></tr>
<tr><td>28</td><td>ENT</td><td>VIB1__0.0</td><td>N/A</td><td></td><td></td></tr>
<tr><td>29</td><td>ENT</td><td>VIB2__0.0</td><td>N/A</td><td></td><td></td></tr>
<tr><td>30</td><td>ENT</td><td>1BLD___0</td><td>#1 pneu x-feed</td><td>1=open, 0=clsd</td><td>1 or 0</td></tr>
<tr><td>31</td><td>ENT</td><td>2BLD___0</td><td>#2 pneu x-feed</td><td>1=open, 0=clsd</td><td>1 or 0</td></tr>
<tr><td>32</td><td>ENT</td><td>1FQ_000.0</td><td>left main tank fuel</td><td>6440</td><td>644</td></tr>
<tr><td>33</td><td>ENT</td><td>2FQ_000.0</td><td>right main tank fuel</td><td>7820</td><td>782</td></tr>
<tr><td>34</td><td>ENT</td><td>3FQ_000.0</td><td>center tank fuel</td><td>0</td><td>0</td></tr>
<tr><td>35</td><td>ENT</td><td>KF___0.00</td><td>N/A</td><td></td><td></td></tr>
<tr><td>36</td><td>ENT</td><td>BLANK</td><td>Send key lights</td><td></td><td></td></tr>
<tr><td>37</td><td>SEND</td><td>BLANK</td><td>Done</td><td></td><td></td></tr>
</table>

DIVERSION				
Step	**Press Key**	**Display**	**Meaning / Remarks**	**Crew Entry**
1	ETA	DES__XXX	Original destination	New destination
2	ENT	ETAXXXXZ	Previous ETA if entered, zeros if no entry made	4 numbers representing new ETA
3	ENT	FOB_000.0	Fuel on board (pounds)	4 numbers (max)
3	ENT	BLANK	Send key lights	
4	SEND	BLANK	Done	

EXPECT FURTHER CLEARANCE TIME - ENROUTE HOLDING (MISC 12)				
Step	**Press Key**	**Display**	**Meaning / Remarks**	**Crew Entry**
1	MISC	______00	Misc key lights	12
2	ENT	EFC0000Z	Expect further clearance	Time: 4 numbers
3	ENT	BLANK	Send key lights	
4	SEND	BLANK	Done	

EXPECT APPROACH CLEARANCE TIME - ARRIVAL HOLDING (MISC 13)				
Step	**Press Key**	**Display**	**Meaning / Remarks**	**Crew Entry**
1	MISC	______00	Misc key lights	13
2	ENT	EAC0000Z	Expect approach clearance	Time: 4 numbers
3	ENT	BLANK	Send key lights	
4	SEND	BLANK	Done	

REQUEST RADIO CALL FROM DISPATCH (ARINC PHONE PATCH)				
Step	**Press Key**	**Display**	**Meaning / Remarks**	**Crew Entry**
1	GND ADRS	G/A___00	Grnd Adrs key lights	
2	GRND ADRS	______XX X	Dispatch area code	713
3	ENT	YYYZZZZ	Dispatch phone number	324????
4	ENT	BLANK	Send key lights	
5	SEND	BLANK	Done	

GATE REQUEST (MISC 96)				
Step	Press Key	Display	Meaning / Remarks	Crew Entry
1	MISC	______00	Misc key lights	96
2	ENT	GATE_REQ	Request gate	
3	ENT	BLANK	Send key lights	
4	SEND	BLANK	Done	

SEND ELECTRONIC MESSAGE TO DISPATCH (MISC 99)				
Step	Press Key	Display	Meaning / Remarks	Crew Entry
1	MISC	______00	Misc key lights	99
2	ENT	00000000	Enter up to 8 numbers or letters at a time. The first 3 characters may be entered with the slew switches or number keys. To enter additional characters, press any number key or keys up to 3 times. This will shift previously entered characters to the left. Then, if necessary, change the values above the slew switches as required. Separate words with - or /. When an 8 character sequence is complete, proceed to next step.	
3	ENT	00000000	Enter up to 4 additional sequences of 8 characters for a total of 5 blocks of 8 characters. SEND key flashes.	
4	SEND	BLANK	Done	

USE OF VHF-3 FOR VOICE COMMUNICATION (CONTROL HEAD NOT INSTALLED)				
Requirement:: The interphone panel must have a button for VHF-3 transmissions.				
Step	Press Key	Display	Meaning / Remarks	Crew Entry
1	MISC	______00	Misc key lights	66
2	ENT	V_128.850	Current voice frequency	
3	CLR	V_000.000	Enter desired frequency	5 numbers
4	ENT	BLANK	Done	

DELAY AWAITING GATE (MISC 14)				
Step	Press Key	Display	Meaning / Remarks	Crew Entry
1	MISC	______00	Misc key lights	14
2	ENT	AWG0000Z	Expect gate open time	Time: 4 numbers
3	ENT	BLANK	Send key lights	
4	SEND	BLANK	Done	

POST FLIGHT REPORT				
Step	Press Key	Display	Meaning / Remarks	Crew Entry
1	FUEL	FOB_000.0	Fuel on board	4 numbers (max)
2	ENT	K____000	N/A	
3	ENT	PL_____0	1 = Capt, 2 = F/O	1 or 2
4	ENT	CAT____0	Approach category	1,2, or 3
5	ENT	SAT____0	Satisfactory, yes or no	Y or N
6	ENT	BLANK	Done	

CONDITION: SELCAL chimes and VOX key is flashing:

MEANING: Dispatch is calling and requests you talk to them on the radio.

ACTION: Press VOX key, Display is **F_XXX.XXX** where the **X**'s represent the VHF voice contact frequency. Dial this frequency in a VHF comm radio and initiate phone patch.

CONDITION: **MISC** key flashes.

MEANING: Dispatch has sent an electronic message to you via ACARS.

ACTION: Press MISC key, Display is ______**45**. Press ENT key. Display shows uplinked message. If longer than 8 characters, the message will scroll from right to left. To adjust the scroll speed press 1 through 9 (1 = slowest, 9 = fastest). Press CLR key to halt the display.

COCKPITFONE PROCEDURES

All MD-80 cockpits are being equipped with GTE Cockpitfones. These phones will allow quick access to MedLink, Dispatch, Maintenance, Ramp tower in EWR/IAH/CLE, and the Operational Performance Department.

The Cockpitfone is mounted on the wall behind the First Officer and powered through circuit breaker S-24 labeled AIRFONES. The handset is similar to those in the passenger cabin, however no credit card or PIN number is required for operation (a credit card swipe will be ignored).

Receiving a Call

The Cockpitfone will alert the flight crew of an incoming call with a green, blinking LED (No audio Ring Tone) on the back of the handset. Press the release button to lift the handset from the holder. Press the "1" key (as instructed by the handset menu screen) to receive the call. Volume control buttons are on the side of the handset.

Placing a Call

Three types of calls are possible: Air to ground, Ground to Air, and Cockpit to Passenger seat. Calls between the cockpit and the ground may only be made to and from authorized parties; and passengers cannot call the cockpit.

The Cockpitfone may be used to set up a conference (3-way) call with two other parties: either two ground users (via speed dial numbers), or one ground user (via a speed dial number) and one cabin. Example: During a medical emergency, the Cockpitfone may be used for a conference call between the cockpit, the Medlink ground station, and a medical person speaking from an Airfone in the cabin near the person in distress.

The screens presented by the handset guide the user when making a call.

English->1 Español->2 Français>3 Speed Dialing->* [Initial Screen]

The Initial Screen is first to appear when using the handset. If a speed dial call is desired, press the * key and follow the menu instructions. Speed dial numbers are listed on the next page. Pressing 1, 2, or 3 brings up the Main Screen.

The Main screen allows access to calling, 3-way calling, messages, and GTE automated assistance.

Place Calls--->1 3-way Calling--->2 See Messages>3 Cust Svc>0 [Main Screen]

Selecting 1 brings up a screen to enter a speed dial number or make a call to a seat in the cabin. If a ground station attempts to call when the Cockpitfone is in use, the number of the caller is shown in Messages.

The instructions for all Cockpitfone operations are contained in the handset screen menus. A GTE Airfone Customer Care representative is available during the daytime at *611 for help using the system.

Note: The cockpitfone should not be used during critical phases of flight.

SPEED DIAL NUMBERS		
Speed Dial	Party Called	Number Dialed
611	Airfone Customer Care Representative	-
900	MEDLINK	602-239-3627
901	Dispatch Desk 1	713-324-7561
902	Dispatch Desk 2	713-324-7562
903	Dispatch Desk 3	713-324-7563
904	Dispatch Desk 4	713-324-7564
905	Dispatch Desk 5	713-324-7565
906	Dispatch Desk 6	713-324-7566
907	Dispatch Desk 7	713-324-7567
908	Dispatch Desk 8	713-324-7568
909	Dispatch Desk 9	713-324-7569
910	Dispatch Desk 10	713-324-7570
951	Dispatch Desk 11	713-324-7571
912	Dispatch Desk 12	713-324-7572
913	Dispatch Desk 13	713-324-7573
914	Dispatch Desk 14	713-324-7574
915	Dispatch Desk 15	713-324-7575
916	Dispatch Desk 16	713-324-7576
917	Dispatch Desk 17	713-324-7577
918	Dispatch Desk 18	713-324-7578
919	Dispatch Desk 19	713-324-7579
920	Dispatch Desk 20	713-324-7580
921	Dispatch Desk 21	713-324-7581
922	Dispatch Desk 22	713-324-7582
923	Dispatch Desk 23	713-324-7583
924	Dispatch Desk 24	713-324-7584
971	Operational Performance Department	713-324-2640
957	Maintenance Control - 757	713-834-5472
977	Maintenance Control - 777/DC-10	713-834-5471
937	Maintenance Control - 737	713-834-5475
980	Maintenance Control – MD-80	713-834-5479
991	Ramp Tower - EWR	201-961-6327
992	Ramp Tower - CLE	216-362-3989
993	Ramp Tower – IAH	281-553-8674

TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM

TCAS II is installed and interfaced with the aircraft's transponder, weather radar system(s), and IVSI's to provide the flight crew with graphic air traffic displays as a back-up to visual collision avoidance, application of "right of way" rules, and Air Traffic Control (ATC).

To effectively work, timely and reliable crew response to TCAS advisories is essential. Delayed crew response or reluctance of a flight crew to adjust flight path as advised by TCAS due to ATC clearance provisions, fear of later FAA scrutiny, or other factors could significantly decrease or negate the protection afforded by TCAS. Operation of the system is expected to be in accordance with the following:

General

Unless otherwise specified, pilots are expected to operate TCAS while in flight in all airspace, including oceanic, international, and foreign airspace. TCAS operation should be in the TA/RA mode except as otherwise required.

The 5 or 10 mile TCAS RANGE should be selected for takeoff. During climb, the range should be incrementally increased to allow optimum traffic display. The selected range is often dependent on the traffic situation and density. The 40 nm selection is normally optimum for cruise flight. During descent, the range may be incrementally adjusted downward as the aircraft approaches and enters the terminal environment. During both climb and descent, ABOVE or BELOW may be selected to "clear" the airspace into which the aircraft is climbing or descending. This action affects only the display of traffic and does not effect the TA/RA.

Deviation From Assigned Clearance

Deviation from a clearance in response to a TA only is not authorized unless the traffic is acquired visually and the pilots determine that evasive action is required in accordance with normal "see and avoid" practices. Such evasive action will be reported as due to visual contact with the traffic.

Deviation from a clearance in response to an RA is authorized only to the extent required to follow the RA display guidance. If the RA requires maneuvering contrary to right of way rules, cloud clearance rules, or other criteria, pilots are expected to follow the TCAS RA guidance. Deviation from rules, policies, procedures, or limitations should be kept to the minimum necessary to comply with TCAS guidance.

Pilot Response To Traffic Alerts (TA)

The flight crew should respond immediately to TA's by attempting to establish visual contact with the traffic. Continue to clear for other traffic during the search for the alert traffic. If the traffic is acquired visually, continue to maintain or attain safe separation in accordance with current FAR's and good operating practices. Do not alter the aircraft's flight path based solely on a TA without visual confirmation of the need to do so. Maneuvering based solely on a TA, in an effort to preempt an RA, is not authorized.

Note: Early TCAS installations were subject to significantly more unnecessary TA's than those equipped with software installed after March of 1992.

Pilot Response To A Resolution Advisory (RA)

The TCAS software design is such that the triggering of an RA indicates a real threat of collision. Therefore, an immediate and correct response to an RA is mandatory unless overriding safety concerns exist. Correct response to an RA is indicated even if the crew believes they have the traffic in sight, due to the possibility of misidentification of the target traffic.

Respond to a preventative RA by monitoring aircraft vertical speed to ensure that it does not enter the red area. Normally, compliance with preventative RA's can be accomplished without deviation from the assigned clearance, however if deviation is required, it is authorized. All crew members should attempt to acquire the traffic visually.

Respond immediately to a corrective RA by altering the aircraft's flight path as indicated. Use positive control inputs similar to those expected in response to an ATC clearance incorporating the term "immediately." Do not maneuver in a direction not specified by the RA display. TCAS is aware of other aircraft in the vicinity and in many instances, TCAS to TCAS coordination may have occurred. The pilot flying should dedicate his direct attention to accurately flying the aircraft in accordance with the RA commands. Respond immediately and decisively to increase, decrease, and reversal commands. Initial response delayed over 5 seconds, or response to subsequent modified (Increase or Reversal) guidance delayed over 2-1/2 seconds will compromise separation. The other crewmember(s) as well as any cockpit observers, should attempt to obtain visual contact with the traffic if possible.

Caution: Turns are not authorized to avoid traffic unless the traffic has been visually acquired and positively identified.

Respond to an RA as specified by the warning. TCAS does not track just one target, but monitors the airspace around the aircraft. When it issues an RA, it has taken all surrounding Mode S or Mode C traffic into account. Excessive maneuvering is not appropriate or advisable and only tends to increase the possibility of interference with other traffic, needlessly exaggerates any ATC clearance deviation, and nullifies TCAS to TCAS maneuver coordination.
From level flight, proper response to an RA typically results in an overall altitude deviation of 600 feet or less. A Climb or Descend RA requires that a vertical speed of 1500 fpm be established and maintained. The use of vertical rates in excess of 1500 fpm is neither required nor desirable due to the possibility of large altitude deviations. There is no situation that requires a climb or descent to the next higher or lower cruising altitude or flight level. Be alert for a "downgrade" of the RA indication, and begin to reduce deviations as soon as possible. Attempt to comply with as much of the current clearance as possible during the RA. For example, continue to fly the ground path specified in the current clearance, if possible, while altering the vertical path in response to the RA. Promptly and smoothly return to the current ATC clearance when the TCAS message, "CLEAR OF CONFLICT," is heard.
If a TCAS RA maneuver is contrary to other critical cockpit warnings such as stall, windshear, or ground proximity, then such warnings are to be respected. In the case of simultaneous audio alarms from TCAS and other systems, GPWS and windshear warnings are given higher priority; the TCAS system goes to TA ONLY, and the IVSI flags indicate RA OFF.

ATC Considerations

WARNING: Do not accept a controller instruction to disregard a TCAS RA.

In responding to a TCAS RA that directs a deviation in assigned altitude, communication with the controlling ATC facility is required as soon as practicable after responding to the RA. Turns to avoid traffic are never TCAS initiated. Therefore, if a turn is made, it must be done based on conventional "see and avoid" practices, after the traffic is acquired visually. The turn should be reported to the controller as being a result of the pilot's visual evaluation of the situation.

Controllers have a much more complete view of the air traffic situation than TCAS allows. Try to refrain from "second guessing" ATC or asking for special handling based on the potentially incomplete traffic information available on the TCAS display.

Operation in TA ONLY Mode

When operating in the TA ONLY mode, a TCAS equipped aircraft will appear to another TCAS aircraft as "Mode C Only." In addition to inhibiting RA's in the "TA only" cockpit, TCAS to TCAS coordination does not occur. These issues, along with the fact that few general aviation aircraft are TCAS equipped, mandate that use of the TA (only) mode be limited to situations of operational necessity. Use of TA (only) may be indicated in one or more of the following circumstances:

- During takeoff towards known nearby traffic which is in positive visual contact and which would cause an unwanted RA. Reselect TA/RA as soon as possible.
- During parallel approaches when the other aircraft has been positively identified visually (VMC) or by the controller (IMC).
- In visual conditions when flying in known close proximity to other aircraft.
- During emergencies and in-flight failures that severely limit aircraft performance or control to the point that ability to respond to an RA is in doubt.
- In response to specific Company guidance regarding areas or operations identified as having a verified and significant potential for unwarranted RA's.

Operational Limitations

TCAS does not alter or diminish the pilot's basic authority and responsibility to ensure safe flight. Since TCAS does not respond to aircraft which are not transponder equipped or aircraft with a transponder failure, TCAS alone does not ensure safe separation in every case. Other aircraft may not be able to maneuver due to equipment malfunctions. Further, TCAS RA's may, in some cases, conflict with flight path requirements due to terrain, such as an obstacle limited climb segment or an approach to rising terrain. Since many approved instrument procedures and IFR clearances are predicated on avoiding high terrain or obstacles, it is particularly important that pilots maintain situational awareness and continue to use good operating practices and judgment when following TCAS RA's. TCAS does not diminish the flight crew's responsibility for outside visual scan and "see and avoid" vigilance.

TCAS may occasionally issue an RA against an aircraft that has legal separation. This may be the result of one aircraft maneuvering, or in the case of 500' VFR - IFR separation, due to either or both aircraft being only slightly off altitude. TCAS uses a target's existing and previous vertical speed to predict separation. It is not aware of traffic's intention to level off at an altitude above or below its own altitude. For this reason, an RA can be issued prior to such a level off.

TCAS is only required to tract aircraft within 14 miles, outside of this range targets may be intermittent. Non-transponder or inoperative transponder aircraft are invisible to TCAS. Traffic with a transponder, but without altitude reporting, will not generate an RA. Mode C only transponders are not capable of coordinating responses. The TCAS aircraft assumes that the Mode C aircraft will not change its flight path.

Required Reports

Submit a Captain's Irregularity Report whenever response to an RA requires deviation from an assigned clearance. Submit Aviation Safety Reporting System (ASRS) reports at the crew's discretion. Report areas or operations that result in a high number of TA's or unwanted RA's via flight envelope write-ups.

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GROUND PROXIMITY WARNING SYSTEM (GPWS)

GPWS Warning

GPWS warnings of "TERRAIN, PULL UP," or any Configuration Warning require an immediate response by the flight crew. Without delay, apply go-around thrust, verify speedbrakes are retracted, and climb at the best angle of climb until clear of terrain.

WARNING: Any "TERRAIN," "PULL UP," or configuration warning that occurs or continues **below 500' AFE** **mandates a go-around, regardless of flight conditions**.

Note: If a warning occurs **above 500' AFE** when flying under daylight VMC conditions, and positive visual verification is made that no hazard exists and that aircraft configuration is correct, the warning may be regarded as cautionary and the approach may be continued.

GPWS Alert

GPWS alerts of "DON'T SINK," "SINK RATE," "GLIDE SLOPE," or "BANK ANGLE" (if applicable) require immediate response by the flight crew. The PF must take immediate action to correct the flight path.

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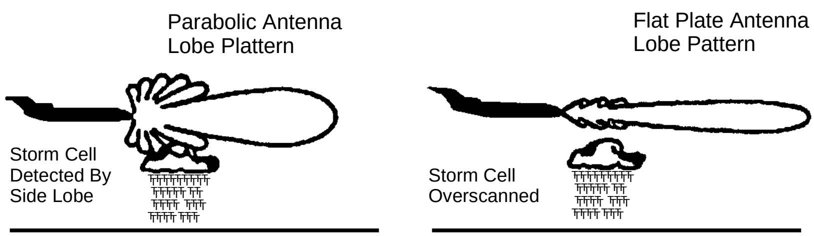
ADVERSE WEATHER

WEATHER RADAR

The requirements for weather radar for dispatch are stated in the aircraft minimum equipment list. If the radar becomes inoperative in flight, the flight may not enter a known or forecast thunderstorm area unless the Captain is satisfied that thunderstorms can be avoided visually. If already in a thunderstorm area when the radar becomes inoperative, the flight will avoid thunderstorms visually, or if this is impossible, slow to recommended turbulence penetration speed and take the shortest course out of the area consistent with safety.

Continental MD-80 aircraft are equipped with an X-Band weather radar receiver/transmitter (Collins WXR-700) and a flat-plate antenna. The flat-plate antenna produces a narrow beam (3.0°) without any significant sidelobes. For optimum performance, more tilt adjustment will be required than with the older parabolic type antenna which produce numerous sidelobes as shown in the diagram below.



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Resolution

There are several factors which affect the resolution of the radar system.

Range

Increasing range will decrease the radar return. The system compensates for this by varying the system gain with range; therefore giving as accurate a return as possible, at varying ranges.

Attenuation

Intervening precipitation and increasing range tend to attenuate the beam. The radar compensates for precipitation or range attenuation up to 80 NM, so that the correct color is displayed on the indicator. This feature is called path attenuation correction (PAC) and is intended for weather modes only. Using weather mode for ground mapping may result in an inaccurate picture due to the PAC circuit.

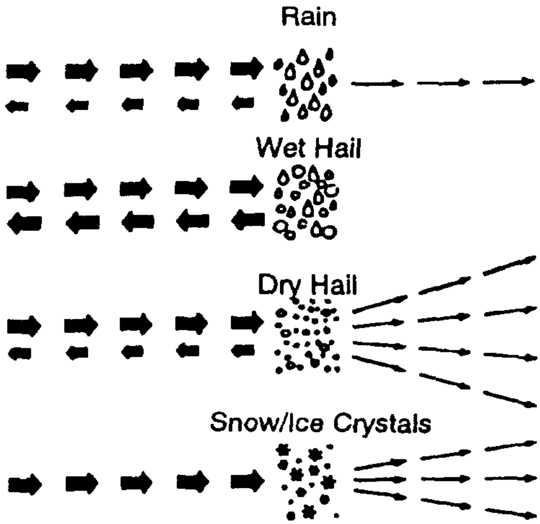
The PAC Alert annunciation identifies the areas of severe attenuation within 80 NM. Should the intervening precipitation be so intense that the signal is attenuated below the lowest signal level (green), a yellow arc (PAC alert bar) is painted at the outermost range mark to indicate the direction where the heavy precipitation is present. Targets beyond the intervening storm cell in this direction may not be accurately displayed or indeed displayed at all.

Caution: Although this special circuitry compensates for areas of precipitation, weather radar should not be used for penetration of thunderstorm areas where the precipitation between aircraft and target is moderate to heavy.

The storm behind the storm may not be displayed under extreme attenuation conditions. Do not penetrate strong targets assuming there is nothing behind it. If the ground cannot be painted behind the storm, then the attenuation compensation is not effective due to extremely high attenuation.

Nature Of Target

Storm targets differ in their ability to return a signal. Precipitation tends to absorb part of the transmitted signal which “masks” targets behind heavy precipitation areas.



As the tilt control is used to sweep a storm target, the return may change color, not due to a change in precipitation rate, but to the type of precipitation target encountered.

Gain Control and Turbulence

Manual gain control is available in all modes. The fully CW position, marked AUTO, is the normal position for gain control. As the gain control knob is moved CCW out of the AUTO position and toward the MIN setting, gain is adjusted from maximum to minimum. The variable gain control should only be used to reduce the receiver's sensitivity to aid in determining the relative intensity of multiple thunderstorms and embedded cells.

Caution: Manual gain settings of maximum, 9, and 8 will somewhat enhance radar receiver sensitivity, but as the gain is reduced there is a chance that all radar displays will be eliminated.

Selecting the TURB position causes all weather targets (precipitation and turbulence) to be displayed. Turbulence detection is limited to the first 50 NM regardless of the range selected. It will be displayed in magenta on the indicator superimposed over the weather information. This feature allows the detection of storm-related turbulence by measuring the Doppler shift of detected particles. Precipitation must be present for this mode to operate. Clear air turbulence (CAT) will not be detected. Manual gain is available in TURB mode, but should have no effect on turbulence targets.

Selecting the wx position will cause all precipitation targets to be displayed. Detectable weather will be displayed in three colors; red, yellow, and green.

Inflight Operations

Antenna Tilt Operations

Takeoff and Landings

Operations below 10,000 feet usually require a tilt setting of 2-3 degrees upward tilt. This will provide target detection up to 40 NM, without excessive ground returns and eliminate frequent tilt adjustment. The tilt setting should be adjusted as necessary to optimize target display. A solid ground return between 35 to 40 NM ensures targets within 35 NM will be detected. If tilt settings below 4 degrees are used for takeoff, some ground return will be detected until passing 5,000 feet AGL. This is due to minor sidelobes. Set 7 degrees up initially for takeoff.

Middle Altitudes (near 20,000 feet):

Antenna tilt settings should be roughly 0 degrees or slightly down. For over land operation, adjust tilt control until a small arc of ground return appears at the outer edge of the display. Storm cells displayed between half scale and the outer edge of the display should be monitored; tilting the antenna down and alternating range setting as necessary to avoid overscanning as you approach these cells.

Higher Altitude (around 35,000 feet):

At longer ranges it will be difficult to obtain ground targets at the outermost area of the display due to the curvature of the earth. Over water or if ground returns cannot be obtained at outer edge, use the following cruise tilt angles:

Target Range (NM)	Approximate Tilt Angle (Degrees)	
	Over Land	Over Water
160	2 Down	3 Down
80	3 Down	5 Down
40	5 Down	8 Down

As targets move past the half-way position, adjust antenna tilt angle and range setting as necessary to avoid overscanning. Detection of targets closer than 20 NM may be difficult as the large tilt down settings being used may result in excessive ground clutter and/or more distant storms not being detected.

Cooling Faults

Caution: If COOL or COOL FAULT is displayed, the system should be shut down at all times not needed for weather avoidance. The system will not automatically shutdown during an overheat condition, allowing Flight Crews to keep the radar on as long as possible if needed for weather avoidance. The system will display COOL FAULT until it fails due to overheat.

Storm Height

Most formulas and charts used to determine storm heights are complex as a result of the accuracy of calibration and the curvature of the earth. However, the following is a method that estimates the top of the detectable moisture (radar top) and is independent of calibration and curvature problems:

While scanning for storm targets, the most effective tilt angle of the antenna depends upon the altitude of the aircraft and the selected range. Once a storm is detected by varying the tilt angle (see previous table), decrease the tilt until the ground return touches the center of the storm and note the tilt angle displayed on the radar indicator. Now, increase the tilt until the storm disappears and again note the tilt angle. The difference of these two settings is important and eliminates the need of calibration corrections. Multiplying this tilt difference figure times the distance of the storm from the aircraft equals the storm height above ground level (i.e., a five degree difference of a storm at fifty miles equals a storm height of 250 or 25,000 ft. AGL).

Recall, the radar top is only the top of the moisture return and not the top of the cloud. Experience has shown that an additional 10,000 to 15,000 feet must be added to the radar top to ensure total clearance of the storm area.

Overwater Operating Procedures

- Do not use MAP mode for weather detection.
- Limit the use of 320 NM range to MAP mode. Weather detection is marginal beyond 220 NM.
- Use 160 NM range for weather surveillance with tilt down 3 degrees and expect some sea clutter at the outer limits, (i.e., above 120 NM).
- As weather is detected, range down to 80 NM then 40 NM using tilt to determine the "radar tops." Radar tops should be avoided by approximately 10,000 to 15,000 feet. Circumnavigate if required.
- Periodically return to 160 NM to re-examine the "big picture."

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ENGINE OPERATION DURING SEVERE PRECIPITATION

Flights should be conducted to avoid moderate to serve thunderstorm activity by overflight or circumnavigation. To the maximum extent possible, moderate to heavy rain/hail should also be avoided. Weather radar, pilot reports, and flight crew observations may be used by the flight crew to determine when moderate to heavy rain/hail/sleet is anticipated. Should flight in moderate to heavy rain/hail/sleet be encountered or anticipated, refer to SEVERE RAIN/ ICE/ TURBULENCE CHECKLIST, Section 3.

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WINDSHEAR AVOIDANCE AND RECOVERY PROCEDURES

The first and foremost rule is to avoid windshear. As enhanced detection and guidance capabilities become available, the pilot must not perceive these aids as providing the capability to penetrate windshear. These aids are intended to be used for avoidance only, in the same manner as radar is used as an aid in avoiding thunderstorms.

Microburst Windshear Probability Guidelines

Observation	**Probability Of Windshear**
Presence Of Convective Weather Near Intended Flight Path	
• With Localized Strong Winds (tower report or observed blowing dust, rings of dust, tornado-line features, etc.)	HIGH
• With Heavy Precipitation (observed or radar indications of contour, red or attenuation shadow)	HIGH
• With Rainshower	MEDIUM
• With Lightning	MEDIUM
• With Virga	MEDIUM
• With Moderate Or Greater Turbulence (reported or with radar indications)	MEDIUM
• With Temperature/Dew Point Spread Between 30 and 50 degrees Fahrenheit	MEDIUM
• Onboard Windshear Detection System Alert (reported or observed)	HIGH
Pirep Of Airspeed Loss Or Gain	
• 20 Knots Or Greater	HIGH
• Less Than 20 Knots	MEDIUM
LLWAS Alert/Wind Velocity Change	
• 20 Knots or Greater	HIGH
• Less Than 20 Knots	MEDIUM
• Forecast Of Convective Weather	LOW

Note: These guidelines apply to operations in the vicinity (within 3 miles of the point of takeoff or landing along the intended flight path below 1,000 feet AGL). The clues should be considered cumulative; and if more than one is observed, the probability is increased. The hazard increases with proximity to the convective weather. Weather assessments should be made continuously.

Takeoff Precautions

Airports Without Terminal Doppler Weather Radar:

If the preceding conditions exist and PIREPS indicate a windshear in excess of 15 knots with increasing intensity, delay departure 30 minutes.

If the preceding conditions exist and PIREPS indicate a windshear of less than 15 knots with diminishing intensity, delay departure 15 minutes.

Airports With Terminal Doppler Weather Radar:

A Microburst Alert or Windshear Alert will be issued by the tower in conjunction with a clearance to a specific runway. If the clearance does not contain an alert, the flight crew may assume that no alert exists at the present time.

If a Windshear Alert accompanied by a reported gain of airspeed is issued, the crew may take off but be alert for sudden airspeed increase. If airborne, the pilot should adjust pitch attitude smoothly to maintain desired airspeed but should not chase large rapid airspeed fluctuations.

If a Windshear Alert accompanied by a reported loss of airspeed, or a Microburst Alert is received, a takeoff should not be attempted. If either alert is received during takeoff prior to 100 knots, the takeoff should be aborted. If either alert is received after 100 knots, the takeoff may be aborted or continued at Captain’s discretion after considering runway available, gross weight, and related meteorological conditions.

If after careful consideration, the decision is made to take off:

1. Select the longest suitable runway that avoids suspected areas of windshear. The choice of a suitable runway involves consideration of exposure to obstacles after liftoff and crosswind and tailwind limitations.
2. Normal takeoff thrust should be used. (Flex takeoff is prohibited.)
3. The flight director and autothrottles will be turned off and not used.
4. Takeoff flaps should be at one of the recommended settings of 11°, 15°, or 4°. Flaps 4° is appropriate on long runways where the greatest concern

is climb performance after takeoff. Flaps 15° is appropriate on short runways where the greatest concern is takeoff roll and initial liftoff. Flaps 11° is recommended in most situations as it covers a larger range of conditions and provides autoslat protection.

5. Use increased V_R speed if available. The delayed rotation speed must not exceed either the runway limit V_R speed or a 20 knot increase.

   - Determine the V_1, V_R, and V_2 speed for the actual aircraft gross weight and flap setting. Set airspeed bugs to these values in the normal manner.

   - Determine the runway limit gross weight for the selected runway by consulting the runway analysis in the flight departure papers. Determine V_R for the runway limit gross weight. If not listed on the runway analysis, consult Section 5, V-Speeds for Takeoff-Manual Calculation to determine runway limit V_R.

   - Use the higher V_R speed (up to 20 knots in excess of actual gross weight V_R) for takeoff. Airspeed bugs should not be reset to the higher speeds.

   - Rotate to normal initial climb attitude at the increased V_R and maintain this attitude. This technique produces a higher initial climb speed which slowly bleeds off to the normal climb speed.

     <u>WARNING</u>: If windshear is encountered at or above the actual gross weight V_R, do not attempt to accelerate to the increased V_R, but rotate without hesitation. If windshear is encountered at or near the actual gross weight V_R and airspeed suddenly decreases, there may not be sufficient runway left to accelerate back to normal V_R. If there is insufficient runway left to stop, initiate a normal rotation at least 2,000 feet before the end of the runway, even if airspeed is low. Higher than normal attitudes may be required to lift off in the remaining runway. Aft body contact may occur.

Throttles may be advanced to the mechanical stops. If increased airspeed was not used prior to liftoff, accelerating to higher than normal airspeed after liftoff is not recommended. Reducing pitch attitude at low altitude to accelerate might produce a hazard if windshear is encountered.

Once the takeoff is initiated, the flight crew should be alert for airspeed fluctuations. If significant airspeed variations occur below V_1, the takeoff should be aborted if sufficient runway remains.

Caution: Accelerate/Stop distances are computed assuming a normal acceleration to V_1. Airspeed fluctuations may cause the aircraft to achieve V_1 at a point farther down the runway than anticipated. Therefore, the aircraft may not be able to stop on the runway.

Approach Precautions

Due to configuration and power settings, aircraft are the most vulnerable to windshear effects during the approach and landing phase of flight. Airspeed losses and excessive sink rates should be immediately responded to by the flight crew since the aircraft may not be able to recover from a situation that has been allowed to progress unchecked. A stabilized approach should be established no later than 1,000 feet AGL to improve windshear recognition capability.

Select minimum normal landing flap consistent with the field length, and do not use autothrottles.

The target airspeed bug should be set based on the surface winds in the usual manner. During the approach, the pilots should continuously monitor airspeed loss reports from other aircraft ahead or the tower if equipped with Terminal Doppler Weather Radar. The reported airspeed loss should be added to V_{REF} and if this value is in excess of target airspeed, the pilot should increase to and maintain this speed. (The target bug should remain set based on the surface wind additive only.) If the reported airspeed loss, when added to V_{REF} results in a speed less than target airspeed, maintain target airspeed. If the additive to V_{REF} (due to either surface wind or reported loss) results in an adjustment in excess of V_{REF} + 20 knots, the approach should not be continued.

Airspeed additive due to reported airspeed loss should be maintained to touchdown; however, the aircraft should not be allowed to float beyond the touchdown zone.

WARNING: Increased touchdown speeds increase stopping distance. An additional 20 knots at touchdown can increase stopping distance by as much as 25%.

Vertical speed should be closely monitored. If the descent rate required to maintain the glide path is significantly different than expected (based on groundspeed and descent slope), continuance of the approach may not be a safe course of action.

Caution: At airports equipped with Terminal Doppler Weather Radar, a missed approach should be executed if the Microburst Alert or a Windshear Alert accompanied by a reported airspeed loss of greater than 20 knots, is received.

As increase in airspeed and ballooning above the glideslope may be first indications of a windshear. Do not make large thrust reductions. This increase in performance may be followed soon by a rapid airspeed loss and an additional loss of performance due to a downdraft. The pilot may choose to accept this initial airspeed gain anticipating an equal or greater loss.
In windshear conditions, a flight director and/or autoflight system which does not have windshear recovery enhancements may command a pitch attitude change to follow target airspeeds or a fixed pitch attitude regardless of flight path degradation. This guidance may be in conflict with the proper procedures for windshear recovery and must be disregarded. Such systems must be disconnected, turned off, or disregarded if recovery is required. Do not follow TOGA commands.

Recovery Maneuver

The following actions are recommended whenever flight path control becomes marginal below 1000 feet AGL on takeoff or approach. As guidelines, marginal flight path control may be indicated by deviations from target conditions in excess of:

- ± 15 knots indicated airspeed
- ± 500 FPM vertical speed deviation from normal
- ± 5 degrees pitch attitude change
- ± 1 dot glideslope displacement
- Unusual throttle position for a significant period of time

Exact parameters cannot be established. In certain situations where significant rates of change occur, it may be necessary to go-around before any of the above are exceeded. The determination to begin the recovery procedure is subjective and based on the pilot's judgment of the situation.

If flight path control becomes marginal at low altitude, initiate the windshear recovery maneuver without delay. If ground contact appears imminent, either pilot calls "MAX THROTTLE." Accomplish the first three steps simultaneously:

1. Disengage the autopilot and autothrottles.
2. Aggressively apply maximum thrust to ensure maximum acceleration and performance. To ensure maximum thrust is obtained with minimum delay, an overshoot to the mechanical stops is recommended until positive indications of recovery are confirmed. Positive indications of recovery include:

A. Altimeter and IVSI indicate level flight or a climb; and

   A. Airspeed stable or increasing; and

   B. No stick shaker warning.

   Note: If positive indications of recovery are confirmed while advancing the throttles to the mechanical stops, the power setting for continuous recovery to normal flight parameters may be limited to maximum rated thrust (i.e., go-around thrust) to avoid unnecessarily exceeding engine limitations.

3. Rotate initially toward a 15 degree pitch attitude at normal rotation rate. Stop rotation immediately if stick shaker or buffet should occur. Roll wings level if in a turn to provide maximum lifting force.
4. Disregard or turn off the flight director.
5. Monitor vertical speed, attitude, and altitude. If the aircraft develops a sink rate, increase pitch attitude smoothly and in small increments to achieve zero or positive vertical path. Always respect stick shaker and use intermittent stick shaker as the upper limit for pitch attitude.
6. Do not change flap, gear, or trim position until terrain contact and/or loss of airspeed is no longer a factor.

Note: After liftoff or initiation of a Go-Around, adjust pitch to achieve a positive vertical flight path. Although exact criteria cannot be established, a target pitch attitude of 15 degrees should provide a positive vertical path. Keeping a positive or zero rate of climb is the major objective. Airspeeds below normal must be accepted at least temporarily. Control pitch attitude in a smooth, steady manner to avoid overshooting the attitude at which stall warning is initiated. Heavy and unusual control column forces (up to 30 lbs) may be required.

Speed is the least important item. If the pilot attempts to regain lost airspeed by lowering the nose, the combination of decreasing airspeed and decreasing pitch attitude produces a high rate of descent. Unless this is countered by the pilot, a critical flight path control situation may develop rapidly.

7. The pilot not flying should focus attention on vertical path, altitude, and pitch attitude. Inform the pilot flying of impending and negative vertical speeds by a callout of “SINK RATE.” The pilot flying should focus attention on pitch attitude and flying the airplane.
8. Windshear ends when the tailwind component stops increasing.

Crew Coordination

The pilot flying should focus attention on flying the airplane. In a windshear encounter, appropriate action should be taken in response to callouts.

The pilot not flying should focus attention on airspeed, vertical speed, altitude, pitch attitude, glidepath deviation, and thrust. If significant deviations should occur, call them out immediately. In a windshear encounter, the pilot not flying should call aircraft trends such as “CLIMBING” or “SINKING” accompanied by radio altitude (AGL).

Pilot Reports

As soon as possible, report the encounter to the tower or controlling agency. The aircraft following might not have the performance required to recover from the same windshear encounter. The windshear may also be increasing in intensity making flight through it even more dangerous.

The pilot report should contain the following information:

- Specifically state either GAIN or LOSS of airspeed.
- Magnitude of GAIN or LOSS.

- Altitude at which shear was encountered.
- Location of shear with respect to runway in use.
- Aircraft type.
- Use the term PIREP to encourage rebroadcast of the report to other aircraft.

Critical remarks establishing severity such as ...MAXIMUM THRUST REQUIRED, ...ALMOST CONTACTED TERRAIN, ETC. are also helpful.

PREDICTIVE WINDSHEAR SYSTEM

Introduction

FAR 121.358 requires installation of an airborne windshear warning and flight guidance system, an approved airborne detection and avoidance system, or an approved combination of these systems. Since 1990 Continental in association with Allied Signal Corporation has participated in the development of the RDR-4B Forward Looking Windshear Detection / Avoidance Weather Radar System.

RDR-4B Radar System Theory

Like all modern radar systems, the RDR-4B operates by emitting short intense pulses of microwave energy which are reflected by objects having reflective characteristics within the range of the system. The reflected signals are processed to produce visual displays that are representative of the size, intensity, bearing and distance of the targets. The RDR-4B incorporates an advanced microprocessor design which utilizes the Doppler principle to identify areas of moderate and higher turbulence as well as low level windshear (microburst) activity. The RDR-4B system is designed to operate in the windshear mode automatically any time the aircraft is below 1500' AGL, at least one engine is running, and the **transponder** is not in OFF or STBY, REGARDLESS OF RADAR MODE SELECTED. The system also operates in the windshear mode below 1500' AGL using an alternate scan technique if the radar is operating in any mode (WX / TURB, WX, MAP). The windshear mode is activated at 2300' AGL. However, no alerts or displays are annunciated above 1500' AGL (See Figure 3).

WARNING: Failure to return the transponder to STBY after landing or selecting any mode except STBY prior to leaving the ramp area allows the radar to operate in the windshear mode creating a radiation hazard to personnel on the ground. The RDR-4B radiation hazard area extends 13.4 feet from the radar antenna in a 120 degree arc left and right of the aircraft centerline. This hazard exists even if the radar mode is selected OFF or TEST.

RDR-4B System Operation

General

The RDR-4B radar system operates in the same way as previous radar systems installed in Continental aircraft for weather and mapping modes.

Windshear Mode

The Windshear mode is intended to be transparent to the pilot unless an alert occurs. The windshear mode is activated any time the aircraft is below 1500' AGL, at least one engine is operating, and the transponder is not OFF or STBY.

The system will generate 3 levels of alerts when it detects hazardous windshear activity in front of the aircraft. The level of the alert (warning, caution or advisory) is dependent on several factors including actual altitude, phase of flight (landing or takeoff) and proximity to the windshear event. All levels of windshear alert are inhibited on the ground above 100 KIAS until 50' AGL.

The areas covered, the level of alert generated and warnings associated with each are presented in the following table and illustrations.

	Advisory	Caution	Warning
VISUAL	ICON	ICON and Amber Lamps.	ICON and Red Lamps.
AURAL	NONE	Chimes	Take Off: "WINDSHEAR AHEAD, WINDSHEAR AHEAD" Landing: "GO AROUND, WINDSHEAR AHEAD"

WINDSHEAR VISUAL AND AURAL MESSAGES

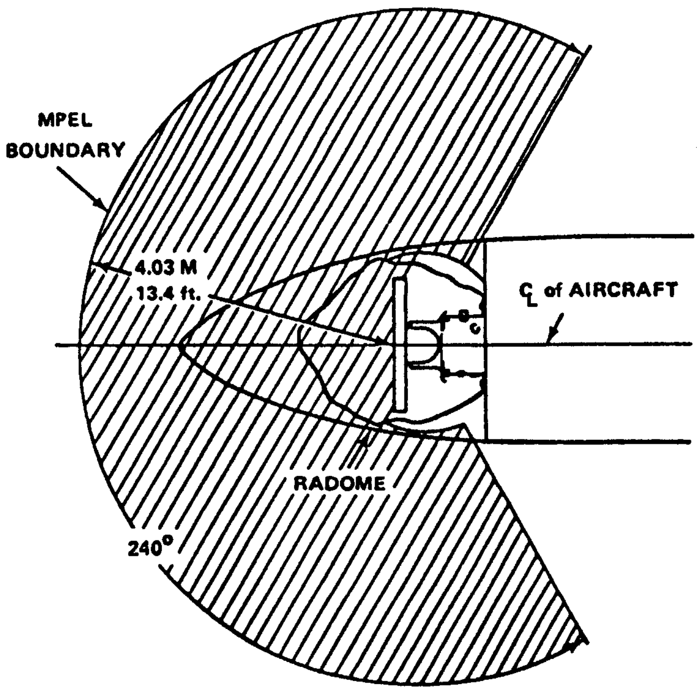
Note: Although the windshear mode is intended to be transparent unless an alert is generated, the crew may notice that the radar update rate is delayed when both radar and windshear modes are active. This delay of up to 12 seconds is caused by the sharing of antenna and processing between the weather and windshear modes in an alternate scan technique.

Alternate Scan

When the radar is operated in a weather mode and the conditions for windshear mode operation are satisfied, the radar switches to the alternate scan function. In an alternate scan operation, the radar uses one sweep for radar mode, the next sweep for windshear mode. On the radar sweep, gain and tilt are controlled by the settings in the flight deck. On the windshear sweep gain and tilt is automatically set by the R/T units programming for optimum windshear detection.

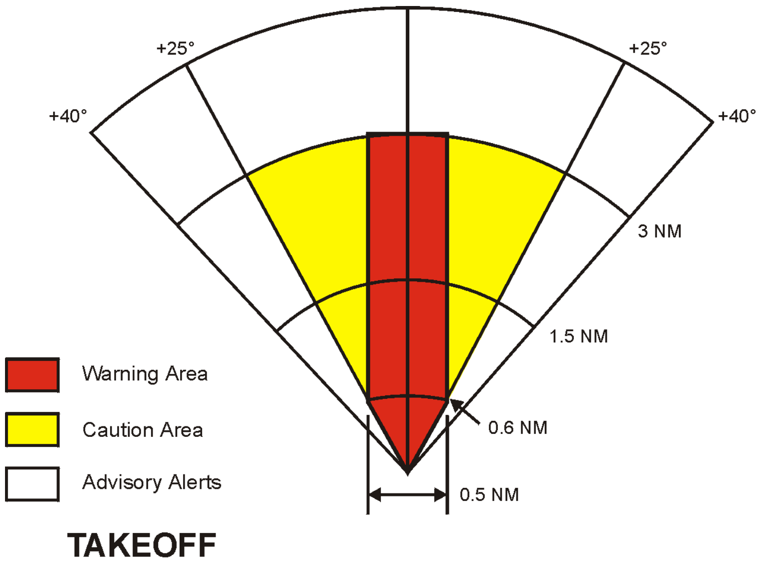
Maximum Permissible Exposure Level (MPEL)

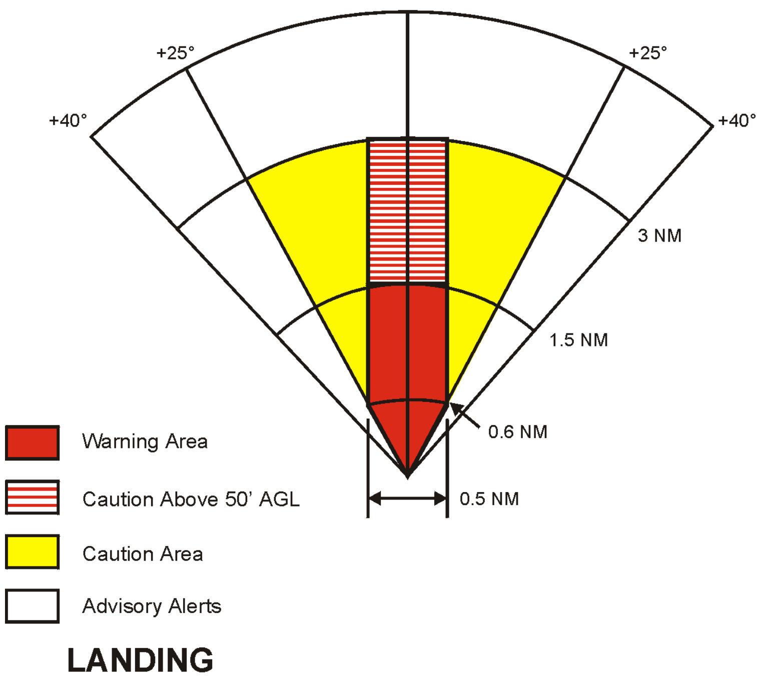
In order to avoid the envelope in which the radiation level may exceed the U.S. Government standard of 10 milliwatt per square centimeter, all personnel should remain beyond the distance indicated in the illustration below. The distance to the MPEL boundary is determined by calculating the near field/far field intersection per FAA Advisory Circular 20-68B.



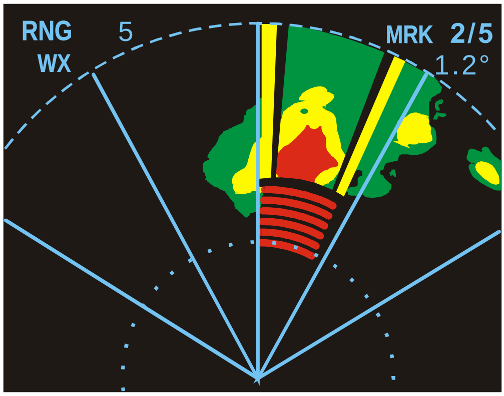
MPEL BOUNDARY

Caution: Failure to place the transponder to ALT ON, TA or TA/RA prior to taking the runway will prevent operation of the radar in the windshear mode unless the radar is selected to an active mode.

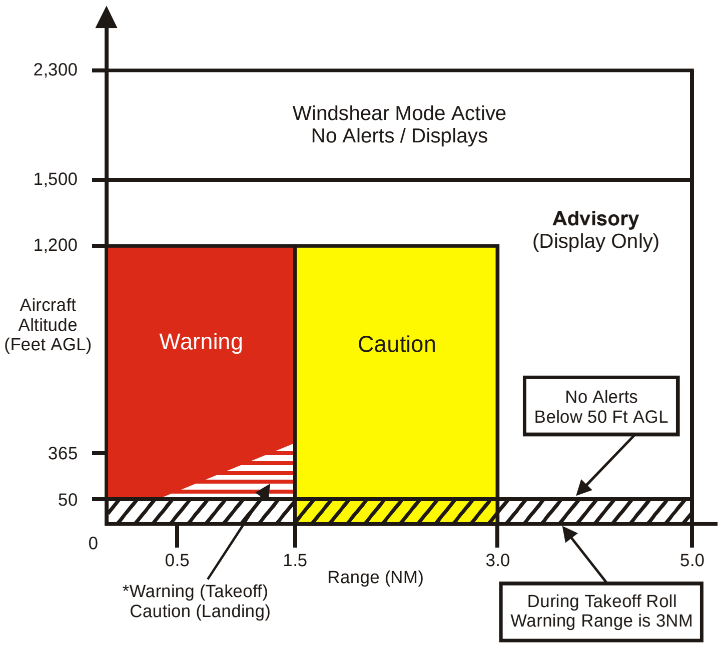

+25°
+25°
+40°
+40°
3 NM
1.5 NM
0.6 NM
0.5 NM
Warning Area
Caution Area
Advisory Alerts
TAKEOFF


+25°
+25°
+40°
+40°
3 NM
1.5 NM
0.6 NM
0.5 NM
Warning Area
Caution Above 50' AGL
Caution Area
Advisory Alerts
LANDING

Md804179



The windshear icon shown on the screen represent size and location. Windshear is detected 2 miles ahead and slightly to the right.



*Note: During final approach the RDR-4B provides automatic range scaling to prevent aural and visual warnings and alerts beyond the touchdown zone of the runway.

MD804180

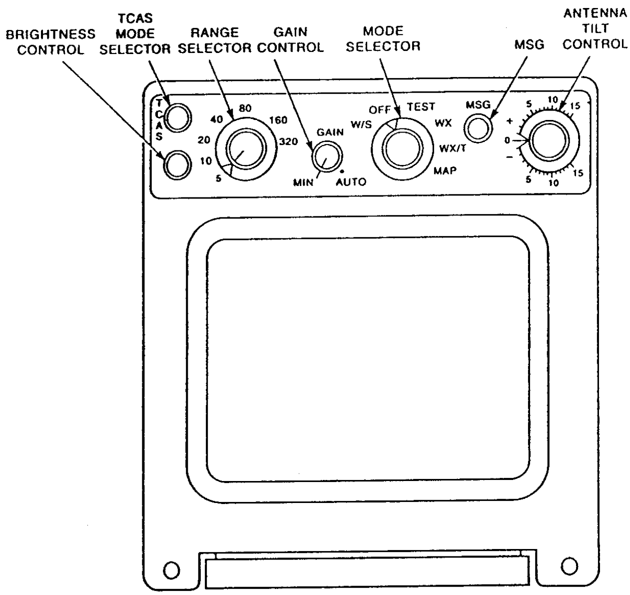
Controls And Indicators

General

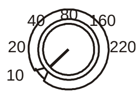
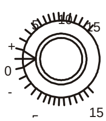
The RDR-4B system controls and indicators consist of a radar indicator with integral controls, system annunciator lights, and an aural warning speaker.

Control and Indicator Unit

The control and indicator unit depicted below replace the existing radar system. The function of the controls are described below.



TYPICAL PPI-B4 CONTROLS

	**TCAS MODE SELECTOR** Windshear has priority over TCAS alerts. While in TCAS only mode, a windshear event pops the system into WX/TCAS overlay mode displaying both windshear and TCAS information. The crew can change mode by pressing the TCAS button again. Refer to appropriate TCAS operating handbook for instructions.
	**BRIGHTNESS CONTROL** Adjusts picture brightness.
	**RANGE SELECTOR** Selects radar display range.
	**GAIN** Controls receiver gain. Rotate fully clockwise for automatic gain. Gain is automatic in windshear only mode.
	**MODE SELECTOR** W/S Windshear Only mode, Icon only, no weather returns. **W/S ONLY** annunciated, tilt and gain removed. When above 2300', **NO W/S DATA AVAILABLE** appears at the screen center indicating inappropriate mode selection. Activates W/S mode regardless of transponder mode. OFF Indicator is off unless turned on by ACARS or TCAS. Additionally, below 1500' AGL a windshear event automatically turns on the PPI-4B, the antenna sweeps ± 60º (±40º display), indicates selected range, annunciates **W/S ONLY**, **TILT** and **GAIN** are removed and the display shows the windshear icon only. <u>Note</u>: Windshear icon overlays test pattern and radar returns. TEST Selects TEST Mode WX Radar is in weather mode. WX/T Combined weather and turbulence mode. MAP Ground mapping mode.
	**MSG** Enables ACARS mode. While in ACARS mode, a windshear event pops the system into WX/TCAS overlay mode. When advisories clear, the system reverts back to MSG mode. Refer to appropriate ACARS operating handbook for instructions.
	**TILT** Controls antenna tilt ±15º. Automatic tilt in windshear only mode.

System Annunciator Lights

Red and Amber Windshear annunciator lights are installed on the forward instrument panel in front of each pilot. The red lights illuminate in conjunction with a warning level alert and the aural warning of "WINDSHEAR AHEAD, WINDSHEAR AHEAD" on takeoff, or "GO AROUND WINDSHEAR AHEAD" on approach. The amber lights illuminate in conjunction with a caution level alert and a two tones aural warning.

An amber Windshear inop annunciator is installed on the annunciator panel. This light illuminates any time the windshear systems detects a fault which renders the system inoperative. The windshear annunciator circuit breaker is located on the Right Radio DC Bus, E-4.

Windshear Icon

The windshear icon consists of red and black bands with straight sides formed by the radials from the aircraft which bound the event. The arcs closest and furthest from the aircraft depict the minimum and maximum range of the event.

Yellow radial lines appear at the edges beyond the event and extend to the edge of the display to provide directional information for the event.

Procedures

The following procedural chart applies to the predictive windshear system. Continental policy is to avoid all windshear and other hazardous weather.

Note: Windshear alerts are inhibited on the ground above 100 KIAS to 50 feet AGL.

Phase of Operation	Warning Alert	Caution Alert	Advisory Alert	System Failure
Before Takeoff	Advise ATC of the location of the Warning Alert. Delay takeoff until the warning is no longer present.	Advise ATC of the location of the Caution Alert. At the Captain's discretion, delay the takeoff, or takeoff and maneuver to avoid the hazard.	Advise ATC of the location of the windshear hazard. After takeoff, maneuver to avoid the windshear hazard area.	Use other means of windshear avoidance in accordance with published FAA windshear recovery guidelines.
Takeoff Prior to V1	Reject the takeoff. Advise ATC of the location of the windshear hazard.	Assure maximum rated thrust is applied. Continue the takeoff, and advise ATC of the hazard and maneuver around the hazard.	Assure maximum rated thrust is applied. Continue the takeoff, and advise ATC of the hazard, and maneuver around the hazard.	Same as above.
After Takeoff	Assure maximum rated thrust is applied. If the windshear is penetrated, utilize windshear recovery procedures. Advise ATC of the hazard.	Assure maximum rated thrust is applied. If the windshear is penetrated, utilize windshear recovery procedures. Advise ATC of the hazard.	Continue the climb out and monitor the windshear hazard. Advise ATC of the hazard.	Same as above.
During Approach	Initiate a normal go around. If the windshear hazard is penetrated, utilize windshear recovery procedures. Advise ATC of the hazard.	At the Captain's discretion, maneuver around the windshear hazard if a safe stabilized approach can be continued after the maneuver, or initiate a normal go around. Advise ATC of the hazard.	Continue the approach, monitor the location of the windshear event. Advise ATC of the hazard.	Same as above.

FLYING IN TURBULENCE

In severe turbulence, two major concerns naturally arise in the pilot's mind. One is the concern of imposing excessive structural loads. The other is the concern that airplane attitude may reach undesirable extremes. Neither of these concerns is totally unjustified. On the other hand, the classical treatment of rough air penetration speed has perhaps placed too much emphasis on the structural aspects. Most pilots are well aware that flight through a given set of gusts at higher speeds will produce higher load factors or G's and a rougher ride for the passengers than a penetration of the same turbulence at a more moderate speed. The admonition to slow down to the rough air penetration speed when entering turbulence has only served to reinforce this concern. Engineering methods for computing the effects of turbulence on structural loads are well known for an airplane in level flight at the time of entry into the turbulence and as a result, the classic discussion of the rough air penetration problem has tended to focus on such calculations and emphasis on the structural significance of high speed entry.

The other major concern, namely that of control, is a much less scientific and less tangible problem and therefore is perhaps lost to some degree in the usual technical discussion. It is important to note here that there is strong suspicion, if not specific evidence, that almost every structural breakup that has occurred in severe turbulence has been accompanied by a prior severe change in attitude and a subsequent combination of stresses resulting from both the recovery maneuver and the severe turbulence. The ride-smoothing qualities of the flexible swept back wing and the high wing loading of today's modern jet transport make it particularly likely that any structural damage which might occur in severe turbulence will be the result of a severe upset and/or recovery maneuver in combination with the turbulence. Thus, the usual simple calculations in straight level flight are perhaps not sufficiently pertinent to the real problem. Rather, some relationship to an upset condition should perhaps be developed as the basis for defining operating techniques in severe turbulence.

Airspeed

In recent incidents where flight difficulties have been experienced while flying jet transports in severe turbulence, a common factor has been reduction of airplane speed to a value that was close to or below the minimum speed formerly recommended for turbulence penetration. While flight at low speeds is satisfactory in moderate turbulence and may seem more comfortable, there are several disadvantages to flying at low speeds in severe turbulence. First, the airplane is closer to stall buffet and since the angle of attack changes caused by severe turbulence can be high, there is greater chance of encountering strong and alarming buffeting and the accompanying high drag that will cause loss of altitude and tempt the pilot to make undesirable thrust changes.

Second, because the trim changes due to thrust changes are higher in the low speed region, because the airplane is flying on the back side of the thrust required curve at low speeds, and because the trim changes required to keep in trim as the airplane changes speed are greater when flying in the low speed region than when flying at higher speeds, the difficulty of maintaining adequate control is compounded. Also, it is easier for the airplane to be laterally and directionally upset at the lower speeds when turbulence is severe.

Because of the disadvantages of low speed flight enumerated above, it is now considered desirable to emphasize flight at somewhat higher speeds than formerly recommended. The speeds now recommended for all turbulence penetrations tend toward the high side of the range previously recommended. For simplicity, it has been considered desirable to emphasize only one indicated speed, 285 knots or .79 Mach, whichever is less, as target speed with the realization that sizable and rapid variations will likely occur depending on the severity of the turbulence.

The question then arises as to the general practices to be employed in attempting to hold speed within a reasonable variation from the target speed. Moderate variations, either above or below, are of minor consequence, therefore, excessive abrupt or severe control motions should not be required, particularly when it is recognized that some of the fluctuation of the instruments is a result of the turbulence itself and does not necessarily represent a real change in the airplane's speed or altitude.

For the reasons previously enumerated, emphasis should be placed on flying on the high side of the target speed rather than the low side. However, it is considered highly undesirable to chase airspeed either with elevator or throttle manipulations since these efforts are usually ineffective and, as will be pointed out later, attitude should be the principal flight reference in turbulence.

Attitude

Flying under extremely turbulent conditions requires techniques which may be contrary to a pilot's natural reactions. Rapid and large aileron control inputs are permissible to hold the wings level, but in extreme turbulence, pitch attitude must be controlled using only small to moderate elevator control inputs to avoid overcontrolling or overstressing airplane structure. The natural stability of the airplane will work in a direction to minimize the loads imposed by turbulence. The pilot should rely, to a major extent, on this natural stability and not become too greatly concerned about pitch attitude variations. Since there is always the uncertainty of the direction, timing, and size of the next gust, it is often better to do nothing at all than to attempt to control airplane pitch attitude too rigidly. The moderate control inputs that are considered desirable will not always allow very precise attitude control. Ideally, elevator control should be applied smoothly in a direction to resist motions away from the desired attitude, and the elevator should be returned to neutral when the airplane is progressing toward the desired attitude. The above described technique will help prevent overcontrolling, and will result in less "G" loads than a technique which very closely controls pitch attitude.

Pitch attitude should be controlled solely with the elevator, never with stabilizer trim. Rapid changes in airspeed and attitude due to extreme gusts and drafts make stabilizer trim difficult to apply effectively. Also, any updraft or downdraft which might tempt the pilot to change trim can be expected to reverse itself in the next few seconds. If trim has been applied to counter the first draft, the second draft, which will likely be in the opposite direction, will exaggerate the out-of-trim condition. It is therefore considered desirable to <u>leave the stabilizer trim alone</u> in severe turbulence.

Thrust

Once the proper thrust setting for the speed recommended for penetration is achieved, it is generally undesirable to make thrust changes during severe turbulence encounters. Large variations in airspeed and altitude are almost certain to occur in severe turbulence, and simple rules of thumb for setting thrust are not universally applicable for all altitudes and weights. The most desired thrust setting in one which will provide near level flight at the recommended penetration speeds of approximately 80 to 85% will be satisfactory. The most important objective is to obtain an initial thrust setting reasonably close to the correct one. Disengage autothrottles if in use.

Altitude

Because of the very high velocity updrafts and downdrafts in severe turbulence regions, large variations in altitude are almost certain to occur. Too much concern about these variations will merely lead to excessive control manipulations, causing large "G" load variations and unwanted airspeed excursions. Altitude should be allowed to vary within reasonable bounds. At high altitude or during high-speed cruise at intermediate altitude, turbulence encounters may produce high speed buffeting. The airplane has been flown into the high speed buffet regime many times during flight tests in the process of determining and evaluating its qualities under these conditions. No unusual flight characteristics have been noted. However, to the uninitiated, the buffeting or shaking might be disconcerting, being somewhat similar in nature but more severe than the shaking that occurs under some conditions when speed brakes are extended.

When experience in combination with severe turbulence, these effects might easily be incorrectly diagnosed as increased severity of the atmospheric disturbance, and result in an exaggerated assessment of the seriousness of the situation. Experience to date has shown that severe turbulence encounters at high altitude have caused positive G's as high as 2.5. However, it is believed that if the recommended attitude control procedures are followed, high load factors need not be imposed.

Even though these procedures are used, an occasional encounter with high-speed buffeting in unexpected severe turbulence may be unavoidable above 30,000 feet. Such an occurrence should not cause great alarm nor be misinterpreted as a low speed stall with an accompanying rapid pushover for recovery, since any such action might aggravate the buffet situation by merely increasing the Mach number.

This tendency to encounter high-speed buffeting in severe turbulence is increased with increasing altitude. It is therefore apparent that climbing in an attempt to avoid an area of expected severe turbulence would lead to this type of buffeting difficulty if the turbulent region could not be completely topped.

Autopilot

If turbulence is light to moderate, it is best to use the autopilot. If turbulence is greater than moderate, the autopilot may be used as long as its operation is monitored. Refer to SEVERE RAIN/ICE/TURBULENCE, Section 3.

Structural

Flap extension in an area of known turbulence should be delayed as long as possible because the airplane can withstand higher gust loads in the clean configuration. Diversion to another airfield is the best policy if severe turbulence persists in the area.

Procedure Summary

In a brief form, the procedures for flight in severe turbulence are summarized as follows:

Airspeed - Recommended turbulence penetration airspeed is 275 to 285 KIAS or MACH .75 to .79 (whichever is lower). At 10,000 feet and below, minimum recommended speed is 250 KIAS or minimum manuevering whichever is greater. Do not fly less than minimum manuevering speed for existing configuration. Severe turbulence will cause large and rapid variations in indicated airspeed. Do not chase airspeed.

Attitude - Maintain wings level and smoothly control pitch attitude. Use attitude indicator as the primary instrument. In extreme drafts, large attitude changes may occur. Do not use sudden large elevator control inputs.

Stabilizer - Maintain control of the airplane with the elevators. After establishing the trim setting for penetration speed, do not change stabilizer trim.

Altitude - Allow altitude to vary. Large altitude variations are possible in severe turbulence. Sacrifice altitude in order to maintain the desired attitude and airspeed. Do not chase altitude.

Refer to SEVERE RAIN/ICE/TURBULENCE, Section 3 for complete description of procedures.

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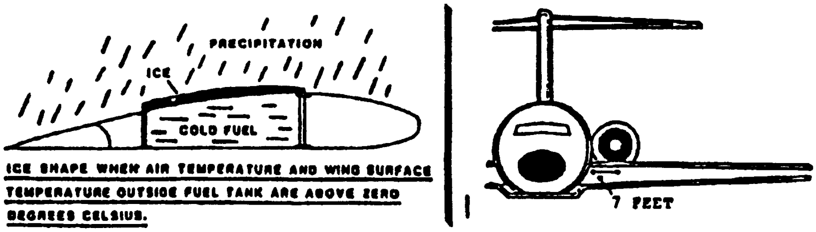
UPPER WING CLEAR ICE A.D. 2001-06-16

Clear Ice Formation

It has been determined the MD-80 has a unique vulnerability to the formation of smooth, crystal clear ice on the wing upper surfaces even with ambient temperatures above freezing. This occurs when sub-freezing temperature fuel comes in contact with the underside of the wing upper surface skin and any moisture, condensation, fog, drizzle, or rain contacts this chilled surface. Ice layer thickness in excess of 20mm (.8 inch) has been verified to form in suitable weather conditions.



This ice accumulation on the upper wing surface is very difficult to detect during the normal exterior walk-around inspection as it cannot be seen from the ground level, either from ahead of or from behind the wing. Detection from the cabin is also very difficult because the ice is very clear and wing surface details show through as though nothing is there. If one fails to detect the ice, there is a great risk that the ice layer will separate from the wing during takeoff roll, or in the worse case during rotation, resulting in ice ingestion, substantial damage, and possible engine(s) failure.

<u>Caution</u>: Ice shedding from the wing upper surface during takeoff can cause severe damage to one or both engines, leading to surge, vibration, and complete thrust loss.

Aircraft <u>Without</u> An Operational Upper Wing Anti-Ice System

A close-up check of the upper wing surface for ice build-up must be accomplished by personnel that are trained and qualified in MD-80 clear ice inspection procedures, or the outbound flight crew prior to all flights. This check must be accomplished after refueling if the aircraft is refueled, and in all cases as close to the time of departure as possible.

The Aircraft Maintenance Logbook box 24, "MD-80 Clear Ice Check Accomplished", is used by the flight crew and maintenance personnel as a maintenance record that the clear ice inspection was performed. The box 24 entry records the date, flight number, station and employee number of the person performing the clear ice inspection. Prior to every departure, an entry in box 24 documenting the inspection is required.

- Continental Maintenance personnel that are trained in MD-80 clear ice inspection procedures will normally perform this inspection and the logbook box 24 entry. If access to the flight deck and logbook is not convenient, the trained Continental Maintenance person performing the inspection must inform the flight crew prior to departure that the clear ice inspection was completed, the aircraft is safe for flight, and provide their employee number. The flight crew will make the box 24 logbook entry.
- When trained Continental Maintenance personnel are not available, the inspection will be conducted by the flight crew or approved contract personnel that are trained in MD-80 clear ice inspection procedures.
- When the out bound flight crew accomplishes the inspection, they will also make the required logbook box 24 entry.
- When approved contract personnel conduct this inspection, they must inform the flight crew prior to departure that the clear ice inspection was completed, the aircraft is safe for flight, and provide their employee number. The flight crew will make the box 24 logbook entry.
- When the aircraft is de-iced at a remote pad at CLE, DEN, EWR, or IAH, the mechanic performing the clear ice inspection will inform the communication center that the aircraft is clear of snow, ice and frost, and provide their employee number. The communication center will notify the flight crew prior to departure that the clear ice inspection was completed, the aircraft is safe for flight, and provide the employee number of the person performing the inspection. The flight crew will make the box 24 logbook entry.
- The notification and logbook sign off requirements described above are in addition to any required notifications and logbook sign offs associated with cold weather operations.

Presently there are three methods of conducting the MD-80 upper wing clear ice check. Use the appropriate method described below based on the configuration of the aircraft. Personnel conducting the check should use extreme caution when conducting the inspection to ensue ladder/stand and footwear are free of ice, snow, etc.

<u>WARNING</u>: Make certain that leading edge slats/flaps are fully retracted and that flap/slat handle, located on the control pedestal is in up/ret position to prevent serious injury or damage due to accidental or inadvertent movement of flap/slat handle.

<u>WARNING</u>: Make certain that the auxiliary hydraulic pump switch, located on the First Officer's main instrument panel, is in the OFF position to prevent serious injury or damage due to accidental or inadvertent application of hydraulic pressure.

1. <u>Ice Detection Tuft and Triangle Decal Assembly</u>

   A physical (hands-on) check may be accomplished by positioning a ladder/stand at the wing leading edge approximately six feet outboard of the fuselage, feeling as much of the upper wing surface, along and aft of the front spar as can safely be reached from the ladder. From the same vantage point, the aft part of the wing is visually checked for the presence of ice. During this check, each cord tuft attached to the triangular decals must be checked for freedom of movement to ensure that they are not embedded in ice. Movement of the tufts can be verified by use of an ice wand. P/N IC-78 (fiberglass pole with rubber tip or equivalent) that is supplied to each station. (If tuft and triangle assemblies are missing refer to inspection requirements described in 3. of this section and MEL/CDL requirements.)

2. <u>Painted Ice Detection Triangle</u>

   A physical (hand-on) check may be accomplished by positioning a ladder/stand at the wing leading edge, approximately six feet outboard of the fuselage, feeling as much of the upper wing surface, along and aft of the front spar, as can safely be reached from the ladder. From the same vantage point, the aft part of the wing is visually checked for the presence of ice. During this check, an ice wand (fiberglass pole with rubber tip or equivalent) is rubbed across the upper third then a final sweep across the lower third of the painted ice detection triangle. The painted ice detection triangle is a pattern of stripes painted on the upper surface of the left and right wings, using a coarse, non-slip black paint. (The non-slip paint is similar to the paint used on the overwing exit walkways.)

When rubbing the ice wand across the painted ice detection triangle, the physical check for wing upper surface ice may be made by assuring that the wing surface is rough where there are black paint stripes, and smooth between the black paint stripes. When the wing surface in the area of the black paint stripes has a consistent texture, either rough or smooth, ice may be present and further check of the upper wing surface is required. Only the rough smooth rough contrast felt with the ice wand indicates that no ice is present. (If portions of the painted ice detection triangle are missing refer to the inspection requirements described in 3. of this section and MEL/CDL requirements.)

3. <u>Critical Ice Detection Tuft and Triangle Assemblies Missing or Painted Ice Detection Triangle Missing</u>

A physical (hands-on) check may be accomplished by positioning a ladder/stand at the wing leading edge near the fuselage, gaining access to the upper wing surface in the vicinity of the overwing exit walkways. Once on the upper wing surface, a tactile check is performed by feeling with your hands, the affected area of the upper wing surface just outboard of the wing tank bulkhead and spanwise just forward of the rear span.

<u>Note</u>: Removal of the overwing exits is not an approved method to gain access to the upper wing surface for the purpose of this check.

Any ice detected must be removed.

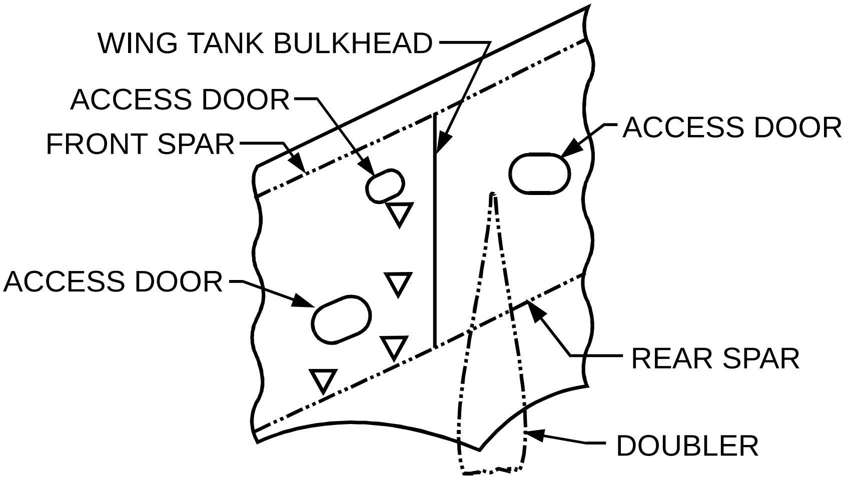
<u>Caution</u>: After removal of ice, the wing upper surface must be checked again using the appropriate method described above, to confirm that the area is free of ice.

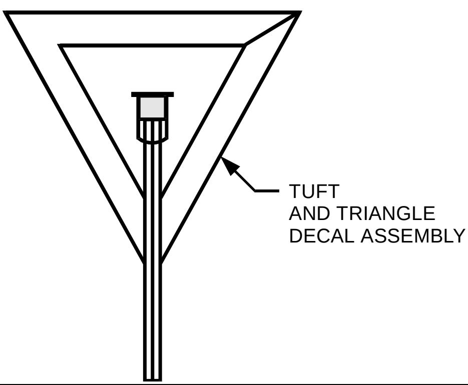
<u>Caution</u>: Check must be made of wing upper surface at inboard end of wing fuel tank as close to time of departure as possible.

<u>Caution</u>: Ice layer is very difficult to detect visually, especially when wing is wet from rain or deicing/anti-icing fluid.

Station personnel will be responsible for providing a means to access the upper wing surface in order to complete the (hands-on) check.

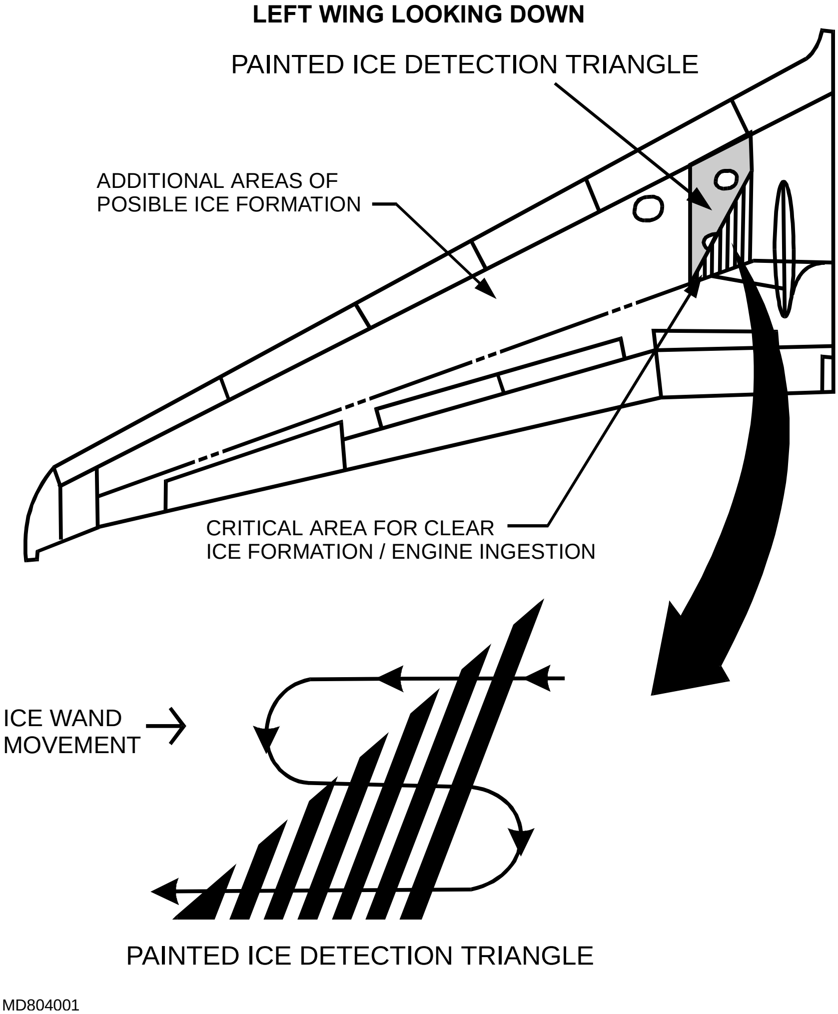
LEFT WING LOOKING DOWN
LOCATION OF TUFT AND TRIANGLE
DECAL ASSEMBLIES





MD804002

TUFT AND TRIANGLE DECAL



PAINTED ICE DETECTION TRIANGLE

Aircraft With An Operational Upper Wing Anti-Ice (UWAI) System

Flight Crew Procedures

Press to test the **WING ICE ALERT** and **WING HTR INOP** lights to ensure the bulbs are working. Then confirm that the **WING ICE ALERT** and **WING HTR INOP** lights are extinguished prior to departure from the gate or parking area. A physical check of the upper wing surfaces is not required. The Aircraft Maintenance Logbook box 24 "MD-80 Clear Ice Check Accomplished" entry is not required.

Caution: All annunciation of the **WING ICE ALERT** and **WING HTR INOP** lights is suppressed when the throttles are advanced to the takeoff position. When performing the check of these lights, ensure the throttles are in the closed position.

If the **WING ICE ALERT** and/or the **WING HTR INOP** lights are on prior to departure, from the gate or parking area, a physical check of the upper wing surfaces and Aircraft Maintenance Logbook box 24 "MD-80 Clear Ice Check Accomplished" entry are required as described previously in Aircraft Without An Operational Upper Wing Anti-Ice System. This check should be accomplished 15 minutes prior to departure to avoid delays.

Caution: During cold months, electrical power should be connected to the aircraft continuously overnight to power the UWAI System. If power has not been connected at least 3 hours prior to flight, there is a potential that an ice buildup (in the protected areas) may not be completely removed by the UWAI System prior to departure. Prior to the FFOD, when ambient temperature during preflight is below 50° F, Flight Crews should exercise special vigilance to verify proper operation of the UWAI System and that no ice is on the upper surface of the wings.

Note: Precipitation may run off a warm overwing heater and refreeze elsewhere on the wing. Flight crews should carefully examine the areas immediately aft of the overwing heaters for ice formation during walk around.

Note: An operational UWAI system does not affect required procedures listed in COLD WEATHER OPERATIONS, this section.

UWAI System Description

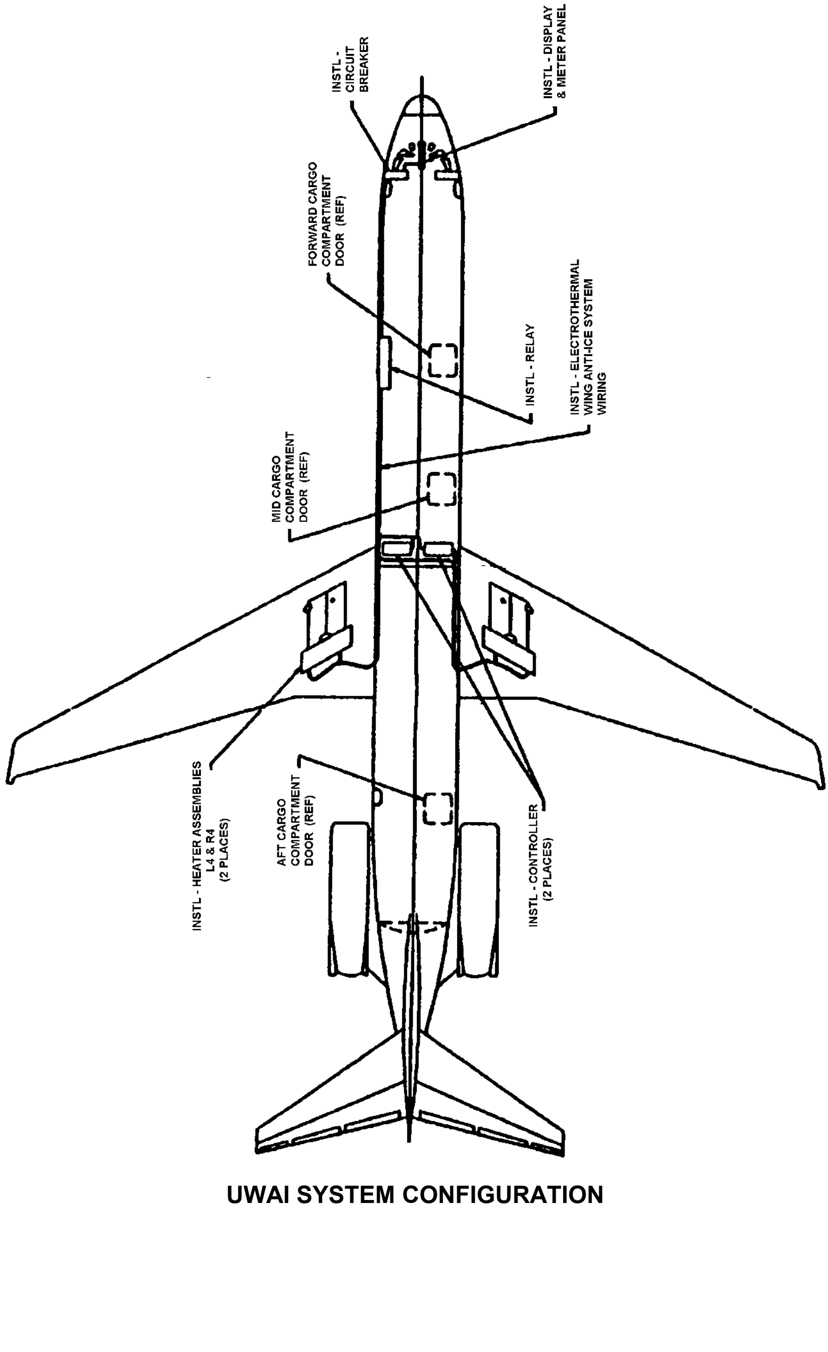
Two amber lights on the upper instrument panel (to the left of the ASSUMED TEMP selector) indicate the status of the UWAI system:

WING ICE ALERT	Indicates the temperature in one or more sensors has fallen below 38°F and there is the possibility of ice formation.
WING HTR INOP	Indicates failure of a heater segment or internal controller failure. The UWAI system is inoperative.

The UWAI system is a very thin electric heater blanket assembly which is bonded to the upper wing surface over the affected area (cold corner). The UWAI system electrically heats the blanket assemblies in essentially the same manner as windshield heat. Temperature sensors embedded in the heater blanket assemblies send upper wing temperature signals to their respective controller unit. The left & right wing controller units (mounted in the fuselage just forward of the slat drive mechanism), regulate electrical power to the heater blanket assemblies to maintain upper wing surface temperature above freezing. The UWAI system does not require any input or control from the flight crew to function.

Electrical bus protection for the UWAI main power circuits is through the #3 galley 35 AMP three phase circuit breakers located on the right generator bus circuit breaker panel, labeled #3 GALLEY POWER AND UPPERWING ANTI-ICE.
Electrical bus protection for the UWAI control circuits is through a 1 AMP circuit breaker located at H-26, labeled UPPER WING ANTI-ICE.
Three phase power that is normally routed to galleys #2 & #3, is now routed through an air/ground sense relay. When the aircraft is on the ground, electrical power is removed from galleys #2 & #3 and is applied to the UWAI system. When the aircraft is airborne, electrical power is completely removed from the UWAI system and electrical power to galleys #2 & #3 is restored. During AC crosstie operation, UWAI power along with galley power will load shed automatically. This is done so that aircraft electrical bus limitations are not exceeded. Pulling the 1 AMP UWAI control circuit breaker, (H-26) labeled UPPER WING ANTI-ICE, will remove all power to the UWAI system and will restore power to galleys #2 & #3. Galley power switch position has no effect on UWAI operation.

The UWAI system performs a self test after initial application of electrical power, and 20 seconds after landing. The **WING ICE ALERT** and **WING HTR INOP** lights will flash rapidly 12 to 15 times. If a failure is detected the **WING HTR INOP** light will remain illuminated.



UWAI SYSTEM CONFIGURATION

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COLD WEATHER OPERATIONS

The problems associated with cold weather operations are those concerned with low temperature and with ice and snow on the aircraft, ramps taxiways and runways. The majority of operational difficulties are encountered on the ground.

Predeparture Check

This check will determine the need for deicing. This check is usually accomplished by the flight crew during the normal walkaround inspection. Normally it will be completed at the gate, prior to departure. However qualified ground personnel may also determine the need for aircraft deicing based on their observations during company required aircraft checks, with or without the flight crew present.

The Predeparture check is a check of critical aircraft surfaces to ensure that they are free of any adhering ice, snow, slush, or frost. Critical aircraft surfaces include the following:

- Wings - Coatings of frost up to 1/8 inch in thickness on the lower wing surfaces caused by very cold fuel in the area of the wing tanks (between the front and rear spars) is permissible if, in the Captain's opinion, it will dissipate by the time takeoff is made. All other wing surfaces must be free of ice, snow, slush or frost.
- Tail
- Control Surfaces
- Engine Inlets
- Landing Gear and Gear Doors, Wheels and Brakes
- Air Conditioning Inlets/Exits and Outflow Valves
- Airdata Sensors, Stall Vanes, Pitot Tubes and Static Ports

If these aircraft surfaces are not free of any adhering ice, snow, slush or frost, the aircraft must be deiced prior to departure.

In many cases, it may be necessary to start the engines and/or taxi to another location prior to deicing the aircraft. In situations such as this, it is permissible to start the engines and proceed to the deicing area with an accumulation of snow and/or ice on the aircraft. However, in no case will an aircraft taxi for takeoff without first ascertaining that the critical aircraft surfaces are free of any adhering ice, snow, slush, or frost.

Ice, Frost, And Snow Removal

Federal regulations prohibit takeoff when frost, snow, or ice is adhering to critical aircraft surfaces. These regulations are based on the "clean" aircraft concept which requires a pre-takeoff contamination check to ascertain that critical aircraft surfaces (wings and control surfaces) are "clean" (free of adhering ice, frost, or snow formations) and to determine that any formations not adhering to critical surfaces will blow off in the early stages of takeoff roll.

De-Icing/Anti-Icing

Aircraft de-icing/anti-icing when required, will be accomplished in accordance with the Continental GMM Section 06-14.

When freezing precipitation conditions exist, a two step deicing/anti-icing procedure will be used. The first step, deicing, is the removal of contaminates from the aircraft. This is accomplished by using diluted Types I, II or IV fluids or, at locations so equipped, by use of an Infrared (IR) de-ice system. When an Infrared system is used, aircraft will be taxi / towed to the entrance of the IR hangar where ground personnel will marshal or Ground Tower will guide the aircraft into the hangar.

Note: The IR system software limits the maximum temperature during aircraft de-icing to 120° F.

The second step, anti-icing, is a separate fluid application to protect against ice, snow, slush or frost adhering to critical aircraft surfaces. Diluted Type 1 or 100% Type II or IV fluids are used for anti-icing.

When freezing precipitation conditions do not exist and are not anticipated, a one step, deicing, procedure will be used to remove any contaminates that may have adhered to the aircraft during a previous exposure to freezing precipitation.

Aircraft may be deiced/anti-iced with the engines and/or APU shutdown or operating. In either case the air conditioning supply switches and APU air switch should be selected off to prevent fumes from entering the cabin through the air conditioning system.

After completion of deicing/anti-icing, run engines and APU for approximately one minute with the air conditioning supply switches and APU air switch selected off to ensure that all deicing/anti-icing fluid has been cleared from the engines and APU. Consider making an announcement advising passengers that a trace of odor may be sensed but it is a normal condition of deicing.

Post De-Icing/Anti-Icing Inspections

After the final anti-icing fluid application, personnel qualified in ground de-icing inspection procedures will inspect critical aircraft surfaces to ensure that they are free of ice, slush, snow, or frost. Critical aircraft surfaces include the following:

- Wings - Coatings of frost up to 1/8 inch in thickness on the lower wing surfaces caused by the very cold fuel in the area of the wing tanks (between the front and rear spars) is permissible if, in the Captain's opinion, it will dissipate by the time takeoff is made. All other wing surfaces must be free of ice, snow, slush, or frost.
- Tail
- Control Surfaces
- Engine Inlets
- Landing Gear and Gear Doors, Wheels and Brakes
- Fuselage
- Air conditioning Inlets/Exits and Outflow Valves
- Air Data Sensors, Stall Vanes, Pitot Tubes, Static Ports

After completion of the inspection, the flight crew will be notified via radio or interphone communication that de-icing/anti-icing and inspection procedures have been completed in accordance with the GMM, Section 06-14. This notification must contain the following four elements:

SAE Fluid Type:	I, II or IV
Fluid Mixture:	100/0 = 100% Fluid / 0% Water, 75/25 = 75% Fluid / 25% Water, 50/50 = 50% Fluid / 50% Water
Local Time:	(Hours/Minutes) of the beginning of the final anti-icing fluid application
Employee Number:	Of qualified person certifying that the de-icing/anti-icing and inspection procedures were accomplished in accordance with the Continental GMM, Section 06-14, and the aircraft is released for flight.

After receipt of this information, the flight crew will make the following aircraft logbook entries:

Block (2)	Aircraft Fleet Number
Block (3)	Flight Number
Block (4)	Employee Number of Captain
Block (5)	Station
Block (6)	Day of Month
Block (7)	Month

Block (8) Aircraft anti-iced, type fluid, fluid mixture, local time (hours/minutes) of the beginning of the final anti-icing fluid application, employee number of qualified person certifying that the de-icing / anti-icing, and inspection procedures were accomplished in accordance with the Continental GMM Section 06-14 and is released for flight (e.g., "Aircraft Anti-iced, Type I / 50/50 / 0830 / 38802").

Note: The above notification and subsequent logbook entry are only required when freezing precipitation conditions exist. The situation may occur where the aircraft was exposed to freezing precipitation several hours prior to its next scheduled departure, such as an RON. The weather at departure time is such that no freezing precipitation conditions exist. In this situation the aircraft requires deicing only to clean any adhering ice, snow, slush or frost that may have previously accumulated on the aircraft. The aircraft does not have to be anti-iced because freezing precipitation conditions do not exist. In this case, post deicing inspection procedures will be accomplished in accordance with the GMM, however the flight crew does not have to be notified and the logbook entry is not required.

Pre-takeoff Contamination Check

After completion of the post deicing preflight inspection and when freezing precipitation conditions exist, if the aircraft is not airborne within 5 minutes of the beginning of the final application of anti-icing fluid (time reported), a pre-takeoff contamination check is required. The pre-takeoff contamination check when required must also be accomplished within 5 minutes of the commencement of the takeoff roll.

A pre-takeoff contamination check is a close visual check by a qualified flight deck crewmember or qualified ground personnel, of wing surfaces, leading edges, engine inlets, and other critical surfaces of the aircraft that are in view either from the cockpit or cabin (whichever provides maximum view). If surfaces have not been treated with FPD (Freezing Point Depressant) fluid, evidence of melting snow and possible freezing is sought. Also, evidence of any ice formation that may have been induced by taxi operations is sought. If the aircraft has been treated with FPD fluids, evidence of a glossy smooth and wet surface is sought. If, as a result of these checks, evidence of ice, snow, or frost formations is observed, the aircraft should be returned for additional deicing.

The fact that it is impractical for a flight deck crewmember to disembark at the end of a runway and perform a pre-takeoff contamination check, means that the crewmember should perform that check from the best vantage points available from within the aircraft. The best vantage points available for this check on the MD-80 aircraft have been identified as the cabin windows directly adjacent to, or installed in the overwing emergency exits on both sides of the aircraft. Other vantage points can be used in this check; however, the identified best vantage points must be used.

The pre-takeoff contamination check requires a flight deck crewmember to leave his or her station on the flight deck to perform this check, therefore the aircraft must be parked and not in motion for the entire time that the flight deck crewmember is not at his or her station.

In some cases, it may become necessary to unseat passengers in the vicinity of the overwing vantage point area to conduct the pre-takeoff contamination check. The flight deck crewmember making the check must ensure that all unseated passengers are reseated with seatbelts fastened before returning to the flight deck

Approved deicing/anti-icing procedures require areas that may be viewed from inside the aircraft are deiced or anti-iced first so that during the pretakeoff contamination check it can be determined that other areas of the aircraft are clean since areas deiced or anti-iced first will generally freeze first.

In the darkness of night, the crewmember should use wing and other aircraft illumination lights on the outside of the aircraft. All lighting inside the cabin should be dimmed to improve the visibility through the cabin windows. The crewmember may, where practical, call upon the assistance of qualified ground personnel. If under any circumstance, the pilot in command cannot ascertain that the aircraft is clean, takeoff should not be attempted.

Conducting pre-takeoff contamination check in the manner described relies upon the flight crew to be knowledgeable of ground deicing/anti-icing procedures, and that the ground deicing process was conducted in a thorough and uniform manner

The decision to takeoff, following pre-takeoff contamination check remains the responsibility of the pilot in command.

Anti-Icing Fluid Holdover Times

Holdover time is the estimated time an application of an anti-icing fluid will prevent the adherence of frost, ice, snow, or slush on the treated surfaces of an aircraft. Holdover time is obtained by anti-icing fluids remaining on the aircraft surfaces. Holdover time begins when the final anti-icing application commences, and expires when the anti-icing fluid applied to the aircraft wings, control surfaces, engine inlets, and other critical surfaces loses its effectiveness.

Due to their properties, SAE Type I fluids form a thin liquid wetting film, which provides limited holdover time, especially in conditions of freezing precipitation.

SAE Type II and IV fluids contain a pseudoplastic thickening agent, which enables the fluids to form a thicker liquid wetting film on external aircraft surfaces. This film provides a longer holdover time, especially in conditions of freezing precipitation.

The Guidelines To Holdover Times table gives an indication as to the time frame of protection that could reasonably be expected under conditions of precipitation. However, due to the many variables that can influence holdover, these times should not be considered as minimums or maximums, as the actual time of protection may be extended or reduced, depending upon the particular conditions existing at the time.

Holdover Times Tables

The responsibility for the application of this data remains with the user.

Caution: This Table is for use in departure planning only, and should be used in conjunction with pre-takeoff contamination check procedures.

Caution: The time of protection will be shortened in heavy weather conditions. Heavy precipitation rates or high moisture content, high wind velocity and jet blast reduce holdover time below the lowest time stated in the range. Holdover time may be reduced when aircraft skin temperature is lower than OAT.

Caution: SAE Type I, II, and IV Fluids used during ground deicing / anti-icing are not intended for and do not provide protection during flight.

Note: For domestic operations using Types II or IV Fluid, Continental Airlines may use a diluted mixture for the first step of a two step (de-ice, then anti-ice) procedure, but uses only a 100% mixture of Type II or Type IV fluid for the second step (anti-ice).

Note: Takeoffs in conditions of moderate and heavy freezing rain are not approved. In lieu of an intensity report (ATC, ATIS, METAR, TAF, etc.) the following may be used to estimate the intensity of the freezing rain:

- **Light**: Scattered drops that, regardless of duration, do not completely wet an exposed surface, up to a condition where individual drops are easily seen.
- **Moderate**: Individual drops are not clearly identifiable; spray is observable just above pavements and other hard surfaces.
- **Heavy**: Rain seemingly falls in sheets; individual drops are not identifiable; heavy spray to height of several inches is observed over hard surfaces.

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Guidelines to Holdover Times

Times in Hours : Minutes

Information contained here in is applicable to light to moderate conditions only.
Takeoff in heavy icing conditions prohibited.

Weather Conditions	OA T ° Celsius	Type Fluid I	Type Fluid II			Type Fluid IV		
		****	50%	75%	100%	50%	75%	100%
Frost * ***	Above 0°	:45	4:00	6:00	12:00	4:00	6:00	18:00
	0° to -3°		3:00	5:00	8:00	3:00	5:00	12:00
	-4° to -14°							
	-15° to -25°							
Freezing Fog * ***	Above 0°	:12 to :30	:15 to :30	:25 to 1:00	:35 to 1:30	:15 to :35	1:05 to 1:45	1:05 to 2:15
	0° to -3°	:06 to :15						
	-4° to -14°			:20 to :55	:20 to 1:05		:25 to :50	:20 to 1:20
	-15° to -25°				:15 to :20			:15 to :40
Snowfall & Snow Grains *	Above 0°	:06 to :15	:05 to :15	:15 to :40	:20 to :55	:05 to :20	:20 to :40	:35 to 1:05
	0° to - 3°	:06 to :15		:15 to :30	:20 to :45	:05 to :15	:20 to :35	:30 to :55
	-4° to -14°	:06 to :15		:15 to :25	:15 to :35		:15 to :25	:20 to :40
	-15° to -25°				:15 to :30			:15 to :30
Rain & Cold Soaked Wing	Above 0°	:02 to :05		:05 to :25	:05 to :40		:05 to :35	:10 to :50
Freezing Drizzle **	-3° & Above	:05 to :08	:05 to :15	:20 to :45	:30 to :55	:10 to :20	:30 to :50	:40 to 1:00
	-4° to -10°			:15 to :30	:15 to :45		:15 to :30	:20 to :45
Light Freezing Rain	-3° & Above	:02 to :05	:05 to :10	:10 to :20	:15 to :30	:05 to :10	:15 to :30	:25 to :40
	-4° to -10°				:10 to :30		:10 to :20	:10 to :25
Snow pellets, ice pellets, moderate & heavy freezing rain, hail & heavy snow	**CAUTION:** No Holdover time guidelines exist.							

* Type II and IV fluids may be used below -25°C, provided the freezing point is at least 7°C below the OAT. No holdover times exist.

** If positive identification of freezing drizzle is not possible: Use holdover time for "Light Freezing Rain."

*** Long ground stops with high humidity may cause an unacceptable dilution at the actual OAT.

**** SAE Type I fluid / water mixture is selected so that the Freezing Point of the mixture is at least 10°C below OAT.

Engine Start

When parked on a slippery area, make sure that chocks are applied both in front and behind the nose and main wheels prior to starting the engines. Chocks may not hold on slippery areas unless they are sanded. If chocks are not available for start, use sand or similar material and clear the airplane for potential movement.

Cold components such as gyros, gauges, actuators, etc., may function slower than normal until reaching operating temperatures. Instrument flags may take longer than normal to retract.

Before starting engines, ensure engine cowl inlet and exhaust areas are clear of any excess de-icing fluid and/or ice accumulations. Use of de-icing solutions for removal of engine inlet ice should be kept to the minimum required.

Apply normal procedures for engine start. Preheating is normally not necessary; however, if engine will not start, or a hung start is experienced, ground heating may be necessary for warm the engine components.

Ensure N_1 rotation prior to moving fuel control lever to on. A cold engine may exhibit abnormal oil pressure and temperature indications during start. The illumination of the L or R OIL STRAINER CLOGGING (or CLOG) annunciator light may occur during a cold engine start. Refer to OIL STRAINER CLOGGING LIGHT ON checklist, Section 3.

After starting engines, if ambient temperatures is below -30°C (-22°F), idle engine two minutes before changing thrust lever position. During all cold weather starts, it is recommended that engines be warmed up at idle, or at thrust settings normally used for taxi, for five minutes before advancing throttles to takeoff thrust.

After engine start, engine anti-ice should be turned on if outside air temperature is less than 6°C (42°F) and visible moisture is present or dewpoint and outside air temperature (RAT or SAT) are within 3°C(5°F) of each other.

Taxi

Reverse taxi (powerback) is not authorized when ice, snow, or slush is on the ramp, or during periods of heavy rain. Single engine taxi is not recommended on ice, snow, or slush-covered surfaces. When on slippery surfaces, make sure the parking brakes are released prior to commencing taxi. When power is applied, the airplane may slide forward even though the brakes are set.

Exercise caution when commencing taxi as ramp areas may be especially slippery due to airplane servicing, de-icing, etc. Avoid high thrust settings when taxiing, especially when leaving the ramp area. If airplane response to throttle movement is slow while on snow or slush, allow a few seconds for the airplane to respond before applying more throttle. Advance power only as necessary to start the airplane moving, then retard the throttles smoothly to idle or to the minimum thrust necessary to maintain appropriate taxi speed.

Extend flaps/slats to the takeoff setting when commencing taxi as in normal established procedures. Spray and debris deflectors combined with prudent taxi speeds on contaminated taxi areas provide sufficient protection from contamination of exposed flap/slat surface areas.

Taxi speed should be as slow as practical on slippery surfaces and should be especially slow when approaching turns or stopping areas. Lead turns by as much as possible considering taxiway width. Nosewheel steering and braking action may both be affected by lack of traction on slick and frozen surfaces; the slower the speed, the better the traction. Avoid excessive nose gear steering deflection. Surface conditions may vary between taxiways and parking areas due to sanding and de-icing. Expect taxiways on bridges or other elevated areas to be more susceptible to ice formation than adjacent areas. An icy surface may be covered by a layer of snow. Melting ice or snow may cause rapid changes in traction. It is essential that the taxi speed be kept low enough that the airplane can be stopped in the space available. Reverse thrust may be used if necessary to assist in stopping.

Taxi slowly on contaminated taxiways to prevent snow and slush from impinging on wheel wells, flaps, and engines. Do not taxi through areas of deep snow or deep slush. A crowned, slippery taxiway or a slick crosswind taxiway may cause sideways slipping or weathervaning into the wind. Taxi as close as possible on the centerline and avoid large nose steering inputs. Be aware of snowbanks as extended flaps are particularly susceptible to damage from such hazards. Be alert for obscured runway, taxiway, or ramp markings and lights.

Caution: During ground operation at temperatures below 6°C (42°F) and simultaneous high moisture conditions (rain, sleet, snow or fog), run each engine to as high a thrust as practical (70% N_1 for a minimum of 15 seconds is desired, however, an alternate thrust setting of 60% N_1 for a minimum of 40 seconds is acceptable) every 10 minutes. Prior to takeoff under these conditions, perform an engine run-up as above and observe that EPR, RPM, and EGT indicate normal engine operation.

Be aware that blasted snow or ice can cause damage at considerable distances. Maintain increased separation behind other airplanes. Expect they may also require an engine run-up to counteract ice formation.

The shortest possible route to the point of takeoff should be used to conserve fuel and minimize the amount of ice fog generated by the jet engines. This fog may delay takeoff by lowering the visibility below takeoff minimum.

Before Takeoff

If a clear, dry run-up area is available during taxi or on the ramp, make a preliminary power run on the clear dry area in order to prevent an abort which may occur if check is made on a slick runway.

Fuel heat should be used during ground operations when the indicated fuel temperature is 0°C or below. When required, fuel heat should be employed for one cycle (1 minute duration). Both fuel heat switches and the **L** and **R FUEL HEAT ON** lights must be off for takeoff.

Prior to takeoff, recheck flight controls and trim for freedom of movement. Use caution when taxiing onto the runway for takeoff. The approach end of the runway may be more slippery than other areas due to melting and refreezing of snow or ice following previous takeoffs. In addition, painted surfaces and normal accumulation of fuel, oil, and rubber are made more slippery when coated with moisture (i.e., water or slush).

Takeoff

Check latest field conditions prior to takeoff. Slush and snow conditions change rapidly. A reduced thrust takeoff is not permitted when the runway is contaminated by water, ice, slush, or snow. Maximum depth of wet snow/slush/water is 1/2 inch (12.7 mm) and maximum depth of dry snow is 4 inches (10 cm).

Dry snow is snow with limited water content. It normally forms a cloud when disturbed and dissipates rapidly. The outside temperature is generally below -2°C (28°F). Dry snow can become wet if exposed to bright sunlight.

Wet snow has sufficient moisture content so that it packs easily and will compact when pushed. It packs down when compressed but has no tendency to splash. If there is a tendency to splash, it must be considered slush. Wet snow quickly becomes slush under certain conditions, if in doubt, consider it as slush.

Slush is partially melted snow with high water content. It will splash when a vehicle is run through it or otherwise compressed.

If the takeoff is being made on a contaminated runway, the ignition should be in OVRD and the APU kept running with the L and R APU bus switches on.

For contaminated runways, consider the use of higher takeoff flap settings as permitted by takeoff performance considerations to reduce takeoff roll.

Align the airplane with the runway centerline and ensure that the nosewheel is straight before applying power for takeoff. Under severe icing conditions, takeoff should be preceded by a static run-up to as high a thrust level as practical with observation of EPR and EGT to assure normal engine operation. On slippery surfaces, ensure the parking brakes are released prior to setting takeoff power to preclude a takeoff with the parking brakes set.

With a contaminated runway, a static takeoff should be performed. Advance throttles to 1.4 EPR or 80% N_2 and check that EPR's are approximately matched. If the airplane starts to move due to poor braking conditions, release the brakes and proceed with a rolling takeoff. Check all engine instruments for proper indications during the early part of this step, including the MINIMUM N_1 FOR TAKEOFF, found in Section 5 or the QRH.

If the PT^2 probe is blocked by a contaminate such as ice and the engine anti-ice system is off, the EPR gauge will indicate a higher thrust than the engine is actually developing. If the PT^2 probe is blocked and the engine anti-ice system is on, (i.e., ice in probe, but insufficient time for anti-ice bleed air to melt the ice), the EPR gauge will indicate a lower thrust than the engine is actually developing.

Asymmetrical thrust can adversely affect directional control on slippery runways. Throttle at partial power may not assure alignment at takeoff power as engine pairs may have different spool-up rates.

On slippery runways, apply some nose down elevator to improve nosewheel traction and directional control until rudder control becomes effective for steering the airplane. Excessive forward control column pressure should be avoided and, as speed increases, the forward pressure on the control column should be reduced to lessen the possibility of nosewheel spray being ingested into the engines when operating on wet, or slush and snow-covered runways.

To maintain the heading during takeoff roll, recognize initial heading deflections early and correct by small rudder pedal steering inputs. Do not use differential thrust.

With the increased stopping distances encountered under contaminated runway conditions, consideration should be given to limiting the decision to abort at speeds between V_1 -20 and V_1 to engine failure, or conditions where the airplane is considered unflyable.

Difficulty with directional control may be encountered after a takeoff rejection, especially under crosswind conditions. When rejecting, ensure spoiler deployment, apply moderate forward pressure on the control column, and maintain directional control with rudder pedal steering, simultaneously applying maximum braking. Both nose wheel steering and differential braking effectiveness are reduced during wet/slippery runway operation. Do not apply excessive forward control column pressure as this will reduce the weight on the main wheels resulting in reduced braking friction. While the use of reverse thrust on wet runways is recommended to reduce the stopping distance, its prolonged use further reduces the total directional control capability (rudder blanking) as the airplane slows. Consequently, reverse thrust should be applied gradually and symmetrically (both engines operating) commensurate with the ability to maintain directional control under the existing conditions. Should directional control become a problem while in reverse thrust, reduce reverse thrust to reverse idle (or forward idle thrust, if required), regain directional control, and reapply reverse thrust as necessary. Do not attempt to maintain directional control by using asymmetric reverse thrust.

After Takeoff

Wing anti-ice should be used after reaching 800’ AGL, or single engine acceleration altitude, whichever is higher. Wing anti-ice must be used any time engine anti-ice is used.

If takeoff is performed when the ram air temperature is below 6°C (42°F), and it is either raining or there is standing water and slush on the runway, accomplish the following:

Conditions permitting, after takeoff with climb power set and at least 15 seconds prior to selecting slats up, use normal procedures to turn the wing anti-ice on, and leave it on until the leading edge devices are fully retracted. If engine and airfoil anti-ice is not required for climb, turn them off after the leading edge devices are up.

Caution: Do not accomplish the above procedure if an engine failure occurs after V_1.

After takeoff in slush or wet snow and when clear of obstacles, extending and retracting landing gear may reduce ice accumulation and possibility of gear door freeze-up.

If pitch-up or roll-off is encountered after lift-off, use aileron, rudder, and elevator as required to maintain the desired flight path. Do not allow further increases in pitch attitude until full lateral control has been regained. Use smooth continuous control inputs to avoid over-controlling. If during flap or slat retraction, pitch-up, roll-off, or buffeting is encountered (due to undetected ice, frost, or snow accumulations), reselect the flaps/slats to the original configuration. Activate the airfoil ice protection prior to any further configuration changes.

Engine Anti-Ice Operations

Engine and airfoil anti-ice should be on whenever icing conditions exist or are expected. Engine anti-ice should be used, and airfoil icing conditions can exist, when the ram air temperature is less than 6°C (42°F) and there is visible moisture in the air. In addition to temperature below 6°C (42°F), be alert for ice build-up on windshield wipers or edges of the windshields as indications of airfoil icing conditions. The higher the temperature, the higher the cloud liquid water content. This will result in more severe icing conditions. At temperatures below -20°C (-4°F), icing conditions should be less severe. However, heavy icing has, on occasion, been reported at temperatures as low as -60°C (-76°F).

One of the first indications of engine ice formation can be an erratic EPR indication due to icing of the PT_2 probe. Ice formation can produce a thrust loss as indicated by a drop of all engine thrust parameters, or induce surging or flameout if allowed to become sufficiently severe. If icing conditions become severe, consideration should be given to altering the flight plan to avoid the area of icing conditions. The flight crew should be familiar with the SEVERE RAIN/ICE/TURBULENCE procedures in Section 3.

When encountering engine inlet icing conditions and before engine anti-icing system is turned on, turn engine ignition on (CONTIN, GRD START & CONTIN or SYS A/SYS B). Move engine anti-ice switches to ON one at a time. Wait until the engine is stabilized before turning on the opposite engine anti-ice. Following engine stabilization, if in light or minimal icing conditions, engine ignition (A/B system) may be turned off to conserve ignition operational time.

During exceptionally severe icing conditions (occurring very infrequently), it is desirable to maintain a minimum of 70% N_1. Necessary thrust reductions <u>below</u> this level should be limited to a maximum of one minute at no less than 55% N_1. A minimum of 70% N_1 should be maintained following reacceleration for at least one minute and preferably longer before reducing thrust again.

When engine anti-ice is no longer required, ensure engine ignition is on, then move engine anti-ice switches to OFF one at a time, allowing each engine to stabilize. Move engine ignition to OFF. Engine thrust will increase when engine anti-ice switches are moved to OFF. It may be necessary to adjust throttles to avoid exceeding engine limits or to maintain desired thrust setting.

When airfoil anti-ice is required, airfoil anti-ice switches should be turned on subsequent to the application of engine anti-ice and, when no longer required, should be selected off prior to the termination of engine anti-icing to maintain normal bleed configuration input to the thrust rating indicator. In addition to the requirement to operate the tail de-ice system each 20 minutes (15 minute cycle for automatic tail de-ice) during icing conditions, tail de-ice cycle should be selected on again (nonautomatic system) prior to terminating airfoil anti-icing, when icing conditions no longer exist.

When extended periods of using the engine and airfoil anti-ice systems are anticipated or encountered, consideration should be given to the increased fuel burned.

Should pitot static problems occur in flight, the following will occur depending on the situation:

1. If the ram air input of the pitot is blocked, indicated airspeed may (probably will) drop to zero.
2. If the ram air input to the pitot is blocked <u>and</u> the drain hole is also blocked, pressure is trapped in the system and the airspeed indicator will react as an altimeter.
    A. In level flight, the <u>indicated</u> airspeed will remain constant even with large power changes.
    B. In a climb, the indicated airspeed will increase. If allowed to continue, the MACH warning alarm will eventually sound. Should the cockpit crew interpret this as a true MACH warning and the appropriate remedial action is followed, further problems, such as stick shaker, could occur.
    C. If a descent, the indicated airspeed will decrease.
3. If the static ports are blocked, the results will be just the opposite of 2. above.

Descent/Approach

When icing is anticipated during descent, commence use of the engine and airfoil anti-ice systems well before reaching the expected icing level. If the engines are at low power, it may be necessary to increase power to a minimum of 1.2 EPR to maintain a minimum of 20 psi pneumatic pressure for the ice protection systems. Increased drag, such as use of speedbrakes, may be necessary to maintain an adequate rate of descent. Vertical speeds should be kept as high as practical to reduce the exposure and ice accretion time. For approach maneuvering, 11 degrees flaps may be used as an intermediate flap setting as slats extended to the mid-position will be less subject to ice accumulation.

Holding is normally flown in the minimum fuel consumption cruise configuration with slats and flaps retracted. Engine bleed air adequate to maintain anti-icing may require a higher drag configuration, much the same as descent, consequently causing a higher fuel consumption. When forced to hold in icing conditions, there is a concern for ice buildup on the underside of the flaps and the flap/slat extension mechanisms. If necessary, the landing gear may be extended to increase drag as the effects of ice accumulation on the landing gear would be less than on the flaps, slats, and speedbrakes.

If airfoil anti-ice is required for approach, tail de-ice should be initiated approximately 1 minute prior to extension of landing flaps, normally just prior to landing gear extension. Fuel heat should be turned on for 1 minute prior to final approach whenever the fuel temperature is 0°C (32°F) or below. Fuel heat switches should be off for final approach and go-around. If a landing is to be made on a runway contaminated with slush, standing water, or during heavy rain, the APU should be started and the left and right APU bus switches on prior to final approach. This will serve as a back-up electrical power source in case the engine-driven generators are lost due to slush or water ingestion by the engines and subsequent loss of engine RPM.

Landing

Refer to Landing On Wet Or Slippery Runways, this section.

Taxi-In

If the approach was made in icing conditions or if the runway was covered by slush or snow, retract the flaps and slats to 15/T.O. EXT. Damage to the flaps and slats could occur if residual ice is present and the flaps and slats are fully retracted. Slush in puddles or runway low spots may be deeper than the maximum allowed for operation and cause damage to flaps or other parts. A check after parking should be made for any damage or the necessity to de-ice the flaps and slats area. After a satisfactory check, flaps and slats should be moved to UP/RET.

Apply the same precautions for taxi-in as for taxi-out. Maintaining a safe taxi speed during taxi after landing may be even more difficult. As the airplane will have a lower gross weight, it will have a tendency to taxi faster with the same thrust. If icing conditions exist during taxi-in, engine anti-ice should be left on until parked at gate and ready for engine shut down. If extended taxi-in delays are encountered, apply the same engine anti-ice run-up procedures as for taxi-out.

Use caution when entering ramp areas. Be alert for obscured taxi and parking lines and surface conditions that may not be conducive to good steering and stopping. Other airplanes may not be parked in proper positions and may not afford sufficient clearance due to contaminated parking areas. If in doubt, request assistance for proper parking and clearance from other airplanes and obstacles.

Parking

The area in which an airplane is to be parked should be cleared of snow and slush. If this is impractical, the area around the main and nose gear wheels should be cleared to reduce the possibility of tires freezing to the ground.

Avoid a parking position during or immediately after completion of a turn. It is best to allow nose wheels to be centered and the airplane to roll forward a few feet to eliminate all side loads on main and nose gear struts.

Both main and nose gear should be properly chocked. Parking brakes should be released to eliminate possibility of brakes freezing. If concerned about chocks holding on an icy ramp, parking brakes may be left on.

If parking for an extended period and extreme cold temperatures are expected, consider parking on sand or similar material to prevent freeze down.

In blowing snow, engine covers may be required, depending on length of stop. After engine shut down, check engines' air inlets for presence of water and/or ice. Remove any accumulations before installing engine inlet plugs and covers. If remaining overnight, ensure all cabin doors, cargo compartment doors, access doors, sliding windows, and outflow valves are closed.

HOT WEATHER OPERATION

Airplane operation in extremely high temperature conditions presents problems of a different nature than those associated with cold weather. High ground temperatures have important effects on passenger and crew comfort and generally decrease aircraft performance. The following information is intended to supplement the normal operating procedures.

Every effort to keep the interior of the airplane as cool as possible is important. All doors to the airplane should be kept closed as much as possible. The cockpit windows must be kept closed and cargo doors should not be left open any longer than necessary. The Flight Attendants should check all gasper outlets open and close the window shades on the hot (sun exposed) side of the passenger cabin. All air conditioning packs should be used (when possible) for maximum cooling.

If cooling air is available from an outside source, the supply should be plugged in immediately after engine shut down and should not be removed until just prior to engine start.

Consideration should be given to reducing the heat being generated in the cockpit. Window heat, radar, and other electronic components which contribute to a high temperature level in the cockpit should be turned off while the airplane is on the ground. Windshield air, foot air vents, and all the air outlets in the cockpit should be open.

To attain maximum cooling on ground, follow these procedures:

IF External Air Is Available:

APU AIR Switch .... OFF

Air Conditioning Supply Switches .... AUTO

IF Pneu Press Is Less Than 20 PSI:

APU AIR Switch .... ON

Note: If cabin temperature is 75° or higher, move APU AIR switch to AIR COND COLDER.

IF External Air Is Not Available:

APU AIR Switch .... ON

Note: If cabin temperature is 75° or higher, move APU AIR switch to AIR COND COLDER.

Air Conditioning Supply Switches .... AUTO

IF Air Conditioning Press is Less Than 12 PSI:

Operate only one air conditioning system.

Taxi Out

When operating in areas of high ambient temperatures, brake temperature levels may be reached which will cause the wheel fuse plugs to melt and deflate the tires. Consideration for brake cooling should be taken into account when operating on runways and taxiways exposed to high temperatures since these areas maintain temperatures considerably above ambient. Allow the airplane to accelerate, then brake to a very slow taxi speed. Release the brakes and repeat the sequence. Gross weight permitting, single engine taxi may help to avoid excess brake usage. For optimum passenger comfort, use APU bleed air to supplement engine bleed for pack operation if taxiing with two engines.

Brake Cooling

Flight crews should be aware of brake temperature buildup when operating a series of short flight segments. They should attempt to maintain cool brakes by additional in-flight cooling prior to each landing to prevent ground delays resulting from overheated brakes and possible loss of main wheel fuse plugs at enroute stops. A series of short flight segments, without additional in-flight brake cooling, can cause excessive brake temperatures as the energy absorbed by the brakes from each landing is accumulative.

Leaving the gear extended for several minutes after takeoff will provide cooling for tires and brakes (important if on a short flight segment).

Extending the gear a few minutes early in the approach will provide sufficient cooling for a landing with cool tires and brakes.

Close adherence to recommended landing rollout procedures will ensure minimum brake temperature buildup. Quick turnaround limitations apply.

Descent

During descent to an airport with high OAT, it is recommended to pre-cool the cabin by selecting FULL COLD on the cabin temperature selectors. This will aid in maintaining a more comfortable cabin temperature while on the ground.

LANDING ON WET OR SLIPPERY RUNWAYS

The flight crew must be aware of the condition of the runway with respect to snow, ice, slush, or precipitation. The most favorable runway in relation to surface condition, wind, and weather should be used. In very general terms, landing on a wet runway increases the stopping distance approximately 1000 feet over a dry runway, and landing on an icy runway increases the stopping distance by more than 3000 feet. Use maximum landing flap configuration when landing on a contaminated runway.

If a landing is planned on a runway contaminated with snow, slush, standing water, or during heavy rain, the following factors must be considered: available runway length; visibility of runway markers and lights; snowbanks and drifts along the runway; wind direction and velocity; crosswind effect on directional control; braking action; possibility of effect on the airplane from slush and water spray (engine ingestion, damage to flaps, gear doors, etc.); and the probability of hydroplaning and its effect on stopping distances.

A common form of hydroplaning is dynamic hydroplaning. It occurs when there is standing water on the runway surface. Water with a depth of about one-tenth of an inch acts to lift the tire off the runway surface. This condition can progress to where the tires no longer contribute to directional control and braking action is nil.

The minimum dynamic hydroplaning speed of a tire has been determined to be 8.6 times the square root of the tire pressure in pounds per square inch. With a main wheel tire pressure of 180 psi, the calculated hydroplaning speed is approximately 115 knots. With a nosewheel tire pressure of 155 psi, the calculated hydroplaning speed of the nosewheel tire is approximately 107 knots. Nosewheel tire hydroplaning might be encountered while executing a high speed turnoff. The calculated hydroplaning speed referred to is for the start of dynamic hydroplaning. Once hydroplaning has started, it may persist to a significantly slower speed.

Braking action can become inhibited following the application of chemical de-icers on an icy runway. When first applied, the chemicals provide a watery film over snow and ice that results in an extremely low coefficient of friction. When in doubt about the type of runway de-icing, ask the tower specifically if chemical de-icers were used.

Blowing or drifting snow can create optical illusions or depth perception problems during landing or taxi-in. In crosswind conditions, they may create a false impression of airplane movement over the ground. It is possible to have an impression of no drift when in fact a considerable drift may exist. When landing under these conditions, runway markers or runway lights can help supply the necessary visual references.

When it has been established that a safe landing can be made, the airplane must be flown with the objective or minimizing the landing distance. The approach must be stabilized early. Precise control over drift and approach speeds is mandatory. Execute a missed approach if zero-drift condition cannot be established prior to touchdown. When making the transition to visual reference for landing, continue to utilize the glideslope and VASI information to control the glidepath as wet windshields and snow-covered surfaces may distort depth perception. The airplane should be flown firmly onto the runway at the aiming point. Avoid holding off. Be prepared to manually deploy the spoilers if automatic deployment does not occur as wheel spin-up may be delayed.

On touchdown, take positive action to lower the nose gear to the runway and maintain moderate forward pressure on the control column to assist in directional control. Avoid excessive forward control column pressure in order to retain maximum braking effectiveness and to reduce the possibility of nose wheel spray. Maintain centerline tracking, ensure spoiler deployment, and simultaneously apply brakes smoothly and symmetrically, as appropriate to the braking action and runway length available to ensure a safe stop. On contaminated surfaces, full braking should be used to realize optimum anti-skid operation. Autobrakes, if available, should be used in the maximum setting. The normal braking technique on slippery runways is that immediately after nose gear touchdown, apply brake pressure smoothly and symmetrically with maximum pedal pressure and hold until a safe stop is assured.

Apply reverse thrust to the idle reverse detent. After reverse thrust is verified, gradually increase reverse thrust as required up to a maximum of 1.3 EPR. If necessary, reverse thrust should be applied smoothly and symmetrically to maximum allowable as soon as possible since the reverse thrust effectiveness is greatest at higher speeds. If difficulty in maintaining directional control is experienced during reverse thrust operation, reduce thrust as required. Do not attempt to maintain directional control by using asymmetric reverse thrust as this will further aggravate the effects of weathervaning. Under emergency conditions, maximum reverse thrust may be used to a complete stop. The use of reverse thrust may cause a visibility problem from blowing snow forward as ground speed decreases and can melt dry snow which can impinge and freeze on cold surfaces. Take action appropriate to the braking effectiveness and runway length available. Avoid rapid return to forward thrust when engine RPM is high. The resultant forward thrust may be high enough to cause the airplane to accelerate.

Maintain directional control primarily with rudder pedals. Use differential braking as needed. Be alert for drift toward downwind side of the runway. The rudder required in strong crosswinds may cause the nose gear to turn to an angle which could induce skidding. Therefore, it may be necessary to hold the nose gear steering wheel centered while controlling steering with rudder and brakes to maintain tracking.

If a skid develops, especially in crosswind conditions, reverse thrust will increase the sideward movement of the airplane. In this case, release brake pressure and reduce reverse thrust to reverse idle, and if necessary, forward idle. Apply rudder as necessary to realign the airplane with the runway and reapply braking and reversing to complete the landing roll. Use as much runway as necessary to slow the airplane. Do not attempt to turn off a slippery runway until speed is reduced sufficiently to turn without skidding. Consider that braking effectiveness in the last 2,000 feet of the runway may be further reduced by painted surfaces and accumulation of fuel, oil, and rubber.

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RECOVERY MANEUVERS

GENERAL

When recovering from an unusual attitude or aircraft upset, the following three steps should be used as appropriate to the situation:

PUSH	- Autopilot & autothrottles off - Forward pressure (or relaxed back pressure) on the yoke to keep angle of attack low (provides best acceleration & roll rate) - Trim as required
ROLL	- Roll shortest direction to the horizon: toward bank angle indicator - Lead with rudder (more roll authority at high angle of attack)
PULL	- Back pressure on yoke to return to level - To avoid ground contact: in and out of stick shaker, avoid stall

Stall Characteristics

Stall speeds are defined as the minimum steady flight speed at which a constant altitude can be maintained (or the minimum steady flight speed at which the angle of attach for maximum lift is attained). During initial stages of stall, local airflow separation results in buffeting, giving natural warning of an approach to a stall.

Initial buffet is caused by airflow separation. Stall warning is considered to be any warning readily identifiable by the pilot, either artificial (stick shaker) or initial buffet (stabilizer shake, aileron shake, or wing shake). Recovery from an approach to stall will be initiated at the earliest recognizable stall warning, initial buffet, or stick shaker.

Due to the effectiveness of the full span leading edge slats, the MD-80 does not exhibit the usual buffeting associated with stalling, nor is there a pronounced loss in lift after the maximum lift is reached. As a result, the usual cues which warn of impending stall and indicate the actual stall are not apparent to the pilot. In simple language, it is very difficult to tell the point where the 1G stall occurs. Therefore, the Supplementary Stall Recognition System (SSRS) has been devised to provide:

- Unmistakable stall warning through stick shakers.
- Positive stall recognition through the loud, urgent sound of a horn, accompanied by a blinking red **STALL** light on the glare shield. On aircraft equipped with the vocal warning system, the words, “STALL, STALL” will be heard.

- If the stall is detected by both stall detection systems and the slats are fully extended, the control columns will be absolutely moved forward by a post stall Stick Pusher system.

Stall Recovery

Initiate recovery at first indication of a stall warning (buffet or stick shaker). The objective of the recovery action is to accelerate to the normal maneuvering airspeed with minimum altitude loss. This is accomplished by pushing the throttles to their furthest forward position, calling “MAX THROTTLES” and leveling the wings if in a turn. Smoothly adjust attitude as necessary to hold altitude (terrain avoidance), or manage altitude to minimum loss. If a pitch change is required, it should be smooth and gradual. At most configurations and gross weights, the aircraft will accelerate away from the stall warning without changing pitch attitude. Less altitude is lost and the recovery is simplified by not changing flap position.

The recovery procedures outlined above are for low altitude, minimum altitude loss situations with terrain a factor. If an indication of an impending stall is encountered at cruising altitude, it may be necessary to lower the pitch attitude below the horizon (10° nose low) to trade altitude for airspeed. Autopilot should be disengaged during recovery maneuver.

At intermediate altitude when terrain contact is not a factor, the pitch attitude should be lowered to approximately 5 degrees ANU while acceptable acceleration is achieved.

All recoveries from approaches to stalls are performed as if an actual stall has occurred. During stall recovery, smooth control inputs will help avoid or minimize altitude loss.

Gear and flaps should be retracted only after altitude loss is arrested, and the aircraft has accelerated to the maneuvering speed for the existing flap setting.

SIMULATOR TRAINING RECOVERY MANUEVERS

Note: These maneuvers will only be performed in the simulator.

Purpose and Desired Results

- Understand and recognize an impending stall condition.
- React with judgment and procedures to counteract the impending stall.
- Accelerate to maneuvering speed for the configuration with minimum altitude loss.

Accelerated Stall and High Bank Angle Maneuver

High bank angle could be encountered unexpectedly due to wake turbulence or windshear. High bank angle could also be necessary to control an extreme pitch-up attitude brought on by nose-up runaway stabilizer trim (steeper bank angles will cause the pitch attitude to lower). The aircraft can stall at high speeds if higher than normal G-forces are present.

Begin the maneuver at 250 KIAS, clean, and at an altitude between 4,000 and 10,000 feet MSL. Autopilot, autothrottles, and flight director off.

Establish a 60° bank angle and trim the aircraft for level flight. When stable, pull aft on the yoke until stick shaker activation. Roll out and recover.

Again, establish a 60° bank angle and trim the aircraft for level flight. When stable put hands in lap and use gentle rudder inputs to control aircraft. If aircraft climbs, increase bank angle slightly to lower pitch. If aircraft descends, reduce bank angle slightly to increase pitch.

Recover and trim to wings level flight.

High Altitude Stall

The autopilot will trim the aircraft to the stall if speed is allowed to decay. Buffet will be felt well before the stall, but is similar to high speed buffet. Thrust is significantly reduced at altitude: approximately 20% of sea level thrust when at FL 350. Altitude must be sacrificed to regain flying airspeed.

Begin the maneuver at FL 350 with autopilot and flight director on; autothrottles off. Pull throttles to idle and allow aircraft to decelerate. Do not recover until aircraft starts to roll and/or the stall warning activates.

Use PUSH-ROLL-PULL to recover. Disconnect autopilot, push yoke forward to 10° nose low, apply max throttles, roll wings level, trim aircraft nose down during acceleration, and pull aft gently on yoke as airspeed nears maneuvering speed to level off.

Takeoff Configuration Stall

Begin the maneuver with autopilot and autothrottles off, flight director on, flaps 11° or 15°, vertical speed set to 1000 FPM up, bank angle 25° and HDG SEL set to 180° from present heading. Set power to 55% N1and fly the flight director until recovery is necessary. Recover with max throttles, roll wings level, and minimize altitude loss. If flaps 11° are used, note activation and effect of auto slats during recovery.

Landing Configuration Stall

This maneuver is flown at 6,000 to 8,000 feet MSL with autopilot, autothrottles, and flight director off. Configure with gear down, flaps 40°, throttles idle, and descend at 500 FPM with wings level. Decelerate to stick shaker and perform windshear recovery maneuver. Climb in and out of stick shaker to practice maneuver.

DUTCH ROLLS

When a swept wing aircraft is subjected to yaw, a Dutch roll condition can result due to the forward moving wing developing more lift than the other wing, which is losing some lift due to its relative direction of movement. Normally, the yaw dampening system of the MD-80 prevents a Dutch roll condition from developing.

Recovery from a Dutch roll is accomplished by applying aileron into the rising wing followed by a return to the neutral aileron position. The combined effect of the aileron and spoiler deflection serves to distort the developing lift on the forward moving wing. The initial required aileron deflection will depend on the severity of the roll. In most cases, however, the control wheel should initially be displaced approximately 30°. Subsequent corrections should be progressively less. Full speed brakes aid in Dutch roll damping. The use of rudder during recovery from a Dutch roll is not recommended

Holding

Planning

Begin speed reduction within 3 minutes prior to estimated arrival at the fix so as to arrive at the holding fix at or below the maximum authorized holding speed for the altitude.

Upon arrival at the fix, maintain holding speed and hold as instructed. Maintain the last assigned altitude/flight level.

Make all turns during entry and while holding at 30 degrees bank angle, or 25 degrees bank angle using the flight director system.

Compensate for known effect of wind, except when turning.

Advise ATC immediately if an increase in airspeed is necessary due to turbulence, or if unable to accomplish any part of the holding procedures.

Configurations

Above 14,000 feet - Hold clean and use holding chart speed, but not above FAA maximum speeds without ATC approval.

At or Below 14,000 feet - Extensive holds should be made in the clean configuration. When expected approach time or altitude to which cleared indicates that an approach clearance is imminent, flaps should be extended and airspeed reduced as required.

Maximum Airspeeds (FAA/ICAO Standard)

MHA through 6,000 feet	-	200 KIAS (230 ICAO)
Above 6,000 through 14,000 feet	-	230 KIAS (210 Where Published)
Above 14,000 feet	-	265 KIAS

Holding airspeeds at international destinations may be further limited by State Regulations. Refer to the Jeppesen STATE RULES AND PROCEDURES for specific holding speeds at foreign destinations.

Timing

Timing of the initial outbound leg should be 1 minute at or below 14,000 feet MSL, and 1½ minutes above 14,000 feet MSL. Timing for subsequent outbound legs should be adjusted as necessary to achieve proper inbound leg time.

Outbound timing begins abeam the fix. If the abeam position cannot be determined, start timing when the turn to the outbound heading is complete and the wings are level.

The time required to complete a 180 degree turn will vary with weight, altitude, and speed. Example: At 5,000 feet and 200 knots, it will take approximately 1¼ minutes. At 20,000 feet and 230 knots, it will take approximately 1½ minutes.

Plan the holding pattern so as to arrive at the holding fix at the correct time to meet EFC requirements.

Standard Pattern

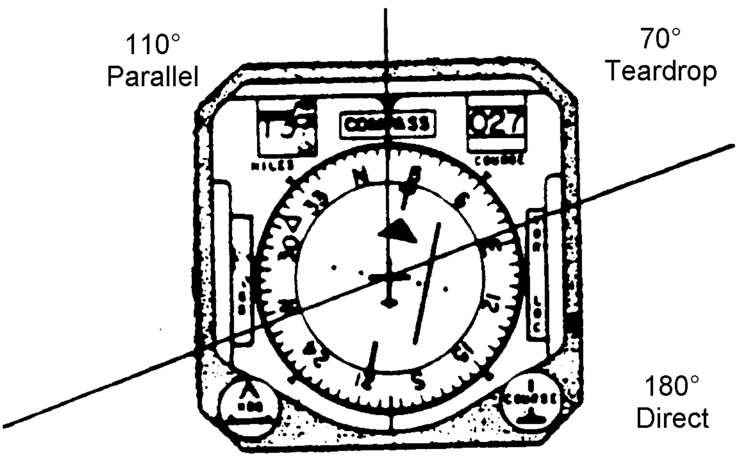
Parallel Entry - Parallel holding course, turn left, and return to holding fix or intercept holding course.

Teardrop Entry - Proceed on an outbound track of 30 degrees (to the holding course) for 45 seconds, then turn right to intercept the holding course.

Direct Entry - Turn right and fly the pattern.

Recommended method for determining entry - Put tail of course needle on outbound course (holding radial). To use the following guidelines, the aircraft must be proceeding direct to the holding fix.

INBOUND COURSE TO HOLDING FIX ON CI



Outbound course (holding radial) within 70 degrees arc, fly teardrop entry.

Outbound course (holding radial) within 110 degrees arc, fly parallel entry.

Outbound course (holding radial) within 180 degrees arc, fly direct entry.

Non-Standard Pattern

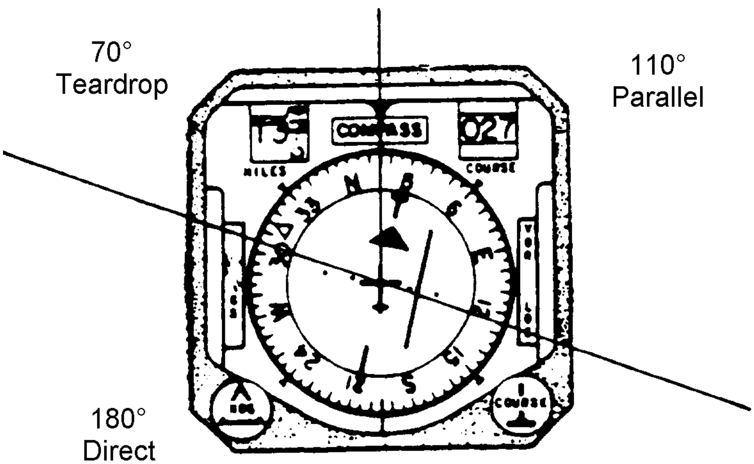
Parallel Entry - Parallel holding course, turn right, and return to holding fix or intercept holding course.

Teardrop Entry - Proceed on an outbound track of 30 degrees (to the holding course) for 45 seconds, then turn left to intercept the holding course.

Direct Entry - Turn left and fly the pattern.

Recommended method of determining entry - Put tail of course needle on outbound course (holding radial). To use the following guidelines, the aircraft must be proceeding direct to the holding fix.

INBOUND COURSE TO HOLDING FIX ON CI



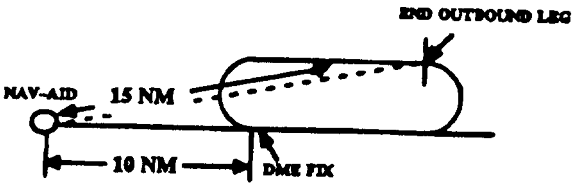
Outbound course (holding radial) within 70 degrees arc, fly teardrop entry.

Outbound course (holding radial) within 110 degrees arc, fly parallel entry.

Outbound course (holding radial) within 180 degrees arc, fly direct entry.

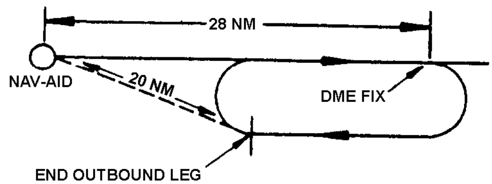
DME Holding

Example #1 - Inbound to the VOR hold east of the 10-mile DME fix on the 090 degrees radial, 5 mile legs, right turns.



Since the inbound course is toward the navaid, the fix distance is 10 NM and the leg length is 5 NM. The end of the outbound leg will be reached when the DME reads 15 NM.

Example #2 - Outbound from the VOR hold west of the 28 mile DME fix on the 090 degrees radial, 8 mile legs, right turns.

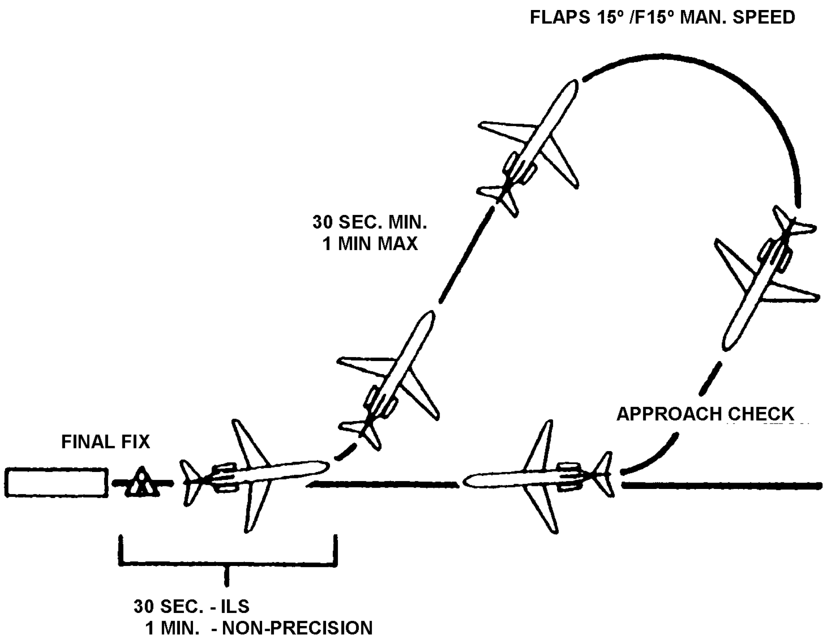


Since the inbound course (to the fix) is away from the navaid, the fix distance is 28 NM and the leg length is 8 NM. The end of the outbound holding legs will be reached when the DME reads 20 NM.

PROCEDURE TURN

A procedure turn is specified whenever it is necessary to reverse direction to establish the aircraft inbound on an intermediate or final approach course. The approach plate will specify the outbound and inbound courses, the distance within which the procedure turn shall be completed, the side of the inbound course on which the turn should be made, and a minimum altitude to be maintained.

Unless specified on the approach plate, the point at which the procedure turn is started is left to the discretion of the pilot. It is recommended that the turn to the outbound heading be commenced 1 minute past the final approach fix on a non-precision approach, and 30 seconds past the final approach fix on an ILS approach. Timing on the outbound leg should be a minimum of 30 seconds and a maximum of 1 minute depending on wind conditions. Normally, the procedure turn will be accomplished with a 15 flap setting and maneuvering airspeed. When established on the inbound course of the procedure turn and cleared for the approach, an approach check should be accomplished.



NOTE: A RACETRACK OR TEARDROP PATTERN MAY BE SPECIFIED ON THE APPROACH PLATE AND MUST BE FLOWN AS DEPICTED.

Procedure Turn

DME ARC

A DME arc is the track of an aircraft maintained at a constant distance from a navigational aid by reference to distance measuring equipment (DME).

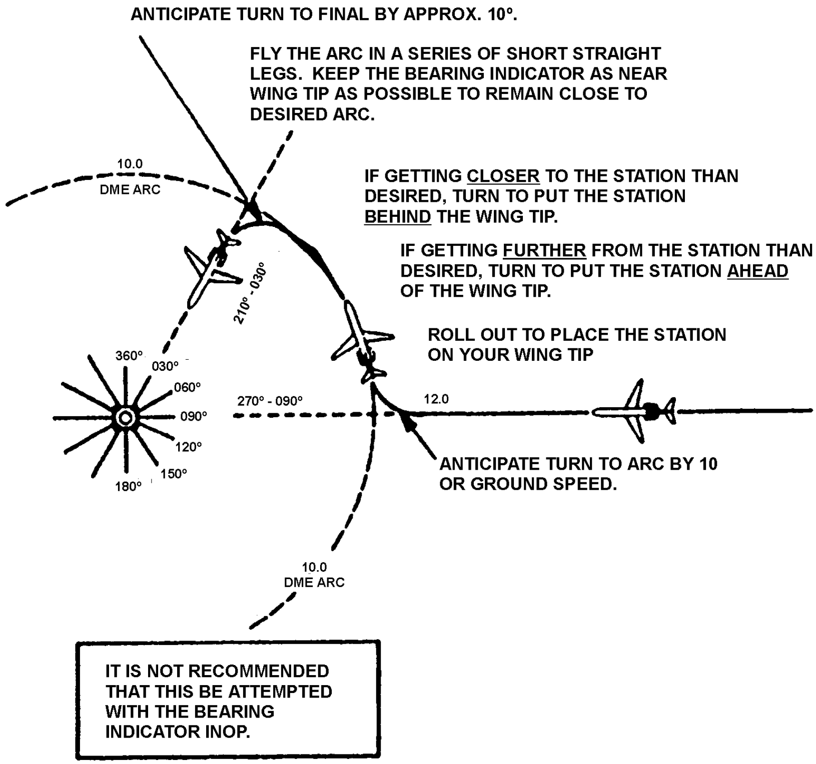
The distinguishing feature of the DME arc is that the pilot is required to fly the aircraft along a circular track around the vortac station at a specified distance.

When turning onto an arc, plan to lead your turn to avoid overshooting the desired arc. A good rule-of-thumb is to lead desired DME indication by 1% of your ground speed. For a 200 knot ground speed, lead 2 miles.

Keeping the bearing indicator near the wing tip will keep you close to the desired arc. Flying in a series of short, straight legs is usually the best technique to use. Do not attempt to fly in a continuous bank.

The DME indication should be the same as the published DME distance each time the VOR-RMI needle passed through the wing tip position. If you drift off the arc, make as small a correction as is practicable to return to the arc; correct 10° for each ½ mile outside the arc, and 5° for each ½ mile inside the arc. Since a graphic presentation of the station's position is important to flying a DME arc, do not attempt this maneuver with the bearing indicator inoperative.

For most DME transitions, a lead of approximately 10 degrees will be adequate for turning from the arc to the final approach course (at 15 NM from the station, 10 degrees of arc is equivalent to 2½ NM).


ANTICIPATE TURN TO FINAL BY APPROX. 10°.
FLY THE ARC IN A SERIES OF SHORT STRAIGHT LEGS. KEEP THE BEARING INDICATOR AS NEAR WING TIP AS POSSIBLE TO REMAIN CLOSE TO DESIRED ARC.
10.0
DME ARC
IF GETTING CLOSER TO THE STATION THAN DESIRED, TURN TO PUT THE STATION BEHIND THE WING TIP.
IF GETTING FURTHER FROM THE STATION THAN DESIRED, TURN TO PUT THE STATION AHEAD OF THE WING TIP.
210° - 030°
ROLL OUT TO PLACE THE STATION ON YOUR WING TIP
360°
030°
060°
090°
120°
150°
180°
270° - 090°
12.0
ANTICIPATE TURN TO ARC BY 10 OR GROUND SPEED.
10.0
DME ARC
IT IS NOT RECOMMENDED THAT THIS BE ATTEMPTED WITH THE BEARING INDICATOR INOP.

DME Arc

CREW EFFECTIVENESS MARKERS

The following Crew Effectiveness Markers were developed to assist crew members in their understanding and practice of Crew Resource Management. The markers were structured in a checklist format for ease of use and recall. Crew members should use the markers as a checklist for decision making and as a guide for crew briefings. They should be reviewed periodically to improve CRM proficiency, just as emergency and abnormal checklists are revisited from time to time. CRM will be evaluated in training events, proficiency checks, and line checks utilizing the Crew Effectiveness Markers.

The Crew Effectiveness Markers can also serve as a debriefing tool after a line flight or training event. A debrief should always be conducted after a flight which challenged a crew in some manner. Potential exists for valuable new learning if a crew conducts a frank yet positive self-evaluation following significant flight events. Debriefings should be conducted by the Captain, but may be initiated by anyone in the crew. Frequent, open communications and active listening are consistently identified as key characteristics of the most effective flight crews.

OVERALL TECHNICAL PROFICIENCY

- Set a professional example.
- Adhere to SOP, FAR's, sterile cockpit, etc.
- Demonstrate high level of flying skills.
- Be adept at normal and abnormal procedures.
- Maintain thorough systems knowledge.

BRIEFING and COMMUNICATION

- Set an open tone.
- Fully brief operational/safety issues.
- Explicitly encourage participation.
- All are obligated to seek and give information.
- State how SOP deviations will be handled.
- Include cabin crew.

LEADERSHIP and TEAMWORK

- Balance authority and assertiveness.
- Promote continual dialogue.
- Adapt to the personalities of others.
- Use all available resources.
- Must share doubts with others.

SITUATIONAL AWARENESS

- Monitor developments (fuel, weather, ATC, etc.)
- Anticipate required actions.
- Ask the right questions.
- Test assumptions, confirm understanding.
- Monitor workload distribution and fellow crew members.
- Report fatigue, stress, and overload in self and others.

DECISION MAKING

- Fly the aircraft.
- Obtain all pertinent information.
- All crew members state recommendations.
- Better idea suggested? Abandon yours.
- Clearly state plan or intentions.
- Establish “Bottom Lines.”
- Resolve conflicts and doubts quickly.

CREW SELF-EVALUATION

- Debrief key events.
- Continuously provide information to self-correct.
- Openly discuss successes and mistakes.
- Ask, “How could we have done better? ”
- Discuss what is right, not who is right.

TRAINING

This section provides the necessary guidelines to assist in the preparation and planning for Captain and First Officer training. The term “Training” as used herein refers to upgrade training, transition training, requalification training, recurrent training, and proficiency checks.

Preparation

A certain amount of anxiety is normal prior to “getting into the box” and demonstrating your proficiency for two intense hours of normal, abnormal, and emergency maneuvers. This is anticipated by the check airman and the progression of the simulator period is designed to allow you time to settle down to the normal business of flying prior to operating in abnormal to emergency configurations. Preparation is a key element of your success during the evaluation. Prepare yourself to be busy. Unlike line flying, your reward for conducting an excellent instrument approach and landing in the first phase of the period will be to conduct several more approaches with malfunctioning systems or an inoperative engine. You should expect and prepare for an oral examination during the briefing. You will be expected to have the most current Flight Manual revisions posted. As a current and qualified flight crewmember, you are responsible for all the data contained in the MD-80 Flight Manual in Section 1, the Immediate Actions items in Section 2, a working knowledge of the engine start abnormals in Section 3 and, with minor/random deviations, you should be able to operate the aircraft using the checklist and procedures shown in Section 4. Anything else can be referenced for you during the evaluation by the non-flying pilot.

You can expect to operate the aircraft in winter conditions for a minimum of one takeoff and landing. You can expect to operate in weather conditions and actually encounter a windshear/microburst on either a takeoff or approach. You will be put in conditions that will require a decision on the use of alternate airports for departure and/or arrival. You will be expected to use and comply with the Minimum Equipment List if any preflight or system failures occur. You can expect the traditional steep turns and stalls. You can expect the traditional steep turns and stalls. Please ask questions on the rarely performed maneuvers during the briefing.

Equipment Required

Proficiency Checks and Recurrent Training
- Flight Manual: Sections 1-5 with most current revisions incorporated.
- JEPPS Manuals: All pages for IAH, CLE, EWR, LAX & SFO.

Initial, Transition, Differences and Upgrade Training
- Flight Manual: Complete Flight Manual (Section Intro through 18) as well as any active Training Bulletins.
- Operations Manual: Complete OPS Manual.
- JEPPS Manuals: Full set.

LOFT Training
- A complete flight kit as would be carried on a normal trip.

Day 1 Training
- Operations Manual: Complete OPS Manual.

Day 2 Training
- Flight Manual: Complete Flight Manual (Section Intro through 18) as well as any active Training Bulletins.

Maneuvers

Non-Precision Approaches

Depending on your bid line, you may not have conducted a non-precision approach since your last PC. Take the time to review the non-precision approaches. Your approach briefing is the key to planning the deceleration, configuration changes, descent rates, flight guidance management, timing (if required), and missed approach procedures. Make sure that both pilots agree on the configuration, speeds, descent points, altitude restrictions, cockpit management, altitude callouts, and missed approach procedures. Don’t allow:

- Premature descents.
- Descents without final approach course guidance.
- Excessive speed due to incorrect configuration.
- Failure to monitor and adjust descent rate as required to arrive at the DDA at the VDP.
- Incorrect or non-standard altitude callouts by the non-flying pilot.
- Failure to cross reference DFGS programming with the FMA display resulting in altitude busts.

Note: Two Non-Precision approaches are required on a PC/RT. One will be handflown (Autopilot off) using the Flight Guidance/Flight Director.

Missed Approach

The average airline crew makes very few real world missed approaches. Review the procedural steps and flight guidance annunciations presented in this flight manual, and missed approach navigation/instructions shown on the Jeppesen plates.

Thorough preparation, review, and study prior to the PC/RT, can prevent the following from happening to you:

- Executing the missed approach procedures in the wrong sequence.
- Failure to use the TOGA mode resulting in incorrect pitch attitudes and partial power application.
- Autothrottle mismanagement and airspeed problems resulting from the failure to re-engage autothrottles or reset speed bug to desired speed.
- Misunderstanding of the exact location of missed approach point.
- Starting a turn prior to reaching the missed approach point.
- Misunderstanding of the missed approach procedures.

For takeoffs or Missed Approaches when the altitude change is less than 3,000 feet, the 1000' AGL callout should be "SPEED TOP BUG (or SPEED 170)." This will preclude canceling an ALT CAP.

Engine Out Procedures

Review the text in Section 2. Refresh yourself on the flight guidance callouts necessary to climb to obstacle clearance altitude, accelerate, and cleanup. Be aware of any unique obstacle/climb gradient requirements, and departure considerations on the 10-7 Jepp Page. If you are making a takeoff at reduced power (T.O. FLEX), call for "CHECK MAX POWER" when the gear is up to increase available thrust. The key to the maneuver is to set 13 degrees of nose-up pitch and maintain your airspeed (V_2) by reference to the airspeed indicator rather than the command bars. Attempt to avoid the following:

- Over-rotation and/or abrupt rotation.
- Chasing the command bars resulting in pumping the elevators and bleeding off airspeed.
- Over-controlling the ailerons resulting in spoiler deflection that aggravates roll control and kills airspeed.
- Exceeding the five (5) minute maximum power setting.
- Misprogramming the Thrust Rating Indicator resulting in **NO MODE** indications and reduced power.

The autothrottles will be off during single engine training. Do not rely on their normal, automatic use. Be careful to manually set the power on the good engine to the thrust rating displayed on the TRI. Checklist execution is a critical item on V_1 cuts. The following checklists should be conducted in the order shown below:

- Engine Failure/Fire Checklist.
- After Takeoff Check.
- One Engine Inoperative Approach and Landing Checklist.

Flight Guidance

It is very easy, and certainly common on the line, to operate the aircraft in PMS modes. Please prepare yourself to demonstrate your proficiency on Flight Guidance in the departure, arrival, precision approach, non-precision approach, and engine out modes. One non-precision approach will be hand flown using the flight guidance system. The engine out precision approach (and missed approach) will be hand flown using the flight guidance system. Good Flight Guidance proficiency can prevent:

- Failure to cross reference the FMA display after each DFGS panel change.
- Re-programming the DFGS while in the ALT CAP mode.
- Not being able to communicate to the pilot not flying your flight guidance requests/changes.

It is Continental policy on MD-80 aircraft that, when the autopilot is disengaged, the pilot flying will call for all changes to the flight guidance control panel and all configuration changes. Please study the Jeppesen charts with that in mind.

Crew Coordination

We put a great deal of emphasis on how well both crew members work together in normal, abnormal, and emergency situations. A takeoff briefing, conducted by the Captain, prior to each takeoff is essential. A thorough approach briefing conducted by the pilot flying is imperative. Allow the monitoring pilot to fly while you review approach plates, recheck abnormal procedures, or set altimeter and airspeed bugs. If you are the pilot flying, fly the aircraft and command/delegate the work. Don't enter holding incorrectly or misinterpret an approach chart; ask the other pilot. Use all the equipment, material, and crew members available to you when managing the cockpit. This very important part of your line flying and PC/RT can help eliminate:

- Abbreviated approach briefings resulting in confusion and mismanagement of vertical navigation and configuration changes.
- Excessive airspeed and incorrect holding entries.
- Both pilots troubleshooting the abnormal/emergency procedures and no one flying the aircraft.
- Use of non-standard altitude callouts and procedures. This results in misunderstandings and confusion of the non-flying pilot.

Performance Goals

Crew members are expected to use good judgement in the selection of configurations and speeds and in the execution of procedures. This includes the use of other crew members to perform functions that would divert attention from maintaining proper aircraft control.

The aircraft should be flown with precision at all times. Desired tolerances (other than on approach) are:

1. Altitude - $\pm$ 100 feet
2. Airspeed - $\pm$ 5 knots
3. Heading - $\pm$ 5°

During simulated emergencies, first consideration should be given to maintaining aircraft control. Be deliberate, fly the aircraft, and then take care of the emergency. Although emergency procedures should be accomplished within a reasonable period of time, no time limit is placed on any particular item.

Satisfactory performance is required on each procedure and maneuver. Advanced preparation resulting in good procedural knowledge will allow concentration on smooth and precise aircraft control. This will enhance overall performance and make the training a meaningful experience.

CAPTAIN AND FIRST OFFICER PROFICIENCY CHECK/ RECURRENT TRAINING MANEUVERS

PREFLIGHT
Walkaround Review
Cockpit Set-Up
Emergency Equipment
Starting Procedures
Taxiing

TAKEOFFS
Normal
IMC (600 RVR/100’ Overcast)
Crosswind
Engine Failure at V_1
Rejected

AIRWORK
Area Departure
Area Arrival
Steep Turns
Holding
Clean Configuration Stall
Takeoff Configuration Stall
Landing Configuration Stall

PRECISION APPROACHES
ILS-CAT II (or Monitored)
(To a Missed Approach and to a Landing.)
ILS-FD (Engine Out)

MISSED APPROACH
From an ILS
Additional Missed Approach
Engine Out

NON-PRECISION APPROACHES
VOR/BC LOC/LDA
NDB/LOC/ASR

LANDINGS
Normal
Rejected
1 Engine Inop
Crosswind
From an ILS

PROCEDURES
Normal
Abnormal
Emergency

GENERAL
Approach Preparation
Equipment/Planning and
Performance

CREW COORDINATION CONCEPTS
Testing of Assumptions
Decision Making/Judgment
Crew Effectiveness Markers

TRAINING
Aircraft Differences
Special Departure Procedures
Windshear: Takeoff
Windshear: Landing

LOFT (Line Oriented Flight Training)

Crews will be scheduled for LOFT periods as part of upgrade and transition training and may be scheduled for LOFT periods as part of annual Recurrent Training. The object of LOFT is to foster a high level of Crew Resource Management (CRM) skills among all Continental crew members. LOFT scenarios challenge the crew's CRM skills in a realistic line trip environment.

Crews will fly trip segments in real time, using the same flight papers, navaids, and communications that they would during a line trip. Abnormal events such as emergencies, ATC, or weather problems are part of the LOFT scenarios. The intent is for the crew to work as a team, making the best use of all available resources. There is seldom one "correct" solution to these problems. A goal is for the crew to work together, using effective CRM skills to obtain a safe outcome.

Batting Practice

"Batting Practice" is a separate training period, in which crew members practice selected maneuvers which retain stick-and-rudder as well as procedural proficiency. Typical maneuvers include: windshear encounters, rejected takeoffs, non-precision approaches, engine failures, and Category II approaches. Unlike LOFT, the simulator may be repositioned during batting practice for maximum training benefit. Maneuvers may be repeated as necessary until the crew is proficient. Batting practice is not graded, but must be satisfactorily completed.

LOFT Preparation

Pilots should be prepared to use the effective CRM skills discussed during the Crew Coordination Concepts (CCC) workshops. The Crew Effectiveness Markers, presented in this section, help define effective CRM. They should be reviewed to better prepare for training events, as well as for routine line operations.

A scheduled LOFT period may revert to a Proficiency Check due to simulator problems or lack of required crew members. For that reason, *it is imperative that pilots who are scheduled for LOFT come prepared to fly a Proficiency Check.* Full flight kits are required, including personal headsets or earpieces, if desired. LOFT crews should arrive prepared for a line trip (without uniforms). Briefings begin ninety minutes before the scheduled LOFT simulator period.

LOFT Debriefing

Plan to devote the time for a complete debriefing following the LOFT. The debriefing is a critical portion of LOFT and requires approximately one hour. Crew members will be asked to evaluate their performance, openly discussing both successes and mistakes. One goal of LOFT is to promote feedback among crew members during normal operations, and particularly after a challenging flight problem is faced. Pilots should ensure that their return travel plans allow for a complete LOFT and debriefing.

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6	12/01/00	37	01/01/00	68	12/01/00
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12	12/01/00	43	08/01/98	74	01/01/00
* 13	01/01/02	44	08/01/98	75	01/01/00
* 14	01/01/02	45	08/01/98	76	12/01/00
15	05/15/95	46	08/01/98	77	01/01/00
16	05/15/95	47	08/01/98	78	01/01/00
17	01/01/97	48	08/01/98	79	01/01/00
18	05/15/95	49	08/01/98	80	08/01/98
19	05/15/95	50	08/01/98		
20	05/15/95				
		51	08/01/98		
21	05/15/95	52	12/01/00		
22	12/01/00	53	01/01/00		
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24	01/01/00	55	01/01/00		
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86	08/01/98	119	08/01/98	151	01/01/00
87	08/01/98	120	01/01/00	152	12/01/00
88	08/01/98			153	12/01/00
89	12/01/00	121	12/01/00	154	12/01/00
90	08/01/98	122	08/01/98	155	12/01/00
		123	08/01/98	156	12/01/00
91	12/01/00	124	08/01/98	157	12/01/00
92	01/01/00	125	08/01/98	158	12/01/00
93	12/01/00	126	08/01/98	159	12/01/00
94	01/01/00	127	08/01/98	160	12/01/00
95	12/01/00	128	08/01/98		
96	01/01/00	129	08/01/98	161	12/01/00
97	12/01/00	130	08/01/98	162	01/01/00
98	01/01/00			163	12/01/00
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		133	12/01/00	166	12/01/00
101	01/01/00	134	12/01/00	167	12/01/00
102	01/01/00	135	12/01/00	168	12/01/00
103	08/01/98	136	01/01/00	169	12/01/00
104	08/01/98	137	12/01/00	170	01/01/00
105	01/01/00	138	01/01/00		
106	08/01/98	139	01/01/00		
107	12/01/00	140	01/01/00		
108	08/01/98				
109	08/01/98	141	12/01/00		
110	01/01/00	142	12/01/00		
		143	12/01/00		
111	08/01/98	144	01/01/00		
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179	01/01/00	204	08/01/98	230	05/15/95
180	01/01/00	205	12/01/00		
* 180-A	01/01/02	206	01/01/00	231	05/15/95
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		211	08/01/98	237	05/15/95
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		216-H	08/01/98		
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* 261	01/01/02	292	12/01/00		
* 262	01/01/02	293	12/01/00		
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266	12/01/00	297	05/15/95		
267	12/01/97	298	05/15/95		
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270	12/01/00				
* 270-A	01/01/02	301	05/15/95		
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		303	01/01/00		
* 271	01/01/02	304	01/01/00		
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FLIGHT PERFORMANCE

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INTRODUCTION

TAKEOFF

ENROUTE

LANDING

INTRODUCTION

GENERAL

Weight & Balance Policy/Procedures

Operations Engineering controls, via the Accuload computer system, the performance data for specific airports/runways in accordance with the limitations set by the FARs and McDonnell Douglas. The load planner generates the Runway Analysis and balance information using the Accuload computer assuring a flight is operated within maximum allowable weight and center of gravity limitations. Appropriate items from the Load Manifest are given to the flight crew via the Pilot Weight Manifest Worksheet.

Flap Selection

The priority for selection of takeoff and landing flaps is as follows (left to right):

Takeoff:	11°, 15°, 4°, Optimum
Takeoff on wet or contaminated runway:	22°, 18°, 15°, 11°, 4°, Optimum
Landing:	40° Primary , 28° Alternate,

When the alternate landing flaps setting of 28° is required, code K will be shown in line 9 of the Pilot Weight Manifest.

Aircraft Performance Penalties

The dispatcher is responsible for identifying and inputing all performance related penalties for takeoff, enroute, and landing.

The flight crew should review the performance penalties applied and advise the dispatcher of any discrepancies.

Preparation of the Load Manifest

Automated - The load planner accesses the Accuload computer which assimilates all the required data and performs the required calculations in accordance with procedures. The data is transmitted to the flight crew via radio closeout, hard copy telex, or a completed Form 362A Pilot Weight Manifest Worksheet. A benefit of the Accuload system, although totally separate from it, is a bank of precomputed Runway Analysis for all runways known as the “stored data”. It is from this bank of “stored data” that the Runway Analysis in the Flight Departure Paperwork is drawn. This data will allow the crew to check takeoff capability in the event of a change in takeoff runway or flap setting. Flight crews must be aware that the “stored data” contains no corrections for abnormal takeoff conditions such as contaminated runway (standing water, slush, or snow), low altimeter setting (less than 29.72), or dispatch with inoperative systems (example: AGS inop). When using the Runway Analysis to calculate takeoff capability with an abnormal takeoff condition in effect, the appropriate takeoff weight penalty from this section must be applied. **If the takeoff weight penalty for an abnormal takeoff condition is not published in this section, the Flight Crew must contact Load Planning for new data in the event of a change in takeoff runway or flap setting.**

Manual Backup - The load planner uses backup data stored on microfiche to obtain the Runway Analysis and manually calculates the center of gravity. The data is transmitted to the flight crew via radio closeout, hard copy telex, or a completed Form 362A Pilot Weight Manifest Worksheet. The flight crew uses the V-Speeds for Takeoff - Manual Calculation procedure in this section to obtain takeoff V-Speeds.

Temp °F -°C Conversion

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
50	122	36	97	22	72	8	47	-6	21	-20	-4	-34	-29
49	120	35	95	21	70	7	45	-7	20	-21	-6	-35	-31
48	119	34	93	20	68	6	43	-8	18	-22	-8	-36	-33
47	117	33	91	19	66	5	41	-9	16	-23	-10	-37	-35
46	115	32	90	18	65	4	40	-10	14	-24	-11	-38	-36
45	113	31	88	17	63	3	38	-11	12	-25	-13	-39	-38
44	111	30	86	16	61	2	36	-12	10	-26	-15	-40	-40
43	110	29	84	15	59	1	34	-13	9	-27	-17	-41	-41
42	108	28	82	14	57	0	32	-14	7	-28	-18	-42	-43
41	106	27	80	13	55	-1	30	-15	5	-29	-20	-43	-45
40	104	26	79	12	54	-2	29	-16	3	-30	-22	-44	-47
39	102	25	77	11	52	-3	27	-17	2	-31	-24	-45	-49
38	100	24	75	10	50	-4	25	-18	0	-32	-25	-46	-50
37	99	23	73	9	49	-5	23	-19	-2	-33	-27	-47	-52

Wind Component Table

ANGLE OF WIND RELATIVE TO RUNWAY IN DEGREES										
↓	WIND VELOCITY AND COMPONENTS									
↓	10 KNOTS		20 KNOTS		30 KNOTS		40 KNOTS		50 KNOTS	
↓	HW/TW	CW	HW/TW	CW	HW/TW	CW	HW/TW	CW	HW/TW	CW
0	10	0	20	0	30	0	40	0	50	0
10	9½	2	19½	3½	29½	5	39½	7	49	9
20	9	4	19	7	28	10½	37½	14	47	17
30	8½	5	17½	10	26	15	34½	20	43	25
40	7	6½	15½	13	23	19½	30½	26	38½	32
50	6	7½	13	15½	19½	23	26	30½	32	38½
60	5	8½	10	17½	15	26	20	34½	25	43
70	4	9	7	19	10½	28	14	37½	17	47
80	2	9½	3½	19½	5	29½	7	39½	9	49
90	0	10	0	20	0	30	0	40	0	50

Note: Shaded areas exceed Maximum Demonstrated Crosswind

INTENTIONALLY LEFT BLANK

TAKEOFF

NORMAL

The runway analysis for takeoff is based on stopping distance data that was determined using well rested and prepared test pilot crews in new aircraft with cold, new brakes and new tires on a dry, scrubbed clean runway. Some factors which can adversely affect a line crew in achieving optimum stopping performance are:

- Alertness/reaction time
- Failure to hold maximum brake pedal deflection until a stop
- Condition/inflation of tires
- Condition/performance of brakes
- Runway lineup distance (not accounted for in data)
- Acceleration rate to V_1
- Variations in winds/ use of crosswind controls
- Wet runway (contaminated runway degradation is accounted for, but no correction is made for a wet runway. Stopping distance on a wet runway generally exceeds that for a dry runway. The possibility of hydroplaning must be considered.)
- Buildup of rubber deposits on the runway surface
- Accumulations of Deicing Fluid on Runway

Pilots should use the following guidance when determining whether or not a runway is wet for dispatch / performance considerations: A runway is considered wet if it has a shiny appearance and .1 inch (3mm) or less of standing water. Runways which are damp (darker in appearance than completely dry runways) but have no shiny appearance, are generally not considered wet. Concrete runways which are grooved and crowned drain well and thus are rarely considered wet except during (and not after) a moderate or greater rain shower. When more than .1 inch (3mm) of standing water is reported on the runway, standing water penalties should be taken.

Runway Analysis in Flight Departure Papers

General

ACCULOAD produces the Runway Analysis in the Flight Departure Papers. These charts provide takeoff performance data for up to seven runways for all valid power/flap combinations. Maximum runway and climb limit gross weights are given for a range of temperatures above and below the planned takeoff temperature. A range of gross weights with the associated flex temperatures and takeoff V-speeds is also included. These charts may be used to manually determine maximum allowable takeoff weights, Flex Temps, and takeoff V-speeds.

Runway Analysis Legend & Procedures

The Runway Analysis section of the Flight Departure Papers normally comes in two parts. The first part contains a header and charts for flaps 11° and 15°. The second part contains a header, a chart for flaps 4° and the runway lengths, slopes, and any runway notams or remarks.

Use the example of Runway Analysis on the following pages as you read through the legend. Runway analysis for takeoff from Austin at a light gross weight is used for the example because it offers a look at all possible variations of the Flex Temp/ V-speed printout. Note that, due to runway slope at Austin, V_1 speeds for the same gross weight vary by up to seven knots for different runways.

1 Flight number/date

3 Aircraft fleet number

2 Aircraft type/power (27A = 217A)

4 This area will say NORMAL BLEED and the data is valid with engine anti-ice on or off. (Other aircraft require correction for engine anti-ice on for takeoff and must have a second set of data to reflect it.)

5 Airport identifier, elevation, temperature, and forecast true winds. The temperature and winds are informational only (gross weights listed are zero wind). The current temperature and winds must be used when assessing takeoff capability with the Runway Analysis.

6 The planned gross weight of the aircraft for takeoff. This weight should be the same as that in the flight plan portion of the flight departure papers. It is a projection used to generate the range of gross weights available for FLEX TEMP calculation. The actual aircraft gross weight must be used when assessing takeoff capability with the Runway Analysis.

```
************** (1) RUNWAY ANALYSIS (2)**************
TGW                       CO  458/04   A/C  801 (3)  (4)
**** TAKEOFF GROSS WEIGHTS  MD80-217   - NORMAL BLEED   ****
(5) \AUS ELEV   632  TEMP  70F  WIND 2008/  PLANNED GW 110000 (6)

  - V-SPDS NOT VALID FOR TAILWINDS - (7) (8) \PWR* 217  FLAP* 11/
 /RNWYS* 13R     17   *  31L    35   *
GW FLEX TO/V-SPEEDS            FLEX TEMP-C/MAX AMB-F
117000 48/99   NA/NA   48/99   N/A
     V1   128     122     129                          FR=143
     VR   133     129     132           (10)           SR=179
     V2   139     138     138                          MM=223
114000 48/99   NA/NA   48/99   N/A
     V1   124     121     127          (11)            FR=141
     VR   129     127     130                          SR=177
(9)  V2   136     136     136                          MM=220
111000 48/99   35/75   48/99   NA/NA
     V1   124     119     127     121  (12)            FR=139
     VR   129     126     130     126                  SR=174
     V2   136     134     136     134                  MM=217
108000 48/99   37/80   48/99   32/44
     V1   121     118     123     119  (13)            FR=137
     VR   126     125     127     124                  SR=172
     V2   133     133     133     132                  MM=214
 TEMP-F                   RWY LIMIT GW                 CLIMB
   60  1442    1196    1385    1151                    1495
   70  1428    1185    1372    1140   (15)       (16)  1495
   80  1404    1165    1349    1121                    1495
   90  1363    1132    1310    1090                    1473
  LB/KT
   HW  0220    0210    0150    0210   (17)
   TW  0990    1010    0970    1010
                                                (8)
  - V-SPDS NOT VALID FOR TAILWINDS -       /PWR* 217  FLAP* 15\
GW FLEX TO/V-SPEEDS            FLEX TEMP-C/MAX AMB-F
117000 48/99   NA/NA   48/99   N/A
     V1   125     120     129                          FR=151
     VR   131     128     131                          SR=180
     V2   137     136     136                          MM=224
114000 48/99   32/44   48/99   N/A
     V1   122     118     126                          FR=149
     VR   128     126     128                          SR=177
     V2   134     134     134         (14)             MM=220
111000 48/99    MC     48/99   NA/NA
(18) V1   122             126     120                  FR=147
     VR   128             128     124                  SR=175
     V2   134             134     132                  MM=217
108000 48/99    MC     48/99   32/44
     V1   118             122     118                  FR=146
     VR   124             125     123                  SR=172
     V2   131             131     131                  MM=214
 TEMP-F                   RWY LIMIT GW                 CLIMB
   60  1456    1210    1386    1152                    1492
   70  1442    1198    1373    1141                    1492
   80  1418    1179    1351    1123                    1487
   90  1376    1145    1312    1090                    1445
  LB/KT
   HW  0230    0250    0150    0250
   TW  0980    0990    0950    0000

PART   1 END PART   2 FOLLOWS
```

```
   TGW                             CO  458/04     A/C  801
19  **** TAKEOFF GROSS WEIGHTS  MD80-217    - NORMAL BLEED      ****
    AUS ELEV    632  TEMP  70F  WIND 2008   PLANNED GW 110000      8

    - V-SPDS NOT VALID FOR TAILWINDS -         PWR* 217   FLAP* 04
    RNWYS* 13R      17  *   31L     35  *
   GW FLEX TO/V-SPEEDS              FLEX TEMP-C/MAX AMB-F
   117000 43/89    N/A    35/75    N/A
       V1  136             139                                  FR=156
       VR  143             144                                  SR=179
       V2  150             151                                  MM=223
   114000 46/94    N/A    40/85    N/A
       V1  135             137                                  FR=153
       VR  142             141                                  SR=176
       V2  148             148                                  MM=219
   111000 48/99    N/A    43/89    N/A
       V1  134             136                                  FR=152
18     VR  141             140                                  SR=175
       V2  147             147                                  MM=218
   108000 48/99   NA/NA   48/99    N/A
       V1  132     126     134                                  FR=149
       VR  138     135     138                                  SR=172
       V2  145     144     144                                  MM=214
     TEMP-F                  RWY LIMIT GW                        CLIMB
       60 1322    1099    1271    1057                           1495
       70 1310    1089    1259    1048                           1495
       80 1288    1071    1238    1031                           1495
       90 1251    1041    1203    1001                           1495
     LB/KT
      HW   0210    0200    0200    0190
      TW   0940    0920    0930    0920

   LGTH    7269    5006    7269    5006  <-- 20
   SLOPE -0.67   -0.66    0.67    0.66

   *17  R CLOSED TO AIRCRAFT OVER 140000 LBS GTOW  <-- 21
   *35  R CLOSED TO AIRCRAFT OVER 140000 LBS GTOW
   PART  2 ** END-TGW **
```

TRAINING USE ONLY

(7) Runway column headings. All data below a runway heading is valid for that runway only. Runway columns will be listed left to right starting with those you are most likely to use for takeoff. Data for up to seven runways can be listed; data for a runway not listed may be obtained from dispatch or load planning. An asterisk (*) following the runway column heading indicates you should check the remarks section (21) at the end.

(8) Engine rating and flap setting for which the data following are valid.

(9) FLEX TEMP GW/V-SPEED Section: A range of gross weights from approximately 3,000 lbs. below to 6,000 lbs. above planned gross weight are the row headings. Choose the row with a gross weight equal to or up to 3,000 lbs greater than actual gross weight, proceed across to the appropriate runway column, and find the FLEX TEMP (in °C) and the MAX AMB TEMP (in °F) for a reduced thrust takeoff. FLEX TEMP-C is the number dialed into the assumed temperature selector for a flex takeoff. MAX AMB-F is the maximum ambient temperature in degrees Fahrenheit for which a flex takeoff is authorized. At outside temperatures above the MAX AMB-F, a full power takeoff must be performed. Directly below the proper FLEX TEMP-C/MAX AMB-F are the first three appropriate takeoff V-speeds (V_1, V_R, & V_2). The last three appropriate takeoff V-speeds (FR, SR, & MM) are in the last column to the right.
Note: These V-speeds are not valid for tailwinds.

(10) V-SPEEDS: If a takeoff is authorized for a given gross weight/ flap/ runway combination, V_1, V_R, & V_2 will be listed in the appropriate runway column/ gross weight rows. If a gross weight row equal to or up to 3,000 lbs greater than actual gross weight is not listed, contact Load Planning for V-speeds. Absence of V-speeds for a particular combination means takeoff is not authorized (Exception: MC is displayed, See Item 14). These V-speeds are valid for either full power or reduced thrust (flex) takeoffs in headwinds or crosswinds. In the far right column are the last three takeoff V-speeds: FR = flap retract, SR = slat retract, & MM = clean minimum maneuver .
Note: These V-speeds are not valid for tailwinds.
There are four possibilities for any gross weight/ flap/ runway combination in this section:

(11) Takeoff not authorized. This will be shown by a single N/A in place of the FLEX TEMP-C/ MAX AMB-F, and no V-speeds present.

12 Flex takeoff not authorized (full power must be used). This will be shown by the double NA/NA in place of the FLEX TEMP-C/ MAX AMB-F, and the appropriate V-speeds below.

13 Flex takeoff authorized. This will be shown by the presence of both the FLEX TEMP-C/ MAX AMB-F and the appropriate V-speeds below. The flight crew must be sure that the actual outside air temperature for takeoff is equal to or less than the MAX AMB-F temperature. If the actual outside air temperature for takeoff is greater than the MAX AMB-F temperature, then the takeoff must be made with the ART switch in AUTO and T.O. selected on the TRI. The V-speeds are valid for either a flex or full power takeoff.

Note: All Section 1 Limitations concerning Flex Takeoffs must adhered to.

14 MC (Minimum Control speed) is displayed with no V-speeds present. This will only occur on very short runways and at light gross weights. It does not mean that takeoff is not authorized. It means that the takeoff V-speeds for this situation are in the minimum control speed range. The "stored data" from which the runway analysis is built will not display takeoff speeds corrected for minimum control speed. The pilot weight manifest or radio closeout received at the gate will contain the correct takeoff speeds and these should be used. If a change of runway or takeoff configuration is required after gate departure, and MC is displayed in the Runway Analysis for the planned takeoff, then Load Planning must be contacted for V-speeds.

15 RUNWAY LIMIT GROSS WEIGHT section: A range of temperatures is listed from approximately 10° below to 20° above planned takeoff temperature. Choose the row equal to or greater than actual takeoff temperature (interpolation is authorized), proceed across to the appropriate runway column and find the (zero wind) RUNWAY LIMIT gross weight in 100's of pounds: 1442 = 144,200 lbs. (this figure may be larger than structural limit to allow room for abnormal condition weight penalties to be applied). This weight (corrected for winds if necessary) is compared to the CLIMB LIMIT gross weight; the lesser of the two is the maximum gross weight for takeoff.

16 CLIMB LIMIT GROSS WEIGHT section: Using the same range of temperatures described above, choose the temperature row equal to or greater than the actual takeoff temperature (interpolation is authorized). Proceed to the right of the form under the CLIMB

LIMIT column and read the CLIMB LIMIT gross weight in 100's of pounds: 1495 = 149,500 lbs. This weight is compared to the RUNWAY LIMIT gross weight; the lesser of the two is the maximum gross weight for takeoff.

17 HEADWIND/TAILWIND CORRECTION section: Using the appropriate runway column, read the headwind/tailwind pounds per knot correction (in pounds: 0220 = 220lbs). A headwind correction is added to and a tailwind correction is subtracted from the zero wind RUNWAY LIMIT gross weight. Tailwind correction (up to 10 knots) must be made, headwind correction is at the Captain's discretion. (V-speeds are not valid for tailwinds.)

18 CHART : The Runway Analysis will have three charts. Each chart accounts for one power/flap combination. For instance, the Runway Analysis section of the flight departure papers for a 217A powered aircraft will have three charts in order of priority (power/flap: 27A/11 , 27A/15 , & 27A/4). Optimum flap data will not appear in the Runway Analysis.

19 HEADING: This data is repeated at the beginning of every part.

20 RUNWAY DATA section: The length of runways is given in feet. If a column is for an intersection departure as noted in either the RUNWAY COLUMN HEADING or the REMARKS section, the length of runway available from the intersection is shown. Slope is shown in percent.

21 REMARKS section: Any asterisked items will be explained here, such as NOTAMs, runway remarks, intersection departure notes, etc.

CREW PROCEDURES

Flight crews receive takeoff data from Load Planning via radio closeout or hard copy. The Runway Analysis in the flight departure papers is provided to allow flight crews to determine their takeoff capability in the event of a change in takeoff runway or flap setting without having to re-contact Load Planning.

Note: The Accuload generated Pilot Weight Manifest from Load Planning takes into account abnormal conditions such as tailwind, low altimeter setting (less than 29.72), contaminated runway, or dispatch with inoperative systems. The Runway Analysis in the flight departure papers does not. **If any of these conditions exist, the appropriate takeoff weight penalty from this section must be applied. If the takeoff weight penalty for an abnormal takeoff condition is not published in this section, the Flight Crew must**

contact Load Planning for new data in the event of a change in takeoff runway or flap setting.

Note: If a performance condition (weight limit, MEL item, weather or runway condition) exists that would prevent use of reduced thrust for takeoff, an assumed temperature will not appear on the Pilot Weight Manifest from Load Planning. When calculating takeoff capability using the Runway Analysis, flight crews may not use reduced thrust for takeoff if the restricting performance condition or any prohibiting Section 1 Operating Parameters are in effect.

V-Speeds for Takeoff

The Flight Crew will be provided V-speeds in the Pilot Weight Manifest (or radio closeout) from Load Planning and also in the Runway Analysis section of the Flight Departure Papers.

Note: The Flex Temps/V-speeds provided by Load Planning via the Pilot Weight Manifest or radio closeout are based on a gross weight up to 2000 lbs. higher than actual to account for late arriving passengers and baggage. The Flex Temps/V-speeds in the Runway Analysis section of the Flight Departure Papers are based on the gross weight listed with no pad. This accounts for the differences sometimes found between Pilot Weight Manifest Flex Temps/V-speeds and Runway Analysis Flex Temps/V-speeds.

Note: V-Speeds in the Runway Analysis may only be used if they are listed for a gross weight equal to or up to 3,000 lbs greater than actual gross weight for takeoff. If a gross weight row equal to or up to 3,000 lbs greater than actual takeoff gross weight is not listed, contact Load Planning for V-Speeds.

Note: V-Speeds in the Runway Analysis are valid after application of any of the takeoff weight penalties in the Abnormal/Adjustments part of this section.

Note: If the Accuload system is totally down and Load Planning is unable to access it to get V-Speeds, the Flight Crew may calculate V-Speeds using the manual procedures in this section.

Sample Problems Using the Runway Analysis

Sample Problem #1. (Use the following figure as a guide.) You have received Flight Departure Papers containing the following Runway Analysis and also a Pilot Weight Manifest with numbers for Runway 14L at IAH based on the following conditions:

Flaps: 11°, Temp: 65°F, Winds: 1508, GTOW: 140,100 lbs. While taxiing, the tower changes your runway for departure to Runway 8. You need to check your capability for takeoff on Runway 8, and then find the appropriate flex temperature and V-speeds.

```
************* B  RUNWAY ANALYSIS      *************
TGW                     CO  487/04      A/C  888
 **** TAKEOFF GROSS WEIGHTS  MD80-217    - NORMAL BLEED    ****
 IAH ELEV    98  TEMP  61F  WIND 1512    PLANNED GW 140605

 - V-SPEEDS NOT VALID FOR TAILWINDS -    A   /PWR* 217   FLAP* 11
 RNWYS* 14L     08      09      26      27      32R     14R *
 GW FLEX TO/V-SPEEDS           FLEX TEMP-C/MAX AMB-F
147000 NA/NA   NA/NA   NA/NA   NA/NA   NA/NA   NA/NA    N/A
    V1  143     144     143     144     144     144              FR=159
    VR  147     147     147     147     147     147              SR=200
    V2  154     154     154     154     154     154              MM=249
144000 37/80   37/80   37/80   37/80   37/80   37/80    N/A
    V1  142     142     142     143     142     143              FR=158
    VR  146     146     146     146     146     146              SR=198
    V2  153     153     153     153     153     153              MM=247
141000 40/85   40/85   40/85   40/85   40/85   40/85    N/A
E   V1  141     141     141     141     141     141              FR=156
    VR  145     145     145     145     145     145              SR=196
    V2  151     151     151     151     151     151              MM=244
138000 43/89   43/89   43/89   43/89   43/89   43/89    N/A
    V1  139     140     139     140     140     140              FR=155
    VR  143     143     143     143     143     143              SR=194
    V2  150     150     150     150     150     150              MM=242
 TEMP-F                    RWY LIMIT GW                          CLIMB
    50  1598    1574    1600    1600    1600    1600    1333      1495
C   60  1595    1571    1600    1600    1600    1600    1322  D   1495
    70  1593    1567    1600    1597    1600    1600    1310      1495
    80  1588    1561    1600    1583    1600    1600    1293      1495
  LB/KT
    HW  0020    0020    0080    0030    0070       0    0220
    TW  0360    0650    0840    0850    0910    0220    1030
```

(A) Locate the data block for 217 power and flaps 11°.

(B) Locate the column for Runway 08.

(C) Enter the Runway Limit Gross Weight section at the rows appropriate to 65°F and read the values in the Runway 08 column. The RUNWAY LIMIT GROSS WEIGHT (zero wind) for 60°F is 157,100 lbs. and for 70°F is 156,700 lbs. Interpolation gives a RUNWAY LIMIT GROSS WEIGHT of about 156,900 lbs.

(D) Proceed on the same row to the right until you are under the CLIMB LIMIT column. The climb limit values for 60 F & 70 F are the same and the CLIMB LIMIT GROSS WEIGHT is 149,500 lbs.

Choose the lesser of RUNWAY LIMIT or CLIMB LIMIT gross weight as the maximum, in this case 149,500 lbs. Since the actual aircraft weight is 140,100 lbs., takeoff on Runway 08 is authorized.

(E) Find the flex temp and V-speeds. Enter the flex temp section at the row equal to or greater than a gross weight of 140,100 lbs. (Interpolation is authorized if desired.) The flex temp is 40 C and the maximum ambient temperature to perform a flex takeoff is 85 F. V-speeds are found just below the 40/85 flex temp/max amb. V_1= 141, V_R= 145, & V_2= 151. Move along the same rows to find FR= 156, SR= 196, & MM= 244.

Sample Problem #2. (Use the following figure as a guide.) You have received flight departure papers containing the following Runway Analysis and also a Pilot Weight Manifest with numbers for Runway 05R at MEX based on the following conditions:

Flaps: 04°, Temp: 70°F, Winds: 0304, GTOW: 120,000 lbs.

While taxiing, the tower changes your runway for departure to Runway 05L. You need to check your capability for takeoff on Runway 05L, and then find the appropriate flex temperature and V-speeds.

```
TGW                                   CO  726/18      A/C  801
 **** TAKEOFF GROSS WEIGHTS  MD80-217     - NORMAL BLEED      ****
 MEX ELEV  7341  TEMP  70F  WIND 0305     PLANNED GW 120000

 - V-SPDS NOT VALID FOR TAILWINDS -            PWR* 217   FLAP* 04
 RNWYS* 23L *  05L *  05R *  23R *
GW FLEX TO/V-SPEEDS            FLEX TEMP-C/MAX AMB-F
127000 23/10    N/A    23/10   N/A
    V1  149             149                                 FR=162
    VR  153             153                                 SR=187
    V2  157             157                                 MM=233
124000 29/32    N/A    29/32   N/A
    V1  147             148                                 FR=159
    VR  151             151                                 SR=183
    V2  155             155                                 MM=229
121000 35/75   23/10   35/75  29/32
    V1  145     144     145    145                          FR=158
    VR  148     148     149    149                          SR=182
    V2  152     152     152    153                          MM=227
118000 37/80   26/20   37/80  35/75
    V1  143     143     144    143                          FR=156
    VR  147     147     147    147                          SR=179
    V2  151     151     151    151                          MM=224
  TEMP-F                  RWY LIMIT GW                        CLIMB
    60 1327    1249    1327   1297                            1331
    70 1304    1228    1304   1274                            1312
    80 1269    1195    1269   1240                            1275
    90 1231    1159    1231   1203                            1233
  LB/KT
   HW     0    0170       0   0170
   TW  0600    0740    0660   0740

LGTH  12795   10958   12795  11896
SLOPE -0.08    0.03    0.08  -0.03

*23L  R SPECIAL ENGINE OUT DEPARTURE PROCEDURE IN EFFECT;
        SEE JEPPESEN 10-7 PAGE FOR DETAILS
*05L  R SPECIAL ENGINE OUT DEPARTURE PROCEDURE IN EFFECT;
        SEE JEPPESEN 10-7 PAGE FOR DETAILS
*05R  R SPECIAL ENGINE OUT DEPARTURE PROCEDURE IN EFFECT;
        SEE JEPPESEN 10-7 PAGE FOR DETAILS
*23R  R SPECIAL ENGINE OUT DEPARTURE PROCEDURE IN EFFECT;
        SEE JEPPESEN 10-7 PAGE FOR DETAILS
PART  2 ** END-TGW **
```

TRAINING USE ONLY

(A) Locate the data block for 217 power and flaps 04°.

(B) Locate the column for Runway 05L.

(C) Enter the Runway Limit Gross Weight section at the row appropriate to 70°F and read the value in the Runway 08 column. The RUNWAY LIMIT GROSS WEIGHT (zero wind) for 70°F is 122,800 lbs.

(D) Proceed on the same row (70°F) to the right until you are under the CLIMB LIMIT column and read the value. The CLIMB LIMIT GROSS WEIGHT is 131,200 lbs.

Choose the lesser of RUNWAY LIMIT or CLIMB LIMIT gross weight as the maximum, in this case 122,800 lbs. Since the actual aircraft weight is 120,000 lbs., takeoff on Runway 05L is authorized.

(E) Find the flex temp and V-speeds. Enter the flex temp section at the row equal to or greater than a gross weight of 120,000 lbs. (Interpolation is authorized if desired.) Using the 121,000 lb. row, the flex temp is 23° C and the maximum ambient temperature to perform a flex takeoff is 10° F. **Since the actual outside air temperature of 70° F is greater than the maximum ambient temperature for flex takeoff, a full power takeoff must be made.** Read the V-speeds: V_1= 144, V_R= 148, & V_2= 152. Move along the same rows to find FR= 158, SR= 182, & MM= 227.

EPR - Reduced Takeoff Thrust

ART switch to OFF, T.O. FLEX on TRI, Assumed Temp set in Selector.

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AS-SUMED TEMP °C	MAX AMB TEMP °F	ARTS OFF / STATIC SETTING (SET BY 60 KTS) AIRPORT PRESSURE ALTITUDE - FEET					
		0	1000	2000	3000	4000	5000 & ↑
26	67	-	-	-	-	-	2.03
28	70	-	-	-	-	2.02	2.01
30	73	-	-	-	-	2.00	2.00
32	78	-	-	-	1.98	1.98	1.98
34	84	-	-	1.96	1.96	1.96	1.96
36	84	1.93	1.94	1.94	1.94	1.94	1.93
38	88	1.92	1.92	1.92	1.91	1.91	1.91
40	90	1.90	1.90	1.90	1.90	1.90	1.90
42	93	1.89	1.89	1.89	1.89	1.88	1.88
44	97	1.87	1.87	1.87	1.87	1.87	1.87
46	100	1.86	1.86	1.86	1.85	1.86	-
48	104	1.84	1.84	1.84	1.84	-	-
50	108	1.83	1.82	1.82	-	-	-
Bleed Corrections:		AC Packs OFF +0.02 / Engine Anti-ice ON +0.00					

-217A

AS-SUMED TEMP °C	MAX AMB TEMP °F	ARTS OFF / STATIC SETTING (SET BY 60 KTS) AIRPORT PRESSURE ALTITUDE - FEET					
		0	1000	2000	3000	4000	5000 & ↑
25	16	-	-	2.01	2.01	2.01	2.01
27	25	-	-	1.99	1.99	1.99	1.99
30	35	-	1.98	1.98	1.97	1.97	1.97
32	44	-	1.96	1.96	1.96	1.96	1.96
34	53	-	1.94	1.94	1.94	1.94	1.94
36	78	1.93	1.93	1.93	1.93	1.92	1.92
38	82	1.91	1.91	1.91	1.91	1.91	1.91
41	85	1.89	1.89	1.89	1.89	1.89	1.89
43	89	1.88	1.88	1.88	1.88	1.87	1.87
45	93	1.86	1.86	1.86	1.86	1.86	-
47	97	1.84	1.84	1.84	1.84	-	-
50	101	1.82	1.82	1.82	-	-	-
Bleed Corrections:		AC Packs OFF +0.02 / Engine Anti-ice ON +0.00					

EPR – Normal Takeoff Thrust

ART switch ON, T.O. on TRI, Assumed Temp Selector set to 00.

-217

OAT °C	OAT °F	STATIC SETTING (SET BY 60 KTS) AIRPORT PRESSURE ALTITUDE - FEET SL	1000	2000	3000	4000	5000 AND ABOVE
-50	-58	1.93	1.98	2.04	2.05	2.05	2.05
-20	-4	"	"	2.04	2.05	2.05	2.05
-10	14	"	"	2.01	2.01	2.01	2.01
0	32	"	1.98	1.98	1.98	1.98	1.98
10	50	"	1.95	1.96	1.96	1.97	1.98
22	71	"	1.95	1.96	1.95	1.95	1.95
24	75	1.93	1.94	1.94	1.94	1.94	1.94
26	79	1.92	1.92	1.92	1.92	1.92	1.92
28	84	1.91	1.91	1.91	1.91	1.91	1.91
30	86	1.89	1.89	1.89	1.89	1.89	1.89
32	90	1.88	1.88	1.88	1.88	1.87	1.87
34	94	1.86	1.86	1.86	1.86	1.86	1.86
36	98	1.84	1.84	1.84	1.84	1.84	1.84
40	104	1.81	1.81	1.81	1.81	1.81	1.81
44	111	1.78	1.78	1.78	1.77	1.77	1.77
Bleed Corrections: AC Packs OFF +0.02 / Engine Anti-ice ON +0.00							

-217A

OAT °C	OAT °F	STATIC SETTING (SET BY 60 KTS) AIRPORT PRESSURE ALTITUDE - FEET SL	1000	2000	3000	4000	5000	6000	7000
-50	-58	1.93	1.96	1.98	2.00	2.02	2.04	2.04	2.04
22	71	"	"	"	"	2.01	2.01	2.01	2.01
24	75	"	"	"	2.00	2.00	2.00	2.00	2.00
26	79	"	"	1.98	1.99	1.98	1.98	1.98	1.98
28	84	"	1.96	1.97	1.97	1.97	1.97	1.97	1.97
30	86	1.93	1.95	1.95	1.95	1.95	1.95	1.95	1.95
32	90	1.91	1.93	1.93	1.93	1.93	1.93	1.93	1.93
34	94	1.89	1.91	1.91	1.90	1.90	1.90	1.90	1.90
36	98	1.88	1.88	1.88	1.88	1.88	1.88	1.88	1.88
38	102	1.86	1.86	1.86	1.86	1.86	1.86	1.86	1.86
40	104	1.85	1.84	1.84	1.84	1.84	1.84	1.84	1.84
42	107	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83
44	111	1.81	1.81	1.81	1.81	1.81	1.81	1.81	1.81
Bleed Corrections: AC Packs OFF +0.02 / Engine Anti-ice ON +0.00									

EPR - Maximum Takeoff Thrust

ART switch to OFF, T.O. on TRI, Assumed Temp Selector set to 00.

-217

OAT °C	OAT °F	STATIC SETTING (SET BY 60 KTS) AIRPORT PRESSURE ALTITUDE - FEET SL	1000	2000	3000	4000	5000 AND ABOVE
-50	-58	1.98	2.04	2.08	2.10	2.10	2.10
-20	-4	"	"	"	2.10	2.10	2.10
-10	14	"	"	2.07	2.07	2.07	2.07
0	32	"	"	2.04	2.04	2.04	2.06
10	50	"	2.01	2.02	2.03	2.04	2.06
22	71	"	"	2.02	2.03	2.03	2.03
24	75	"	"	2.02	2.02	2.02	2.02
26	79	"	2.01	2.01	2.01	2.01	2.00
28	84	"	1.99	1.99	1.99	1.99	1.99
30	86	1.98	1.98	1.98	1.98	1.98	1.98
32	90	1.96	1.96	1.96	1.96	1.96	1.96
34	94	1.95	1.95	1.95	1.95	1.95	1.95
36	98	1.93	1.93	1.93	1.93	1.93	1.93
40	104	1.90	1.90	1.90	1.90	1.90	1.90
44	111	1.87	1.87	1.87	1.87	1.87	1.87
Bleed Corrections: AC Packs OFF +0.02 / Engine Anti-ice ON +0.00							

-217A

OAT °C	OAT °F	STATIC SETTING (SET BY 60 KTS) AIRPORT PRESSURE ALTITUDE - FEET SL	1000	2000	3000	4000	5000	6000	7000
-50	-58	1.99	2.00	2.02	2.04	2.06	2.07	2.07	2.07
22	71	"	"	"	"	2.05	2.05	2.05	2.05
24	75	"	"	"	2.04	2.04	2.04	2.04	2.04
26	79	"	"	"	2.03	2.03	2.03	2.03	2.03
28	84	1.99	"	2.02	2.02	2.02	2.02	2.01	2.01
30	86	1.98	2.00	2.00	2.00	2.00	2.00	2.00	2.00
32	90	1.96	1.98	1.98	1.98	1.98	1.98	1.98	1.98
34	94	1.95	1.96	1.96	1.96	1.96	1.96	1.95	1.95
36	98	1.93	1.94	1.94	1.93	1.93	1.93	1.93	1.93
38	102	1.92	1.92	1.92	1.92	1.91	1.91	1.91	1.91
40	104	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
42	107	1.89	1.89	1.89	1.89	1.88	1.88	1.88	1.88
44	111	1.88	1.87	1.87	1.87	1.87	1.87	1.87	1.87
Bleed Corrections: AC Packs OFF +0.02 / Engine Anti-ice ON +0.00									

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EPR - Denver Bump

Both air conditioning packs on for takeoff.
Both air conditioning packs off for single engine go-around.

-217A

DENVER BUMP EPR SETTINGS			
TEMP °C	TEMP °F	TAKEOFF	GO-AROUND
-40	-40	2.07	2.08
22	71	2.07	2.08
23	73	2.06	2.07
27	80	2.05	2.07
32	90	2.03	2.06
33	92	2.01	2.06
34	94	1.99	2.05
35	95	1.97	2.04
36	98	1.95	2.02
37	99	1.93	2.00
43	109	1.87	1.90
45	113	1.86	1.88
Bleed Corrections: Engine & Airfoil Anti-ice ON -.03 from Go-Around EPR			

Minimum N_1 for Takeoff

-217 & -217A

EPR	MINIMUM N_1, %RPM			
	OUTSIDE AIR TEMPERATURE C			
	-20°	-10°	0°	+10°
2.12	91.1	93.0	-	-
2.10	90.0	91.8	93.6	95.4
2.05	87.2	88.9	90.6	92.3
2.00	84.3	86.0	87.7	89.3
1.95	81.8	83.5	85.1	86.7
1.90	79.6	81.2	82.8	84.4
1.85	78.0	79.6	81.2	82.7
1.80	76.8	78.4	79.9	81.4
1.75	75.5	77.0	78.5	80.0
1.70	74.0	75.5	77.0	78.5
1.65	72.5	73.9	75.4	76.8

NOTE: To be used only as an EPR error crosscheck and not for setting takeoff thrust. The actual N_1 during takeoff will normally be higher than the minimum values tabulated above.

EPR - Maximum Climb Thrust

-217

RAT °C	PRESSURE ALTITUDE - FEET 1000	2000	5000	10000	15000	20000	25000	30000	35000
-50	2.01	2.07	2.09	2.09	2.08	2.08	2.08	2.08	2.08
-26	"	2.07	2.09	2.09	2.08	2.08	2.08	2.08	2.08
-20	"	2.06	2.06	2.06	2.05	2.05	2.04	2.04	2.04
-16	2.01	2.03	2.03	2.03	2.02	2.02	2.02	2.02	2.04
-12	2.00	2.00	2.00	2.00	2.00	1.99	1.99	2.00	2.04
-8	1.97	1.97	1.97	1.97	1.97	1.96	1.96	2.00	2.02
-4	1.95	1.95	1.95	1.95	1.94	1.94	1.95	1.99	1.99
0	1.92	1.92	1.92	1.92	1.91	1.91	1.95	1.97	1.97
4	1.89	1.89	1.89	1.89	1.89	1.90	1.94	1.94	1.94
8	1.87	1.87	1.87	1.87	1.87	"	1.92	1.92	1.92
12	1.84	1.84	1.84	1.84	"	1.90	1.90	1.90	1.90
16	1.82	1.82	1.82	1.83	1.87	1.88	1.87	1.87	1.87
20	1.78	1.78	1.78	1.83	1.86	1.85	1.85	1.85	-
30	1.73	1.74	1.77	1.79	1.79	1.78	1.78	-	-
40	1.71	1.71	1.71	1.71	1.70	1.70	1.70	-	-
46	1.65	1.65	1.65	1.69	1.64	-	-	-	-
Anti-ice Bleed Corrections: Engine ON -0.08 / Engine & airfoil -0.10									

-217A

RAT °C	PRESSURE ALTITUDE - FEET 1000	2000	5000	10000	15000	20000	25000	30000	35000
-50	1.97	2.00	2.06	2.06	2.05	2.05	2.05	2.05	2.05
-20	"	"	2.06	2.06	2.05	2.05	2.05	2.05	2.05
-16	"	"	2.03	2.03	2.03	2.02	2.02	2.02	2.02
-12	"	2.00	2.00	2.00	2.00	2.00	1.99	"	"
-8	1.97	1.98	1.98	1.98	1.97	1.97	1.97	"	"
-4	1.95	1.95	1.95	1.95	1.95	1.94	"	2.02	2.02
0	1.92	1.92	1.92	1.92	1.92	1.91	"	2.00	2.00
4	1.90	1.90	1.90	1.90	1.89	"	1.97	1.97	1.97
8	1.87	1.87	1.87	1.87	1.88	"	1.95	1.95	1.95
12	1.84	1.84	1.84	1.84	"	1.91	1.92	1.92	1.92
16	1.82	1.82	1.82	"	"	1.90	1.90	1.90	1.90
20	1.78	1.78	1.80	"	1.88	1.87	1.87	1.87	-
24	1.75	1.77	"	1.84	1.85	1.85	1.84	1.84	-
30	1.75	1.77	1.80	1.82	1.81	1.81	1.80	-	-
40	1.73	1.73	1.73	1.73	1.73	1.72	1.72	-	-
46	1.66	1.66	1.66	1.66	1.66	-	-	-	-
Anti-ice Bleed Corrections: Engine ON -0.08 / Engine & airfoil -0.10									

Climb Gradient Charts

The following tables are informational only and provide an example of the two engine climb capability.

Note: Calculations are for flaps 15° takeoffs (conservative for flaps 11° & 4°). Maximum climb thrust, sea level, standard day, long range climb, all engines operating, 250 KIAS climb speed.

-217 & -217A

WT. 1000 LBS.	Average Climb Gradient to 3000 FT FT/NM	Average Climb Gradient to 5000 FT FT/NM
100	1128	1092
120	912	871
140	744	708
150	672	648

The two engine Second Segment Climb gradient for a 130,000 lb. aircraft is 814 FT/NM. (-217 & -217A.)

ABNORMAL/ ADJUSTMENTS

Departure with Abnormal Conditions

The following abnormal takeoff conditions require weight penalties to be applied to the allowable takeoff weight. The Dispatcher will input these penalties so that they are applied in the Pilot Weight Manifest that is provided to you. The Runway Analysis in the Flight Departure Paperwork does not take into account any abnormal takeoff conditions. If the Flight Crew needs to use the Runway Analysis in the Flight Departure Paperwork to calculate takeoff capability when any abnormal takeoff condition is in effect, the appropriate takeoff weight penalty from this section must be applied.

Note: V-Speeds in the Runway Analysis in the Flight Departure Paperwork are valid after application of any of the takeoff weight penalties in this section. (They are only valid if listed for a gross weight equal to or up to 3,000 lbs heavier than actual takeoff gross weight.)

Weather Related Abnormal Conditions:

- Tailwind
- Low altimeter setting (less than 29.72)
- Contaminated runway: standing water, slush, or snow

Aircraft Related Abnormal Conditions:

- Automatic ground spoilers actuator inoperative
- Inboard ground spoilers inoperative
- Right engine hydraulic pump inoperative
- Approach idle fail high
- Any other MEL item that requires a performance penalty

Runway Available Reduced From The Normal Length.

The manual corrections found in this section will almost always be much larger than the corrections made by the Accuload system. This is due to the fact that Accuload takes into account more factors and is able to calculate penalties more precisely. The manual corrections cover wider ranges of variables, are very conservative, and usually will not compare with Accuload generated penalties.

Headwind/Tailwind Correction

For explanation of how to make the correction for a headwind or tailwind, refer to the instructions on page 11.

Low Altimeter Setting Correction

For an altimeter setting below 29.72, subtract the appropriate weight (found in the table below) from both the Runway Limit and Climb Limit gross weights.

-217/-217A

CORRECTION TO ALLOWABLE TAKEOFF WEIGHT FOR LOW ALTIMETER SETTING SUBTRACT CORRECTION FIGURE FROM THE ALLOWABLE TAKEOFF WEIGHT					
ALTIMETER SETTING	CORRECTION (POUNDS)	ALTIMETER SETTING	CORRECTION (POUNDS)	ALTIMETER SETTING	CORRECTION (POUNDS)
29.71	75	29.61	825	29.51	1575
29.70	150	29.60	900	29.50	1650
29.69	225	29.59	975	29.49	1725
29.68	300	29.58	1050	29.48	1800
29.67	375	29.57	1125	29.47	1875
29.66	450	29.56	1200	29.46	1950
29.65	525	29.55	1275	29.45	2025
29.64	600	29.54	1350	29.44	2100
29.63	675	29.53	1425	29.43	2175
29.62	750	29.52	1500	29.42	2250
Subtract another 75 lbs. for each 0.01 inch HG. below 29.42 inch HG.					

Example: The sample problem on page 9 calculates a Runway Limit gross weight of 155,300 lbs. and a Climb Limit gross weight of 149,500 lbs. If the altimeter setting for takeoff was 29.52 the takeoff weight penalty is 1500 lbs. The corrected Runway Limit gross weight is 153,800 and the corrected Climb Limit gross weight is 148,000 lbs yielding a maximum allowable takeoff weight of 148,000 lbs.

Contaminated Runway

If the Flight Crew uses the Runway Analysis in the Flight Departure Paperwork to determine takeoff capability, the appropriate takeoff weight correction from the table below should be subtracted from the maximum runway limit weight.

-217

Contaminated Runway - Takeoff Weight Correction (lbs.)						
SL to 6000 FT / Slope -1% to 1% / Tailwind Takeoff Not Authorized						
Runway Length	¼ Inch Slush or Water (2 Inches Dry Snow)			½ Inch Slush or Water (4 Inches Dry Snow)		
	Flaps 4°	Flaps 11°	Flaps 15°	Flaps 4°	Flaps 11°	Flaps 15°
5,000	TBD	N/A	N/A	TBD	N/A	N/A
6,000	TBD	N/A	8,700	TBD	N/A	N/A
7,000	TBD	11,000	8,900	TBD	28,000	25,600
8,000	TBD	11,000	8,600	TBD	28,000	25,900
9,000	TBD	10,000	7,900	TBD	27,000	24,900
10,000	TBD	5,000	2,700	TBD	24,000	20,400
11,000	TBD	1,400	0	TBD	21,000	15,700
12,000	TBD	1,000	0	TBD	17,000	11,300
13,000	TBD	0	0	TBD	13,000	7,100

Note: Data for flaps 4° takeoffs was not available at the time of this revision.

Contaminated Runway

If the Flight Crew uses the Runway Analysis in the Flight Departure Paperwork to determine takeoff capability, the appropriate takeoff weight correction from the table below should be subtracted from the maximum runway limit weight.

-217A

Contaminated Runway - Takeoff Weight Correction (lbs.)						
SL to 6000 FT / Slope -1% to 1% / Tailwind Takeoff Not Authorized						
Runway	¼ Inch Slush or Water (2 Inches Dry Snow)			½ Inch Slush or Water (4 Inches Dry Snow)		
Length	Flaps 4°	Flaps 11°	Flaps 15°	Flaps 4°	Flaps 11°	Flaps 15°
5,000	TBD	N/A	N/A	TBD	N/A	N/A
6,000	TBD	9,000	9,000	TBD	N/A	N/A
7,000	TBD	9,000	8,800	TBD	26,500	26,100
8,000	TBD	8,700	8,600	TBD	26,700	26,400
9,000	TBD	8,300	8,300	TBD	26,700	26,200
10,000	TBD	5,400	2,400	TBD	24,100	21,400
11,000	TBD	0	0	TBD	19,100	16,500
12,000	TBD	0	0	TBD	14,400	11,800
13,000	TBD	0	0	TBD	10,000	7,200

Example: The sample problem on page 9 calculates a Runway Limit gross weight of 155,300 lbs. If there was ¼" of standing water on runway 8 the takeoff weight penalty for a flaps 11° takeoff would be 8300 lbs. (Interpolation between 8300 and 5400 is authorized if necessary.) The corrected Runway Limit gross weight is 147,000 lbs and the Climb Limit gross weight remains 149,500 lbs yielding a maximum allowable takeoff weight of 147,000 lbs.

Automatic Ground Spoilers Actuator Inoperative

If the Flight Crew uses the Runway Analysis in the Flight Departure Paperwork to determine takeoff capability, the appropriate takeoff weight correction from the table below should be subtracted from the maximum runway limit weight.

-217/-217A

Automatic Ground Spoilers Actuator Inop - Takeoff Weight Corr. (lbs.)								
Runway slopes -2% to +1.7% / Winds -10 to +30								
Airport Pressure Altitude	Runway Length							
	6000	7000	8000	9000	10,000	11,000	12,000	13,000
	Flaps 4°							
Sea Level	5100	4500	3900	3400	3100	2800	2600	2300
2000	4900	4300	3900	3400	3100	2800	2500	2400
4000	N/A	4100	3700	3300	3100	2800	2500	2400
6000	N/A	3700	3400	3100	2900	2700	2400	2200
	Flaps 11°							
Sea Level	5300	4700	4000	3600	3200	2900	2600	2300
2000	5200	4600	4000	3500	3200	2800	2600	2400
4000	4900	4400	3900	3400	3100	2800	2600	2300
6000	4400	4000	3600	3200	3000	2600	2500	2300
	Flaps 15°							
Sea Level	5200	4700	4300	3700	3300	2900	2800	2500
2000	5000	4500	4200	3800	3400	3100	2800	2400
4000	4800	4400	4100	3800	3400	3100	3200	2600
6000	4400	4200	3900	3800	3400	3100	2800	2900

Example: The sample problem on page 9 calculated a Runway Limit gross weight of 155,300 lbs. If the automatic ground spoilers actuator was inoperative, the takeoff weight penalty for a flaps 11° takeoff on runway 8 is 3600 lbs. (Interpolation between 3200 and 3600 is authorized if necessary.) The corrected Runway Limit Gross weight is 151,700 and the Climb Limit gross weight remains 149,500 yielding a maximum allowable takeoff weight of 149,500 lbs.

Inboard Ground Spoilers Inoperative

If the Flight Crew uses the Runway Analysis in the Flight Departure Paperwork to determine takeoff capability, the appropriate takeoff weight correction from the table below should be subtracted from the maximum runway limit weight.

-217/-217A

Inboard Ground Spoilers Inoperative - Takeoff Weight Corr. (lbs.)								
Runway slopes -2% to +1.7% / Winds -10 to +30 / A/C On or Off								
Airport Pressure Altitude	Runway Length							
	6000	7000	8000	9000	10,000	11,000	12,000	13,000
	Flaps 4°							
Sea Level	3100	2800	2400	2200	1900	1800	1600	1400
2000	3000	2700	2400	2100	1900	1800	1600	1500
4000	2800	2500	2300	2100	1900	1700	1600	1500
6000	2600	2300	2100	1900	1800	1600	1500	1300
	Flaps 11°							
Sea Level	3300	2900	2500	2200	2000	1800	1600	1400
2000	3200	2800	2500	2200	2000	1800	1600	1500
4000	3000	2700	2400	2100	1900	1800	1600	1500
6000	2700	2500	2300	2000	1900	1600	1500	1500
	Flaps 15°							
Sea Level	3300	2900	2700	2300	2200	1900	1700	1600
2000	3100	2800	2600	2400	2300	2000	1600	1700
4000	3000	2700	2600	2400	2200	2000	1700	1600
6000	2700	2600	2400	2400	2200	1900	1900	1600

Example: The sample problem on page 9 calculated a Runway Limit gross weight of 155,300 lbs. If the inboard ground spoilers were inoperative, the takeoff weight penalty for a flaps 11° takeoff on runway 8 is 2200 lbs. (Interpolation between 2200 and 2000 is authorized if necessary.) The corrected Runway Limit Gross weight is 153,100 and the Climb Limit gross weight remains 149,500 yielding a maximum allowable takeoff weight of 149,500 lbs.

Right Engine Hydraulic Pump Inoperative

If the Flight Crew uses the Runway Analysis in the Flight Departure Paperwork to determine takeoff capability, the appropriate takeoff weight correction from the table below should be subtracted from the maximum runway limit weight.

-217/-217A

Right Engine Hydraulic Pump Inop - Takeoff Weight Correction (lbs.)								
Runway slopes -2.0% to +1.7% / Winds -10 to +30 / A/C on or off								
Airport Pressure Altitude	Runway Length							
	6000	7000	8000	9000	10,000	11,000	12,000	13,000
SL to	Flaps 4°							
1000	N/A	1700	1500	1300	1200	1100	1000	900
2000	N/A	1600	1400	1300	1200	1000	1000	900
4000	N/A	1500	1400	1200	1100	1000	1000	900
6000	N/A	1400	1300	1200	1100	1000	900	900
SL to	Flaps 11°							
1000	N/A	1700	1500	1300	1200	1100	0	0
2000	N/A	1600	1400	1300	1100	1000	0	0
4000	N/A	1500	1400	1200	1100	1000	0	0
6000	N/A	1500	1300	1200	1100	900	0	0
SL to	Flaps 15°							
1000	N/A	1700	1600	1400	1300	1200	0	0
2000	N/A	1600	1500	1300	1200	1100	0	0
4000	N/A	1600	1400	1300	1200	1100	0	0
6000	N/A	1500	1300	1200	1100	1000	0	0

Example: The sample problem on page 9 calculated a Runway Limit gross weight of 155,300 lbs. If the right engine hydraulic pump were inoperative, the takeoff weight penalty for a flaps 11° takeoff on runway 8 is 1300 lbs. (Interpolation between 1300 and 1200 is authorized if necessary.) The corrected Runway Limit Gross weight is 154,000 and the Climb Limit gross weight remains 149,500 yielding a maximum allowable takeoff weight of 149,500 lbs.

Approach Idle Fail High - ARTS Not Reset

If the Flight Crew uses the Runway Analysis in the Flight Departure Paperwork to determine takeoff capability, the appropriate takeoff weight correction from the table below should be subtracted from the maximum runway limit weight.

-217/-217A

Approach Idle Fail High (ARTS not reset) - Takeoff Weight Corr (lbs.)								
Runway slopes -2.0% to +1.7% / Winds -10 to +30 / A/C on or off								
Airport Pressure Altitude	Runway Length							
	6000	7000	8000	9000	10,000	11,000	12,000	13,000
SL to	Flaps 4°							
1000	N/A	2800	2400	10700	17200	21000	21000	21000
2000	N/A	2600	2300	8400	15000	20400	20500	20500
4000	N/A	2500	2300	5100	12400	17200	19600	19600
6000	N/A	2400	2100	2000	8000	13000	16600	16600
SL to	Flaps 11°							
1000	N/A	2900	2500	9100	9000	9000	10600	10600
2000	N/A	2800	2400	6600	7400	7400	7400	9000
4000	N/A	2600	2300	3900	3900	3900	5500	5500
6000	N/A	2400	2200	1900	1800	1600	2500	2500
SL to	Flaps 15°							
1000	N/A	2900	3200	5200	5200	7200	7500	7500
2000	N/A	2700	2600	3900	3900	4700	6100	6100
4000	N/A	2700	2300	2100	1900	2000	3100	3100
6000	N/A	2500	2200	2000	1800	1600	400	400

Example: The sample problem on page 9 calculated a Runway Limit gross weight of 155,300 lbs. If the approach idle system fails to high, the takeoff weight penalty for a flaps 11° takeoff on runway 8 is 9100 lbs. (Interpolation between 9100 and 9000 is authorized if necessary.) The corrected Runway Limit Gross weight is 146,200 and the Climb Limit gross weight remains 149,500 yielding a maximum allowable takeoff weight of 146,200 lbs.

V-Speeds for Takeoff - Manual Calculation

Policy & Examples

Note: The following procedure for manual calculation of takeoff V-speeds is for use only when the Accuload system is totally "down" and the Load Planner is unable to use it to prepare the weight manifest. It is not to be used when the Accuload system is in operation.

The instructions for manually calculating V-speeds are on the front of the appropriate (-217 or -217A) foldout page in this section.

Note: Flex (reduced thrust) takeoffs are not authorized when using V-speeds calculated with this procedure.

Example problem #1

Flight 486 LAS to IAH		LAS runway	25R
Aircraft	806 / -217A	Elevation	2175'
Gross Weight	144,000	Runway slope	+1.03
Flaps	4°	Ambient temp	95°F

MD-80 TAKEOFF V-SPEEDS WORKSHEET						
GW 144,000	PWR -217A			ALT 2175		
FLAPS 4°	SLOPE +1.03			AMB TEMP 95		
	V1	VR	V2	V_{FR}	V_{SR}	MM
1 BASIC SPEEDS	154	159	166	Adjust basic speeds with Table 2A/2B corrections.		
2A SLOPE CORR	+3					
2B ALT/TEMP CORR	+5	+2				
CORRECTED SPEEDS	162	161	166	Choose higher of corrected or minimum speeds.		
3 MINIMUM SPEEDS	-	-	-			
TAKEOFF V-SPEEDS	162	162	166	171	198	246

Note that in this problem V_R was increased to equal V_1.

Example problem #2

Flight 1573 IAH to AUS		IAH runway	14L
Aircraft	870 / -217	Elevation	98'
Gross Weight	100,000	Runway slope	-.08
Flaps	11°	Ambient temp	35°F

MD-80 TAKEOFF V-SPEEDS WORKSHEET						
GW 100,000	PWR -217			ALT 98		
FLAPS 11°	SLOPE -0.08			AMB TEMP 35		
	V1	VR	V2	V_{FR}	V_{SR}	MM
1 BASIC SPEEDS	110	117	127	Adjust basic speeds with Table 2A/2B corrections.		
2A SLOPE CORR	-					
2B ALT/TEMP CORR	+1	-				
CORRECTED SPEEDS	111	117	127	Choose higher of corrected or minimum speeds.		
3 MINIMUM SPEEDS	118	122	131			
TAKEOFF V-SPEEDS	118	122	131	136	165	205

Note that in this problem minimum speeds need to be used for takeoff.

Blank V-Speeds Worksheet

MD-80 TAKEOFF V-SPEEDS WORKSHEET						
GW________________	PWR____________			ALT____________		
FLAPS______________	SLOPE__________			AMB TEMP_______		
	V1	VR	V2	VF_R	VS_R	MM
1 BASIC SPEEDS				Adjust basic speeds with Table 2A/2B corrections.		
2A SLOPE CORR						
2B ALT/TEMP CORR						
CORRECTED SPEEDS				Choose higher of corrected or minimum speeds.		
3 MINIMUM SPEEDS						
TAKEOFF V-SPEEDS						

INTENTIONALLY LEFT BLANK

Note: Use this procedure only if the Accuload system is not available.

1 BASIC TAKEOFF SPEEDS

GROSS	FLAPS 15°			FLAPS 11°			FLAPS 4°		
WEIGHT	V1	VR	V2	V1	VR	V2	V1	VR	V2
90,000	100	108	119	102	110	121	111	120	131
92,000	101	110	120	104	111	122	113	122	132
94,000	103	111	121	105	113	123	114	124	134
96,000	104	113	123	107	114	125	116	126	135
98,000	106	115	124	108	116	126	117	127	137
100,000	107	116	125	110	117	127	119	129	138
102,000	109	117	126	111	118	128	121	131	139
104,000	110	118	128	113	120	129	123	132	142
106,000	112	120	129	114	121	131	124	134	143
108,000	113	121	131	116	123	132	126	135	144
110,000	115	122	132	117	124	133	128	136	145
112,000	116	123	133	118	125	134	129	138	146
114,000	118	125	134	120	127	136	131	139	148
116,000	119	126	135	121	128	137	132	140	149
118,000	121	128	136	122	129	138	134	142	150
120,000	122	129	137	124	130	139	135	143	152
122,000	123	130	138	125	132	140	137	145	153
124,000	125	131	139	127	133	141	139	146	154
126,000	126	132	141	128	134	142	140	147	155
128,000	127	134	142	129	135	144	142	149	157
130,000	129	135	143	131	136	145	143	150	158
132,000	130	136	144	132	138	146	145	151	159
134,000	131	137	145	133	139	147	146	153	160
136,000	133	139	146	135	140	148	148	154	162
138,000	134	140	147	136	141	149	149	155	163
140,000	136	141	148	138	142	150	151	157	164
142,000	137	142	150	139	143	151	152	158	165
144,000	138	143	151	140	145	152	154	159	167
146,000	140	144	152	141	146	154	155	161	168
148,000	141	146	153	143	147	155	156	162	169
150,000	143	147	154	144	148	156	158	163	170

CHECK FOR MINIMUM SPEEDS IN SHADED AREA

PROCEDURE:

NOTE: FLEX TAKEOFFS NOT AUTHORIZED WHEN USING V-SPEEDS FROM THIS PROCEDURE.

1. DETERMINE BASIC TAKEOFF SPEEDS V1, VR, V2 FOR TAKEOFF WEIGHT AND FLAP SETTING FROM TABLE **1**. (NOTE: IF BASIC TAKEOFF SPEEDS ARE IN THE SHADED AREA OF TABLE **1**, A MINIMUM SPEED CHECK WILL BE REQUIRED AFTER DETERMINING THE CORRECTED TAKEOFF SPEEDS.)
2. DETERMINE CORRECTED TAKEOFF SPEEDS BY ADDING ΔV VALUES FROM CORRECTION TABLES **2A** AND **2B** (SUBTRACT WHEN SHOWN WITH NEGATIVE SIGN). IF V1 > VR DUE TO SLOPE CORRECTION, INCREASE VR TO EQUAL V1.
3. WHEN BASIC TAKEOFF SPEEDS OBTAINED IN STEP 1 ARE FROM THE SHADED AREA, USE THE HIGHER OF THE CORRECTED TAKEOFF SPEEDS OBTAINED IN STEP 2, OR THE MINIMUM SPEEDS FROM TABLE **3**. WHEN CHECKING MINIMUM SPEEDS IN TABLE **3**, ALWAYS USE ACTUAL TEMPERATURE.
4. THE TRANSITION SPEEDS (FLAP RETRACTION, SLAT RETRACTION, AND MINIMUM MANEUVER) ARE DETERMINED BY ENTERING TABLE **4.**

MD-80 TAKEOFF V-SPEEDS WORKSHEET

GW________________	PWR____________		ALT_____________		
FLAPS_____________	SLOPE___________		AMB TEMP_______		

	V1	VR	V2	V_{FR}	V_{SR}	MM
1 BASIC SPEEDS				Adjust basic speeds with Table 2A/2B corrections.		
2A SLOPE CORR						
2B ALT/TEMP CORR						
CORRECTED SPEEDS				Choose higher of corrected or minimum speeds.		
3 MINIMUM SPEEDS						
TAKEOFF V-SPEEDS						

4 TRANSITION SPEEDS

GROSS WEIGHT	FLAP RET	SLAT RET	MIN MAN
90,000		157	194
92,000		159	196
94,000		160	198
96,000	V2	162	201
98,000	+	163	203
100,000	5	165	205
102,000		167	207
104,000	FOR	168	209
106,000		170	211
108,000	11°	171	213
110,000	&	173	215
112,000	4°	175	217
114,000		176	219
116,000	FLAP	178	221
118,000		179	223
120,000		181	225
122,000		182	227
124,000		184	229
126,000		185	230
128,000		187	232
130,000		188	234
132,000	V2	189	236
134,000	+	191	238
136,000	15	192	239
138,000		194	241
140,000	FOR	195	243
142,000		196	245
144,000	15°	198	246
146,000		199	248
148,000	FLAP	201	249
150,000		202	251

-217
MD-80 TAKEOFF V-SPEEDS
-217

2A RUNWAY SLOPE CORRECTION Interpolate to nearest 1 knot	Flaps 4° or 11°	Flaps 15
CORRECTION TO V1 PER 1% UPHILL SLOPE ΔV1	+3	+5
CORRECTION TO V1 PER 1% DOWNHILL SLOPE ΔV1	-2	-3

2B ALTITUDE/TEMPERATURE CORRECTION - Corrections on a GW line are valid up to that gross weight.

TEMP °F / TEMP °C		-40 - 67°F / -40 - 19°C				68 - 76°F / 20 - 24°C				77 - 85°F / 25 - 29°C				86 - 94°F / 30 - 34°C				95 - 103°F / 35 - 39°C				104 -112°F / 40 - 44°C				113 - 122°F / 45 - 50°C			
FLAPS		15°		11°, 4°		15°		11°, 4°		15°		11°, 4°		15°		11°, 4°		15°		11°, 4°		15°		11°, 4°		15°		11°, 4°	
ALT (FT)	GW	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR
S.L.	120	1	0	1	0	1	0	2	1	1	1	2	1	2	1	3	1	2	2	3	2	3	2	5	2	4	3	5	3
TO	130	1	0	1	0	1	0	2	1	1	1	2	1	2	1	3	1	3	2	3	2	5	2	5	2	6	3	5	3
2000	150	1	0	1	0	1	0	2	1	2	1	2	1	3	1	3	1	5	2	3	2	7	2	5	2	8	3	5	3
2001	120	2	1	2	1	2	1	3	1	3	2	3	2	3	2	4	2	4	3	5	2	5	3	6	3	6	4	7	3
TO	130	2	1	2	1	3	1	3	1	3	2	3	2	4	2	4	2	5	3	5	2	6	3	6	3	8	4	7	3
4000	150	3	1	2	1	4	1	3	1	4	2	3	2	6	2	4	2	7	3	5	2	9	3	6	3	11	4	7	3
4001	120	3	2	4	2	4	3	5	2	4	3	6	3	5	3	6	4	6	4	7	4	7	4	8	4	8	4	9	4
TO	130	4	2	4	2	5	3	5	2	6	3	6	3	7	3	6	4	8	4	7	4	9	4	8	4	10	4	9	4
6000	150	6	2	4	2	7	3	5	2	8	3	6	3	10	3	6	4	12	4	7	4	13	4	8	4	14	4	9	4
6001	120	5	3	6	3	6	4	7	3	6	4	8	4	7	4	8	4	8	5	9	4	9	5	10	5	N	N	N	N
TO	130	7	3	6	3	7	4	7	3	8	4	8	4	9	4	8	4	10	5	9	4	11	5	10	5	/	/	/	/
8000	150	10	3	6	3	11	4	7	3	12	4	8	4	13	4	8	4	15	5	9	4	16	5	10	5	A	A	A	A

3 MINIMUM SPEEDS - Always use actual ambient temperature

TEMP °F / TEMP °C		UP TO 39°F / UP TO 4°C			40 - 57°F / 5 - 14°C			58 - 75°F / 15 - 24°C			76 - 93°F / 25 - 34°C			94 - 111°F / 26 - 44°C			112 - 122°F / 45 - 50°C		
ALT (FT)	FLAP	V1 MIN	VR MIN	V2 MIN	V1 MIN	VR MIN	V2 MIN	V1 MIN	VR MIN	V2 MIN	V1 MIN	VR MIN	V2 MIN	V1 MIN	VR MIN	V2 MIN	V1 MIN	VR MIN	V2 MIN
S.L.	15°	117	119	128	117	119	128	117	119	128	117	119	128	112	115	124	108	111	119
TO	11°	118	122	131	118	122	131	118	122	131	118	122	131	113	117	127	109	114	123
999	4°	118	124	133	118	124	133	118	124	133	118	124	133	113	119	129	109	115	124
1000	15°	117	119	129	116	118	127	116	118	127	115	117	126	110	113	122	106	109	117
TO	11°	119	122	132	117	121	130	117	121	130	116	120	129	111	116	124	107	112	120
1999	4°	119	124	134	117	123	132	117	123	132	116	122	131	111	117	126	107	113	121
2000	15°	117	119	129	114	117	125	114	117	125	113	115	124	108	111	120	104	107	115
TO	11°	119	123	132	115	119	128	115	119	128	113	117	127	109	114	122	105	110	118
2999	4°	119	125	134	115	121	130	115	121	130	113	119	129	109	115	124	105	111	119
3000	15°	116	118	127	112	115	124	112	115	124	110	113	121	106	109	117	102	106	113
TO	11°	117	121	130	113	117	127	113	117	127	110	115	124	106	111	120	102	107	115
3999	4°	117	122	132	113	119	129	113	119	129	110	116	126	106	112	121	102	108	116
4000	15°	114	116	125	110	114	122	110	114	122	107	111	119	104	107	115	100	105	111
TO	11°	115	119	128	111	116	125	111	116	125	108	113	122	104	109	118	101	106	113
4999	4°	115	121	130	111	117	127	111	117	127	108	114	123	104	110	119	101	107	114
5000	15°	111	114	123	109	111	120	109	111	120	105	108	117	102	105	113	98	103	109
TO	11°	112	117	126	110	115	123	110	115	123	106	111	120	103	108	116	99	104	111
5999	4°	112	118	128	110	116	125	110	116	125	106	112	121	103	109	117	99	105	112
6000	15°	109	112	120	106	110	118	106	109	118	103	106	114	100	103	110	N	N	N
TO	11°	110	115	123	107	112	121	107	112	121	104	109	117	101	106	113	/	/	/
6999	4°	110	116	125	107	113	122	107	113	122	104	110	118	101	107	114	A	A	A
7000	15°	107	110	118	104	108	115	104	107	112	101	104	112	99	102	108	N	N	N
TO	11°	108	113	121	105	110	118	105	110	118	102	110	118	99	104	111	/	/	/
7999	4°	108	114	122	105	111	119	105	111	119	102	111	119	99	105	112	A	A	A

Note: Use this procedure only if the Accuload system is not available.

1 BASIC TAKEOFF SPEEDS

GROSS WEIGHT	FLAPS 15° V1	FLAPS 15° VR	FLAPS 15° V2	FLAPS 11° V1	FLAPS 11° VR	FLAPS 11° V2	FLAPS 4° V1	FLAPS 4° VR	FLAPS 4° V2
90,000	100	108	119	101	110	120	110	120	130
92,000	102	109	120	102	111	121	112	122	132
94,000	103	111	121	104	113	123	114	123	133
96,000	105	112	123	106	114	124	116	125	135
98,000	106	114	124	107	116	126	118	126	136
100,000	108	115	125	109	117	127	120	128	138
102,000	109	116	126	111	118	128	122	130	139
104,000	111	118	128	112	120	129	123	131	141
106,000	112	119	129	114	121	131	125	133	142
108,000	114	121	131	115	123	132	126	134	143
110,000	115	122	132	117	124	133	128	136	144
112,000	116	123	133	118	125	134	130	137	146
114,000	118	125	134	120	126	135	131	139	147
116,000	119	126	136	121	128	137	133	140	149
118,000	121	128	137	122	129	138	135	142	150
120,000	122	129	138	124	131	139	136	143	151
122,000	124	130	139	125	132	140	138	145	153
124,000	125	131	140	127	133	141	139	146	154
126,000	126	133	141	128	134	142	141	147	155
128,000	128	134	142	130	135	143	142	149	156
130,000	129	135	143	131	137	144	144	150	158
132,000	131	136	144	132	138	146	145	151	159
134,000	132	137	145	134	139	147	147	153	160
136,000	133	139	146	135	140	148	148	154	161
138,000	135	140	147	136	141	149	150	155	163
140,000	136	141	148	137	143	150	151	157	164
142,000	137	142	150	139	144	151	152	158	165
144,000	139	143	151	140	145	152	154	159	166
146,000	140	144	152	141	146	153	155	160	168
148,000	142	146	153	143	147	155	157	162	169
150,000	143	147	154	144	148	156	158	163	170

CHECK FOR MINIMUM SPEEDS IN SHADED AREA

PROCEDURE:

NOTE: FLEX TAKEOFFS NOT AUTHORIZED WHEN USING V-SPEEDS FROM THIS PROCEDURE.

1. DETERMINE BASIC TAKEOFF SPEEDS V1, VR, V2 FOR TAKEOFF WEIGHT AND FLAP SETTING FROM TABLE **1**. (NOTE: IF BASIC TAKEOFF SPEEDS ARE IN THE SHADED AREA OF TABLE **1**, A MINIMUM SPEED CHECK WILL BE REQUIRED AFTER DETERMINING THE CORRECTED TAKEOFF SPEEDS.)
2. DETERMINE CORRECTED TAKEOFF SPEEDS BY ADDING ΔV VALUES FROM CORRECTION TABLES **2A** AND **2B** (SUBTRACT WHEN SHOWN WITH NEGATIVE SIGN). IF V1 > VR DUE TO SLOPE CORRECTION, INCREASE VR TO EQUAL V1.
3. WHEN BASIC TAKEOFF SPEEDS OBTAINED IN STEP 1 ARE FROM THE SHADED AREA, USE THE HIGHER OF THE CORRECTED TAKEOFF SPEEDS OBTAINED IN STEP 2, OR THE MINIMUM SPEEDS FROM TABLE **3**. WHEN CHECKING MINIMUM SPEEDS IN TABLE **3**, ALWAYS USE ACTUAL TEMPERATURE.
4. THE TRANSITION SPEEDS (FLAP RETRACTION, SLAT RETRACTION, AND MINIMUM MANEUVER) ARE DETERMINED BY ENTERING TABLE **4.**

MD-80 TAKEOFF V-SPEEDS WORKSHEET

GW____________	PWR__________			ALT__________		
FLAPS__________	SLOPE_________			AMB TEMP______		
	V1	VR	V2	V_{FR}	V_{SR}	MM
1 BASIC SPEEDS				Adjust basic speeds with Table 2A/2B corrections.		
2A SLOPE CORR						
2B ALT/TEMP CORR						
CORRECTED SPEEDS				Choose higher of corrected or minimum speeds.		
3 MINIMUM SPEEDS						
TAKEOFF V-SPEEDS						

4 TRANSITION SPEEDS

GROSS WEIGHT	FLAP RET	SLAT RET	MIN MAN
90,000		157	194
92,000		159	196
94,000		160	198
96,000	V2	162	201
98,000	+	163	203
100,000	5	165	205
102,000		167	207
104,000	FOR	168	209
106,000		170	211
108,000	11°	171	213
110,000	&	173	215
112,000	4°	175	217
114,000		176	219
116,000	FLAP	178	221
118,000		179	223
120,000		181	225
122,000		182	227
124,000		184	229
126,000		185	230
128,000		187	232
130,000		188	234
132,000	V2	189	236
134,000	+	191	238
136,000	15	192	239
138,000		194	241
140,000	FOR	195	243
142,000		196	245
144,000	15°	198	246
146,000		199	248
148,000	FLAP	201	249
150,000		202	251

-217A

MD-80 TAKEOFF V-SPEEDS

-217A

2A RUNWAY SLOPE CORRECTION Interpolate to nearest 1 knot	Flaps 4° or 11°	Flaps 15°
CORRECTION TO V1 PER 1% UPHILL SLOPE ΔV1	+3	+5
CORRECTION TO V1 PER 1% DOWNHILL SLOPE ΔV1	-2	-3

2B ALTITUDE/TEMPERATURE CORRECTION - Corrections on a GW line are valid up to that gross weight

TEMP °F / TEMP °C		-40 - 67°F / -40 - 19°C				68 - 76°F / 20 - 24°C				77 - 85F° / 25 - 29C°				86 - 94°F / 30 - 34°C				95 - 103°F / 35 - 39°C				104 -112°F / 40 - 44°C				113 - 122°F / 45 - 50C°			
FLAPS		15°		11°, 4°		15°		11°, 4°		15°		11°, 4°		15°		11°, 4°		15°		11°, 4°		15°		11°, 4°		15°		11°, 4°	
ALT (FT)	GW	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR	Δ V1	Δ VR
S.L.	80	0	0	1	1	0	0	1	1	0	0	1	1	1	1	1	2	2	1	2	2	2	1	3	3	4	2	5	4
TO	120	0	0	1	1	0	0	1	1	0	0	1	1	1	1	1	1	2	1	2	1	2	1	3	2	4	2	5	3
2000	150	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	3	2	2	1	5	2	3	1	7	3	6	2
2001	80	1	0	2	2	1	1	2	2	2	1	2	2	2	1	3	3	4	2	4	4	4	2	6	4	5	2	7	5
TO	120	1	0	2	1	1	1	2	1	2	1	2	1	2	1	3	2	4	2	4	2	4	2	6	3	5	2	7	3
4000	150	3	1	2	1	3	2	2	1	3	2	2	1	5	2	3	1	7	3	5	2	9	3	6	2	11	4	8	3
4001	80	2	1	3	3	2	2	3	3	3	2	4	4	4	2	5	4	5	2	7	5	6	3	8	5	7	3	8	6
TO	120	2	1	3	2	2	2	3	2	3	2	4	2	4	2	5	2	5	2	7	3	6	3	8	3	7	3	8	4
6000	150	6	2	3	1	6	2	4	2	6	3	5	2	9	3	6	2	11	4	8	2	13	4	9	3	14	5	10	3
6001	80	4	2	5	4	5	2	6	4	5	2	6	4	6	2	7	5	7	3	8	6	7	3	9	6	N	N	N	N
TO	120	4	2	5	2	5	2	6	3	5	2	6	3	6	3	7	4	7	3	8	4	7	3	9	4	/	/	/	/
8000	150	8	3	6	2	9	3	7	2	11	4	8	2	12	4	9	3	15	5	11	3	16	5	12	3	A	A	A	A

3 MINIMUM SPEEDS - Always use actual ambient temperature

TEMP °F / TEMP °C		-40 TO 68°F / -40 TO 20°C			69 - 77°F / 21 - 25°C			78 - 86°F / 26 - 30°C			87 - 95°F / 31 - 35°C			96 - 104°F / 36 - 40°C			105 - 113°F / 41 - 45°C		
ALT (FT)	FLAP	V1 MIN	VR MIN	V2 MIN	V1 MIN	VR MIN	V2 MIN	V1 MIN	VR MIN	V2 MIN	V1 MIN	VR MIN	V2 MIN	V1 MIN	VR MIN	V2 MIN	V1 MIN	VR MIN	V2 MIN
S.L.	15°	115	118	127	115	118	127	115	117	127	113	116	124	111	114	122	109	112	120
TO	11°	116	121	130	116	121	130	116	121	129	114	119	127	112	117	125	110	115	123
999	4°	116	122	132	116	122	132	116	122	131	114	120	129	112	118	127	110	116	125
1000	15°	114	116	125	114	116	125	114	116	125	112	114	122	109	112	120	107	110	118
TO	11°	115	120	128	115	120	128	115	120	128	112	117	125	110	114	122	108	113	121
1999	4°	115	121	130	115	121	130	115	121	130	112	118	127	110	115	124	108	114	122
2000	15°	112	115	124	112	115	124	111	114	123	109	112	120	106	110	118	105	108	116
TO	11°	113	118	126	113	118	126	112	117	126	110	115	123	107	113	121	106	111	119
2999	4°	113	119	128	113	119	128	112	118	128	110	116	125	107	114	122	106	112	120
3000	15°	111	114	122	111	114	122	109	112	121	107	110	118	104	108	116	103	106	114
TO	11°	112	117	125	112	117	125	110	115	123	108	113	121	106	111	119	104	109	116
3999	4°	112	118	127	112	118	127	110	116	125	108	114	122	106	112	120	104	110	117
4000	15°	110	113	121	109	112	120	107	110	119	105	108	116	103	106	114	101	104	111
TO	11°	111	116	123	110	115	122	108	113	122	106	111	119	104	109	116	102	107	114
4999	4°	111	117	125	110	116	124	108	114	123	106	112	120	104	110	117	102	108	115
5000	15°	108	111	120	106	110	118	105	108	116	103	106	114	101	104	111	99	102	110
TO	11°	109	114	122	107	113	121	106	112	119	103	109	116	101	107	114	100	105	113
5999	4°	109	115	124	107	114	123	106	113	120	103	110	117	101	108	115	100	106	114
6000	15°	106	110	118	104	108	116	103	107	114	101	104	112	99	102	109	97	101	107
TO	11°	107	113	121	105	111	119	104	110	117	102	107	114	100	105	113	98	103	111
6999	4°	107	114	123	105	112	121	104	111	118	102	108	115	100	106	114	98	104	112
7000	15°	104	107	115	102	106	114	101	104	112	99	102	110	97	101	108	95	100	105
TO	11°	105	111	118	103	109	117	102	108	115	100	105	113	98	103	111	96	101	109
7999	4°	105	112	119	103	110	118	102	109	116	100	106	114	98	104	112	96	102	110

ENROUTE

NORMAL

Two Engine Operation - Cruise Altitude Capability

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Flight Level	Maximum Gross Weight in Lbs to Cruise at the Flight Level with 1.3 G Buffet Protection STD Temp ± 10°C			
	LRC	.76 Mach	.78 Mach	.80 Mach
FL 370	114,000	114,000	112,000	106,000
FL 350	126,000	126,000	124,000	118,000
FL 330	138,000	140,000	136,000	126,000
FL 310	150,000	150,000	150,000	134,000
FL 290	150,000	150,000	150,000	140,000

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Flight Level	Maximum Gross Weight in Lbs to Cruise at the Flight Level with 1.3 G Buffet Protection STD Temp ± 10°C			
	LRC	.76 Mach	.78 Mach	.80 Mach
FL 370	114,000	114,000	112,000	106,000
FL 350	126,000	126,000	124,000	118,000
FL 330	138,000	140,000	136,000	128,000
FL 310	150,000	150,000	150,000	134,000
FL 290	150,000	150,000	150,000	140,000

EPR - Maximum Cruise Thrust

-217

RAT	PRESSURE ALTITUDE - FEET									
°C	10000	15000	20000	25000	27000	29000	31000	33000	35000	37000
-34	2.09	2.08	2.07	2.06	2.08	2.10	2.10	2.10	2.09	2.09
-30	2.07	2.06	2.05	2.03	2.05	2.07	2.08	2.08	2.07	2.07
-26	2.04	2.03	2.02	2.01	2.02	2.04	2.05	2.05	2.04	2.04
-22	2.01	2.00	1.99	1.98	2.00	2.01	2.02	2.02	2.01	2.01
-18	1.98	1.97	1.96	1.95	1.97	1.99	1.99	1.99	1.98	1.98
-14	1.95	1.94	1.93	1.92	1.94	1.96	1.98	1.96	1.95	1.95
-10	1.92	1.91	1.90	1.84	1.91	1.93	1.93	1.93	1.93	1.92
-6	1.89	1.88	1.87	1.86	1.88	1.90	1.91	1.90	1.90	1.89
-2	1.87	1.86	1.85	1.83	1.85	1.87	1.88	1.88	1.87	1.87
2	1.84	1.83	1.82	1.81	1.83	1.85	1.85	1.85	1.85	1.84
6	1.82	1.80	1.79	1.78	1.80	1.82	1.83	1.82	1.82	1.82
10	1.79	1.78	1.77	1.76	1.77	1.79	1.80	1.80	1.79	1.79
14	1.76	1.75	1.74	1.72	1.74	1.76	1.77	1.77	1.76	1.76
18	1.72	1.71	1.70	1.69	1.71	1.73	1.74	1.73	-	-
22	1.68	1.67	1.66	1.65	1.67	1.69	1.70	-	-	-
26	1.65	1.64	1.63	1.61	1.63	1.65	1.66	-	-	-
Anti-ice Bleed Corrections: Engine ON -0.08 / Engine & Airfoil ON -0.10										

-217A

RAT	PRESSURE ALTITUDE - FEET									
°C	10000	15000	20000	25000	27000	29000	31000	33000	35000	37000
-50	2.06	2.05	2.04	2.03	2.05	2.05	2.05	2.05	2.04	2.04
-30	2.06	2.05	2.04	2.03	2.05	2.05	2.05	2.05	2.04	2.04
-26	2.04	2.03	2.02	2.01	2.03	2.05	2.05	2.05	2.04	2.04
-22	2.01	2.00	1.99	1.98	2.00	2.02	2.03	2.02	2.02	2.01
-18	1.98	1.97	1.96	1.95	1.97	1.99	2.00	1.99	1.99	1.98
-14	1.95	1.94	1.93	1.92	1.94	1.96	1.97	1.96	1.96	1.95
-10	1.93	1.92	1.91	1.90	1.91	1.93	1.94	1.94	1.93	1.93
-6	1.90	1.89	1.87	1.87	1.88	1.90	1.91	1.90	1.90	1.90
-2	1.87	1.86	1.85	1.83	1.86	1.88	1.88	1.88	1.87	1.87
2	1.84	1.83	1.82	1.81	1.83	1.85	1.86	1.85	1.85	1.84
6	1.82	1.81	1.80	1.79	1.81	1.83	1.83	1.83	1.82	1.82
10	1.79	1.78	1.77	1.76	1.78	1.80	1.80	1.80	1.79	1.79
14	1.76	1.75	1.73	1.73	1.75	1.77	1.77	1.77	1.76	1.76
18	1.72	1.71	1.70	1.69	1.71	1.73	1.74	1.73	-	-
22	1.69	1.68	1.67	1.66	1.68	1.69	1.70	-	-	-
26	1.65	1.64	1.63	1.62	1.64	1.66	1.68	-	-	-
Anti-ice Bleed Corrections: Engine ON -0.08 / Engine & Airfoil ON -0.10										

-217

Long Range Cruise

WT. 1000 LB.	STANDARD DAY 250 KIAS TO 10,000 FT 290 KIAS TO 27,000 FT .72M TO CRUISE ALT			CRUISE (SET EPR & IAS)					EPR IAS FUEL FLOW
	FL 210	FL 230	FL 250	FL 270	FL 290	FL 310	FL 330	FL 350	FL 370
94	1.37 249 2474	1.40 247 2427	1.44 246 2390	1.47 241 2307	1.52 244 2319	1.57 244 2310	1.62 245 2313	1.67 245 2299	1.72 240 2262
98	1.39 253 2568	1.42 253 2535	1.46 249 2464	1.49 244 2391	1.54 251 2446	1.59 249 2418	1.64 250 2414	1.69 248 2387	1.75 243 2350
102	1.40 259 2673	1.44 257 2621	1.47 251 2537	1.51 252 2522	1.57 254 2527	1.61 255 2535	1.67 255 2520	1.72 251 2468	1.77 245 2426
106	1.42 263 2767	1.45 260 2702	1.48 255 2617	1.54 261 2668	1.58 259 2644	1.64 260 2638	1.69 259 2619	1.74 253 2552	1.80 246 2491
110	1.43 267 2860	1.46 262 2774	1.51 262 2748	1.56 264 2760	1.61 266 2764	1.66 265 2744	1.71 262 2699	1.76 256 2639	1.82 246 2572
114	1.45 270 2939	1.48 265 2855	1.53 269 2877	1.58 269 2861	1.63 269 2858	1.68 269 2845	1.73 264 2781	1.78 257 2710	1.85 246 2643
118	1.46 272 3004	1.49 268 2940	1.55 273 2979	1.60 274 2975	1.65 274 2967	1.70 272 2932	1.75 267 2869	1.81 257 2776	-
122	1.47 275 3090	1.52 277 3093	1.56 277 3079	1.61 279 3084	1.66 279 3073	1.71 274 3011	1.77 268 2949	1.83 258 2858	-
126	1.48 277 3161	1.54 283 3214	1.58 282 3194	1.63 283 3192	1.68 282 3171	1.73 276 3094	1.79 269 3016	1.85 258 2928	-
130	1.50 284 3299	1.55 285 3296	1.60 287 3309	1.65 287 3294	1.70 285 3253	1.75 279 3184	1.81 269 3083	-	-
134	1.52 290 3430	1.57 290 3408	1.62 292 3420	1.67 291 3394	1.72 287 3333	1.77 280 3264	1.83 270 3168	-	-
138	1.54 295 3548	1.59 295 3530	1.63 296 3522	1.68 294 3495	1.73 289 3416	1.79 281 3330	1.85 270 3238	-	-
142	1.55 298 3598	1.60 300 3604	1.65 300 3627	1.70 297 3582	1.75 291 3507	1.80 281 3397	-	-	-
146	1.57 301 3696	1.62 303 3704	1.67 303 3729	1.71 299 3662	1.77 293 3589	1.83 282 3482	-	-	-

ADJUST FUEL FLOW: ±10 LB/HR PER ±1°C OFF ISA
ENGINE ANTI-ICE ON: +6% FUEL FLOW
ENGINE & AIRFOIL ANTI-ICE ON: +17% FUEL FLOW

-217A

Long Range Cruise

STANDARD DAY — 250 KIAS TO 10,000 FT; 290 KIAS TO 27,000 FT; .72M TO CRUISE ALT

CRUISE (SET EPR & IAS) — EPR / IAS / FUEL FLOW

WT. 1000 LB.	FL 250	FL 270	FL 290	FL 310	FL 330	FL 350	FL 370
80	1.37 229 2067	1.40 229 2037	1.44 227 1999	1.48 227 1977	1.53 230 1993	1.59 233 2015	1.64 235 2042
85	1.39 235 2180	1.43 234 2146	1.46 230 2082	1.50 231 2068	1.56 232 2069	1.61 234 2077	1.67 235 2090
90	1.41 242 2301	1.45 238 2240	1.48 234 2183	1.54 239 2219	1.59 239 2209	1.64 240 2199	1.69 237 2182
95	1.44 247 2410	1.47 242 2333	1.52 245 2352	1.57 244 2335	1.62 247 2337	1.67 245 2323	1.72 241 2284
100	1.45 250 2504	1.49 248 2457	1.55 251 2478	1.60 252 2477	1.65 252 2469	1.70 249 2430	1.76 244 2388
105	1.48 254 2605	1.53 258 2634	1.57 258 2615	1.62 259 2612	1.68 257 2592	1.73 252 2530	1.79 245 2475
110	1.50 261 2745	1.55 263 2756	1.60 265 2766	1.65 265 2750	1.70 261 2698	1.76 255 2638	1.82 246 2570
115	1.53 270 2915	1.57 269 2887	1.62 270 2887	1.68 270 2869	1.73 264 2800	1.78 256 2727	1.85 246 2664
120	1.55 274 3021	1.60 276 3037	1.65 276 3020	1.70 273 2973	1.75 267 2909	1.81 257 2819	-
125	1.57 280 3158	1.62 281 3162	1.67 281 3144	1.72 275 3071	1.78 268 2998	1.84 257 2911	-
130	1.60 287 3310	1.64 286 3291	1.69 284 3253	1.75 278 3183	1.80 269 3084	-	-
135	1.62 292 3438	1.67 291 3421	1.71 286 3351	1.77 280 3279	1.83 269 3186	-	-
140	1.64 297 3572	1.69 295 3538	1.73 289 3454	1.79 281 3363	-	-	-
145	1.66 302 3705	1.70 297 3635	1.76 292 3568	1.81 281 3460	-	-	-

ADJUST FUEL FLOW: ±10 LB/HR PER ±1°C OFF ISA
ENGINE ANTI-ICE ON: +5% FUEL FLOW
ENGINE & AIRFOIL ANTI-ICE ON: +10% FUEL FLOW

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Mach .76 Cruise

250 KIAS TO 10,000 FT 290 KIAS TO 27,000 FT .72M TO CRUISE ALT	CRUISE (SET EPR & IAS)					EPR FUEL FLOW	
WT. 1000 LB.	INDICATED AIRSPEED / TRUE AIRSPEED							

WT. 1000 LB.	333/465 FL 230	319/462 FL 250	306/458 FL 270	293/454 FL 290	281/450 FL 310	269/447 FL 330	257/443 FL 350	245/436 FL 370
94	1.58 3785	1.59 3540	1.60 3273	1.62 3034	1.64 2821	1.67 2634	1.70 2469	1.74 2331
98	1.59 3812	1.60 3568	1.61 3305	1.63 3069	1.65 2860	1.68 2677	1.72 2512	1.76 2381
102	1.59 3888	1.60 3598	1.62 3338	1.64 3106	1.67 2901	1.70 2722	1.73 2558	1.78 2435
106	1.60 3917	1.61 3630	1.63 3373	1.65 3145	1.68 2944	1.71 2766	1.75 2607	1.80 2490
110	1.60 3947	1.62 3663	1.64 3409	1.66 3185	1.69 2989	1.72 2810	1.77 2660	1.82 2558
114	1.61 3978	1.63 3697	1.65 3448	1.67 3228	1.70 3034	1.74 2858	1.78 2714	1.85 2624
118	1.61 4011	1.63 3733	1.66 3488	1.68 3272	1.72 3078	1.75 2908	1.80 2772	-
122	1.62 4045	1.64 3771	1.67 3530	1.70 3317	1.73 3123	1.77 2961	1.83 2842	-
126	1.63 4080	1.65 3811	1.68 3573	1.71 3362	1.74 3172	1.79 3017	1.85 2908	-
130	1.64 4117	1.66 3851	1.69 3618	1.72 3407	1.76 3223	1.81 3076	-	-
134	1.64 4156	1.67 3894	1.70 3664	1.73 3454	1.77 3278	1.83 3147	-	-
138	1.65 4196	1.68 3938	1.71 3710	1.74 3503	1.79 3333	1.85 3215	-	-
142	1.66 4237	1.69 3984	1.72 3754	1.76 3554	1.80 3392	-	-	-
146	1.67 4280	1.70 4030	1.73 3801	1.77 3608	1.82 3463	-	-	-

ADJUST FUEL FLOW: ±10 LB/HR PER ±1°C OFF ISA
ENGINE ANTI-ICE ON: +6% FUEL FLOW
ENGINE & AIRFOIL ANTI-ICE ON: +17% FUEL FLOW

-217A

Mach .76 Cruise

250 KIAS TO 10,000 FT 290 KIAS TO 27,000 FT .72M TO CRUISE ALT	CRUISE (SET EPR & IAS)				EPR FUEL FLOW		
WT.	INDICATED AIRSPEED / TRUE AIRSPEED						
1000	319/462	306/458	293/454	281/450	269/447	257/443	245/436
LB.	FL 250	FL 270	FL 290	FL 310	FL 330	FL 350	FL 370
80	1.56 3444	1.58 3173	1.59 2925	1.60 2700	1.62 2499	1.64 2319	1.67 2174
90	1.57 3476	1.58 3208	1.60 2961	1.61 2741	1.63 2544	1.66 2370	1.69 2229
95	1.58 3511	1.59 3243	1.61 3000	1.63 2784	1.65 2592	1.68 2424	1.71 2284
100	1.59 3546	1.60 3281	1.62 3042	1.64 2830	1.67 2644	1.70 2479	1.74 2343
105	1.60 3583	1.61 3321	1.63 3087	1.65 2880	1.68 2699	1.72 2534	1.76 2407
110	1.60 3621	1.62 3363	1.64 3134	1.67 2933	1.70 2754	1.74 2594	1.79 2475
115	1.61 3662	1.63 3409	1.66 3185	1.68 2988	1.72 2810	1.76 2659	1.82 2557
120	1.62 3706	1.64 3457	1.67 3238	1.70 3044	1.74 2870	1.78 2727	1.85 2642
125	1.63 3752	1.65 3508	1.68 3294	1.72 3100	1.76 2934	1.81 2806	-
130	1.64 3800	1.67 3562	1.70 3351	1.73 3159	1.78 3002	1.84 2889	-
135	1.65 3851	1.68 3618	1.71 3406	1.75 3223	1.80 3076	-	-
140	1.66 3905	1.69 3675	1.73 3465	1.77 3291	1.83 3165	-	-
145	1.68 3960	1.71 3731	1.74 3528	1.79 3360	1.85 3246	-	-

ADJUST FUEL FLOW: ±10 LB/HR PER ±1°C OFF ISA
ENGINE ANTI-ICE ON: +5% FUEL FLOW
ENGINE & AIRFOIL ANTI-ICE ON: +10% FUEL FLOW

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Mach .78 Cruise

250 KIAS TO 10,000 FT 310 KIAS TO 25,000 FT .74M TO CRUISE ALT	CRUISE (SET EPR & IAS)				EPR FUEL FLOW		
WT.	INDICATED AIRSPEED / TRUE AIRSPEED						
1000	329/470	315/466	302/462	289/458	277/454	264/450	253/447
LB.	FL 250	FL 270	FL 290	FL 310	FL 330	FL 350	FL 370
94	1.63 3784	1.64 3500	1.66 3244	1.68 3015	1.71 2816	1.74 2642	1.78 2503
98	1.63 3815	1.65 3534	1.67 3281	1.69 3057	1.72 2863	1.76 2693	1.80 2557
102	1.64 3847	1.66 3569	1.68 3320	1.70 3101	1.74 2911	1.77 2745	1.82 2618
106	1.65 3881	1.66 3606	1.69 3361	1.72 3148	1.75 2960	1.79 2799	1.85 2689
110	1.65 3917	1.67 3645	1.70 3405	1.73 3196	1.77 3013	1.81 2856	1.87 2763
114	1.66 3953	1.68 3685	1.71 3451	1.74 3245	1.78 3067	1.83 2921	*
118	1.67 3991	1.69 3728	1.72 3499	1.76 3295	1.80 3122	1.86 2991	*
122	1.68 4031	1.70 3774	1.73 3548	1.77 3350	1.82 3181	1.88 3067	*
126	1.69 4073	1.71 3821	1.75 3597	1.79 3405	1.84 3252	*	*
130	1.70 4117	1.72 3970	1.76 3649	1.80 3461	1.86 3319	*	*
134	1.70 4164	1.74 3920	1.77 3705	1.82 3521	1.88 3398	*	*
138	1.71 4212	1.75 3970	1.79 3760	1.84 3593	*	*	*
142	1.72 4261	1.76 4022	1.80 3816	1.85 3661	*	*	*
146	1.73 4311	1.77 4078	1.81 3877	1.87 3739	*	*	*

ADJUST FUEL FLOW: ±10 LB/HR PER ±1°C OFF ISA
ENGINE ANTI-ICE ON: +6% FUEL FLOW
ENGINE & AIRFOIL ANTI-ICE ON: +17% FUEL FLOW

* High speed buffet margin less than 1.3 G

-217A

Mach .78 Cruise

250 KIAS TO 10,000 FT 310 KIAS TO 25,000 FT .74M TO CRUISE ALT	CRUISE (SET EPR & IAS)				EPR FUEL FLOW		
WT.	INDICATED AIRSPEED / TRUE AIRSPEED						
1000	329/470	315/466	302/462	289/458	277/454	264/450	253/447
LB.	FL 250	FL 270	FL 290	FL 310	FL 330	FL 350	FL 370
94	1.63 3784	1.64 3500	1.66 3244	1.68 3015	1.71 2816	1.74 2642	1.78 2503
98	1.63 3815	1.65 3534	1.67 3281	1.69 3057	1.72 2863	1.76 2692	1.80 2557
102	1.64 3847	1.66 3569	1.68 3320	1.70 3101	1.74 2911	1.77 2745	1.82 2618
106	1.65 3881	1.66 3606	1.69 3361	1.72 3108	1.75 2960	1.79 2799	1.85 2689
110	1.65 3917	1.67 3645	1.70 3405	1.73 3196	1.77 3013	1.81 2856	1.87 2763
114	1.67 3953	1.68 3685	1.71 3451	1.74 3245	1.78 3067	1.83 2921	*
118	1.67 3991	1.69 3728	1.72 3499	1.76 3295	1.80 3122	1.86 2991	*
122	1.68 4031	1.70 3774	1.73 3548	1.77 3350	1.82 3181	1.88 3067	*
126	1.69 4073	1.71 3821	1.75 3597	1.79 3405	1.84 3252	*	*
130	1.70 4117	1.72 3870	1.76 3604	1.80 3461	1.86 3319	*	*
134	1.70 4164	1.74 3920	1.77 3705	1.82 3521	1.88 3398	*	*
138	1.71 4212	1.75 3970	1.79 3760	1.84 3593	*	*	*
142	1.72 4261	1.76 4022	1.80 3816	1.85 3661	*	*	*
146	1.73 4311	1.77 4078	1.81 3877	1.87 3739	*	*	*

ADJUST FUEL FLOW: ±10 LB/HR PER ±1°C OFF ISA
ENGINE ANTI-ICE ON: +5% FUEL FLOW
ENGINE & AIRFOIL ANTI-ICE ON: +10% FUEL FLOW

* High speed buffet margin less than 1.3 G

-217

Mach .80 Cruise

250 KIAS TO 10,000 FT 310 KIAS TO 25,000 FT .74M TO CRUISE ALT	CRUISE (SET EPR & IAS)				EPR FUEL FLOW	
WT.	INDICATED AIRSPEED / TRUE AIRSPEED						

WT. 1000 LB.	338/482 FL 250	324/478 FL 270	311/474 FL 290	297/469 FL 310	285/465 FL 330	272/461 FL 350	260/459 FL 370
94	1.68 4126	1.70 3822	1.71 3545	1.74 3298	1.77 3081	1.81 2901	1.86 2774
98	1.68 4163	1.70 3861	1.72 3587	1.75 3345	1.78 3135	1.83 2969	1.88 2852
102	1.69 4201	1.71 3901	1.73 3631	1.76 3394	1.80 3194	1.85 3036	1.91 2945
106	1.70 4241	1.72 3943	1.75 3679	1.77 3446	1.82 3258	1.87 3115	1.94 3057
110	1.71 4281	1.73 3986	1.76 3726	1.79 3504	1.84 3327	1.90 3193	*
114	1.72 4322	1.74 4034	1.77 3778	1.81 3567	1.86 3402	1.92 3301	*
118	1.73 4365	1.75 4081	1.78 3833	1.83 3636	1.88 3479	1.95 3413	*
122	1.73 4410	1.76 4130	1.80 3892	1.84 3704	1.90 3566	*	*
126	1.74 4459	1.77 4183	1.81 3958	1.86 3783	1.93 3679	*	*
130	1.75 4508	1.79 4241	1.83 4028	1.88 3860	*	*	*
134	1.76 4557	1.80 4301	1.85 4097	1.90 3949	*	*	*
138	1.77 4612	1.81 4368	1.86 4178	1.93 4063	*	*	*
142	1.79 4670	1.83 4438	1.88 4255	1.95 4176	*	*	*
146	1.80 4731	1.84 4508	1.90 4340	*	*	*	*

ADJUST FUEL FLOW: ±10 LB/HR PER ±1°C OFF ISA
ENGINE ANTI-ICE ON: +6% FUEL FLOW
ENGINE & AIRFOIL ANTI-ICE ON: +17% FUEL FLOW

* High speed buffet margin less than 1.3 G

-217A

Mach .80 Cruise

250 KIAS TO 10,000 FT
310 KIAS TO 25,000 FT
.74M TO CRUISE ALT

CRUISE (SET EPR & IAS) — EPR / FUEL FLOW

WT. 1000 LB.	INDICATED AIRSPEED / TRUE AIRSPEED						
	338/482	324/478	311/474	297/469	285/465	272/461	260/459
	FL 250	FL 270	FL 290	FL 310	FL 330	FL 350	FL 370
94	1.68 4126	1.69 3822	1.71 3545	1.74 3298	1.77 3081	1.81 2901	1.86 2774
98	1.68 4163	1.70 3861	1.72 3587	1.75 3345	1.78 3135	1.83 2969	1.88 2852
102	1.69 4201	1.71 3901	1.73 3631	1.76 3394	1.80 3194	1.85 3036	1.91 2945
106	1.70 4241	1.72 3943	1.75 3679	1.78 3446	1.82 3258	1.87 3115	1.94 3057
110	1.71 4281	1.73 3986	1.76 3726	1.79 3504	1.84 3327	1.90 3193	*
114	1.72 4322	1.74 4034	1.77 3778	1.81 3567	1.86 3402	1.92 3301	*
118	1.73 4365	1.75 4081	1.78 3833	1.83 3636	1.88 3479	1.95 3413	*
122	1.73 4388	1.76 4130	1.80 3892	1.84 3704	1.90 3566	*	*
126	1.74 4459	1.77 4183	1.81 3958	1.86 3783	1.93 3679	*	*
130	1.75 4508	1.79 4241	1.83 4028	1.88 3860	1.95 3791	*	*
134	1.76 4557	1.80 4601	1.85 4097	1.90 3949	*	*	*
138	1.77 4612	1.81 4368	1.86 4178	1.93 4063	*	*	*
142	1.79 4670	1.83 4438	1.88 4255	1.95 4176	*	*	*
146	1.80 4731	1.84 4508	1.90 4340	*	*	*	*

ADJUST FUEL FLOW: ±10 LB/HR PER ±1°C OFF ISA
ENGINE ANTI-ICE ON: +5% FUEL FLOW
ENGINE & AIRFOIL ANTI-ICE ON: +10% FUEL FLOW

* High speed buffet margin less than 1.3 G

Indicated RAT to SAT Conversion Chart

	INDICATED MACH NUMBER												
IND	.34	.36	.38	.40	.42	.44	.46	.48	.50	.52	.54	.56	.58
RAT	TRUE (STATIC) AIR TEMPERATURE - OAT - °C												
40	33	32	31	30	29	28	27	26	25	24	26	21	20
38	31	30	30	29	28	27	25	24	23	22	21	20	18
36	29	28	28	27	26	25	23	22	21	20	19	18	17
34	28	27	26	25	24	23	21	20	19	18	17	16	15
32	26	25	24	23	22	21	19	18	17	16	15	14	13
30	24	23	22	21	20	19	17	16	15	14	13	12	11
28	22	21	20	19	18	17	16	15	14	12	11	10	9
26	20	19	18	17	16	15	14	13	12	10	9	8	7
24	18	17	16	15	14	13	12	11	10	9	8	7	6
22	16	15	14	13	12	11	10	9	8	7	6	5	4
20	14	13	12	11	10	9	8	7	6	5	4	3	2
18	12	11	10	9	8	7	6	5	4	3	2	1	0
16	10	9	8	7	6	5	4	3	2	1	0	-1	-2
14	8	7	6	5	4	3	2	1	0	-1	-2	-3	-4
12	6	5	4	3	2	1	0	-1	-2	-3	-4	-5	-6
10	4	4	3	2	1	0	-2	-3	-4	-5	-6	-7	-8
8	2	2	1	0	-1	-2	-4	-5	-6	-7	-8	-9	-10
6	0	-1	-1	-2	-3	-4	-6	-7	-8	-9	-10	-11	-12
4	-2	-3	-3	-4	-5	-6	-8	-9	-10	-11	-12	-13	-13
2	-4	-5	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15
0	-6	-7	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17
-2	-8	-9	-9	-10-	-11	-12	-13	-14	-15	-16	-17	-18	-19
-4	-10	-11	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21
-6	-12	-13	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23
-8	-14	-15	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25
-10	-16	-17	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27
-12	-18	-19	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-28
-14	-20	-21	-21	-22	-23	-24	-25	-26	-27	-28	-29	-30	-30
-16	-22	-23	-23	-24	-25	-26	-27	-28	-29	-30	-31	-31	-32
-18	-24	-25	-25	-26	-27	-28	-29	-30	-31	-32	-33	-33	-34
-20	-26	-27	-27	-28	-29	-30	-31	-32	-33	-34	-35	-35	-36
-22	-28	-28	-29	-29	-30	-31	-32	-33	-34	-35	-36	-37	-38
-24	-30	-31	-31	-32	-32	-33	-34	-35	-36	-37	-38	-39	-39
-26	-32	-33	-33	-34	-35	-36	-36	-37	-38	-39	-40	-41	-41
-28	-34	-35	-35	-36	-37	-38	-38	-39	-40	-41	-42	-43	-43
-30	-36	-37	-37	-38	-38	-39	-40	-41	-42	-43	-44	-45	-45
-32	-38	-38	-39	-39	-40	-41	-42	-43	-44	-45	-46	-47	-47
-34	-40	-40	-41	-41	-42	-43	-44	-45	-46	-47	-48	-49	-49
-36	-42	-42	-43	-43	-44	-45	-46	-47	-48	-49	-50	-50	-51
-38	-44	-44	-45	-45	-46	-47	-48	-49	-50	-51	-52	-52	-52
-40	-46	-46	-47	-47	-48	-49	-50	-51	-52	-53	-54	-54	-54

Indicated RAT to SAT Conversion Chart

	INDICATED MACH NUMBER												
IND	.60	.62	.64	.66	.68	.70	.72	.74	.76	.78	.80	.82	.84
RAT	TRUE (STATIC) AIR TEMPERATURE - OAT - °C												
40	20	19	17	16	14	13	11	9	8	6	4	3	1
38	18	17	15	14	12	11	9	7	6	5	3	1	-1
36	17	15	14	12	10	9	8	6	4	3	1	-1	-3
34	15	13	12	10	9	7	6	4	3	1	-1	-3	-5
32	13	11	10	8	7	5	4	2	1	-1	-3	-5	-7
30	11	10	8	6	5	4	2	0	-2	-3	-5	-7	-8
28	9	8	6	5	3	2	0	-2	-3	-5	-7	-9	-10
26	7	6	4	3	1	0	-2	-4	-5	-6	-8	-10	-12
24	5	4	3	1	-1	-2	-4	-5	-7	-8	-10	-12	-14
22	3	2	1	-1	-3	-4	-5	-7	-9	-10	-12	-14	-15
20	2	0	-2	-3	-5	-6	-7	-9	-10	-12	-14	-16	-17
18	0	-2	-3	-5	-6	-8	-9	-11	-12	-13	-16	-18	-19
16	-2	-4	-5	-7	-8	-9	-11	-13	-14	-15	-17	-19	-20
14	-4	-6	-7	-9	-10	-11	-13	-14	-16	-17	-19	-21	-22
12	-6	-8	-9	-10	-12	-13	-14	-16	-18	-19	-21	-23	-24
10	-8	-9	-11	-12	-13	-15	-16	-18	-19	-21	-23	-25	-26
8	-10	-11	-12	-14	-15	-17	-18	-20	-21	-22	-24	-26	-27
6	-12	-13	-14	-16	-17	-19	-20	-22	-23	-24	-26	-28	-29
4	-14	-15	-16	-18	-19	-20	-22	-23	-25	-26	-28	-30	-31
2	-15	-17	-18	-19	-21	-22	-24	-25	-26	-28	-30	-32	-33
0	-17	-19	-20	-21	-23	-24	-25	-27	-28	-29	-31	-33	-34
-2	-19	-20	-22	-23	-25	-26	-27	-29	-30	-31	-33	-35	-36
-4	-21	-22	-24	-25	-26	-28	-29	-30	-32	-33	-35	-37	-38
-6	-23	-24	-25	-27	-28	-29	-31	-32	-34	-35	-37	-39	-40
-8	-25	-26	-27	-29	-30	-31	-33	-34	-35	-37	-38	-40	-41
-10	-27	-28	-29	-30	-32	-33	-34	-36	-37	-38	-40	-42	-43
-12	-28	-30	-31	-32	-33	-35	-36	-38	-39	-40	-42	-44	-45
-14	-30	-32	-33	-34	-35	-37	-38	-39	-41	-42	-44	-46	-47
-16	-32	-34	-35	-36	-37	-38	-40	-41	-42	-44	-45	-47	-48
-18	-34	-36	-36	-38	-39	-40	-42	-43	-44	-46	-47	-49	-50
-20	-36	-37	-38	-40	-41	-42	-43	-45	-46	-48	-40	-51	-52
-22	-38	-39	-40	-42	-43	-44	-45	-46	-48	-50	-51	-52	-53
-24	-39	-41	-42	-43	-45	-46	-47	-48	-50	-51	-52	-54	-55
-26	-41	-42	-44	-45	-46	-47	-49	-50	-52	-53	-54	-56	-57
-28	-43	-44	-45	-47	-48	-49	-50	-52	-54	-55	-56	-57	-58
-30	-45	-46	-47	-49	-50	-51	-52	-53	-56	-57	-58	-59	-60
-32	-47	-48	-49	-51	-52	-53	-54	-55	-57	-58	-59	-61	-62
-34	-49	-50	-51	-53	-54	-55	-56	-57	-59	-60	-61	-63	-64
-36	-51	-52	-53	-55	-55	-56	-58	-59	-61	-62	-63	-64	-65
-38	-52	-54	-55	-56	-57	-58	-59	-60	-62	-64	-65	-66	-67
-40	-54	-55	-56	-58	-59	-60	-61	-62	-64	-65	-66	-68	-69

Standard Day Temperatures at Altitude

ICAO STANDARD ATMOSPHERE TEMPERATURES					
ALTITUDE (FEET)	°C	°F	ALTITUDE (FEET)	°C	°F
0	15	59	22,000	-29	-20
5,000	5	41	23,000	-31	-23
10,000	-5	23	24,000	-33	-27
11,000	-7	20	25,000	-35	-30
12,000	-9	16	26,000	-37	-34
13,000	-11	13	27,000	-38	-37
14,000	-13	9	28,000	-41	-41
15,000	-15	6	29,000	-42	-44
16,000	-17	2	31,000	-46	-52
17,000	-19	-2	33,000	-50	-59
18,000	-21	-5	35,000	-54	-66
19,000	-23	-9	37,000	-57	-70
20,000	-25	-12	39,000	-57	-70
21,000	-27	-16	41,000	-57	-70

INTENTIONALLY LEFT BLANK

Initial Buffet Speeds At Cruise Altitudes

WARNING: Cruise flight with less than 1.2 G initial buffet protection is not authorized.

WT. 1000 LB.	TYPE SPEED	1.2 G INITIAL BUFFET SPEEDS MANEUVERING CAPABILITY UP TO 33° BANK							
		FL 310		FL 330		FL 350		FL 370	
		SLOW SPEED	HIGH SPEED	SLOW SPEED	HIGH SPEED	SLOW SPEED	HIGH SPEED	SLOW SPEED	HIGH SPEED
110	KIAS MACH	201 .553	309 .828	204 .588	294 .823	208 .623	279 .818	208 .655	263 .807
115	KIAS MACH	207 .570	308 .825	209 .604	292 .819	213 .638	278 .812	215 .674	259 .798
120	KIAS MACH	215 .587	306 .822	216 .620	291 .815	219 .653	275 .807	221 .693	257 .790
125	KIAS MACH	219 .602	305 .819	222 .635	289 .810	223 .668	273 .800	-	-
130	KIAS MACH	225 .617	303 .816	227 .650	287 .805	229 .683	271 .794	-	-
135	KIAS MACH	231 .632	302 .813	234 .668	285 .803	237 .705	266 .783	-	-
140	KIAS MACH	236 .647	301 .810	240 .685	284 .800	-	-	-	-
145	KIAS MACH	241 .659	300 .807	247 .705	280 .789	-	-	-	-

WT. 1000 LB	TYPE SPEED	1.5 G INITIAL BUFFET SPEEDS MANEUVERING CAPABILITY UP TO 48° BANK							
		FL 250		FL 300		FL 350		FL 370	
		SLOW SPEED	HIGH SPEED	SLOW SPEED	HIGH SPEED	SLOW SPEED	HIGH SPEED	SLOW SPEED	HIGH SPEED
110	KIAS MACH	218 .530	330 .830	228 .615	310 .820	240 .715	264 .775	-	-
115	KIAS MACH	225 .549	330 .830	236 .630	309 .815	-	-	-	-
120	KIAS MACH	234 .565	330 .825	243 .645	308 .810	-	-	-	-
125	KIAS MACH	242 .580	330 .825	249 .665	304 .805	-	-	-	-
130	KIAS MACH	~248 .595	330 .822	255 .675	300 .798	-	-	-	-
135	KIAS MACH	253 .612	330 .820	264 .700	298 .787	-	-	-	-
140	KIAS MACH	258 .624	330 .817	274 .725	292 .770	-	-	-	-
145	KIAS MACH	265 .637	330 .815	-	-	-	-	-	-

Stalling Speeds

Gross Weight	Stalling Speeds Slats Extended - KIAS				
	Flaps 0°	Flaps 11°	Flaps 15°	Flaps 28°	Flaps 40°
90,000	104	98	96	92	89
95,000	107	101	99	94	92
100,000	110	104	102	97	94
105,000	112	106	104	99	96
110,000	115	109	107	101	99
115,000	117	111	109	104	101
120,000	120	114	111	106	103
125,000	122	116	113	108	105
130,000	125	118	116	110	107
135,000	127	120	118	112	109
140,000	129	122	120	114	111
145,000	132	124	122	116	113

Gross Weight	Stalling Speeds Slats Retracted - KIAS				
	Flaps 0°	Flaps 11°	Flaps 15°	Flaps 28°	Flaps 40°
90,000	132	122	119	112	106
95,000	136	125	123	116	109
100,000	139	128	126	118	112
105,000	143	132	129	122	114
110,000	146	135	132	124	117
115,000	149	138	135	127	120
120,000	152	141	138	130	122
125,000	156	143	141	133	125
130,000	159	146	143	135	127
135,000	162	149	146	138	130
140,000	165	152	149	141	132
145,000	168	155	152	143	135

ABNORMAL

Holding Speeds / Fuel Flow

WT.	CLEAN CONFIGURATION - KIAS & FUEL FLOW LB/HR								
1000 LB.	2000 FT	4000 FT	6000 FT	8000 FT	10000 FT	13000 FT	15000 FT	17000 FT	FL 190
80	183 4222	183 4118	183 4026	183 3942	183 3862	183 3748	183 3682	183 3652	183 3632
85	188 4420	188 4322	188 4232	188 4146	188 4064	188 3950	188 3882	188 3818	188 3758
90	194 4624	194 4528	194 4436	194 4350	194 4268	194 4156	194 4086	194 4022	194 3962
95	199 4830	199 4734	199 4644	199 4556	199 4472	199 4360	199 4290	199 4226	199 4166
100	204 5038	204 4942	204 4848	204 4762	204 4680	204 4566	204 4496	204 4432	204 4374
105	209 5246	209 5148	209 5054	209 4970	209 4886	209 4774	209 4704	209 4640	209 4580
110	214 5456	214 5356	214 5264	214 5176	214 5094	214 4982	214 4912	214 4852	214 4782
115	219 5664	219 5564	219 5472	219 5386	219 5302	219 5190	219 5122	219 5056	219 4982
120	224 5874	224 5776	224 5682	224 5594	224 5512	224 5400	224 5332	224 5258	224 5184
125	228 6086	228 5988	228 5894	228 5806	228 5722	228 5612	228 5538	228 5460	228 5388
130	233 6300	233 6200	233 6106	233 6018	233 5934	233 5824	233 5742	233 5662	233 5590
135	237 6514	237 6414	237 6318	237 6230	237 6148	237 6032	237 5946	237 5870	237 5796
140	242 6728	242 6628	242 6532	242 6444	242 6362	242 6238	242 6150	242 6074	242 6002
145	246 6944	246 6842	246 6748	246 6660	246 6578	246 6444	246 6362	246 6280	246 6222

Increase/decrease fuel flow ± 12 lb/hr per 1°C ±ISA.
Increase fuel flow by 4% when holding during turns.
Increase fuel flow by 5% for engine anti-ice.
Increase fuel flow by 15% for engine & airfoil anti-ice.

Holding Speeds / Fuel Flow

WT.	CLEAN CONFIGURATION - KIAS & FUEL FLOW LB/HR								
1000 LB.	FL 210	FL 230	FL 250	FL 270	FL 290	FL 310	FL 330	FL 350	FL 370
80	184 3630	184 3622	183 3574	183 3520	183 3468	183 3420	183 3392	183 3394	183 3412
85	188 3724	188 3702	188 3676	190 3664	188 3660	188 3618	188 3612	188 3622	188 3646
90	194 3906	194 3852	194 3792	194 3762	194 3736	194 3734	194 3758	194 3786	197 3870
95	199 4112	199 4050	199 3992	199 3938	199 3904	199 3908	199 3914	199 3942	199 4014
100	204 4312	204 4248	204 4190	204 4142	204 4128	204 4146	204 4146	204 4174	206 4238
105	209 4512	209 4450	209 4390	209 4358	209 4368	209 4366	209 4390	209 4422	212 4504
110	214 4712	214 4648	214 4594	214 4588	214 4608	214 4606	214 4636	215 4680	219 4774
115	219 4916	219 4854	219 4818	219 4830	219 4826	219 4852	219 4886	221 4946	230 5062
120	224 5116	224 5060	224 5050	224 5072	224 5070	224 5102	224 5144	228 5216	-
125	228 5320	228 5282	228 5292	228 5290	228 5316	228 5352	230 5410	237 5492	-
130	233 5532	233 5512	233 5534	233 5530	233 5564	233 5604	236 5680	-	-
135	237 5750	237 5756	237 5760	237 5778	237 5814	238 5868	244 5954	-	-
140	242 5980	242 6000	242 5992	242 6028	242 6070	244 6140	255 6240	-	-
145	246 6224	246 6238	246 6244	246 6278	246 6326	250 6412	-	-	-

Increase/decrease fuel flow ±10 lb/hr per 1°C ±ISA.
Increase fuel flow by 4% when holding during turns.
Increase fuel flow by 5% for engine anti-ice.
Increase fuel flow by 15% for engine & airfoil anti-ice.

Diversion To Alternate

DIST TO ALT IN NM	TIME TO ALT MIN	LANDING WEIGHT - LBS. 90,000 TO 100,000	100,000 TO 110,000	110,000 TO 120,000	120,000 TO 130,000	CRUISE ALTITUDE TO ALTERNATE
		FUEL LBS.				
≤ 50	10	<2400	2400	2600	2800	11,000
75	15	<2600	2600	2800	3000	15,000
100	25	<2800	2800	3000	3200	17,000
125	29	3200	3200	3400	3600	19,000
150	32	3600	3600	3800	4000	25,000
175	36	3900	3900	4100	4300	27,000
200	39	4300	4300	4700	5100	29,000
225	43	4600	4600	5000	5400	31,000
250	46	4900	4900	5300	5700	33,000
275	50	5100	5100	5500	5900	35,000
300	53	5400	5400	5800	6200	35,000

Climb speed: 250 KIAS to 10,000 / 290 KIAS to .72 MACH
Cruise speed: LRC
Data includes 400 lbs. / 1 minute for missed approach at original destination and 450 lbs. / 4 minutes for approach and landing at alternate.

Note: For every 50 Knots of headwind, use the data from the next row down.

Example: Distance to alternate is 200 NM and there is a 100 knot headwind at FL 290. For a 120,00 LB aircraft, time and fuel are 46 minutes and 5300 lbs.

Driftdown Information

Note: TC= Terrain Clearance DD= Driftdown

Preflight

The flight release will contain the applicable TC or DD weight limit and enroute alternates (must meet alternate weather minimums) if dispatched DD. The flight crew must carefully monitor aircraft gross weight changes due to adding fuel, extra payload, and passenger count to remain within the TC or DD weight limit. If dispatched DD, the flight crew should review the route, noting the location of driftdown alternates and high terrain. The engine out altitudes on the flight plan can be compared to the appropriate grid MORA's (Minimum Off-Route Altitude) on the Jeppesen charts to determine driftdown possibilities. The forecast weather and notams for the driftdown alternate airports should be checked for suitability. The departure airport Jeppesen pages should be reviewed for any special engine out departure procedures, the IFR departure procedure, and the MSA's.

Takeoff

In the event of engine failure, follow the special engine out departure procedure if applicable. If no special engine out procedure is applicable, fly a ground track that avoids obstructions by use of ATC vector, the IFR departure procedure, or MSA's. If diversion to a takeoff alternate is required use these means to climb to the MEA/MOCA/MORA for the planned route.

Climbout

If engine failure occurs during climbout over high/mountainous terrain prior to reaching the cruise altitude, the aircraft should proceed via the climb-out track back to the departure airport and land. Two engine aircraft have an all engine climb capability steeper than the engine out driftdown flight path at altitudes where terrain could be encountered. Specifically, the MD-80 at 140,000 lbs. and 290 kias will normally be climbing at a gradient of +9.7% at 10,000 ft. The engine out gradient at that altitude and 210 kias would be a +2.0%. If it is necessary to proceed to a takeoff alternate, choose an enroute altitude that is at or above the MEA/MOCA/ MORA as appropriate.

Note: If engine failure occurs on climb-out above FL240, or in cruise, the distance to driftdown to the single engine gross climb altitude will, in all cases, exceed 150 NM. For example, the MD-80 at 140,000 lbs. would require about 190 NM to driftdown from FL240 to 15,000 ft with all ice protection on.

Enroute (TC)

Aircraft takeoff weight was at or below the Terrain Clearance weight limit: If an engine fails at cruise altitude, the aircraft is capable of clearing all terrain along the route between the departure airport and the destination. The crew may proceed along the route to the nearest suitable airport for landing.

Enroute (DD)

Aircraft takeoff weight was greater than the Terrain Clearance weight limit: If an engine fails at cruise altitude the aircraft is not capable of clearing all terrain along the route between the departure airport and the destination. For dispatch, the route was analyzed in sections based on high terrain. The flight crew should proceed to an appropriate driftdown alternate for the portion of the route they are on.

Enroute (TC/DD)

If the flight has deviated from the planned route due to weather/ATC vectors: The crew must become familiar with the terrain/obstructions, determine safe flight levels, and should consider returning to the route when able. Failure to return to the route compromises TC/DD planning for obstruction clearance and complicates off-route flight as the MORA/single engine altitude capability do not necessarily provide navigation signal coverage or ATC communication. If the flight is off the planned route and engine failure occurs, the crew should proceed to an appropriate driftdown alternate or the nearest suitable airport for landing. The Western US Driftdown chart in the Jeppesen enroute section may be used in planning a course of action. The engine out altitudes shown on the flight plan may be compared to the grid MORA's on the Jeppesen high charts. The One Engine Operation - Net Altitude Capability charts in this section may be checked to assure terrain clearance.

Descent

The crew should not descend below cruise altitude until necessary for landing at the destination. Prior to descent, the crew should review the MEA /MOCA /MSA's for the arrival and review the location of known obstructions. If ATC offers early descent, the crew should be wary of descending to an altitude that would not allow continuation of the flight to destination in the event of engine failure. If it becomes necessary to proceed from the destination to an alternate with an engine failure, use the same considerations listed above in Takeoff/Climbout.

EPR - Maximum Continuous Thrust (One Engine Operation)

-217

RAT °C	PRESSURE ALTITUDE - FEET								
	1000	2000	5000	10000	15000	20000	25000	30000	35000
-50	2.02	2.07	2.09	2.09	2.09	2.08	2.06	2.05	2.04
-16	"	"	"	"	2.08	2.07	2.06	2.05	2.04
-12	"	2.07	2.09	2.09	2.07	2.06	2.04	2.03	2.02
-8	"	2.06	2.07	2.07	2.06	2.04	2.03	2.02	2.01
-4	"	2.05	2.05	2.05	2.04	2.03	2.02	2.01	2.00
0	"	2.04	2.04	2.04	2.03	2.02	2.01	2.00	1.99
4	2.02	2.03	2.03	2.03	2.02	2.01	2.00	2.00	1.98
8	2.01	2.01	2.01	2.01	2.00	1.99	1.98	1.97	1.96
12	2.00	2.00	2.00	2.00	1.99	1.98	1.97	1.96	1.95
16	1.98	1.98	1.98	1.98	1.97	1.96	1.95	1.94	-
20	1.96	1.96	1.96	1.96	1.95	1.94	1.93	1.92	-
24	1.94	1.94	1.94	1.94	1.93	1.92	1.91	-	-
30	1.90	1.90	1.90	1.90	1.90	1.88	1.87	-	-
40	1.83	1.83	1.83	1.83	1.82	-	-	-	-
46	1.79	1.79	1.79	1.79	-	-	-	-	-
Bleed Corrections: Anti-ice Engine ON -0.08 / Engine & airfoil -0.13 Pack OFF (Below 10,000') +.02									

-217A

RAT °C	PRESSURE ALTITUDE - FEET								
	1000	2000	5000	10000	15000	20000	25000	30000	35000
-50	1.97	2.00	2.06	2.06	2.05	2.04	2.03	2.02	2.01
-8	"	"	2.06	2.06	2.05	2.04	2.03	2.02	2.01
-4	"	"	2.05	2.05	2.04	2.03	2.02	2.01	2.00
0	"	"	2.04	2.04	2.03	2.02	2.01	2.00	1.99
4	"	"	2.03	2.03	2.02	2.01	2.00	1.99	1.98
8	"	"	2.01	2.01	2.00	1.99	1.98	1.97	1.96
12	"	2.00	2.00	2.00	1.99	1.98	1.97	1.96	1.95
16	"	1.98	1.98	1.98	1.97	1.96	1.95	1.94	-
20	1.96	1.96	1.96	1.96	1.95	1.94	1.93	1.92	-
24	1.94	1.94	1.94	1.93	1.93	1.92	1.91	-	-
28	1.91	1.91	1.91	1.91	1.90	1.89	1.88	-	-
32	1.89	1.89	1.89	1.88	1.88	1.87	-	-	-
36	1.86	1.86	1.86	1.86	1.85	1.84	-	-	-
40	1.83	1.83	1.83	1.83	1.82	-	-	-	-
46	1.79	1.79	1.79	1.79	-	-	-	-	-
Bleed Corrections: Anti-ice Engine ON -0.08 / Engine & airfoil -0.13 Pack OFF (Below 10,000') +.02									

-217

One Engine Operation - Net Altitude Capability

WT. 1000 LB.	NO ICE PROTECTION GEAR & FLAPS UP - SLATS RETRACTED - ONE PACK ON - MCT POWER					
	STD -20°C	STD -10°C	STD	STD +10°C	STD +20°C	STD +30°C
90	25,000	25,000	25,000	25,000	24,200	23,500
95	23,900	23,900	23,900	23,500	22,900	22,200
100	22,800	22,800	22,800	22,200	21,500	20,800
105	21,600	21,600	21,600	21,000	20,300	19,300
110	20,600	20,600	20,500	19,800	19,100	18,000
115	19,600	19,600	19,400	18,600	17,900	16,500
120	18,600	18,600	18,200	17,500	16,700	15,200
125	17,600	17,600	17,200	16,400	15,500	14,000
130	16,700	16,700	16,100	15,400	14,400	12,500
135	15,800	15,800	15,100	14,800	13,200	11,100
140	15,000	14,800	14,100	13,300	12,000	9,800
145	14,200	13,800	13,100	12,300	10,800	8,500

WT. 1000 LB.	ENGINE & AIRFRAME ICE PROTECTION GEAR & FLAPS UP - SLATS RETRACTED - ONE PACK ON - MCT POWER					
	STD -20°C	STD -10°C	STD	STD +10°C	STD +20°C	STD +30°C
90	22,700	22,600	22,600	22,000	21,300	20,300
95	21,500	21,400	21,300	20,700	19,900	18,800
100	20,300	20,200	20,100	19,400	18,500	-
105	19,200	19,100	18,800	18,100	17,200	-
110	19,100	18,000	17,600	16,900	15,900	-
115	17,100	17,000	16,500	15,600	14,500	-
120	16,100	16,000	15,300	14,500	13,200	-
125	15,200	14,900	14,200	13,300	-	-
130	14,200	13,800	13,000	12,200	-	-
135	13,300	12,800	11,900	11,000	-	-
140	12,400	11,800	10,800	9,800	-	-
145	11,400	10,700	9,800	8,600	-	-

Note: Altitudes are in feet and reflect a 1.1% degradation from gross capability.

-217A

One Engine Operation - Net Altitude Capability

WT. 1000 LB.	NO ICE PROTECTION GEAR & FLAPS UP - SLATS RETRACTED - ONE PACK ON - MCT POWER					
	STD -20°C	STD -10°C	STD	STD +10°C	STD +20°C	STD +30°C
90	24,400	24,400	24,400	24,400	24,200	23,500
95	23,200	23,200	23,200	23,200	22,800	22,100
100	22,100	22,100	22,100	22,100	21,500	20,800
105	21,000	21,000	21,000	20,900	20,200	19,300
110	19,900	19,900	19,900	19,800	19,000	18,000
115	18,900	18,900	18,700	18,500	18,000	16,500
120	17,900	17,900	17,900	17,500	16,800	15,200
125	17,000	17,000	17,000	16,400	15,500	13,800
130	16,000	16,000	16,000	15,200	14,300	12,500
135	15,100	15,100	15,000	14,200	13,100	11,100
140	14,200	14,200	14,000	13,200	12,000	9,600
145	13,400	13,400	13,100	12,200	10,800	8,500

WT. 1000 LB.	ENGINE & AIRFRAME ICE PROTECTION GEAR & FLAPS UP - SLATS RETRACTED - ONE PACK ON - MCT POWER					
	STD -20°C	STD -10°C	STD	STD +10°C	STD +20°C	STD +30°C
90	22,000	21,900	21,800	21,800	21,200	20,200
95	20,800	20,800	20,600	20,500	19,900	18,800
100	19,600	19,500	19,500	19,300	18,500	-
105	18,500	18,400	18,400	18,000	17,200	-
110	17,400	17,400	17,300	16,800	15,900	-
115	16,300	16,300	16,300	15,600	14,500	-
120	15,400	15,400	15,300	14,500	13,200	-
125	14,300	14,300	14,100	13,200	-	-
130	13,400	13,400	13,000	12,100	-	-
135	12,500	12,500	12,000	11,000	-	-
140	11,600	11,600	10,900	9,800	-	-
145	10,700	10,700	9,800	8,500	-	-

Note: Altitudes are in feet and reflect a 1.1% degradation from gross capability.

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One Engine Operation - Long Range Cruise

WT. 1000 LB.	STANDARD DAY NORMAL BLEED			CRUISE (SET EPR & IAS)			EPR IAS FUEL FLOW	
	FL 110	FL 130	FL 150	FL 170	FL 190	FL 210	FL 230	FL 250
94	1.58 243 4863	1.62 241 4774	1.66 236 4621	1.72 239 4654	1.77 234 4528	1.83 232 4484	1.90 226 4394	1.96 218 4289
98	1.60 248 5050	1.64 244 4913	1.69 241 4818	1.75 242 4832	1.80 237 4710	1.87 234 4654	1.92 226 4517	2.00 223 4568
102	1.62 251 5153	1.66 245 5051	1.72 249 5090	1.77 243 4956	1.83 241 4907	1.89 235 4795	1.95 227 4687	2.03 225 4780
106	1.64 253 5300	1.69 250 5245	1.75 252 5269	1.80 247 5133	1.86 244 5079	1.92 235 4936	1.99 231 4956	2.06 226 4986
110	1.66 254 5411	1.72 258 5542	1.77 253 5391	1.83 250 5335	1.89 245 5233	1.94 235 5070	2.02 234 5180	2.06 211 4839
114	1.69 259 5621	1.75 261 5722	1.79 256 5566	1.86 254 5532	1.91 245 5371	1.98 240 5342	2.06 238 5466	-
118	266 1.71 5892	1.76 262 5851	1.82 259 5773	1.88 254 5671	1.93 244 5486	2.01 242 5578	2.06 228 5388	-
122	1.74 270 6154	1.78 264 6002	1.84 262 5956	1.90 255 5815	1.96 248 5727	2.04 246 5856	-	-
126	1.75 272 6320	1.80 267 6195	1.87 264 6121	1.92 255 5938	2.00 252 5998	2.05 241 5883	-	-
130	1.77 273 6453	1.83 271 6406	1.89 265 6259	1.94 255 6088	1.02 254 6219	2.06 228 5778	-	-
134	1.79 276 6642	1.86 273 6581	1.91 265 6410	1.97 258 6326	2.04 254 6414	-	-	-
138	1.82 280 6855	1.88 274 6719	1.93 265 6539	2.00 263 6635	2.05 245 6332	-	-	-
142	1.84 282 7033	1.90 277 6912	1.95 266 6726	2.03 264 6846	-	-	-	-
146	1.86 294 7216	1.91 276 7023	1.98 270 6998	2.04 261 6916	-	-	-	-

ADJUST FUEL FLOW: ±13 LB/HR PER ±1°C OFF ISA
ENGINE ANTI-ICE ON: +5% FUEL FLOW
ENGINE & AIRFOIL ANTI-ICE ON: +8% FUEL FLOW

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One Engine Operation - Long Range Cruise

WT. 1000 LB.	STANDARD DAY NORMAL BLEED			CRUISE (SET EPR & IAS)			EPR IAS FUEL FLOW	
	FL 110	FL 130	FL 150	FL 170	FL 190	FL 210	FL 230	FL 250
94	1.58 243 4863	1.62 241 4774	1.66 236 4622	1.73 239 4660	1.77 234 4527	1.84 232 4494	1.90 226 5390	1.96 218 4296
98	1.60 248 5050	1.64 244 4919	1.69 240 4813	1.75 243 4838	1.80 237 4710	1.87 234 4656	1.92 226 4518	2.00 223 4561
102	1.62 251 5213	1.66 245 5051	1.73 249 5094	1.77 244 4960	1.83 241 4906	1.90 236 4810	1.95 227 4685	2.03 225 4771
106	1.64 253 5360	1.69 250 5254	1.75 252 5272	1.80 247 5138	1.86 244 5079	1.92 235 4935	1.99 231 4952	-
110	1.66 255 5492	1.72 258 5536	1.77 253 5396	1.83 251 5350	1.89 245 5235	1.94 235 5069	2.02 234 5180	-
114	1.68 258 5680	1.75 261 5724	1.79 256 5566	1.85 253 5510	1.91 245 5370	1.98 240 5342	2.04 229 5217	-
118	1.72 266 5973	1.76 263 5874	1.82 260 5780	1.88 254 5670	1.93 243 5462	2.01 242 5579	-	-
122	1.74 269 6150	1.78 264 6004	1.84 262 5956	1.90 255 5816	1.96 248 5727	2.04 245 5828	-	-
126	1.75 272 6318	1.80 267 6195	1.87 264 6119	1.92 255 5937	2.00 252 5997	-	-	-
130	1.77 273 6453	1.83 271 6408	1.89 265 6259	1.94 255 6091	2.02 253 6218	-	-	-
134	1.79 276 6644	1.86 274 6586	1.91 266 6416	1.97 258 6328	2.04 254 6414	-	-	-
138	1.81 279 6834	1.88 275 6742	1.92 263 6497	2.00 263 6634	-	-	-	-
142	1.84 283 7056	1.90 276 6911	1.95 266 6723	2.03 264 6847	-	-	-	-
146	1.86 284 7221	1.91 276 7030	1.98 270 6996	2.04 261 6913	-	-	-	-

ADJUST FUEL FLOW: ±13 LB/HR PER ±1°C OFF ISA
ENGINE ANTI-ICE ON: +5% FUEL FLOW
ENGINE & AIRFOIL ANTI-ICE ON: +8% FUEL FLOW

LANDING

NORMAL

-217/-217A

V-Speeds for Normal Landings

NORMAL CONFIGURATION ARRIVAL AND V/REF SPEEDS								
WT. 1000 LB.	MINIMUM MANEUVER				V/REF		GO AROUND	
	0°/RET	0°/TO	11°/TO	15°/TO	28°/LND	40°/LND	11°/TO	15°/TO
90	194	152	134	131	113	110	118	115
92	197	154	135	132	114	111	119	116
94	199	155	137	134	116	112	121	117
96	201	157	138	135	117	113	122	118
98	203	159	139	136	118	114	123	119
100	205	160	141	138	119	115	124	120
102	207	162	142	139	121	117	126	122
104	209	163	143	140	122	118	127	123
106	211	165	145	142	123	119	128	124
108	213	166	146	143	124	120	129	125
110	215	168	148	144	125	121	130	126
112	217	170	148	145	126	122	131	127
114	219	171	150	147	128	123	133	128
116	221	173	151	148	129	124	134	129
118	223	174	152	149	130	126	135	131
120	225	176	154	151	131	127	136	132
122	227	177	155	152	132	128	137	133
124	228	178	156	153	133	129	138	134
126	230	180	157	154	134	130	139	135
128	232	181	159	156	135	131	140	136
130	234	183	160	157	136	132	141	137
132	236	184	161	158	137	133	142	138
134	237	186	162	159	138	134	143	139

EPR - Maximum Go-Around Thrust

-217

OAT	PRESSURE ALTITUDE - FEET						5000 AND
°C	SL	500	1000	2000	3000	4000	ABOVE
-20	1.96	1.99	2.03	2.08	2.10	2.10	2.09
-16	-	-	-	2.08	2.09	2.09	2.09
-12	-	-	-	2.08	2.07	2.07	2.07
-8	-	-	-	2.06	2.06	2.06	2.06
-4	-	-	-	2.05	2.05	2.05	2.05
0	-	-	-	2.04	2.04	2.04	2.04
4	-	-	2.03	2.03	2.03	2.03	2.03
8	-	-	2.02	2.02	2.02	2.03	2.03
12	-	1.99	2.00	2.01	2.02	2.03	2.03
24	-	1.98	1.99	2.01	2.02	2.02	2.02
28	-	1.98	1.99	2.00	2.00	2.00	2.00
32	1.96	1.96	1.96	1.96	1.96	1.96	1.96
36	1.93	1.93	1.93	1.93	1.93	1.93	1.93
40	1.90	1.90	1.90	1.90	1.90	1.90	1.90
44	1.87	1.87	1.87	1.87	1.87	1.87	1.87

Bleed Corrections:	AC Packs OFF +0.02	Engine Anti-ice ON +0.00
Airfoil anti-ice ON:	1 ENG OPER -.04	2 ENG OPER -.02

-217A

OAT	PRESSURE ALTITUDE - FEET						
°C	SL	1000	2000	3000	4000	5000	8000
-50	1.96	1.97	2.00	2.02	2.04	2.06	2.06
20	-	-	-	-	-	2.06	2.06
22	-	-	-	-	-	2.05	2.05
24	-	-	-	-	2.04	2.04	2.04
26	-	-	-	-	2.03	2.03	2.03
28	-	-	-	2.02	2.02	2.01	2.01
30	-	-	2.00	2.00	2.00	2.00	2.00
32	1.96	1.97	1.98	1.98	1.98	1.98	1.98
34	1.95	1.96	1.96	1.96	1.96	1.96	1.95
36	1.93	1.94	1.94	1.93	1.93	1.93	1.93
38	1.92	1.92	1.92	1.92	1.91	1.91	1.91
40	1.90	1.90	1.90	1.90	1.90	1.90	1.90
42	1.89	1.89	1.89	1.88	1.88	1.88	1.88
44	1.87	1.87	1.87	1.87	1.87	1.87	1.87
46	1.86	1.86	1.86	1.85	1.85	1.85	1.85

Bleed Corrections:	AC Packs OFF +0.02	Engine Anti-ice ON +0.00
Airfoil anti-ice ON:	1 ENG OPER -.04	2 ENG OPER -.02

Approach Climb And Landing Runway Limit Charts

If a landing must be made at a field not dispatched to, the approach climb and landing runway limit gross weights should be checked to assure a safe landing. The lesser of approach climb limit weight or landing runway limit weight is the normal maximum allowable landing weight.

Accumulated Ice Penalty

When icing conditions are predicted during takeoff and/or enroute and the predicted landing temperature is below 68° F, the "Ice Protection Off or Engine Ice Protection Only" approach climb limit weight must be reduced by an accumulated ice penalty. This reduction is required to account for the ice remaining on the non-heated structure after the ice protection systems have been cycled. The accumulated ice penalties are as follows:

-217 &-217A Power	-appoach flaps 11°:	1,250 lbs
-217 &-217A Power	-appoach flaps 15°:	1,400 lbs

Example Problem:

Aircraft:	120,000 lbs. gross weight / -217 / all systems operating
Runway:	Elevation 5,000 Ft / Length 8,000 Ft / Wet runway
Weather:	Winds calm / Temp 80°F

Determine the max allowable landing weight.

Enter the -217, Flaps 15 approach climb limit chart on page 60 at the row for 80°F. Proceed to the right until under the column for elevation 4001 - 6000 feet. The approach climb limit weight is 129,500 lbs.

Enter the landing runway limit chart for flaps 40°, elevation 4,001 - 6000 feet, wet runway on page 66 at the row for runway length of 7,001 - 8,000 feet. Proceed to the right until under the column for 0 wind and all systems operating. The landing runway limit weight is 130,000 lbs.

The lesser of the two is 129,500 lbs. and this is the maximum allowable landing weight for these conditions. Since the example aircraft weighs 120,000 lbs., a safe landing is possible.

Approach Climb Limit Charts

-217

Flaps 15°	-217	Approach Climb Limit Weight - Lbs.		
Ice Protection Off or Engine Ice Protection Only				
	Elevation in Feet			
Temp °F	S.L. - 2,000	2001 - 4000	4001 - 6000	6001 - 7500
120	127,500	-	-	-
110	133,000	124,000	115,500	-
100	139,500	129,500	120,500	113,500
90	144,500	134,500	125,000	118,000
80	150,000	139,500	129,500	122,000
70	150,000	145,000	134,000	126,500
60	150,000	147,000	137,500	130,000
50	150,000	147,000	137,500	130,000
40	150,000	147,000	137,500	130,000
30	150,000	147,500	137,500	130,000
20	150,000	149,000	138,500	131,000
10	150,000	150,000	140,500	132,500
0	150,000	150,000	142,500	134,500
-10	150,000	150,000	144,500	137,000
Accumulated Ice Penalty (If Required): Subtract 1,400 lbs from above weights..				

Engine and Airfoil Ice Protection On				
	Elevation in Feet			
Temp °F	S.L. - 2,000	2001 - 4000	4001 - 6000	6001 - 7500
50	148,000	139,000	130,000	123,000
40	148,000	139,000	130,000	123,000
30	150,000	140,000	130,000	123,000
20	150,000	141,500	131,500	124,500
10	150,000	143,500	133,500	126,000
0	150,000	145,500	135,000	129,500
-10	150,000	148,000	137,500	129,500

Approach Climb Limit Charts

-217

Flaps 11°	-217	Approach Climb Limit Weight - Lbs.		
Ice Protection Off or Engine Ice Protection Only				
	Elevation in Feet			
Temp °F	S.L. - 2,000	2001 - 4000	4001 - 6000	6001 - 7500
120	136,500	-	-	-
110	142,500	133,000	123,500	-
100	149,000	139,000	129,000	121,500
90	150,000	143,500	133,500	127,000
80	150,000	149,500	138,500	131,000
70	150,000	150,000	143,000	135,500
60	150,000	150,000	147,500	139,500
50	150,000	150,000	147,500	139,500
40	150,000	150,000	147,500	139,500
30	150,000	150,000	147,500	139,500
20	150,000	150,000	148,000	140,500
10	150,000	150,000	150,000	142,500
0	150,000	150,000	150,000	144,500
-10	150,000	150,000	150,000	146,500
Accumulated Ice Penalty (If Required): Subtract 1,250 lbs from above weights..				
Engine and Airfoil Ice Protection On				
	Elevation in Feet			
Temp °F	S.L. - 2,000	2001 - 4000	4001 - 6000	6001 - 7500
50	150,000	150,000	140,500	133,000
40	150,000	150,000	140,500	133,000
30	150,000	150,000	140,500	133,000
20	150,000	150,000	141,500	133,500
10	150,000	150,000	143,500	136,000
0	150,000	150,000	145,500	138,000
-10	150,000	150,000	148,000	140,000

Approach Climb Limit Charts

-217A

Flaps 15°	-217A	Approach Climb Limit Weight - Lbs.		
Ice Protection Off or Engine Ice Protection Only				
	Elevation in Feet			
Temp °F	S.L. - 2,000	2001 - 4000	4001 - 6000	6001 - 7500
120	127,000	-	-	-
110	134,000	124,500	115,500	-
100	139,500	129,500	120,500	113,500
90	145,000	135,000	125,000	118,000
80	150,000	142,000	131,500	124,000
70	150,000	147,500	137,000	129,500
60	150,000	149,000	140,500	133,000
50	150,000	149,000	140,500	133,000
40	150,000	149,000	140,500	133,000
30	150,000	149,000	140,500	133,000
20	150,000	149,000	140,500	133,000
10	150,000	149,000	140,500	133,000
0	150,000	149,000	140,500	133,000
-10	150,000	149,000	140,500	133,000
Accumulated Ice Penalty (If Required): Subtract 1,400 lbs from above weights..				
Engine and Airfoil Ice Protection On				
	Elevation in Feet			
Temp °F	S.L. - 2,000	2001 - 4000	4001 - 6000	6001 - 7500
50	147,000	141,500	133,500	125,500
40	147,000	141,500	133,500	125,500
30	147,000	141,500	133,500	125,500
20	147,000	141,500	133,500	125,500
10	147,000	141,500	133,500	125,500
0	147,000	141,500	133,500	125,500
-10	147,000	141,500	133,500	125,500

Approach Climb Limit Charts

-217A

Flaps 11°	-217A	Approach Climb Limit Weight - Lbs.		
Ice Protection Off or Engine Ice Protection Only				
	Elevation in Feet			
Temp °F	S.L. - 2,000	2001 - 4000	4001 - 6000	6001 - 7500
120	136,500	-	-	-
110	143,500	150,000	-	-
100	149,500	150,000	129,000	121,500
90	150,000	150,000	133,000	126,500
80	150,000	150,000	141,000	133,000
70	150,000	150,000	146,000	138,500
60	150,000	150,000	150,000	143,000
50	150,000	150,000	150,000	143,000
40	150,000	150,000	150,000	143,000
30	150,000	150,000	150,000	143,000
20	150,000	150,000	150,000	143,000
10	150,000	150,000	150,000	143,000
0	150,000	150,000	150,000	143,000
-10	150,000	150,000	150,000	143,000
Accumulated Ice Penalty (If Required): Subtract 1,250 lbs from above weights..				

Engine and Airfoil Ice Protection On				
	Elevation in Feet			
Temp °F	S.L. - 2,000	2001 - 4000	4001 - 6000	6001 - 7500
50	150,000	150,000	143,500	136,000
40	150,000	150,000	143,500	136,000
30	150,000	150,000	143,500	136,000
20	150,000	150,000	143,500	136,000
10	150,000	150,000	143,500	136,000
0	150,000	150,000	143,500	136,000
-10	150,000	150,000	143,500	136,000

Landing Runway Limit Charts

For example see page 59

FLAPS 40°		ELEV S.L. - 2,000'			DRY RUNWAY
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	130.0	105.5	113.5	NA	NA
6,001 - 7,000	130.0	130.0	130.0	98.3	88.7
7,001 - 8,000	130.0	130.0	130.0	118.6	109.0
8,001 - 9,000	130.0	130.0	130.0	130.0	130.0
9,001 - 10,000	130.0	130.0	130.0	130.0	130.0
10,001 - 11,000	130.0	130.0	130.0	130.0	130.0
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Note: Structural weight limitations must be observed.

FLAPS 40°		ELEV S.L. - 2,000'			WET RUNWAY
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	107.0	83.5	92.4	NA	NA
6,001 - 7,000	130.0	112.8	123.5	82.4	NA
7,001 - 8,000	130.0	130.0	130.0	100.0	91.7
8,001 - 9,000	130.0	130.0	130.0	117.7	109.4
9,001 - 10,000	130.0	130.0	130.0	130.0	127.1
10,001 - 11,000	130.0	130.0	130.0	130.0	130.0
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Landing Runway Limit Charts

FLAPS 40°		**ELEV 2,001'- 4,000'**			**DRY RUNWAY**
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	122.8	99.3	106.9	NA	NA
6,001 - 7,000	130.0	130.0	130.0	92.8	83.8
7,001 - 8,000	130.0	130.0	130.0	111.8	102.9
8,001 - 9,000	130.0	130.0	130.0	130.0	121.9
9,001 - 10,000	130.0	130.0	130.0	130.0	130.0
10,001 - 11,000	130.0	130.0	130.0	130.0	130.0
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Note: Structural weight limitations must be observed.

FLAPS 40°		**ELEV 2,001'- 4,000'**			**WET RUNWAY**
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	100.7	NA	86.9	NA	NA
6,001 - 7,000	130.0	106.2	116.3	NA	NA
7,001 - 8,000	130.0	130.0	130.0	94.4	86.6
8,001 - 9,000	130.0	130.0	130.0	111.0	103.2
9,001 - 10,000	130.0	130.0	130.0	127.5	119.8
10,001 - 11,000	130.0	130.0	130.0	130.0	130.0
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Landing Runway Limit Charts

FLAPS 40°	ELEV 4,001'- 6,000'				DRY RUNWAY
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	115.6	93.3	100.5	NA	NA
6,001 - 7,000	130.0	123.6	130.0	87.0	NA
7,001 - 8,000	130.0	130.0	130.0	105.0	96.6
8,001 - 9,000	130.0	130.0	130.0	123.0	114.5
9,001 - 10,000	130.0	130.0	130.0	130.0	130.0
10,001 - 11,000	130.0	130.0	130.0	130.0	130.0
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Note: Structural weight limitations must be observed.

FLAPS 40°	ELEV 4,001'- 6,000'				WET RUNWAY
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	94.7	NA	81.6	NA	NA
6,001 - 7,000	122.6	99.9	109.5	NA	NA
7,001 - 8,000	130.0	126.3	130.0	88.6	81.2
8,001 - 9,000	130.0	130.0	130.0	104.2	96.9
9,001 - 10,000	130.0	130.0	130.0	119.9	112.5
10,001 - 11,000	130.0	130.0	130.0	130.0	128.5
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Landing Runway Limit Charts

FLAPS 40°		**ELEV 6,001'- 7,500'**			**DRY RUNWAY**
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	110.4	89.0	95.9	NA	NA
6,001 - 7,000	130.0	118.1	126.7	83.2	NA
7,001 - 8,000	130.0	130.0	130.0	100.3	92.3
8,001 - 9,000	130.0	130.0	130.0	117.5	109.4
9,001 - 10,000	130.0	130.0	130.0	130.0	126.5
10,001 - 11,000	130.0	130.0	130.0	130.0	130.0
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Note: Structural weight limitations must be observed.

FLAPS 40°		**ELEV 6,001'- 7,500'**			**WET RUNWAY**
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	90.3	NA	NA	NA	NA
6,001 - 7,000	117.1	95.3	104.5	NA	NA
7,001 - 8,000	130.0	130.0	130.0	84.7	NA
8,001 - 9,000	130.0	130.0	130.0	99.6	92.6
9,001 - 10,000	130.0	130.0	130.0	114.5	107.5
10,001 - 11,000	130.0	130.0	130.0	129.4	122.4
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Landing Runway Limit Charts

FLAPS 28°		**ELEV S.L. - 2,000'**			**DRY RUNWAY**
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	121.3	98.3	105.6	NA	NA
6,001 - 7,000	130.0	129.8	130.0	92.7	83.6
7,001 - 8,000	130.0	130.0	130.0	111.9	102.8
8,001 - 9,000	130.0	130.0	130.0	130.0	122.0
9,001 - 10,000	130.0	130.0	130.0	130.0	130.0
10,001 - 11,000	130.0	130.0	130.0	130.0	130.0
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Note: Structural weight limitations must be observed.

FLAPS 28°		**ELEV S.L. - 2,000'**			**WET RUNWAY**
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	99.5	NA	85.8	NA	NA
6,001 - 7,000	128.5	105.1	114.9	NA	NA
7,001 - 8,000	130.0	130.0	130.0	94.3	86.5
8,001 - 9,000	130.0	130.0	130.0	111.0	103.2
9,001 - 10,000	130.0	130.0	130.0	127.7	119.9
10,001 - 11,000	130.0	130.0	130.0	130.0	130.0
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Landing Runway Limit Charts

FLAPS 28°	ELEV 2,001'- 4,000'			DRY RUNWAY	
Max Landing Weight in 1000 Lbs.				(-217 & -217A)	
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	114.2	93.1	99.3	NA	NA
6,001 - 7,000	130.0	122.4	130.0	87.3	NA
7,001 - 8,000	130.0	130.0	130.0	105.4	96.9
8,001 - 9,000	130.0	130.0	130.0	123.5	115.0
9,001 - 10,000	130.0	130.0	130.0	130.0	130.0
10,001 - 11,000	130.0	130.0	130.0	130.0	130.0
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Note: Structural weight limitations must be observed.

FLAPS 28°	ELEV 2,001'- 4,000'			WET RUNWAY	
Max Landing Weight in 1000 Lbs.				(-217 & -217A)	
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	93.5	NA	80.6	NA	NA
6,001 - 7,000	121.1	99.0	108.2	NA	NA
7,001 - 8,000	130.0	125.0	130.0	88.9	81.5
8,001 - 9,000	130.0	130.0	130.0	104.6	97.2
9,001 - 10,000	130.0	130.0	130.0	120.3	112.9
10,001 - 11,000	130.0	130.0	130.0	130.0	128.6
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Landing Runway Limit Charts

FLAPS 28°	ELEV 4,001'- 6,000'				DRY RUNWAY
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers Spoilers	Manual Spoilers Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	107.5	86.8	93.4	NA	NA
6,001 - 7,000	130.0	115.2	123.3	82.3	NA
7,001 - 8,000	130.0	130.0	130.0	99.2	91.3
8,001 - 9,000	130.0	130.0	130.0	116.1	108.2
9,001 - 10,000	130.0	130.0	130.0	130.0	125.1
10,001 - 11,000	130.0	130.0	130.0	130.0	130.0
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Note: Structural weight limitations must be observed.

FLAPS 28°	ELEV 4,001'- 6,000'				WET RUNWAY
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	87.9	NA	NA	NA	NA
6,001 - 7,000	114.0	93.0	101.7	NA	NA
7,001 - 8,000	130.0	117.6	127.8	83.8	NA
8,001 - 9,000	130.0	130.0	130.0	98.5	91.6
9,001 - 10,000	130.0	130.0	130.0	113.2	106.3
10,001 - 11,000	130.0	130.0	130.0	127.9	121.0
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Landing Runway Limit Charts

FLAPS 28°		**ELEV 6,001'- 7,500'**			**DRY RUNWAY**
Max Landing Weight in 1000 Lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	102.3	82.5	88.8	NA	NA
6,001 - 7,000	130.0	109.7	117.6	NA	NA
7,001 - 8,000	130.0	130.0	130.0	94.7	87.1
8,001 - 9,000	130.0	130.0	130.0	110.9	103.3
9,001 - 10,000	130.0	130.0	130.0	127.1	119.5
10,001 - 11,000	130.0	130.0	130.0	130.0	130.0
11,001 - 12,000	130.0	130.0	130.0	130.0	130.0
600 lbs. may be added per knot of headwind					

Note: Structural weight limitations must be observed.

FLAPS 28°		**ELEV 6,001'- 7,500'**			**WET RUNWAY**
Max Landing Weight in 1000 lbs.					(-217 & -217A)
Runway Length Feet	Anti-Skid On			Anti-Skid Off	
	Auto Spoilers		Manual Spoilers	Auto Spoilers	Manual Spoilers
	0 Wind	-10 Wind			
5,001 - 6,000	83.5	NA	NA	NA	NA
6,001 - 7,000	108.6	88.4	96.8	NA	NA
7,001 - 8,000	130.0	112.1	121.9	NA	NA
8,001 - 9,000	130.0	130.0	130.0	94.0	87.4
9,001 - 10,000	130.0	130.0	130.0	108.1	101.5
10,001 - 11,000	130.0	130.0	130.0	122.2	115.6
11,001 - 12,000	130.0	130.0	130.0	130.0	129.7
600 lbs. may be added per knot of headwind					

ABNORMAL

V-Speeds for Abnormal Landings

ABNORMAL CONFIGURATION ARRIVAL AND V/REF SPEEDS							
WT.	Maneuver	V/REF					
1000 LB.	15°/RET	0°/RET	0°/TO	11°/TO	15°/TO	28°/RET	40°/RET
90	163	162	137	122	120	141	131
92	165	164	139	124	122	142	133
94	166	166	140	125	123	144	134
96	168	168	142	126	124	145	136
98	170	170	143	128	126	147	137
100	172	171	145	129	127	148	138
102	173	173	146	130	128	150	140
104	175	175	148	131	129	151	141
106	177	176	149	133	131	153	142
108	178	178	150	134	132	154	144
110	180	180	152	135	133	156	145
112	182	181	153	136	134	157	147
114	184	183	155	138	136	158	148
116	185	185	156	139	137	160	149
118	187	186	157	140	138	161	150
120	188	188	159	141	139	163	152
122	190	189	160	142	140	164	153
124	191	191	161	143	141	165	154
126	193	192	163	145	142	167	155
128	194	194	164	146	144	168	157
130	196	195	165	147	145	169	158
132	197	197	166	148	146	171	159
134	199	198	168	149	147	172	160

Estimated Landing Distance Required (In Feet) For Various Flap/Slat Configurations

Flaps/ Slats	Aircraft Gross Weight in 1,000 Pounds						
	90	100	110	120	130	140	150
40°/Ext	2240	2400	2560	2720	2880	3040	3200
28°/Ext	2340	2520	2680	2860	3040	3200	3380
15°/Ext	2920	3140	3360	3580	3800	4020	4260
0°/Ext	3440	3720	4020	4300	4580	4880	5180
40°/Ret	3400	3700	3980	4260	4560	4840	5140
28°/Ret	3740	4060	4360	4680	4980	5300	5600
15°/Ret	4180	4580	4880	5240	5620	5980	6340
0°/Ret	4480	4900	5320	5760	6180	6600	7000
Conditions:	Sea Level, Standard Day, No Wind, Forward Idle Thrust, Dry Runway						

Estimated Landing Distance Required (In Feet) With Complete Hydraulic Failure

Runway	Aircraft Gross Weight in 1,000 Pounds						
	90	100	110	120	130	140	150
Dry	5500	6100	6600	7100	7600	8100	8700
Icy	11500	12600	14000	15200	16500	17800	19000
Conditions:	Sea Level, Standard Day, No Wind, Two Engines at Reverse Idle to Stop, Zero Flaps, Slats Retracted, No Spoilers, Anti-Skid On, Zero Slope, Approach Speed = 1.25 Vs.						

Estimated Landing Distance Required (In Feet) With No Brakes

Time from touchdown to reverser deployed (seconds)	Engine Thrust Setting	Landing Weight (lbs)	
		80,000	150,000
6	2 @ 1.3 EPR to 0 knots	5850	11050
6	2 @ 1.3 EPR to 80 knots, then 2 @ reverse idle to 0 knots	7670	12350
Conditions: Time from contact to nose down = 1.0 sec, to spoiler actuation = 0.25 sec, to full spoilers = 0.8 sec, to brake actuation = 0.25 sec, and to full braking = 1.5 sec. Time from reverser deployed to 1.3 EPR reverse thrust = 6 sec.			

Estimated Landing Distance (In Feet) With Anti-Skid Inoperative

FLAPS	Aircraft Gross Weight in 1,000 Pounds						
	90	100	110	120	130	140	150
DRY RUNWAY							
11°	5540	6030	6520	7020	7490	7980	8460
15°	5370	5850	6120	6790	7260	7730	8200
28°	3375	3650	3950	4250	4550	4850	5150
40°	3200	3500	3775	4050	4325	4600	4875
WET RUNWAY							
28°	3850	4200	4575	4925	5275	5600	5900
40°	3700	4000	4350	4650	5000	5300	5600
Conditions: Sea Level, Standard Day, No Wind, Forward Idle Thrust, Approach Speed = 1.40 Vs.							

Estimated Landing Distance Required (In Feet) For Various Runway Surface Conditions

Engine Thrust Setting	2 @ FWD IDLE		2 @ 1.3 EPR REV	
Landing Weight (lbs)	80,000	150,000	80,000	150,000
Runway Condition	Flaps 40° Landing			
Wet	2910	4590	2830	4450
Water/Slush 0.25”	3240	6350	3150	5800
Water/Slush 0.50”	3090	5830	3000	5370
Water/Slush 0.75”	2950	5390	2870	5010
Water/Slush 1.00”	2830	5030	2740	4710
Runway Condition	Flaps 28° Landing			
Wet	3040	4850	2930	4580
Water/Slush 0.25”	3420	7120	3330	6350
Water/Slush 0.50”	3230	6420	3150	5810
Water/Slush 0.75”	3060	5860	2980	5370
Water/Slush 1.00”	2920	5400	2840	5010
Conditions: Sea level, standard day, level runway, no wind, reverse thrust was lowered to reverse idle at 80 knots				

Estimated Landing Distance Required (In Feet) On An Ice Covered Runway

Time from touchdown to reverser deployed (seconds)	Engine Thrust Setting	Landing Weight (lbs) Flaps 40° Landing Distance To 0 Knots Final Speed	
		80,000	150,000
6	2 @ 1.3 EPR to 0 knots	4230	7220
6	2 @ 1.3 EPR to 80 knots, then 2 @ forward idle to 0 knots	5490	8010
Conditions: Time from contact to nose down = 1.0 sec, to spoiler actuation = 0.25 sec, to full spoilers = 0.8 sec, to brake actuation = 0.25 sec, and to full braking = 1.5 sec. Time from reverser deployed to 1.3 EPR reverse thrust = 6 sec.			

V-Speeds for Overweight Landings

OVERWEIGHT CONFIGURATION ARRIVAL AND V/REF SPEEDS								
WT. 1000 LB.	MINIMUM MANEUVER				V/REF		GO AROUND	
	0°/RET	0°/TO	11°/TO	15°/TO	28°/LND	40°/LND	11°/TO	15°/TO
130	234	183	160	157	136	132	141	137
132	236	184	161	158	137	133	142	138
134	237	186	162	159	138	134	143	139
136	239	187	164	161	139	135	144	140
138	241	188	165	162	140	136	145	141
140	243	190	166	163	141	137	146	142
142	244	191	167	164	142	138	147	143
144	246	192	168	165	143	139	148	144
146	248	194	169	166	144	139	149	144
148	249	195	171	168	145	140	150	145
149	250	196	172	169	146	141	151	146

Overweight Landing - Minimum Landing Distance Required

1. Compare the minimum landing distance required from the table (corrected for wet runway if applicable) to runway available.
2. Determine go-around capability by checking the approach climb limiting weight in this section. The approach climb limiting weight is the maximum weight at which the aircraft has go-around capability with one engine inoperative in the approach configuration. At gross weights above the charted value minimum go-around capability is not attainable with an engine out.
3. Determine if the runway available and go-around capability warrant a landing with the actual flight circumstances.

The minimum landing distances in this table are based on the following:

1. Clean, dry runway
2. Flaps 40° , slats extended
3. Over the threshold at 50 FT and at V_{ref}
4. 30 knot headwind at 50 FT height
5. Maximum braking (Bendix Brakes No. 2608892.1)
6. Ground Spoilers deployed
7. Anti-skid operative
8. No reverse thrust

The distances represent actual distances to stop with no margin.

MINIMUM LANDING DISTANCE REQUIRED IN FEET					
Airport Pressure Altitude	AIRCRAFT GROSS WEIGHT IN LBS.				
	110,000	120,000	130,000	140,000	150,000
0	2190	2340	2490	2610	2790
1000	2238	2388	2538	2685	2850
2000	2280	2430	2580	2760	2910
3000	2334	2508	2658	2820	2970
4000	2370	2580	2730	2880	3030
5000	2448	2628	2790	2958	3120
6000	2520	2670	2850	3030	3210
7000	2568	2745	2925	3105	3285
8000	2610	2820	3000	3180	3360
Add 15% to the landing distance if the runway is wet.					

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3	12/01/97			54	05/15/95
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5	05/15/95	32	05/15/95	56	05/15/95
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15	05/15/95	42	05/15/95	66	05/15/95
16	05/15/95	42-A	08/01/98	67	05/15/95
17	01/01/00	42-B	08/01/98	68	05/15/95
18	01/01/00	42-C	08/01/98	69	05/15/95
18-A	01/01/00	42-D	08/01/98		
18-B	01/01/00	43	01/01/00	70	05/15/95
19	05/01/96	44	01/01/00	71	05/15/95
20	05/15/95	44-A	01/01/00	72	05/15/95
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21	05/15/95	45	01/01/00		
22	01/01/00	46	05/15/95		
23	05/15/95	47	05/01/96		
24	05/15/95	48	05/15/95		
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* Asterisk indicates page(s) revised or added by the current revision.

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AIRPLANE GENERAL

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AIRPLANE GENERAL

Introduction

This chapter provides the flight crew with general airplane information and specific descriptive information for the following systems:

- Lavatories and galleys
- Passenger forward entrance door and stairway, forward service door
- Oxygen systems
- Lighting systems
- Emergency exits and equipment

General

The MD-80 airplane is powered by two aft-mounted turbofan engines and is designed to provide efficient operation and reliable transportation of passengers and cargo. Simplicity of design permits efficient operation with a crew of seven: a Captain, First Officer, and five Flight Attendants.

An Auxiliary Power Unit (APU) and an integral passenger forward stairway and aft stairway facilitates passenger loading, unloading, and engine starting at airports equipped with minimal ground support equipment. External service points may be reached without use of ladders or stands. Cargo may be manually loaded from the ground without special equipment resulting in an approximate turnaround time of 20 to 30 minutes.

Fuselage

The fuselage is of all-metal construction consisting of a nose section, a center section, and a tail section. In addition to the flight compartment and the passenger compartment, the fuselage contains a nose-gear wheel well, a forward accessory compartment, an electrical / electronics compartment, forward, mid, and aft lower cargo compartments, main gear wheel well, and an aft accessory compartment in the tail section aft of the pressure bulkhead.

All external doors and emergency exits, with the exception of the forward stair well door, are plug type and pressure sealed. Door operating instructions have either stenciled instructions or instruction plates adjacent to the latches.

Wing

The wing is all metal, fully cantilevered, sweptback, and mounted through the lower fuselage. The wing incorporates the leading edge slats, ailerons, spoilers, trailing edge flaps, integral fuel tanks, and supporting structure for the main gear.

The slats are located on the leading edge of the wings and are hydraulically actuated to the takeoff, landing, and retract positions by pressure from both hydraulic systems. The slat system permits slower takeoff and landing speeds and use of shorter runways.

The aileron and aileron trim tab system provide lateral control and trim of the airplane by aerodynamically operated ailerons. A bus cable system connects the two ailerons; so that, as one aileron is moved, aerodynamically or manually, the other aileron moves in the opposite direction. The aileron system provides input to control hydraulically actuated flight spoilers for lateral control assist.

The flaps are hinged to the trailing edge of each wing and are hydraulically operated. The flaps may be positioned from full up to full down to obtain increased drag, to increase the lift of the wind, and to lower the stall speed for landing and takeoff.

The spoiler system consists of hydraulically operated flight / ground spoiler panels on the upper surface of each wing, forward of the flaps. The flight spoiler system aids lateral control and also serves as a speedbrake during flight. The flight spoiler panels are also used as ground spoilers after landing to reduce stopping distance. An additional Inboard Ground Spoiler panel is installed on each wing to improve stopping performance – on the ground.

Tail

The tail group consists of a vertical stabilizer, a horizontal stabilizer, two elevators, and a rudder. The vertical stabilizer is mounted on the aft fuselage, and the horizontal stabilizer is mounted on the top of the vertical stabilizer. The rudder and elevators are mounted on the vertical and horizontal stabilizers, respectively.

The vertical stabilizer is fully cantilevered and sweptback. A scoop for cooling the air-conditioning systems is located on the lower leading edge section and is heated when the Airfoil Anti-ice is operating.

The longitudinal trim control system is an electrically actuated system that controls the movement of the horizontal stabilizer to provide longitudinal trim. The system is controlled from the flight compartment. The longitudinal trim control system consists of a primary system and an alternate system. The leading edge of the horizontal stabilizer is heated when the Airfoil Anti-ice is operating in the Tail De-ice mode.

The elevators are aerodynamically positioned by mechanically controlled tabs, to provide longitudinal control during normal flight. In addition, a power boost system (hydraulic augmentation) is installed to position the elevators to the down position only if 10 degrees or more of up-tab is commanded. This power boost only operates when the Elevators have otherwise failed to respond to a normal control input. An anti-float tab is installed on each elevator to provide improved longitudinal trim in the landing configuration. The pilot does not have direct control over the anti-float tab.

An elevator load feel system is installed to improve longitudinal control. The system provides a variable force consistent with longitudinal trim movement. Therefore the control column forces are light at low airspeeds and heavy at high airspeeds.

The rudder is normally operated with hydraulic pressure; however, if hydraulic pressure drops below normal operating pressure, the rudder system will automatically revert to manual operation. Manual operation of the rudder can also be selected by placing the hydraulic power shutoff valve control lever in the off position. The rudder is tab driven during manual operation.

Tail Cone

The tail cone is the detachable, jettisonable aft end of the airplane fuselage. A door, mounted in the lower forward portion of the tail cone, provides external maintenance access to the aft accessory compartment.

The tail cone may be jettisoned by actuation of either an interior or exterior control handle when the airplane is on the ground to provide an emergency exit. An automatic jettison feature is incorporated into the aft cabin door. The tailcone is accessible from the passenger compartment via the aft passenger door and a walkway provided by the lowered aft stairway ceiling.

Air Conditioning and Pressurization

Cabin pressurization and conditioned air ventilation of the flight and passenger compartments are provided to maintain crew and passenger comfort. Pressurized, conditioned air is delivered through two independent air-conditioning systems designed for parallel operation but capable of independent operation. Engine bleed air is the primary source of air and energy for the air conditioning and pressurization system. During flight, cabin ventilation is also supplemented by a recirculation fan. .

Separate, automatic temperature control systems are installed to regulate flight and passenger compartment temperature to the desired settings.

All cargo compartments are pressurized. Heat is provided to the forward cargo compartment lining by vented heat air from the electrical/electronics compartment left and right radio racks. In addition, the forward cargo compartment has a fan and heater assembly to assist in maintaining the liner of the forward portion of the cargo compartment above freezing temperatures. The mid cargo compartment is provided with a fan to circulate ambient air.

Pressurization is normally controlled by one of two automatic controllers. Manual control of the Outflow Valve assembly is available by operation of a pressurization wheel on the cockpit pedestal.

Ram air may be supplied to the distribution system through the coolant air scoop in the dorsal fin. The Ram Air ventilation feature may be used on the ground or during unpressurized flight when the air conditioning is inoperative.

Also, a separate external ground connector is installed to allow connection of a ground source to supply preconditioned air to the airplane during ground operation if required.

Automatic Flight

The airplane is equipped for automatic flight guidance through the entire envelope of a flight (takeoff to landing). Digital flight guidance computers provide data for functions that follow: autopilot, stability augmentation, speed control, thrust rating, autothrottle, automatic reserve thrust, altitude alert, flight director, EPR synchronization, and on some airplanes Performance Management System.

Auxiliary Power Unit (APU)

The gas turbine-powered APU supplies pneumatic and electrical power for ground operation and electrical power while in flight. The APU is located in the aft accessory compartment and is surrounded by a fireproof enclosure. The unit is protected by a fire detection and a fire extinguishing system which can be operated either from the flight compartment or the external ground control panel located in the left aft fuselage.

Communications

The airplane is equipped with air-to-ground and air-to-air voice flight communication systems. Cockpit / cabin / ground service interphone, passenger address, and voice recorder systems are provided.

Flight attendant, pilot, mechanic, and passenger call systems are installed in the airplane. This system includes call lights and chime tones.

A separate passenger entertainment system is also provided.

All voice communication is provided through VHF radios.

ACARS is installed to provide automatic data communications for many functions.

Electrical

The airplane is equipped with an AC and DC electrical power system. The systems are divided into two independent systems designated left and right. Two engine-driven AC generators, one on each engine, are normally the primary source of AC power. In the event that engine-driven AC generators fail in flight, or when external power is not available on the ground, auxiliary electrical power may be supplied by an auxiliary power unit driven generator installed in the tail section. The 28-volt DC electrical power is normally supplied by four transformer rectifiers installed in the forward accessory compartment. These T/R's are supplied 115/120-volt AC power from the AC distribution system. Battery power is supplied by two 14-volt, nickel-cadmium batteries connected in series.

Engines

The airplane is powered by two Pratt and Whitney JT8D axial-flow turbofan engines. In addition to powering the airplane, the engines supply pneumatic power for pressurization, air conditioning, anti-icing, portable water pressure, and de-icing.

Fire Warning and Protection

The fire warning and protection system provides for continuous detection of engine and/or APU fire, and crewmember notification through visual, aural, and vocal warnings. The airplane is equipped with fire extinguishing capability for each engine nacelle area or for the auxiliary power unit compartment.

Cargo Compartment smoke detection and fire extinguishing is provided by a separate system.

Flight Controls

Primary flight controls consist of conventional aileron, rudder, and elevator control surfaces. Secondary flight controls consist of lift augmenting leading-edge slats, spoilers (lateral control / speedbrake and ground spoilers), inboard and outboard flaps, and horizontal stabilizer. The primary flight controls are cable connected to the control surfaces and are aerodynamically actuated via control tabs. When the secondary flight controls are hydraulically actuated, both the left and right hydraulic systems supply operating power. During powered rudder operation, rudder hydraulic power is supplied by the right hydraulic system. When elevator boost is required, hydraulic power is supplied by the left hydraulic system.

Fuel

The fuel system consists of three integral tanks - one in each wing and one in the wing center section. The tanks are normally filled through a single-point, pressure-fueling adapter, located approximately mid-span of the right wing leading edge. The pressure-fueling control panel is located just inboard of this adapter. A manual defueling valve is located just inboard of the pressure-fueling control panel to permit defueling or fuel transfer through the pressure-fueling adapter.

An overwing gravity fueling adapter is located on top of the outboard section of each wing tank.

Some airplanes are also equipped with two auxiliary fuselage fuel tanks; one in the mid cargo compartment and one in the aft cargo compartment. These tanks are not used at CAL.

Hydraulics

Hydraulic power is provided by two separate, hydraulically closed-circuit systems identified as the left system and the right system. The right system provides hydraulic power to the rudder, aft passenger entrance stairway, and the landing gear actuating subsystem; the left system provides hydraulic power to the elevator augmentor. All other hydraulic subsystems are served by both systems through separate valves and actuators. The primary source of hydraulic power for each system is an engine-driven pump with an electrically powered auxiliary pump in the right system. There is a power transfer unit between the right and left systems with adequate capacity to transfer full available power between systems.

Ice and Rain Protection

Ice and rain protection is provided for various areas and components of the airplane by the following systems:

- Airfoil leading edge, ram air scoop, and forward strakes anti-icing and horizontal stabilizer de-icing system
- Engine and engine nose cowl anti-icing system
- Windshield and window anti-icing and anti-fogging system
- Pitot tubes, static ports, and stall warning left transducer anti-icing system
- Windshield wipers

The anti-icing system prevents an accumulation of ice, and the de-icing system removes accumulated ice. Hot air from the pneumatic system is used for anti-icing the wing slats, ram air scoop, forward strakes, engine, and engine nose cowl. Pneumatic air is also used to de-ice the horizontal stabilizer when selected.

An electrical anti-icing system is provided for the windshields, pitot tubes, static ports, and the stall warning lift transducers. Anti-fogging of the windshield and windows is also accomplished electrically.

Instrumentation and Navigation

Instrumentation and navigation systems are provided to permit flight under limited visibility conditions. The navigation systems encompass both ground-dependent and independent systems.

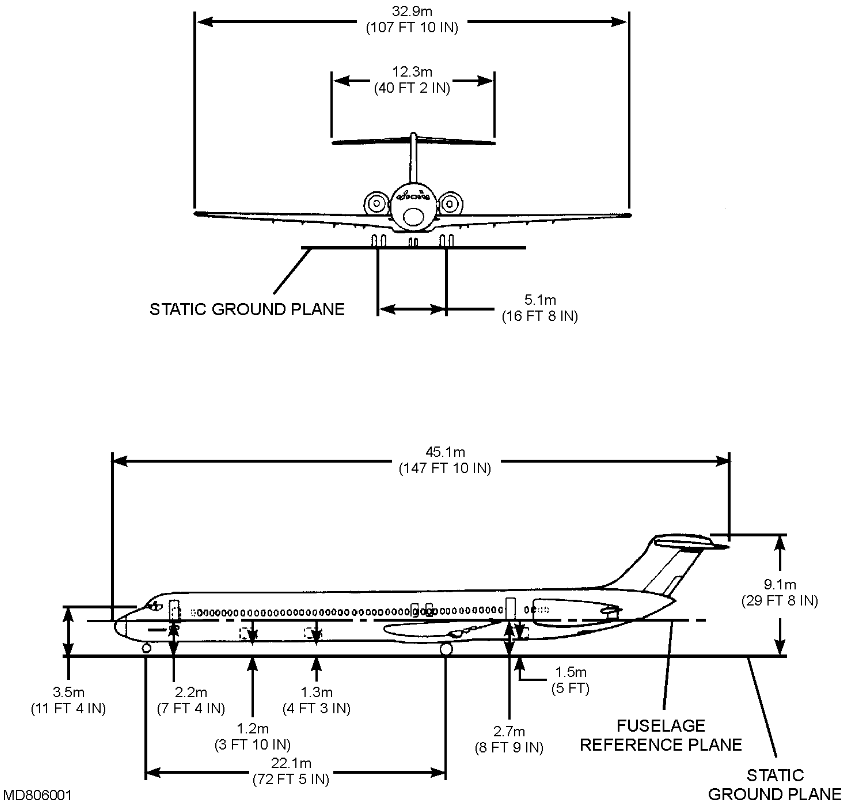
The systems provide instrument and annunciator displays for the flight crew to determine airplane attitude, airspeed, altitude, vertical speed, heading, course, geographical location, weather avoidance, time, and guidance during approach and landing.

Landing Gear

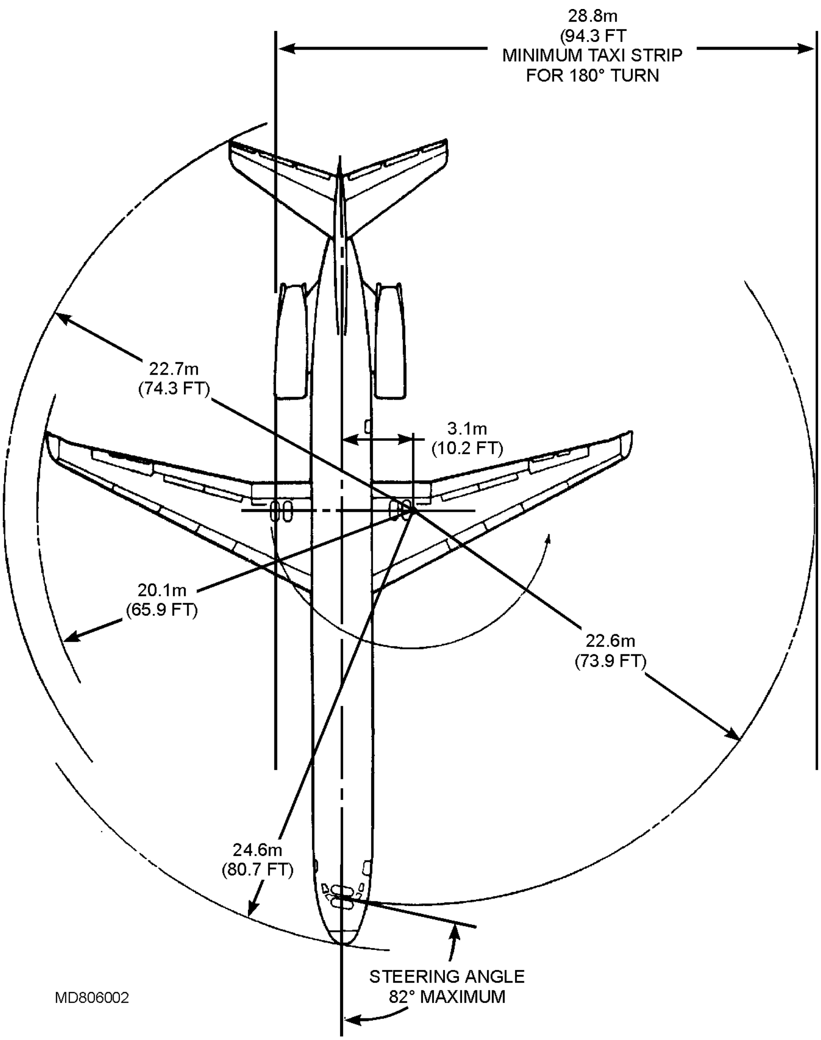
The airplane has a fully retractable tricycle landing gear arrangement. The nose gear assembly is a dual-wheel, steerable assembly with an oleo strut mounted in the forward, lower section of the fuselage. The two main gear assemblies consist of two oleo struts with a set of dual wheels and brakes attached to each strut. The struts are mounted in the wing root area, aft of the right and left rear wing spar. Each wheel well is completely enclosed by doors when the landing gear is retracted.

Pneumatics

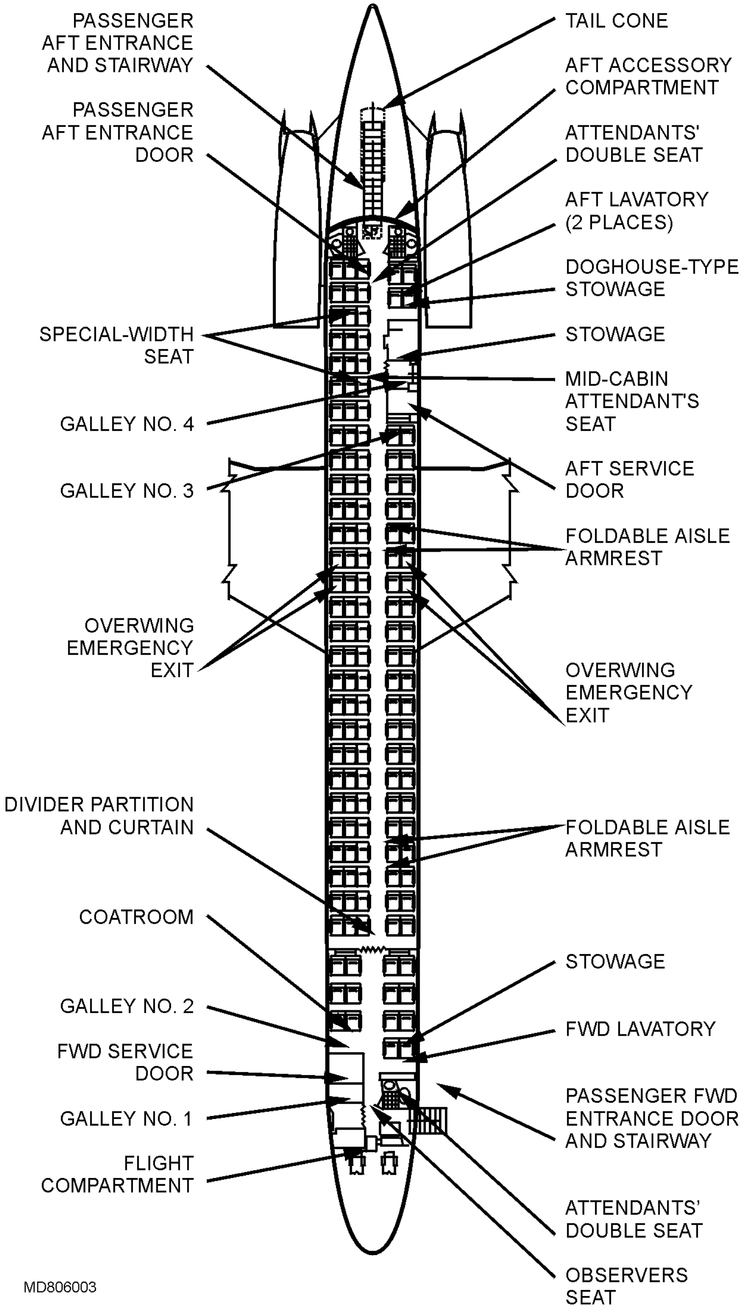
The pneumatic system supplies bleed air for air conditioning, cabin pressurization, potable water pressurization and ice protection. Normally, engine bleed air is used to supply the system. In addition to engine bleed air, an external ground connection is installed to permit connection of a ground pneumatic power source for engine starting and air conditioning operation. The APU, when operating, can also supply the pneumatic requirements while the airplane is on the ground.



AIRPLANE DIMENSIONS



TURNING RADIUS



INTERIOR ARRANGEMENT

FLIGHT COMPARTMENT

The flight compartment is designed for operation by a two-man flight crew with accommodations for an observer. The two-man capability is made possible by locating all essential controls where they are accessible to either man, and locating all visible indicators and legends where they may be viewed by either man.

The compartment provides flight stations for the Captain and First Officer. The seats are track mounted and are fully adjustable in fore-and-aft, up-and-down, and reclining planes, with positive locking in any position. In addition, a folding seat is provided for a flight observer. All flight compartment seats are provided with safety belts and shoulder harnesses.

Effective for some airplanes: To aid each pilot in attaining a precise seat adjustment, an alignment device is provided under the glareshield on each side of the instrument panel. To properly adjust the seat, each pilot must look across the flight compartment to the alignment target. When the seat is properly adjusted, the pilot should see a white dot centered in the right eye target locator.

The flight compartment contains four different types of windows: a center windshield and two side windshields, a clearview window on either side, aft window on either side, and two upper (eyebrow) windows immediately above the clearview windows.

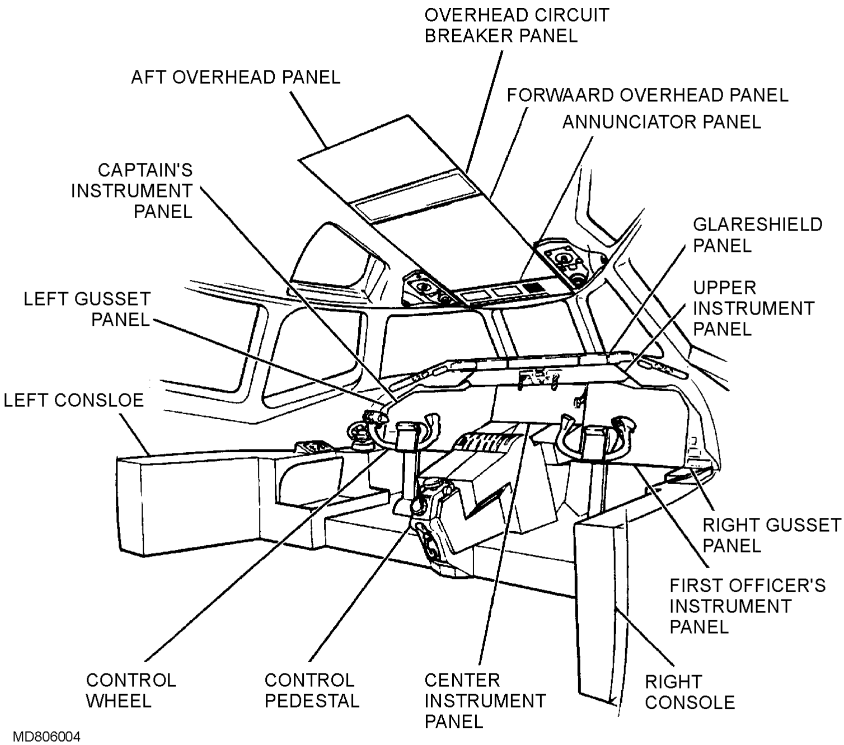
The center windshield and two side windshields are electrically heated for anti-icing, antifogging, and added bird impact resistance.

The clearview windows can be opened to provide forward vision when the flight compartment is not pressurized, and also provide an emergency exit using the escape lines stowed directly above them. These windows are electrically heated for antifogging, but not for anti-icing. The eyebrow windows are electrically heated for antifogging. The two windows located aft of the clearview windows are not heated.

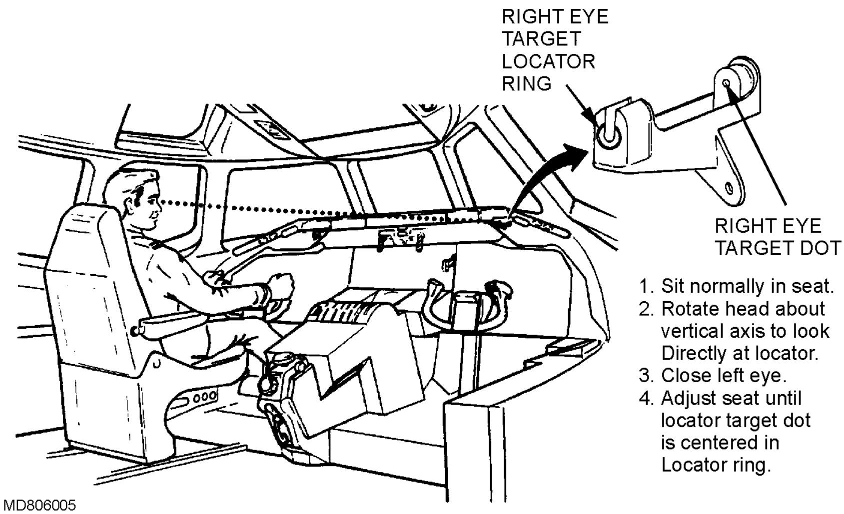
A fire extinguisher is secured to the bulkhead behind the First Officer's station in quick release-type brackets.

An emergency fire axe is secured to the bulkhead behind the Captain's station.

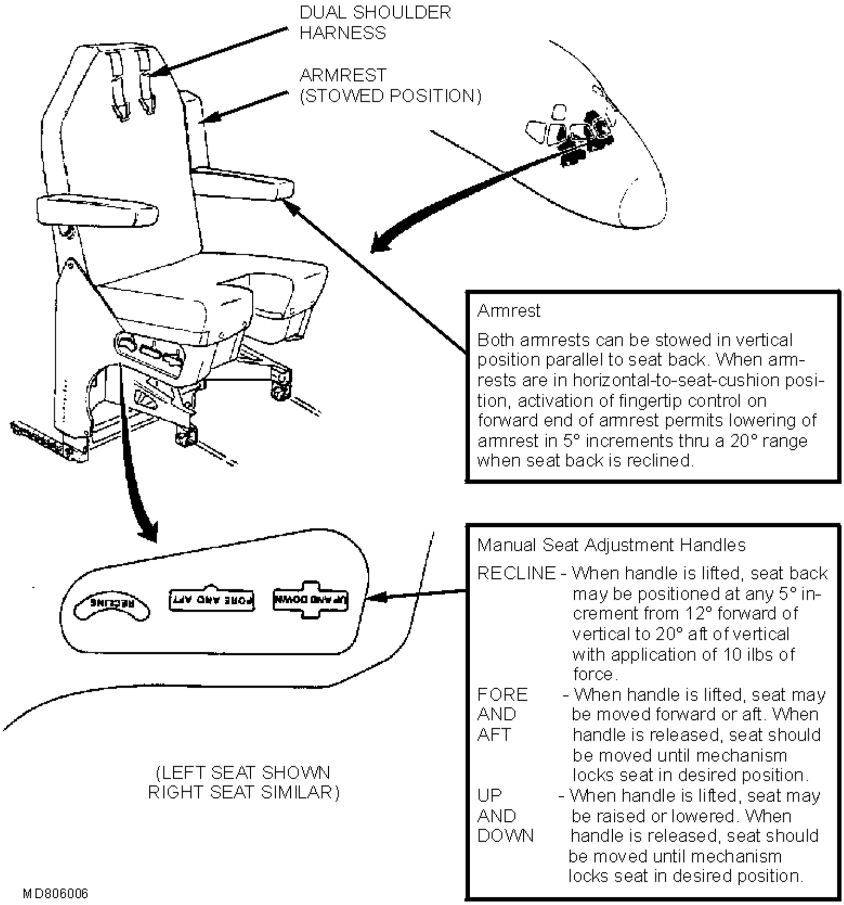
The flight compartment door incorporates an electrical lock operated by a pushbutton switch located on the forward overhead switch panel. In the event of lock malfunction or power loss, the door may be opened from the flight compartment by turning the handle and, from the passenger compartment, by a key. The door automatically locks when closed. A wide-angle viewer in the door provides crew members with a view of the passenger compartment. Louvered panels in the door allow air pressure to balance between flight compartment and passenger compartment in the event of rapid decompression during pressurized conditions. The louvers may be closed during smoke conditions.



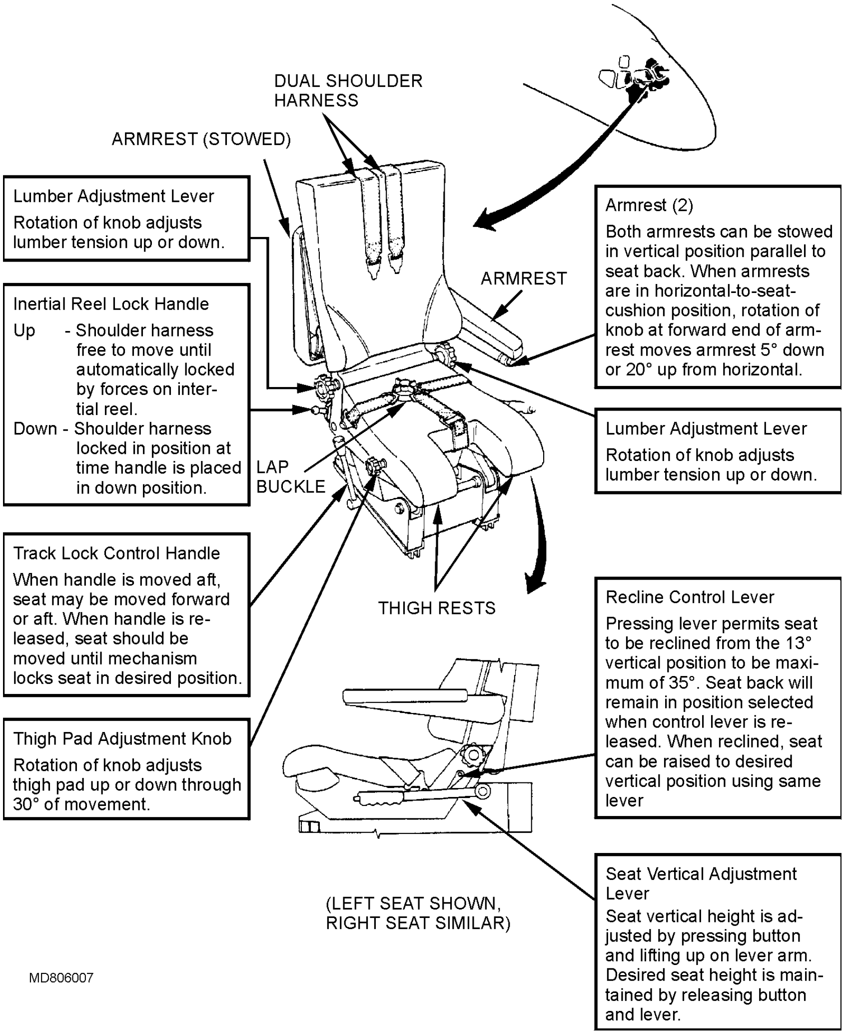
FLIGHT COMPARTMENT ARRANGEMENT



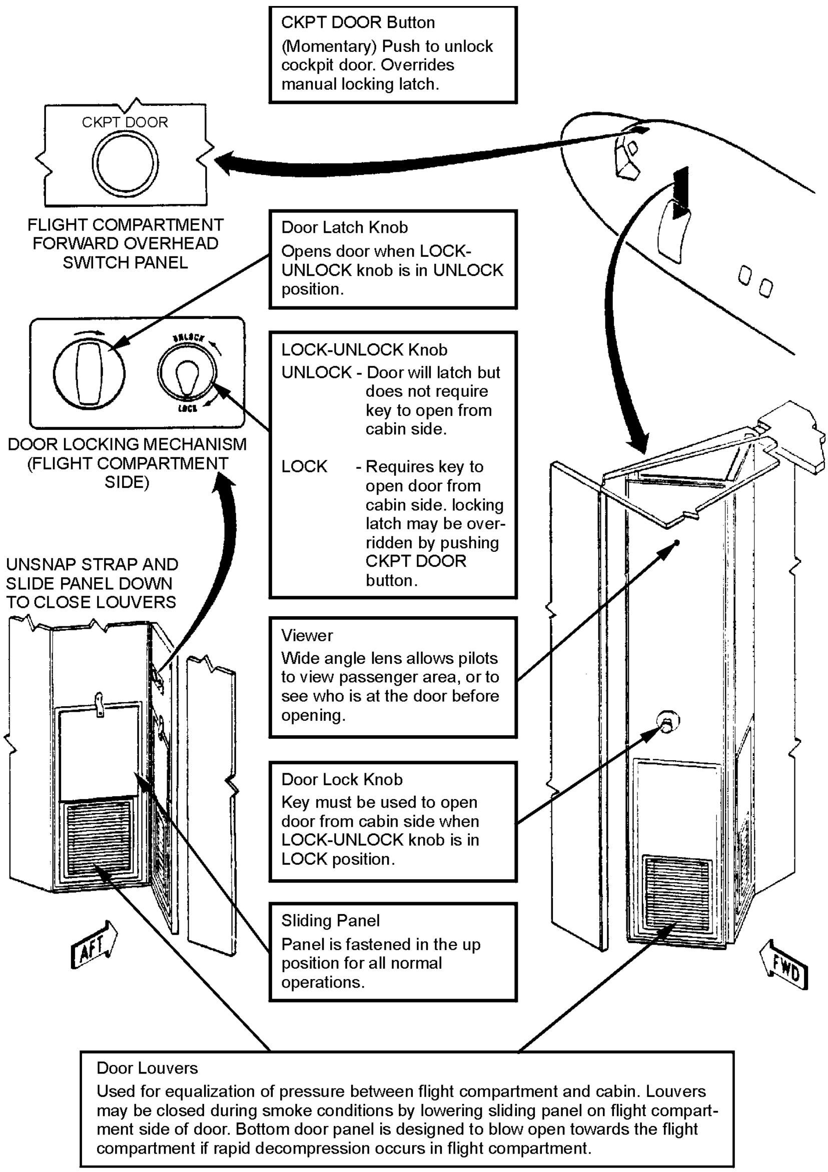
PILOT EYE LOCATOR
(Left Side Shown - Right Side Opposite)
Installed on Some Airplanes



PILOT SEATS
(Installed on Some Airplanes)



PILOT SEATS
(Installed on Some Airplanes)



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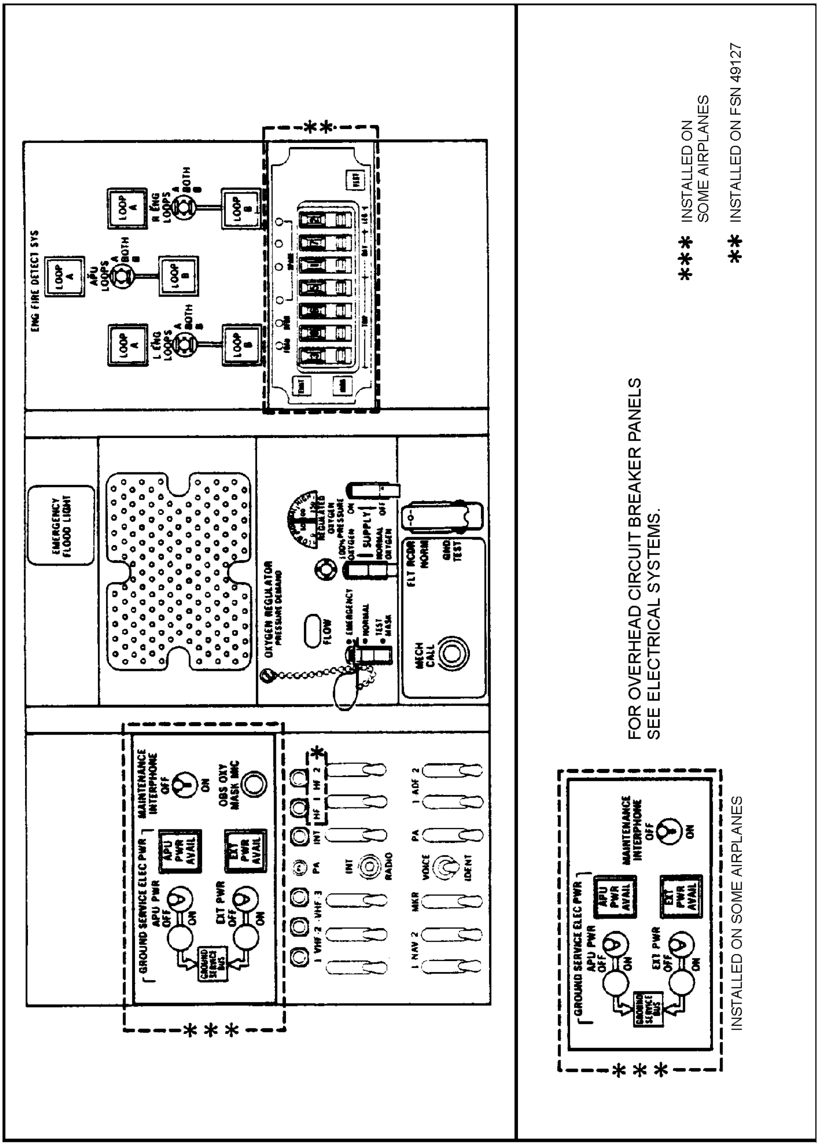
FLIGHT COMPARTMENT DOOR



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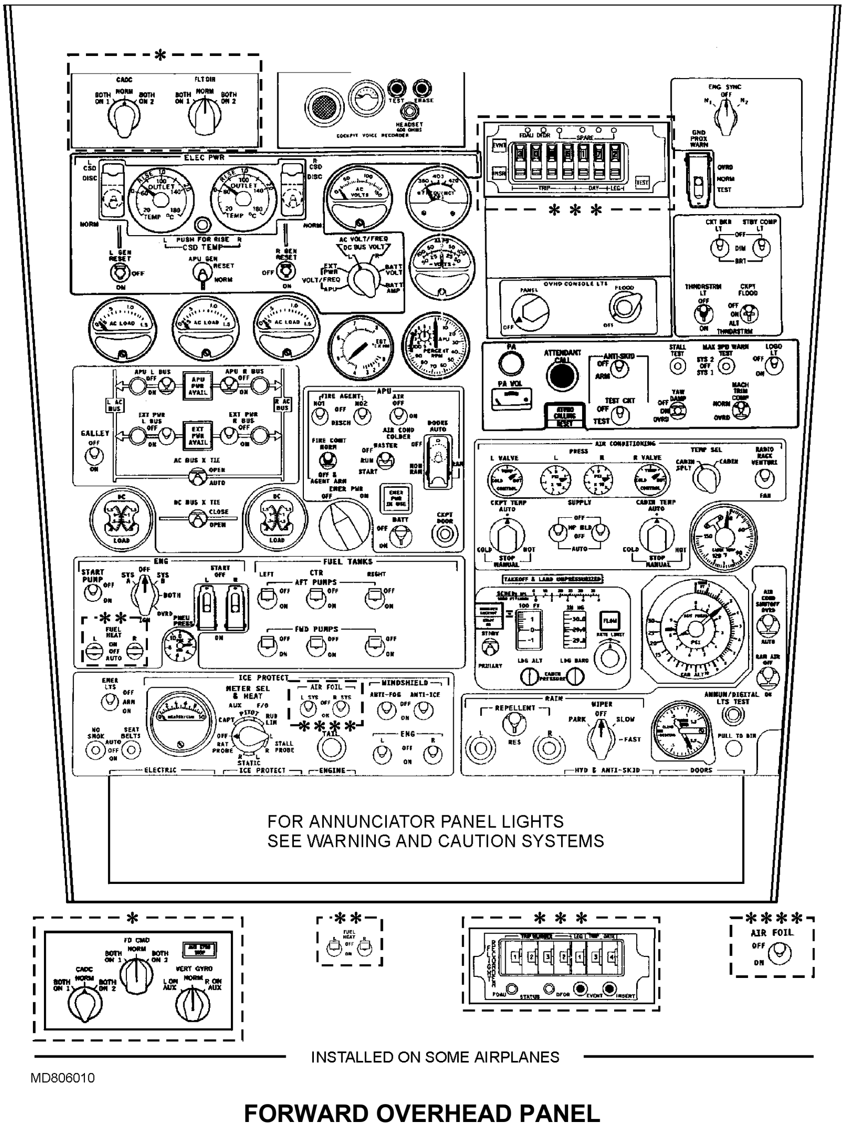
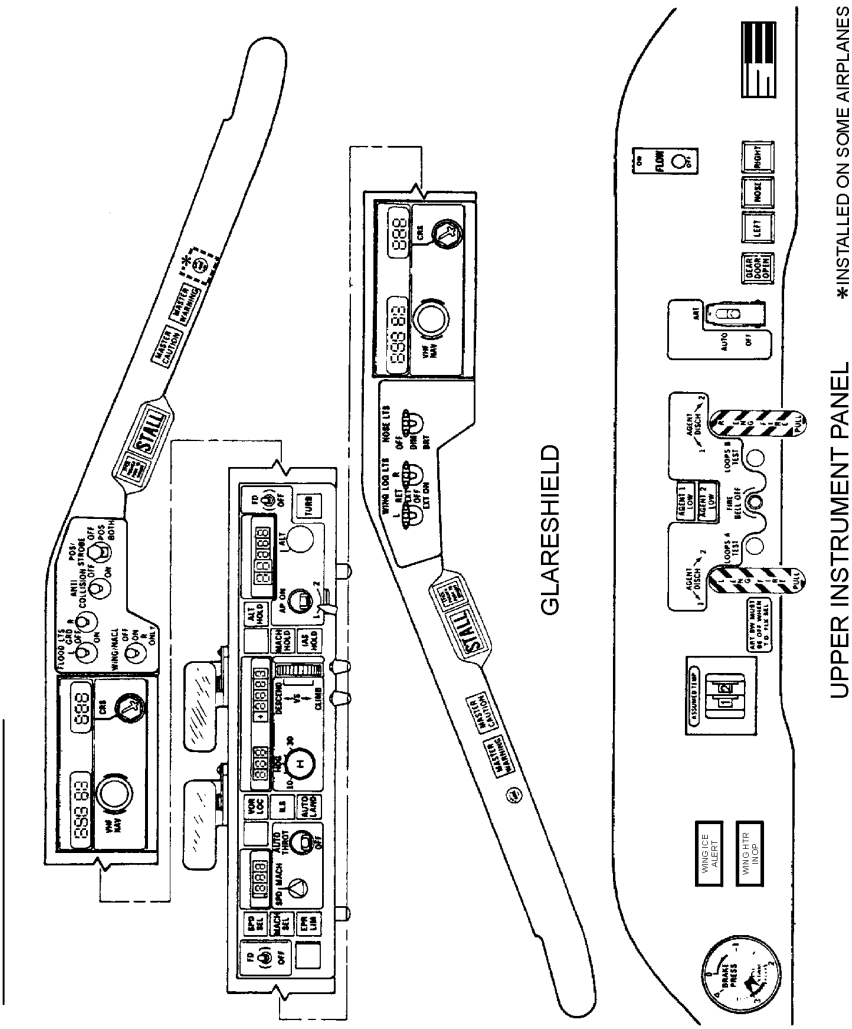
AFT OVERHEAD PANEL



FORWARD OVERHEAD PANEL



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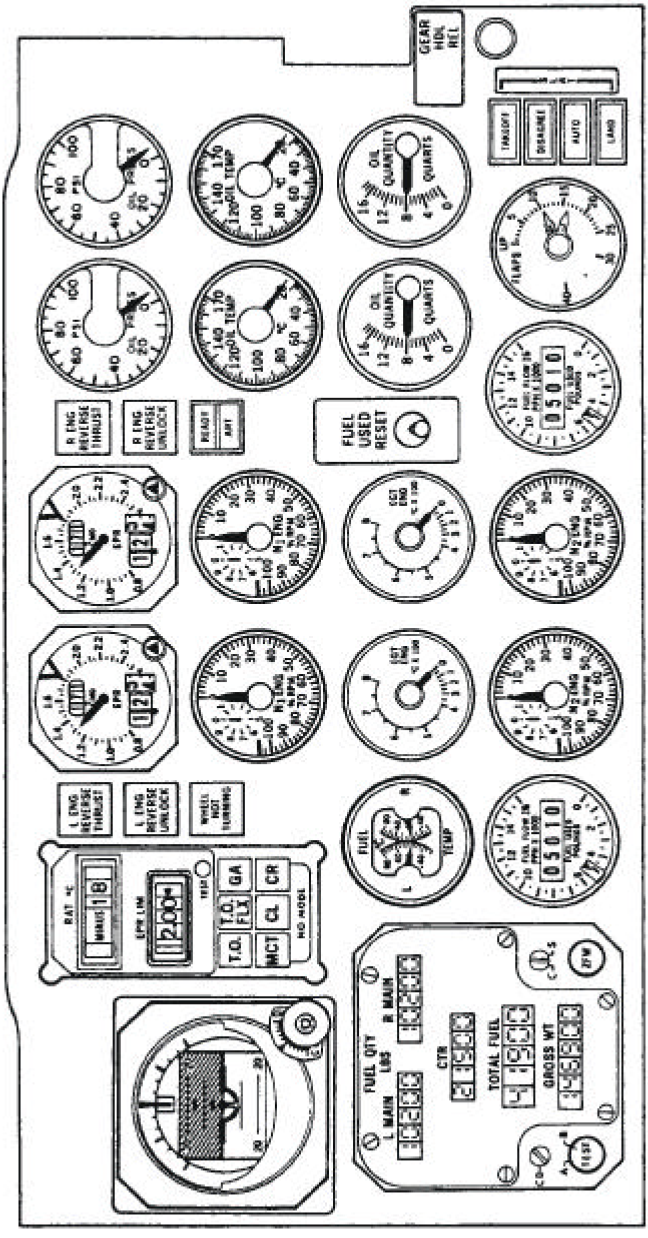
GLARESHIELD AND UPPER INSTRUMENT PANEL



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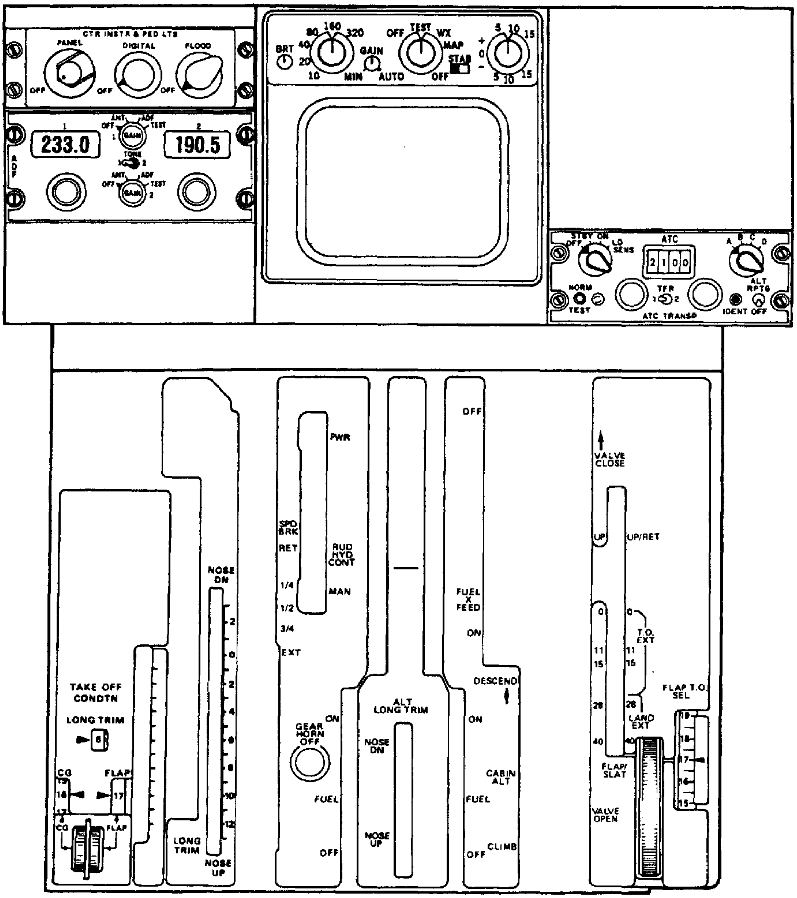
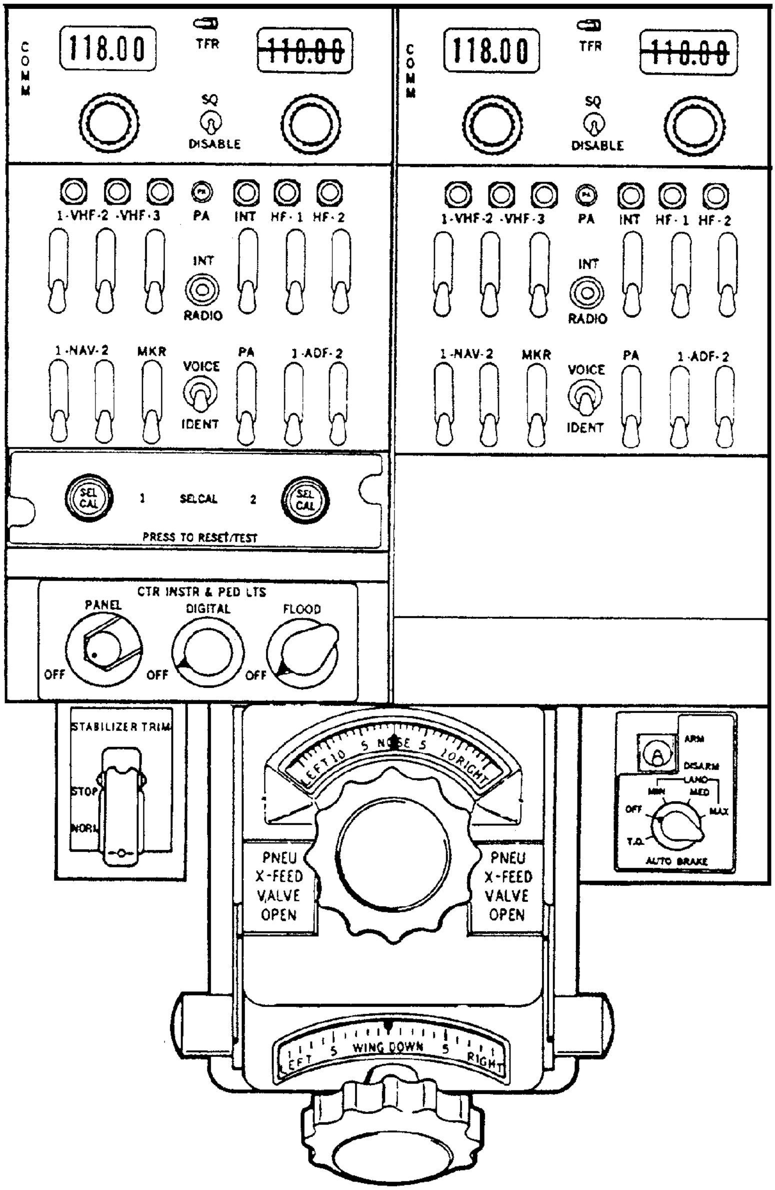
CENTER INSTRUMENT PANEL



MD806014

NOTE:
CONTROLS REMOVED FOR CLARITY

PEDESTAL (FORWARD)



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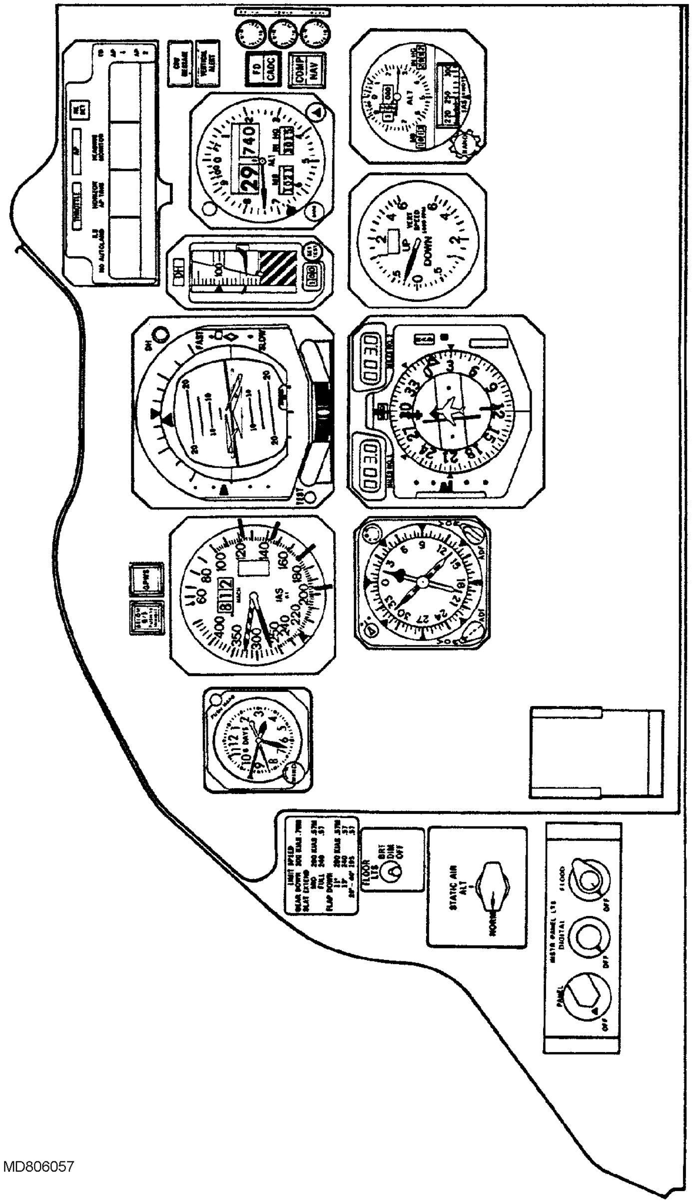
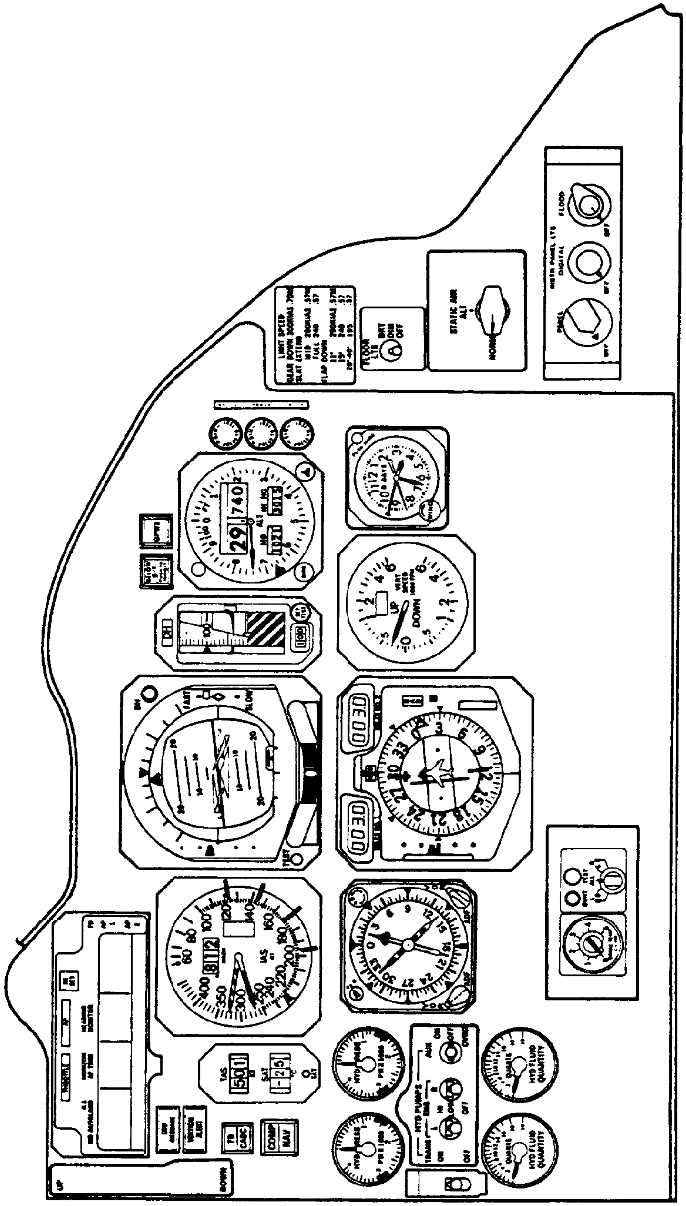
PEDESTAL (AFT)



MD806057

CAPTAINS INSTRUMENT PANEL



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FIRST OFFICERS INSTRUMENT PANEL

PASSENGER COMPARTMENT

General

The passenger compartment arrangement, interior furnishings, and equipment are designed to provide a high level of comfort and versatility in seating arrangements.

Door Dimensions

Approximate door dimensions are as follows:

Passenger Forward Entrance Door	(34 x 72 inches)
Forward Service Door	(27 x 48 inches)
Overwing Emergency Exit	(20 x 36 inches)
Passenger Aft Entrance Door	(28 x 72 inches)
Aft Service Door	(27 x 60 inches)

Flight Attendants'Stations

Three flight attendants' stations are provided with seating for 5 flight attendants. Two flight attendants' seats are located forward at the left of the flight compartment door in the forward entryway area, two are located aft at the passengers' aft entrance door, and one is located inboard on the galley G4 wall. A flight attendant's control panel and oxygen service is installed at each attendant's station.

Passenger Utilities

Passenger utilities, consisting of reading lights, cold air outlets, attendant call buttons, and oxygen masks, are grouped on panels mounted on the overhead stowage rack lower surface.

Passenger Seats

Each seat is equipped with a seat belt, ashtray, folding utility tray, and literature stowage pocket. All seat backs, except on the outboard seats adjacent to each overwing exit, are adjustable in the recline position by means of a push-button control in the armrest. The seat will return to the normal upright position when the push-button is pressed and no backward force is present.

Each seat back, except on the outboard seats adjacent to each overwing exit, can be forced by twenty-five pounds of force (approximate) to fold from its normal upright position to lay flush with the seat cushion. The seats may be returned to normal upright position by manually lifting with approximately ten pounds of force.

All armrests, except the one adjacent to the aisle, may be folded up, flush with the seat back. The seat bottom cushions are equipped with hand straps to facilitate use as flotation gear.

Galleys

Four galley units are installed in the passenger compartment. Galleys G1 and G2 are located forward on the right side of the passenger compartment adjacent to the forward service door. Galleys G3 and G4 are located aft on the left side of the passenger compartment near the aft service door. Galleys G1 and G4 are wet galleys and water is supplied from the pressurized potable water system. Galley sinks drain overboard through heated drain masts.

See Airplane General - Interior Arrangement for galley arrangement and location.

Lavatories

Three lavatories are installed in the passenger compartment. One is located forward just aft of the forward passenger entryway and two are located aft on either side of the aft passenger entrance door.

Note: A locked lavatory door can be unlocked from the outside by inserting a screwdriver or other sharp instrument into a slot on the occupied sign on the door latch and sliding the sign to the vacant position.

Water is supplied to the lavatories from the pressurized potable water system. A water shutoff valve is located under the washbasin to shut-off or adjust flow of water to the basin. Hot water is provided by a water heater located under the wash-basin in each lavatory.

The lavatories contain integral waste tanks which are drained through exterior service panels.

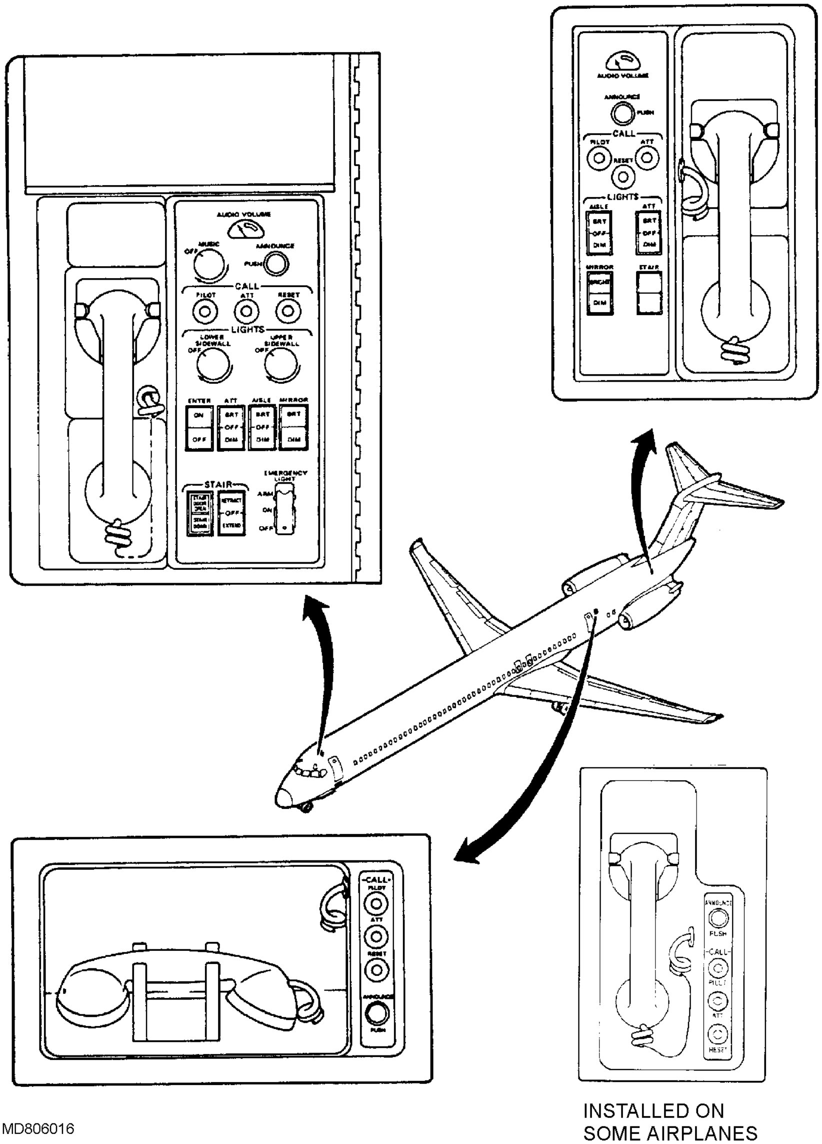
Potable Water System

A 47 gallon pressurized potable water tank, located in the fuselage right tunnel just forward of the mid compartment door, supplies water to the wet galleys and lavatories.

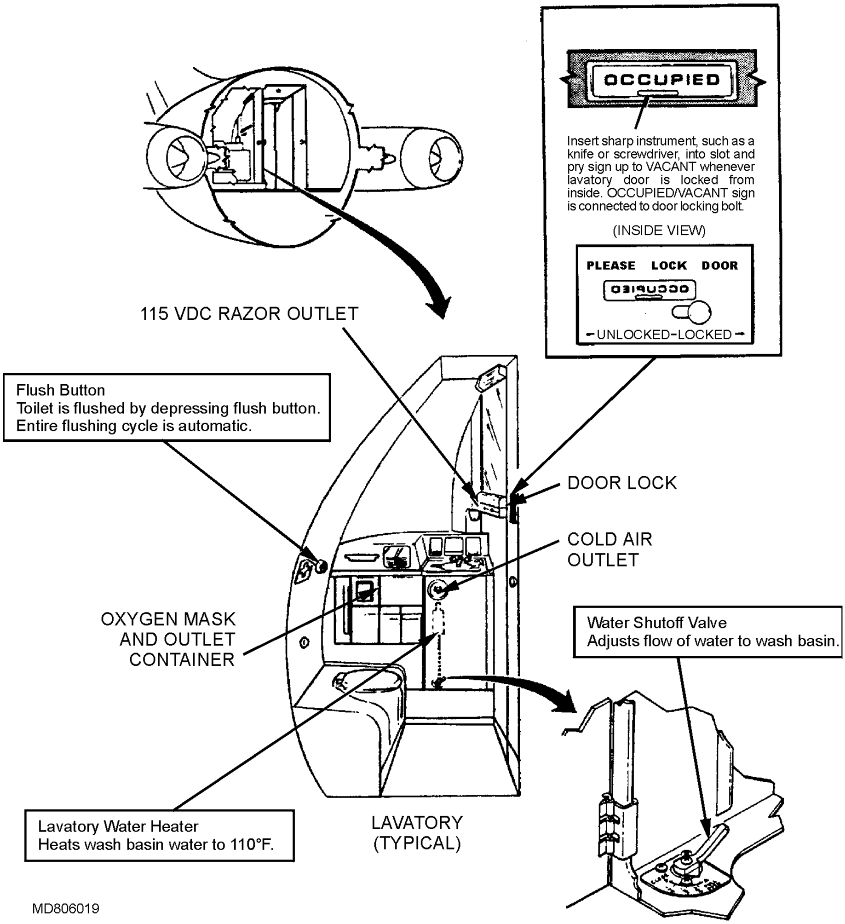
The potable water tank is normally pressurized from the airplane air conditioning system. On the ground when the air conditioning system is not operating, the tank can be pressurized from a ground source through the fill valve nipple on the water service panel.

The water service panel, located on the lower left side of the fuselage, also contains switches and indicators required for filling and venting the tank and draining the water lines.

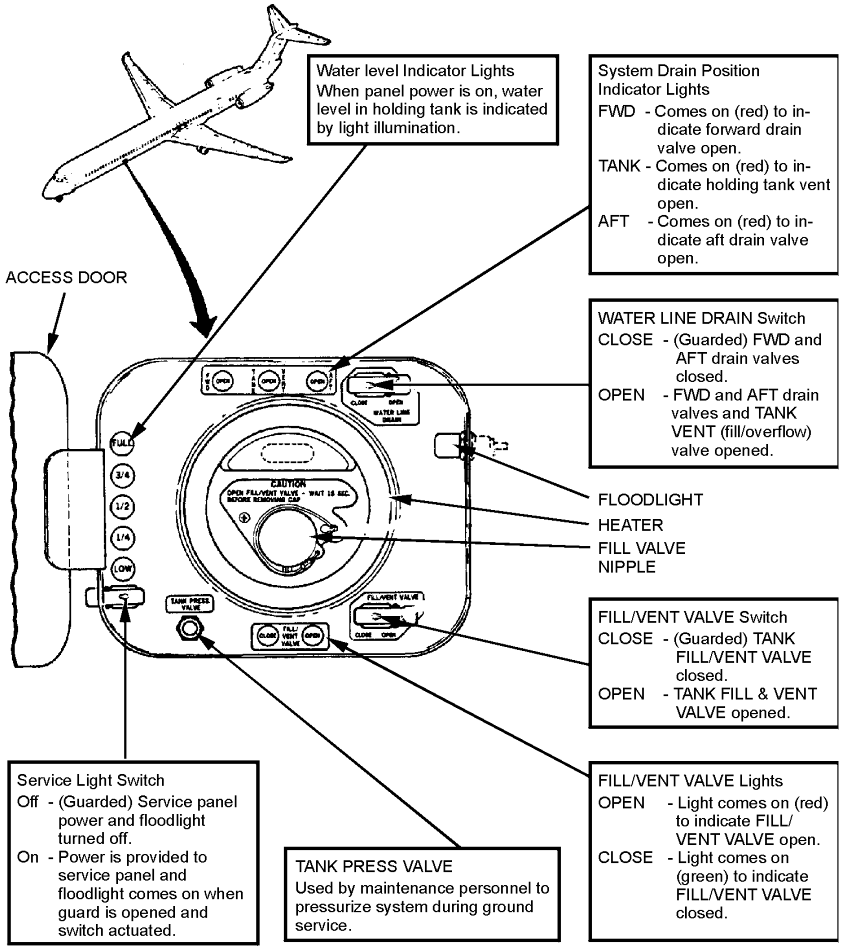
Note: The potable water tank cannot be drained by use of the water service panel controls. The tank can be drained by manually opening a drain valve located on the tank bottom accessible by removing a cargo compartment sidewall panel.



FLIGHT ATTENDANTS PANELS



LAVATORIES
Effective On Some Airplanes



WATER SERVICE PANEL

Effective On Some Airplanes

PASSENGER ADDRESS AND ENTERTAINMENT SYSTEMS

Passenger Address System

The passenger address (PA) system enables the pilots and flight attendants to address passengers through speakers in the passenger compartment and lavatories. Selector switches are provided in the cockpit which permit pilots to monitor flight attendant PA announcements.

Handsets, installed in the flight compartment and at each of the flight attendants' stations, are used to make announcement over the PA system. A VU meter, located on the cockpit overhead panel and the forward and aft flight attendants' panels, provides an indicator of PA audio output level.

Since the speakers and handsets are common to both the PA system and the passenger entertainment system, a priority sequence is installed. The priority sequence (listed in order of priority) is as follows: pilots' PA announcements, flight attendants' PA announcements, recorded emergency oxygen mask announcements (if installed), recorded announcements (if installed), and passenger entertainment. The forward flight attendant's station has priority over the mid and aft attendants' stations. The mid and aft attendants' station have equal priority.

Flight attendant PA announcements can be initiated from any cabin panel by removing the handset from its hanger, pushing the ANNOUNCE button, and speaking into the microphone. The speaker at the forward flight attendant's station is muted to prevent feedback through the handset microphone whenever that handset is used for PA system transmission.

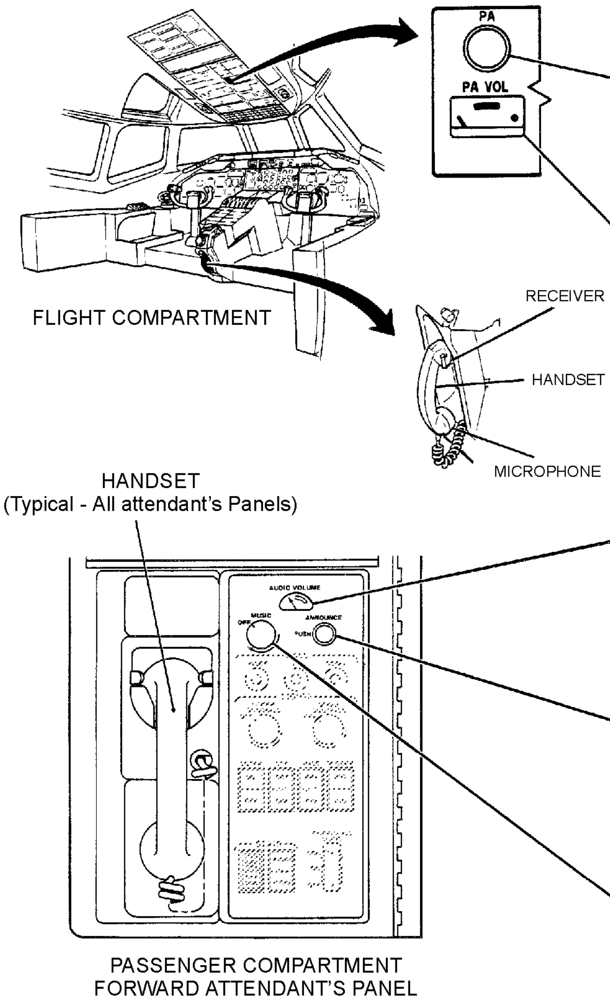
Recorded announcements can be initiated from the automatic announcement control panel (if installed), at the forward flight attendant's station.

A recorded emergency oxygen mask announcement is automatically initiated (if installed), when a cabin depressurization occurs (cabin pressure altitude exceeds 14,000 feet). The audio level of the recorded oxygen announcement (stored on Channel A1) is preset to a higher volume than any other recorded announcement. The oxygen announcement cannot be canceled at the automatic announcement control panel, but the announcement can be overridden by use of any PA handset microphone. The recorded oxygen announcement (if installed), can be initiated by manual operation of the oxygen eject switch located in the cockpit.

Passenger Entertainment System

Boarding and deboarding music, played over the passenger address system speakers, provides a pleasing background while passengers are boarding or leaving the airplane. The music is turned on and off and the volume is controlled by operation of the MUSIC ON / OFF volume control located on the forward flight attendant's control panel. A VU meter, located on the cockpit overhead panel and the forward and aft flight attendants' panels, provides an indication of passenger entertainment system audio output level.

Note: PA and passenger entertainment system volume level is automatically boosted when airplane is in flight mode.



PA Button-Light
With handset off hanger, momentarily push button to connect handset to public address system. Light will come on. When handset is replaced on hanger, public address system is disconnected and handset reverts to service interphone function. Light will go off.

PA VOL Meter
Indicates output level of public address amplifier. Radial markings indicate desired level of modulation.

AUDIO VOLUME Meter
(Typical forward and aft attendants' panels.)
Indicates output level of PA amplifier. Radial markings indicate desired level of modulation.

ANNOUNCE Button-Light
(Typical - all attendants panels.)
With handset off hanger, momentarily push button to connect handset to passenger address system. Light will come on. When handset is replaced on hanger, passenger address system is disconnected and handset reverts to service interphone function. Light will go off.

MUSIC OFF/on Knob
(Forward attendants panels only.)
On – Boarding music on. Volume varied by rotating knob. Output indicated on AUDIO VOLUME meter.
OFF – Boarding music off.

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PASSENGER ADDRESS AND ENTERTAINMENT SYSTEM - CONTROLS AND INDICATORS

CARGO AND ACCESSORY COMPARTMENTS

General

The cargo and accessory compartments consist of the forward accessory compartment; the electrical / electronics compartment, forward, mid, and aft cargo compartments, main-gear wheel well accessory compartment; and aft accessory compartment.

Lower Cargo Compartments

The lower cargo compartments are located below the passenger compartment floor in the belly of the airplane. All cargo compartments are pressurized. Heat is provided to the forward cargo compartment liner by vented heated air from the electrical / electronics compartment left and right radio racks. In addition, the forward cargo compartment has a fan and heater assembly to assist in maintaining the forward portion of the cargo compartment liner above freezing temperatures. The mid cargo compartment is provided with a fan to circulate ambient air.

The forward cargo compartment, forward of the cargo door, is suitable for transporting live animals. The ceilings, sidewalls, and floor are lined with laminated glass fiber panels that are removable in sections to facilitate inspection and repair. Other equipment in the compartments includes cargo tiedown tracks, web barrier nets, and door barriers. All compartments are equipped with lights and control switches located immediately inside the door. Tunnel areas outboard of the cargo compartment liners contain environmental, electrical and avionic equipment installations.

Forward Accessory and Electrical / Electronics Compartments

Two pressurized compartments are located in the forward section of the fuselage. The forward accessory compartment houses electronic and electrical equipment. The compartment is accessible through a plug-type door in the ceiling of the nose-gear wheel well.

The electrical / electronics compartment is located between the nose gear wheel well and the forward lower cargo compartment. The compartment houses the rack-mounted electronic components and is ventilated with exhausted air from the flight compartment. A ground access door for the compartment is located aft of the nose gear wheel well, and an in-flight access door is located in the fight compartment floor behind the Captain’s seat. Both of the forward compartments are equipped with lights. The external doors to the forward accessory and electrical / electronics compartment have door warning lights on the annunciator panel which remain on when the doors are not closed and locked.

Main Gear Wheel Well Accessory Compartments

The main gear wheel wells are located in the lower segment of the fuselage aft of the wing center section. In addition to housing the wheels when retracted, the wells house such hydraulic system components as reservoirs, filters, accumulators, pressure gauges, pumps, and service panels. The inboard wheel well doors can be opened for access to the hydraulic components while the airplane is on the ground.

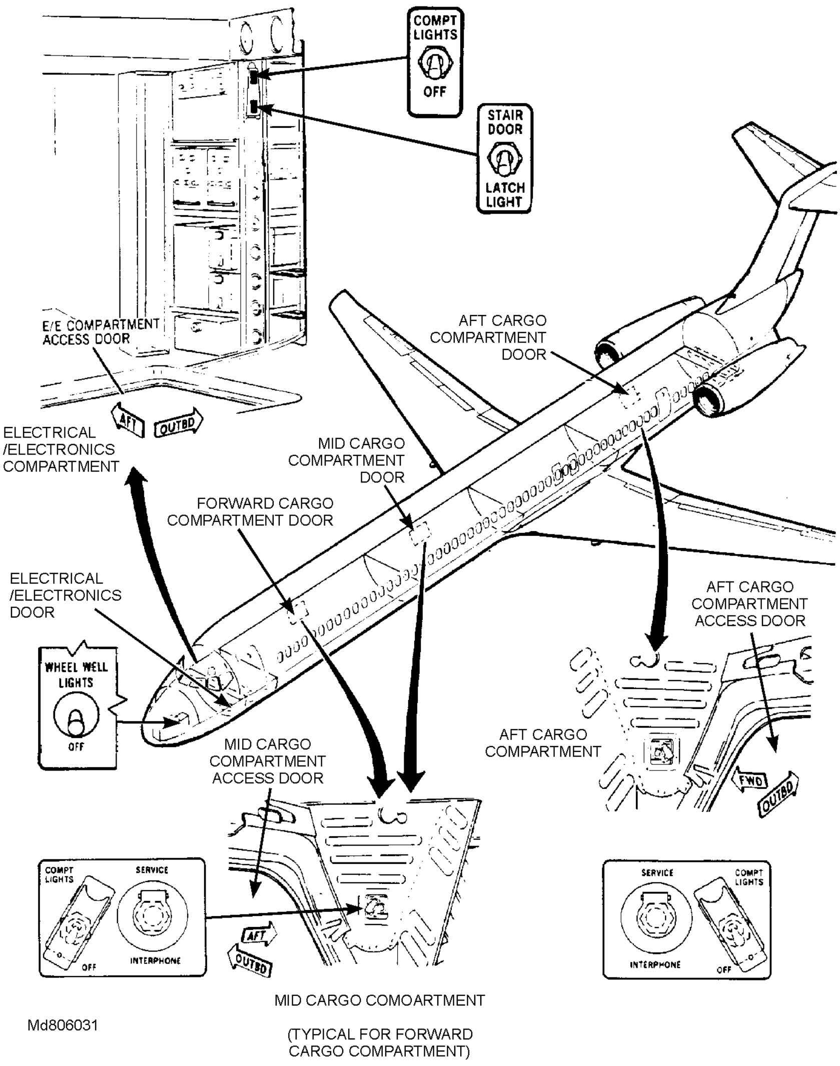
Aft Accessory Compartments

The aft accessory compartment is located in the tail section of the airplane, aft of the pressure bulkhead. The air conditioning equipment and engine fire extinguishing equipment are installed in the compartment. Access to the compartment is made through the aft cabin door, through the tail cone access door, the aft stairway door, or through the opening with the tail cone removed.

A walkway is provided in the compartment. The walkway is down when the Ventral stairs are retracted. When the Ventral stairs are extended, the walkway is raised for form the ceiling of the stairway area.

The APU compartment is located in the bottom of the aft accessory compartment, immediately aft of the pressure bulkhead. The APU installation is shrouded with a fireproof cover. Servicing access to the APU is provided on the fuselage exterior.

The aft accessory compartment is non-pressurized.



CARGO AND ACCESSORY COMPARTMENTS

PASSENGER ENTRANCE DOORS AND STAIRS AND SERVICE DOORS

Passenger Forward Entrance Door and Forward Service Door

The passenger forward entrance door is installed on the left side of the fuselage, and the forward service door is installed on the right side. Either door can be opened from either inside or outside the airplane. The doors swing outward after the hinge has moved inward permitting the doors to move edgewise through the doorway. An evacuation slide is installed on each door. Operating instructions for the door and the slide are stenciled on the door and slide container, respectively. Door warning lights on the annunciator panel will remain on when either door is not closed and locked.

Passenger Forward Entrance Stair

The forward entrance stair is removed from all CAL aircraft.

A mechanical interlock, which is part of the stairwell door latching mechanism, prevents the stairwell door from being opened when the passenger door is locked closed and prevents the passenger door from being locked when the stair door is opened.

Forward Stairwell Door Latch Inspection Viewer

An inspection viewer is installed in the left side of the floor beam immediately forward of the stairwell, in the electrical / electronics compartment.

The viewer is used to determine that the stairwell door is latched if the **STAIR DOOR** light on the annunciator panel and / or the **STAIR DOOR OPEN** light on the forward attendant's panel inadvertently come on. The viewer installation consists of a small door in the floor beam, and a light switch to turn on the stair lights. Access to the electrical / electronics compartment is gained through the door in the floor of the flight compartment, just aft of the Captain's seat or through the external electrical / electronics access door aft of the nose gear well. (See illustration title Forward Stairwell Door Latch Inspection Viewer.)

Passenger Aft Entrance Door

The passenger aft entrance door is mounted on the aft pressure bulkhead and hinged on the right side to swing forward against the lavatory wall. A viewing window is installed in the door handle recess to allow inspection of the stairway area with the door closed. The door provides access to the forward end of the passenger aft stair passageway, where the internal stairway control panel is located. The aft flight attendant's seat is attached to the door and automatically folds into a recess in the door when not in use. The seat bottom must be folded into the recess when the door is opened. A barrier strap is installed to be placed across the aisle forward of the door for takeoff and landing, to preclude passenger interference when opening the door. A hold open latch is installed on the right side of the aisle to hold door in the open position.

Door warning lights on the flight compartment annunciator panel will remain on when the door is not closed and latched.

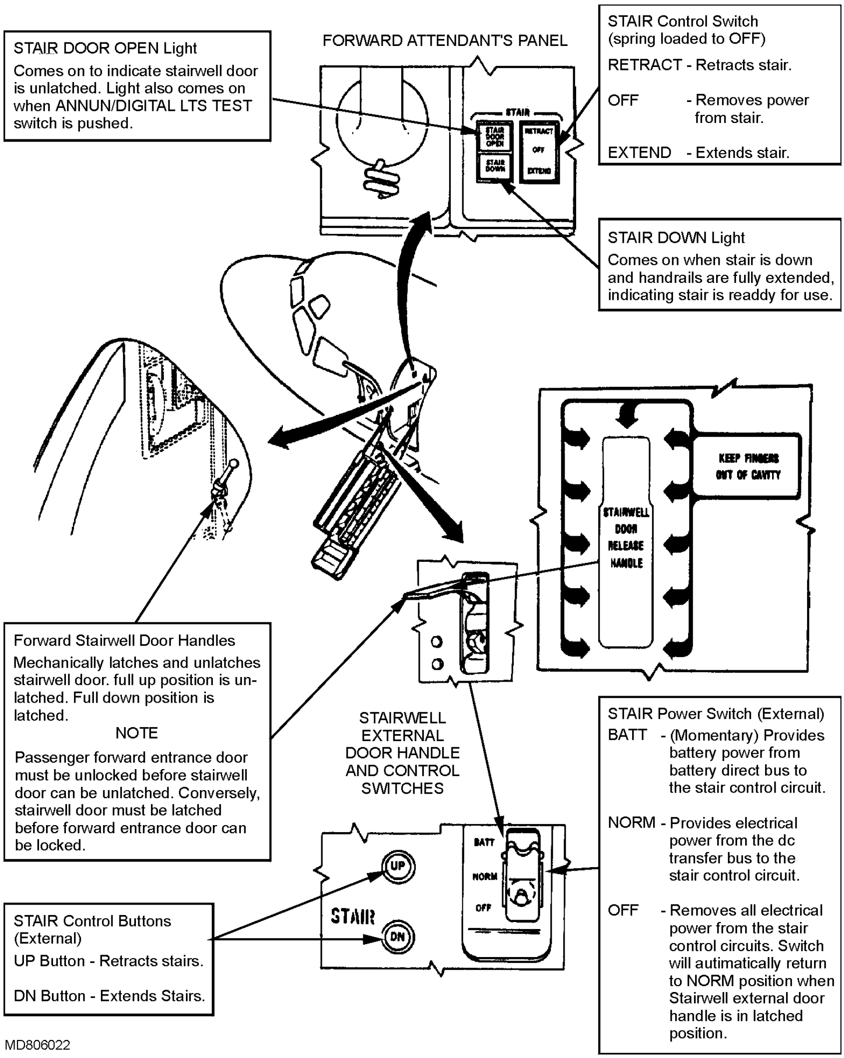
Passenger Aft Entrance Stairway

The aft entrance stairway is hydraulically actuated and powered by the right hydraulic system and, if normal hydraulic power is not available, the stairway may be extended by free-fall and retracted by using the hand pump in the right main wheel well to pressurize the right hydraulic system. When retracted, the stairway is automatically locked in the up position by mechanical locks. The stairway may only be operated by a control handle located in the exterior stairway control panel. Advisory lights, mounted on the stairway interior control panel, indicate stairway and stairway door position.

In the extended position, the stairway does not normally touch the ground. However, under certain conditions, such as an uneven ramp, the folding step may touch the ground, and the lower step extension will fold to accommodate the variations. If the airplane is subjected to extreme conditions, such as high winds over the nose or abnormal aft section loading, the airplane may tip aft causing the lower step extension to fold until the main step contacts the ground. The lower steps of the stairway are designed to absorb ground contact without damage. In addition, the stairway is equipped with shock absorbing tubes. If the shock absorbing tubes become deformed by stairway-ground contact, they must be replaced before normal operation can be resumed.

Aft Service Door

The aft service door is installed on the left side of the fuselage and can be opened from either inside or outside the airplane. The door swings outward after the hinge has moved inward and upper and lower gates fold, permitting the door to move edgewise through the doorway. An evacuation slide is installed on the door. Operating instructions for the door and the slide are stenciled on the door and slide container, respectively. A door warning light on the annunciator panel will come on when the door is not closed and locked.



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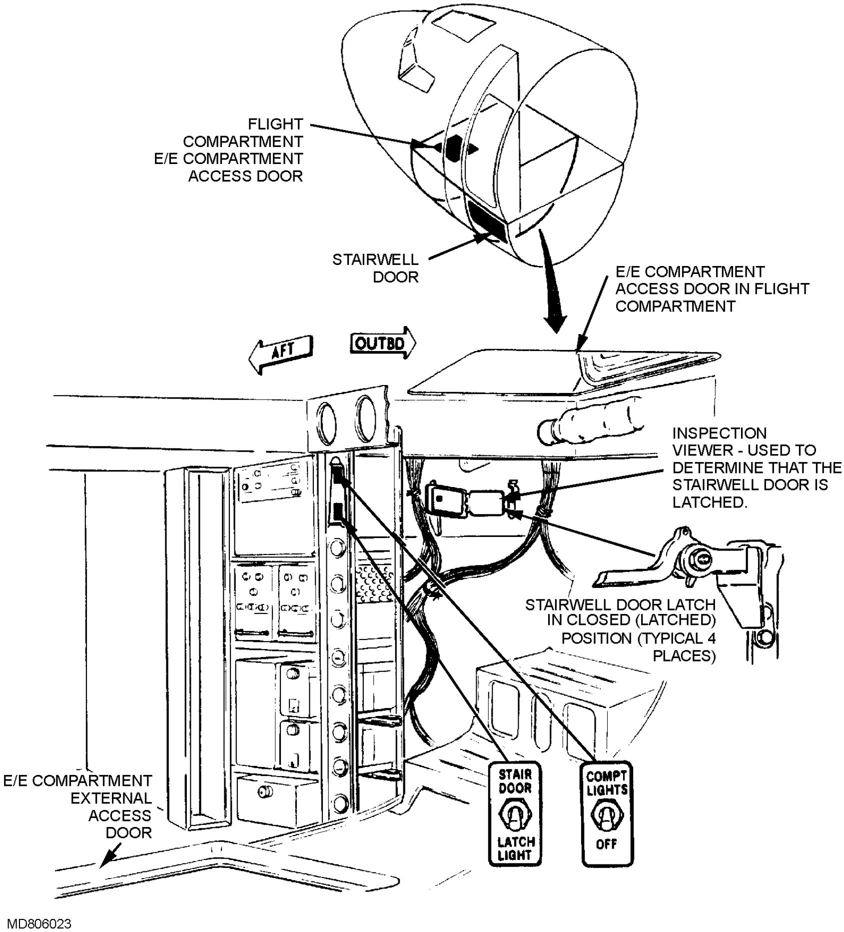
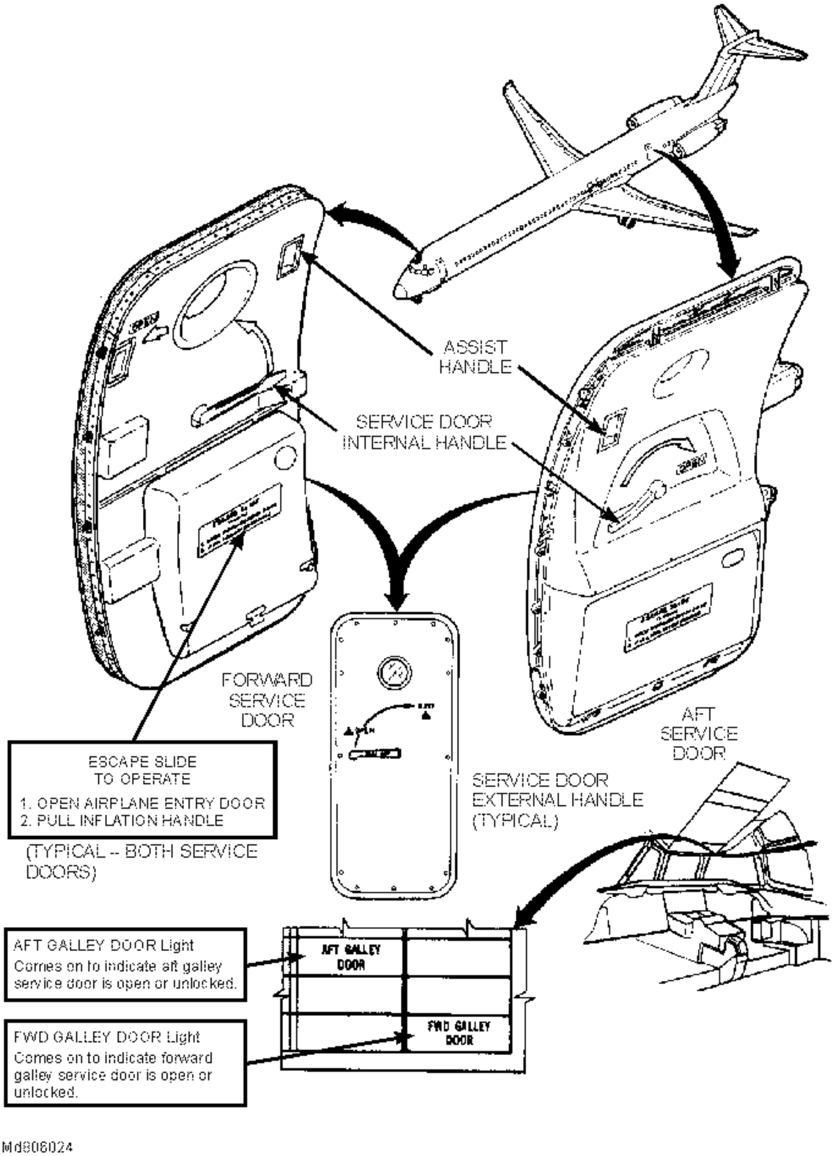
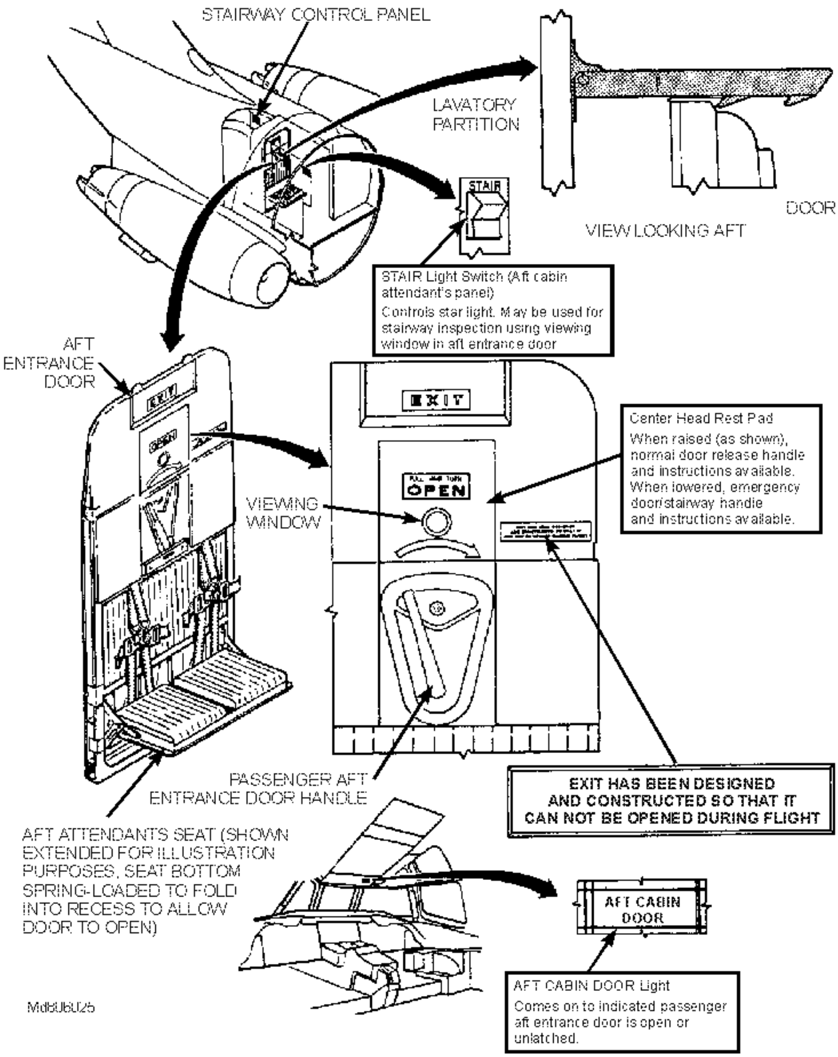
PASSENGER FORWARD ENTRANCE DOOR AND STAIR



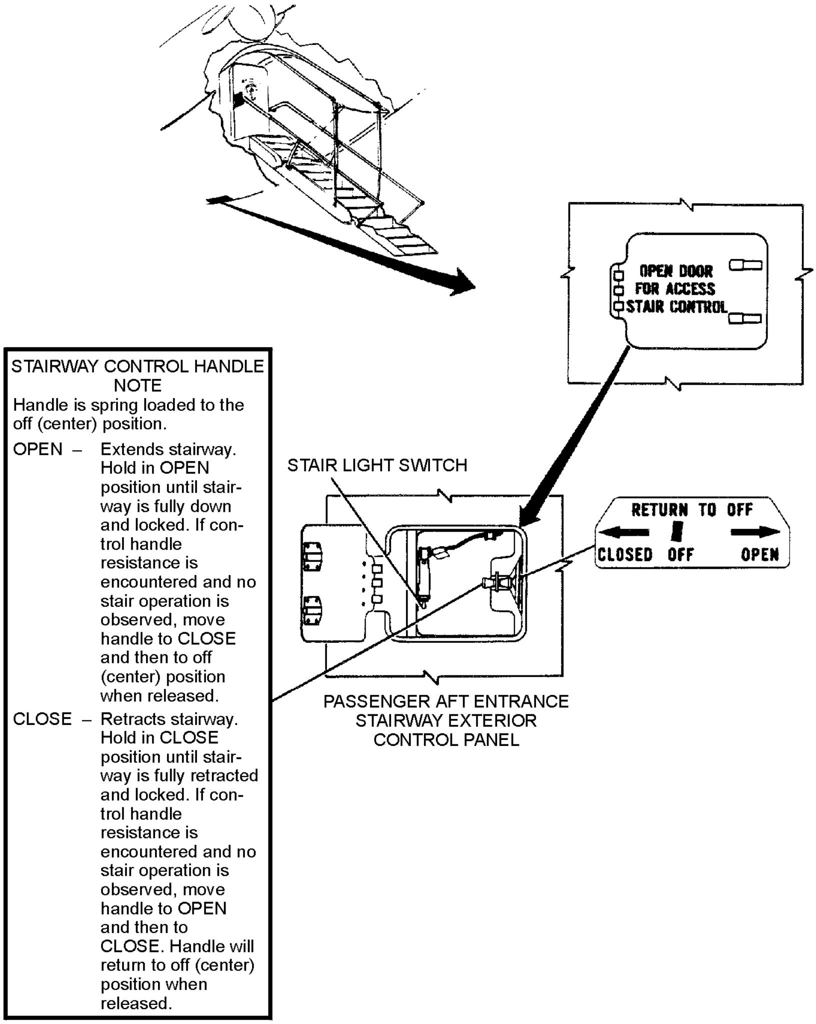
FORWARD STAIRWELL DOOR LATCH INSPECTION VIEWER



FORWARD AND AFT SERVICE DOORS



PASSENGER AFT ENTRANCE DOOR AND STAIR



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PASSENGER AFT ENTRANCE DOOR AND STAIR

FLIGHT COMPARTMENT LIGHTING

Flight compartment lighting provides general and local lighting of the cockpit area, panels, instruments, and controls. Separate lighting control panels provide individual selection of intensity and the area to be lighted.

White incandescent floodlights are provided for the overhead panel pedestal, Captain's, First Officer's, and center instrument panels. White fluorescent floodlights are provided for the Captain's and First Officer's instrument panels. Lighted digital readouts are provided at the digital flight guidance control panel, Captain's and First Officer's flight mode annunciators, and the fuel quantity indicator. Integral panel and instrument lighting is also provided.

A thunderstorm light switch is provided which overrides the individual lighting controls and turns on all floodlights and digital lighting to maximum intensity.

Note: With the Thunderstorm light switch **ON**, the digital lights will not operate at full bright unless either fuel control lever is ON. This feature extends the service life of the digital readout lamps.

A flight deck floodlight switch operates two floodlight units in the ceiling to provide general cockpit floodlighting below the level of the thunderstorm lights. In the ON position, one light is on in each unit. In the ALT THNDRSTRM position, one additional light comes on in each unit for additional lighting.

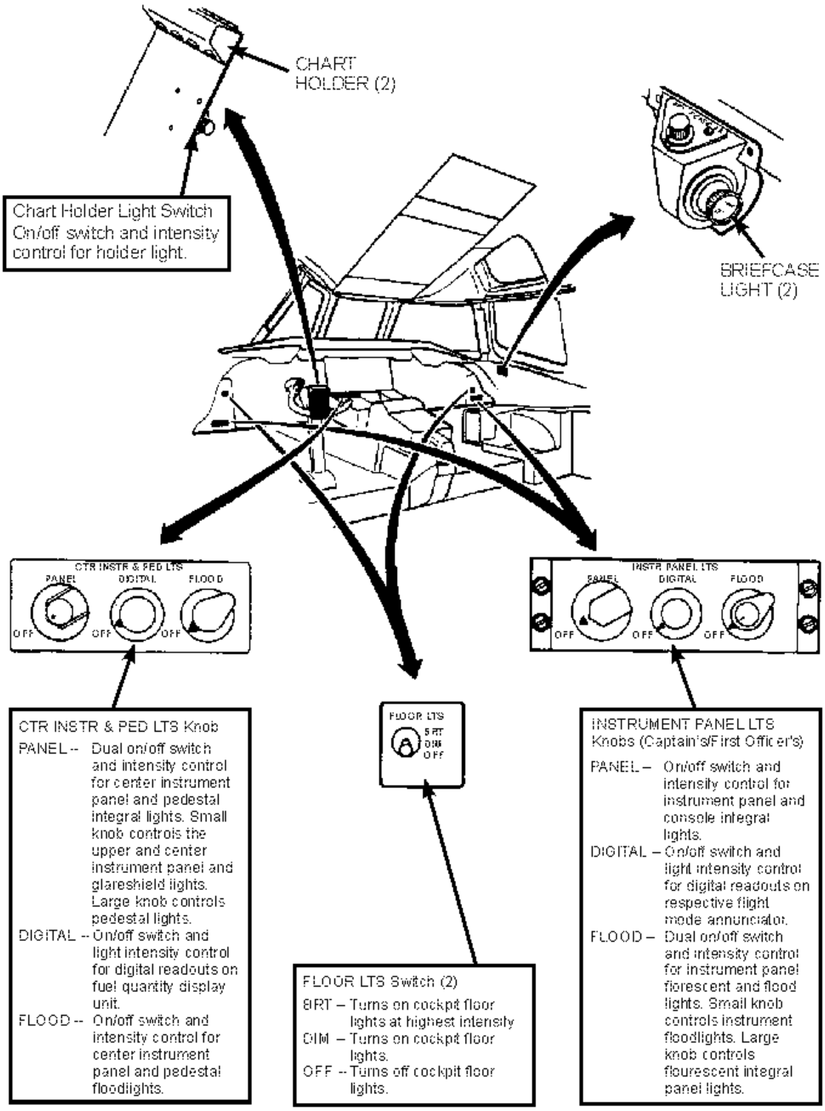
In the event of complete loss of normal electrical power with the battery switch in ON, minimal lighting is automatically provided by incandescent floodlights at the Captain's and First Officer's instrument panels and at the left center instrument panel and left pedestal. In this situation, the lights receive electrical power from the DC transfer bus through the **COCKPIT WHITE FLOOD LIGHTS** circuit breaker. The intensity of the left center instrument panel and left pedestal floodlights can be individually adjusted from minimal to bright using the center instrument and pedestal floodlights knob. The right overhead panel floodlight can be adjusted from off to maximum intensity using the overhead console flood light knob.

When the emergency power switch is moved to ON with normal electrical power off and battery switch in ON, minimal floodlighting will continue to be provided at the Captain's and First Officer's instrument panels floodlights and at the left center instrument panel and left pedestal floodlights. In this situation, the lights receive electrical power from the emergency DC bus and the DC transfer bus through the **CAPT & F / O WHITE FLOODLIGHTS** and the **COCKPIT WHITE FLOODLIGHTS** circuit breakers respectively. All floodlights which come on automatically can be individually controlled from minimal to maximum intensity using their respective floodlights knob.

Immediate bright floodlighting can be obtained, if desired, from the Captain's, First Officer's, left center instrument panel, left pedestal and right overhead switch panel incandescent floodlights by moving the thunderstorm light switch to ON.

Note: With normal electrical power off, battery switch in ON, and emergency power switch ON or OFF, the Captain's, First Officer's, left center instrument panel, and left pedestal incandescent floodlights cannot be turned off by their individual floodlights knobs. Lights may be turned off, if desired, at the circuit breakers. If battery switch is inadvertently turned off with normal electrical power off, THNDRSTRM LIGHT switch at OFF and emergency power switch in ON, the Captain's and First Officer's incandescent floodlights will continue to provide minimal lighting and can be individually adjusted to bright.

Additional flight compartment lighting consists of floor lights, map lights, briefcase lights, circuit breaker light, standby compass light, and chart holder lights.



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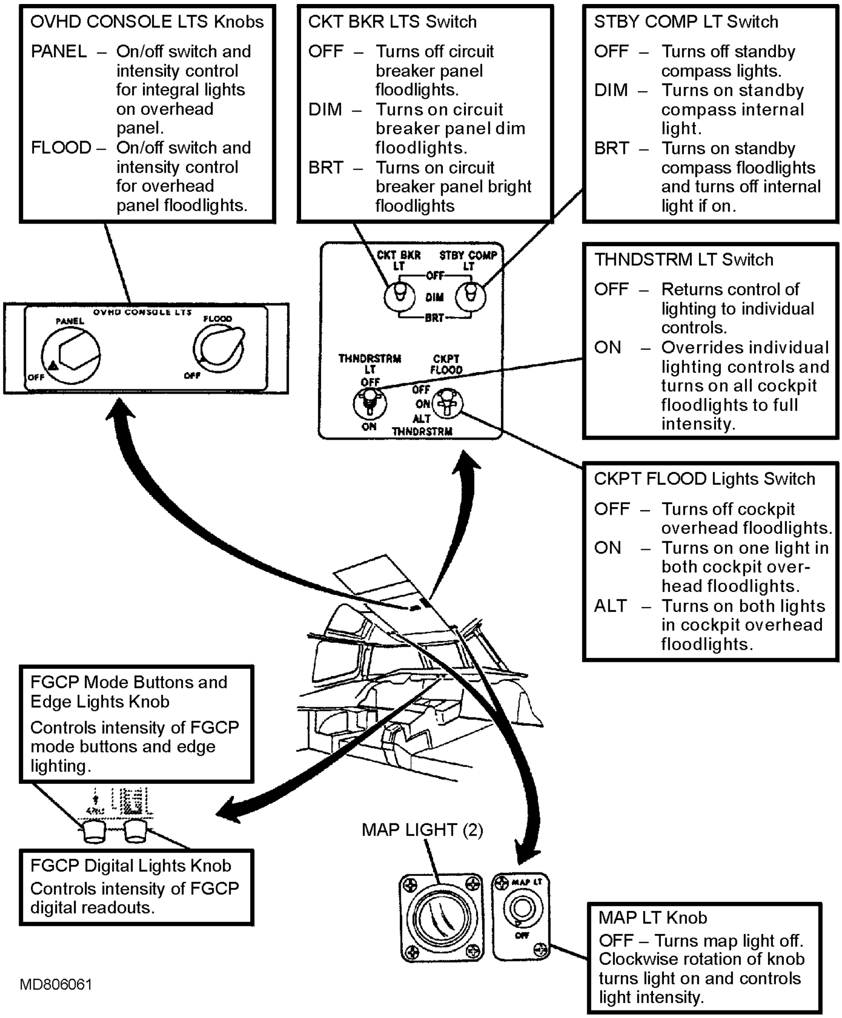
FLIGHT COMPARTMENT - CONTROLS AND INDICATORS



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FLIGHT COMPARTMENT – CONTROLS AND INDICATORS

PASSENGER COMPARTMENT LIGHTING

The passenger compartment lighting system consists of upper and lower sidewall lights, aisle drop ceiling lights, door and entrance lights, aft passenger stairway lights, and other miscellaneous lights.

The upper sidewall lights provide indirect lighting for the ceiling by means of fluorescent lights installed along each side of fuselage ceiling above the overhead baggage-racks. A variable intensity rotary control-knob for the lights is located on the forward flight attendant's panel.

The lower sidewall lights provide indirect sidewall lighting below the baggage-rack by means of fluorescent lights installed along each sidewall below the overhead baggage-racks. A variable intensity rotary control-knob for the lights is located on the forward flight attendant's panel.

Note: On some aircraft the upper and lower baggage-rack fluorescent lights will come on full bright automatically whenever cabin altitude exceeds 14,150 feet and the oxygen masks are released, regardless of flight attendant's control panel switch position.

Aisle drop ceiling lights are installed in the forward and aft passenger compartments. The fluorescent lights are controlled by switches on the forward and aft flight attendants' control panels.

Forward passenger entry door light installations use a combination of incandescent lighting at the entrance area for normal and emergency conditions. The light control switches are located on the forward attendant's panel.

Aft passenger stairway lighting includes fluorescent lights on both sides of the stair, floodlights located on the right and left bulkheads above the stairway, and a ceiling light. The lights are controlled by a switch located on the aft attendant's panel or by a switch located on the aft stairway exterior control panel. (See Lighting -- Emergency Evacuation.)

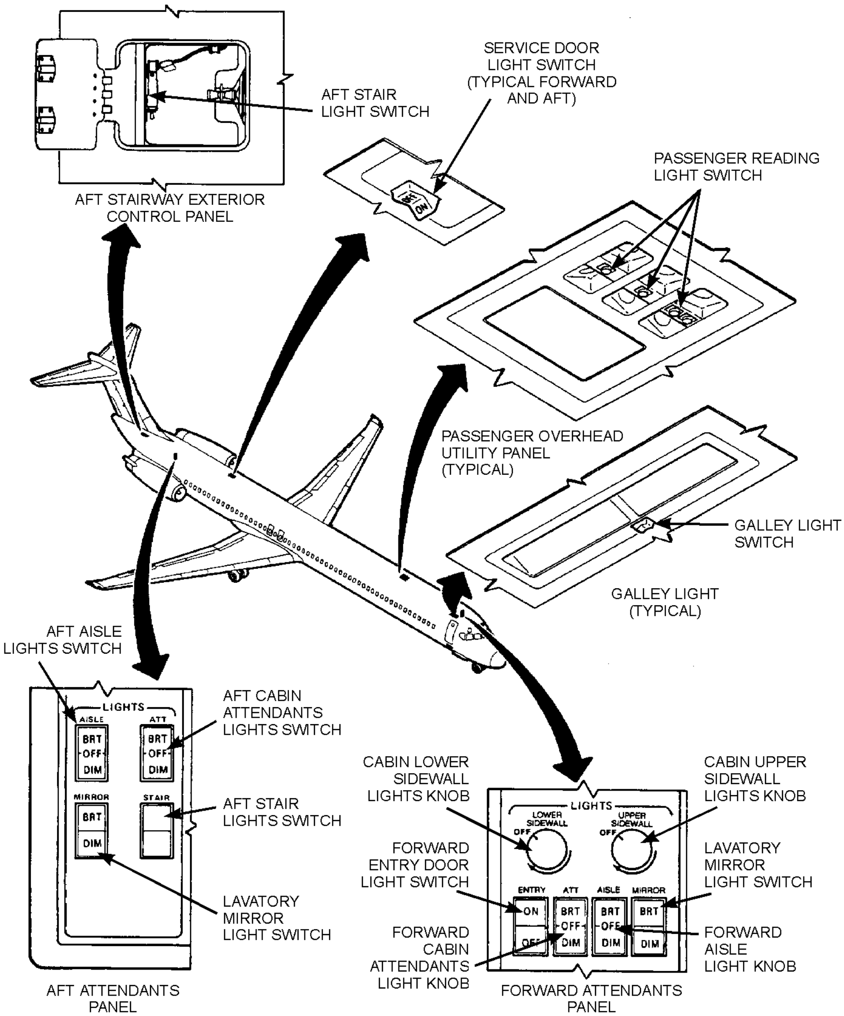
The lavatory mirror lights brightness are controlled by switches actuated by movement of lavatory door and by switches on the forward and aft attendants' panels. With the attendants' panel switch at DIM, the mirror lights will be dim with the lavatory door open and bright with the door closed. Lavatory mirror lights will be bright at all times with attendants' panel switch in BRIGHT.

Flight attendants' lights are provided at the forward and aft attendants' stations and are controlled by light switches at the respective attendant's panel.

Service door lights are provided at the forward and aft service doors and are controlled by integral light switch on the light assembly.

A galley fluorescent light is provided at the forward and aft service doors and are controlled by an integral light switch on each light unit.

A standby lighting system provides lighting in the main cabin whenever normal electrical power supply is not available. The system is comprised of separate bulbs located in the ceiling. The standby lights are powered from the airplane battery through the emergency DC bus and are controlled by the emergency power switch located on the forward overhead panel. (Refer to Section 9 - Electrical for description of the emergency power switch.)



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PASSENGER COMPARTMENT LIGHTING - CONTROLS AND INDICATORS

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PASSENGER INFORMATION SIGNS

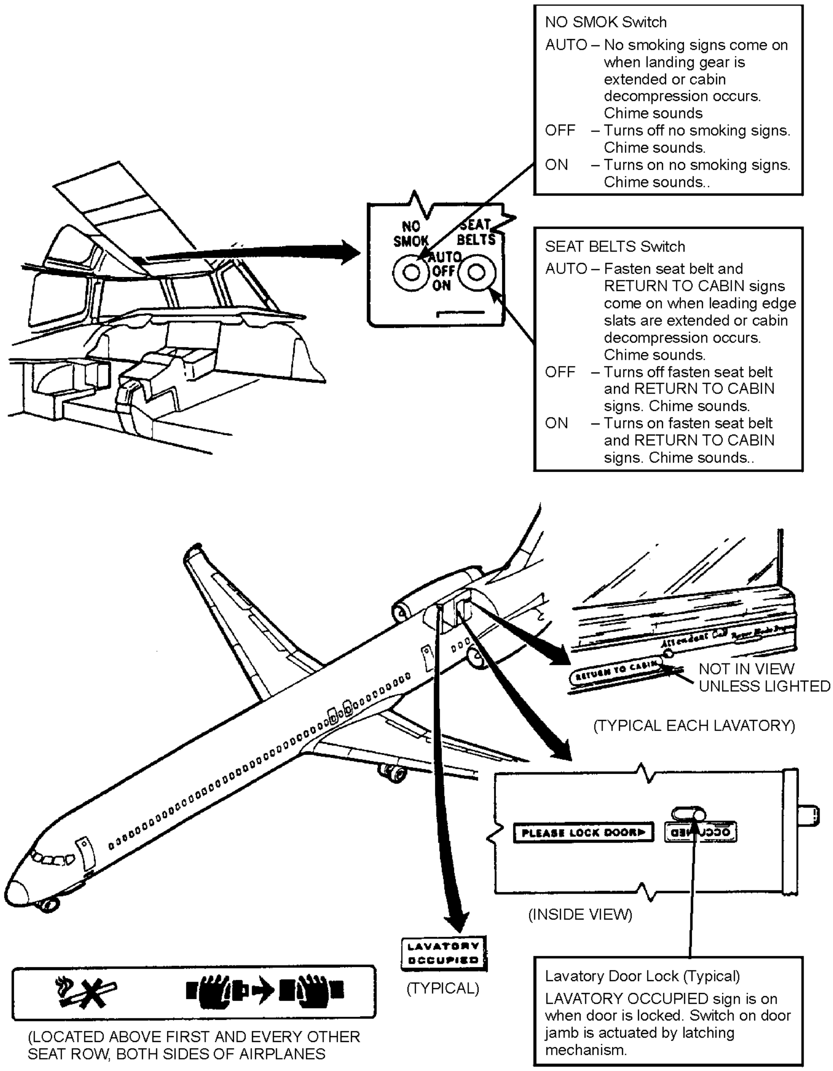
Lighted signs and illuminated pictographic-type signs located throughout the passenger compartment provide specific instructions or pertinent information for the passengers and flight attendants.

The no smoking and fasten seat belts pictographic signs are controlled by two switches located on the forward overhead panel.

The **RETURN TO CABIN** signs in the lavatories will come on when the fasten seat belt signs are turned on.

Note: When decompression occurs (cabin altitude exceeds 10,000 feet), the no smoking signs will automatically come on if the **NO SMOK** sign switch is at AUTO; the fasten seat belt and **RETURN TO CABIN** signs will automatically come on if the seat belts sign switch is at AUTO.

The **LAVATORY OCCUPIED** signs are turned on by actuation of a switch installed on the lavatory door latching mechanisms.



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PASSENGER INFORMATION SIGNS

CARGO AND SERVICE COMPARTMENT LIGHTING

The cargo and service compartment lights are installed in various compartments and accessory areas to facilitate passenger and cargo loading, area inspection, and servicing. Control switches are installed in the compartments adjacent to the access door. When the forward, mid, or aft cargo door is closed, a portion of the door contacts and closes the light switch guard thereby turning out the cargo compartment light. The cargo compartment lights can also be operated by switches on the cargo compartment ceiling.

The nose gear wheel well, main gear wheel well, and forward accessory compartment lights are controlled by a switch on the external power receptacle panel.

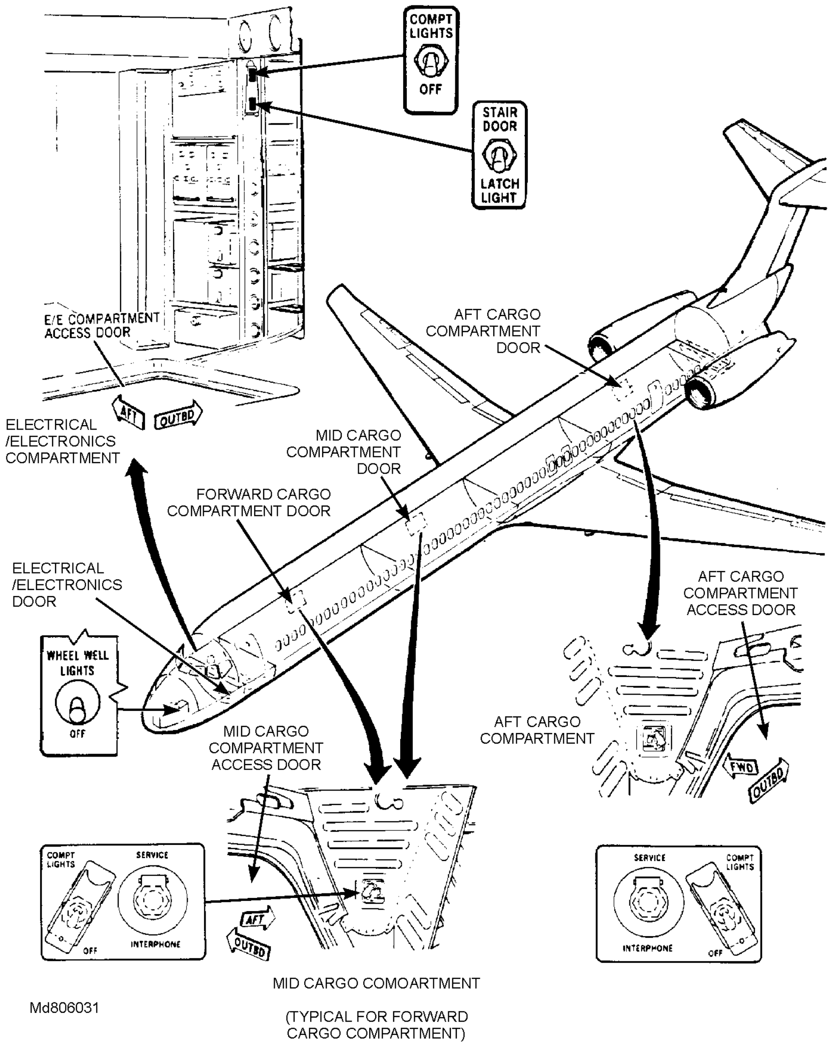
The main gear wheel well lights are also controlled by a switch adjacent to the periscope viewing port in the passenger compartment floor.

Electrical / electronics compartment lights are controlled by a switch near the access door.

The fuel and water service panel light switches are installed on the respective fuel and water service panels.

Tail section area and aft accessory compartment service lights can be operated by either of two switches. One is located adjacent to the aft accessory compartment access door and the other is located on the passenger aft entrance stairway interior control panel.

Forward passenger door stair lights may be turned on to illuminate the forward stairwell door by holding a switch, located in the electrical / electronics compartment, in the down position. These lights aid in the inspection of the Forward Stairway door– an MEL maintenance function.



CARGO AND SERVICE COMPARTMENT LIGHTING - CONTROLS AND INDICATORS

EXTERIOR LIGHTING

The exterior lights consist of wing and nacelle floodlights, forward and aft position and strobe lights, ground floodlights, anti-collision lights, logo lights, and landing and taxi lights.

The wing and nacelle floodlights are installed in each side of the fuselage to visually check the engine nacelle and wing leading edge for icing conditions. The lights also have sufficient disbursement to facilitate ground servicing and fueling and to aid in taxiing.

The wing tip position and strobe lights include forward position lights consisting of a red light on the left wingtip and a green light on the right wingtip. A white strobe light assembly is also installed in each wingtip adjacent to the forward position lights. A clear wingtip lens fairing covers each forward position / strobe light. A combination aft white position light and white strobe light assembly is installed in the trailing edge of each wingtip.

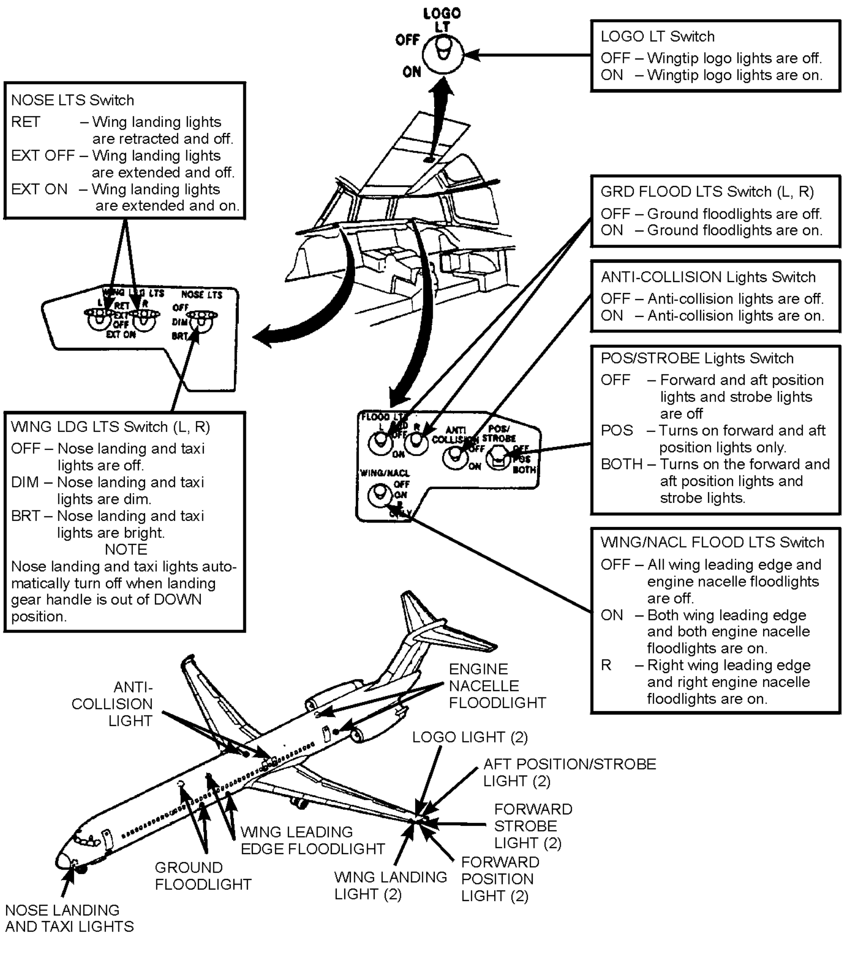
Note: Wing tip strobe lights operate only when **POS/STROBE** lights switch is at **BOTH** and nose wheel is off the ground.

The ground floodlights provide area lighting for ground service and aid side and forward visibility while taxiing.

Anti-collision lights are installed on the upper and lower fuselage surfaces.

The landing and taxi lights consist of the nose gear landing and taxi lights and the wing landing lights. Two sealed-beam, fixed-position, combination landing and taxi lights are installed on the nose gear assembly. The circuit is interlocked with the landing gear control relays so that the lights will come on only when the landing gear control handle is in the down position. One sealed-beam retractable landing light is installed on the lower surface of each wingtip. Each light assembly is enclosed in a housing and contains a motor to retract and extend the lights.

Note: With a single engine failure, wing landing lights will turn off and retract automatically when landing gear is retracted after takeoff or go-around.



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EXTERIOR LIGHTING – CONTROLS AND INDICATORS

EMERGENCY LIGHTING

Emergency lighting consists of lights for illumination of the cockpit and passenger compartments, the aft passenger stair and tail section; lighted overwing exits signs in the passenger compartment; aisle path lighting, and exterior overwing emergency evacuation lights. The lights are powered by rechargeable battery packs that supply power for approximately 15 minutes when fully charged.

Emergency lighting is controlled by an emergency light switch located on the overhead panel. When the system is armed, the emergency lights come on automatically if power is removed from the emergency DC bus.

When the overwing exit doors are removed, the overwing exit signs provide exterior illumination of the escape paths on the wings and the ground below the wind trailing edge. The exterior emergency evacuation lights provide illumination to the emergency escape paths on the wings and the ground below the wing trailing edge.

An additional emergency light switch is located on the forward attendant's panel. This switch provides the capability of turning on the emergency lights regardless of the position of the emergency light switch on the overhead panel. Once the emergency lights are turned on at the attendant's panel, they cannot be turned off until the attendants' switch is in OFF and the cockpit emergency light switch is moved to OFF or ARM with the emergency DC bus energized.

To prevent emergency lights from coming on when power is removed from the airplane, the emergency light switch on the cockpit overhead panel and the forward attendant's panel must be in OFF.

Note: If electrical power is removed from the aircraft with the EMER LTS switch in ARM, the emergency lights will come on and cannot be turned off until power is restored to the emergency DC bus and the EMER LTS switch moved to OFF.

A portable, self-contained, emergency light is installed on the cabin forward bulkhead adjacent to the passenger door. This light can be removed and unplugged and used as a portable flashlight. When installed and connected to the emergency lighting circuit, the light battery pack is maintained in a charged condition the same as other emergency battery packs. When the portable flashlight light is connected to the emergency lighting circuit with the emergency light switch on the overhead panel in ARM, an amber lamp on the emergency light glows continuously indicating battery packs are being charged.

EMER LTS Switch

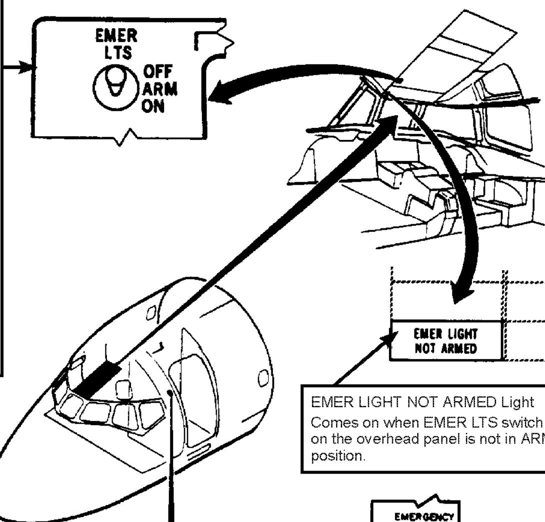
OFF – Presents emergency lights from coming on. Connects battery packs charging circuits to DC TRANSFER BUSS. EMER LIGHT NOT ARMED light is on and amber lamp in portable emergency light is off.

NOTE

OFF position of the EMER LTS switch can be overridden and emergency lights turned on at the EMERGENCY LIGHT switch on the forward attendant's panel.

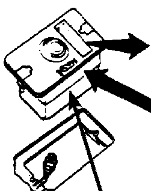
ARM – Normal flight position. Emergency lights are off. Connects battery packs charging circuits to EMER GENCY DC BUS and turns on amber light in portable emergency light. Emergency lights come on automatically if airplane electrical power is interrupted.

ON – Simulates electrical power failure. All emergency lights and EMER LIGHT NOT ARMED light come on.

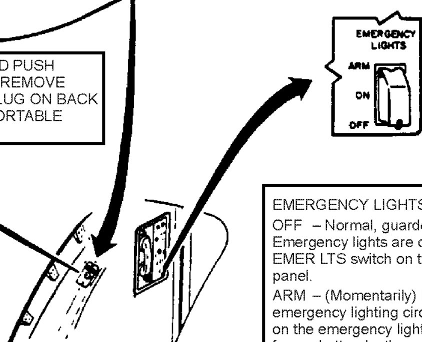


EMER LIGHT NOT ARMED Light

Comes on when EMER LTS switch on the overhead panel is not in ARM position.



1. LIFT TAB SAND PUSH BUTTONS TO REMOVE
2. PULL ELEC PLUG ON BACK TO USE AS PORTABLE FLASHLIGHT.



PORTABLE EMERGENCY LIGHT

Light is a portable self contained unit. It operates on the emergency lighting circuit or can be removed and used as a flashlight. To use as portable flashlight, disconnect electrical plug and place ON/OFF switch, located on unit, to ON. To install portable light into its receptacle, connect electrical plug, lift tabs, push buttons in, and close tabs.

When the light is used in the airplane circuit with the emergency light power switch moved to ARM, an amber lamp in the unit glows continually to provide visual indications that the battery pack is being charged.

EMERGENCY LIGHTS Switch

OFF – Normal, guarded position. Emergency lights are controlled by EMER LTS switch on the overhead panel.

ARM – (Momentarily) Readys the emergency lighting circuit for turning on the emergency lights from the forward attendant's panel.

ON – Simulates electrical power failure. All emergency lights and EMER LIGHT NOT ARMED light come on.

CAUTION

Emergency lights can not be turned off unless EMERGENCY DC BUS or DC TRANSFER BUS is powered.

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EMERGENCY LIGHTING - CONTROLS AND INDICATORS

EMERGENCY EXITS AND EQUIPMENT

Emergency Exits

Flight Compartment

Normally, passenger compartment exits will be utilized by flight crewmembers. However, two sliding clearview windows, adjacent to the windshields, provide an alternate escape route. Escape lines are provided adjacent to the clearview windows for use by crewmembers to lower themselves to the ground.

Passenger Compartment

There are eight passenger compartment emergency egress doors: a forward entrance door, service doors (right forward fuselage and left aft fuselage), four overwing emergency exit doors (two each fuselage side), and, when the tailcone is jettisoned, the aft entrance door. Operating instructions for each door are located on the interior and exterior surface of each door. Both service doors and forward entrance door have identical handles and operating instructions. The overwing emergency exit doors have identical handles and emergency operating instructions. On some airplanes two escape lines are provided to assist overwing evacuation egress. One line is stowed in an overhead stowage compartment adjacent to each aft overwing emergency exit. These lines become accessible when placarded stowage compartment door is opened.

The forward entrance door and both service doors are equipped with slides that deploy automatically when the door is opened with the girt bar installed in airplane floor fittings. These slides then must be manually inflated by pulling a handle mounted on the slide girt.

Note: For normal door operation, the girt bar on the forward entrance, forward service, and aft service doors must be removed from the floor fittings and stowed in clips on the slide cover.

When the aft cabin door is opened using the emergency exit handle, the tailcone is jettisoned and the tailcone slide is automatically deployed and inflated. A back-up inflation handle is provided on the tailcone slide should the slide fail to inflate automatically. All door slides (except tailcone slide on some airplanes) have integral emergency lighting.

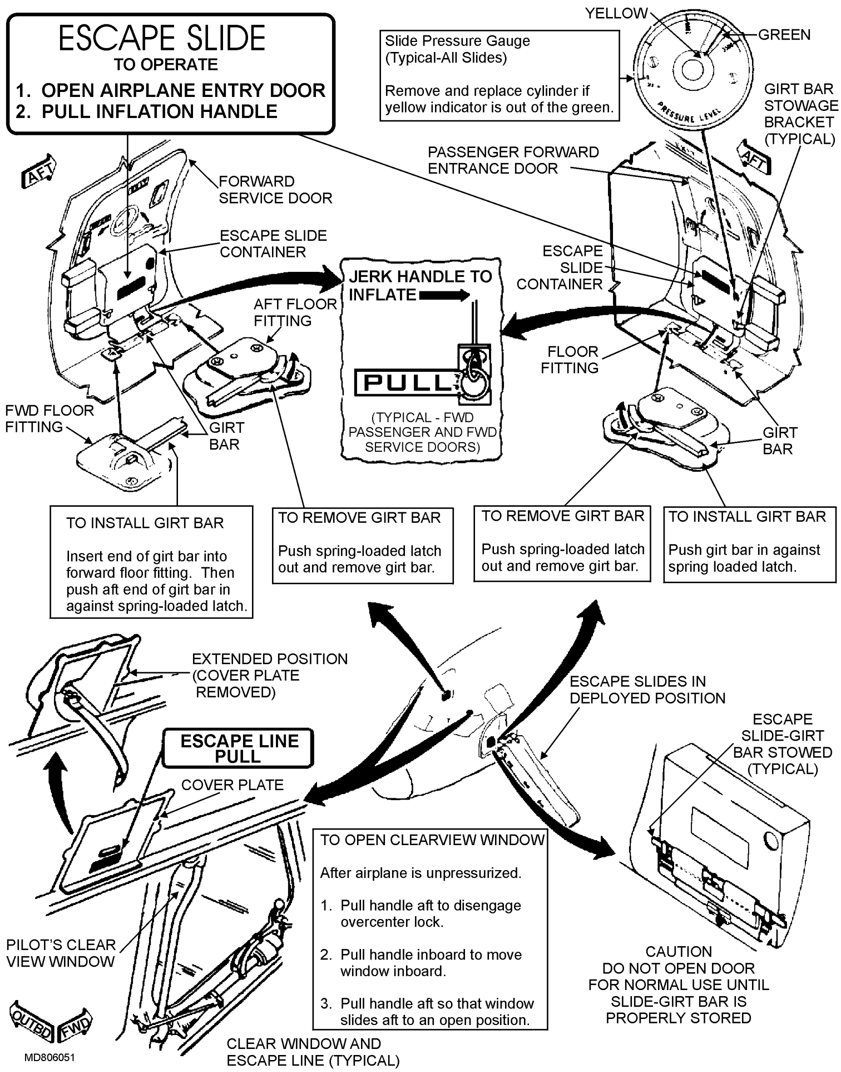
Emergency Equipment

The airplane is equipped with first-aid kits, on some airplanes life rafts, hand-operated fire extinguishers, and a fire axe. For location, quantity, and operation, see Section 2, Emergency Equipment.

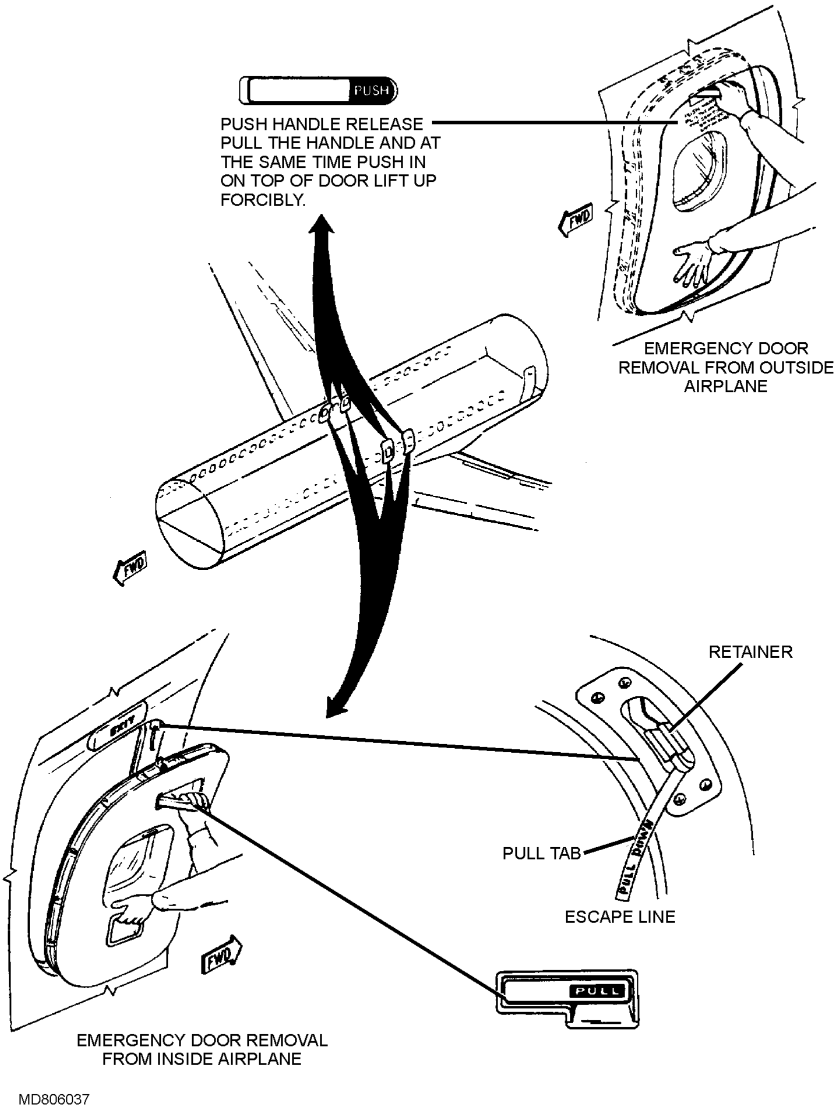
Lavatory Trash Container Fire Extinguisher (Installed on Some Airplanes)

A self-activating fire extinguisher is installed within the trash bin in each lavatory.

A temperature-sensitive indicator is installed adjacent to each of the extinguisher units to show when a unit has been activated.

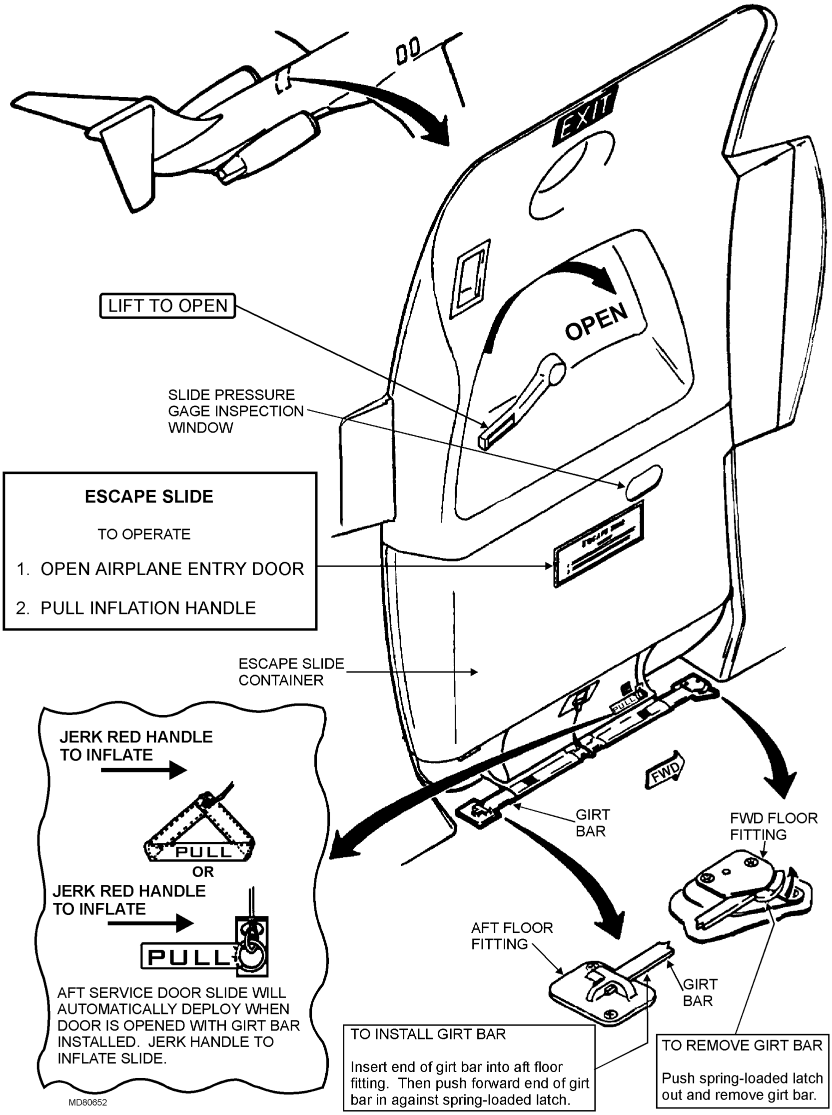


EMERGENCY EXITS AND EQUIPMENT - PASSENGER FORWARD ENTRANCE AND FORWARD SERVICE DOOR

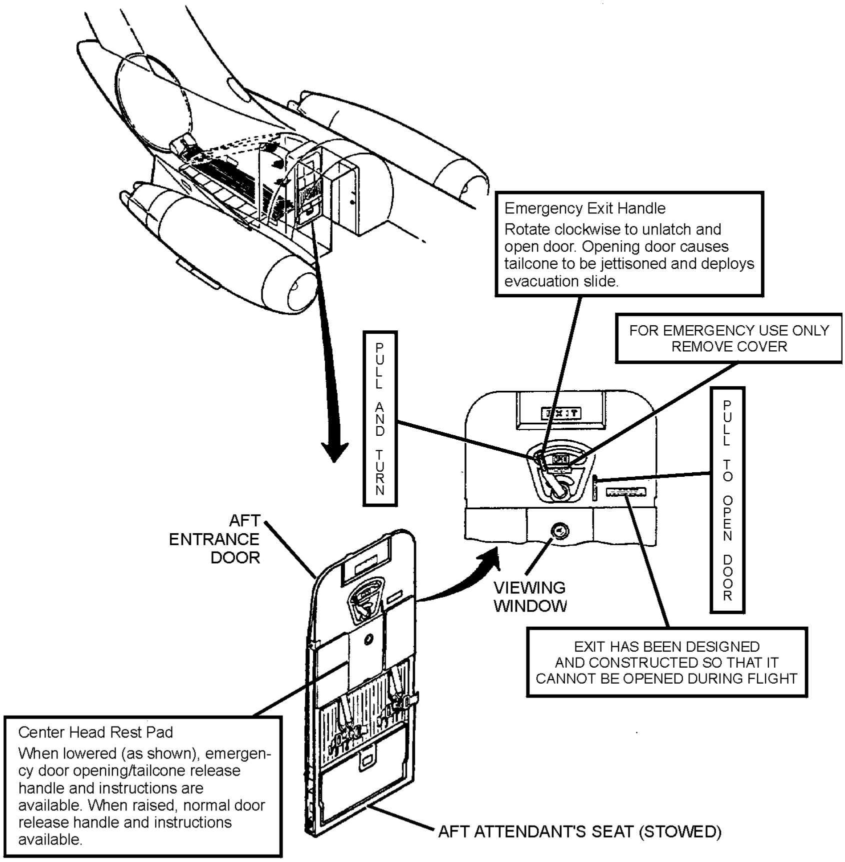


EMERGENCY EXITS AND EQUIPMENT – OVERWING EMERGENCY EXIT DOORS

(Escape Line Installed On Some Aircraft)



EMERGENCY EXITS AND EQUIPMENT - AFT SERVICE DOOR



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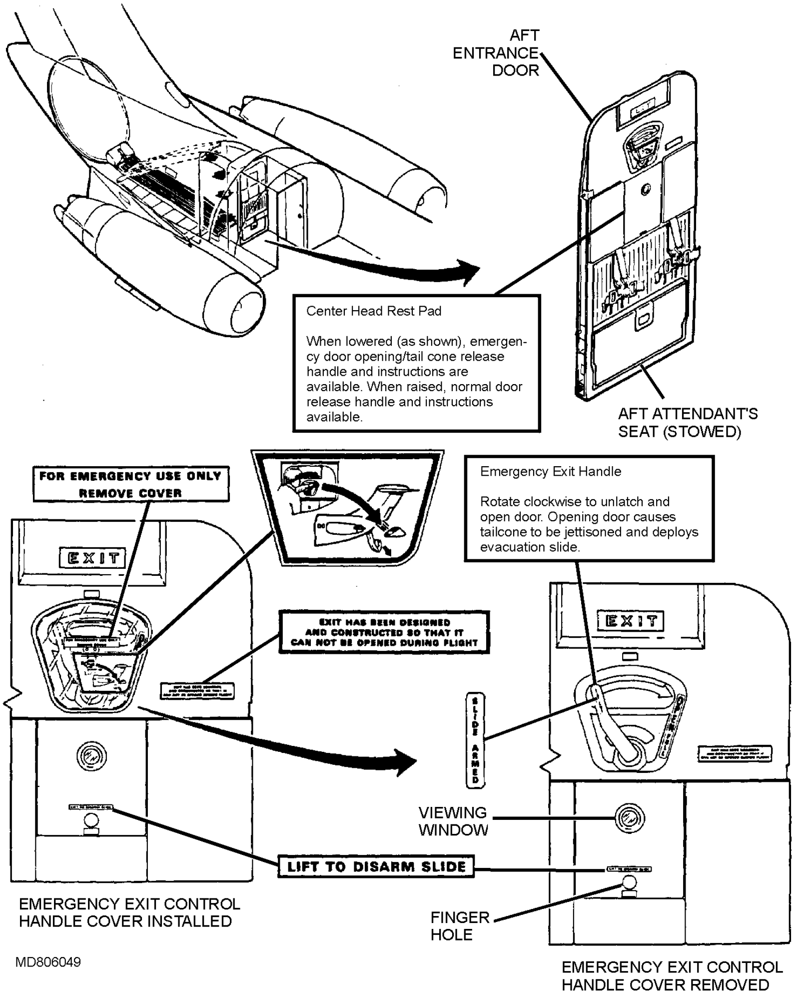
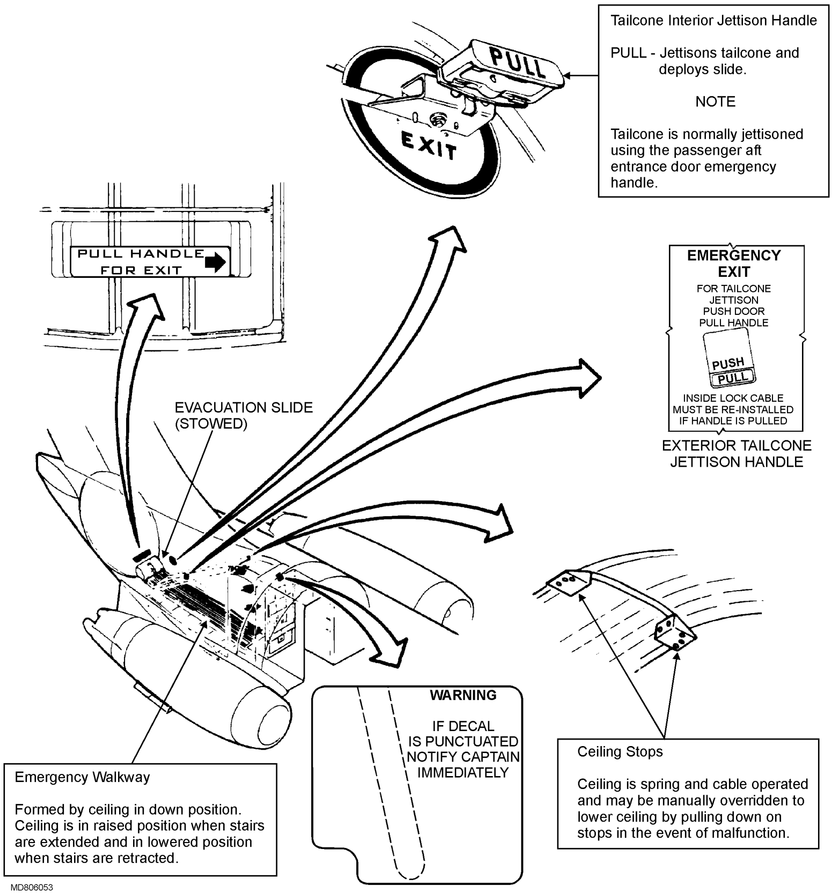
EMERGENCY EXITS AND EQUIPMENT – AFT ENTRANCE DOOR

Effective For Some Aircraft



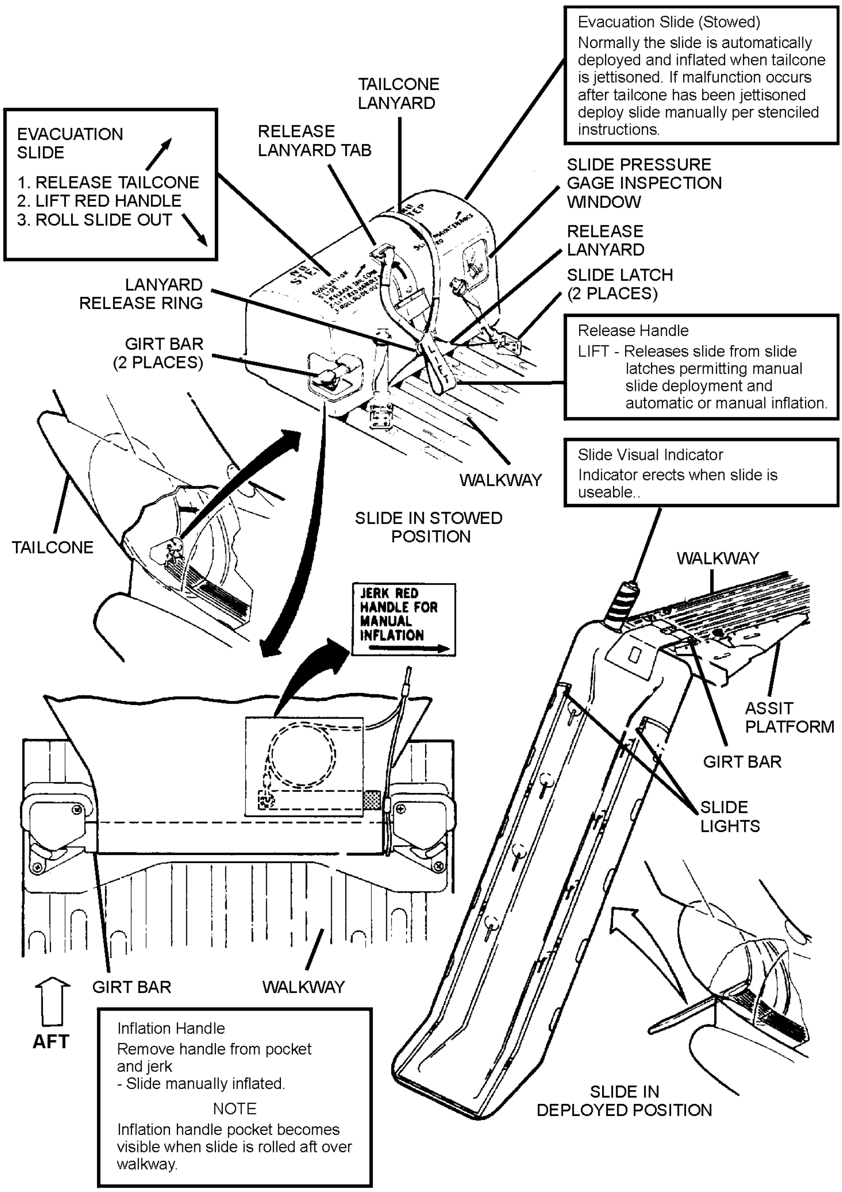
EMERGENCY EXITS AND EQUIPMENT – AFT ENTRANCE DOOR

Effective For Some Aircraft



EMERGENCY EXITS AND EQUIPMENT – TAILCONE JETTISON / WALKWAY

Tailcone Jettison System Safety Decal Install On Airplanes With Service Bulletin 52-175 Incorporated Or Production Equivalent



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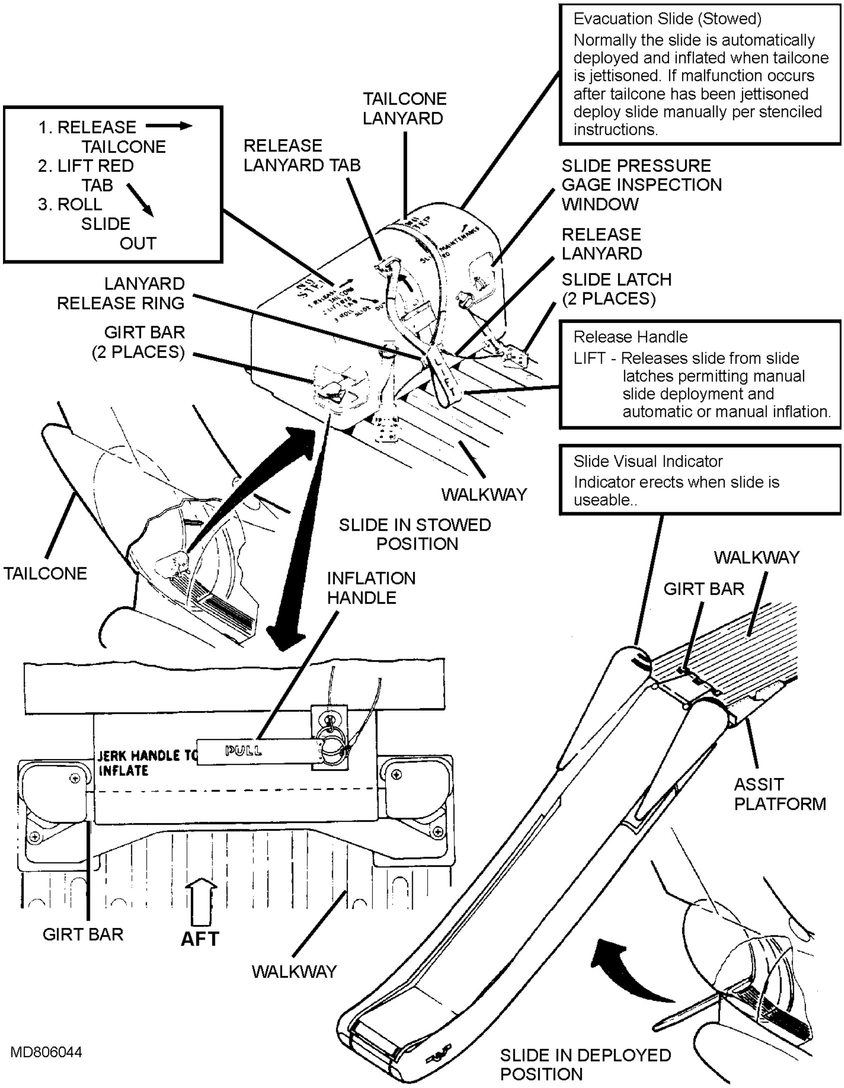
EMERGENCY EXITS AND EQUIPMENT – TAILCONE SLIDE

(Effective For S9ome Airplanes)



EMERGENCY EXITS AND EQUIPMENT – TAILCONE SLIDE
(Effective For Some Aircraft)

WARNING AND CAUTION SYSTEMS

The warning and caution systems provide aural, visual, and / or tactile indications to warn of potentially unsafe operating conditions or airplane configurations and system malfunctions. Indications are generated by a Central Aural Warning System (CAWS), a visual warning and caution system, or a tactile warning system.

Central Aural Warning System (CAWS)

Aural warnings generated by a central control unit provide warning discrimination by means of varying the pitch, duration, and repetitive frequency of the aural signal. CAL aircraft are equipped with voice warnings in addition to the aural tones.

Additional information regarding the operation and testing of CAWS generated signals is provided in the aural / vocal warning and caution system section of this chapter and in applicable system chapters.

A CAWS FAIL annunciator light illuminates when the CAWS is powered but has failed a self test. Caution: if any CAWS c.b. is pulled, certain alerts are disabled – but the CAWS FAIL light may remain extinguished.

Visual Warning and Caution System

Visual warning and caution indications are provided in the engine fire handles and by annunciator lights. Where practical, individual lights are located adjacent to or in the controls or indicators for the respective system. Lights pertaining to systems with controls or indicators in more than one area are located on the forward overhead panel. The red master warning lights come on to indicate a condition that requires immediate attention. The amber master caution lights come on to indicate a condition that requires less than immediate attention.

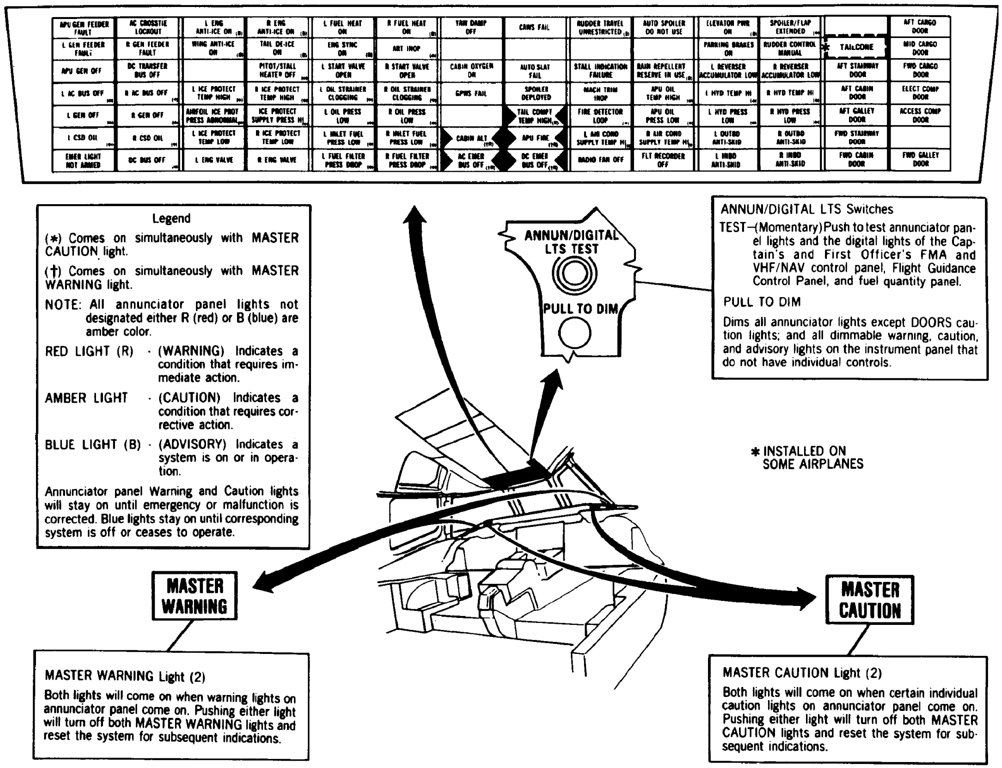
Master Warning and Master Caution lights come on concurrently with their respective individual warning and caution lights and can be reset for subsequent indications. The individual warning or caution lights will remain on until the condition has been corrected. Certain individual amber caution lights are considered advisory and do not cause the master caution lights to come on.

Tactile Warning System

In addition to the stall warning lights, the dual stall warning system actuates a stick shaker to warn of an impending stall. Refer to Instrumentation and Navigation chapter.

APU Fire Warning Horn

An aural warning for APU fire is provided by an exterior horn located adjacent to the APU ground control panel in the tailcone. Refer to Fire Warning and Protection chapter for detailed description.



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ANNUNCIATOR PANEL, MASTER WARNING AND CAUTION LIGHTS

Aural/Vocal Warning and Caution Systems (Sheet 1)

WARNING INDICATED	AURAL/VOCAL WARNING CHARACTER	VISUAL INDICATION	CONDITION INDICATED	DEACTIVATE	TEST
ENGINE FIRE *	Continuous bell sound for one second, followed by words "FIRE LEFT ENGINE" or "FIRE RIGHT ENGINE" for one second, followed by continuous bell sound for one second. Cycle continuous until condition corrected or warning deactivated.	L, or R ENG FIRE handle(s); respective LOOPS A and B lights; and FIRE DETECTOR LOOP light, and MASTER CAUTION lights.	Fire or overheat in engine nacelle.	Aural/vocal warning silenced by pushing FIRE BELL OFF button or pulling the fire handle out. MASTER CAUTION lights reset by pushing light cap. Remaining visual indications will remain on until fire is extinguished.	LOOPS TEST switch (A and B).
APU FIRE *	Continuous extremely loud exterior horn. Cockpit indications are intermittent horn sound for one second, followed by words "APU FIRE" for one second, followed by intermittent horn sound for one second. The words "APU FIRE" will automatically cancel after three (3) cycles.	APU FIRE and FIRE DETECTOR LOOP lights, MASTER WARNING / CAUTION lights, APU LOOP A and B lights, and APU FIRE light (on external APU ground control panel).	Fire or overheat in APU compart-ment.	MASTER WARNING / CAUTION light reset by pushing light caps. The APU FIRE, FIRE DETECTOR LOOP and APU loop lights and external fire warning horn will stay on until fire is extinguished.	LOOPS TEST switch (A and B).
TAKEOFF WARNING *	Modulating horn (same as SPOILER/FLAP EX-TENDED and CABIN ALTITUDE) for one second, followed by appropriate word for one second followed by modulating horn. Cycle continues until condition is corrected.		Airplane on ground, either throttle advanced and:	Retard both throttles and/or (one of following actions):	
	Word - "BRAKES"	PARKING BRAKES ON light	Parking brake is not released.	Release parking brake	None.
	Word - "FLAP"	Flaps lever position does not agree with selected position in computer window.	Flaps not set for takeoff.	Set flaps for takeoff.	None.
	Word - "SLAT"	SLAT TAKEOFF Light not on.	Slats not set for takeoff.	Set slats for takeoff.	None.
	Word - "SPOILERS"	None.	Speedbrake handle not in the retracted position.	Set speedbrake / spoiler handle at RET.	None.
	Word - "STABILIZER"	Stabilizer setting not in agreement with computer readout.	Stabilizer not set for takeoff.	Set stabilizer to match computer readout or indicator.	None.

* Vocal warning on some aircraft, other aircraft no vocal warning.

Aural/Vocal Warning and Caution Systems (Sheet 2)

WARNING INDICATED	AURAL/VOCAL WARNING CHARACTER	VISUAL INDICATION	CONDITION INDICATED	DEACTIVATE	TEST
TAKEOFF WARNING * (Continued)	Word - "AUTO BRAKE"	1. ABS light on. 2. AUTO BRAKE FAIL caution light on and AUTO BRAKE ARM/DISARM switch at DISARM.	1. Autobrake system not armed. 2. ABS malfunction.	1. Set AUTO BRAKE ARM/ DISARM switch to ARM and AUTO BRAKE selector at T.O. Set flaps at less than 26º. 2. Set AUTO BRAKE ARM/DISARM switch to ARM and cycle AUTO BRAKE selector to OFF and back to T.O. If fault was cleared, system will rearm	None.
	Word - " AUTO SPOILER"	SPEEDBRAKE/ SPOILER not armed with AUTO BRAKE SELECTOR AT T.O.	AUTO SPOILERS not armed.	Arm SPEED BRAKE/ SPOILER lever or turn off ABS.	
ALTITUDE ALERT *	None.	Altimeter altitude advisory light on steady.	Within threshold of selected altitude (within 750 to 250 feet from selected altitude).	Capture selected altitude (within 250 feet of selected altitude) or select new altitude.	Select altitude above field elevation and rotate BARO
	"C" chord for one second, followed by word "ALTITUDE" for one second, followed by "C" chord. Cycle continues until condition corrected or warning deactivated.	Altimeter altitude advisory light on flashing.	Deviation of more than 750 feet from selected altitude after entering the threshold and prior to capturing selected altitude.	Re-enter the threshold, push ALT set knob, or select new altitude.	set knob to 750 feet and 250 feet of selected altitude.
	None.	None.	Selected altitude captured (within 250 feet of selected altitude).	None.	
	"C" chord for one second, followed by word "ALTITUDE" for one second, followed by "C" chord. Cycle continues until condition corrected or warning deactivated.	Altimeter altitude advisory light on flashing.	Deviation of more than 250 feet selected altitude after capturing selected altitude.	Recapture selected altitude or select new altitude.	Same as above

* Vocal warning on some aircraft, other aircraft no vocal warning.

Aural/Vocal Warning and Caution Systems (Sheet 3)

WARNING INDICATED	AURAL/VOCAL WARNING CHARACTER	VISUAL INDICATION	CONDITION INDICATED	DEACTIVATE	TEST
SPOILERS/ FLAPS EXTENDED *	Modulating horn (same as TAKEOFF WARNING and CABIN ALTITUDE) for one second, followed by word “SPEED BRAKE” for one second, followed by modulating horn. Cycle continues until condition corrected.	SPOILER/FLAP EXTENDED light and MASTER CAUTION light.	Spoilers extended with flaps extended beyond six degrees.	Set speedbrake / spoiler handle at RET or retract flaps.	None.
LANDING GEAR *	Steady horn sounds for one second, followed by word “LANDING GEAR” for one second, followed by steady horn for one second. Cycle continues until condition corrected or warning deactivated.	Red lights for any gear not down and locked.	1. Gear not down locked and flaps extended beyond 26º.	Extend gear or retract flaps to less than 26º.	None.
			2. Gear not down and locked, any throttle fully retarded, air speed less than 210 kts.	Aural/Vocal warning silenced by pushing GEAR HORN OFF button, provided flaps are set, but at less than 26º.	
STABILIZER IN MOTION *	1. Momentary horn sound for one second. (Sound starts between 0.5º to 1.0º of stabilizer movement and repeats every 0.5º of motion.)	None. (Stabilizer LONG TRIM indicator may be crosschecked.)	Horizontal stabilizer in motion. Movement is by action of the primary trim control.	Warning silenced when stabilizer is stopped.	Operate primary trim controls.
	2. Momentary horn sound starts after 0.5º to 1.0º of stabilizer movement and repeats every 0.5º of stabilizer movement . “STABILIZER MOTION” voice warnings will sound when either the autopilot or a runaway trim motor moves the stabilizer more than 2º in 30 seconds and will continue to sound as long as stabilizer moves. Cycle continues until stabilizer movement ceases.		Horizontal stabilizer in motion. Movement is by action of the alternate trim control.		Operate alternate trim controls.

* Vocal warning on some aircraft, other aircraft no vocal warning.

Aural/Vocal Warning and Caution Systems (Sheet 4)

WARNING INDICATED	AURAL/VOCAL WARNING CHARACTER	VISUAL INDICATION	CONDITION INDICATED	DEACTIVATE	TEST
AUTO-PILOT *	(Activated during automatic landing mode only.) Warbling horn sound for one second, followed by word "AUTOPILOT" for one second, followed by warbling horn sound. Cycle continues until condition corrected.	Flashing red AP light on flight mode annunciators.	Autopilot disengaged.	Press AP release button on either control wheel	None.
OVER - SPEED *	Clacker sound for one second, followed by appropriate word for one second, followed by clacker sound for one second. Cycle continues until condition corrected.				MAX SPD WARN TEST switch.
	Word - "OVERSPEED"	None.	V_{MO}/M_{MO} exceeded.	Correct overspeed condition.	
	Word - "SLAT OVERSPEED"	None.	280 KIAS (Mach 0.57) exceeded with slats extended.	Correct overspeed condition or retract slats.	
CABIN ALTITUDE *	Modulating horn (same as TAKEOFF WARNING and SPOILER/FLAP EXTENDED) for one second, followed by word "CABIN ALTITUDE" for one second, followed by modulating horn sound for one second. Cycle continues until condition is corrected or until five seconds when warning is automatically reset.	CABIN ALT light and MASTER WARNING lights.	Cabin altitude has exceeded allowable limit.	Reduce cabin altitude to 10,000 feet or below.	None.
GROUND PROXIMITY WARNING	"SINK RATE, SINK RATE" "WHOOP WHOOP-PULL UP"	Red GPWS light.	Excessive sink rate.	Recover from condition indicated.	GND PROX WARN Switch TEST
	"TERRAIN-TERRAIN" "WHOOP WHOOP-PULL UP"	Red GPWS light.	Excessive terrain closure rate-airplane not in landing configuration.		

* Vocal warning on some aircraft, other aircraft no vocal warning.

Aural/Vocal Warning and Caution Systems (Sheet 5)

WARNING INDICATED	AURAL/VOCAL WARNING CHARACTER	VISUAL INDICATION	CONDITION INDICATED	DEACTIVATE	TEST
GROUND PROXIMITY WARNING (Continued)	"DON'T SINK, DON'T SINK"	Red GPWS light.	Altitude loss after takeoff.	Recover from condition indicated.	GND PROX WARN Switch TEST
	"TOO LOW GEAR" "TOO LOW TERRAIN"	Red GPWS light.	Terrain clearance - Descending in wrong configuration - Gear up.		
	"TOO LOW FLAP" "TOO LOW TERRAIN"	Red GPWS light	Terrain clearance - Descending in wrong configuration - Gear down, flaps not in landing position		
	"GLIDESLOPE"	Amber BELOW G/S light.	Descent Below Glideslope.		
STALL WARNING *	Stall warning horn will sound for one second followed by word "STALL." Cycle will continue until condition corrected.	Red STALL warning light.	Airspeed approaching stall condition for flap/slat configuration.	Correct stall condition.	STALL TEST Switch.
	Tactile warning by stick shaker. Both columns will vibrate simultaneously.				

* Vocal warning on some aircraft, other aircraft no vocal warning.

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AIR CONDITIONING, PRESSURIZATION AND PNEUMATICS

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AIR CONDITIONING AND PRESSURIZATION

General

Pressurized air from the pneumatic system is used for air conditioning and pressurization. During ground operation, pneumatic air to operate the air conditioning systems can be obtained from a ground source connected to the airplane, from the Auxiliary Power Unit (APU), or from the engines. During flight, only the engines supply bleed air for air conditioning and pressurization.

Air Conditioning Systems

The air conditioning system has two identical air conditioning systems, designed for independent or parallel operation. Normally the right system operates from right engine bleed and controls the passenger compartment temperature. The left system operates from the left engine bleed air and controls the flight compartment temperature. Either system is capable of supplying the requirements of both compartments.

The air conditioning systems are protected against overheat conditions by thermal shutdown switches. The air conditioning flow control and pressure regulator valves will close, preventing bleed air airflow to its respective system when compressor discharge, turbine inlet, or supply duct temperature is excessive.

Air Distribution

Cold air is ducted to individual eyeball-type outlets for each passenger and crewmember seat. Each cold air outlet may be adjusted for air direction and flow. Conditioned air from the air conditioning system passes through a mixing chamber and sound suppresser for distribution to the passenger and flight compartments. Conditioned air for the passenger compartment is discharged from continuous outlets below the overhead stowage racks, and from an overhead diffuser in the passenger compartment entryway. A recirculating fan, located forward of the rear pressure bulkhead, returns the cabin air to the overhead ducts for recirculation through the passenger compartment. The recirculating fan has no cockpit control or indication and will operate in flight only. Conditioned air for the flight compartment is discharged through two adjustable nozzles adjacent to the instrument panel, three adjustable overhead diffusers, and two-foot warmers.

Flight and Passenger Compartment Temperature Control

Flight compartment and passenger compartment temperature is controlled from the flight compartment. Movement of the CKPT TEMP and CABIN TEMP selectors in the AUTO mode (right or left of the center index) selects and automatically maintains temperature in the flight and passenger compartments through a temperature range of 65°F to 80°F (18°C to 27°C). Operation of the AUTO mode requires normal electrical power.

When operating in the MANUAL mode, the CKPT TEMP and CABIN TEMP selectors are spring loaded to the STOP position and must be momentarily held in HOT or COLD positions until the desired temperature is obtained. The MANUAL mode operates when the Emergency AC Bus is powered.

Movement of the left pack temperature control valve in the hot direction is inhibited by a thermal switch if pack discharge temperature exceeds 130°F (54°C). The switch will reset if pack discharge temperature is less than 130°F in either the MANUAL or AUTO mode, or if pack is shut off.

A CABIN TEMP indicator displays temperature in the passenger compartment or cabin supply ducting only as selected. Temperature in the flight compartment may be adjusted according to flight crew comfort requirements.

Radio Rack Cooling and Airplane Air Exhaust

Radio rack equipment cooling is provided by conditioned air from the flight compartment. When the RADIO RACK switch is in the FAN position, the conditioned air is drawn by fans from the radio rack and then exhausted under the forward cargo compartment floor for heating. When the RADIO RACK switch is in the VENTURI position, forward cargo compartment heating is not provided, and the air from the radio rack is exhausted overboard through the venturi.

A standby radio rack fan, located in the radio rack cooling ducting, will turn on automatically if the primary fan fails in flight. In ground mode, the primary and standby fans are both on when the RADIO RACK switch is in either FAN or VENTURI position. An annunciation, **RADIO FAN OFF**, will come on only when both fans have failed in flight or if the primary fan has failed on the ground.

APU On Ground Air Conditioning

The APU can be used to supply air conditioning to the flight compartment and passenger compartment while the aircraft is on the ground. The bleed AIR switch, in the ON position, supplies electrical power to the APU bleed air control valve, thereby providing air to the pneumatic system. The AIR COND COLDER position provides increased differential pressure for additional cooling air capacity. The OFF position discontinues electrical power to the APU bleed air control valve and the pneumatic shutoff valve circuits.

When the airplane is on the ground and the throttles are in idle, placing the APU bleed air switch to ON or AIR COND COLDER also activates an electrical solenoid which causes the air conditioning pressure regulator to move full open. In this mode, full APU bleed air pressure is provided to increase the cooling capabilities during ground operation. Advancing the throttles or when in flight mode, will revert the system to normal regulation by deactiviating the solenoid.

Airplane Pressurization

Pressurization is provided by a controlled flow of bleed air from the pneumatic supply, which passes through the air conditioning systems and is then ducted to the pressurized areas. Desired pressurization levels are maintained by regulating escape of the compressed air through the cabin air outflow valve. Normally, the outflow valve is automatically positioned by a dual automatic pressurization system to control cabin pressure rates from takeoff to landing.

For automatic operation of the outflow valve, the CABIN ALT control lever must be in the up position. The CABIN ALT control wheel will rotate as it automatically adjusts to maintain pressurization. A position indicator, next to the wheel, will move to indicate outflow valve position.

For manual operation of the cabin air outflow valve, the CABIN ALT control lever must be in the down position. To manually maintain pressurization, press down on the wheel and rotate in the same direction to indicate outflow valve position.

Dual pressure relief valves are installed to protect the airplane structure from maximum input pressure or pressure from a possible wing anti-ice duct rupture. The relief valves will start to limit cabin differential pressure between 7.95 and 8.27 psi. The maximum limit of the pressurization system is 8.32 psi. Negative pressure is relieved by the inward movement of the galley service and passenger entrance door seals, and one negative pressure relief valve installed in the aft pressure bulkhead.

With airplane in the ground mode, the dual automatic system will start to pressurize the cabin when the throttles are positioned for takeoff and a 60-second timer is actuated. In the event of a rejected takeoff, the cabin will automatically begin to depressurize when the throttles are retarded. If airplane is not in the flight mode within 60 seconds after throttles are positioned for takeoff, the cabin will depressurize. When in the flight mode, cabin pressure is maintained automatically. During climb, cruise and descent the cabin will automatically climb, cruise and descend as programmed by the altitude schedule, which is a function of airplane altitude.

When the selected landing altitude is above the schedule, the cabin will climb to or hold at the selected landing altitude. If the landing altitude is set below actual field altitude, at airplane touchdown, a signal from the ground control relay will depressurize the cabin at a controlled rate for 20 seconds, at which time the cabin outflow valve will drive full open.

When operating on the pressure schedule, the cabin rate of climb will be proportional to airplane rate of climb with maximum limits as set by the rate limit knob. When climbing or descending toward a selected altitude above schedule, the cabin rate of change will be as selected on the rate limit knob. With the knob at the index mark, the rate limit is normally 700 FPM climb and 300 FPM descent.

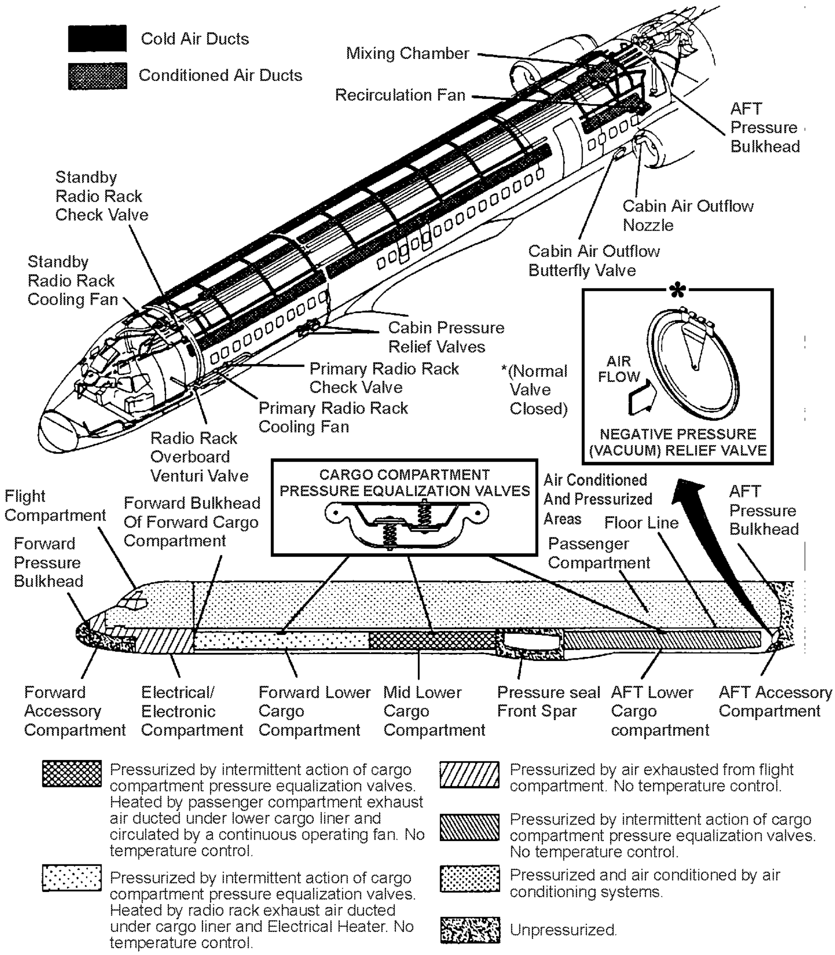
The dual automatic pressurization system consists of two identical but independent systems, powered from different electrical sources, which are controlled by the cabin pressure selector panel. One system has primary control, while the other serves as a standby.

If either an automatic or manual transfer occurs prior to landing, it will result in lockout of any subsequent automatic transfer or system interchange after landing. The **TRANSFR LOCKOUT** and **STDBY ON** switch lights will be on and are not to be reset. This will assist maintenance in identifying which system requires fault isolation.

If performance of the standby system is not satisfactory, the primary system may be reselected by placing the system selector switch to STDBY and then back to PRIMARY. Manual selection between the two systems permits selection of the best performing system. Do not reset the **TRANSFR LOCKOUT** switch/light. With the **TRANSFR LOCKOUT** switch/light illuminated, any automatic transfer from the best selected system is inhibited.

Random electrical power impulses during ground operations may cause the **TRANSFR LOCKOUT** and **STBY ON** switch lights to come on necessitating that the switch lights be reset prior to takeoff.

Note: **TRANSFR LOCKOUT** and / or **STBY ON** switch lights coming on during ground operation are not an indication of system failure unless light(s) remain on after an attempt to reset.



CAG(IGDS) *CHANGE: Negative pressure relief valve.*

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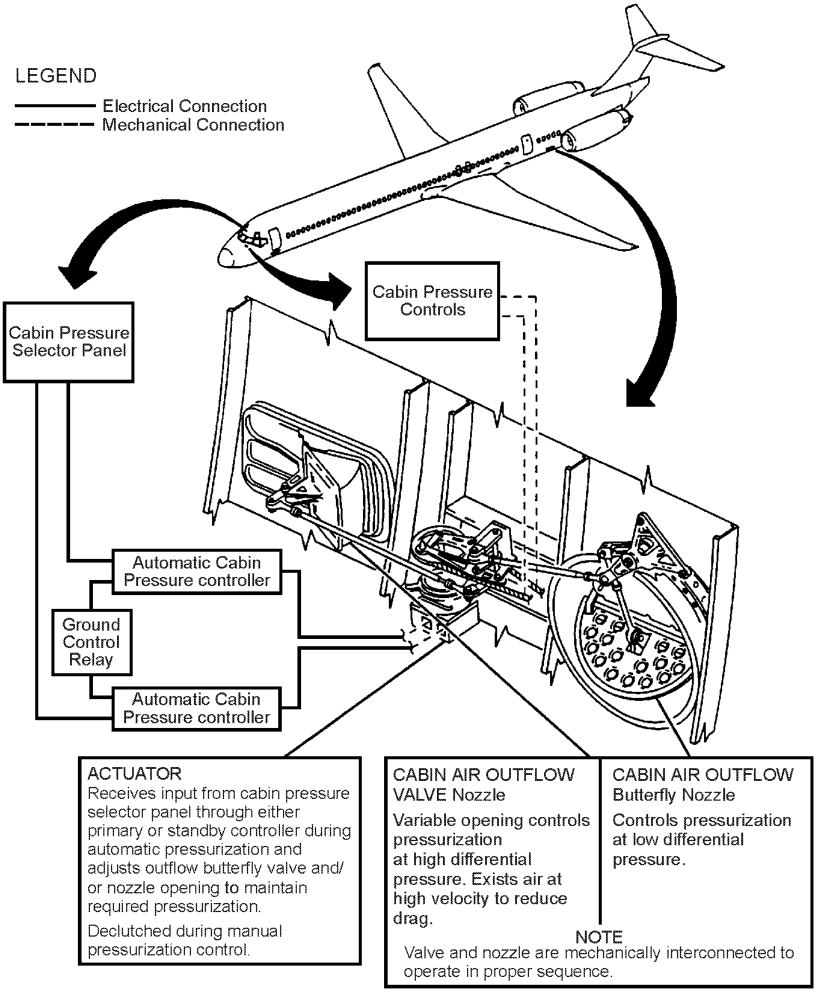
AIR CONDITIONING AND PRESSURIZATION - COMPONENT LOCATION



AIR CONDITIONING AND PRESSURIZATION - COMPONENT LOCATION

TEMP CONTROL VALVE Indicator (L, R)

Indicator position of air conditioning system control valve.

COLD - indicates temperature control valve is closed and blocking hot air supply.

HOT - Indicates temperature control valve is fully open to allow maximum hot Air supply.

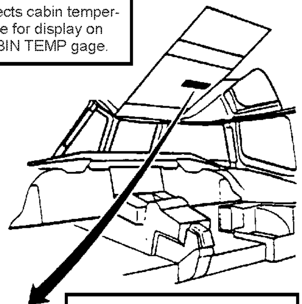
PRESS Gage (L, R)

Indicate pneumatic supply Pressure available for operation of each air conditioning system.

TEMP SEL Switch

CABIN SPLY - selects cabin supply duct temperature for display on CABIN TEMP gage.

CABIN - Selects cabin temperature for display on CABIN TEMP gage.



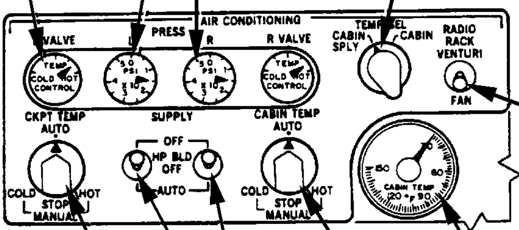
RADIO RACK Switch

VENTURI - In flight, turns off radio rack fan and opens venturi valve.

FAN - In flight, turns on primary radio rack fan and closes venturi valve for radio rack cooling and forward cargo compartment heating. Standby radio rack fan comes on automatically if primary fan fails in flight.

NOTE

On the ground both primary and standby radio rack fans are on and venturi valve is closed regardless of switch position



CKPT TEMP Selector

For selector position see CABIN TEMP selector.

CABIN TEMP Gage

Indicates cabin temperature or cabin supply duct temperature as selected by cabin TEMP SEL switch.

SUPPLY Switch (L, R)

OFF - Closes pressure regulator valve, flow control valve, augmentation vale, and on ground, turns off heat exchanger cooling fan.

HP BLD OFF - maintains augmentation valve at closed, opens pressure regulator valve, flow control valve, and thru ground control relay, starts heat exchanger cooling fan.

AUTO - Opens pressure regulator valve, flow-control valve, and through ground control relay, turns on heat exchanger cooling fan. If pneumatic supply pressure from low stage in engine is too low, opens respective augmentation valve.

CABIN TEMP Selector

AUTO - Temperature may be automatically adjusted by moving selector to left or right of index.

COLD - (Momentary) moves TEMP CONTROL VALVE indicator toward COLD.

HOT - (Momentary) moves TEMP CONTROL VALVE indicator toward HOT.

STOP - Stops movement of TEMP CONTROL VALVE indicator, in MANUAL mode.

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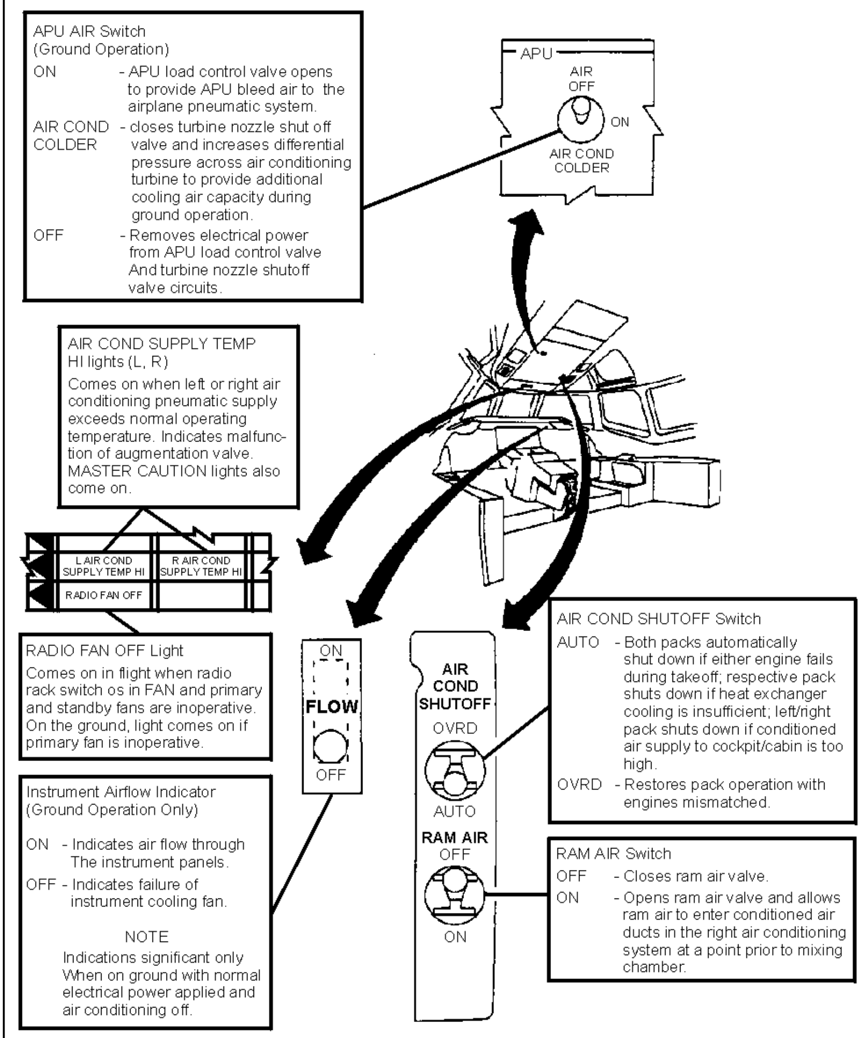
AIR CONDITIONING - CONTROLS AND INDICATORS



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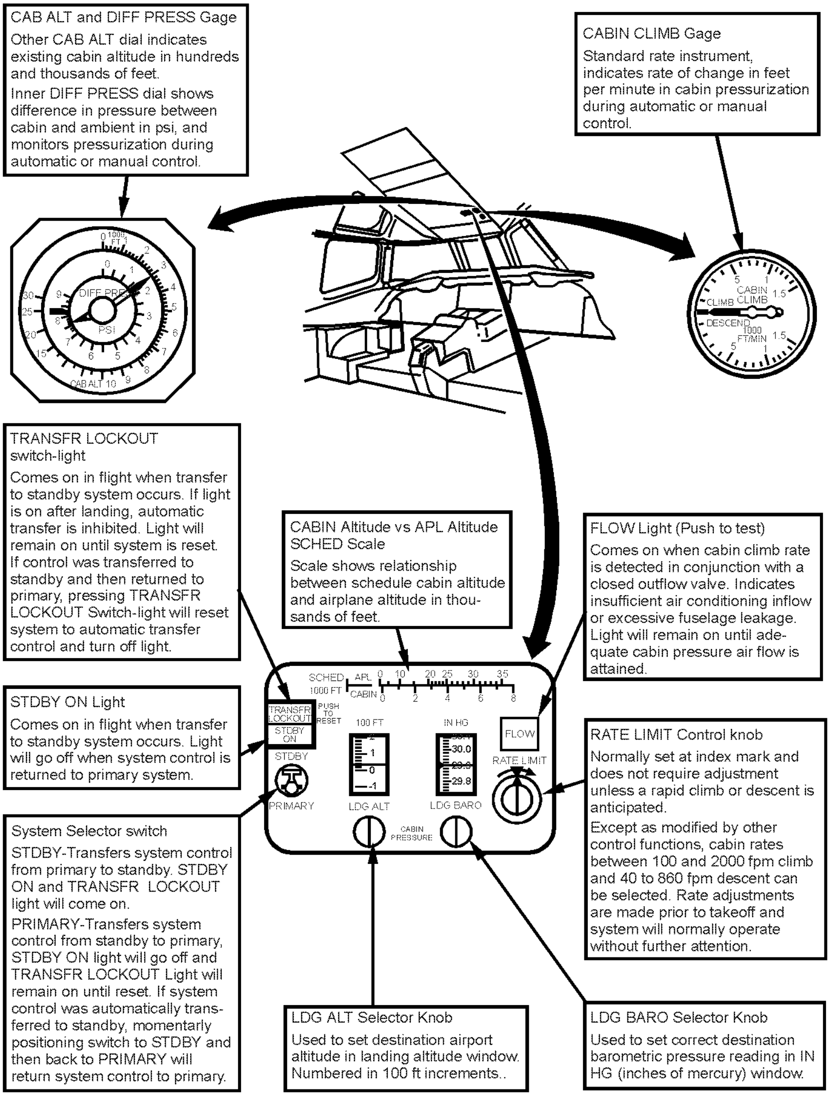
AIR CONDITIONING - CONTROLS AND INDICATORS



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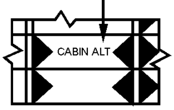
AIR CONDITIONING - CONTROLS AND INDICATORS

CABIN ALT Light

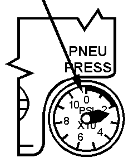
Comes on when pressurization system fails to maintain cabin pressure equivalent to a altitude of 10,000 feet or less. When light comes on, a warning horn will sound for five seconds and MASTER WARNING Lights come on.

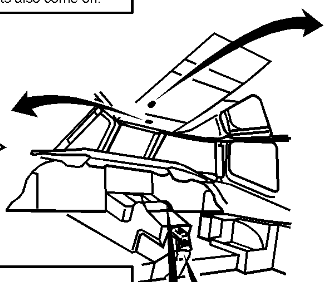
On some aircraft warning horn will be followed by vocal warning. (Cabin Altitude). Tone and voice warning will be cycled, 1 second tone followed by 1 second vocal message for duration of warning period. MASTER WARNING lights also come on.



PNEU PRESS Gage

Indicates pneumatic pressure available in crossfeed manifold for systems operation.





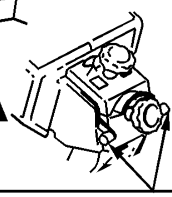
CABIN ALT Control Wheel

With CABIN ALT control lever in auto (up) position, control wheel rotates as cabin air outflow valve automatically adjusts to maintain cabin altitude.

With CABIN ALT control lever in manual (down) position, control wheel is locked in position. To adjust cabin altitude, push down on control wheel and rotate in desired direction.

NOTE

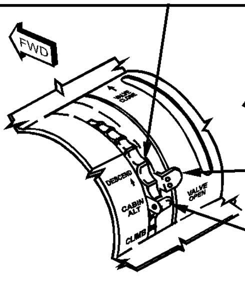
Forces required to move control wheel vary with cabin differential pressure and indicated airspeed. These forces may be high, but manageable. When declutched, control wheel and outflow valve position indicator may move toward VALVE CLOSE Control wheel must be held firmly until positioned as required and locking detents engaged before releasing.



PNEU X-FEED VALVE lever (2)

OPEN - Allows routing of APU or external air on ground for engine start and air conditioning operation. Both air conditioning systems and air foil ice protection system may be operated from one engine pneumatic supply.

CLOSE - Pneumatic supply sources are isolated. The left engine supplies bleed air for the left pneumatic system and the right engine supplies bleed air for the right pneumatic system.



Outflow Valve Position Indicator

Indicates position of Cabin air outflow valve.

CABIN ALT Control Lever

Auto (Up) - Cabin altitude is controlled automatically.

Manual (Down) - Cabin altitude is manually controlled by adjusting the CABIN ALT control wheel. All annunciator lights in CABIN PRESSURE selector panel are inoperative.

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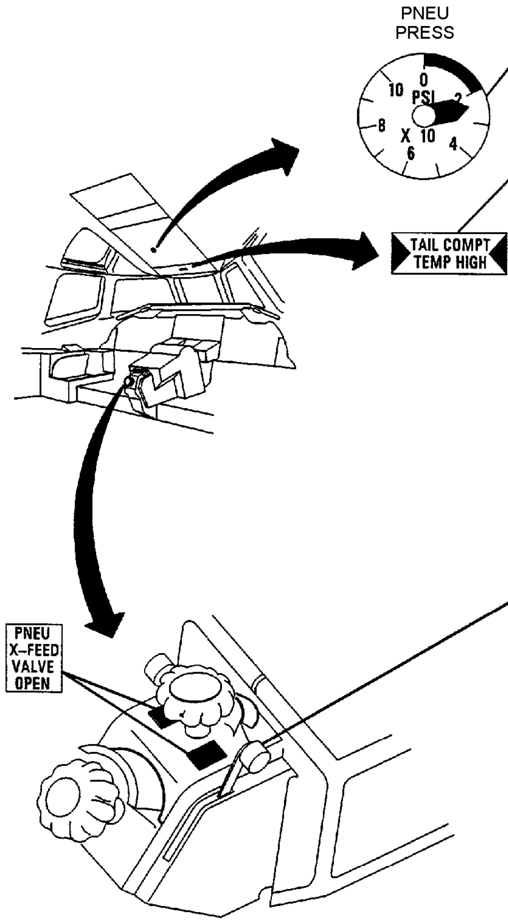
AIR CONDITIONING - CONTROLS AND INDICATORS



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PNEU PRESS Gage
Indicates pneumatic pressure in crossfeed manifold.

TAIL COMPT TEMP HIGH Light
Comes on to indicate tail compartment temperature is exceeding normal temperature. MASTER WARNING lights also come on.

PNEU X-FEED VALVE Lever (L, R)

OPEN – Supplies engine bleed air for airfoil ice protection (in flight only), for operating both air conditioning packs from one operating engine, and for making pneumatic crossfeed starts from opposite operating engine. Also, on the ground, supplies APU bleed air or air from pneumatic ground source for operating one or both air conditioning packs or for engine starting.

NOTES

When PNEU X-FEED VALVE lever is moved from closed position with AIR FOIL anti-ice switch in ON, associated augmentation valve is energized to maintain airfoil anti-ice temperature control.

If ENG FIRE handle is pulled, placing respective PNEU X-FEED VALVE lever to OPEN will retract ENG FIRE handle.

Closed – Shuts off engine bleed air for airfoil ice protection and pneumatic crossfeed starts, deactivates temperature control of associated augmentation valve, and each air conditioning pack is supplied engine bleed air from its respective engine only. On the ground, APU Bleed air or air from pneumatic ground source is not available for air conditioning packs or engine starts.

NOTE

Pneumatic crossfeed valve may be set in any position from fully closed to fully open.

PNEUMATICS – CONTROLS AND INDICATORS

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AUXILIARY POWER UNIT

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AUXILIARY POWER UNIT

General

The GTCP 85-98 DHF auxiliary power unit (APU) is a gas turbine engine installed to supply pneumatic requirements for cabin air conditioning and engine starting as well as electrical power for normal airplane systems operation while on the ground. The APU is operable in flight to supply an alternate source of electrical power in the event that one or both of the engine generators are unavailable.

The APU is installed in the unpressurized, fireproof, enclosed area of the lower fuselage, aft of the pressure bulkhead. Start, operation, and fire controls are located on the APU control panel located on the overhead panel in the flight compartment. An exterior APU ground control panel, located on the lower fuselage aft of the APU compartment, is used for emergency shutdown and fire agent discharge. A fire detector system, having the same characteristics as the main engine fire detector system, is installed on the APU.

APU Start and Shutdown

All APU starts, both in flight and on the ground, receive DC power from the airplane battery. A start abort function precludes depletion of the airplane battery if the start is not completed within a prescribed time due to malfunction.

Bleed air, for starting the main engines and operating the air conditioning system, is controlled by the APU AIR switch. The switch, when in ON, opens a load control valve and provides APU bleed air to the airplane pneumatic system. When in OFF the load control valve closes, thus removing APU bleed air from the pneumatic system. A check valve prevents reverse airflow from the engines from re-entering the APU.

Circuits are installed to provide an automatic 60-second warm-up period when starting the APU. The APU MASTER switch, located on the overhead panel, is used for APU start and normal shutdown. When moved to OFF, the APU air is immediately terminated. The APU then executes a 60-second time delay, which allows the APU to cool down, thus minimizing thermal shock. The 60-second cool-down period is bypassed if the cockpit fire control (FIRE CONT) switch is moved to OFF & AGENT ARM.

Aft Accessory Compartment Overheat Detection

Overheat sensors, located in the aft accessory compartment, detect high compartment temperatures resulting from a broken or disconnected pneumatic duct. The red **TAIL COMP TEMP HIGH** warning light on the overhead annunciator panel and the glareshield **MASTER WARNING** lights will illuminate.

APU Fuel Supply

Fuel is normally supplied to the APU from the right main tank. The DC start pump or any operating right main or center tank boost pump will provide fuel to the APU. Fuel can also be supplied to the APU from a left main tank boost pump when the FUEL X FEED lever is in the ON position (crossfeed valve open).

Once the APU has started, whenever possible, at least one main boost pump should be on to provide fuel to the APU. Operating the APU with the center boost pumps on and main boost pumps off should be avoided if center tank quantity is low (below 800 pounds), otherwise air may be ingested from the center tank into the APU fuel line. Air in the APU fule line can cause APU flameout and can prevent the APU from starting. Output pressure from the DC start pump is much lower than pressure from the AC powered boost pumps.

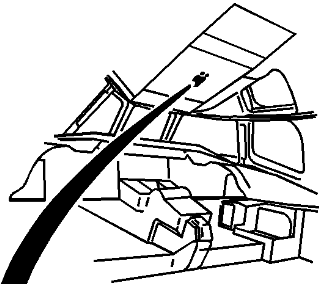
The APU fuel control automatically regulates fuel flow to maintain APU RPM. Pneumatic bleed extraction is limited by a bleed load control valve controlled by a pneumatic thermostat. The APU generator shaft horsepower requirements have priority over the pneumatic bleed air extraction.

APU Inlet Doors

The APU doors, two non-ram (forward and aft) and one ram (center), located on the aft underside of the fuselage, provide intake air for the APU.

An APU DOORS control switch, located on the overhead instrument panel, provides for manual or automatic selection of the inlet doors position. The switch is positioned to AUTO for all normal start and operating conditions. During normal operation, the ram air door opens automatically at the beginning of the start cycle. The ram air door will close and the non-ram air doors open when APU RPM reaches 95%. Door sequence provides ram assist for windmill starting with the switch in AUTO position. It is not necessary to manually select RAM position for windmill starts.

Normally, all APU starts will be made using the airplane battery and APU starter. If left and right AC busses lose power in flight, the starter is disabled. However, the ram air door will allow ram air to windmill the APU for starting.

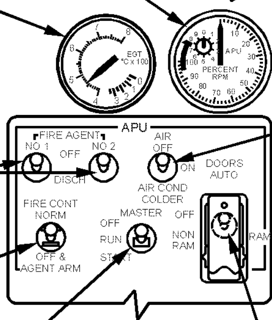


APU PERCENT RPM Gage
Indicates APU rpm as a percentage of an established normal operating rpm. The small inner dial makes one full revolution for each 10 percent rpm. Normal operating range is indicated by a green arc between 95 and 105 percent rpm.

APU EGT Gage
Indicates APU exhaust gas temperature in degrees centigrade.

APU FIRE AGENT Switch (NO 1 and NO 2)
For description refer to Fire Warning and Protection Chapter.

APU FIRE CONT Switch
For description refer to Fire Warning and Protection Chapter.



APU AIR Switch
ON - APU load control valve opens to provide APU bleed air to the airplane pneumatic system.
AIR COND COLDER - Closes turbine nozzle shutoff valve and increases differential pressure across air conditioning turbine to provide additional cooling air capacity during ground operation.
OFF - Removes electrical power from APU load control valve and turbine nozzle shutoff valve circuits.

APU MASTER Switch
START - (Momentary) Initiates APU start. Release to RUN.

NOTE
Switch should be released to RUN prior to attaining starter cutout speed of 35 percent rpm.

RUN - Normal APU operating mode.

NOTE
When starting APU, an automatic 60 second warm-up period is provided regardless of AIR switch position.

OFF - Automatically shuts off bled air regardless of AIR switch position and, after 60 second delay for cooldown, shuts down APU. Closes APU inlet doors with APU DOORS switch in AUTO.

APU DOORS Control Switch
OFF - Removes electrical power from door control circuit.
NON RAM - (Momentary) Provides manual override to open non ram doors.
AUTO - Automatically selects ram door position for starting and non ram door position for ground and flight operation.
RAM - (Momentary) provides manual override to open ram doors.

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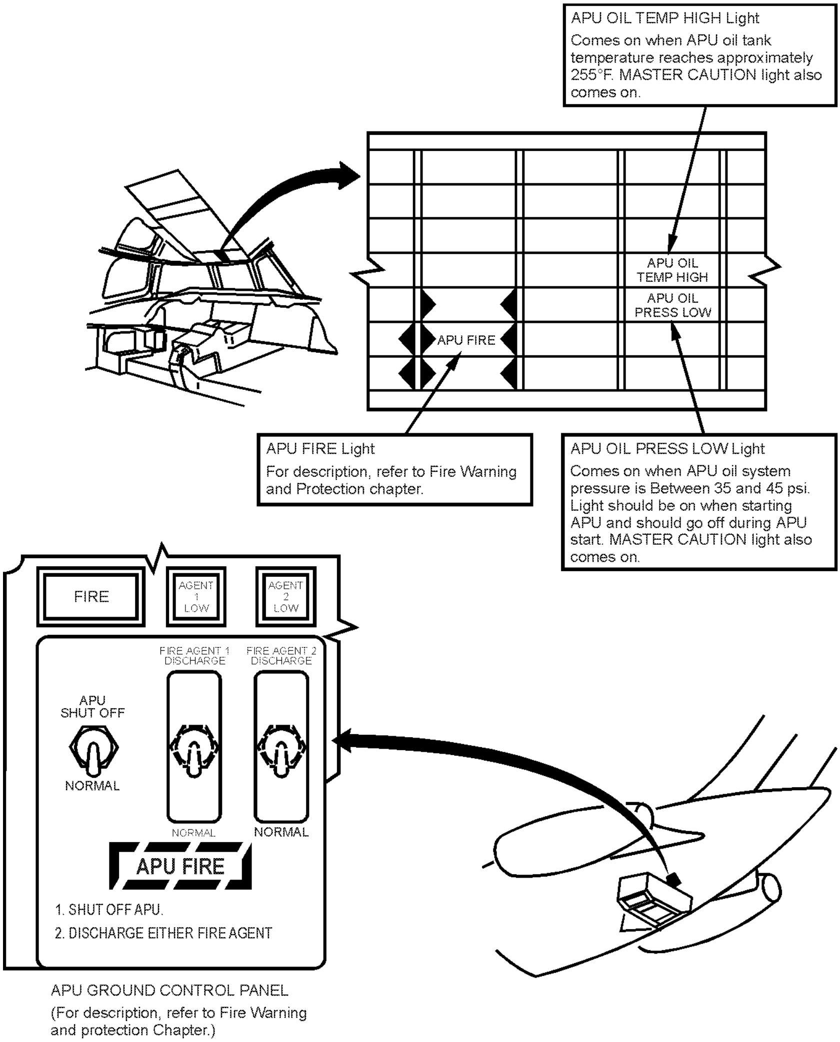
APU - CONTROLS AND INDICATORS



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APU - CONTROLS AND INDICATORS

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ELECTRICAL

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ELECTRICAL SYSTEM

The airplane electrical power system consists of a 115/200 volt, 400-Hz, 3-phase AC power generating and distribution system that furnishes power to the AC and emergency AC busses. For control circuits, lighting, and other load devices requiring DC power, 115-volt AC from the AC distribution busses is converted to 28-volt DC by transformers-rectifiers (TRs).

For instrument power, 115-volt AC from the AC busses is reduced to 28-volt AC by single phase transformers.

Power for certain portions of the DC system is supplied by a battery, when the main power distribution system is de-energized. In addition, power for APU starting is supplied by the battery.

An inverter, powered from the battery direct bus, supplies single phase 115-volt, 400-Hz AC power for emergency use when all other sources of AC power have been lost. The inverter also supplies AC power to the refueling system or ignition system when normal electrical power is not available.

A battery charger, powered from an AC bus, maintains the battery in a charged condition.

AC Power Generating System

AC power is normally supplied by any two of three AC generators, one on each engine and one on the auxiliary power unit (APU). Each generator is rated at 40-kva continuous output and is capable of supplying sufficient power for operation of essential electrical systems in the event of loss of the other two generators.

The APU generator is mounted directly on the APU and is driven at a constant speed by the APU governing system. The APU generator may be substituted for an engine generator or may be used for ground electrical power.

Each engine-driven generator is driven though a constant-speed drive (CSD), which converts the variable speed output of the engine to a constant speed. The CSDs and electronic units maintain a constant voltage and frequency output from the generators regardless of varying engine speeds and electrical loads.

An oil indicating system for each CSD shows the oil outlet temperature and the oil temperature rise across the drive. Each CSD has a disconnect switch which will uncouple the CSD from the engine if required. When disconnected, a CSD must be engaged manually at the engine, after engine shutdown.

Fault protection is incorporated in each generator control circuit to automatically remove the generator from its bus and de-energize the generator in the event of certain circuit malfunctions. Pulling the ENG FIRE handle will also de-energize the generator. The generator may be restored to operation by the reset function of the generator switch when the malfunction is corrected. (ENG FIRE handle must be reset first, if pulled.)

A generator may be reset only once for a given fault. If a fault trips the generator after reset, the fault should be located and corrected before attempting to place the generator on its bus again.

AC Power Distribution System

The AC power distribution system is divided into two separate systems operating independently of each other, but with crosstie capabilities. The right and left engine-driven generators supply power directly to the respective systems. Power from the APU generator may be selected to either or both generator busses, or directly to the ground service bus when only ground service power is required.

The left and right generator busses supply heavy 3-phase loads, such as galley power and cooling fans. The generator busses supply subordinate left and right AC busses respectively. The subordinate AC busses supply lighter 3-phase loads such as fuel pumps, transformer-rectifiers (TRs), and single phase AC circuits. The right generator bus also supplies the ground service bus.

The ground service bus provides power to those circuits necessary for ground servicing operations, without having to energize the remainder of the electrical system. Power to the ground service bus is supplied directly from external power or the APU generator, provided the right generator bus is not energized. The ground service bus supplies power to the battery charger and right TR 2. When the right generator bus is energized, the ground service bus functions as a part of the right AC distribution system, receiving power directly from the right generator bus. When desired, all AC busses may be energized through the external power receptacle.

There is a priority control of AC power distribution. That is, if the APU generator is supplying power to a bus, and an engine-driven generator is placed on the bus, the APU generator will automatically be taken of the bus. If external power is supplying power to a bus, and either the APU or an engine driven generator is placed on the bus, external power will automatically be taken off the bus, and the generator will take the load for that bus.

The shutdown of a generator, for any reason other than a fault on that generator bus, will automatically transfer the load from that generator to the remaining operating generator, through the AC crosstie relay. Should a generator become inoperative because of a fault on its own bus, or due to differential fault protection action, the AC crosstie relay will lock open, isolating that bus from the rest of the system. The loads connected to the bus will remain de-energized until the fault on the bus is cleared. The loads on the other generator will not be affected.

DC Power Distribution

The function of the DC power distribution system is similar to the AC system in that the right and left systems function separately. The DC system has a manual crosstie in the event of a failure of either side. In addition to the left and right systems, DC power is supplied from the battery. In the left DC system, power is supplied by two TRs, both receiving power from the left AC bus. In the right system, TR 1 is powered from the right AC bus, and TR 2 is powered from the ground service bus. When the ground service bus is receiving power from the generator bus, the two TRs are connected through the DC ground service tie relay to furnish power to the right DC bus. When the ground service bus is powered directly from either external power or the APU generator, the right TR 1 is isolated and only the right TR 2 supplies power to the DC transfer bus. The DC bus crosstie differs from the AC bus crosstie in that the DC bus crosstie is not automatic and must be opened or closed manually. In addition to supplying power to the respective DC busses, the TRs supply power to the emergency DC bus, and to the DC transfer bus.

The battery supplies 28-volt DC power to the battery direct bus (regardless of battery switch position) and when the battery switch is ON, to the battery bus. The battery is connected to the DC transfer bus when the right and left DC busses are not energized, except when ground service power is being used. The battery is being charged when the battery switch is ON and the ground service bus is energized. When the emergency power switch is ON, the battery is connected to the DC emergency bus and disconnected from the battery charger.

Battery Charger

The battery charger is in a charging position when the ground service bus is powered and the battery switch is on. When the battery is fully charged, the battery charger will be in a pulsating mode. If the battery is in a low state of charge, the ammeter may initially oscillate but should stabilize within 4 seconds at a continuous current of approximately 40 amperes and transitioning into a pulsating mode as the battery becomes fully charged. Pulse intervals will range from 5 seconds to 30 minutes.

Emergency AC and DC Power Supply

During normal operation, the emergency AC bus receives single phase AC power from the left AC bus, and the emergency DC bus receives power from the left DC bus. Loss of power to the left generator bus will transfer the emergency AC bus to the right AC bus and the emergency DC bus to the right DC bus.

In the event of complete loss of power, the battery will provide both AC and DC emergency power when the emergency power switch is ON. The emergency DC bus will be powered from the battery direct bus, which will also power the emergency inverter to provide power to essential equipment for approximately 30 minutes. When emergency electrical power is in use, the battery charger is not available.

CSD oil Temperature Gage (L, R)
Indicates CSD oil outlet temperature or oil temperature rise across the drive.

CSD Disconnect Switch (L, R)
NORM - Guarded switch normally in this position.
DISC - (Momentary) Disconnects CSD from engine drive.

AC VOLTS meter
Indicates voltage output of generators or external power.

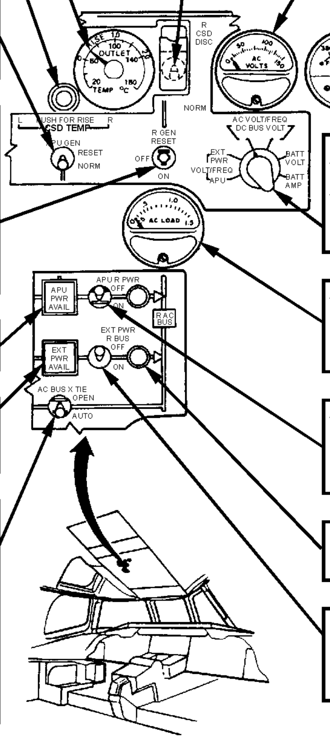
CSD TEMP PUSH FOR RISE Button
When actuated, temperature rise (outlet temperature minus inlet temperature) is displayed on outer scale of indicator.

FREQUENCY Meter
Indicates frequency output of generator or external power in cycles per second.

APU GEN Switch
RESET - (Momentary) Resets generator control circuit.
NORM - For normal operation.

GEN Switch (L, R)
RESET - (Momentary) Resets generator control circuit.
OFF - Disconnects generator from ac power distribution system.
ON - Connects generator to ac power distribution system providing all protection circuits are satisfied.

Indicator Selector Switch
When moved to either L or R positions, ac voltage and frequency and dc bus voltage for selected sources is read on respective meters. All other positions select only single source indicated on switch placard.



AC LOAD Meter (3)
Indicates load each ac generator is delivering to distribution system. Indicates from 0 to 1.5 with 1.0 indicating 100% of generator rated capacity..

APU PWR AVAIL Light
Indicates APU power is available.

EXT PWR AVAIL Light
Indicates external power is available. And phase sequence is suitable.

APU BUS switch (L, R)
OFF - Removes APU power from respective buses.
ON - Selects APU power to respective buses.

AC BUS X TIE Switch
OPEN - Opens ac crosstie relay isolating left and right ac distribution systems. Prevents closing of relay if open.
AUTO - Normally operated in this position. The ac crosstie relay will operate automatically.

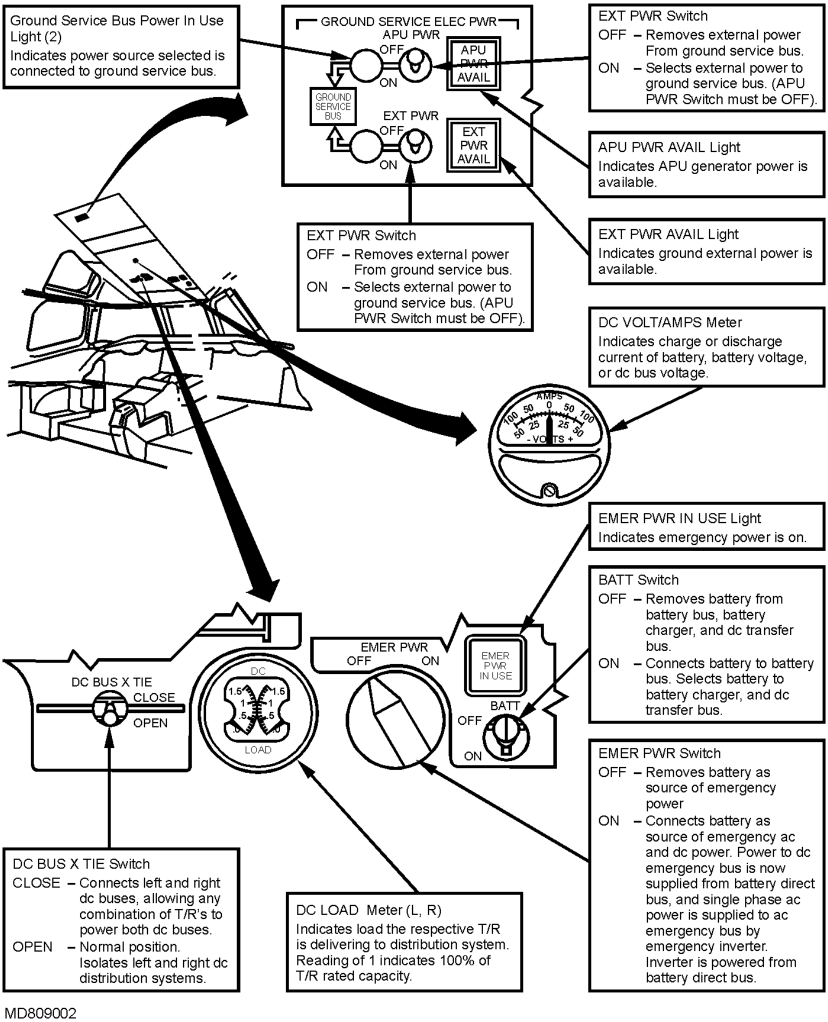
NOTE
Under certain fault conditions, ac crosstie relay will lock open.

Power in Use Light (4)
Indicates selected power source is connected to respective bus.

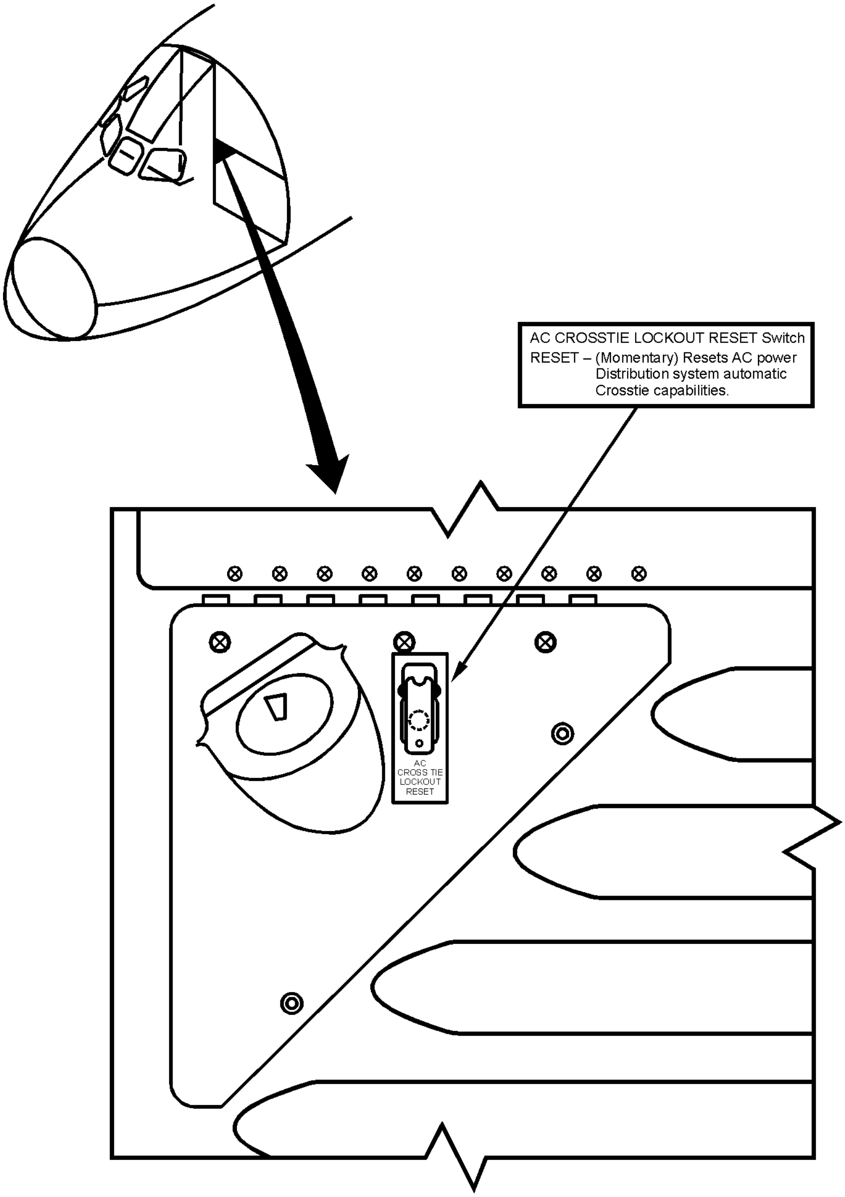
EXT PWR BUS Switch (L, R)
OFF - Removes external power from selected buses.
ON - Selects external power to respective buses.

MD809001

ELECTRICAL - CONTROLS AND INDICATORS

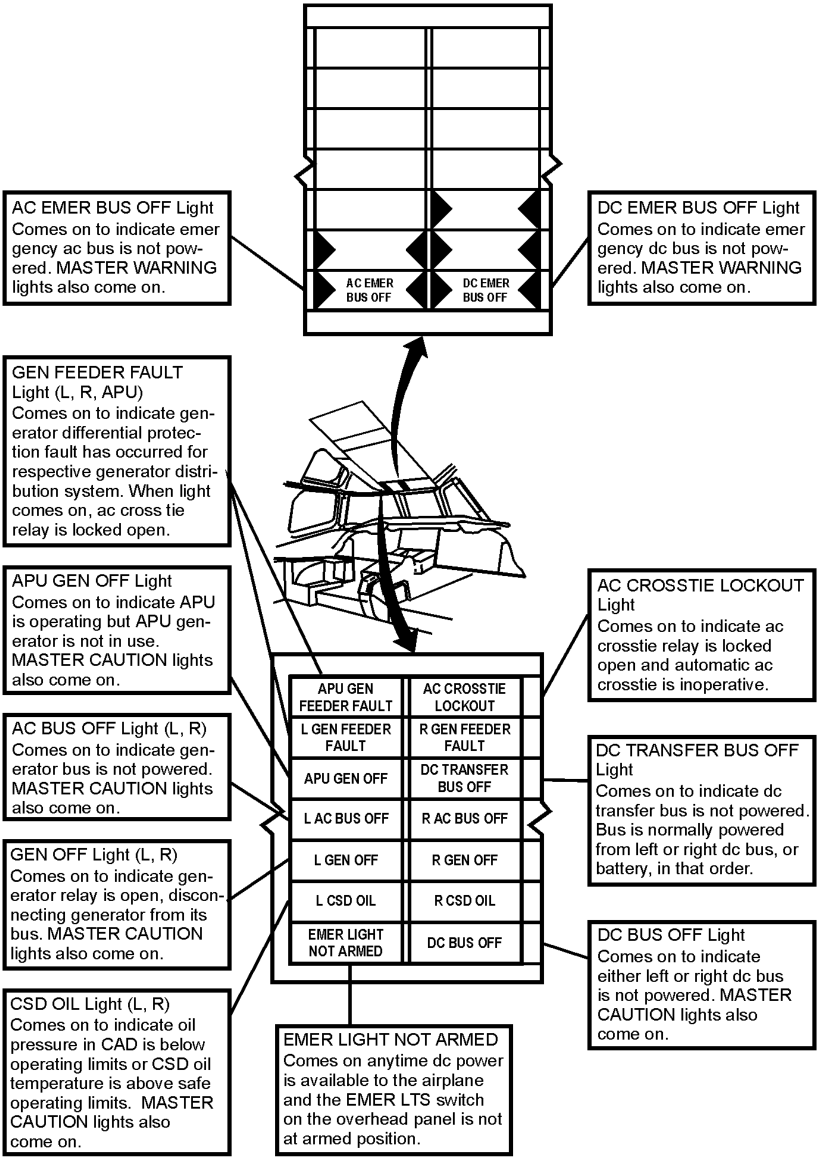


ELECTRICAL - CONTROLS AND INDICATORS



MD809003

ELECTRICAL - WARNING AND CAUTION LIGHTS



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ELECTRICAL - CONTROLS AND INDICATORS

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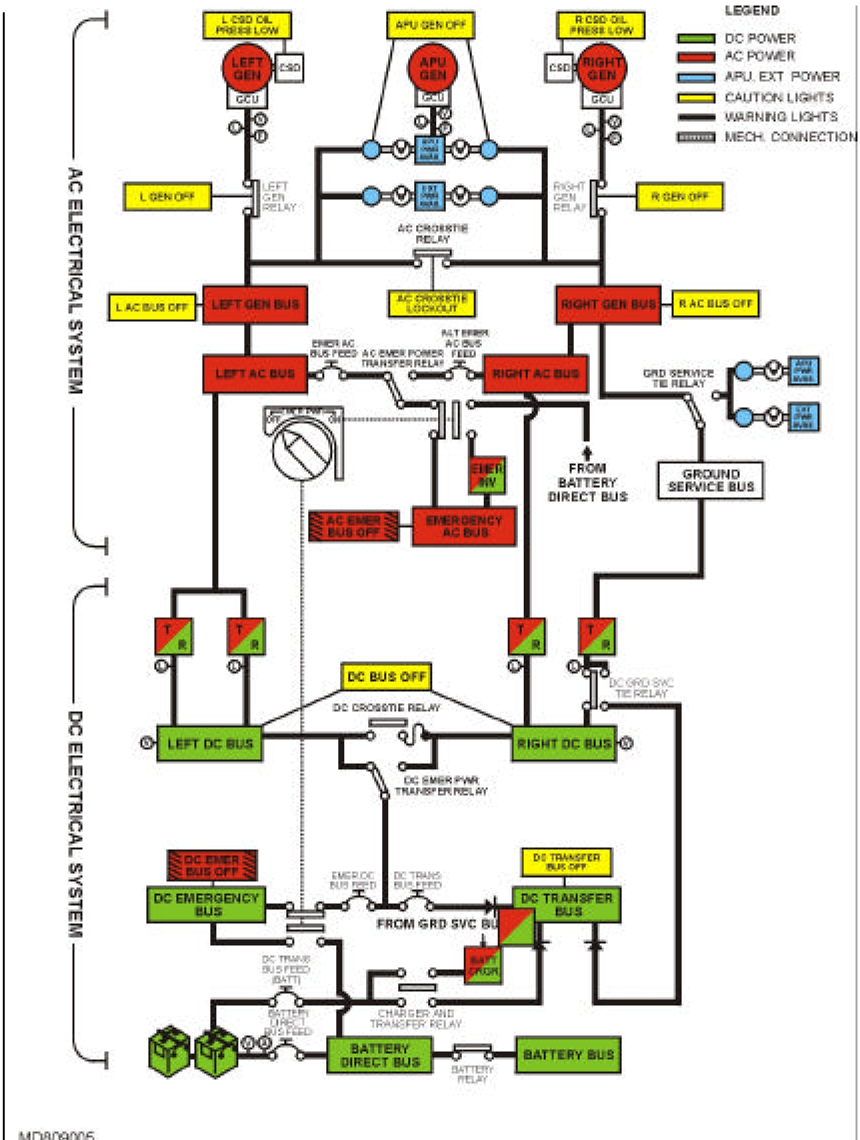

ELECTRICAL SYSTEM SCHEMATIC

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FIRE WARNING AND PROTECTION

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FIRE WARNING AND PROTECTION

GENERAL

The fire warning and protection system provides the means to detect, and extinguish a fire in the engine nacelles and the auxiliary power unit (APU).

The fire warning and protection system consists of fire detection, fire warning and fire extinguishing systems.

FIRE DETECTION SYSTEM

A fire detection system is provided for each engine and the APU. Each detection system consists of two sensing element fire detector loops (one loop redundant) mounted parallel to each other. The resistance of the sensing elements for each fire area is monitored by a control unit (detector amplifier). False fire warnings are minimized (LOOP switch at BOTH) because both loops must be subjected simultaneously to fire or overheat conditions before they will electrically trigger the control units and energize the warning system. If one sensing loop is confirmed defective, the airplane can still be dispatched, or continue in flight, using the single operational loop by moving the applicable LOOPS switch to the operational loop position. In normal operation, with the LOOPS switch in BOTH, if a single system is falsely energized, only the applicable **LOOP** light will illuminate, but the fire warning light and aural warning will not activate.

FIRE WARNING SYSTEM

The fire warning system for the engines consists of **ENG FIRE** lights located in the fire handles on the upper instrument panel, **LOOP A** and **B** lights on the overhead switch panel, **FIRE DETECTOR LOOP** light on the overhead annunciator panel, both **MASTER CAUTION** lights on the glareshield, and aural warnings (bell sound) from the central aural warning system. The **ENG FIRE** handle light and **LOOP** lights identify which engine has the fire or overheat condition. The aural warning, associated engine AC generator, fuel system, and hydraulic system are shut off and the pneumatic crossfeed valve is closed when the ENG FIRE handle is pulled. The aural warning, including the voice warning if aircraft is so equipped, can also be shut off by pushing the FIRE BELL OFF button located on the upper instrument panel. The **ENG FIRE** lights and the **LOOP** lights will remain on until the fire is extinguished.

The fire warning for the APU consists of a red **APU FIRE** light and **FIRE DETECTOR LOOP** light on the annunciator panel, both **MASTER WARNING** and both **MASTER CAUTION** lights on the glareshield, **APU LOOP** lights on the overhead panel, aural warning (intermittent horn sound) from the central aural warning system, an **APU FIRE** light on the external APU ground control panel, and an exterior fire warning horn. The aural warnings will shut off automatically after three cycles. The **MASTER WARNING** and **MASTER CAUTION** lights can be shut off by pushing the respective light caps. The **APU FIRE** lights, **FIRE DETECTOR LOOP** light, **LOOP** lights and exterior fire warning horn will remain on until the fire is extinguished.

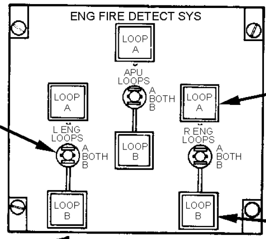
Note: The APU will shut down automatically if APU fire is detected and fire warning system is activated.

FIRE EXTINGUISHING SYSTEM

The fire extinguishing system consists of two fire extinguisher agent containers, distribution lines, control circuits, and **AGENT LOW** lights. Each container has separate discharge heads and distribution lines to each engine and APU. The ENG FIRE handles on the upper instrument panel and the APU fire agent discharge switches on the overhead switch panel and on the APU ground control panel provides the means to select the container and dispense the fire-extinguishing agent. **AGENT LOW** lights on the upper instrument panel and the APU ground control panel illuminate when pressure in container is below minimum, indicating that the fire-extinguishing agent has been discharged.

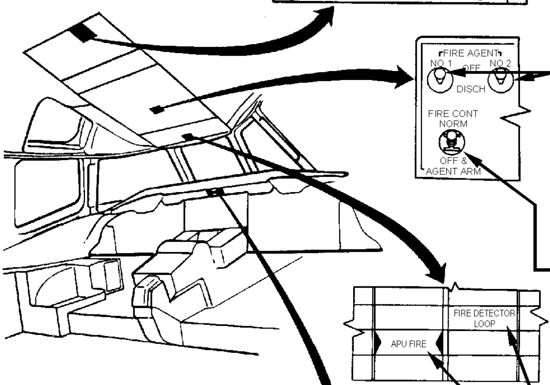
Portable fire extinguishers are provided at strategic locations in the cabin and flight compartment. Refer to Airplane General chapter or Emergency chapter for specific locations.

LOOPS Switch (L ENG, R ENG, and APU)
Connects applicable engine or APU fire warning system to the selected (LOOP A, LOOP B, or BOTH) fire detection loop(s). Switches normally in BOTH except when isolating and testing suspected fire detection loop malfunction or one loop confirmed inoperative and opposite loop selected.



LOOPS A Light (L ENG, R ENG, and APU)
Comes on when activated by associated fore detection loop or LOOPS TEST switch. Indicates possible fire detection loop malfunction when single LOOP (A or B) light comes on and associated engine or APU FIRE warning light does not come on.

LOOPS B Light (L ENG, R ENG, and APU)
Same as LOOP A light.

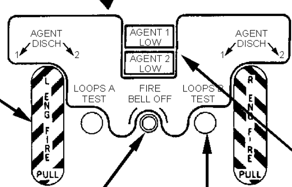


APU FIRE AGENT Switch (NO 1 and NO 2)
(Momentary) Moving switch to DISCH with APU fire Cont Switch in OFF & AGENT ARM discharges respective fire extinguishing agent into the APU compartment.

APU FIRE CONT Switch

NORM	– Provides control power to APU MASTER switch for normal operation.
OFF & AGENT ARM	– Shuts down APU and arms APU FIRE AGENT switches for subsequent discharge of fire extinguishing agent.

FIRE DETECTOR LOOP Light
Comes on when any LOOP A and/or LOOP B light(s) come on. MASTER WARNING lights also come on.



ENG FIRE Handle (L and R)
Provides fire warning indication and protection for the applicable engine. Lights within the handle are turned on by engine fire detection system or test circuit. Pulling a handle will silence the aural warnings, trip the generator control relay, shut off engine fuel and hydraulic pump supply and close the pneumatic crossfeed valve. Turning handle counterclockwise (or clockwise) will discharge fire extinguisher agent from container -1 (or -2).

APU FIRE Light
Comes on when APU fire detection system is activated. MASTER WARNING lights also come on.

AGENT LOW Light (1 and 2)
Comes on to indicate fire extinguishing agent has been discharged (Pressure below required minimum).

FIRE BELL OFF Button
Push to turn off warnings for engine fire.

LOOPS TEST Button (A and B)
Push to test associated fire detection system loop(s) circuits. The LOOPS switch(es) on the ENG FIRE DETECT SYS panel must be in the corresponding loop position or if BOTH position is selected, both LOOPS a and LOOPS B TEST buttons must be pushed simultaneously to activate fire warning systems test.

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FIRE WARNING AND PROTECTION - CONTROLS AND INDICATORS

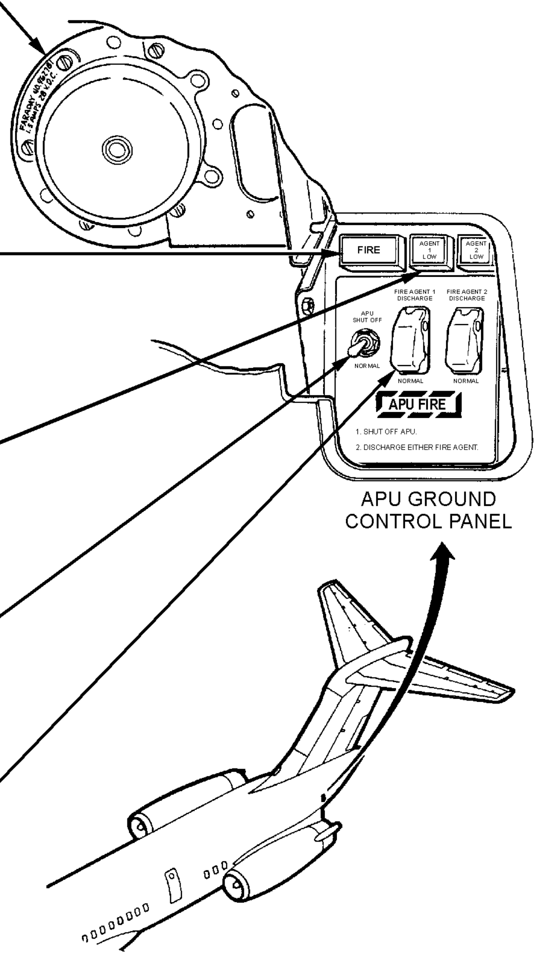
APU Fire Warning Horn
Sounds when APU fire detection system is activated.

APU Fire Light
Comes on when APU fire detection system is activated.

AGENT LOW Light (1 and 2)
Comes on to indicate fire extinguishing agent has been discharged (pressure below required minimum).

APU SHUT OFF Switch
(Momentary) Moving switch to SHUT OFF shuts down APU and arms FIRE AGENT DISCHARGE switches.

FIRE AGENT DISCHARGE Switch (1 and 2)
(Momentary) Moving switch DISCHARGE with the APU fire control relay energized discharges respective fire extinguishing agent into the APU compartment.



MD801002

APU FIRE WARNING AND PROTECTION – GROUND PANEL

CARGO FIRE DETECTION AND SUPPRESSION SYSTEM

OVERVIEW

All three cargo compartments are protected by a fire detection and suppression system. In the event of an inflight cargo fire, the Flight Crew will be alerted by an aural horn, Master Caution and Warning lights, **SMOKE DET LOOP** and **CARGO FIRE** lights on the annunciator panel, and several lights on the Cargo Detection Suppression Control panel on the Overhead panel. The warning horn is silenced with the Horn Reset Button. The Flight Crew pushes the BTL 1 DISCH button releasing a knockdown discharge of Halon to the appropriate compartment. Fifteen minutes later the Flight Crew pushes the BTL 2 DISCH button initiating a 45 minute (approximate) metered discharge of Halon. Upon receipt of a Cargo Compartment Fire Warning, the Flight Crew must immediately divert to land at the nearest suitable airport and evacuate the aircraft.

SYSTEM COMPONENTS

Fire Detection

Each cargo bay ceiling contains a forward and aft detection unit. Each unit contains one Loop A and one Loop B detector, for a total of four detectors in each cargo bay. The status of both A detectors in a cargo bay is indicated by one **DET** light and one **FAIL** light (the same is true for the B detectors) on the Cargo Detection Suppression panel.

When a detector senses smoke, the appropriate cargo bay Loop (A or B) **DET** light, the annunciator panel **SMOKE DET LOOP** light and the Master Caution lights will all illuminate.

When a detector fails, the appropriate cargo bay Loop (A or B) **FAIL** light, the annunciator panel **SMOKE DET LOOP** light and the Master Caution lights will all illuminate. When one detector in a unit fails, the system automatically operates that detector unit in a single loop mode.

A cargo fire warning will occur when any Loop A detector plus any Loop B detector in the same bay detect smoke. When operating in single loop mode, a cargo fire warning will occur if the operating detector in the affected unit detects smoke.

A cargo fire warning consists of the following:

Aural warning
Master Warning lights
Master Caution lights
Annunciator Panel:
CARGO FIRE light
SMOKE DET LOOP light
Cargo Suppression Detection panel:
FIRE warning light
A & B DET lights for affected bay
FWD/MID/AFT Squib light for affected bay
BTL-1 and BTL-2 Squib lights

Fire Suppression

Each cargo compartment contains four agent discharge nozzles. Two Halon bottles are mounted in the mid cargo bay and are connected with tubing through a three way diverter valve to each compartment's nozzles. Five squibs (electrically actuated explosive charges which open diaphragm valves) direct the flow of halon to the appropriate cargo bay. Pushing the BTL-1 DSCH button fires two squibs: One to release the halon from bottle 1, and one of three squibs on the diverter valve to direct the halon to the bay with the cargo fire. Pushing the BTL-2 DSCH button fires one squib to release the halon from bottle 2, which flows through the previously activated diverter valve into the same compartment as bottle 1. A metering device in the line from bottle 2 sustains the discharge of halon for approximately 45 minutes. Fire suppression will last 60 minutes.

System Controls

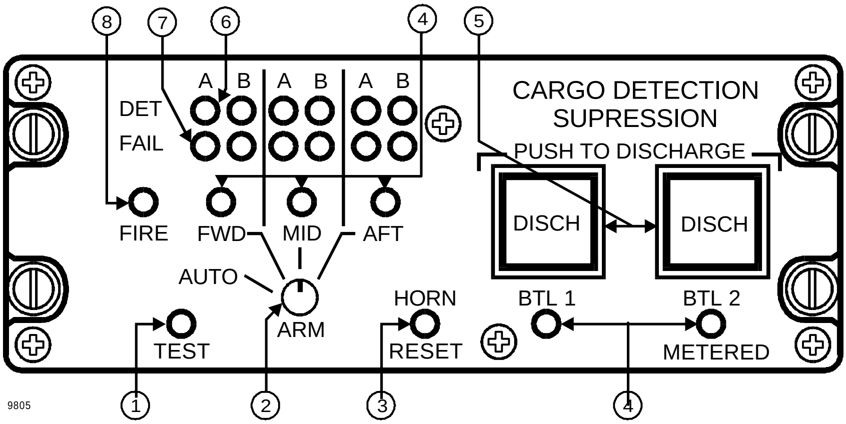
A Smoke Detector Fault Panel is in the E&E compartment (maintenance use only).

A Cargo Detection Suppression control panel and speaker are located on the F/O's side of the cockpit overhead panel. Refer to figure 1 for description.

Three circuit breakers power the system:

SMOKE DET PNLS	S-42
SMOKE A LOOP	T-41
SMOKE B LOOP	S-41

(Standard location, refer to CB guide in Section 3 for alternate locations)



① TEST Button.

When pressed for three seconds, the TEST button tests integrity of detection and suppression systems. All functions and lights on the panel (except the DSCH annunciators) are tested. If a detector has failed, the system will automatically turn off the faulty detector, turn on the respective **FAIL** light, and switch the unit to single loop mode.

② ARM Switch.

Controls arming of the five-halon discharge control squibs.

AUTO position: A cargo fire warning will automatically arm the diverter valve squib for the appropriate (FWD, MID, or AFT) bay, and arm both the BTL 1 and BTL 2 squibs. The respective squib lights will illuminate.

FWD, MID, or AFT position: Manually arms the diverter valve squib for the selected bay and both the BTL 1 and BTL 2 squibs (a cargo fire warning is not required). The respective green squib lights will illuminate.

Note: When ARM switch is in FWD, MID, or AFT position, pressing the BTL 1 or BTL 2 PUSH TO DISCHARGE switches will discharge halon regardless of cargo fire warning.

③ HORN / RESET

Silences the aural warning horn.

④ **SQUIB** Lights (Green)

Squib lights illuminate during a system test, or when the system is armed, to show the status of the squibs. An illuminated squib light indicates the respective squib has not been fired and is ready. After a squib is fired, its respective squib light will not illuminate.

FWD, MID, or AFT: show status of squibs on the diverter valve.

BTL 1 or BTL 2: show status of squibs for halon bottles 1 and 2.

Note: Whenever squib lights are illuminated (even when TEST button is pressed), pressing the BTL 1 or BTL 2 PUSH TO DISCHARGE switches will discharge halon.

⑤ PUSH TO DISCHARGE Switches

These capped switches are not powered until armed. When the ARM switch is in AUTO position, these switches are armed automatically when a cargo fire is detected. When the ARM switch is in FWD, MID, or AFT position, these switches are armed regardless of a cargo fire warning. When armed, pressing the BTL 1 PUSH TO DISCHARGE switch fires a squib releasing halon from bottle 1, and also fires a squib on the diverter valve directing the halon to the appropriate cargo bay. Pressing the BTL 2 PUSH TO DISCHARGE switch fires a squib releasing halon from bottle 2 through a restrictor into the same bay as bottle 1.

DSCH annunciators (in the PUSH TO DISCHARGE switches) show status of halon bottles 1 and 2. The lights (Amber) in these buttons will illuminate when pressure for their respective bottle is low, either after intentional discharge or from a leak. These lights are tested using the cockpit ANNUN/DIGITAL LTS TEST switch.

⑥ **DET** Lights (Amber)

When system test switch is pressed: Illuminate to verify the loop is operational (if light is off during test, loop is inoperative).

When system test switch is not pressed: Illuminate when a detector in the respective Loop senses smoke.

⑦ **FAIL** Lights (Amber)

Illuminate when a detector in the respective Loop has failed.

⑧ **FIRE** Light (Red)

Illuminates when a cargo fire is detected.

System Test

- Press the cockpit ANNUN/DIGITAL LTS TEST switch. The **BTL 1** and **BTL 2 DSCH** lights, and all other lights on the Cargo Detection Suppression Control Panel, should illuminate. Release switch.
- Press the Cargo Detection Suppression Control Panel TEST button for at least three seconds. Within three seconds the following must occur:
  - The aural cargo fire warning should sound. The aural warning may be silenced by pressing the HORN RESET switch.
  - The **MASTER CAUTION** and **MASTER WARNING** lights, and the **SMOKE DET LOOP** and **CARGO FIRE** lights on the annunciator panel should illuminate.
  - All lights on the Cargo Detection Suppression Control Panel, except for the **BTL 1** and **BTL 2 DSCH** lights, should illuminate.
- Reset the Master Caution and Warning lights.
- Release the Cargo Detection Suppression Control Panel TEST button.

  Note: If the TEST button is released prior to completion of the test, all or some of the **FAIL** lights may illuminate. This is not an indication of system failure, but is the result of a failed test due to early release of the TEST button.
- All lights on the Cargo Detection Suppression Control Panel should be out and the aural warning should be silent.

Note: If horn does not sound during test, accomplish the following:

- Perform three separate tests of the system.
- If horn still does not sound, pull and reset system circuit breakers.
- Perform up to three more separate tests of the system.

Dispatch Notes

The aircraft may be dispatched with one detector inoperative for each detection unit (enclosure). When a detector is inoperative, the annunciator panel **SMOKE DET LOOP** light and the Cargo Suppression Detection Control panel **FAIL** light for the affected Loop will remain on throughout the flight.

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FLIGHT CONTROLS

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FLIGHT CONTROLS

GENERAL

Primary flight controls consist of aileron, rudder, and elevator control systems. Secondary flight controls consist of lift augmenting leading-edge slats, flight and ground spoilers, inboard and outboard flaps, and horizontal stabilizer. Warning systems are provided for stall and adverse takeoff, slats, or maximum speed conditions.

PRIMARY FLIGHT CONTROLS

Lateral Control System

Control column wheels are used for lateral control. Control wheels are cable connected to an aileron control tab and are linked together by a torque tube arrangement that causes both control wheels to move together. Should any part of the system between the torque tube and control tab become jammed, either control wheel will drive the unjammed aileron tab cable system by application of approximately 50 pounds of pressure at wheel rim.

Aerodynamic forces on the control tabs move the ailerons. The ailerons are cable connected in a manner that each aileron must respond to movement of the opposite aileron. Each aileron contains a trim tab that is cable connected to the pedestal trim knob. Aileron lateral control is augmented by flight spoilers operating in proportion to control wheel displacement and/or speed brake input.

Longitudinal Control System

The longitudinal control system is a pair of elevators attached to the horizontal stabilizer. The elevator control is, for all normal flying, an aerodynamic boost system that operates a single control tab on each elevator. Each control tab is driven by an independent two-way cable system from the corresponding control column in the cockpit. The only interconnection between the two control systems is a bus torque tube that connects the control columns. Movement of the control column moves the control tab, and aerodynamic force generated by the tab moves the elevator. As each elevator moves, an additional tab, geared to the elevator movement, moves to assist the control tab. An anti-float tab, geared to horizontal stabilizer movement, is installed on each elevator outboard of the geared tab to improve the longitudinal trim in an extreme forward center-of-gravity (beyond ten degrees airplane nose up) landing configuration.

The engine strakes are added to the engine nacelles to enhance longitudinal control for post-stall recovery.

A 3000 psi hydraulic power augmentor system provides elevator control for additional nosedown capability in extreme, high angle-of-attack flight conditions. Supplied by the left hydraulic system, the power augmentor system activates during an extreme stall condition after elevator control tabs have been displaced approximately 10 degrees airplane nosedown with respect to the elevator surface. This augmentor action will restore positive column elevator control. A light on the annunciator panel (**ELEVATOR POWER ON**) is provided to indicate when hydraulic pressure is used to drive the elevator.

Aerodynamic load feel forces are supplemented by a variable load feel system consisting of a mechanical ratio changer attached between the First Officer's control column and the elevator load feel and centering spring. The variable load feel mechanism is connected by cables to the longitudinal trim system. Control column force will vary with stabilizer movement and will decrease with forward center-of-gravity conditions.

A Mach trim spring is also connected to the First Officer's control column. The Mach trim spring is controlled by a Mach trim compensator that provides corrective Mach trim at high Mach number conditions. Operating on a Mach schedule, the Mach trim compensator pulls the First Officer's control column aft as Mach number increases. As the control column moves aft, an indicator rod on the left side of the First Officer's control column extends, giving visual indication of Mach trim operation. Mach trim can be selected or overridden by a switch on the overhead panel.

Directional Control System

Directional control is obtained through rudder pedals that control rudder movement. The rudder is normally powered by the right hydraulic system.

Powered Rudder Operation

During powered rudder operation, the rudder control tab is locked hydraulically, and rudder pedal movement activates the entire rudder. Hydraulic power to the rudder may be shut off by placing the rudder power control handle in the manual position. When hydraulic power to the rudder control unit is shut off, or when right hydraulic system pressure drops to approximately 950 psi, the rudder automatically reverts to manual operation, unlocking the rudder control tab. A light on the annunciator panel comes on to indicate manual rudder operation.

The maximum rudder deflection in the powered mode is approximately 22 degrees to either side of neutral.

Manual Rudder Operation

During manual rudder operation, rudder pedal movement operates a control tab on the rudder. Aerodynamic force on the control tab moves the rudder.

Due to the aerodynamic operation of the rudder control tab, maximum rudder deflection in the manual mode is expected to be approximately 17 degrees to either side of neutral.

Each set of rudder pedals is individually adjusted. The Captain's and First Officer's rudder pedal systems are connected by a torque tube forward of the pedals.

Rudder Trim

Trim is accomplished by turning a trim knob on the pedestal. Movement of the trim knob will cause the rudder pedals to displaced accordingly. Whether the rudder is operating in the powered or manual mode, the trim will operate. In the powered mode, the trim will cause the entire rudder to be hydraulically displaced. In the manual mode, the trim will cause the rudder control tab to be displaced.

Rudder Throw Limiter

A rudder throw limiter is installed to protect the empennage from overload in case of inadvertent application of excessive rudder control. The limiter operates (in either powered or manual modes) by ram air pressure from the pitot tube on the leading edge of the vertical stabilizer. The higher the airspeed, the more ram pressure, resulting in proportional restriction of rudder movement. The throw limiter is scheduled to vary the maximum available rudder throw from ±22° (unrestricted) to ±2.5°.

On acceleration, rudder throw is unrestricted to 180 KIAS (200 KIAS MD-83), then will gradually reduce until reaching ±2.5° at 300 KIAS. On deceleration, the throw will increase until reaching ±22° at 144 KIAS (165 KIAS MD-83).

A blue **RUDDER TRAVEL UNRESTRICTED** light on the annunciator panel comes on during unrestricted rudder throw operation. This light must be on for takeoff and should be on for landing. If it is not on for landing, an Abnormal Procedure is accomplished by the crew.

The rudder limiter pitot tube is normally electrically heated to prevent ice by use of the pitot heat selector switch on the cockpit ice protection panel.

Yaw Damper

An electrically operated yaw damper is installed in the rudder system to provide automatic damping of any lateral directional oscillation. Yaw damper operation is selected by a switch on the overhead panel. A light on the annunciator panel comes on when the damper is turned off or the yaw damper becomes inoperative.

The YAW DAMP switch has OVRD, OFF, and ON positions.

The OVRD position depowers the yaw damper servo – rendering the Yaw Damper inoperative.

The OFF position powers the yaw damper servo but will not allow the DFGS to signal the yaw damper – unless theautopilot is engaged.

The ON position powers the yaw damper servo and provides a DFGS signal to the yaw damper – regardless ofautopilot engagement.

SECONDARY FLIGHT CONTROLS

Spoiler System

Each wing has two hydraulically operated flight spoilers that are operational during all phases of flight and a ground spoiler that is operable on the ground only. The spoiler system provides the following operational modes:

- Lateral control augmentation in all modes of flight spoiler operation.
- Automatic ground and flight spoiler extension upon touchdown and main wheel spinup to spoil lift, thereby increasing braking efficiency.
- Manual extension of ground and flight spoilers during landing or rejected takeoff.
- Selectable extension of flight spoilers to serve as speedbrakes.

Flight Spoilers

An inboard and outboard spoiler on each wing supplement the ailerons for lateral control. Movement of the spoilers occurs as the control wheel actuates the ailerons, which are cable connected to the spoiler system. Both the inboard and outboard spoiler systems are interconnected to both aileron control systems through a mechanical mixer assembly. This aileron/spoiler mixer assembly provides control of spoiler movement in relation to aileron movement. When the control wheel is moved to approximately 5° of aileron throw, the flight spoiler will start to extend on the downward wing. Further control wheel movement will extend the spoiler proportionate to lateral control demands.

When the speed brake handle is manually moved aft and the control wheel rotated, the aileron/spoiler mixer assembly will operate the flight spoilers asymmetrically to increase spoiler extension on the downward moving wing and decrease spoiler extension on the upward wing. During landing roll, when the spoilers are at the maximum extend position (60°), use of down aileron (to lift wing) will cause the spoiler on that wing to partially retract.

Inboard and outboard flight spoiler systems are powered by separate hydraulic systems. If one hydraulic system fails, one-half of the flight spoiler system effectiveness is retained.

Speed Brakes

During flight, manually moving the pedestal-mounted speedbrake/spoiler lever aft will extend the four flight spoilers to serve as speedbrakes. These surfaces may be symmetrically extended approximately 6° per notch to a maximum of 35°.

Use of aileron control during speed brake operation results in asymmetrical extension of the spoilers to aid in lateral control.

In flight, if the speed brakes are extended with the flaps beyond 6°, the annunciator light (**SPOILER / FLAP EXTENDED**), and **MASTER CAUTION** lights illuminate. In addition, the aural warning will sound.

On the ground, if either throttle is (or on airplanes with Service Bulletin 31-34 incorporated or production equivalent, both throttles are) advanced with the spoilers extended (speedbrakes), the aural warning will come on. The **SPOILER / FLAP EXTENDED** light will come on whenever the flaps are extended to or beyond 6 ° amd the spoilers are extended. The **SPOILER / FLAP EXTENDED** light is de-energized on the ground during and after an automatic-spoiler landing until retraction of flaps or speedbrakes.

Ground Spoilers

The aircraft is equipped with an Inboard Ground Spoiler panel on each wing. These panels are normally locked down and are unlocked when the aircraft has normal electrical power, the throttles are at idle, and weight is on the main gear.

After landing, all spoilers (flight and ground) may be extended (by use of the Spoiler lever) to a maximum of 60° to serve as ground spoilers.

The system may be armed for automatic operation by pulling up on the speedbrakes / spoiler lever until a red armed placard is exposed and the lever latches in the up position.

When the system is armed for landing and throttles are at idle, the spoilers will automatically extend after wheel spin-up on ground contact or after nosegear oleo actuates ground shift. The spoilers will retract and the speedbrakes / spoiler lever will be disarmed if left throttle is advanced for a go-around. A **SPOILER DEPLOYED** light will illuminate when the airplane is on the ground, speedbrake / spoiler lever stowed, and any spoiler panel is extended more than approximately 10° ± 2° regardless of throttle position. On airplanes with Service Bulletin 27-257 incorporated or production equivalent, the **SPOILER DEPLOYED** light is inhibited for the flight spoilers when the airplane is on the ground, the throttles are advanced for takeoff, and the spoilers are extended by means of control wheel input.

Some aircraft are equipped with autospoilers for a rejected takeoff. When the system is armed for takeoff, the spoilers will automatically extend after the thrust reverse levers are moved to actuate the reversers.

On these aircraft, both the Autospoilers and ABS must be armed for takeoff, or neither must be armed for takeoff. If the Autospoilers or ABS is armed for takeoff – without the other – a CAWS warning is activated when the throttles are advanced for takeoff.

Flaps System

The trailing edge flap system consists of inboard and outboard flap segments of each wing. Each flap is powered by an inboard and outboard hydraulic cylinder. The outboard cylinders are supplied by the left hydraulic system; the inboard cylinders are supplied by the right hydraulic system. Although the flaps normally operate on both hydraulic systems, one hydraulic system is capable of operating the flap system at a reduced rate. All flap segments are mechanically bussed together for simultaneous extension and retraction.

Flaps may be positioned in any of six permanent detents of a 0° to 40° range by movement of the cockpit FLAP/SLAT handle. A takeoff flap selector thumbwheel that positions a movable takeoff detent anywhere in the 0° to 13° and 15° to 24° range may also be used to set takeoff flaps. This selector is used for optimum flap takeoffs.

The preferred sequence for takeoff flaps is listed in Section 5. There is a different preferred sequence for normal takeoffs and contaminated runway takeoffs.

Normal landing flaps is 28° or 40°. Flaps 28° may be required for improved go-around performance situations at MEX. See accuload for more information.

The go-around flap setting is normally 15°. If a high performance go-around is required for MEX, the go-around flap setting is 11°. This will be noted on accuload.

A two-speed restrictor valve system restricts flap travel speed during retraction from 20° to 0°; retraction rate from 40° to 20° is at a faster rate.

Flap Position Indicator

The indicator contains dual, superimposed pointers and a dial which is graduated in degrees of flap travel. Each outboard flap is linked to a separate flap position transmitter that operates one of the dual pointers. The pointers respond to actual flap movement rather than flap control handle movement and will normally move in unison.

Takeoff Warning System

The takeoff warning system provides an aural alert if certain parameters are not properly set for takeoff. The system requires normal electrical power.

When the airplane is on the ground, any one of the following conditions will cause the aural warning system to sound: Either throttle is (or, on airplanes with Service Bulletin 31-34 incorporated or production equivalent, both throttles are) advanced for takeoff and the FLAP/SLAT handle (after being positioned to the takeoff flap setting) is not in agreement with the value set in the FLAP window of the TAKEOFF CONDTN computer, or the horizontal stabilizer is not set within the green-band area of the LONG TRIM indicator, or the slats are not extended, or the spoiler handle is not in the retract detent, flaps extended beyond 26^0, or the parking brake is set.

Some additional parameters (on some aircraft) that will activate the takeoff warning are: Autospoilers armed with ABS not armed, ABS armed with Autospoilers not armed.

Flap / Landing Gear Warning System

Inflight, if the flaps are extended beyond 26° and the landing gear are not down and locked, the aural warning system will sound until the gear are down and locked.

Inflight, if either or both throttles are retracted to idle, the airspeed is less than 210 knots, and the landing gear are not down and locked, the aural warning system will sound. The aural warning may be silenced by pushing the GEAR HORN OFF button if the flaps are set less than 26°.

Leading Edge Slat System

The leading edge slat system provides wing lift augmentation. The slats are divided into six segments on each wing that are fastened together and operate as a single unit. The slats normally operate by pressure from both hydraulic systems but will continue to operate, at a reduced rate, with pressure from a single hydraulic system. All slat segments are protected by the anti-ice system.

The slats are manually actuated by the FLAP / SLAT handle. Three slat positions may be selected: retracted, mid-sealed, and extended. When the FLAP/SLAT handle is in the UP / RET position, the slats are retracted. When the FLAP/SLAT handle is in the 0° to 13° range, the slats are in the mid-sealed position. The slats will be in the extended position whenever the FLAP/SLAT is in the 15° to 40° range. The range between 13° and 15° is the DO NOT USE range.

When the FLAP T.O. Selector is used to select a detent in the 0° to 13° range and the FLAP/SLAT handle is moved to that selected detent, the slats will be actuated to the mid-sealed position. When the FLAP T.O. Selector is used to select a detent in the 15° to 24° range and the FLAP/SLAT handle is moved to that selected detent, the slats will be actuated to the extended position.

Extension of the slats to the mid-sealed position is accomplished hydro-mechanically – and does not require electrical power.

Extension of the slats to the full extend position requires electrical power to at least one of the two SSRS computers.

Partial slat position status is provided by slat advisory lights on the center instrument panel. The aural warning system will be activated if the throttles are advanced for takeoff and the slats are not extended.

The **TAKEOFF** slat light illuminates if the slats are appropriately positioned for flap settings of less than 26°. The slats may be in the mid position (flaps 0° to 13°) or full extend position (flaps 15° to 24°) when this light is on.

The **AUTO** slat light illuminates if the Autoslat system has actuated to extend the slats from Mid to Full. Illumination of this light is always accompanied by the illumination of the **DISAGREE** slat light.

The **DISAGREE** slat light illuminates if the slats are not in the expected position as selected by the flap range. This light illuminates during transit conditions or if the slats are in the wrong position.

The **LAND** slat light illuminates if the slats are appropriately positioned for flap settings greater than 26°. The slats are in the full extend position when this light is on.

If the slats are in the MID position and the airspeed exceeds 280 knots, an aural overspeed warning "SLAT OVERSPEED" is delivered until the speed is reduced below 280 knots or the slats are retracted.

Horizontal Stabilizer

A movable horizontal stabilizer provides longitudinal trim. The stabilizer is moved by a jackscrew driven by either a primary or an alternate electric motor. Primary trim control is accomplished by actuating dual switches on each control wheel or by moving dual handles on the pedestal. Operation of the primary control moves the stabilizer 1/3° per second. Operation of the dual handles on the pedestal has priority over operation of the control wheel switches. Operation of control wheel switches on one pilot's control wheel in one direction and operation of control wheel switches on the other pilot's control wheel in the opposite direction – will cancel the trim operation. Operation of Primary trim by any means will cause the AP to disengage.

Alternate stabilizer operation is provided by two ALT LONG TRIM switch levers mounted on the center of the pedestal. Operation of the alternate control moves the stabilizer 1/10° per second. The alternate motor is also used by the autopilot for trim.

All stabilizer trim operation is protected by dual switches and dual circuits. One switch/circuit controls an electric brake; the second controls power to the jackscrew motor. Whenever the control wheel trim switches or LONG TRIM handles are actuated, both switches/handles must be moved simultaneously and in the same direction to result in stabilizer movement.

When the horizontal stabilizer is being moved by any of the three methods of contorl or by the autopilot trim, an audible signal is sounded once for each 1/2° (approximately) of stabilizer movement. On some aircraft, a vocal warning will be sounded whenever the stabilizer is moved by the autopilot at a rate of or greater than 2° in 30 seconds. A switch on the aft pedestal is used to stop a primary-trim runaway stabilizer condition. When the switch is returned to the normal position, stabilizer trim power is restored.

<u>Note</u>: With loss of normal electrical power, the Primary and Alternate Trim systems are inoperative.

Take Off Condition Computer

Stabilizer trim takeoff settings are determined by entering calculated takeoff values for C.G. and flap setting into the pedestal mounted computer. When the appropriate C.G. and flap settings appear in their respective readout windows, the stabilizer setting numeric value will appear in the TAKEOFF CONDTN LONG TRIM window. This numeric value may then be set using either the LONG TRIM handles or the pilots' control wheel trim switches. When the LONG TRIM indicator matches the LONG TRIM position takeoff indicator, the stabilizer is set for takeoff.

If either throttle (or, on airplanes with Service Bulletin 31-34 incorporated or production equivalent, both throttles are) is advanced for takeoff and the stabilizer setting does not agree with the TAKEOFF CONDTN LONG TRIM numeric value, or the FLAP / SLAT handle (after being positioned to the T.O. flap setting) does not agree with the value in the stabilizer takeoff setting computer FLAP readout, an intermittent audible warning signal will be activated.

STALL PROTECTION SYSTEM

Prior to the onset of an aerodynamic stall, a stall protection system will be activated. An approach to stall will be detected by either of two, independent, stall indication systems. Each detection system has a computer that receives input from an angle-of-attack vane and horizontal stabilizer and flap / slat position transmitters. Either detection system will provide pre-stall warning indications by actuation of stick shakers at approximately 10% above stall. At stall recognition, either detection system will provide input to the autoslat system and extend the slats, if in mid-sealed position, and actuate the stall warning system by means of a pulsating input to the glareshield **STALL** lights and to the stall recognition speakers (on some aircraft the CAWS system with vocal warning). With slats extended and stall recognition conditions exceeded by programmed amounts as detected by both computers, the control columns will be mechanically moved forward simultaneously with appropriate elevator movement. In addition, the **STICK PUSHER PUSH TO INHIBIT** lights on the glareshield will illuminate. Both the prestall and stall recognition signals are provided with rate anticipation that will cause the stall protection warning system to actuate quicker when stall is approached at high rate of angle-of-attack change.

Autoslats

If the FLAP/SLAT handle is set in the 0° to 13° flap takeoff range, airspeed 240 KIAS or less, and either of the two stall warning computers detect that an approach-to-stall, the slats will extend automatically from the mid-sealed to extended position. When the approach-to-stall condition ceases to exist, the slats will retract automatically to the mid-sealed position. The slat **DISAGREE** and **AUTO** lights will illuminate upon autoslat extension. The autoslat system automatically undergoes a self test whenever takeoff flaps/slats are selected. When the flap handle is moved from 0° RET to the takeoff range, the slats will extend from the retracted position through the mid-sealed position. While the slats are at the extended position, the slat **DISAGREE** and **AUTO** lights will be on. If the **AUTO SLAT FAIL** light also illuminates, an invalid test is indicated. The **AUTO SLAT FAIL** light can be reset and the test reaccomplished by cycling the FLAP / SLAT handle to 0° RET and back to flap takeoff range.

Post Stall Pusher System

Whenever a stall condition is detected by both stall detection systems and slats are fully extended, the control columns will be abruptly moved forward, the **STICK PUSHER PUSH TO INHIBIT** glareshield annunciator lights will illuminate, and the autopilot, if engaged, will disconnect. The post stall pusher system will keep forward pressure on the control columns until either the stick shaker system is shut off, the G-force is reduced to between +0.65G to +0.50G, or the post stall pusher system is turned off by pushing either of the **STICK PUSHER PUSH TO INHIBIT** glareshield annunciator lights. In addition, the stick pusher may be manually overridden by pulling aft on the control column. However, if stall persists and aft pressure is released, the stick pusher will again force the column forward. The **STALL INDICATION FAILURE** light will illuminate any time the post stall pusher system is shut off via pushing either glareshield annunciator lights or by reduction in G forces. The **PUSH TO INHIBIT** glareshield annunciator lights will go off whenever the system is automatically disengaged or whenever either glareshield annunciator light is pushed.

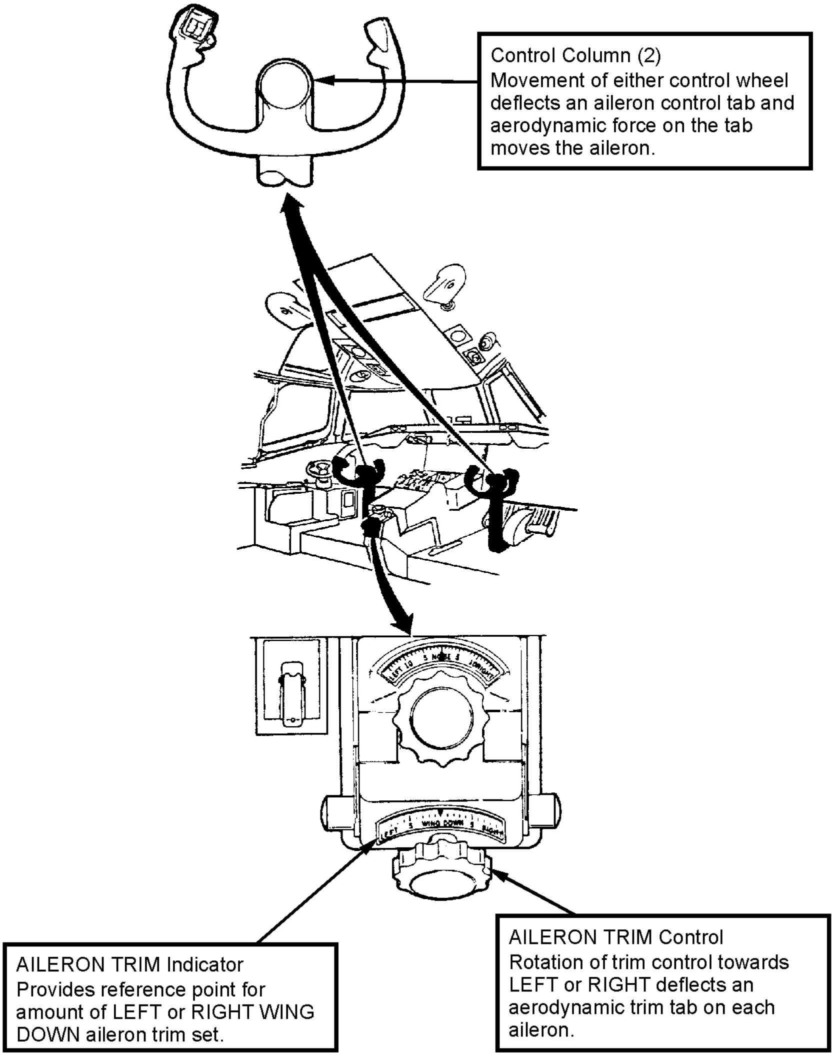
On some aircraft, after the **PUSH TO INHIBIT** light has been pressed, the pusher remains inhibited. On these aircraft, the **STALL INDICATION FAILURE** light remains on until the pusher is reset by maintenance.

On some aircraft, after the **PUSH TO INHIBIT** light has been pressed, the pusher will reset after the stall condition is removed. On these aircraft, the **STALL INDICATION FAILURE** light goes out when the pusher is automatically reset.

Stall Protection System Self-Test

A switch on the overhead panel provides the capability of testing each detection system individually. The stall warning test may be performed at any flap/slat configuration on the ground or inflight. Switch position 1 or 2 tests the ability of each computer to actuate both stick shakers, both stall recognition speakers, and annunciator lights. Any failure in angle-of-attack, flap or slat inputs or faults within a single computer will inhibit all stall warning outputs on the affected side and turn on the **STALL INDICATION FAILURE** light. Stabilizer input faults will not inhibit the stall warning outputs but will turn on the **STALL INDICATION FAILURE** light to illuminate and inhibit only the recognition speakers. On the ground, stall warning system comparators are armed and most system failures will be detected and indicated by the **STALL INDICATION FAILURE** light prior to takeoff. If one of the detection systems malfunctions in flight, causing the **STALL** lights and/or stall recognition speakers to come on at full intensity, the **STALL** lights can be dimmed by placing the STALL TEST switch to either SYS 1 or SYS 2. The STALL TEST switch is normally at OFF at all times except during stall indication test or isolating malfunctioning system.

FLIGHT CONTROLS



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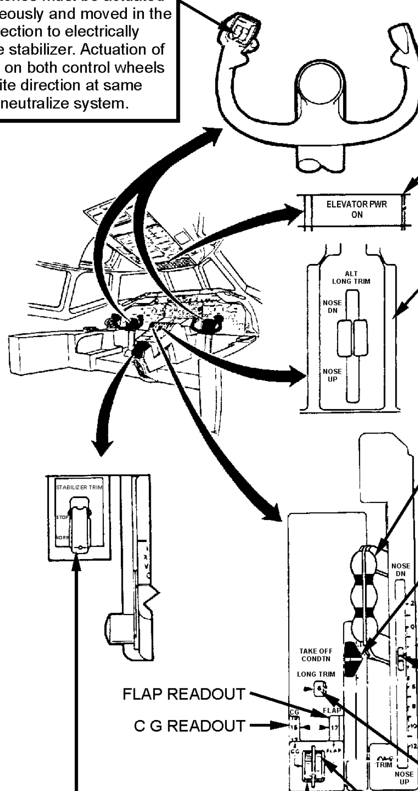
FLIGHT CONTROLS - CONTROLS AND INDICATORS LATERAL CONTROL AND TRIM



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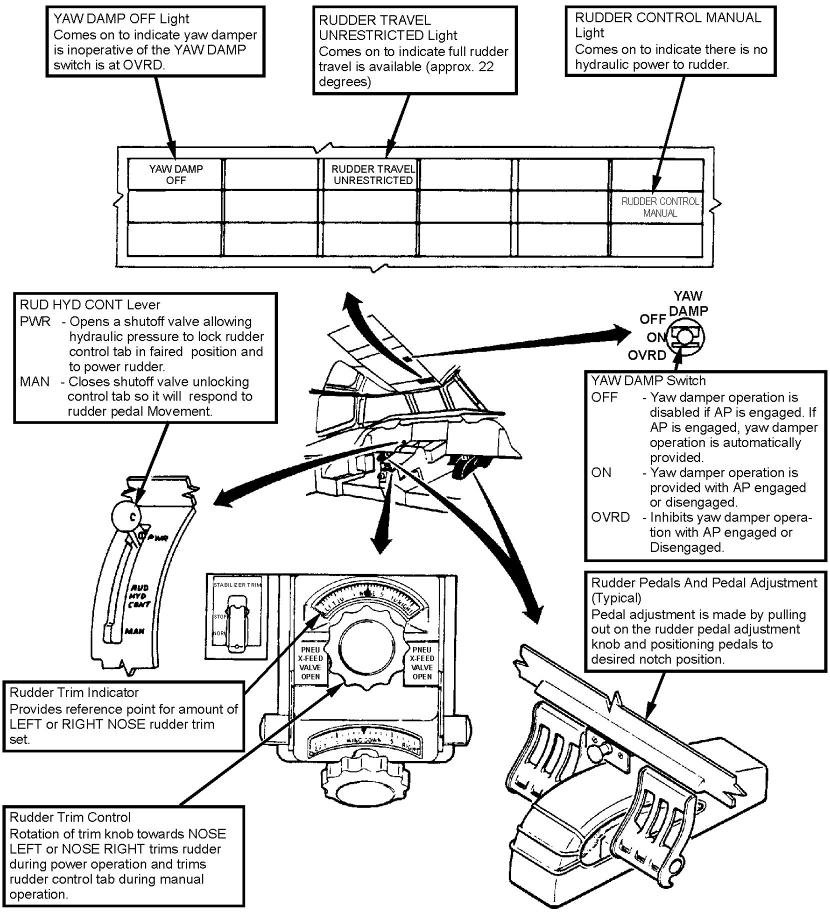

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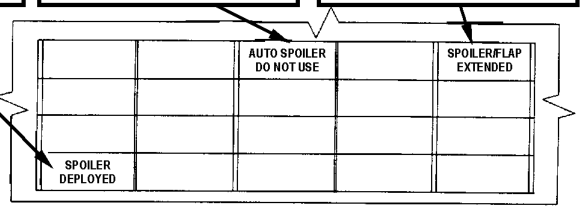
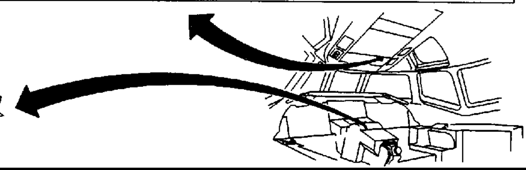
FLIGHT CONTROLS - CONTROLS AND INDICATORS DIRECTIONAL CONTROL AND TRIM

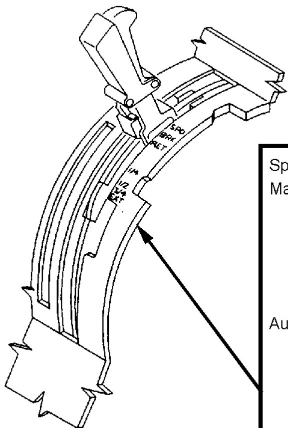
AUTO SPOILER DO NOT USE Light
Comes on to indicate malfunction in ground spoiler system or when system is armed and only one main landing gear senses ground contact. Does no prelude manual operation of spoilers.

AUTO SPOILER DO NOT USE Light
Comes on to indicate malfunction in ground spoiler system or when system is armed and only one main landing gear senses ground contact. Does no prelude manual operation of spoilers.

SPOILER/FLAP EXTENDED Light
Comes on to indicate speed-brakes extended with flaps extended beyond 6 degrees. MASTER CAUTION light will also come on. (Light system de-energized in ground mode.)







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Spoiler/ Speedbrake Lever

Manual – In flight lever is used to control the flight spoilers to act as speedbrakes by pulling lever aft without arming to eighter ¼, ½, ¾, or EXT positions.

On ground, lever may be used to deploy all spoilers during a rejected takeoff by pulling lever up aft-up. Lever is also used to release AUTO SPOILER actuation by pushing lever down allowing it to move forward to RET position.

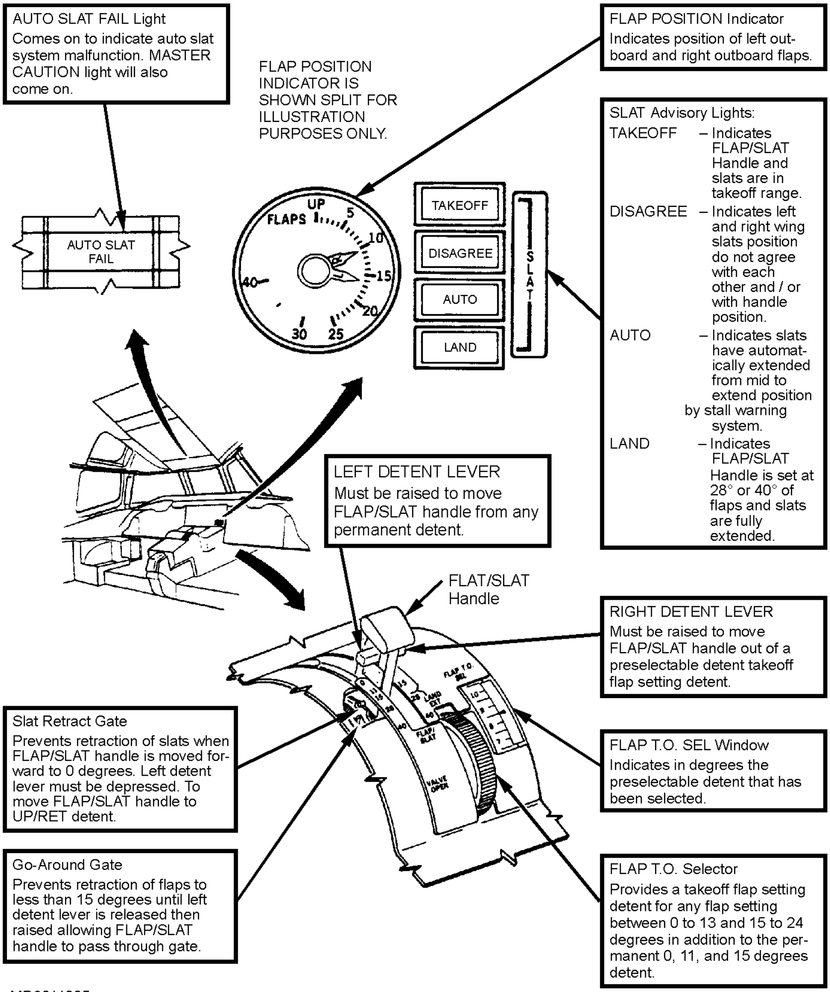
Automatic – AIRPLANES WITHOUT AUTO BRAKES. When armed prior to landing, flight and ground spoilers will automatically extend fully upon main wheel spinup at touchdown and lever will move to EXT position. Lever can only be armed if main gear has been retracted. When armed (up), a red placard labeled ARM in white letters can be seen on both sides of levers.

AIRPLANES WITH AUTO BRAKES. When armed prior to takeoff and a rejected takeoff is initiated (nosewheel on ground and throttles retarded), flight and ground spoilers will automatically extend to 60° upon actuation of reverse thrust levers. When armed prior to landing, flight and ground spoilers will automatically extend to 60° upon main wheel spinup or after nosegear ground shift actuation.

When spoilers extend fully to 60°, spoiler lever will move fully aft to EXT position.

When armed (up), a red placard labeled ARM in white letters can be seen on both sides of lever.

FLIGHT CONTROLS - CONTROLS AND INDICATORS SPOILER / SPEEDBRAKE SYSTEM



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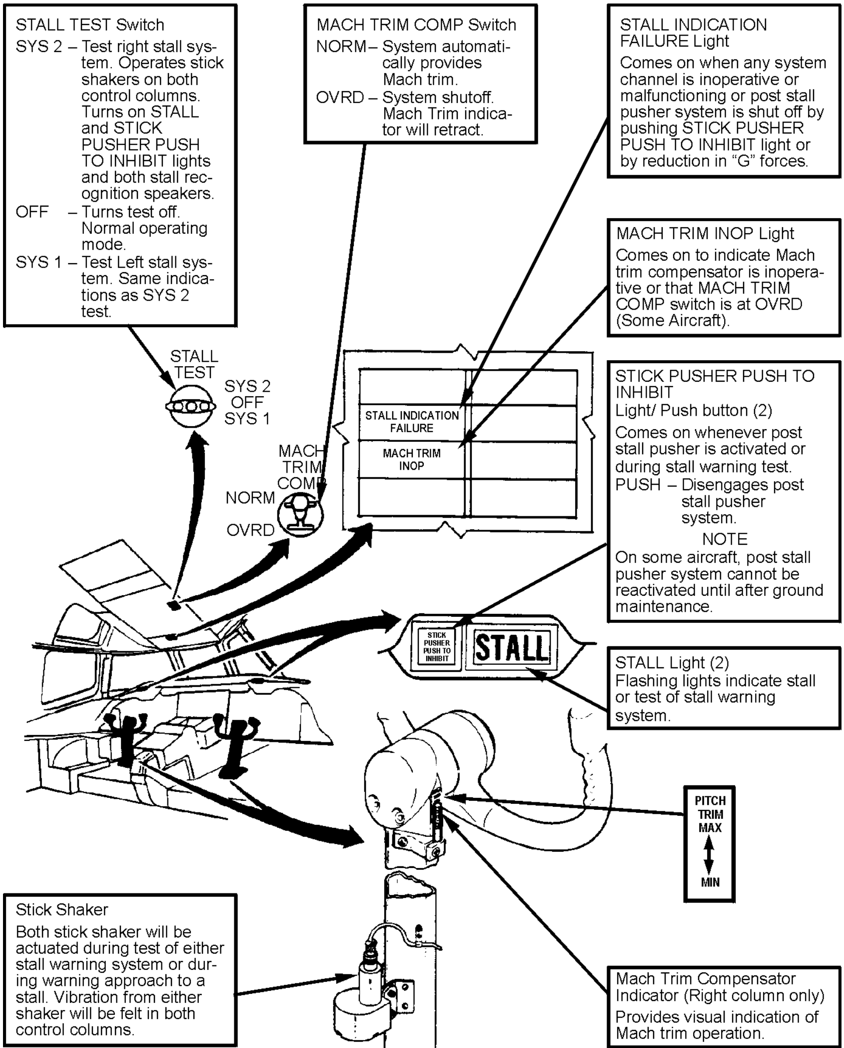
FLIGHT CONTROLS - CONTROLS AND INDICATORS FLAP / SLAT SYSTEM



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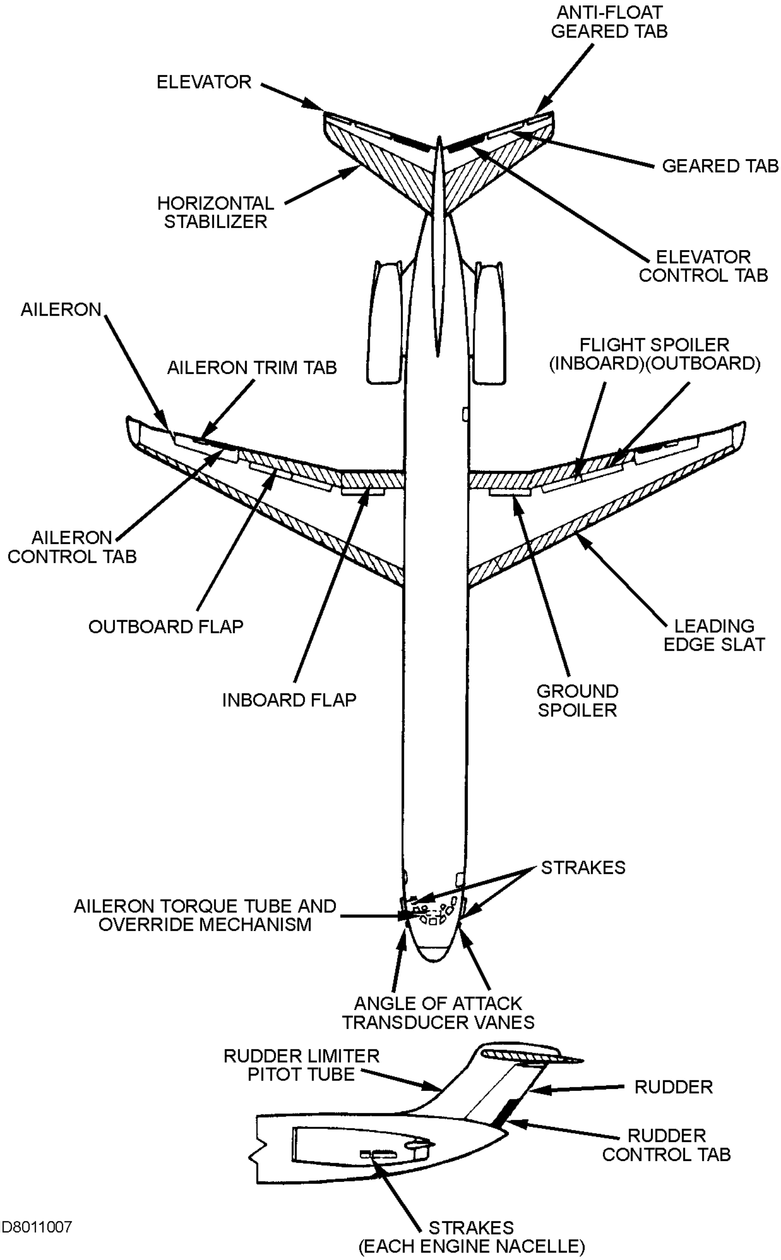
FLIGHT CONTROLS - CONTROLS AND INDICATORS MACH TRIM AND STALL WARNING



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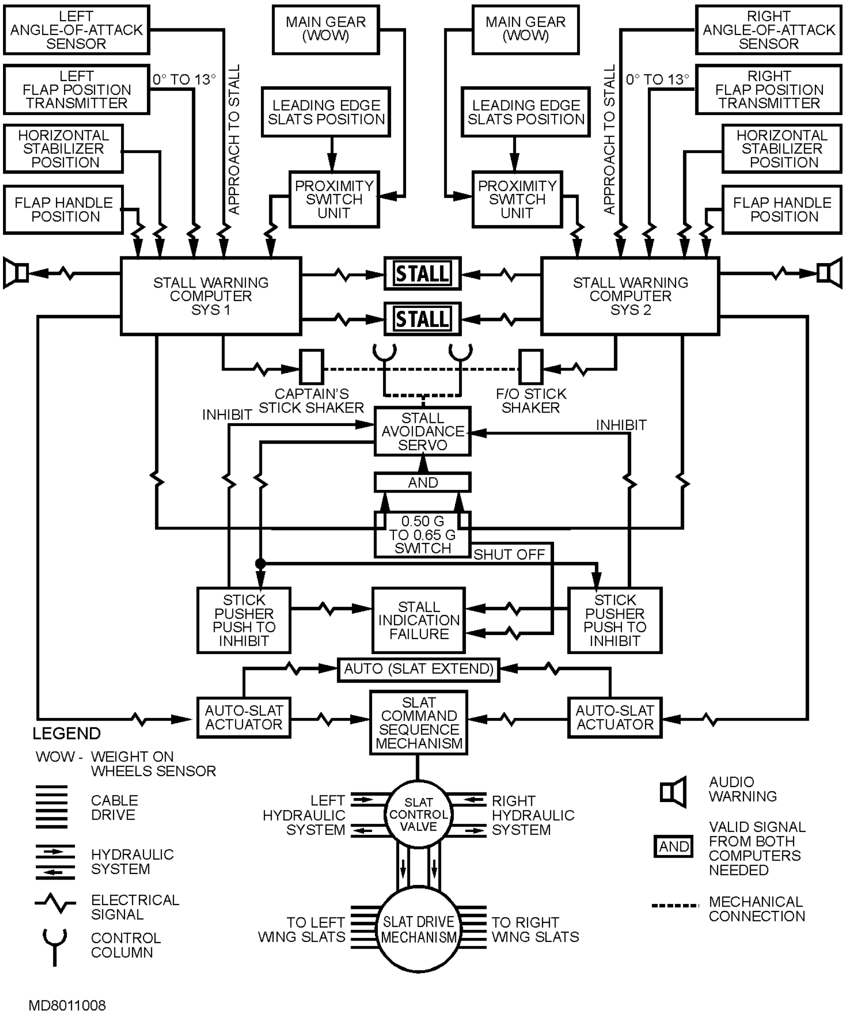
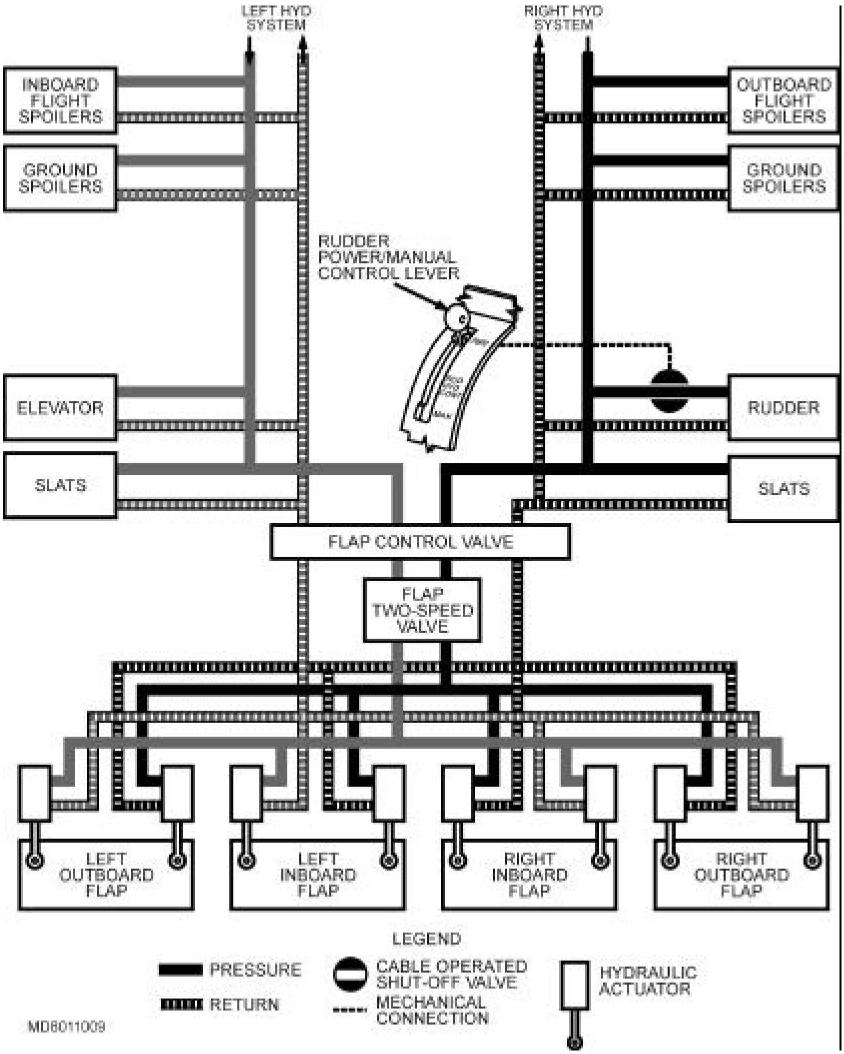
FLIGHT CONTROLS - MAJOR COMPONENT LOCATION



FLIGHT CONTROLS - FUNCTIONAL SCHEMATIC STALL PROTECTION SYSTEM



FLIGHT CONTROLS - FUNCTIONAL SCHEMATIC FLIGHT HYDRAULICS

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AUTOPILOT / FLIGHT GUIDANCE SYSTEMS

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AUTOMATIC FLIGHT

GENERAL

The airplane is equipped with a Flight Guidance System (FGS) for flight guidance throughout the entire flight envelope (takeoff to landing). Two Digital Flight Guidance Computers (DFGC 1 and 2) and Performance Management System (PMS) provide data input for the FGS functions.

DFGC 1 and 2 receive inputs from the digital Central Air Data Computers (CADC 1 and 2), VHF navigation systems (VOR / LOC 1 and 2), compass systems 1 and 2, vertical gyros 1 and 2, radio altimeters 1 and 2, dual three-axis accelerometer, dual lateral accelerometer, performance management computer, and sensors of other airplane systems and functions. A Flight Guidance Control Panel (FGCP) is provided for selection of desired FGS modes of operations by the Captain and First Officer.

DFGC 1 or 2, as selected, provides data inputs for the following integrated FGS functions: Autopilot (AP); stability augmentation; Flight Director (FD); Speed Control (SC); Autothrottle System (ATS); thrust (EPR) rating; Automatic Reserve Thrust (ART); and altitude alert.

Aircraft in the Continental fleet are equipped with a -904, -906, or -930 DFGC.

Flight Mode Annunciators (FMAs) are provided for the Captain and First Officer. The FMAs display the following: annunciations for selected FGS mode of operation; legend annunciations to indicate that the navigation instrument comparator monitor has detected a difference between redundant systems, or to indicate a system failure (associated with an indicator flag); **AP** and **THROTTLE** warning lights; and FD and AP selection.

An ANNUN / DIGITAL LTS TEST button is provided on the overhead panel for testing the legend annunciation and warning lights and digital alphanumeric display lights on both FMAs, and the digital display lights on the FGCP and VHF NAV control panels. When the button is pushed, the **THROTTLE**, **AP**, legend annunciation, and digital alphanumeric display lights on the FMA's will come on, and the digital display lights on the FGCP and VHF NAV control panels will come on. Each of the four digital alphanumeric displays on each FMA will form a lighted starburst. When the test button is released, FMA displays **ILS**, **HORIZON**, **HEADING**, and **MONITOR**, go out for 0.5 seconds, and then come back on. All amber caution lights will return to normal display 5 seconds after the test button is released.

AUTOPILOT

The Autopilot (AP) function, operating in conjunction with the yaw damper function, automatically controls the airplane in pitch, roll, and yaw maneuvering axes. Appropriate control surfaces are actuated by the AP to control the airplane for the selected AP mode of operation.

The FGCP contains the necessary controls for the Captain and First Officer to select desired AP modes of operation. The AP modes of operation will automatically control the airplane pitch and roll attitude for the following maneuvers: maintain an existing altitude; descend or climb to and maintain, a preselected altitude; maintain a selected vertical speed, indicated airspeed or Mach number; fly a Performance Management System (PMS) profile (if installed); maintain an existing heading; fly to and maintain a preselected heading; fly to, capture, and track a selected VOR or localizer course; capture and track a glideslope; runway alignment and flare for automatic landing. A DFGC switch is provided on the FGCP for selection of DFGC 1 or 2 for data input for AP operation.

The **AP** warning light on the FMAs will illuminate when the AP disengages for any reason. An **AP TRIM** annunciator light on the FMAs will illuminate to indicate that the horizontal stabilizer is out of trim. The light will extinguish when horizontal stabilizer is in trim. Appropriate annunciations will appear on both FMAs to indicate existing AP operating mode.

STABILITY AUGMENTATION

Mach Trim Compensator

DFGC 1 or 2 provides computations for the Mach Trim Compensator (MTC) function if MACH TRIM COMP switch is in NORM. CADC inputs through the DFGC control the MTC actuator in relation to Mach number. The MTC compensates for nosedown pitching moments that are generated during operation at high Mach numbers. MTC function can be inhibited by moving MACH TRIM COMP switch to OVRD.

Yaw Damper

The yaw damper function is activated at any time the AP is engaged when the YAW DAMP switch is ON or OFF. With AP disengaged, the yaw damper function is activated by moving the YAW DAMP switch to ON. Rudder movements generated by the yaw damper function are not transmitted to the rudder pedals. Yaw damper function can be inhibited by moving the YAW DAMP switch to OVRD.

FLIGHT DIRECTOR

The Flight Director (FD) provides visual guidance commands to fly the airplane manually or to visually monitor AP response to the guidance commands. The visual guidance commands (pitch, roll, and speed control) are integrated with FGS operating modes selected on the FGCP for AP operation. The FGS operating modes (except LAND) can be selected for FD only with the AP disengaged.

Pitch (including speed control) and roll guidance cues from the DFGC are displayed on the Attitude Director Indicator (ADI). A V-command bar on the ADI directs the pilot to turn, climb, or descend. A fast / slow indicator reflects airplane speed in relation to speed selection on the FGCP or computed safe speed above stall (ALFA speed) or the target speed as computed by PMS.

A Captain's FD switch and First Officer's FD switch are provided on the FGCP. When the Captain's FD switch is ON, pitch and roll commands are displayed on the Captain's ADI. When the First Officer's FD switch is ON, pitch and roll commands are displayed on the First Officer's ADI.

A Flight Director selector provides the capability to select either DFGC 1 or 2 for control of the V-command bar and fast / slow pointer on both ADI's. When in NORM, DFGC 1 controls the V-command bar and fast / slow pointer on the Captain's ADI, and DFGC 2 controls the V-command bar and fast / slow pointer on the First Officer's ADI. When in BOTH ON 1, DFGC 1 controls the V-command bar and fast / slow pointer on the Captain's and First Officer's ADI. When in BOTH ON 2, DFGC 2 controls the V-command bar and fast / slow pointer on the Captain's and First Officer's ADI. When data provided to the V-command bar on either ADI is unusable, the applicable V-command bar will be removed from view and a warning flag will appear.

Appropriate annunciations will appear on both FMAs to indicate existing operating mode of the FGS.

Autothrottle / Speed Control

The autothrottle / speed control functions are available for operation from takeoff to landing. Aerodynamic sensors, airplane surface transducers, CADCs, and other sources provide inputs to the DFGCs for speed control processing. The DFGCs provide speed control pitch commands for flight director, autopilot and the fast/slow indicator display. The FGCP contains the necessary controls for selection of the reference SPD / MACH and the desired autothrottle mode of operation.

The speed control functions provide two coupled speed control modes (takeoff and go-around). The takeoff and go-around modes are available only when the flight director and/or autopilot is engaged. Four throttle operational modes may be selected on the FGCP and additional modes occur automatically. Selected throttle modes are: PERF (PMS), indicated airspeed select (SPD SEL); Mach select (MACH SEL); and EPR limit. The thrust rating indicator is used to select a thrust EPR for limit mode. Thrust EPRs that may be selected include takeoff (TO), takeoff flexible (TO FLX), go-around (GA), maximum continuous thrust (MCT), climb (CL), and cruise (CR). Modes that occur automatically are as follows: SPD ATL / MACH ATL, LOW LIM, FLAP LIM, SLAT LIM, VMO LIM, MMO LIM, ALFA SPD, RETD, and CLMP. These modes are available only for autothrottle control of throttles. Speed error signals are displayed by the fast / slow indicator on the ADI. Fast / slow indications are displayed for all modes except retard (RETD).

Appropriate annunciations including numerical values (when applicable) appear on the FMA to indicate existing operating mode of autothrottle / speed control.

Speed Control

Speed control inputs for attitude control are displayed by the V-command bar and fast / slow indicator and the ADI during takeoff and go-around modes.

During takeoff mode of operation, the V-command bar on the ADI will command a pitch attitude to maintain V_2+10 KIAS for two-engine operation. In the event of an engine failure during takeoff, pitch commands for one engine operation will be as follows: if the airspeed is between V_2 and V_2+10 KIAS at the time of engine failure, the V-command bar will command a pitch attitude to maintain an airspeed between V_2 and V_2+10. If the airspeed is less than V_2, the V-command bar will command a pitch attitude to maintain V_2. If the airspeed is V_2+10 KIAS or greater at the time of engine failure, the V-command bar will command a pitch attitude to maintain V_2+10 KIAS.

During go-around mode, the V-command bar on the ADI will command the go-around speed.

The fast / slow indicator will display airspeed error between computed takeoff or go-around speed and the existing airspeed. Thrust is set to the ERP LIM manually or automatically by the autothrottle if engaged.

Any desired airspeed can be selected on the FGCP, but speed control inputs are limited to prevent commands which exceeds flap / slat and V_{MO} / M_{MO} limit speed and to prevent commands lower than safe stall margin speed. Speed control inputs for fast / slow indications and the autothrottle command the pilot or autothrottle to adjust the throttles to maintain the higher reference speed of either the safe stall margin speed (ALFA speed) or the airspeed selected on the FGCP.

Autothrottle

The autothrottle function automatically positions the throttles to maintain airspeed or engine thrust as required for the operational mode selected. The autothrottle function will control the throttles for the following maneuvers: takeoff, climb, cruise, holding, approach, flare, and go-around.

The autothrottle function is engaged by moving the AUTO THROT switch from OFF to AUTO THROT position. The switch will not remain in the AUTO THROT (on) position unless all interlocks and engage requirements are satisfied. When the autothrottle is engaged, the AUTO THROT switch will automatically revert to OFF when the FGS monitor detects a malfunction or when the autothrottle disconnect button on either throttle is pushed. The **THROTTLE** warning lights on the FMAs will illuminate when the above occurs or when the AUTO THROT switch is manually moved to OFF. Pushing either autothrottle disconnect button or manually moving the AUTO THROT switch to ON will cause **THROTTLE** lights to go out.

Autothrottle EPR LIM mode is initiated by pressing the EPR LIM pushbutton if autothrottle is already engaged or by selecting T.O. or T.O. FLX on the thrust rating indicator, pushing the TO/GA button on either throttle lever, and engaging the autothrottle. The airplane must be on the ground greater than 20 seconds to initiate takeoff mode. Go-around mode is also initiated by pushing either TO/GA button as for takeoff mode except airplane must be airborne or on the ground for less than 20 seconds.

Upper and lower authority limits are provided for throttle control. The autothrottle function provides upper authority limits by means of EPR limit control modes. Lower limit authority is a function of THROTTLE LOWER LIMIT switches (not operative when PMS mode is engaged). The upper limit protects against exceeding EPR limits. The lower limit prevents the throttles from being driven to the idle stops. As a general rule, when the throttles are commanded beyond either authority limit, electrical power is removed from the servo motor until a command in the opposite direction is generated. Power is also removed from the servo motor whenever the autothrottle is engaged in the CLMP mode.

A clutch mechanism permits manual positioning of either throttle lever with minimum force without disengaging the autothrottle.

Altitude Alert System

The altitude advisory system automatically alerts the Captain and First Officer that the airplane is approaching the preselected altitude or that the airplane is deviating from a previously selected and acquired altitude. An advisory light on each altimeter provides the alert for either of the above situations.

The system processes data from the CADCs. Although the system is part of the integrated FGS, the system is independent of the autopilot or flight director functions. An altitude select knob and readout are provided on the FGCP to select desired altitude.

The alert lights will illuminate (steady) when the airplane is at the altitude alert threshold. The threshold is approximately 750 feet from the selected altitude. When within 250 feet of the selected altitude, the advisory lights will extinguish. If the airplane subsequently deviates more than 250 feet from selected altitude, the alert lights will illuminate (flashing) and a continuing series of an aural tone alternating with the spoken word "ALTITUDE" will be heard. When the airplane is again within 250 feet of selected altitude, the lights will extinguish and the aural tone and spoken word will be reset. A different desired altitude may be preselected at any time. The alert lights and aural tone / vocal annunciation can be turned off by pushing the ALT select knob full in or by selecting another altitude.

The altitude alert function will be inhibited if the flaps are extended more than 26° or if the glideslope is captured when -920 or subsequent DFGCs are installed.

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS

Captain's FD Switch

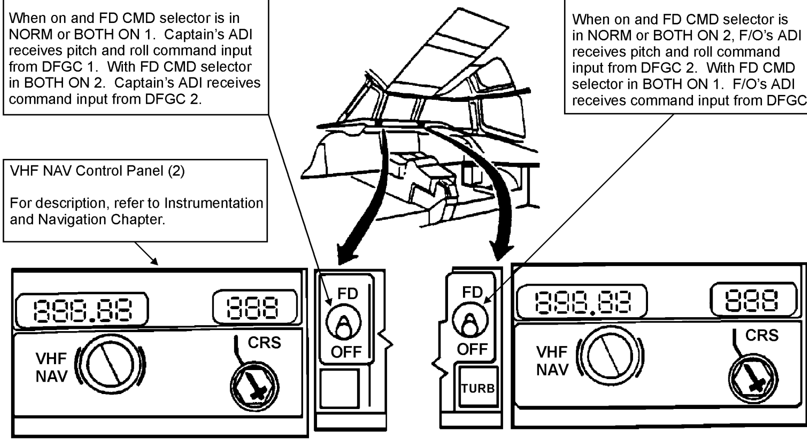
When on and FD CMD selector is in NORM or BOTH ON 1. Captain's ADI receives pitch and roll command input from DFGC 1. With FD CMD selector in BOTH ON 2. Captain's ADI receives command input from DFGC 2.

First Officer's FD Switch

When on and FD CMD selector is in NORM or BOTH ON 2, F/O's ADI receives pitch and roll command input from DFGC 2. With FD CMD selector in BOTH ON 1. F/O's ADI receives command input from DFGC1.

VHF NAV Control Panel (2)

For description, refer to Instrumentation and Navigation Chapter.



FD CMD Selector

NORM - DFGC-1 provides command inputs to V-command bar and fast/slow pointer on Captain's ADI. DFGC-2 provides command inputs to V-command bar and fast/slow pointer on the First Officer's ADI.

BOTH ON 1 - DFGC-1 provides command inputs to V-command bar and fast/slow pointer on Captain's and First Officer's ADL.

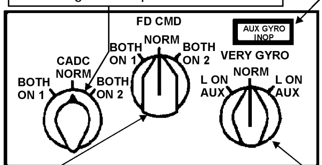
BOTH - DFGC-2 provides command inputs to V-command bar and fast/slow pointer on Captain's and First Officer's ADL.

CADC Selector

For description refer to Instrumentation and Navigation Chapter.

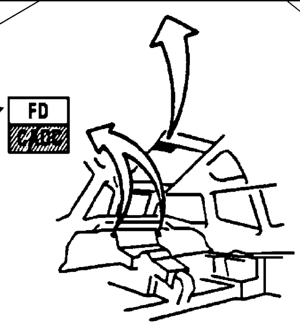
AUX GYRO INOP Light

Comes on to indicate AUX vertical gyro malfunction. VERT GYRO selector should be moved out of NORM.



FD Light

Comes on to indicate FD CMD selector is out of NORM.



VERT GYRO Selector

NORM - Vertical gyro 1 provides input to Captain's ADI and DFG-1 and 2. Vertical gyro 2 provides input to First Officer's ADI, DFGC-1 and 2, and weather radar. AUX vertical gyro provides input to DFGC-1 and 2.

L ON AUX - AUX vertical gyro provides input to Captain's ADI in lieu of vertical gyro 1. Vertical gyro 1 input to DFGC-1 and 2 is overridden.

R ON - AUX vertical gyro provides input to First Officer's ADI and weather radar in lieu of vertical gyro 2. Vertical gyro 2 input to DFGC-1 and 2 is overridden.

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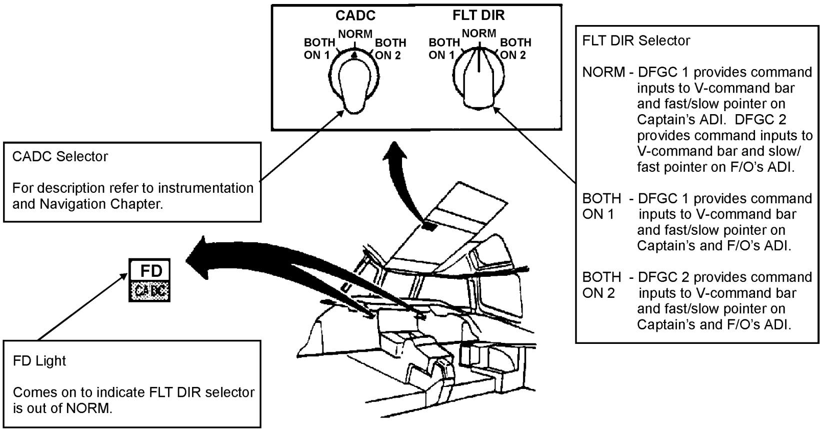
AUTOPILOT AND FLIGHT DIRECTOR



MD801222

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
AUTOPILOT AND FLIGHT DIRECTOR

Effective for Some Airplanes

HDG Readout

Digital readout of heading selected with HDG select knob.

Pitch Profile Readout

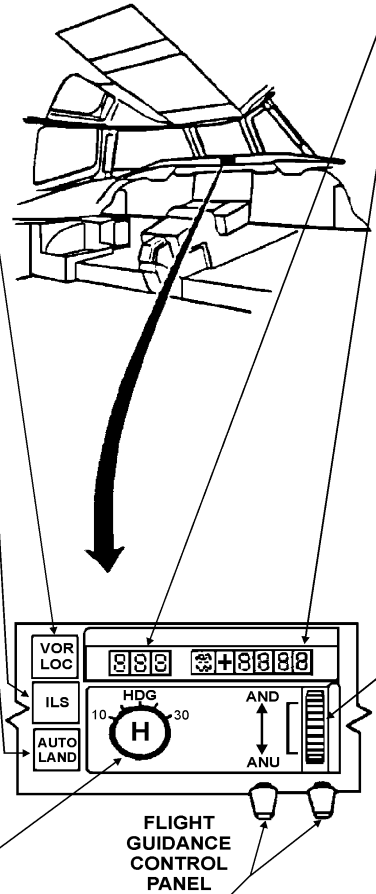
First window displays operating mode. V (vertical speed), M (Mach), S (indicated airspeed), or P (turbulance), as selected. Second window displays pitch reference, + (climb) or - (descend). Remaining windows display appropriate numerical values.

Mode Select Buttons

VOR - Arms FGS to capture and track a selected VOR or LOC course. ADI displays roll commands and AP will fly airplane to capture and track course. FMA will annunciate VOR or LOC when armed, VOR CRS during station passege, VOR or LOC CAP at course capture and VOR or VOR TRK when tracking course.

ILS - Arms FGS to capture and track a selected localizer course and glideslope. ADI displays roll and pitch commands and AP will fly airplane to capture and track localizer and glideslope. FMA will annunciate ILS when when armed, LOC TRK when tracking localizer, GS CAP at glideslope capture, GS TRK when tracking glideslope.

AUTO LAND - Arms FGS to establish AUTO LAND mode after localizer and glideslope capture. After both localizer and glideslope are being tracked and AUT LND is annunciated on FMA, all other control modes except go-around are inhibited.



Pitch Control Readout

When FD and/or AP is engaged, manually rotating wheel toward AND (Airplane Nose Down) or ANU (Airplane Nose UP) will cause pitch profile readout display to change. When in FD, ADI displays pitch commands to capture and maintain airplane vertical speed, IAS, Mach or pitch attitude as determined by selected mode. If AP is engaged, FGS will automatically maneuver the airplane to comply with pitch commands. When FD/AP is engaged or VERT SPD button is pressed, VERT SPD mode will engage and FMA will annunciate VERT SPD at the existing vertical speed. (If speed captured is less than 100 fpm, ALT HOLD will engage.) Rotating Pitch control wheel while in VERT SPD alters reference speed. If pitch control wheel is rotated to feel-detent, a 0 fpm speed will be commanded and ALT HOLD will engage. Once in ALT HOLD mode, movement of pitch control wheel out of feel-detent will cause VERT SPD to re-engage and reference speed will be determined by pitch control wheel movement. When IAS/MACH mode is engaged, initial speed used as reference will be same as indicated by airplane when mode is selected and is displayed in pitch profile readout window. IAS or MACH control mode reference speed can be adjusted by rotating pitch control wheel to AND (increase) or ANU (decrease). New value (S or M) will be displayed in pitch profile readout.

When selected, TURB mode pitch altitude reference can be adjusted, as required, by use of pitch control wheel for a new value. New value will be displayed in pitch profile readout.

Pitch control wheel function is automatically inhibited after glideslope capture.

HDG Select Knob

(Inner knob) Four position, spring-loaded to normal. Normal provides fine heading select. First push-in (momentary) detent provides fast heading select. Second push-in (momentary) detent engages heading hold mode (FMA will annunciate HDG HOLD). Pull-out (momentary) engages heading select mode (FMA will annunciate HDG SEL). In either mode, ADI displays roll commands and autopilot will fly airplane to maintain heading.

(Outer knob) Provides selection of bank limit fo HDG HLD, HDG SEL, VOR CAP and VOR CRS only.

FGCP Light Intensity Controls

Left knob controls light intensity for mode buttons and edge lighting. Right knob controls light intensity for digital readouts lighting.

MD801206

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
AUTOPILOT AND FLIGHT DIRECTOR

Mode Select Buttons

ALT HOLD - Selects existing altitude for FGS altitude hold mode. ADI displays pitch commands to maintain altitude and AP will maintain altitude. FMA annunciates ALT HLD.

VERT SPD - Selects FGS vertical speed mode. ADI displays pitch commands to maintain existing vertical speed and AP adjusts pitch attitude to maintain selected vertical speed. FMA annunciates VERT SPD.

IAS MACH - Above 27,000 ft. and above 0.5 Mach:

Selects existing Mach for FGS MACH control mode. If desired, FGS IAS control mode may be selected by pressing IAS-MACH mode select button second time.

Below 27,000 Feet:

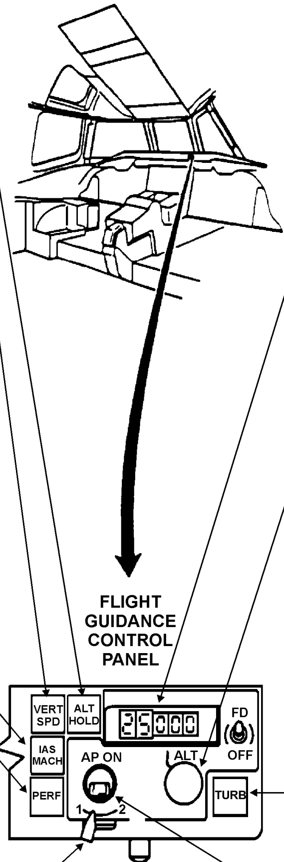
Selects existing indicated airspeed for FGS control mode. If desired, FGS MACH control mode may be selected by pressing IAS-MACH mode select button second time.

ADI displays commands to maintain MACH or IAS and AP adjusts pitch attitude to maintain selected MACH or IAS. FMA annunciates either MACH or IAS, as appropriate.

NOTE
Mach mode is not available at any altitude if airspeed is below 0.5 Mach.

PERF - Selects PMS data for pitch and thrust control. FMA annunciates PERF CLB, PERF CRZ or PERF DES.

NOTE
Pitch profile readout operation depends upon selected pitch mode.



ALT Preselect Readout

Digital readout of preselected altitude selected with ALT knob.

Range: -1000 to + 50000
Symbology:

=9000	Below 10000
==500	Below 1000
-0500	Below 0

When - 920 or subsequent DFGCs are installed, altitudes below 0 are not selectable.

ALT Set Knob

Knob has three positions, spring-loaded to center position.

Center position provides 1000ft. Increment altitude adjustments.

Momentary push-in position provides 100 ft. Increment altitude adjustment and cancels altitude preselect function and flashing altitude alert light.

Momentary pull-ouy position arms FGS for preselected altitude capture.

An armed altitude may be cancelled by selecting another altitude.

TURB Mode Button

Pushing button provides dampened FGS pitch and roll altitude control. Autothrottle will automatically disengage. FMA annunciates WNG LVL and TURB, and the THROTTLE Light comes on flashing. Pitch profile readouts will display airplane pitch attitude existing at time mode is engaged.

DFGC 1-2 Switch

Permits selection of DFGC 1 or 2 for all FGS functions. If AP and/or ATS are engaged, switching DFGC will cause the AP and ATS to disengage.

AP ON Switch

(Solenoid held) Permits engagement and disengagement of AP. Switch will automatically disengage when a loss of power or malfunction occurs and logic for engagement is not satisfied.

MD801204

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
AUTOPILOT AND FLIGHT DIRECTOR

Mode Select Buttons

VOR LOC – Arms FGS to capture and track a selected VOR or LOC course. ADI Displays roll commands and AP will fly airplane to capture and track course. FMA will annunciate VOR or LOC when armed. VOR CRS during station passage, VOR or LOC CAP at course capture, and VOR or LOC TRK when tracking course.

ILS – Arms FGS to capture and tracks a selected localizer course and glideslope. ADI displays roll and pitch commands and AP will fly airplane to capture and track localizer and glideslope. FMA will annunciate ILS when armed. LOC CAP at localizer capture, LOC TRK when tracking localizer, GS CAP at glideslop capture, and GS TRK when tracking glideslope.

When in ILS MODE, selecting any other roll or pitch mode will disenegage ILS or LOC only mode.

AUTO LAND – Arms FGS to establish AUTO LAND mode after localizer and glideslope capture.

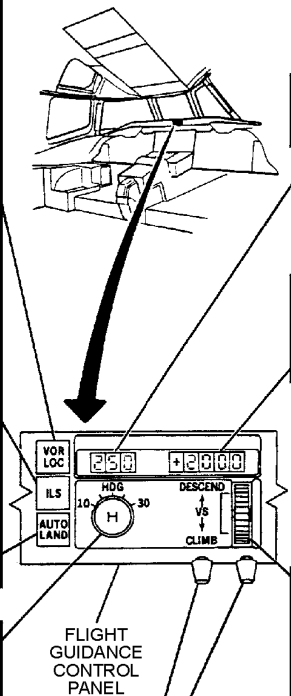
After both localizer and glideslope are being tracked and AUT LND is annunciated on FMA, all other control modes except go-around are inhibited.

HDG Readout

Digital readout of heading selected with HDG select knob.

Pitch Profile Readout

First window displays pitch reference, + (climb), - (descend). Remaining windows display appropriate numerical values.



HDG Select Knob

(Inner Knob) Four position, Spring-loaded to normal. Normal provides fine heading select. First push-in (momentary) detent provides fast heading select. Second push-in (momentary) detent engages heading hold mode (FMA will annunciate HDG HLD). Pull-out (momentary) engages heading select mode (FMA will annunciate HDG SEL). In either mode, ADI displays roll commands and autopilot will fly airplane to maintain heading.

HDG select knob also positions heading select bug on both HSI's.

(Outer knob) Provides selection of bank limit for HDG SEL, HDG HLD, VOR CAP and VOR CRS only.

FGCP Light Intensity Controls

Left knob controls light intensity for mode buttons and edge lighting. Right knob controls light intensity for digital readouts lighting.

Pitch Control Wheel

When FD and/ or AP is engaged, manually rotating wheel toward DESCEND or CLIMB will cause pitch profile readout display to change. When in FD, ADI displays pitch commands. When in AP, FGS will fly airplane to maintain vertical speed set by wheel. FMA will annunciate VERT SPD. Rotating wheel to command zero vertical speed (less than 100 fpm in profile readout will establish altitude hold mode. FMA annunciate ALT HLD.

Pitch control wheel has a detent at zero vertical speed setting and is automatically positioned at zero whenever ALT HOLD, MACH HOLD or IAS HOLD select button is pushed.

Pitch control wheel function is automatically inhibited after glideslope capture.

MD806063

AUTOMATIC FLIGHT – CONTROLS AND INDICATORS

Autopilot And Flight Director

Mode Select Buttons

ALT HOLD – Selects existing altitude for FGS altitude hold mode. ADI displays pitch commands to maintain altitude and AP will maintain altitude. FMA annunciates ALT HLD.

MACH HOLD – Selects existing MACH for FGS Mach control Mode. ADI displays pitch commands to maintain existing MACH and AP adjusts pitch atitude to maintain existing Mach. FMA annunciates MACH.

IAS HOLD – Selects existing indicated airspeed for FGS IAS control mode. ADI displays pitch commands to maintain existing IAS and AP adjusts pitch attitude to maintain existing IAS. FMA annunciates IAS.

ATL Preselect Readout

Digital readout of preselected altitude selected with ALT set knob.
Range: – 1000 to + 5000
Symbology:

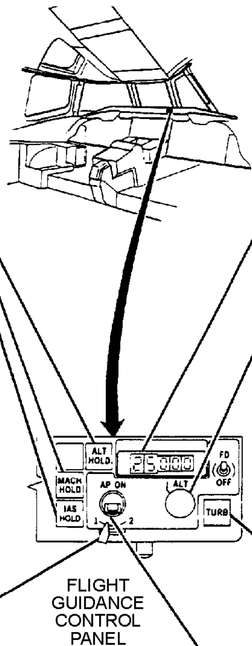
= 9 0 0 0 Below 10000

= = 5 0 0 Below 1000

- 0 5 0 0 Below 0

NOTE

When – 920 or subsequent DFGC's are installed, altitudes below 0 are not selectable.



ALT Set Knob

Knob has three positions, Spring-loaded to center position.

Center position provides 1000 ft. increment altitude adjustments.

Momentary push-in position provides 100 ft. increment altitude adjustment, and cancels altitude preselect function and flashing altitude alert light.

Momentary push-out position arms FGS for preselected altitude capture.

TURB Mode Button

Pushing button provides dampened FGS pitch and roll attitude control. Autothrottle with automatically disengage. Throttle warring light comes on flashing. FMA annunciates WNG LVL and TURB, and flight director V-command bars are automatically removed from view.

AP ON Switch

(Solenoid held) Permits engagement and disengagement of AP. Switch will automatically disengage when a loss of power or malfunction occurs.

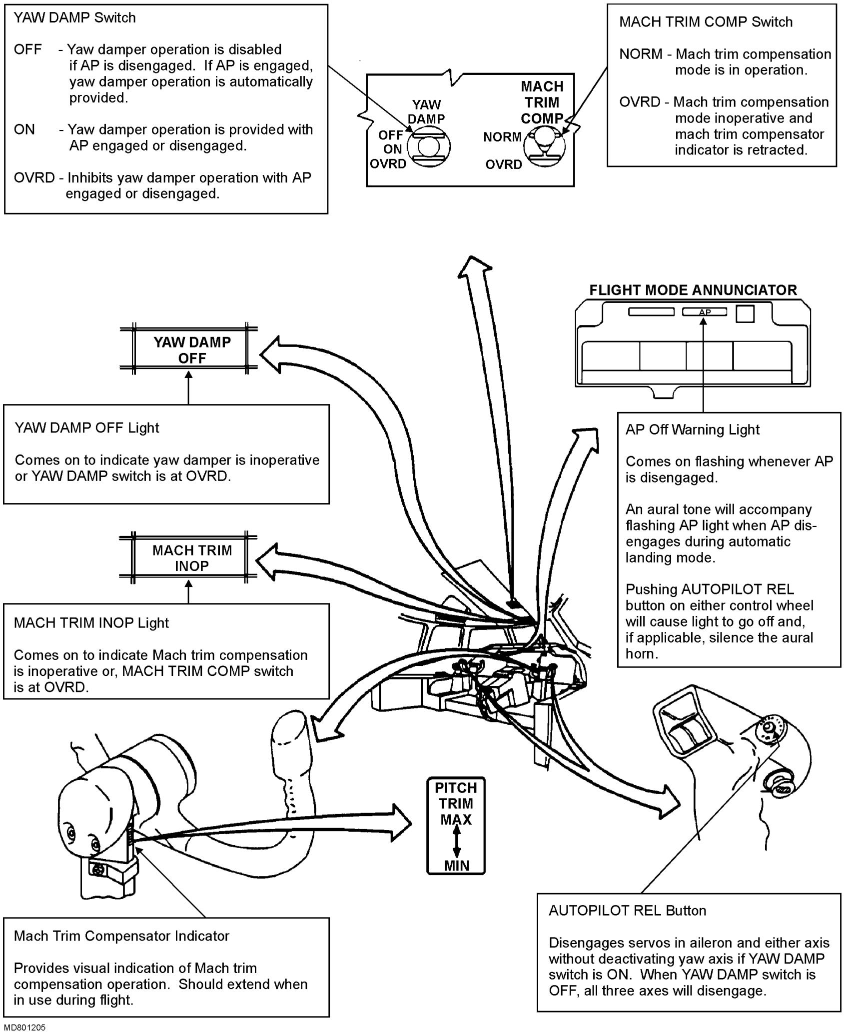
AP ON Switch

(Solenoid held) Permits engagement and disengagement of AP. Switch will automatically disengage when a loss of power or malfunction occurs.

MD806064

AUTOMATIC FLIGHT – CONTROLS AND INDICATORS

Autopilot And Flight Director



AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
AUTOPILOT AND FLIGHT DIRECTOR

Bank Indicator Horizon Bar

Bank angle is displayed by pointer read against fixed bank angle index. Roll attitude is shown by horizon bar rotation relative to the fixed airplane symbol. Horizon moves vertically to display pitch attitude as read against pitch calibration scale on the sphere, using the airplane symbol center dot as a reference.

Glide Slope Deviation Display

Shows vertical deviation from glide slope. Pointer is removed from view when an ILS frequency is not selected on VHF NAV control panel.

TEST Button Deviation Display

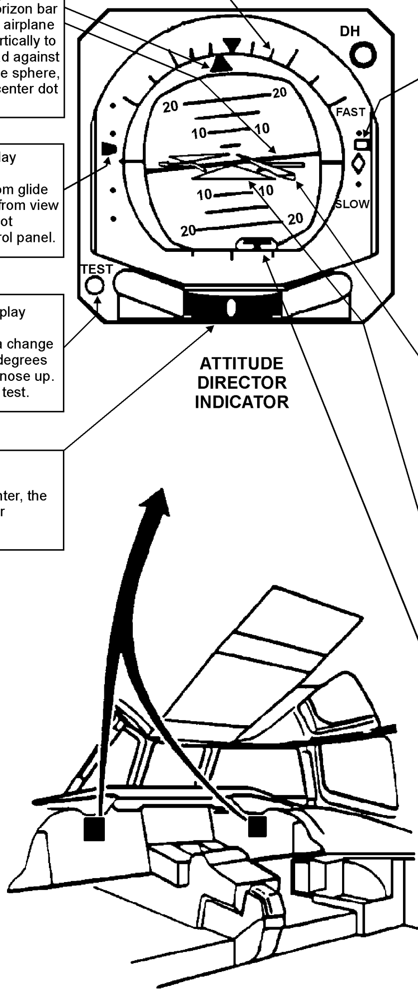
Pushing button will cause a change in attitude indication of 20 degrees right bank and 10 degrees nose up. ATT flag will appear during test.

Slip Indicator

If ball is displaced from center, the airplane is either slipping or skidding.

Bank Angle index

Markings at 10, 20, 30, 45 and 60 degrees.



FAST/SLOW Pointer

Indicates fast/slow indications referenced to autothrottle SPD/MACH readout or safe stall margin speed (ALPA SPD). Full deflection either side of center equals approximately 10 knots. If selected airspeed is less than minimum safe percentage above stall for existing configuration, indicator will be centered when ALPHA SPD is maintained. In takeoff and go-around mode, indicator will display airspeed error between computed and actual speeds(V2/V2+10 or go-around speeds KIAS). Pointer will be removed from view when speed control data is invalid or when ATS is in the RETD (retard) mode.

V-Command Bar

Provides Pitch and roll guidance commands from DFGC. V-command bar is removed from view if pitch or roll guidance command is invalid, or if guidance information is not compatible with engaged autopilot.

Fixed Airplane Symbol

Indicates position of airplane in relation to horizon index.

Rising Runway

Indicates deviation from LOC course. When actuated by radio altimeter at 200 ft AGL, rising runway starts rising until it appears to touch the fixed airplane symbol at actual touchdown. Rising runway is removed from view if not tuned to a LOC frequency.

MD801207

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
AUTOPILOT AND FLIGHT DIRECTOR

GS Flag

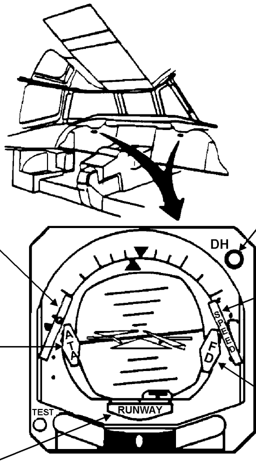
Appears when glide slope indications are unusable. Flag is removed from view when not tuned to LOC frequency.

ATT Flag

Appears for test and to indicate that attitude data are unusable.

RUNWAY Flag

Appears when LOC or radio altimeter signals are unusable. Flag is removed from view when not tuned to LOC frequency.



ATTITUDE DIRECTOR INDICATOR

DH Light

Comes on at and when the decision height selected on radio altimeter is reached. The Captain's DH light controlled by the Captain's radio altimeter and the F/O's DH light controlled by the F/O's radio altimeter.

SPEED Flag

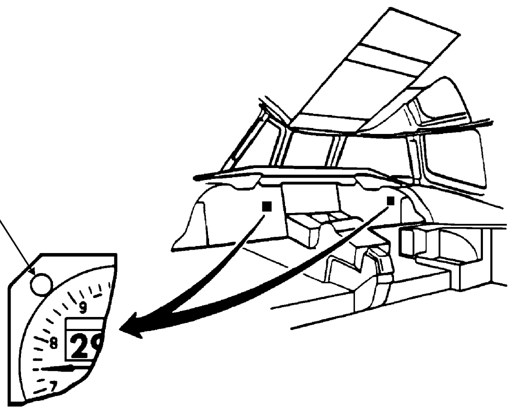
Appears when SLOW/FAST indications are unusable.

FD Flag

Appears when data input to V-command bar is unusable. V-command bar will be removed from view.

Advisory Alert Light

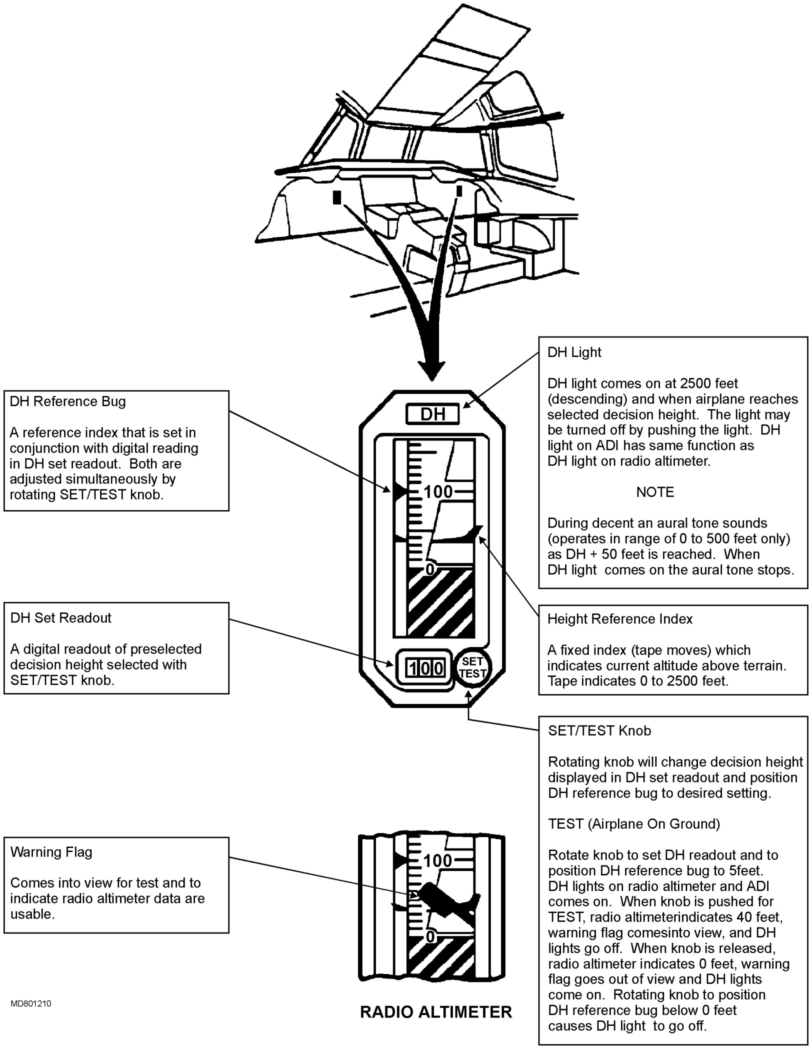
Works in conjunction with altitude alert system. Light comes on steady when airplane is at the altitude alert threshold (minimum of 750 feet from selected altitude) and goes off when within 250 feet of selected altitude. Alert light flashes (in conjunction with 2 seconds aural tone) and voice warning annunciates "altitude" when airplane deviates 250 feet or more from previously selected and acquired altitude. The warnings can be reset any time in flight by selecting a new altitude with the ALT preselect knob or by pushing the knob full in.



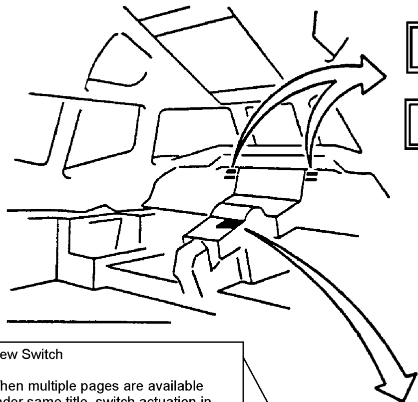
ALTIMETER

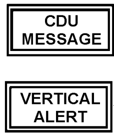
MD801209

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
AUTOPILOT AND FLIGHT DIRECTOR



AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
AUTOPILOT AND FLIGHT DIRECTOR





CDU MESSAGE Light (2)

When PERF mode is engaged, comes on when a message is displayed in scratchpad of PMS CDU and goes off when CLEAR key on PMS CDU is pressed.

VERTICAL ALERT Light (2)

When PERF mode is engaged, comes on 15 seconds prior to PMS generated vertical leg change at top of descent point, at start of a deceleration man-euver to 250 kts at 10,000 feet and at start of an acceleration maneuver to exceed 250 kts climbing through 10,000 feet. Light goes off when vertical leg is started.

Slew Switch

When multiple pages are available under same title, switch actuation in either up or down direction will display these pages. A cue, in the form of a symbol (↓ or ↑ or both) , will appear in last two characters of scratchpad to indicate direction to activate switch.

Light Sensor

Senses ambient light level and automatically adjusts the reference brightness level.

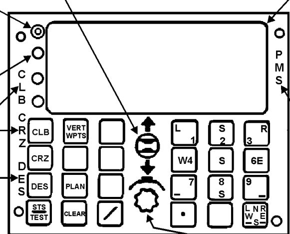
Line Select Keys (1, 2, 3)

When pushed, can transfer data entries from scratchpad to selected data line, or arm/or select PMS submodes, or call up additional data relevant to a specific display line. When illuminated, acts as a cue to select mode of function.

Mode Annunciators (CLB, CRZ, DES)

CLB - PMS in climb mode.
CRZ - PMS in cruise mode.
DES - PMS in descent mode.

NOTE: Annunciators are active when PERF mode is not engaged and will indicate actual vertical mode of airplane.



PMS CONTROL DISPLAY UNIT (CDU)

Data Display Area

Contains a four line display of up to 24 characters per line. Each character formatted with 5X7 Llight Emitting Diode (LED) dot matrix. First line consist of TITLE (Characters 1-12) and SCRATCHPAD (Characters 13-24).

PMS Failure light

Comes on when PMS data is not valid.

Dim Control Knob

When rotated to one of any four position detents, the bright-ness of data display and mode annunciators will be adjusted. The light intensity of function keys and line select keys are controlled by operation of large PANEL knob on CTR INSTR & PED LTS control panel.

MD801212

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
PERFORMANCE MANAGEMENT SYSTEM

PMS CONTROL DISPLAY UNIT (CDU)

Function Keys (11) (Push to activate)

CLB - Selects display of performance and related data associated with climb.

CRZ - Selects display of performance and related data associated with cruise.

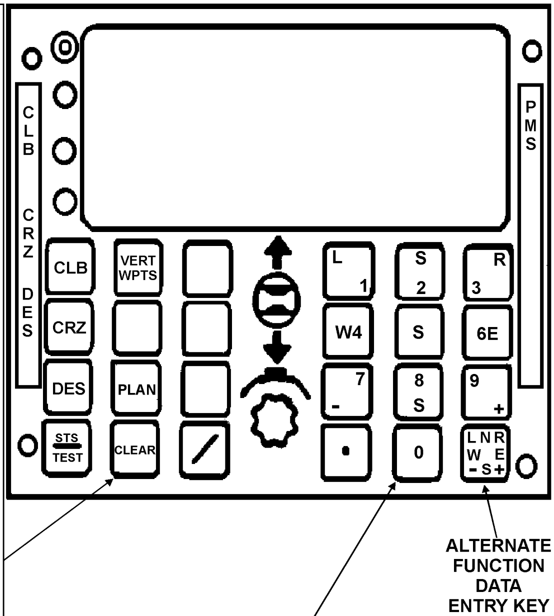
DES - Selects display of performance and related data associated with descent.

VERT WPTS - Provides display of data relative to vertical waypoints.

PLAN - Calls up data pages relative to preflight and enroute planning.

CLEAR - Clears: alert/advisory messages in scratchpad or last data loaded in scratchpad; data previously entered in a data line (when related line select key is pushed); Example: when neither a data load is in progress or an alert/advisory message is in scratch-pad, the word CLEAR appears in scratchpad. When a line select key is pushed, the previously entered data is removed. The slash (/) data entry key is used in conjunction with CLEAR key to selectively clear data when more than one parameter was previously entered on selected line.

STS TEST - Combination lamp test command and status display select key. When pushed and held (functions as a lamp/display test), PMS failure light, CLB, CRZ, and DES mode annunciators come on and uniform squares appear in display area. While key is being held, all other key/switches can be operated to generate specific display characters as a verification of proper key/switch operation and CDU input decoding. When key is released, STS (status) page is displayed.



Data Entry Keys (13)

Pushing any key except "alternate function" key enters corresponding character in scratchpad (left to right).

Dual function keys will enter numeric character unless "alternate function" key is pushed first. Example: "W4" will enter number 4 in scratchpad, pushing "alternate function" key first then pushing "W4" will enter letter W in scratchpad. Next numeric key pushed will result in that numeric character appearing in scratchpad if "alternate function" key is not pushed first.

Slash (/) key is used if data line has more than one loadable parameter.

MD801213

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
PERFORMANCE MANAGEMENT SYSTEM

Autothrottle Mode Select Buttons

SPD SEL - Selects SPD SEL mode. FMA will display SPD and preselected numerical value.

MACH SEL - Selects MACH SEL mode. FMA will display MACH and preselected numerical value.

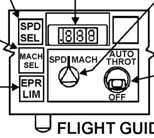
EPR LIM - Selects EPR LIM mode. FMA will display EPR plus mode selected on thrust rating indicator except when T.O. FLX mode is selected. When T.O. FLX mode is selected, EPR plus temperature selected on ASSUMED TEMP selector is displayed on FMA.

Autothrottle SPD/MACH Readout

Digital readout of indicated airspeed or Mach selected with SPD/MACH selected knob.

Autothrottle SPD/MACH Select Knob

Knob has three positions, spring returned to normal. Normal position selects SPD/MACH at a slow rate. Pushed to mid-detent selects SPD/MACH at a fast rate. Pushed to maximum detent alternately switches SPD and MACH readouts (if not in SPD SEL mode) and stores data in DFGCs. Airspeed command bug on MACH/IAS indicators will also be set to airspeed appearing in readout.



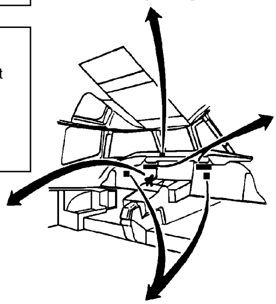
FLIGHT GUIDANCE CONTROL PANEL

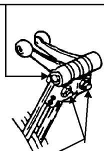
AUTO THROT Switch

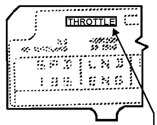
(Solenoid held) Permits engagement and disengagement of ATS. Switch will automatically go to OFF when a loss of power or malfunction occurs, or when reverse thrust is actuated. If FMA THROTTLE light is on, placing switch to AUTO THROT resets light.

Autothrottle Disconnect Button

Pushing either button will disconnect autothrottle. AUTO THROT switch will automatically return to OFF and THROTTLE light on FMA will come on. Pushing either button second time turns off THROTTLE light.







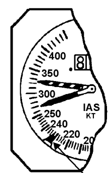
FLIGHT MODE ANNUNCIATOR

THROTTLE Warning Light

Comes on flashing whenever autothrottle disengages by system interlocks or by moving AUTO THROT switch to OFF. Pushing autothrottle disconnect button on either throttle or moving AUTO THROT switch to on will cause light to go off.

Takeoff and Go-Around (TO/GA) Button

Pushing either button will initiate takeoff or go-around mode, whichever is applicable. FMA will display TAK OFF or GO RND, as applicable, on pitch and roll annunciation. EPR TO or EPR GA, as selected on the thrust rating indicator, will be displayed in the ATS annunciator on the FMA if ATS is engaged.



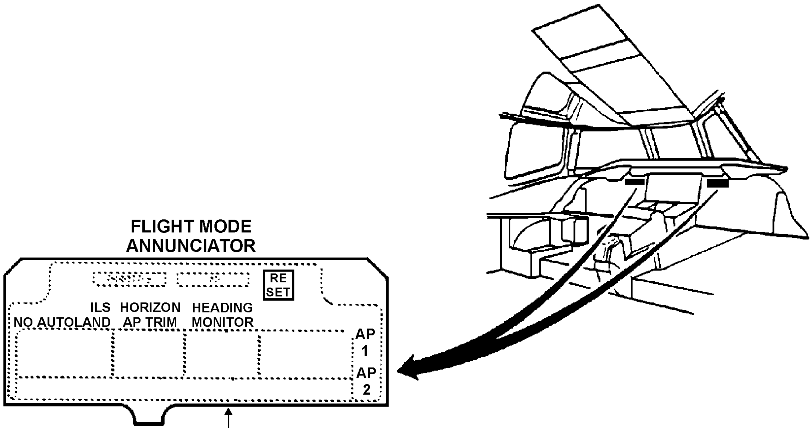
MACH / AS INDICATOR

Airspeed Command Bug

Set with SPD/MACH select knob to airspeed set in SPD/MACH readout or when PERF mode is selected, the bug is moved to a target speed as determined by the PMS.

MD801214

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
AUTOTHROTTLE



Flight Mode Annunciator Legend Lights and Reset Buttton

ILS Light (Amber) - When comparator detects a deviation between LOC/GS 1 and LOC/GS 2 signals, ILS light on both flight mode annunciators will illuminate (steady). When a failure is detected (flag in view), ILS light on side that has failed will illuminate flashing and ILS light on opposite side will illuminate steady.

HORIZON Light (Amber) - When comparator detects a difference in pitch or roll attitude betwen Captain's and F/O's ADIs, HORIZON light on both flight mode annunciators will illuminate (steady).

NOTE:

If comparator error is a result of a turn error effects on vertical gyro, comparator will reset automatically when error is within tolerance, and the HORIZON light will extinguish.

When a failure is detected (flag in view), HORIZON light on side that has failed will illuminate flashing, and HORIZON light on opposite side will illuminate steady.

Heading Light (Amber) - When comparator detects a difference between Captain's and F/O's compass (HSI), HEADING light on both flight mode annunciators will illuminate (steady). When a failure is detected (flag in view), HEADING light on side that has failed will illuminate flashing and HEADING light on both flight mode annunciators will illuminate (steady).

MONITOR Light (Amber) - MONITOR light on both flight mode annunciators will illuminate (steady) when a failure affects validity of comparator monitor.

NO AUTOLAND Light (Amber) - Illuminates steady anytime the selected DFGC detects a condition that does not permit an automatic landing.

AP TRIM Light (Amber) - Indicates that the autopilot has a sustained out-of-trim horizontal stabilizer condition. Light will remain on until out-of-trim condition corrects itself or autopilot is disengaged.

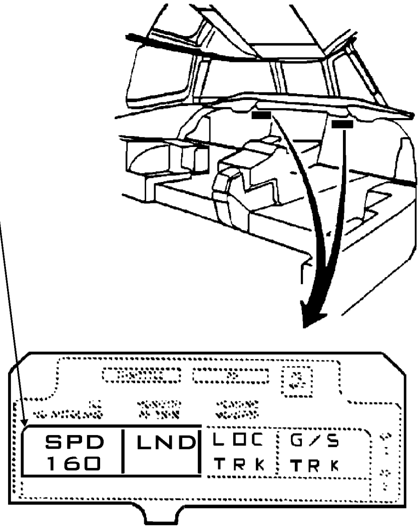
AP 1/AP 2 Lights (Blue) - Indicates whether DFGC 1 (AP 1) or DFGC 2 (AP 2) is providing input.

RESET Button - Pushing button on either flight mode annunciator will manually reset ILS, HORIZON, HEADING, MONITOR, and NO AUTOLAND legend lights.

Any legend light that has been reset manually can be recalled by pushing the RESET button a second time.

MD801215

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
FLIGHT MODE ANNUNCIATOR



Autothrottle Mode Annunciaions (Green)

AUTO - Autoland preflight ground test is in progress. Appears for approximately 20 seconds.

CLMP - ATS clamp mode. Power is removed from ATS servo (throttles remain stationary).

RETD - ATS in retard mode. Throttles automatically retarded during flare maneuver.

ALFA SPD - ATS in ALFA speed mode. Throttles controlled to maintain a safe margin above stall speed.

MACH 784 - ATS in Mach select mode. Throttles controlled to maintain .784 Mach as selected in SPD MACH readout.

SPD 250 - ATS in speed select mode. Throttles controlled to maintain 250 KIAS as selected in SPD MACH readout.

FLAP LIM - ATS controlling throttles to prevent exceeding flap limit airspeed. Occurs automatically when a reference airspeed greater than slat design limit airspeed is selected.

SLAT LIM - ATS controlling throttles to prevent exceeding slat limit airspeed. Occurs automatically when a reference airspeed greater than slat design limit airspeed is selected.

VMO LIM - Indicates that ATS is automatically limited to not exceed maximum operating Mach number (MMO).

MMO LIM - Indicates that ATS is automatically limited to not exceed maximum operating Mach number (MMO).

SPD ATL/ MACH ATL - ATS limit when operating in SPD SEL or MACH SEL mode, as applicable. Automatically occurs when ATS throttle command would exceed EPR limit.

LOW LIM - Occurs automatically when ATS throttle command would require a throttle setting lower than the minimum authority limit.

EPR T/O - ATS in EPR LIM Mode with T/O thrust selected. Throttles controlled to maintain EPR limit takeoff thrust.

EPR 23 - ATS in EPR LIM Mode with 23° selected on ASSUMED-TEMP selector (assumed temperature will be displayed) and TO FLX thrust selected. Throttles controlled to maintain derated takeoff thrust.

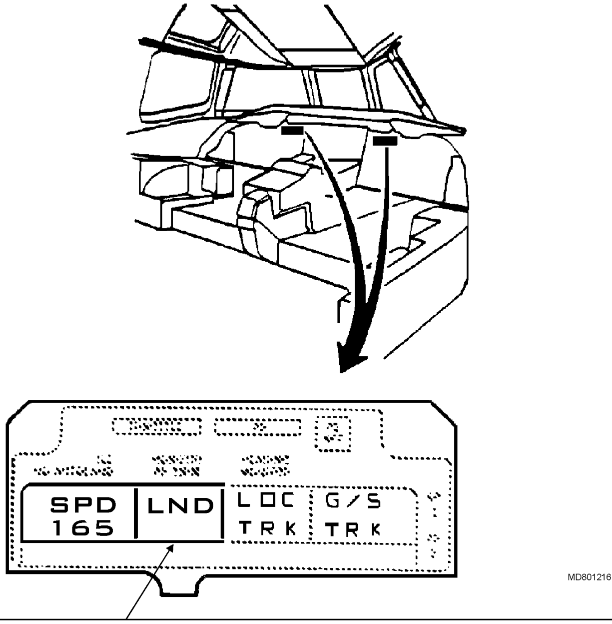
EPR G/A - ATS in go-around mode with G/A thrust selected. Throttles controlled to maintain maximum continuous thrust.

EPR MCT - ATS in EPR LIM Mode with MCT thrust selected. Throttles controlled to maintain maximum continuous thrust.

EPR CL - ATS in EPR LIM Mode with CL thrust selected. Throttles controlled to maintain climb thrust.

EPR CR - ATS inl EPR LIM Modes with CR thrust selected. Throttles controlled to maintain cruise thrust limit.

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
FLIGHT MODE ANNUNCIATOR



Arm Mode Annunciations (Amber)

PRE - Autoland preflight ground test in progress. Appears approximately 20 seconds.

LND - Automatic landing mode armed for automatic capture of selected ILS for automatic landing.

ILS - ILS mode armed for automatic capture of selected localizer course.

LOC - LOC mode armed for automatic capture of selected localizer course.

VOR - VOR mode armed for automatic capture of selected VOR course.

ALT - Altitude landing mode armed for automatic capture of selected altitude.

LND ALT - Automatic landing mode armed for automatic capture of selected localizer course and altitude preselect armed for automatic capture of selected altitude.

ILS ALT - ILS mode armed for automatic capture of selected ILS and altitude preselect armed for automatic capture of selected altitude.

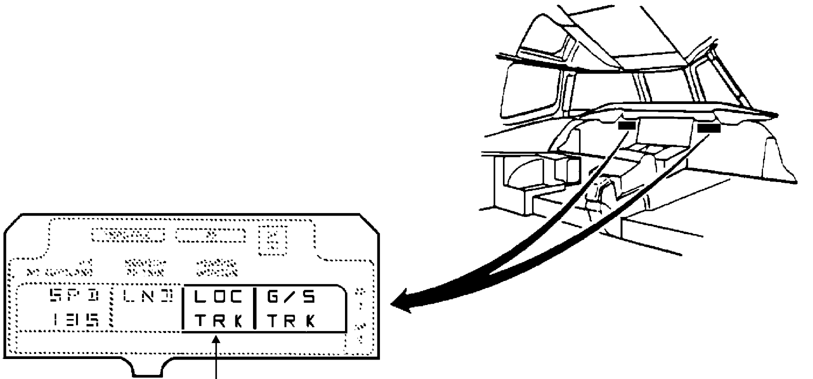
LOC ALT - LOC mode armed for automatic capture of selected localizer course and altitude preselect armed for automatic capture of selected altitude.

VOR ALT - VOR mode armed for automatic capture of selected localizer course and selected altitude preselect armed for automatic capture of selected altitude.

AUT G/A - Flight guidance system armed for full automatic go-around capability.

MAN G/A - Flight guidance system armed for manual go-around capability.

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
FLIGHT MODE ANNUNCIATOR



MD801218

Roll Mode Annunciations

FLT - Autoland preflight ground test in progress. Appears for approximately 20 seconds.

HDG - Heading hold (roll basic mode) engaged and existing magnetic heading maintained.
HLD

HDG - Heading select mode engaged and heading selected in HDG readout maintained.
SEL

VOR - Capture of selected VOR course has occured.
CAP

VOR - Airplane is tracking selected VOR course.
TRK

VOR - Station passage is occuring. Airplane will maintain existing heading during station passage.
CRS

LOC - LOC, ILS, or LAND mode engaged and capture of localizer course has occured.
CAP

LOC - LOC, ILS, or LAND mode engaged and airplane is tracking localizer course.
TRK

TAK - Flight director takeoff mode engaged. After lift-off, roll command bar on ADI command wings
OFF level to maintain heading.

WNG - Turbulance mode engaged
LVL

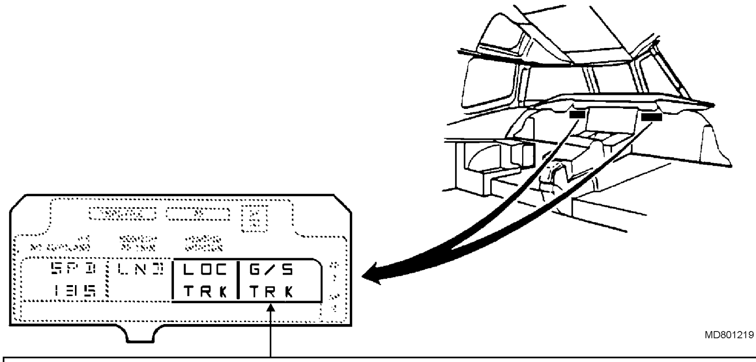
GO - Go-around mode engaged. Existing magnetic heading maintained and roll command bar
RND on ADI commands wings level.

AUT - LAND mode engaged. Logic for mode is satisfied to perform automatic landing to prescribed
LND minimum altitude.

ALN - Align mode engaged. Airplane maneuvered to maintain runway alignment.

ROL - Main gear wheel spin-up has occured. Annunciation remains until nose gear touchdown.
OUT

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
FLIGHT MODE ANNUNCIATOR



Pitch Mode Annunciations (Green)

TEST - Autoland preflight ground test in progress. Appears for approximately 20 seconds.

VERT SPD - Vertical speed (a pitch basic mode) engaged. Airplane vertical speed is being maintained by pitch attitude.

ALT CAP - Attitude preselect mode engaged and altitude capture has occured.

ALT HLD - Altitude hold (a pitch basic mode) engaged and altitude maintained by pitch altitude.

IAS - IAS HOLD mode engaged and indicated airspeed maintained by pitch attitude.

MACH - MACH HOLD mode engaged and Mach number maintained by pitch attitude.

TURB - Turbulance mode engaged. Pitch attitude controlled by use of pitch wheel.

TAK OFF - Flight director takeoff mode engaged. After lift-off, pitch command bar on ADI will display pitch commands to maintain V2 or V2 + 10 KIAS.

G/S CAP - ILS or LAND mode engaged and glideslope capture has occured.

G/S TRK - ILS or LAND mode engaged and airplane is tracking glideslope.

GO RND - Go-around mode engaged. Airplane controlled to maintain a safe margin above stall airspeed while establishing a climb attitude. Pitch command bar on ADI will display commands to maintain a safe margin above stall airspeed.

AUT LND - LAND mode engaged. Logic for mode is satisfied to perform automatic landing.

FLAR - LAND mode engaged and flare mode initiated.

NO FLR - ILS mode engaged and autopilot remains engaged at radio altitude of 100 feet. This is a flashing annunciation.

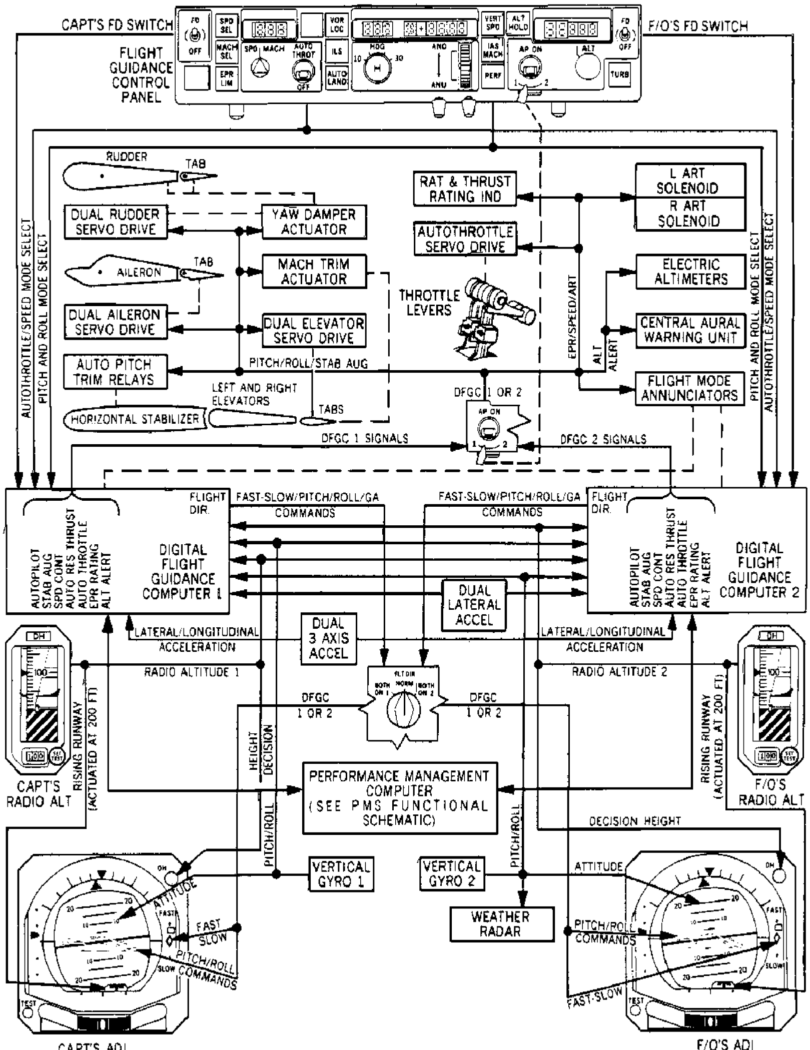
ROL OUT - Main gear wheel spin-up has occured. Annunciation remains until gear touchdown.

ALFA SPD - The engaged pitch mode is commanding a pitch attitude that results in an airspeed below the ALFA reference speed.

NOTE

On airplanes equipped with DFGCs 4034241-904, SPD LOW is annunciated in lieu of ALFA SPD. SPD LOW annunciation will flash alternately with engaged pitch mode annunciation when airspeed decreases to 10 percent below the ALFA reference speed.

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
FLIGHT MODE ANNUNCIATOR



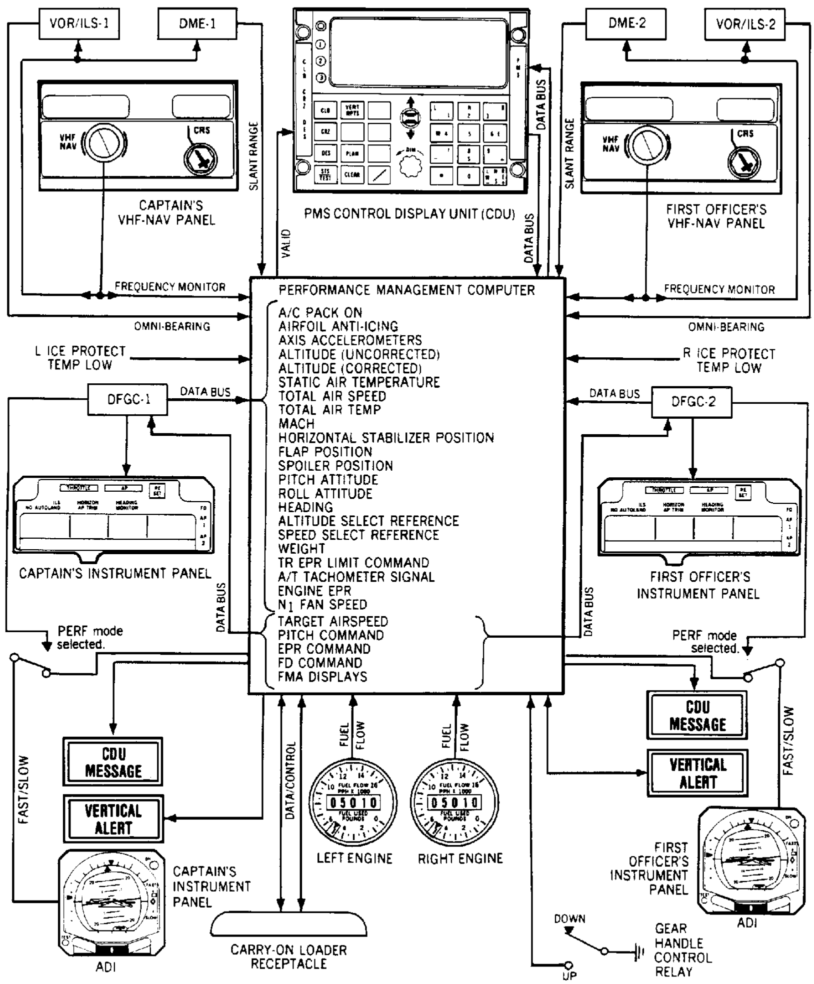
NOTE

REFER TO FUNCTIONAL SCHEMATICS IN INSTRUMENTATION AND NAVIGATION CHAPTER FOR VOR/LOC/GS INPUTS TO ADI'S AND DFGC'S AND FOR COMPASS HEADING AND CADC INPUTS TO DFGC'S.

MD801220

PMS NOT INSTALLED ON SOME AIRPLANES

AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
FLIGHT MODE ANNUNCIATOR



AUTOMATIC FLIGHT - CONTROLS AND INDICATORS
FLIGHT MODE ANNUNCIATOR

AUTOMATIC FLIGHT OPERATION REVIEW

AUTOLAND AVAILABILITY TEST

Note: This test must be performed while airplane is on the ground.

VHF NAV Radios ....SET

Set both VHF NAV radios to the identical, non-local, ILS frequency.

AUTOLAND Button ....PUSH

Push the AUTOLAND button and observe the following:

NO AUTOLAND legend light flashing continuously.

Autothrottle, arm, roll and pitch mode annunciators display **AUTO LND** / **PRE** / **FLT** / **TEST**.

Radio altimeters, ADI's and ILS indications display self-test functions.

After approximately 50 seconds, flight mode annunciator goes blank or reverts to previous display and **NO AUTOLAND** legend light goes out indicating a valid test.

Note: If test is invalid, the **NO AUTOLAND** legend light remains on until the RESET button is pushed.

Move DFGC 1-2 switch to the opposite position and repeat the test.

VHF NAV Radios ....SET

Captain and First Officer set desired VHF NAV frequency and course.

SELECT FLIGHT DIRECTOR / AUTOPILOT TAKEOFF MODE

Note: This procedure describes steps necessary to make a flight director takeoff, including autopilot engagement at 1000 ft. AGL. On the ground, the takeoff mode (TAK OFF, TAK OFF) is flight director only. In flight, the takeoff mode is both flight director and autopilot.

Note: During flight director operation with autopilot off and autothrottles engaged, two possible incompatible modes may be displayed if non-normal sequence of autopilot and autothrottle modes is selected. These incompatible mode displays are speed on throttle (IAS or MACH SEL) and speed on pitch (IAS or MACH HOLD). The incompatibility will be displayed on non-selected side FMA. For example: With AP off and autothrottles engaged, if DFGC switch is in 1, pushing IAS HOLD or MACH HOLD mode button then pushing SPD SEL or MACH SEL mode button will cause Captain's FMA to display "**SPD** __ __ __" or "**MACH** __ __ __" and **IAS** or **MACH**.

Note: Items 1 through 7 should be accomplished no later than the "Flight Guidance & TRI – SET" step on the TAXI CHECKLIST.

Flight Director Switches ....FD

Speed / Mach Select Knob ....V_2

Push the SPEED / MACH SELECT knob to the first detent (FAST / SLOW) and set the computed V_2 speed for takeoff. Push the SPEED / MACH SELECT knob full in and set the desired climb Mach number. Verify that the SPEED / MACH SELECT knob to the maximum (full in) detent again to display V_2 speed.

Note: After electrical power interruption, initial electrical power application or after a Power Up Test, the Speed / Mach Readout will revert to 100 knots.

Heading Selector ....SET

Set the heading selector to runway heading or the first heading after takeoff.

Bank Angle Limit Selector ....15 DEGREES

Altitude Select ....SET / ARMED

Rotate the ALTITUDE SELECT knob to the initial level off altitude and pull out on the knob to arm the selected altitude. **ALT** will be displayed on both FMA's.

(Continued)

TRI ....SET

Push T.O. / FLEX on the Thrust Rating Indicator (TRI) and verify the maximum limit indexes (chevrons) on the EPR gages. Indicate the same value as the TRI Readout.

Note: If T.O. / FLEX is not used for takeoff, set 00°C in the Assumed Temperature Readout.

TO/GA Button..PUSH

Push either TO/GA button on either throttle. Verify that the roll and pitch windows in both FMA's read **TAK-OFF, TAKE-OFF**. The flight director command bars will command wings level and level flight. The FAST / SLOW indicators will indicate full SLOW. The flight director command bars and FAST / SLOW indicators are not valid until after rotation.

When ready for takeoff, if autothrottles are used, advance the throttles to 1.4 EPR (80% N_2) and verify that the EPR's are matched and all engine parameters are normal.

Autothrottle Switch .... ON

Verify the throttle window of the FMA displays EPR / T.O. and the throttles drive forward to the takeoff EPR displayed on the CLMP mode. (Removing electrical power from the autothrottle servo.) The autothrottles will remain in CLMP until EPR / LIM is selected on the flight guidance panel or GA, MCT, CL, or CR are selected to the TRI.

Caution: The CLMP mode engages when the central air data computer senses 60 knots. If the takeoff is made in a strong headwind, or a combination of a rolling takeoff and strong headwind the CLMP mode may engage sooner than expected and the throttles must be advanced manually to the takeoff or takeoff flex EPR.

Note: If, while in autothrottle system EPR mode, flap limit airspeed is exceeded, autothrottle system will disengage.

Note: When autothrottle system us engaged in an EPR limit mode, and ENG SYNC switch is in OFF, digital flight guidance computer ensures both engine EPR's are same.

(Continued)

At rotation speed, rotate the aircraft to satisfy the command bar presentation. Crosscheck the pitch attitude being commanded with the primary airspeed indicator. After gear retraction and at or above 1000 ft. AGL, engage the autopilot by moving the AP switch to ON. Verify that the **AP 1** or **AP 2** light on the FMA illuminates.

Note: While the autopilot is engaged, if the aircraft is maneuvered about the pitch axis at an indicated airspeed below minimum maneuvering speed, the pitch window of the FMA's will alternately flash **SPD LOW** and **VERT SPD** until corrective action is taken by the pilot.

Note: If the autopilot is engaged during a turn with **TAK-OFF** displayed in the roll window of the FMA, the autopilot will engage and roll the aircraft smoothly to wings level. The autopilot will maintain the aircraft on the heading existing at the moment that bank angle reduces to 3°. To avoid this wings level mode, select HDG SEL prior to autopilot engagement.

At 1000 Ft. AGL:

Climb Power...SET

Press the CL button on the TRI and verify that the CLMP mode disengages and **EPR / CL** is displayed in the throttle window of both FMA's. The throttles should reduce to the EPR setting displayed on the TRI.

Pitch Profile Readout...SET

Rotate pitch wheel to decrease existing vertical speed by one-half.

Note: This action will disengage flight director TAK OFF mode, and pitch FMA's will display **VERT SPD**. If roll FMA's were in TAK OFF prior to mode disengagement, they will now display **HDG HLD**.

When reaching required airspeed, retract flaps and slats and accelerate to desired climb speed.

When in clean configuration and at climb speed:

IAS HOLD Button ....PUSH

Push IAS HOLD button and observe pitch FMA's display IAS.

(Continued)

Note: If autothrottle system is engaged in SPD SEL mode when IAS HOLD or MACH HOLD mode is engaged, **CLMP** will be displayed in autothrottle FMA's and will flash for approximately 5 seconds. CLMP mode will remain engaged until a pitch mode other than IAS HOLD or MACH HOLD is selected, until glideslope beam is captured, or any autothrottle system mode is selected.

Note: (930 Aircraft) Pitch wheel has 2 functions. In IAS or MACH mode, it functions as a speed or Mach trim wheel. If any other pitch mode (except TURB) is selected, it functions as a vertical speed selector.

If MACH HOLD mode is desired (passing FL270),

MACH HOLD Button ....PUSH

Note: If engaged in IAS HOLD or MACH HOLD modes, there are four methods or disengagement:

1. Capturing an altitude, using altitude preselect.
2. Pushing ALT / HOLD button.
3. Pushing SPD SEL button.
4. Pushing MACH SEL button.
5. Pushing VERT SPD button (930 Aircraft).

AUTOMATIC ALTITUDE CAPTURE

AP Switch .... AP ON

ALT Readout..SET

Rotate ALT SET knob until desired altitude is displayed in ALT readout.

Altitude Preselect Mode...ARM

Pull ALT SET knob to engage altitude preselect mode. Observe **ALT** is displayed in the ARM FMA's.

Note: Altitude preselect mode provides automatic capture of a preselected altitude. The flight guidance system may be in any available pitch mode.

Approximately 750 feet from the preselected altitude, a steady amber light on each primary altimeter will come on. The light will go off when 250 feet from selected altitude. When capture threshold is reached, ALT CAP mode will engage and Pitch Profile Readout will read existing vertical speed. When ALT HLD mode engages, the Pitch Profile Readout will display zeros.

Deviation greater than 250 feet above or below the selected altitude causes alt advisory lights to flash, and a two-second tone to sound. Selecting a new reference altitude or flying back to within 250 feet of the selected altitude will extinguish the flashing lights and silence the tone warning.

The altitude preselect mode will disarm if the turbulence mode is selected, the glideslope is captured or if in the localizer only approach mode below 1500 feet AGL.

AUTOMATIC AUTOTHROTTLE MODE CHANGE

During climb, before reaching preselected altitude:

SPD MACH Readout ....SET

Rotate SPD MACH select knob until desired speed or Mach is displayed in SPD Mach Readout.

Note: When ALT CAP mode engages, the autothrottle system will automatically switch from EPR / CL mode to the airspeed or mach displayed in the primary SPD MACH Readout.

Pressing the ALT HLD button or selecting ALT HLD mode by rotation of the pitch select wheel will also cause automatic switching from EPR mode to SPD / MACH mode.

If primary SPD / MACH display is not as desired for cruise prior to ALT CAP mode engagement:

SPD / MACH Knob...PUSH / RELEASE

Observe new primary display.

FLIGHT DIRECTOR / AUTOPILOT TURBULENCE MODE

ENG IGN Selector .... SYS A OR SYS B / GRD START & CONTIN

TURB Mode Button .... PUSH

Note: Pitch mode annunciator displays **TURB** and roll annunciator displays **WNG LVL**. Flight director command bars provide guidance to maintain pitch profile selected in Pitch Profile Readout. The command bars command wings level. The autothrottle system will disengage and **THROTTLE OFF** lights will flash. Pushing ATS disconnect button (on throttle) will turn off lights. FAST / SLOW indicates display deviation from reference airspeed displayed in SPD MACH Readout.

Automatic pitch trim function is inhibited when in TURB mode.

AUTO THROT Switch .... OFF

Observe AUTO THROT switch automatically drops to OFF. Push ATS disconnect button (on throttle) to turn off flashing red **THROTTLE** lights.

Adjust throttles manually for desired airspeed. Change only for large airspeed variations. Do not chase airspeed.

Note: The maximum rough air speed is 285 KIAS or Mach .79, whichever is lower. Below 10,000 feet, 250 KIAS may be observed.

Do not fly less than minimum maneuvering speed for the configuration.

Yaw Damper Switch .... ON

Verify YAW DAMP switch is in ON.

If flying flight director (autopilot off), fly attitude indicator as the primary pitch reference. Sacrifice altitude to maintain attitude. Do not chase altitude. Descend if necessary to improve buffet margin.

When turbulence mode is no longer desired, select any roll or pitch mode. Autopilot or flight director will engage into basic HDG HLD (heading hold) and ALT HLD (altitude hold) mode or VERT SPD (vertical speed).

DESCENT INITIATION VERTICAL SPEED MODE

With FD switches in ON, AP switch in ON, AUTO THROT switch on UP, and in MACH SEL mode.

ALT Readout..SET

Rotate the ALT SET knob until level-off altitude is displayed in Alt Readout.

Altitude Preselect Mode...ARM

Pull ALT SET knob to engage altitude preselect mode.

SPD / MACH Knob...SET

Rotate the SPD / MACH knob until the desired descent Mach is set. Push full in on the knob and set the indicated airspeed to be used later in the approach. Release knob and observe FMA's display the selected Mach.

Pitch Profile Readout..SET

Rotate pitch wheel toward AND to initiate descent until **V-2500** appears in Pitch Profile Readout. **VERT SPD** will be displayed in the pitch FMA's.

When desired airspeed is attained:

SPD SEL Button..PUSH

Observe autothrottle system FMA's display **SPD**.

SPD Readout ....SET

Rotate SPD / MACH knob to set 250 knots in SPD Readout. Observe throttles retard to idle.

Note: Setting 250 initially in the SPD / MACH Readout assures throttles remain in idle and maintains a safe airspeed in the event of level off requirements. Adjust pitch wheel to maintain 0.80 Mach until 320 knots is attained. Maintain 320 knots to 3000 feet above speed limiting altitude.

At 3000 feet above speed limiting altitude:

Pitch Profile Readout..SET

Rotate pitch wheel toward:ANU to reduce rate of descent until **V-1500** appears in Pitch Profile Readout. Observe airplane decelerate so as to pass speed limiting altitude indicating required airspeed. Adjust pitch wheel as required for remainder of descent.

(Continued)

As flap / slat configuration changes:

SPD Readout ....SET

Rotate SPD / MACH knob to set desired airspeed in SPD Readout.

Nearing initial approach altitude (no closer than 50 feet from selected level-off altitude), observe stead amber altitude advisory light come on. Observe light goes out when within 250 feet of selected altitude.

Note: Deviation from selected altitude is indicated by a flashing altitude advisory light and a two-second tone.

Returning to within 250 feet of reference altitude or selecting new reference altitude will turn off flashing lights.

DESCENT INITIATION IAS / MACH MODE

With FD switches in ON, AP switch in ON, AUTO THROT switch on (UP), and in MACH SEL mode:

ALT Readout..SET

Rotate ALT SET knob until level-off altitude is displayed in ALT Readout.

Altitude Preselect Mode..ARM

Pull ALT SET knob to engage altitude preselect mode.

Pitch Profile Readout..SET

Rotate pitch wheel toward AND to initiate descent until **V-2500** appears in Pitch Profile Readout. **VERT SPD** will be displayed in pitch FMA's.

When desired Mach or IAS is attained:

IAS / MACH Button ....PUSH

Observe pitch FMA's indicate Mach or IAS as appropriate and ATS FMA's switch to **CLMP** and flash for 5 seconds. If Mach is selected, Pitch Profile Readout will display **M** followed by Mach number. If IAS is selected, readout will display **S** followed by the indicated airspeed selected.

SPD / MACH Knob.. PUSH / SET

Push full in on the SPD / MACH knob and set the required airspeed to be used later in the descent and approach.

Note: If SPD SEL or MACH SEL autothrottle modes are re-established, IAS or MACH mode will be overridden automatically and pitch FMA's will switch to VERT SPD or ALT HDL as appropriate, and pitch displays will flash for 5 seconds.

If in MACH or IAS mode, rotating the pitch wheel will change MACH or IAS displayed in Pitch Profile Readout.

If in CLMP, selecting a pitch mode other than MACH or IAS will cause CLMP mode to disengage and prior primary autothrottle mode to be re-established. Autothrottle system FMA's will flash for approximately 5 seconds to alert crew of change.

FLIGHT DIRECTOR / AUTOPILOT VOR MODE

VHF NAV Readouts...SET

Set and identify desired VOR frequency.

CRS Readouts ....SET

Set desired for VOR course.

HDG Readout...SET

Rotate HDG selector knob until desired intercept heading appears in HDG Readout.

Note: If not already in HDG SEL mode, pull HDG selector knob and observe roll FMA's display **HDG SEL**.

VOR / LOC Button ....PUSH

Observe arm FMA's display **VOR**.

Note: Roll control responds to the selected heading and with autopilot engaged, VOR radial will be captured automatically. On the HSI, at approximately 2 dots on the course deviation indictor (CDI), VOR capture mode will engage and **VOR CAP** will be displayed in roll FMA's.

At approximately one-half dot CDI deviation, roll FMA's will display **VOR TRK**. Crosswind correction will be provided to maintain beam centerline. CDI will display any beam deviation.

ILS OR LOC ONLY APPROACH

Note: Autopilot may be engaged for a coupled approach or off for a flight director approach.

VHF NAV Radios...SET

Set and identify desired ILS station frequency.

Front Inbound ILS Course...SET

Set same ILS front inbound course in both Course Readouts.

Note: If correct ILS / LOC inbound course has not been set, and a large discrepancy exists between the actual LOC inbound course and the selected course, flight guidance system will not attempt to complete the course intercept; the airplane will fly through the localizer, wings level. In that case, **LOC CAP** may be annunciated and G/S TRK could occur, causing the airplane to begin to descent. Upon failing to attain LOC TRK and after existing the localizer beam, autopilot will disconnect and flight guidance will revert to HDG HLD / VERT SPD.

SPD MACH Readout ....SET

Rotate SPD MACH select knob to set desired IAS in SPD Readout.

Note: If autothrottle system is desired, verify AUTO THROT switch is in on (UP) position.

HDG Readout..SET

Verify required localizer intercept heading is set in HDG Readout.

ILS Button...PUSH

Push ILS button and observe arm FMA's display **ILS**.

Note: If localizer only mode is desired, push VOR / LOC button. Glideslope logic will be inhibited.

Arm FMA's will display **LOC**. During localizer capture, arm FMA's will go blank and roll FMA's display **LOC CAP**. When airplane is on centerline, FMA's will switch from LOC CAP to LOC TRK.

Pitch Profile Readout..SET

Rotate pitch wheel as required to position airplane at initial approach altitude.

(Continued)

Monitor localizer capture and tracking.

Note: Direction and amount of crab angle will be displayed on HSI as the angular difference between airplane heading and the setting on course select pointer.

When glideslope pointer becomes active, lower the landing gear. When one dot below glideslope, select 28° flaps.

SPD MACH Readout ....SET

Rotate SPD / MACH select knob to set target speed in SPD Readout.

Note: If SPD MACH Readout is set prior to selecting final approach flaps, the autothrottle system FMA's will display **ALFA SPD** (minimum maneuvering airspeed).

ALFA SPD mode is automatically engaged and annunciated when SPD MACH Readout is set to a value less than the alfa speed reference, and SPD SEL or MACH SEL autothrottle mode are engaged.

Monitor glideslope capture.

Note: As airplane reaches capture threshold, pitch mode annunciators change to **G/S CAP**. Capture point is variable and is function of rate of beam closure, plus beam deviation. Glideslope can be captured from above or below.

If 40 degrees flaps are used for landing, move flap / slat handle to 40 degree detent at glideslope intercept.

Monitor glideslope track.

Note: When the airplane is on beam centerline, pitch FMA's change from G/S CAP to G/S TRK. Rudder authority, in event of a go-around, is established. Arm FMA's change from ILS to AUT/GA if automatic go-around logic is satisfied.

When decision height is reached:

DH Lights ....ON

Observe **DH** lights come on when airplane reaches decision height.

Note: In ILS and localizer only approach below 1500 feet AGL, the altitude preselect mode is inhibited.

(Continued)

If autopilot is engaged:

AP Disengage Button ....PUSH

Push AP disengage button twice.

Monitor autothrottle retard mode.

Note: When reverse thrust levers are actuated, the autothrottle system will disengage AUTO / THROT switch drops to OFF. The **ATS THROTTLE OFF** warning lights will not come on.

GO AROUND FROM FLIGHT DIRECTOR APPROACH

AT decision height:

TO/GA Button ....PUSH

Pilot flying manually advance throttles and push TO/GA button and hold for at least 1 second. Autothrottle mode changes from SPD (plus selected value) to EPR GA. Arm mode goes blank. Roll and pitch modes change from LOC TRK and G/S TRK to GO RND.

Note: When pressure on the throttles is released, the autothrottle system will refine the go-around thrust setting.

The thrust rating computer automatically changes to go-around (GA) if not previously selected.

Go-Around Maneuver..PERFORM

Note: Flight director command bar commands fly up (maximum 20° airplane nose up).

Flight director command bar commands go-around reference speed, wings level and maintains existing heading when roll attitude is less than 3°.

FAST / SLOW indicator on each ADI will provide guidance to go-around speed (which equals approximately 1.3 V_5 + 5 knots for landing flaps).

If an immediate climbing turn is required:

HDG Select Knob...PULL

Momentarily pull out of HDG select knob to engage heading select mode. Verify bank angle limit is set at 15°. Rotate HDG select knob until desired heading is displayed in HDG Readout. FMA's will display **EPR GA / HDG SEL / GO RND**.

For all contingencies:

ALT Set Knob ....PULL

Momentarily pull out on the ALT SET knob to arm the FGS for missed approach altitude capture. Arm mode will display **ALT**.

Pitch Control Wheel ....ROTATE

Rotate pitch control wheel as required to accelerate at 1,000 ft. AGL. Pitch mode changes to VERT SPD.

(Continued)

CL Mode Button ....PUSH

Push CL mode button. EPR limit for climb thrust will be displayed in the EPR LIM Readout and EPR reference bug on EPR gage will be automatically positioned. Autothrottle mode changes from EPR GA to EPR CL.

SPD / MACH Readout ....SET

Rotate the SPD / MACH select knob until desired speed appears in SPD / MACH Readout.

AUTOLAND APPROACH

1 –2 Switch .... 1 OR 2

Select flight guidance computer 1 or 2.

AP Switch .... ON

AUTO THROT Switch .... ON

Move AUTO THROT switch to on (UP) position and observe FMA displays **SPD** (plus selected value), **HDG SEL**, and **ALT HELD**.

VHP / NAV Readouts..SET

Set the same ILS frequency in both VHF / NAV Readouts and identify.

Note: Both VHF and CRS Readouts must be set to the same ILS frequency and course before autoland logic can complete.

VHF / CRS Readouts ....SET

Rotate VHF / CRS select knobs until required ILS front inbound course is displayed in each Readout.

Note: If correct ILS / LOC inbound course has not been set, and a large discrepancy exists between the actual LOC inbound course and the selected course, flight guidance system will not attempt to complete the course intercept; the airplane will fly through the localizer, wings level. In that case, **LOC CAP** may be annunciated and G/S TRK could occur, causing the airplane to begin to descent. Upon failing to attain LOC TRK and after exiting the localizer beam, autopilot will disconnect and flight guidance will revert to **HDG HLD / VERT SPD**.

No Autoland Light .... OFF

Observe that the **NO AUTOLAND** light is off.

Note: If the **NO AUTOLAND** light is on, move 1 – 2 switch to opposite position and again observe **NO AUTOLAND** light. If the **NO AUTOLAND** light is off, continue autoland operation. If the **NO AUTOLAND** light is on, autoland operation is not possible.

The **NO AUTOLAND** light can come on any time the computer is powered.

(Continued)

HDG Readout..SET

Rotate HDG selector knob until required localizer intercept heading appears in HDG Readout. Verify HDG SEL mode is engaged.

AUTOLAND Button ....PUSH

Push AUTOLAND pushbutton and observe FMA's display **LND**.

Note: The pitch wheel may be used to arrive at approach entry altitude.

When the localizer beam deviation reduces to the capture threshold, the airplane automatically turns as required to localizer beam centerline. **LOC CAP** will be annunciated in the roll FMA's.

During localizer capture, the bank limiter is overridden and the airplane can bank to a maximum of 30 degrees.

As the airplane settles on beam centerline, roll FMA's change from LOC CAP to LOC TRK. The autopilot will automatically establish the required crab angle.

When the glideslope pointer becomes active, move the gear handle to DOWN and observe 3 gear green lights on and the gear door light is out.

When one dot below glideslope, move flap / slat handle to 28 degree detent, observe flaps position indicators show 28 degrees, and **LAND** light is on.

If 40 degrees flaps are used for landing, move flap / slat handle to 40 degree detent at glideslope intercept.

SPD / MACH Readout ....SET

Rotate SPD / MACH select knob to set target speed in SPD Readout. Autothrottle system FMA's will display **SPD** (plus selected value).

Note: Is SPD Readout is set prior to selecting landing flaps, the autothrottle system FMA's will display **ALFA SPD**. After selecting landing flaps, FMA's will again display **SPD**.

Verify that correct decision height has been set.

(Continued)

Note: Align mode engages at approximately 150 feet, roll FMA's switch from AUT LAND to ALN (align), and any crab angle maintained by the autopilot is removed.

If **ALN** is not annunciated on an FMA by 100 feet of radio altitude, initiate a go-around or disconnect the autopilot and continue the approach manually, conditions permitting.

Autothrottle system retard mode engages at approximately 50 feet AGL, as measured by the radio altimeter, reducing engine thrust at the rate programmed to reach idle or near idle at touchdown. Fast / slow indicators are removed from view. Autothrottle FMA's change from SPD (plus selected value) to RETD.

Flare mode engages at approximately the same time as retard mode, adjusting pitch attitude for touchdown. Pitch FMA's change from AUT LAND to FLAR (flare).

For airplanes without autoland rollout guidance:

- Roll out mode engages at main gear wheel spin-up, roll and pitch FMA's switch to ROL OUT (roll out), arm FMA's go blank, and throttles move rapidly to aft idle stop.
- After nose gear touchdown, arm, roll, and pitch FMA's go blank and flight director command bars on both ADI's are removed from view.
- Autopilot disengages five seconds after nose gear strut compression. Push autopilot disconnect button on control wheel to turn off flashing red **AP** lights and silence aural and vocal warning. Roll and pitch FMA's will now display **HDG HLD** and **ALT HLD**.
- When reverse thrust is applied, autothrottle switch drops to OFF and autothrottle system FMA's go blank. PF must maintain runway alignment manually after nose gear strut compression.

For airplanes with autoland rollout guidance:

- At main gear spin-up roll mode engages and roll and pitch FMA's switch to ROL OUT (rollout). Localizer deviation signals then control rudder and nosewheel steering to maintain localizer centerline. Also at main gear spin-up, throttles will move rapidly to aft idle stop.

(Continued)

- At nose gear compression, ROL OUT remains in roll and pitch FMA's. The autopilot will automatically keep airplane on runway centerline. Flight director command bars will provide lateral steering guidance.
- When reverse thrust is applied, AUTO THROT switch drops to OFF and ATS FMA's go blank. Red lights will not come on. If reverse thrust greater than 1.6 EPR is applied, autopilot may disengage.
- Twenty seconds after main gear spin-up, arm FMA's go blank advising pilot that go-around guidance is no longer available.
- At end of landing roll, press control wheel release button twice, once to disengage autopilot and second time to turn flashing red lights off and to silence aural and vocal warnings. Roll and pitch FMA's now display **HDG HLD** and **ALT HLD**.

GO AROUND FROM AUTOLAND APPROACH

At decision height:

TO/GA Button ....PUSH

Pilot flying manually advance throttles, push TO/GA button and hold for at least 1 second. Autothrottle mode changes from SPD (plus selected value) to EPR GA. Arm mode goes blank. Roll and pitch modes change from AUT LND to GO RND.

Note: When pressure is released on the throttles, the autothrottles system will refine the go-around thrust setting.

The thrust rating indicator automatically changes to go-around (GA) if not previously selected.

Pilot flying monitor autopilot performance.

Note: If go-around is selected after the flaps have been retracted from the landing configuration, the autopilot will not engage into the go-around mode.

If runway contact is made during an autopilot go-around, the autopilot will remain engaged. The autopilot will disengage if the go-around mode is selected after runway contact is made.

Autopilot will roll the airplane to wings level and rotate it to a pitch attitude to maintain go-around reference speed (maximum pitch attitude is 20° airplane nose up). The airplane will maintain the heading existing when roll attitude is less than 3°.

The Fast / Slow indicator on each ADI will provide guidance to go-around speed (which equals approximately 1.3 V_S = 5 knots for landing flaps).

If an immediate climbing turn is required:

HDG Select Knob...PULL

Momentarily pull out HDG select knob to engage heading select mode. Verify bank angle limit is set at 15°. Rotate HDG select knob until desired heading is displayed in HDG Readout. FMA's will display **EPR GA / / HDG SEL / GO RND**.

Note: Autopilot will disconnect if heading select is engaged during a single engine go-around.

(Continued)

For all contingencies:

ALT Set Knob ....PULL

Momentarily pull out of the ALT SET knob to arm the FGS for missed approach altitude capture. Arm mode will display ALT.

Pitch Control Wheel ....ROTATE

Rotate pitch control wheel as required to accelerate at 1,000 ft. AGL. Pitch mode changes to VERT SPD.

CL Mode Button ....PUSH

Push CL mode button. EPR limit for climb thrust will be displayed in the EPR LIM Readout and EPR reference bug on EPR gage will be automatically positioned. Autothrottle mode changes from EPR GA to EPR CL.

SPD / MACH Readout ....SET

Rotate SPD / MACH select knob until desired speed appears in SPD / MACH Readout.

PERFORMANCE MANAGEMENT SYSTEM (If Installed)

The Performance Management System (PMS) operates as a fully integrated selectable mode of the Digital Flight Guidance System (DFGS). The PMS consists of a PMS Computer Unit (PCU), a PMS Control Display Unit (CDU), and PMS advisory lights. The PCU provides information to the CDU for message and data displays and to the DFGS for flight path control. The PCU is programmed to compute a cost efficient flight profile (considering fuel and time costs, airplane performance, and manual inputs). The computer program contains airplane performance characteristics (i.e., speed envelope, lift, drag), engine limits, and airplane maximum and minimum speeds (including flap placard speeds) for all flight modes. An automatic longitudinal speed restriction of 250 knots for all altitudes below 10,000 feet is also included in the computer program and can be manually overridden using the CDU. Based on programmed limits, the PCU provides automatic protection against engine overboost, airplane overspeed, and underspeed.

The PMS optimizes the entire flight profile by making continuous profile changes using current data while considering the remaining flight as new data is entered. Flight parameters and other functional data on such as distance, and fuel remaining are derived from continuous and automatic inputs from other systems and from manually inputted data and are presented as an advisory display. PMS advisory lights indicate that a message is being displayed on the CDU or that a vertical leg change is imminent.

Data input reasonableness tests are included in the computer program. The reasonableness test applied to input data include comparison of entered Gross Weight (GWT) to airplane maximum and minimum limits; comparison of entered fuel to maximum limit and GWT minus (-) zero fuel weight; comparison of computed Bottom of Descent (BOD) GWT and maximum GWT for landing; and computed BOD fuel weight less than 5000 pounds. Failure of these reasonableness tests will cause messages to appear in the CDU where they will remain until a new entry has been made or the message cleared.

The PMS is integrated with the FGS to provide automatic control of pitch attitude and thrust during climb, cruise, and descent flight modes. The climb mode can be operated in an optimum submode (for minimum operating cost), in maximum submode (for maximum climb angle), or in a non-optimum submode (for selecting manually a climb speed and/or rate of climb). The cruise mode can be operated in an optimum mode (for minimum operating cost), in a non-optimum submode (for selecting manually cruise speed), or in a holding/maximum endurance submode (for maintaining the maximum endurance speed for airplane configuration). The descent mode can be operated in an optimum submode (throttles idle for minimum operating cost) or in non-optimum submode (for selecting manually a rate of descent and/or airspeed).

Automatic system mode selection is provided so that when the PERF mode is selected on the FGCP, the PMS will engage into the appropriate climb, cruise, or descent mode of operation. The PMS will use existing vertical speed and altitude (compared to armed altitude) to determine appropriate flight regime. The climb, cruise or descent mode, which will be entered, is the currently armed (or selected) mode with a default to optimum for CLB or CRZ and NON-OPT MACH/IAS for descent. The descent mode entered is optimum if the airplane is within 5 NM of the optimum descent path at time of mode selection. The PMS will always honor the armed altitude. Once in a cruise mode, the PMS will not leave the current altitude to climb or descend until the new altitude has been armed and the mode change commanded by the pilot.

PMS generated data, command entries, and performance data are displayed on the CDU in the form of pages. The top line in the CDU display area is used as a combination page title / scratchpad line. The remaining three lines are numbered and are used for data entry and display or in conjunction with line select keys for callup of subpages (expansion of information on a given line). Page title relates the displayed page to the function key calling-up that page. Alert/advisory messages appear in the scratchpad area. Data entered will first be displayed in the scratchpad. All data entries are loaded in the scratchpad from left to right. Data entries of more than 12 characters (i.e., position latitude and longitude) are accommodated by an automatic shift of the first 12 characters one space to the left for each additional character entered, thus spilling into the page title area. When appropriate line select key is pushed, data will be transferred to the left side of the selected data line. If data is to be transferred to the right of the selected data line, the slash (/) data entry key must be pushed before entering data into the scratchpad. Data loading has priority over display information or alert/advisory messages which may be displayed.

Certain data entered may require a solution from the computer. When a solution is not available within one second, dashes will appear in the scratchpad. When the solution becomes available, the dashes are automatically cleared and the required data displayed.

Two planning pages are available. Plan page 1, PLAN, permits entry of weight and trip data. Plan page 2, PLAN-CRZ, permits entry of planned cruise flight levels, average trip wind component and temperature data. Data for both plan pages may be entered during the ground preflight and the computed climb, cruise and descent profile reviewed. When using the first planning page, the PMS interprets gross weight and fuel weight data as follows:

- One to six numeric characters entered with a decimal point is displayed on a data line rounded to the nearest thousand pounds (KLB).
- One to three numeric characters entered without a decimal point is displayed on a data line as entered.
- Four to six numeric characters entered without a decimal point is displayed on a data line rounded to the nearest thousand pounds (KLB).

Distance (ground distance) entries are entered to the nearest nautical mile (NM). When using the second planning page, cruise altitudes are displayed on a data line in flight level (FL) format, separated by a slash (/) as necessary. The PMS interprets cruise altitudes as follows:

- Three or less numeric characters entered is interpreted as an entry to the nearest 100 feet.
- Four or five numeric characters entered is interpreted as an entry to the nearest foot.
- Entries of either type will be displayed on a data line in FL format rounded to the nearest 100 feet.

Three basic climb modes are CLB OPT, CLB MAX, and CLB NON OPT. The OPT mode is basic and is automatically selected for all climbs unless manually changed using the CDU. The MAX mode is selected by operation of the slew key and data line select key 1 operation. The NON OPT mode is obtained by pilot input of longitudinal speed. Operation of the slew switch in either direction will cause the display to cycle through all available display pages. When using climb pages, the PMS interprets altitude entries as follows:

- All entries must be five numeric characters or less.
- Three or less numeric characters entered is interpreted as an entry to the nearest 100 feet. In addition, if the entry is 180 or greater it will be displayed in FL format.
- Four or five numeric characters entered is interpreted as an entry to the nearest foot and will be displayed as entered.

The PMS interprets climb speed entries as follows:

- A maximum of three numeric characters is permitted and can be preceded by a decimal point.
- If first character entered is a number 1, 2, 3, or 4, the entry is interpreted as indicated airspeed (IAS). If first character is either a decimal point or a number greater than four, the entry is interpreted as a Mach number. The data line display will be padded with a trailing 0 to display two numeric characters for a single numeric character entry.

Three basic cruise modes are CRZ OPT, CRZ NON OPT, and CRZ HOLD / ENDUR. The OPT mode is basic and is automatically selected to provide a cost factor optimized speed. The NON OPT results from a manual input of desired Mach/IAS. HOLD / ENDUR is obtained from any other cruise page by operation of the slew switch to obtain best holding speed. Entry of mode occurs by operating the line select key.

Three basic descent modes are DES OPT, DES NON OPT and DES V/S. The OPT mode provides a cost factor optimized speed to Bottom of Descent (BOD) point. The DES NON OPT is the default mode and permits manual entry of desired descent speed/vertical speed. DES V/S permits manual entry of desired descent speed or vertical speed. If in cruise, and altitude is armed below current altitude, the DES display page will be automatically selected. However, pilot action is required to actually initiate the descent. Once the descent mode has been entered, it is terminated by either a different mode selection or by reaching the armed altitude.

Operation of the VERT WPTS function key provides the basic page from which the following functions are performed: display of vertical events in sequence; definition/display of vertical flight plan waypoint data; display of current position and related navigation data (track, groundspeed, wind, etc.).

In general, any display page can be called up at any time, with one exception. During preflight and prior to entering GWT, climb, cruise, and descent pages cannot be displayed. In addition, information available to the PMS at its interface is used to provide automatic display page selection as follows:

- Selects first planning page when airplane is on the ground and both engines are shut down.
- Selects cruise page when armed clearance altitude is reached during climb or descent in PMS.
- Selects climb or descent page when in PMS cruise and a new clearance altitude is armed.

PMS OPERATION REVIEW

PMS PLAN

Prior to loading PMS data:

STS / TEST Key .... PUSH / HOLD / RELEASE

Push and hold STS / TEST key and verify mode annunciators, line select keys, data display and PMS warning annunciator are illuminated. Release STS / TEST key and verify airframe / engine type is correct as displayed and software program identification number is displayed.

Cost Index Factor .... ENTER INTO SCRATCHPAD

Enter Cost Index Factor into scratchpad using the data entry keys.

Note: The Cost Index Factor is loadable from 0 to 255. This will effect OPT speeds and altitudes. If no value is loaded for Cost Index Factor, PMS will use a default value of zero. Cost Index Factor may be loaded while in flight.

Line Select Key 1 .... PUSH

Push Line Select key 1 to enter COST Index Factor into data line 1.

Drag / Fuel Flow Factors .... ENTER INTO SCRATCHPAD

Enter drag factor (KD), fuel flow factor (KF) into scratchpad using data entry keys. KD and KF may have values from – 9.9 to ± 9.9. Default is zero. Values for KD and KF affect OPT speeds.

Line Select Key 2 .... PUSH

Push Line Select key 2 to enter KD and KF data.

Descent Default Speed .... ENTER

Descent default speed can be changed on this page only while on the ground.

To load the PLAN page:

PLAN Key .... PUSH

Push PLAN key and observe PLAN page is displayed in scratchpad.

Note: All data on this page is required for complete PERF OPERATION. If all data is not entered, only limited PERF functions are available.

(Continued)

GWT..ENTER INTO SCRATCHPAD

Enter GWT into scratchpad. Push Line Select key 1 to transfer GWT into Data Line 1.

FUEL..ENTER INTO SCRATCHPAD

Enter FUEL into scratchpad. Push Line Select key 2 to transfer FUEL into Data Line 2.

TRIP..ENTER INTO SCRATCHPAD

Enter TRIP distance into scratchpad. Push Line Select key 3 to transfer TRIP distance into Data Line 3.

<u>Note</u>: Unreasonable GWT and FUEL will cause **CHECK GWT** or **CHECK FUEL** (respectively) messages to appear in scratchpad.

Editing any parameter, except fuel, will cause a recomputation to take place.

No other pages are available (except the STS / TEST page) until planning data is entered.

Observe flashing ↑ in scratchpad. BOD GWT and BOD FUEL weights are being computed and are displayed as ----. Move slew switch up or down until PLAN-CRZ page is displayed.

<u>Note</u>: Data on PLAN CRZ page is not necessary for system engagement. If no data is entered, planned trajectory will be based on no altitude constraints, zero wind and standard day temperature.

CRZ Altitudes ....ENTER INTO SCRATCHPAD

Enter CRZ altitudes (flight levels) into scratchpad. Push Line Select key 1 to transfer CRZ altitude(s) into Data Line 1.

<u>Note</u>: If an altitude is armed above the planned altitude but below maximum altitude (in flight), altitude will change on PLAN-CRZ page to agree with new armed altitude. If altitude above maximum is armed, the arm will be cancelled by the PMS approximately 2 seconds later. (Maximum altitude is gross weight dependent with an upper limit of 37,000 feet.)

(Continued)

Wind Component ....ENTER INTO SCRATCHPAD

Enter WIND COMPONENT into scratchpad (+ for tailwind, - for headwind).

Note: A positive wind component entry does not require a + sign. However, for a negative wind component, first push the Alternate Function key, then the – key, then the WIND COMPONENT.

The loaded wind continues to be displayed and can be edited in flight. However, computations begin to use current wind when the first PLAN altitude is reached.

Push Line Select key 2 to transfer WIND COMPONENT to Data Line 2.

TEMP Or DEV ....ENTER INTO SCRATCHPAD

Enter TEMP at initial cruise altitude or the corresponding DEV (deviation from standard at initial flight level) preceded by a / to scratchpad. Push Line Select key 3 to enter TEMP or DEV into Data Line 3. In flight, this line changes to single engine maximum altitude with distance and time to that altitude.

Note: The loaded TEMP / DEV continues to be displayed and can be changed at any time before reaching 15,000 feet. Above 15,000 feet, editing of TEMP / DEV is inhibited and computations are based on current deviation.

In flight, the PLAN page TRIP distance changes to BOD / ALT.

GWT, FUEL and BOD distance display current data in flight. These parameters can be edited at any time.

Distance to BOD is entered TRIP distance minus 30 NM and BOD ALT is 10,000 feet. These are initial values and can be edited.

BOD definition is primarily used by the PMS to compute an initial flight profile. Further geographic definition of the BOD is done on EXPANDED BOD page.

If BOD is to be expanded further while on the PLAN page:

Line Select Or VERT WPTS Key ....PUSH

Push Line Select key or VERT WPTS key and observe WPTS page is displayed. Slew up until BOD line display comes into view.

(Continued)

Line Select Key ....PUSH

Push Line Select key adjacent to BOD line display and observe PMS displays WPT BOD* page.

Note: Data line of WPT BOD* page contained lateral position data of BOD, which can be defined as a VOR / DME, ILS / DME, VOR or ILS frequency / distance or a VOR frequency / radial / distance.

Lateral Position Data ....ENTER INTO SCRATCHPAD

Enter lateral position data into scratchpad using data entry keys.

Note: A / must be inserted between a frequency and radial and between a radial and distance entry.

Line Select Key 1 ....PUSH

Push Line Select key 1 and observe lateral position data is displayed in data line one.

Note: Data line 2 defines desired speed / wind speed / wind direction at BOD. Any or all of these can be inserted, but if omitted, wind will default to zero and speed will be that used during descent if BOD is above 10,000 feet or 250 knots if BOD is 10,000 feet or lower.

Wind data can be loaded only after lateral position has been completely loaded and will default to zero if altitude definition is changed.

Speed / Wind Speed / Wind Direction.....ENTER INTO SCRATCHPAD

Enter speed, /, wind speed, /, wind direction into scratchpad using data entry keys.

Note: Any speed above 130 knots can be loaded into system and PMS will compute a deceleration phase into profile.

Line Select Key 2 ....PUSH

Push Line Select key 2 and observe speed / wind speed / wind direction is displayed in data line 2.

(Continued)

Note: Data line 3 displays BOD distance and altitude. Distance and/or altitude on this line can be loaded at any time (in flight or on ground), except when within 200 NM of a BOD that is defined relative to a VOR / DME and that VOR / DME is tuned and being used for distance update. If an attempt to edit BOD distance is made under this condition, it will not be accepted and advisory message **DISTANCE UP, DATING** will be displayed.

Distance / Altitude....................................ENTER INTO SCRATCHPAD

Enter distance and/or / altitude into scratchpad using data entry keys.

Line Select Key 3 ....PUSH

Push Line Select key 3 and observe distance and/or / altitude are displayed in Data Line 3.

PLN DES W/V page:

PLN DES W/V page allows loading of wind data at three flight levels. Winds are used to develop a vertical wind profile for descent.

Note: PLN DES W/V page may be selected after a GWT and TRIP or BOD distance have been entered on PLAN page and BOD GWT and BOD FUEL have been computed.

Winds may be entered in any order of altitude but a wind direction and speed must be specified.

Altitude of a wind may be entered in feet or flight level but will always be displayed to nearest flight level.

Winds are entered in relation to airplane heading. Wind component is then used b the PMS to develop a descent vertical wind model.

PMS maximum wind shear is 20 knots per 1000 feet. If an edit not within this limit is made, the message **CHECK WIND PROFILE** will be displayed in scratchpad.

To enter data on PLN DES W/V page:

Altitude / Wind Direction / Wind Speed .ENTER INTO SCRATCHPAD

Appropriate Line Select Key ....PUSH

Enter altitude / wind direction / and wind speed into scratchpad. Push Line Select key 1, 2, or 3 and observe wind data is now displayed in corresponding data line.

(Continued)

Note: To enter a second or third wind, repeat previous steps using remaining blank data lines and their appropriate Line Select key.

Clearing of a wind from a data line may be accomplished by pushing CLEAR key then pushing appropriate Line Select key.

Winds may be edited at anytime. However, once below an altitude, a wind is no longer used by the PMS.

When a REPLAN is desired:

When edits are made on the PLAN page, the PMS makes adjustments as required to the current computed profile.

A second procedure, REPLAN, completely clears the current profile from the PMS and allows for the definition of a new profile.

Note: REPLAN is automatically accomplished at the end of the PMS profile, but can be manually initiated any time a new profile (climb, cruise, descent) is desired.

PLAN key ....PUSH

Push PLAN key and observe PLAN page is displayed.

CLEAR Key / LINE SELECT Key 3 .... PUSH / PUSH

Push the CLEAR key then Line Select key 3 and observe the message **CONFIRM PLAN** is displayed in Data Line 3 and Line Select key 3 is illuminated.

Line Select Key 3 ....PUSH

Push Line Select key 3 again.

At this point, (1) GWT and FUEL weight are retained and continue to be updated and (2) all other flight plan data previously entered into PMS is cleared, including all of the PLAN CRZ page and the geographic definition of BOD, if previously entered.

BOD distance, ALT and other planning data can now be entered and the new profile will be computed by the PMS.

PMS PLAN (TRIP DATA NOT ENTERED)

Note: When current trip related data is not available to the PMS, only limited operation of the system is possible. This occurs when any of the following conditions exist:

- The airplane leaves the ground with TRIP distance not entered on the PLAN page.
- The airplane flies past the bottom of descent (BOD) without subsequent entry of a new BOD distance and altitude.
- The airplane is in climb past the PMS computed top of descent (TOD).
- BOD distance and ALT are cleared from PLAN page.

PMS operations under any of these conditions will be limited to a pitch and thrust coupled speed hold mode which will be identified as CLB (NON OPT), CRZ (NON OPT) or DES (NON OPT). No profile computations will be made by the PMS, but maximum / minimum speeds and engine limits will be computed and honored and the airplane will not be allowed to climb or descent through selected altitude.

PLAN Key ....PUSH

Push PLAN key and observe PLAN page is displayed.

GWT...ENTER

Enter gross weight into scratchpad.

Line Select Key 1 ....PUSH

Push Line Select key 1 to transfer GWT into data line 1.

If only gross weight is entered into the PMS CDU, no profile related data will be displayed. Therefore, PMS will only operate in a coupled speed hold mode, within the constraints of minimum / maximum speeds, engine limits and selected altitude.

Note: Only NON OPT, CLB, CRZ, and DES modes are available under these circumstances.

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PMS CLIMB

Initial selection and entry into a PMS climb mode can only be completed after the following conditions have been satisfied:

- Climb vertical speed greater than 240 FPM (**CLB** annunciator illuminated), and selected altitude above current altitude.
- TRI not in takeoff or go-around.
- Either FD or AP engaged.
- PMS valid.
- Autothrottle engaged.

Note: All these conditions are normally satisfied during takeoff at 1000 ft. AGL when climb power is set. PMS should normally be engaged after clean-up and acceleration.

PERF Button ....PUSH

Push the PERF button and observe that autothrottle and pitch FMA's display **PERF CLB**.

When transitioning from PERF CRUZ to CLB and a higher altitude has been armed (observe auto-selection of CLB OPT page and illumination of Line Select key 1 with **SPD** and **SEL** alternatively flashing in data line 1).

Note: PERF modes are disconnected whenever any other DFGS pitch axis mode is selected, or whenever another autothrottle mode is selected, or whenever flap position exceeds approximately 26° extended, or whenever PMS is invalid or whenever T.O. or TO FLX is selected on TRI.

Line Select Key 1 ....PUSH

Push Line Select key 1 to engage CLB OPT mode.

Note: When transitioning from CRZ (NON OPT) to CLB OPT, a short duration speed bug transient may occur.

If an altitude is armed above planned altitude, altitude on PLAN CRZ page will change to agree with armed altitude.

If the 250 knot speed restriction is displayed in data line 1, speed bug will be at 250. However, PMS will control the autothrottles and FAST / SLOW indicator will center at 2.5 knots below the 250 knot restriction.

(Continued)

The 250 knot vertical event for climb is displayed in Data Line 3.

Bracketed quantity indicates speed restriction is in effect.

To clear the (250) knot speed restriction:

CLEAR Key .... PUSH

Line Select Key 1 Or 2 .... PUSH

Note: If Line Select key 1 was pushed, observe Line Select key 1 illuminated with **SPD** and **SEL** alternately flashing and unrestricted speed displayed in Data Line 1.

If Line Select key 3 was pushed, observe Data Line 3 display flashing between **CLEAR** and current display.

Line Select Key 1 Or 3 .... PUSH

Push Line Select key 1 or 3 (same key as used in the preceding step). Observe removal of restriction with the new speed displayed in Data Line 1.

Note: Removal of speed restrictions can also be obtained by calling up the vertical waypoint BOD page and editing CLEAR in the line where restriction is displayed.

At altitudes of 27,000 feet or above, **SPD** is displayed as a Mach number.

If a climb other than CLB OPT is desired:

CLB (NON-OPT)

Desired Speed .... ENTER INTO SCRATCHPAD

Enter desired speed into scratchpad using the data entry keys.

Note: Display changes from speed (SPD) to Mach (M.) at leading digit of speed entry as follows:

1 through 4 – IAS

5 through 9 – MACH

If leading decimal is used, any Mach entry that does not exceed the limit speeds will be accepted by the system.

(Continued)

Line Select Key 1 ....PUSH

Push Line Select key 1 and observe it is illuminated with **SPD** and **SEL** alternately flashing in Data Line 1 and page title changed to CLB (NON OPT). Push Line Select key 1 again to engage mode.

Note: Further edits may be made to change speed as required.

CLB OPT page can be recalled by slewing on this page and pushing Line Select key 1 or editing CLEAR on line 1.

CLB MAX

Slew Switch ....PUSH

Push SLEW switch in either direction until CLB MAX page is displayed. Observe Line Select key 1 is illuminated and **SPD** and **SEL** alternately flashing in Data Line 1.

Line Select Key 1 ....PUSH

Push Line Select key 1 to engage mode.

Note: IAS / MACH is computed by system for maximum angle of climb. CLB MAX speed is the higher of 1.5 V_S for a clean airplane or 1.3g buffet (low).

CLB OPT page can be recalled by slewing on this page and pushing Line Select key 1 or editing CLEAR on line 1.

Climb Altitude / Distance Inquiry:

The altitude / distance inquiry procedure is valid only from present position on the profile to the next top of climb (TOC) point. Editing of an altitude below current altitude will result in a **CHECK ENTRY** message. Editing of an altitude or distance beyond the next TOC point will be accepted in line 3 but the remainder of the parameters will be dashed.

Note: This procedure will allow entry of an altitude or distance in Data Line 3 of any CLIMB page (except when trip data is not loaded), thus creating a new vertical event called ALT*, with its corresponding altitude / distance time data.

If an altitude / distance inquiry is desired:

Note: A CLIMB page must be displayed, (but does not need to be engaged) in order to make an altitude / distance inquiry. If not on a CLIMB page, push the CLB key and observe that ENGAGED mode is displayed.

(Continued)

Altitude Inquiry:

Altitude Desired ....ENTER INTO SCRATCHPAD

Enter desired altitude into scratchpad using the data entry keys.

Line Select Key 3 ....PUSH

Push Line Select key 3 and observe data is now displayed On Data Line 3.

Note: The distance and time in Data Line 3 will decrement until desired altitude is reached, then Data Line 3 will change to display the next vertical event.

Distance Inquiry:

Distance Desired ....ENTER INTO SCRATCHPAD

Enter desired distance into scratchpad using the data entry keys.

Line Select Key 3 ....PUSH

Push Line Select key 3 and observe data is now displayed in Data Line 3.

Note: The altitude and time now correspond to the desired distance. Distance and time also decrement for this edit case. Altitude will vary slightly but will always be that projected to be reached in the displayed distance and time.

Distance inquiries are limited to 999 NM.

PMS CLIMB (TRIP DATA NOT ENTERED)

CLB (NON OPT) mode, without profile related data, is the only available mode during climb.

To initiate a speed change:

Desired SPD ....ENTER INTO SCRATCHPAD

Enter desired SPD into scratchpad using the data entry keys.

Line Select Key 1 ....PUSH

Push Line Select key 1 and observe desired **SPD** now displayed in data line 1, with **SPD** and **SEL** alternately flashing, and Line Select key 1 is illuminated. Push Line Select key 1 again to command new speed.

Note: Speed editing is the only operation that can be performed on this page.

Thrust target is dashed (EPR ----) when mode is not engaged.

PMS CRUISE

Initial selection and entry into a PMS cruise mode can only be completed after the following conditions have been satisfied:

- Vertical speed less than 240 FPM (**CRZ** annunciator illuminated) and selected altitude within 512 feet of current altitude.
- TRI not in takeoff or go-around.
- Either FD or AP engaged.
- PMS valid.
- Autothrottle engaged.

PERF Button .... PUSH

Push the PERF button and observe autothrottles and pitch FMA's display **PERF CRZ**.

Note: When transitioning to PERF CRZ from a climb or decent mode, the PMS will capture selected altitude automatically.

At capture of planned altitude (from PLAN CRZ page), the PMS will transition to CRZ OPT or CRZ (NON OPT) when a non optimum cruise speed has been armed.

At capture of any other altitude (intermediate level-off), PMS will transition to CRZ (NON OPT) at currently commanded speed.

CRZ OPT:

The CRZ OPT will be auto-selected whenever a transition is made from climb to cruise within 1024 feet of PLAN altitude.

CRZ (NON OPT):

Note: This mode is entered when climb or descend is interrupted by an intermediate altitude clearance. The airplane captures the altitude and PMS mode becomes CRZ (NON OPT) at the currently commanded speed.

CRZ (NON OPT) can also be created by editing IAS or Mach on the CRZ page.

(Continued)

If a speed change is desired:

Desired Speed..ENTER INTO SCRATCHPAD

Enter the desired speed into scratchpad using the data entry keys.

Line Select Key 1 ....PUSH

Push Line Select key 1 and observe **SPD** and **SEL** alternately flashing in Data Line 1 and desired speed now displayed. Push Line Select key 1 again to command new speed.

Note: Speed or Mach may be edited at any time. The CRZ (NON OPT) can thus be armed for entry at transition to CRZ.

After speed edit, the remaining page data is for the edited speed.

Display changes from speed to Mach at leading digit of speed entry as follows:

5 or Less – IAH

5 or More – MACH

If leading decimal is used, any legal Mach entry will be accepted by the system.

To return to the CRZ OPT page:

Slew Switch ....PUSH

Push SLEW switch in either direction until the CRZ OPT page is displayed. Observe Line Select key 1 is illuminated and **SPD** and **SEL** are alternately flashing in Data Line 1.

Line Select Key 1 ....PUSH

Push Line Select key 1 to command CRZ OPT mode.

Note: CRZ OPT can also be obtained from the CRZ (NON OPT) page by pushing the CLEAR key and then pushing Line Select key 1 twice.

(Continued)

HOLD / ENDUR

Note: HOLD / ENDUR mode and display is a cruise mode where speed is controlled to a minimum fuel flow as computed for current conditions.

HOLD ./ ENDUR speed is based on one of the two airplane configurations:

- Clean.
- Slats extended, flaps zero.

This speed is limited to V_{MAX} / V_{MIN} which will consider current flap extension.

If HOLD / ENDUR mode is desired:

Note: If not on a CRUISE page, push the CRZ key to obtain a CRUISE page before starting procedure.

Slew Switch ....PUSH

Push SLEW switch in either direction until HOLD / ENDUR page is displayed. Observe that Line Select key 1 is illuminated and **SPD** and **SEL** are alternately flashing in Data Line 1.

Line Select Key 1 ....PUSH

Push Line Select key 1 to command mode.

To return to CRZ OPT page:

Slew Switch ....PUSH

Push SLEW switch in either direction until the CRZ OPT page is displayed. Observe Line Select key 1 is illuminated and **SPD** and **SEL** are alternately flashing in Data Line 1.

Line Select Key 1 ....PUSH

Push Line Select key 1 to command CRZ OPT mode.

During cruise, 5 minutes before computed top of descent, the PLAN page with the message **DIST TO BOD?** is automatically displayed.

Caution: Prior to initiating a descent under PMS control, it is essential that the distance to BOD be confirmed. Errors in distance to BOD can be caused by diversions from the originally planned route of flight or drop outs by VOR / DME data to the PMS during flight.

(Continued)

The **DIST TO BOD?** scratchpad message must be cleared in accordance with one of the following methods:

- If the BOD is defined relative to a VOR and bottom of descent distance displayed is less than 200 NM, verify that the BOD definition is correct, BOD VOR is tuned and that no VOR / DME flags are present.
- Push CLEAR key to clear the **DIST TO BOD?** message.

  Note: BOD distance displayed in this case will be the distance direct from present position to the BOD point.
- In all other cases, BOD distance must be cross-checked against other navigation systems or charts. If displayed BOD distance is not correct, edit to correct values.

When BOD distance is correct, push the CLEAR key to clear the **DIST TO BOD?** message.

Note: After clearing the **DIST TO BOD?** message, the PMS will display the preselected DESCENT page. If a descent mode has not been selected, PMS will automatically display **DES** (NON OPT).

ARM ALT? will be displayed on scratchpad if a lower than cruise altitude is not selected and armed.

PLN CRZ W/V Page:

The PLN CRZ W/V page advises pilot of the characteristics of the cruise wind model being used by the PMS, and will allow edits of model based on pilots knowledge of winds above and below airplane's current altitude.

Note: Based on pilot inputs, PMS will compute a modified optimum altitude.

This page is available only in cruise at a PLAN altitude.

If PLAN CRZ W/V page is desired:

PLAN Key ....PUSH

Push PLAN key and observe PLAN page is displayed. Slew up or down until PLN CRZ W/V page is displayed. Observe Data Line 2 displays current measured wind direction, speed and component of that wind along airplane heading.

(Continued)

Note: No edits are allowed on Data Line 2.

Data Lines 1 and 3 respectively default to altitudes 4000 ft above and below the current cruise altitude with zero wind shear in that altitude band.

When loading data into lines 1 and 3, both wind angle and speed must be entered at the same time.

If default altitudes are to be used, it is not necessary to load altitude into PMS.

To enter winds on PLN CRZ W/V page:

Altitude (If Applicable) /
Direction / Speed......................................ENTER INTO SCRATCHPAD

Enter altitude (if other that a default altitude), / , direction, / , and speed of wind into scratchpad. Push Line Select key 1 or 3 to enter data on corresponding data line. To enter second wind, repeat above step entering data on remaining Data Line by using appropriate Line Select key.

Note: After an edit has been made, the edited line and optimum altitude display are bracketed to indicate that each is resultant of an edit.

Bracketed optimum altitude will also appear on all other pages where optimum altitude is normally displayed.

Wind direction and speed edits will be dashed if the data line 2 component changes by more than 20 knots due to a wind change or a turn to a new heading.

To clear a previous edit:

CLEAR Key / Line Select Key... PUSH / PUSH

Push CLEAR key and then push appropriate Line Select key. Observe that Data Line has reverted to default altitude and direction and speed of wind are now dashed.

Cruise Altitude / Distance Inquiry:

The altitude / distance inquiry procedure is valid only from present position on the profile to the next top of climb (TOC) point. Editing of an altitude below current altitude will result in a **CHECK ENTRY** message. Editing of an altitude or distance beyond the next TOC point will be accepted in Line 3, but the remainder of the parameters will be dashed.

(Continued)

Note: This procedure will allow entry of an altitude of distance in Data Line 3 of any CRUISE page (except when trim data is not loaded), thus creating a new vertical event called ALT, with its corresponding altitude / distance / time data.

If an altitude / distance inquiry is desired:

Note: A CRUISE page must be displayed in order to make an altitude / distance inquiry. If not on a CRUISE page, page the CRZ key and observe that the engaged mode is displayed.

Altitude Inquiry

Altitude Desired ....ENTER INTO SCRATCHPAD

Enter desired altitude into scratchpad using the data entry keys.

Line Select Key 3 ....PUSH

Push Line Select key and observe data is now displayed on Data Line 3.

Note: The distance and time in Data Line 3 will now decrement until desired altitude is reached. Then Data Line 3 will change to display next vertical event.

Distance Inquiry

Distance Inquiry......................................ENTER INTO SCRATCHPAD

Enter desired altitude into scratchpad using the data entry keys.

Line Select Key 3 ....PUSH

Push Line Select key 3 and observe data is now displayed in Data Line 3.

Note: The altitude and time now correspond to the desired distance. Distance and time also decrement for this edit case. Altitude will vary slightly but will always be that projected to be reached in the displayed distance and time.

Distance inquires are limited to 999 NM.

PMS CRUISE (TRIP DATA NOT ENTERED)

CRZ (NON OPT) mode, without profile related data, is the only available mode during cruise.

Note: Speed editing is the only operation that can be performed on this page.

To initiate a speed change:

Desired Speed..ENTER INTO SCRATCHPAD

Enter desired speed into scratchpad using the data entry keys.

Line Select Key 1 ....PUSH

Push Line Select key 1 and observe desired SPD now displayed in Data Line 1 with SPD and SEL alternately flashing and Line Select key 1 is now illuminated. Push Line Select key 1 again to command new speed.

Note: Thrust target is dashed (EPR ---) when mode is not engaged.

PMS DESCENT

Initial selection and entry into a PMS descent mode can only be completed after the following conditions have been satisfied:

- Descent vertical speed greater than 240 feet per minute (**DES** annunciator illuminated) and selected altitude below current altitude.
- TRI not in takeoff or go-around.
- Either FD or AP engaged.
- PMS valid.
- Autothrottle engaged.

PERF Button ....PUSH

Push the PERF button and observe autothrottle and pitch FMA's display **PERF DES**.

When transitioning to PERF DES mode and time to TOD vertical event is less than 5 minutes, armed altitude below current altitude and BOD definition has been completed.

Line Select Key 1 ....PUSH

Push Line Select key 1 and observe **VERTICAL ALERT** light illuminated 15 seconds prior to TOD.

Note: Descent begins at optimum point (distance and time to TOD = ZERO).

There are three descent modes available in PERF, DES (NON OPT), DES OPT and DES (V/S).

PMS maintain control of pitch and thrust in all modes.

Descent speed, BOD distance and BOD definition may be edited in all PERF DES mode except when trip data is not loaded.

If BOD distance is less than 200 NM with BOD defined relative to a VOR and the BOD VOR is tuned and being used for distance updates, attempts to edit BOD distance will not be accepted.

PMS will continue to compute a descent profile for defined conditions. Pitch and thrust commands (within limits of allowable speed and thrust) will be commanded by the PMS.

(Continued)

When unplanned tailwinds are present, the trajectory of the airplane will tend to go long, and an **ADD DRAG** advisory message will be displayed based on the altitude / miss distance. Similarly, a **REMOVE DRAG** message will be displayed if the miss distance is negative and speedbrakes are extended.

If descent is interrupted by an intermediate clearance altitude, the PMS will transition to CRZ (NON OPT) at selected altitude.

<u>DES (NON OPT)</u>

This page is auto-selected during cruise after clearing **DIST TO BOD?** message. Without a lower altitude armed, **ARM ALT?** message will appear in scratchpad, and Line Select key 1 will be illuminated with alternate flashing of **SPD** and **SEL** in Data Line 1.

<u>Note</u>: Descent speed will be default value unless changed by pilot.

This page will be displayed any time lower altitude is armed. However, Line Select key 1 will not be illuminated and **SPD** and **SEL** will not flash in Data Line 1 until 5 minutes from TOD.

Line Select Key 1 ....PUSH

Push Line Select key 1 for automatic entry at TOD.

<u>Note</u>: Page will again be displayed at 6 NM to TOD with a **SELECT DES?** message if mode has not been engaged as described.

To initiate a speed change:

Desired Speed..ENTER INTO SCRATCHPAD

Enter desired speed into scratchpad using the data entry keys.

Line Select Key 1 ....PUSH

Push Line Select key 1 and observe, speed displayed in Data Line 1 with **SPD** and **SEL** flashing and Line Select key 1 illuminated. Push Line Select key 1 again to command speed.

<u>Note</u>: If the 250 knot speed restriction below 10,000 feet is in effect, **VERTICAL ALERT** it will illuminate when projected time to 10,000 feet is 15 seconds. The command shown on the CDU and speed bug will begin to decrease as altitude approaches 10,000 feet such that 250 knots will be achieved at 10,000 feet.

(Continued)

DES OPT

Note: The DES OPT page can be called up at any time to arm the DES OPT mode.

For auto-selection of DES OPT at TOD:

DES Key ....PUSH

Slew Switch ....PUSH

Push SLEW switch in either direction until DES OPT page is displayed. Observe **SPD** and **SEL** flashing in Data Line 1.

Line Select Key 1 ....PUSH

Push Line Select key 1 to COMMAND mode.

To transition to DES OPT from another DESCENT mode:

Slew Switch ....PUSH

Push SLEW switch in either direction until DES OPT page is displayed. Observe **SPD** and **SEL** flashing in Data Line 1. Push Line Select key 1 to COMMAND mode.

Note: If the 250 knot speed restriction is in effect, the **VERTICAL ALERT** light will illuminate when the projected time to 10,000 feet is 15 seconds. Speed will transition to 250 knots or remain at optimum, whichever is lower.

DES (V/S)

To transition to DES (V/S), PMS must be CRZ or DES, and armed altitude below current altitude. Observe **DES (V/S) NOW?** is displayed in Data Line 2 of DES (OPT or (NON OPT)) page.

Line Select Key 2 ....PUSH

Push Line Select key 2 and observe DES (V/S) page is displayed with **SEL** and **V/S** alternately flashing in Data Line 2. Push Line Select key 2 again to COMMAND mode.

Note: At entry to mode, PMS will hold current IAS and a vertical speed of 1000 feet per minute. EPR display in line 1 is thrust command required to hold IAS and V/S as displayed.

Either IAS or V/S can be edited.

(Continued)

Any IAS – Vertical speed combination can be edited, provided drag is not required, to maintain that combination. IAS edit must be within V_{MIN} / V_{MAX} limits. V/S edit must be within – 200 to – 6000 feet per minute or a **CHECK ENTRY** message will be displayed. If the V/S edit is greater than the maximum V/S obtainable with idle thrust and no drag at descent speed, a **MAX RATE XXX** message will be displayed.

Note: When both quantities are enclosed in brackets, editing CLEAR into Data Line 1 will allow IAS to vary and hold displayed V/S at idle thrust. Or, editing CLEAR into line 2 will allow V/S to vary and hold displayed IAS at idle thrust.

Intercept of DES OPT or DES (NON OPT) Profile from DES (V/S):

In DES (V/S), when within 6 NM of the armed descent profile, the page for the armed mode is auto selected with a **SELECT DES** message displayed in the scratchpad.

Line Select Key 1 ....PUSH

Push Line Select key 1 to disengage DES (V/S) and begin descent to BOD.

PERF mode at BOD:

When the airplane is either at BOD altitude and beyond BOD or below BOD altitude, the PMS reverts to a (NON OPT) mode and trip data is deleted. The PLAN page will be automatically selected with ENTER PLAN in the scratchpad to allow data to be entered for a new profile.

Descent Altitude / Distance Inquiry:

The altitude / distance inquiry procedure is valid only from present position on the profile to the end of defined profile. Edit of an altitude above current altitude will result in a **CHECK ENTRY** message; edit of an altitude or distance beyond the end of profile will be accepted in line 3, but the remainder of the parameter will be dashed.

Note: This procedure will allow entry of an altitude or distance in Data Line 3 of any DESCENT page except when trip data is not loaded, thus creating a new vertical event called ALT*, with its corresponding altitude / distance / time data.

If an altitude / distance inquiry is desired:

Note: A DESCENT page must be displayed in order to make a altitude / distance inquiry. If not on a DESCENT page push the DES key and observe that the ENGAGED mode is displayed.

(Continued)

Altitude Inquiry

Altitude Desired ....ENTER INTO SCRATCHPAD

Enter desired altitude into scratchpad using the data entry keys.

Line Select Key 3 ....PUSH

Push Line Select key 3 and observe data is now displayed in Data Line 3.

Note: The distance and time in Data Line 3 will now decrement until desired altitude is reached. Data Line 3 will change to display next vertical event.

Distance Inquiry

Distance Desired ....ENTER INTO SCRATCHPAD

Enter desired altitude into scratchpad using the data entry keys.

Line Select Key 3 ....PUSH

Push Line Select key 3 and observe data is now displayed in Data Line 3.

Note: The altitude and time now correspond to the desired distance. Distance and time also decrement for this edit case. Altitude will vary slightly but will always be that projected to be reached in the displayed distance and time.

Distance inquires are limited to 999 NM.

PMS DESCENT (TRIP DATA NOT ENTERED)

DES (NON OPT) mode, without profile related data, is the only mode available during descent.

Note: Speed editing is the only operation that can be performed on this page.

To initiate a speed change:

Desired Speed..ENTER INTO SCRATCHPAD

Enter desired speed into scratchpad, using data entry keys.

Line Select Key 1 ....PUSH

Push Line Select key 1 and observe desired **SPD** is displayed in Data Line 1 with **SPD** and **SEL** alternately flashing and Line Select key 1 is illuminated. Push Line Select key 1 again to command new speed.

PMS CROSS-POINT (X-PT*)

PMS cross-point (X-PT*) procedure allows entry of an altitude / distance X-PT* event in Data Line 3 of any CRZ or DES page when POA is active.

Note: A maximum of two cross-points maybe defined at any one time. After a cross-point has been used by PMS, it may be replaced by another.

X-PT* procedure cannot be used before last planned TOC on PMS profile has been reached. If X-PT* data is entered prior to last planned TOC, PMS will display **X-PT BEFORE TOC** in scratchpad.

If **X-PT BEFORE TOC** is displayed, pushing CLEAR key will remove message from scratchpad.

If a X-PT* is desired:

WAYPOINTS Page:

Note: If a X-PT* is created on a WPTS page, PMS will automatically place X-PT* in proper sequence according to its altitude.

Altitude / Distance....................................ENTER INTO SCRATCHPAD

Enter altitude, / and distance into scratchpad using data entry keys.

Line Select Key ....PUSH

Push any Line Select key and observe X-PT* and its corresponding altitude / distance and time have been placed in their proper sequence and are now displayed on Data Line 2.

CRZ or DES Page:

Altitude / Distance....................................ENTER INTO SCRATCHPAD

Enter altitude, / and distance into scratchpad using data entry keys.

Line Select Key 3 ....PUSH

Push Line Select key 3 and observe PMS automatically transitions to basic waypoints page with X-PT* event displayed on Data Line 2.

Note: After a X-PT* has been created, altitude and/or distance may be edited (one at a time) on WPTS page.

(Continued)

If an altitude or distance edit is desired:

Altitude or / Distance ....ENTER INTO SCRATCHPAD

Enter altitude or / distance into scratchpad using data entry keys.

Note: If a distance edit is to be made, it must be preceded by a /.

Line Select Key ....PUSH

Push appropriate Line Select key and observe altitude or / distance now displays edited value.

If further definition of a X-PT* is desired:

Note: A X-PT* definition can be expanded further to include lateral position and a speed restriction.

To expand X-PT* definition, PMS must display WPT X-PT* page. WPT X-PT* page may be displayed by one of the following methods:

- From a CRZ or DES page, push VERT WPTS key and slew until X-PT* event is displayed, then push Line Select key adjacent to X-PT*.
- From a VERT WPTS page, slew until X-PT* event is displayed, then push Line Select key adjacent to X-PT*.
- From expanded PPOS page, slew up until WPT-X-PT* page is displayed.
- From expanded BOD page, slew down until WPT X-PT* page is displayed.

Note: Data Line 1 defines lateral position of X-PT*. It can be loaded as a frequency, frequency / radial / distance or, if an ILS frequency is used, as a frequency / / distance.

Lateral Position Data ....ENTER INTO SCRATCHPAD

Enter lateral position data into scratchpad using data entry keys.

Line Select Key 1 ....PUSH

Push Line Select key 1 and observe lateral position data is displayed in Data Line 1.

Desired Speed..ENTER INTO SCRATCHPAD

Enter desired speed (at X-PT*) into scratchpad using the data entry keys.

(Continued)

Line Select Key 2 ....PUSH

Push Line Select key 2 and observe desired speed is displayed in Data Line 2.

Note: If no speed is entered, PMS will automatically display a X-PT* speed after X-PT* has been completely defined on Data Line 3. This speed will be an optimum POA speed, non-optimum default descent speed or 250 KTS if X-PT* is at or below 10,000 feet and speed restriction is in effect.

Altitude / Distance....................................ENTER INTO SCRATCHPAD

Enter altitude / distance into scratchpad using data entry keys.

Line Select Key 3 ....PUSH

Push Line Select key 3 and observe altitude and distance are displayed in Data Line 3.

Note: Distance will now decrease until X-PT* is reached.

PMS SINGLE ENGINE OPERATION

Note: Engine failure is detected based on either a loss of an EPR sensor or excessive difference between EPR readings (indicating loss of power on one engine).

At engine failure, PMS will annunciate SELECT MCT thrust mode unless mode was previously engaged.

Note: If engine failure indication is in error, pushing CLEAR key will remove **SELECT MCT** message from scratchpad.

MCT Button .... PUSH

Push MCT button on TRI and observe **MCT LIM** is displayed in Data Line 2.

PMS will continue to command single engine speeds and a complete 2 engine profile until engine failure has been confirmed by one of the following:

- If above single engine maximum altitude, confirmation is automatic. As airplane decelerates and approaches driftdown speed, PMS automatically enters driftdown mode.
- If below single engine maximum altitude, PMS will display PLAN CRZ page with **CONFIRMED ENGINE FAILURE** and **1 ENG FL XXX XXXMN X:XX**, alternately flashing in Data Line 3. Pushing Line Select key 3 will engage engine out mode and will clear flashing display from Data Line 3.

Note: At or below single engine maximum altitude, all CLB, CRZ and DES modes are available.

Above single engine maximum altitude, PMS can only be engaged into DES OPT or DRIFTDOWN submodes or engine out.

After entering DRIFTDOWN, PMS will continue to command driftdown speed and TRI selected thrust until two engine operation is restored or one of the following occurs:

- Arrival at single engine maximum altitude.
- Arrival at armed altitude below single engine maximum altitude.
- Start of descent profile to BOD.

A cross-point (X-PT*) cannot be created in this mode and all previously inserted cross-points are cancelled.

(Continued)

Driftdown Altitude / Distance Inquiry:

Note: The driftdown altitude / distance inquiry will allow entry of an altitude or distance in Data Line 3 of the DRIFTDOWN page, thus creating a new vertical event called ALT*, with its corresponding altitude / distance / time data.

Altitude / distance inquiry procedure is valid only between present position and the end of the driftdown profile.

Note: If inquiry is to a point beyond driftdown profile it will not be accepted by the PMS.

If an Altitude / Distance inquiry is desired:

Altitude

Altitude Desired ....ENTER INTO SCRATCHPAD

Enter desired altitude into scratchpad using data entry keys.

Line Select Key 3 ....PUSH

Push Line Select key 3 and observe data is now displayed on Data Line 3.

Note: Distance and time in Data Line 3 will decrease until desired altitude is reached, then Data Line 3 will change to display next vertical event.

Distance

Distance Desired ....ENTER INTO SCRATCHPAD

Enter a / and the desired distance into scratchpad using data entry keys.

Line Select Key 3 ....PUSH

Push Line Select key 3 and observe data is now displayed in Data Line 3.

Note: Altitude and time now correspond to desired distance. Distance and time also decrease until zero distance and time are reached. Altitude will vary slightly but will always be that projected to be reached in displayed distance and time.

Distance inquires are limited to 999 NM.

OPERATIONAL ADVISORIES

Note: CDU Operational Advisory Messages appear in scratchpad of CDU. **CDU MESSAGE** annunciator (located on main instrument panel) will illuminate when a CDU scratchpad message appears. Procedures for clearing these messages are listed in the following tables.

MESSAGE	CONDITION(S)	CLEARED BY	REMARKS, NOTES
ENTER PLAN	1. ENGINE start before plan data entered.	1. GWT entry. 2. PLAN entry.	
CHECK GWT	1. Entered GWT outside limits (88 – 151 KLB).	1. Entry of GWT within limits. 2. CLEAR key. 3. Selection of different display page.	Will not accept GWT outside limits.
CHECK FUEL	1. Engine start before fuel weight entered. 2. Entered fuel outside limits (10 – 43 KLB).	1. Fuel weight entry. 2. CLEAR key. 3. Selection of different display page if due to entry.	Fuel displays blanked.
MAX LAND WT?	1. Predicted GWT at BOD greater than 135 KLB.	1. Correction of previously entered planning data if in error. 2. Entry of additional planning data: alt, wind, and temp. 3. CLEAR key.	Correction or entry of additional data may cause predicted BOD gross wt. To fall below max.
CHK BOD FUEL	1. Predicted fuel at BOD less than 5 KLB. 2. Preflight or distance to BOD less than 500 nautical miles.	1. Correction of previously entered data if in error. 2. Entry of additional planning data: alt and wind. 3. CLEAR key.	Correction or entry of additional data may cause predicted BOD fuel to increase above minimum.

(Continued)

MESSAGE	CONDITION(S)	CLEARED BY	REMARKS, NOTES
V_{MAX} XXX KT OR V_{MIN} XXX KT	1. Airplane too fast / slow for configuration. 2. Edited longitudinal speed outside V_{MAX} / V_{MIN} limits.	1. Aircraft speed within MAX / MIN limits. 2. CLEAR key, entry of acceptable speed, or different page selection.	This message is not clearable with the CLEAR key. Status message annunciator is cleared. Control laws hold speed within V_{MAX} / V_{MIN} limits when PMS is engaged. PMS does not accept commands outside V_{MAX} / V_{MIN}.
ARM ALT?	1. In CLB or DES with clearance altitude not armed. 2. Time to TOD 5 min. or less and lower altitude not armed.	1. ARM appropriate altitude. 2. CLEAR key.	Alert does not appear until clearance altitude input for 10 sec. Unchanged. Cannot initiate CLB or DES from CRZ without armed ALT.
SELECT DES	1. In CRZ, +1 – 6 NM to TOD, DES not enabled. 2. In DES V/S within 3 NM of profile.	1. CLEAR, DES enabled / selected or 3 NM past TOD.	Replaced by PAST TOD message if airplane remains in CRZ 3 NM past TOD.
PAST TOD	1. In CRZ and 3 past NM past TOD.	1. CLEAR, begin DES, or arm another DES mode.	Defaults to DES page with message.
MAX RATE XXXX	1. In DES V/S and edited V/C – IAS combination cannot be held without drag.	1. Edit new V/S or IAS.	Not clearable with CLEAR key.
CHECK ENTRY	1. Improper sequence of entries in scratchpad.	1. Reload scratchpad data. 2. CLEAR key. 3. Selection of a different display page.	

(Continued)

MESSAGE	CONDITION(S)	CLEARED BY	REMARKS, NOTES
DIST TO BOD?	1. 5 minutes prior to TOD.	1. Edit BOD distance. 2. CLEAR key.	PLAN page auto selected when message appears.
STEP CLB?	1. 5 min. or less to step climb point in cruise and higher altitude not armed.	1. Higher altitude armed. 2. CLEAR key.	
CHECK ALTITUDE	1. Entered altitude negative or greater than operational ceiling. 2. Illegal entry, i.e., single digit.	1. Enter altitude in range. 2. CLEAR key. 3. Selection of different display page.	BOD altitude limited to 37,000 feet or TOD altitude.
CHECK TEMPERATURE	1. Entered temperature more than 25°C from standard.	1. Enter in range temperature. 2. CLEAR key. 3. Selection of different display page.	
CHECK WIND	1. Wind magnitude greater than 250 kt or wind direction outside range 0 to 360°.	1. Enter in range parameter. 2. CLEAR key. 3. Selection of different page.	
CONFIRM PLAN	1. In cruise below current planned altitude for 10 minutes.	1. Edit current planned altitude to current cruise altitude. 2. CLEAR key.	If message is cleared with CLEAR key, the 10 minute timer is restarted. Permanent clear is obtained if current planned altitude is edited t current cruise altitude. The PLN-CRZ page shall be auto selected unless data is being loaded on another page.

(Continued)

MESSAGE	CONDITION(S)	CLEARED BY	REMARKS, NOTES
CHECK DISTANCE	Entered trip distance less than 50 NM (on GND only) or greater than upper limit.	1. Entry of an in tolerance distance. 2. CLEAR key. 3. Selection of a different page.	
D / R	1. Invalid data from both VORs, both DMEs, or one VOR and one DME. 2. DES not VOR / DME referenced.	1. Valid data from both VOR and DME on either 1 or 2 side. 2. Define BOD as FREQ / RDL / DIS.	Message is not clearable by CLEAR key. Indicates PMS is dead reckoning due to inadequate nav data. (Only shows in DES mode.)
ADD DRAG	See NOTES.	Extending speed brakes or **REMOVE DRAG** message conditions.	Not displayed in driftdown.
REMOVE DRAG	See NOTES.	Retracting speed brakes or **ADD DRAG** message conditions.	
BOD ABOVE X-PT	1. Altitude is greater than a X-PT altitude.	1. CLEAR key.	
BOD BEFORE X-PT	1. Distance entered is less than the distance to a X-PT + 1 NM.	1. CLEAR key.	
CHECK WIND PROFILE	1. An edit wind shear greater than 20 KTS per 1,000 ft.	1. Enter in range parameter. 2. CLEAR key. 3. Selection of different page.	
DISTANCE UPDATING	1. Distance updating is occurring. 2. If a X-PT BOD is tied to a WPT, a distance edit will be rejected.	1. Change X-PT or BOD definition. 2. CLEAR key.	

(Continued)

MESSAGE	CONDITION(S)	CLEARED BY	REMARKS, NOTES
LAND FLAPS	1. PERF mode exit due to landing flap configuration.	1. Exit Land Flap configuration and re-enter PERF mode. 2. CLEAR key.	
NO ENTRY	1. Entry of planned cruise altitudes on the PLAN-CRZ page will be inhibited in DRIFTDOWN mode.	1. CLEAR key.	
SELECT CL LIMIT	1. Inadequate thrust to maintain speeds above V_{MIN} at high altitudes with CRZ thrust selected.	1. CLEAR key. 2. Manually select CLB thrust limit.	
SELECT MCT LIMIT	1. At detection of ENGINE OUT.	1. CLEAR key. 2. Select MCT on TRI.	
X-PT BEFORE TOC	1. WPT distance is less than last TOC distance.	1. Check distance. 2. CLEAR key.	
X-PT BELOW BOD	1. Altitude is less than BOD altitude and distance is less than distance to BOD but greater than X-PT distance, if X-PT is previously defined.	1. Check altitude. 2. CLEAR key.	
X-PTS FULL	1. Two X-PTS were previously defined.	1. CLEAR key.	

(Continued)

MESSAGE	CONDITION(S)	CLEARED BY	REMARKS, NOTES
X-PT PAST BOD	1. Distance entered is greater than distance to BOD and altitude is greater than or equal to BOD's altitude.	1. Check altitude and distance. 2. CLEAR key.	

Notes: An **ADD DRAG** advisory message will be displayed based on altitude / miss distance from profile.

A **REMOVE DRAG** message will be displayed if muss distance is negative and speed brakes are extended and in DRIFTDOWN any time drag is out.

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* 3	12/01/00	* 34	12/01/00	* 66	12/01/00
* 4	12/01/00	* 35	12/01/00	* 67	12/01/00
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* 8	12/01/00	* 39	12/01/00		
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FUEL
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FUEL

General

The airplane fuel system is designed to provide an uninterrupted fuel flow under all conditions and attitudes encountered in normal service, with minimum system management. The system is also designed to permit fuel servicing activities to be accomplished from a single point.

Fuel Tanks

The three integral fuel tanks, left main, center, and right main have a capacity of 5,840 U.S. gallons (22,104 liters) or 39,128 pounds (17,748 kilograms), based on a density of 6.7 pounds per gallon (0.803 kilograms per liter).

A sump drain is located at the lowest inboard point of each main tank and aft at the bottom of each auxiliary fuel tank (if installed). Two sump drains are located in the center tank. Four magnetic, dripless sticks (magna-sticks) are located in each main tank and one in the center tank. An inclinometer in the nosewheel well provides airplane ground attitude information for fuel gauging calibrations. Sump drains and magna-sticks can be operated with a screwdriver.

Some airplanes have two auxiliary fuselage tanks (not used at Continental), one in the mid-cargo compartment and one in the aft cargo compartment. Each auxiliary tank has a capacity of 565 gallons (2,139 liters) for a total of 1,130 U.S. gallons (4,278 liters) or 7,571 pounds (3,343 kilograms).

Tank Venting

The fuel tank vent system is designed to provide fuel tank ventilation, scavenging from the vent system, and overfill protection during fueling.

The vent system is composed of bellmouth openings, fuel line vent valves, and climb vent float valves housed within each tank, and vent boxes located in each wing tip.

Normally as fuel is consumed, air enters the tank through the vent lines.

If the tank is overfilled during refueling, the fuel will fill the vent lines and then move to the opposite wing vent box. If the vent box becomes overfilled, fuel will spill out onto the ramp. Therefore a fuel spill from a vent box indicates that the opposite wing is overfilled.

Note: The Center Tank vents to the right wing vent box along with the left wing main tank.

Fuel Feed

Each main fuel tank has two AC boost pumps installed. These pumps are connected in parallel to provide approximately 15 psi with one or both pumps operating. Either boost pump in the main fuel tanks has adequate flow to supply both engines at takeoff power. An interconnect system and cable operated crossfeed valve between the fuel tank systems permits use of fuel from either main fuel tank to both engines.

The two center tank pumps are connected in series to provide pressure higher than that of the main tank pumps, and insure usage of the center tank fuel even with both main tank pumps operating. When fuel is loaded in the Center tank, both pumps are selected ON until the center tank is empty. One way poppet valves are installed in the center tank supply lines to prevent engine flameout caused by the engine pumps suction feeding air from an empty center tank.

Each AC boost pump is powered by a different electrical system so that one pump in each tank remains operational with a loss of either left or right AC power.

Note: With only one pump operating in each fuel tank, the center fuel will not feed normally due to the operation of the poppet valves.

A 28-volt DC start pump, operated by a switch on the overhead panel, is installed in the right main tank and is used for APU or engine starting when AC power is not available. The start pump is powered by the DC Transfer bus and has an output of approximately 10 psi maximum.

When the AC ground service bus is powered, the right aft AC fuel boost pump may be used for APU operation instead of the DC start pump.

Low fuel pressure (less than 5 psi) at engine inlet is indicated by a **L/R INLET FUEL LOW PRESS** light on the annunciator panel.

Fuel lines which pass through pressurized areas of the fuselage are shrouded to prevent possible leakage into the fuselage. The shrouds empty through pylon mounted drains on the lower aft fuselage.

Auxiliary Tank Fuel Transfer (not used at Continental)

The forward and aft auxiliary tanks transfer directly into the center tank, at an even rate (if Transfer Pump switches are in AUTO) when center tank reaches approximately 1,940 U.S. gallons (7,343 liters) or 13,200 pounds (5,987 kilograms).

The center tank fuel stop transfer float switches control operation of the transfer pumps to prevent overfilling the center tank. The **FWD/AFT AUX FUEL PUMP PRESS LOW** lights are armed when a transfer pump switch is in TEST or when in AUTO and the transfer float circuitry is in the fuel transfer mode.

Note: If power to the aux tank transfer control relay is interrupted (such as by bus switching) during fuel transfer, the relay will relax, remove power from the transfer pumps and end transfer. Automatic fuel transfer will start again, however, when the center tank float switch level is reached.

Fuel Tank Quantity Indicating

A standardized modular fuel gauging system is used which requires no adjustment or calibration after system installation or component replacement.

The Digital Fuel Quantity Display is located on the center instrument panel to indicate the quantity of the three tanks and gross weight. Operation of this display requires normal AC power.

An “A” or “B” channel may be selected for display.

A TEST button is installed to test the display before dispatch.

A Zero Fuel Weight feature allows the pilot to enter the dispatch ZFW which enables the gross weight display to add total fuel and provide an accurate Gross Weight for the flight.

For the refueler, an integral fuel load selector display panel located in the leading edge of the right wing, displays fuel quantity and load selection. A fuel control panel located adjacent to the fuel load selector display panel, controls the operation of the fill valves.

Fueling and Defueling

All fuel tanks can be fueled and defueled through a single-point fueling adapter and manifold located on the right wing. The method and quantity of refueling is determined by selective operation of the fuel control panel and fuel load selector display panel. The control panels, fuel fill valves and defueling valve are located in the right wing leading edge and are behind an access door. The fueling and defueling valves have pressure relief valves that vent into fuel tanks.

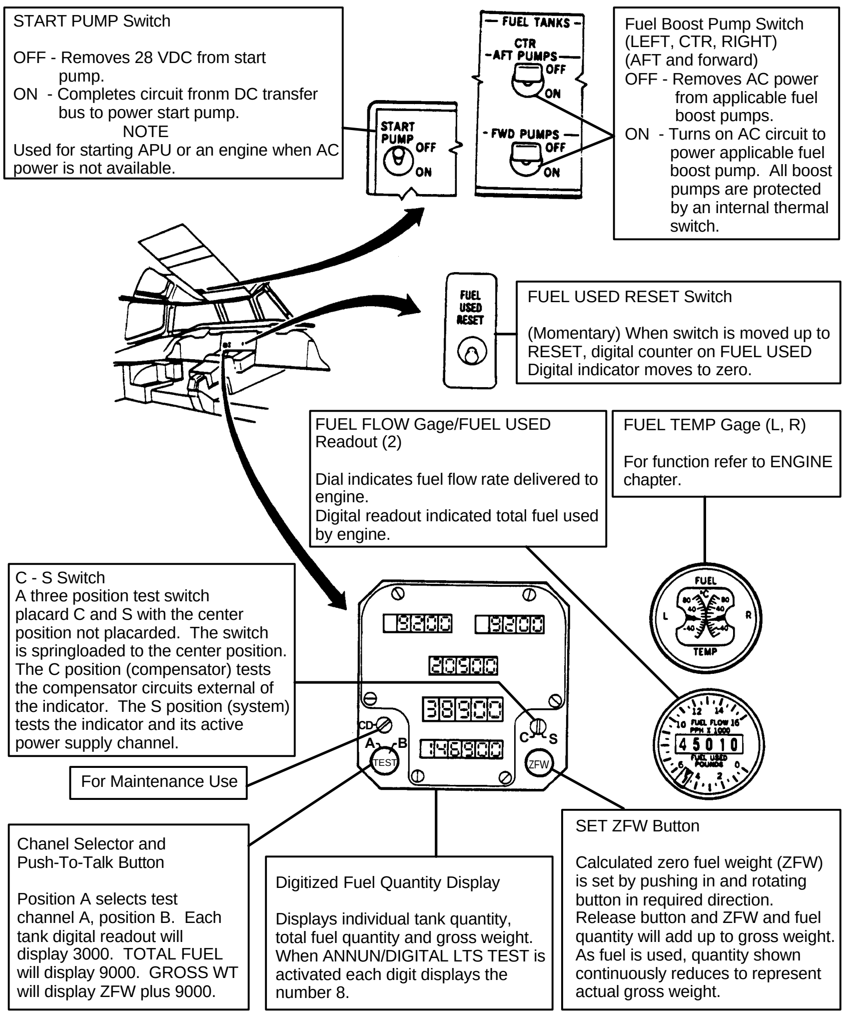
All fueling operations can be accomplished with airplane or externally supplied electrical power. If electrical power is not available for fueling operations, all fuel tank valves can be manually operated and fuel quantity measured using magnasticks. Fuel tanks may be defueled using tank boost pumps or by suction defueling. A ground service interphone jack is located near the fuel load selector panel.

Each fuel tank has a fuel fill valve that may be controlled automatically or manually as determined by the selection of individual guarded switches. A fuel level float switch in the center tank and two level float switches in each main tank will automatically close the fill valves when the tank is full. Various quantities of fuel in tanks can be predetermined by selection of quantities on the fuel load selector display panel.

The left and right main fuel tanks can be gravity refueled through overwing fill adaptors. The center tank can be refueled via the main fuel tanks by transferring fuel from either of the main tanks using main tank fuel boost pumps to transfer fuel through the defueling manifold and center tank fill valve.

When AC power is available, fuel can be transferred from the center tank using center tank boost pumps and by opening the defueling valve and the fill valve of the selected tank.

Note: During fueling and defueling operations, ground service equipment must be electrically grounded to the airplane through grounding receptacles provided near the fueling receptacle in right wing leading edge or on top of the wings near the overwing fill adapters.



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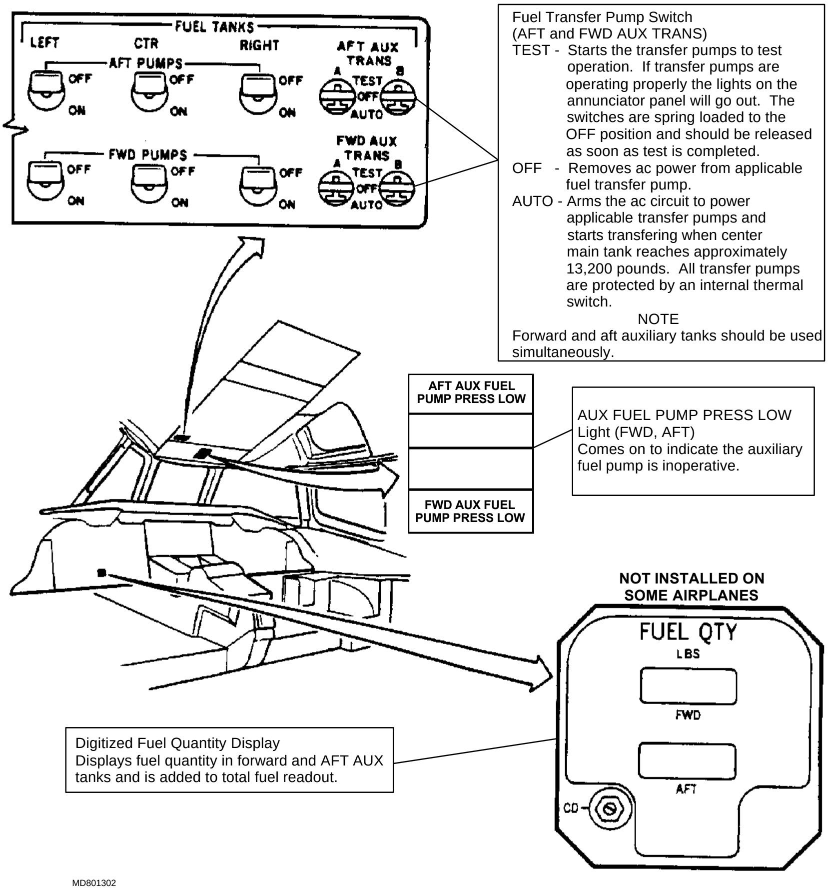
FUEL - CONTROLS AND INDICATORS



Fuel Transfer Pump Switch
(AFT and FWD AUX TRANS)

TEST - Starts the transfer pumps to test operation. If transfer pumps are operating properly the lights on the annunciator panel will go out. The switches are spring loaded to the OFF position and should be released as soon as test is completed.

OFF - Removes ac power from applicable fuel transfer pump.

AUTO - Arms the ac circuit to power applicable transfer pumps and starts transfering when center main tank reaches approximately 13,200 pounds. All transfer pumps are protected by an internal thermal switch.

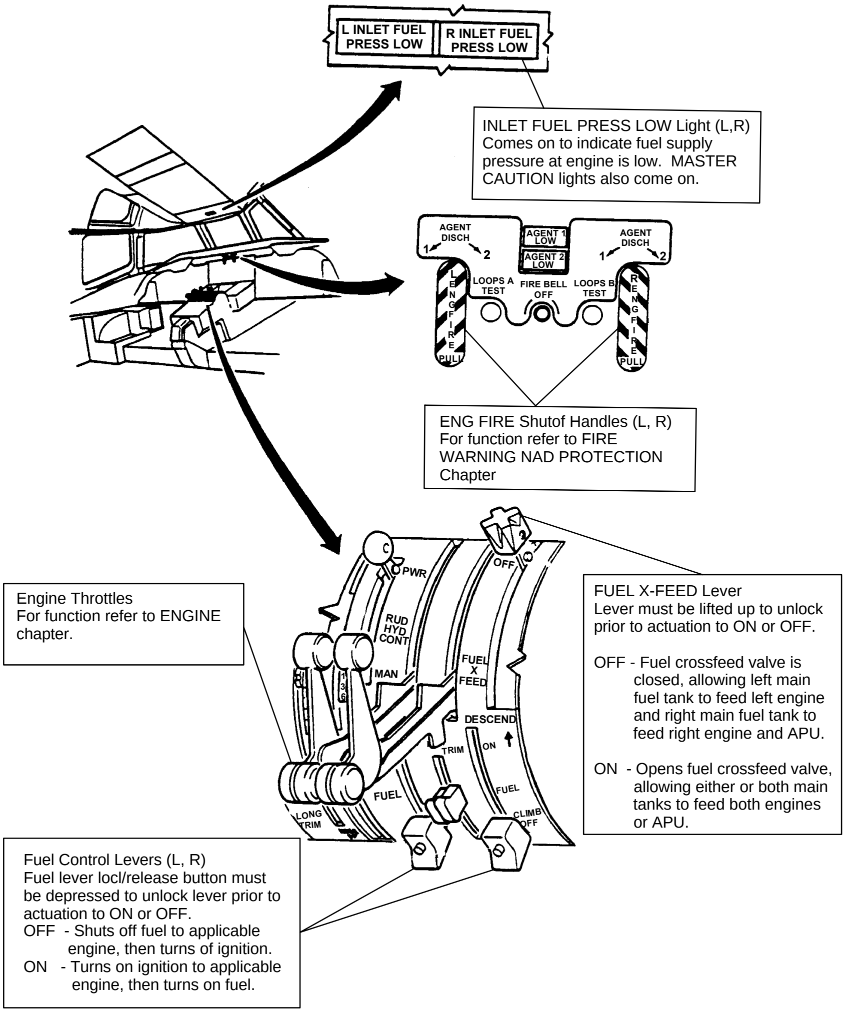
NOTE

Forward and aft auxiliary tanks should be used simultaneously.

AUX FUEL PUMP PRESS LOW Light (FWD, AFT)
Comes on to indicate the auxiliary fuel pump is inoperative.

Digitized Fuel Quantity Display
Displays fuel quantity in forward and AFT AUX tanks and is added to total fuel readout.

FUEL - CONTROLS AND INDICATORS



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FUEL - CONTROLS AND INDICATORS

FUEL SELECT Digital Indicator (5)

Digital display reflects numerically the fuel quantity selected by the set knob. FUNCTION knob must be at NORMAL and REFUEL knob must be at AUTO.

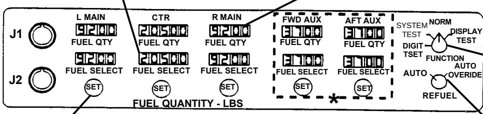
FUEL QTY Digital Indicator (5)

Indicates total fuel quantity in respective fuel tank when FUNCTION knob is at NORMAL.

FUNCTION Knob

DIGIT TEST - All individual digit readouts display an 8. MASTER REFUEL switch must be at AUTO FILL.
SYSTEM TEST - FUEL QTY digital readouts display 3000.

NORMAL - FUEL SELECT and FUEL QTY digital readouts display actual fuel quantity and/or fuel load selected.
DISPLAY TEST - FUEL QTY digital readouts display 3000.



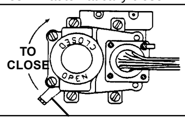
FUEL LOAD DISPLAY PANEL

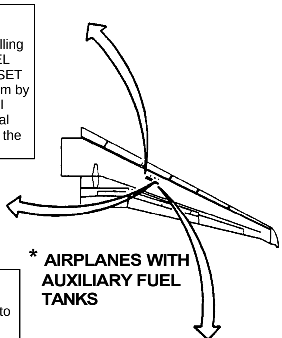
Fuel Load Selector SET knob (5)

When the REFUEL knob is at AUTO, pulling out and rotating SET knob changes FUEL SELECT digital display. Pushing in the SET knob activates automatic refueling system by opening the fuel-fill valves permitting fuel flow until fuel level reaches quantity equal to FUEL SELECT numeric display when the fuel-fill valves will automatically close.

REFUEL knob

AUTO - Turns on automatic fuel-fill valve system.
AUTO OVERIDE - Turns off automatic fuel-fill valve system and FUEL SELECT digital display. Fuel will flow into tank(s) until fuel level closes fuel-level float switches (full tanks).





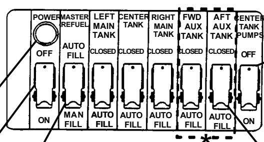
* **AIRPLANES WITH AUXILIARY FUEL TANKS**

FUEL FILL VALVE (5)

OPEN - Opens fill valve, allowing fuel to flow into respective fuel tank.
CLOSED - Stops fuel flow into fuel tank. Valve may be operated electrically by use of fuel control panel switches, or may be operated manually for manual fueling.

Fuel Transfer Switch

ON - Supplies power to center tank boost pumps if AC power is available. Enables fuel to transfer from center tank when defueling valve is opened and fill valve of selected tank is opened.
OFF - Boost pumps off.



Fueling POWER Light

When light is on, power is being supplied to groung refueling circuits.

Fueling POWER Switch

OFF - Removes power from fuel load selector display panel and fuel fill valve switches.
ON - Supplies power from battery or external power to fuel load selector display panel and fuel fill valve switches.

MASTER REFUEL Switch

AUTO - Provides electrical power to fuel-fill valve actuating motors and float switches for automatic refueling.
MANUAL - Removes electrical power from fuel-fill valve motors and float switches for manual refueling

Fill Valve Switches (5)

CLOSED - Electrically closes the tank fill valves.
AUTO FILL - Tank fill valves will close automatically when preset fuel quantity is reached in tanks.

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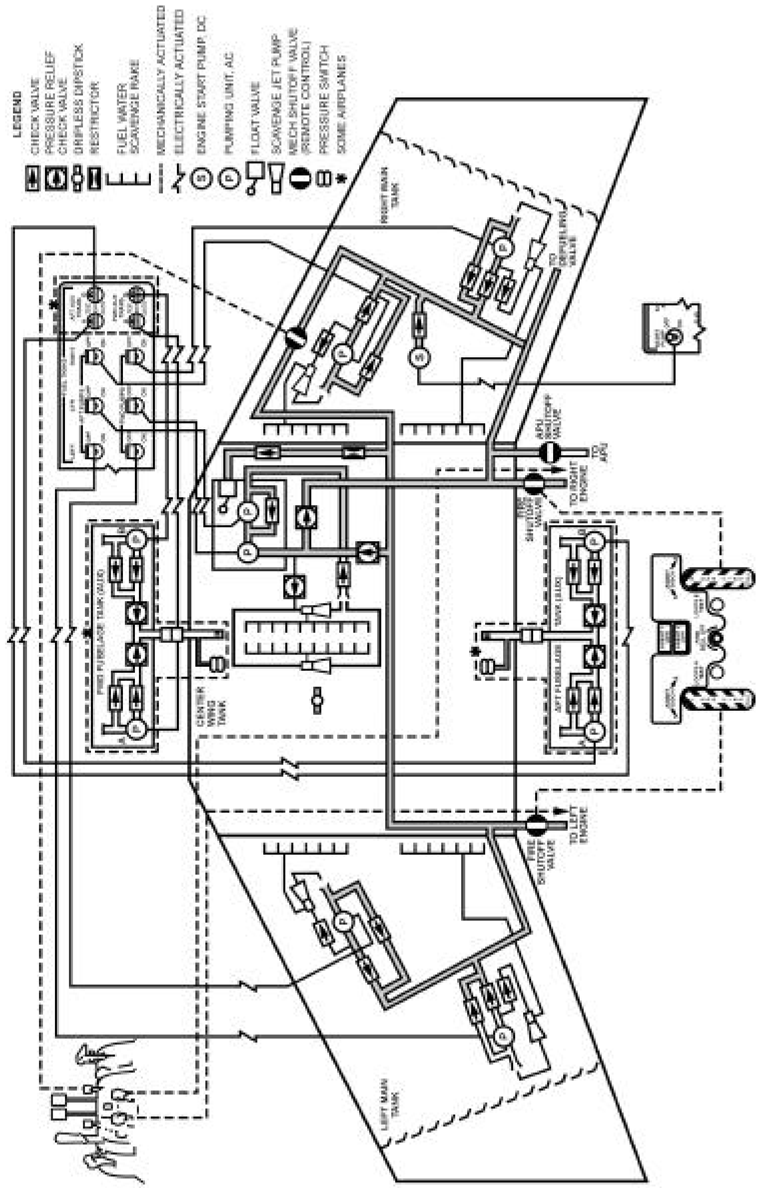
FUEL - CONTROLS AND INDICATORS



FUEL - FUEL FEED FUNCTIONAL SCHEMATIC

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HYDRAULICS, LANDING GEAR, AND BRAKES

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HYDRAULICS

General

The airplane has two independent hydraulic systems utilizing fire-resistant hydraulic fluid. Each system has a reservoir and is pressurized by a single engine-driven pump. Ground service provisions for each system are located in the main gear wheel wells. These include a ground service connection panel, a hand pump for building pressure for ground maintenance operations, and a spoiler shutoff and system depressurization valve.

Hydraulic Reservoir

The left and right hydraulic system reservoirs are located in left and right main gear wheel wells, respectively. Each reservoir supplies fluid to its own system exclusively. A manifold on the bottom of the reservoir ports fluid to supply lines for the engine-driven pump, the electrically-driven auxiliary hydraulic pump, and a ground service hydraulic hand pump. Internally, the reservoir utilizes system pressure of 3000 or 1500 psi to maintain a pressure head of approximately 30 or 15 psi. This pressure head ensures positive transfer of fluid to the pumps. The reservoir is protected against over-pressurization by a relief valve set for 47 psi. A temperature pick up in the reservoir will cause the applicable (**L** or **R**) **HYD TEMP HI** annunciator light to illuminate when hydraulic fluid temperature is above normal. An instruction plate provides filling instructions and direct fluid level indications for both system pressurized and unpressurized conditions. A fluid quantity transmitter, located at each reservoir, transmits fluid quantity information to the applicable hydraulic quantity indicator on the First Officer's instrument panel.

Hydraulic Pumps

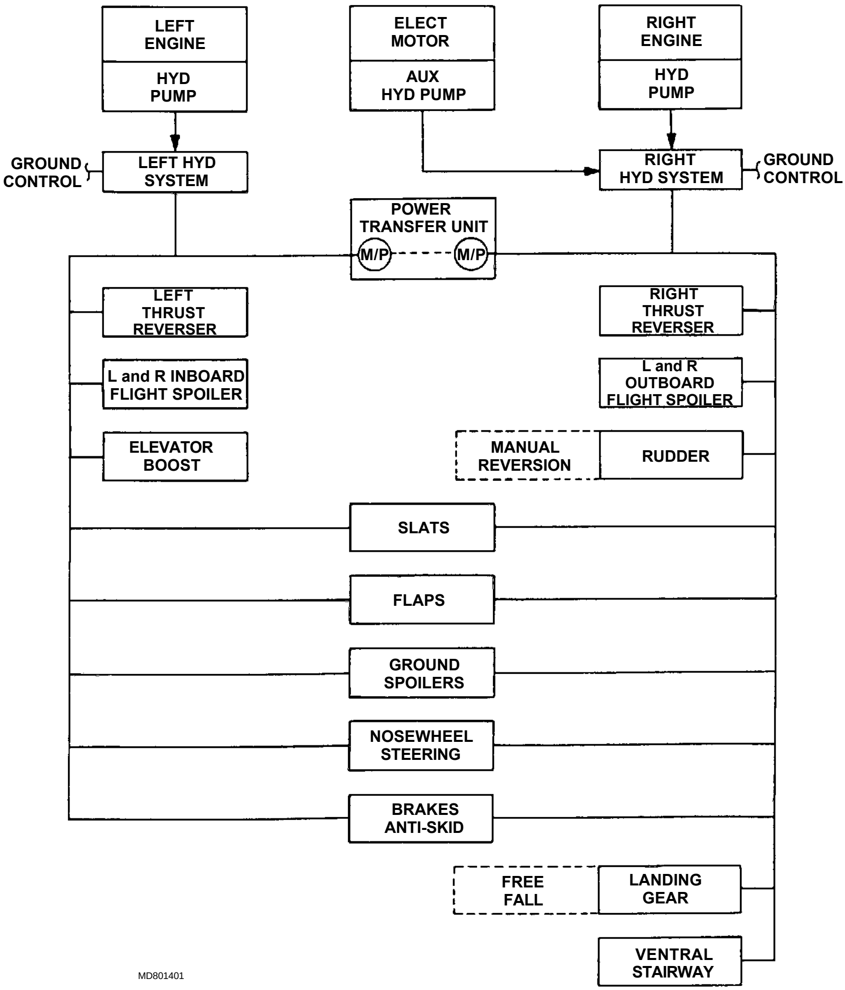
The left hydraulic system is pressurized by a system pump mounted on the left engine; a system pump mounted on the right engine powers the right system. Each pump is capable of providing pressure to 3000 psi during all flight modes; 1500 psi can be selected for cruise flight operation.

An auxiliary pump, incorporated into the right system, provides hydraulic pressure for landing gear operation, flight backup, preflight, and maintenance operations. The pump is electrically powered and is designed for continuous operation at 3000 psi.

A power transfer unit mechanically connects left and right hydraulic system and enables hydraulic pressure to be transferred from the highest to the lowest side (the high pressure side operates as a motor and the low pressure side operates as a pump). The unit is controlled by a single motor operating two shutoff valves, one in each hydraulic system. Operation is controlled by a switch on the First Officer's instrument panel. The shutoff valves will automatically close if either system reservoir quantity falls below a safe level.

Airplane systems that normally receive pressure from both hydraulic systems will operate at a reduced rate if one system is inoperative. Complete fluid supply to a system can be stopped by pulling the fire shutoff handle on the upper instrument panel for the engine desired. Pump operation is controlled by switches on the First Officer's instrument panel. Annunicator panel lights, one for each system, will illuminate whenever either system pressure is low.

A hand pump, installed in each main hydraulic system and located in the main gear well, supplements the standard power sources for ground actuation of the various subsystems. The quick disconnect fittings in the inlet suction line of each hand pump and/or auxiliary pump may be connected to a ground source of hydraulic fluid to manually fill the reservoirs. These pumps make the hydraulic systems completely self-sufficient. Hydraulic ground connections are provided in the forward end of each main gear well for servicing and testing each main hydraulic system.



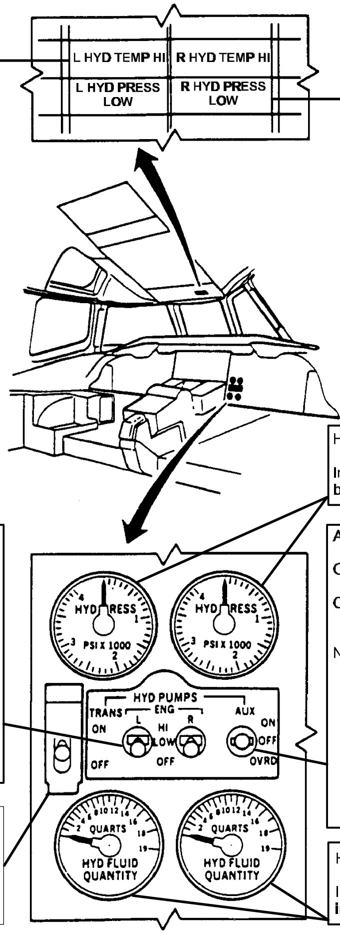
HYDRAULICS - BLOCK DIAGRAM

HYD TEMP Lights (L,R,)

Comes on to indicate hydraulic reservoir fluid temperature above normal. MASTER CAUTION lights will also come on.

HYD PRESS LOW (L,R)

Comes on to indicate hydraulic pressure I spoiler supply system drops below normal. MASTER CAUTION lights also come on.



HYD PRESS Gage (2)

Indicates system hydraulic pressure between pumps and reservoir.

ENG HYD PUMPS Switch (L,R)

NOTE: Engine pumps will operate at full output during electrical failure regardless of switch position.

HI - Engine-driven hydraulic pump will operate at 3000psi output.

LOW - Engine-driven hydraulic pump will operate at 1500 psi output.

OFF - No pressure output for system operation. Hydraulic fluid will circulate for pump lubrication and cooling.

AUX HYD Pumps Switch

ON - Turns on electrically driven hydraulic pump.

OFF - (Must be held in OVRD position) Auxiliary pump turned on.

NOTE: Auxiliary pump is protected from overheat damage by a thermal protective circuit that automatically shuts off pump when exceeding normal operating temperature. OVRD position bypasses protective circuit pump operation when needed.

TRANS HYD Pumps Switch

ON - Mechanically connects left and right hydraulic systems.

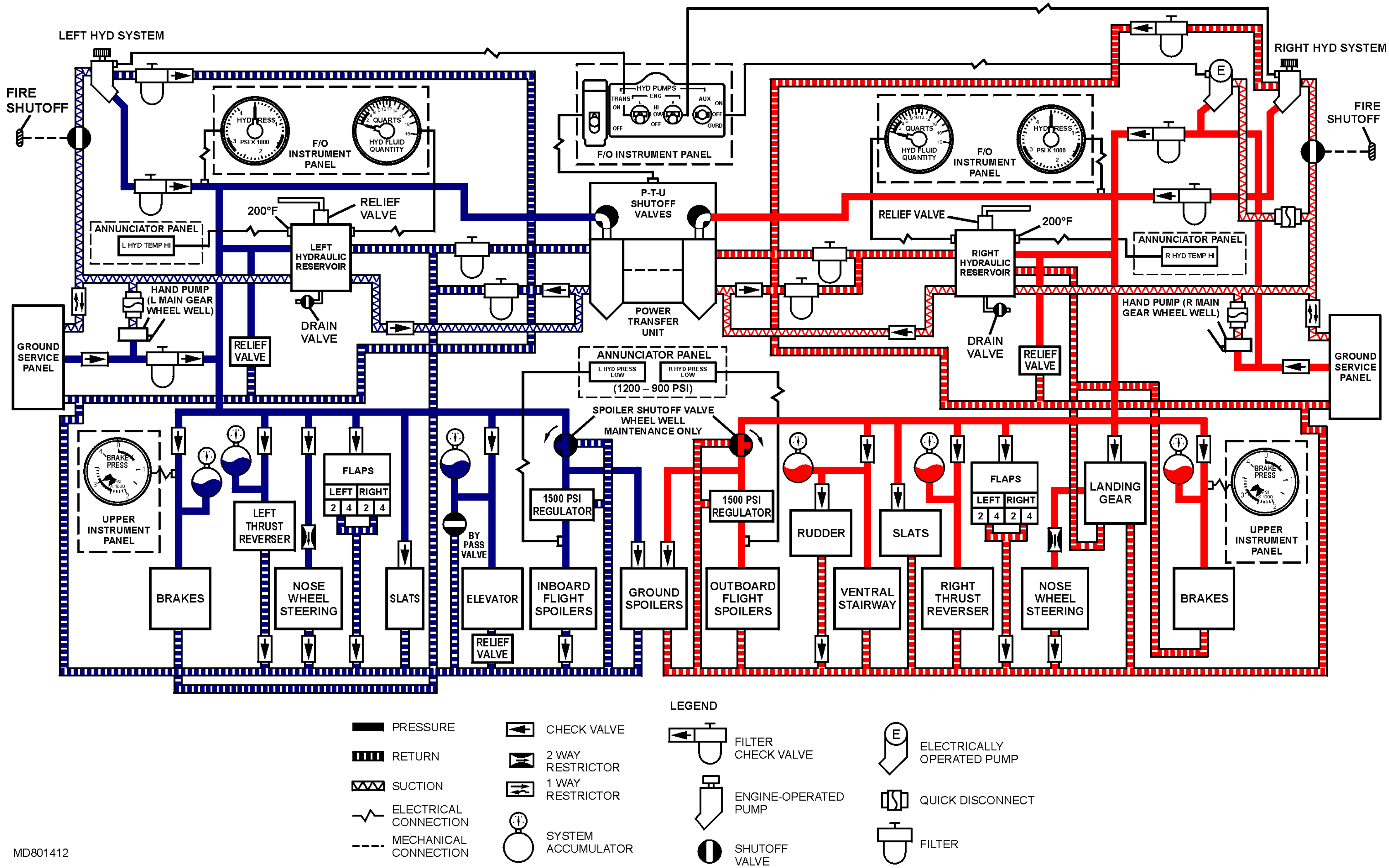
OFF - Mechanically separates left and right hydraulic systems.

HYD FLUID QUANTITY Gage (2)

Indicates quantity of hydraulic fluid in reservoir.

MD801402

HYDRAULICS - CONTROLS AND INDICATORS


LEFT HYD SYSTEM
RIGHT HYD SYSTEM
FIRE SHUTOFF
FIRE SHUTOFF
F/O INSTRUMENT PANEL
F/O INSTRUMENT PANEL
F/O INSTRUMENT PANEL
HYD PRESS
PSI X 1000
QUARTS
HYD FLUID QUANTITY
HYD PUMPS
TRANS
ENG
AUX
ON
OFF
HI
LOW
OVRD
P-T-U SHUTOFF VALVES
POWER TRANSFER UNIT
RELIEF VALVE
RELIEF VALVE
200°F
200°F
ANNUNCIATOR PANEL
L HYD TEMP HI
ANNUNCIATOR PANEL
R HYD TEMP HI
LEFT HYDRAULIC RESERVOIR
RIGHT HYDRAULIC RESERVOIR
HAND PUMP (L MAIN GEAR WHEEL WELL)
HAND PUMP (R MAIN GEAR WHEEL WELL)
DRAIN VALVE
DRAIN VALVE
RELIEF VALVE
RELIEF VALVE
GROUND SERVICE PANEL
GROUND SERVICE PANEL
ANNUNCIATOR PANEL
L HYD PRESS LOW
R HYD PRESS LOW
(1200 – 900 PSI)
SPOILER SHUTOFF VALVE WHEEL WELL MAINTENANCE ONLY
BRAKE PRESS
UPPER INSTRUMENT PANEL
UPPER INSTRUMENT PANEL
LEFT THRUST REVERSER
FLAPS
LEFT RIGHT
2 4 2 4
FLAPS
LEFT RIGHT
2 4 2 4
BY PASS VALVE
1500 PSI REGULATOR
1500 PSI REGULATOR
RUDDER
SLATS
LANDING GEAR
BRAKES
NOSE WHEEL STEERING
SLATS
ELEVATOR
RELIEF VALVE
INBOARD FLIGHT SPOILERS
GROUND SPOILERS
OUTBOARD FLIGHT SPOILERS
VENTRAL STAIRWAY
RIGHT THRUST REVERSER
NOSE WHEEL STEERING
BRAKES
LEGEND
PRESSURE
RETURN
SUCTION
ELECTRICAL CONNECTION
MECHANICAL CONNECTION
CHECK VALVE
2 WAY RESTRICTOR
1 WAY RESTRICTOR
SYSTEM ACCUMULATOR
FILTER CHECK VALVE
ENGINE-OPERATED PUMP
SHUTOFF VALVE
E
ELECTRICALLY OPERATED PUMP
QUICK DISCONNECT
FILTER
MD801412

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LANDING GEAR

General

The airplane has a tricycle landing gear that is mechanically actuated and hydraulically operated. Normally, actuated by a landing gear handle, the gear may be raised or lowered by pressure from the right hydraulic system or by pressure transferred from the left hydraulic system through the power transfer unit. When retracted, the gear is fully enclosed by doors. If the right hydraulic system fails, the gear can be mechanically released to free-fall to the extended and locked position. Dual, hydraulic-powered multi-disc wheel brakes with anti-skid control systems are provided on the main gear. An electrically monitored visual/aural/vocal indicating and warning system provides indication of gear and brake system status.

Spray deflectors on both main gear and nose gear assemblies serve to minimize water and slush ingestion on takeoff and landing.

A tail bumper assembly, mounted on the bottom of the aft fuselage, prevents structural damage if the aft fuselage should make contact with the ground.

Nose Gear

The nose gear assembly consists of dual wheels mounted on a steerable shock strut. The nose gear assembly is locked in both the extended and retracted positions by overcenter linkage. During normal operation, the overcenter linkage is released hydraulically to permit gear extension and retraction. If hydraulic pressure is not available, the overcenter links may be released by the emergency gear extension lever.

A ground shift mechanism, mounted on the nose gear strut, is operated by the compression and extension of the nose gear strut. When the strut is not compressed, the ground shift mechanism disengages the rudder pedal nosewheel steering mechanism, centers the nosewheel for retraction, and retracts the landing gear handle release button. The ground shift mechanism also actuates two ground control switches that establish ground or flight modes of operation.

Nose Gear Doors

The nose gear wheel well enclosure consists of two forward and two aft doors. The doors are mechanically operated by movement of the nose gear during retraction and extension. The forward doors are closed when the gear is extended but may be opened for ground maintenance operations.

Nose Wheel Steering

Nosewheel steering is hydraulically actuated and mechanically controlled by a steering wheel or rudder pedals. The steering wheel is the primary control used to maneuver the airplane at normal taxi speeds and provides 82° of turning angle in either direction. The rudder pedals are used to steer the aircraft at high speeds during takeoff and landing, and provide 17° of turning angle in either direction.

The nosewheel steering system consists of two independent control valves and actuating cylinders that are supplied hydraulic pressure from separate sources. The left steering cylinder receives pressure from the left hydraulic system; the right cylinder is supplied by the right system. Nosewheel steering, with only one hydraulic system operating, will function normally except for a reduction in maximum steering angle.

While the steering system is in the neutral position, the cylinders function as shimmy dampers. A manually operated bypass valve is actuated prior to towing the airplane, which deactivates the steering system permitting manual movement of the nose gear strut.

Main Gear

The airplane has two main gear assemblies consisting of dual wheels mounted on a shock strut. When extended, each main gear assembly is locked in the extended position by overcenter linkage. When retracted, the main gear assemblies will be held up by hydraulic pressure providing the engine driven hydraulic pumps are selected to provide 3000 psi. If the pumps are selected to provide 1500 psi, the main gear will rest upon the doors. If hydraulic pressure is not available for gear extension, the main gear door latches may be released by the emergency gear extension lever.

Main Gear Doors

Each main gear wheel well enclosure consists of a hydraulically operated main gear door and a mechanically operated outboard door. The main gear doors are mechanically latched when closed and support the main gear during flight. The main gear doors cycle to the closed position after the main gear approaches the fully extended position. The main gear doors may also be mechanically released and opened on the ground.

Visual / Aural Indicating and Warning System

Landing gear position and main landing gear door status is indicated by gear lights on the upper instrument panel. Landing gear position lights illuminate green to indicate that the landing gear and landing gear handle are in the down-and-locked position. The lights illuminate red when the landing gear is in any intermediate position between up-and-locked and down-and-locked or individually, when the associated landing gear assembly is not in the position that corresponds to the position of the gear handle and either one or both throttles are less than one-half inch from the idle stop position. The **GEAR DOOR OPEN** light will illuminate any time either one or both main gear doors are not closed.

The landing gear warning horn and vocal warning will sound when either one or both throttles are less than approximately one-half inch from idle stop position and the landing gear is not down-and-locked or the landing gear is down and locked but the gear handle is not in the DOWN detent. The landing gear warning horn and vocal warning will not sound unless the airplane's airspeed is less than 210 KIAS. The aural/vocal warnings will also sound any time the landing gear is not down-and-locked and the flaps are extended beyond approximately 26 degrees. The aural/vocal warnings may be silenced by pressing the GEAR HORN OFF button on the pedestal except when the landing gear is not down-and-locked and the flaps are extended beyond the approach flaps position.

Reference markings on each main gear overcenter link may be viewed from inside the airplane to confirm gear fully extended and locked. Nose gear verification is provided by an indicator on the pedestal in the flight compartment.

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BRAKES

Airplane wheel brakes can be applied by depressing the brake pedals. When either set of brake pedals are depressed, hydraulic pressure from both the left and right hydraulic brake systems is applied to the main wheel brakes. A fully automatic, pressure modulating, anti-skid system is installed. The anti-skid system will reduce hydraulic pressure if necessary to prevent tire skidding and provide maximum braking. The anti-skid system is electrically controlled and has a touchdown wheel protection circuit that prevents braking action prior to main gear wheel spinup. The system is deactivated whenever the gear handle is not in the DOWN detent, parking brakes set, arming switch at OFF, or airplane is at low taxi speeds. When the system is deactivated, braking action is mechanically controlled by pilot input at the pedals.

Each main gear wheel is equipped with a disc type power brake, actuated by two independent sets of pistons (4 in each set); each set is powered by one of the hydraulic systems. In addition, each system has an accumulator that will supply reserve brake pressure in the event of normal hydraulic pressure failure. A dual pointer pressure gauge provides visual indication of hydraulic pressure in each system.

A BRAKE TEMP gauge and an **OVHT** light provide visual indication of brake temperature. If main gear tires are exposed to excessive brake temperature, fuse plugs in the wheel will melt releasing tire pressure. Each brake assembly is equipped with wear indicators so that visual checks can be made of brake wear.

The parking brakes are set by depressing the brake pedals, pulling up on the park brake control knob (located in the center of the nose-gear steering wheel), and releasing the brake pedals. This mechanically opens the brake control valves and closes the anti-skid return lines in both hydraulic systems, trapping accumulator pressure in the wheel brake system. When the parking brake knob is raised, it actuates a switch that disables the anti-skid system and turns on **PARKING BRAKES ON** light. If parking brakes are not set and one to four **ANTI-SKID** lights are on, a parking brake or anti-skid malfunction is indicated. If throttles are advanced to a takeoff setting with the parking brake set, the aural/vocal warning system will be activated.

Automatic Brake System (ABS) (Some Aircraft)

When armed, the automatic brake system (ABS) will automatically apply brakes during landing and takeoff modes of flight. The ABS landing mode is armed prior to landing after the landing gear is extended by selecting MIN, MED, or MAX by the AUTO BRAKE selector switch and placing the AUTO BRAKE ARM/DISARM switch to ARM. The anti-skid system must be armed and operational as a condition for ABS operation. ABS landing mode is activated when spoilers are deployed either automatically or manually with throttle levers retarded and brake pedals released. Automatic braking is delayed after spoiler deployment for approximately 1 second in MAX position and approximately 3 seconds in MIN or MED positions to allow for normal nose wheel touchdown. ABS landing mode is inhibited if throttles are not retarded below 22 degrees. Pilot takeover can be initiated at any time, and the ABS will disarm and revert to normal anti-skid braking if either brake pedal is depressed beyond approximately 25 percent of travel, if throttle lever 1 or 2 is advanced beyond +22 degrees, or if the ARM-DISARM switch is placed in the DISARM position. The ARM/DISARM switch will drop to the disarm position and the ABS lights will illuminate for the above conditions. The ABS will also disarm and the ABS lights will illuminate if flaps are raised to less than 26 degrees with airplane speed above 70 knots. Stowing the ground spoilers will release brake pressure without disarming the ABS. The ABS lights will remain off and automatic braking will again be available if spoilers are re-deployed.

The ABS takeoff mode is armed by selecting T.O. on the AUTO BRAKE selector switch and placing the ARM/DISARM switch in the ARM position. The speedbrake/spoilers lever must be retracted and flaps must be selected to less than 26 degrees.

Takeoff aural warning horn will sound if either spoilers or ABS is armed and the other system is not armed. The ABS takeoff mode is activated during a rejected takeoff upon deployment of ground spoilers. If a rejected takeoff is initiated below 70 knots, the ABS reverts to landing mode operation and MIN braking is applied. At speeds greater than 70 knots, maximum dual-system automatic braking is applied immediately without any time delay. Pilot takeover can be initiated by either advancing throttle levers 1 or 2 beyond +22 degrees of travel or by depressing the brake pedals beyond 25 percent of travel. Both conditions will cause the ABS to disarm, the ARM/DISARM switch will fall to the disarm position, and the ABS lights on the glareshield will illuminate.

Note: If spoilers fail to deploy automatically, manual spoiler deployment will activate ABS.

An ABS malfunction will cause the system to automatically disarm. The ARM-DISARM switch will fall to the DISARM position, and the ABS lights, **AUTO BRAKE FAIL** light, and the **MASTER CAUTION** lights will illuminate. To rearm the ABS system after it has automatically disarmed, the AUTO BRAKE selector switch must be placed to the OFF position and then back to the deceleration setting and the ARM/DISARM switch must be placed to the ARM position. If the fault has cleared, the system will rearm.

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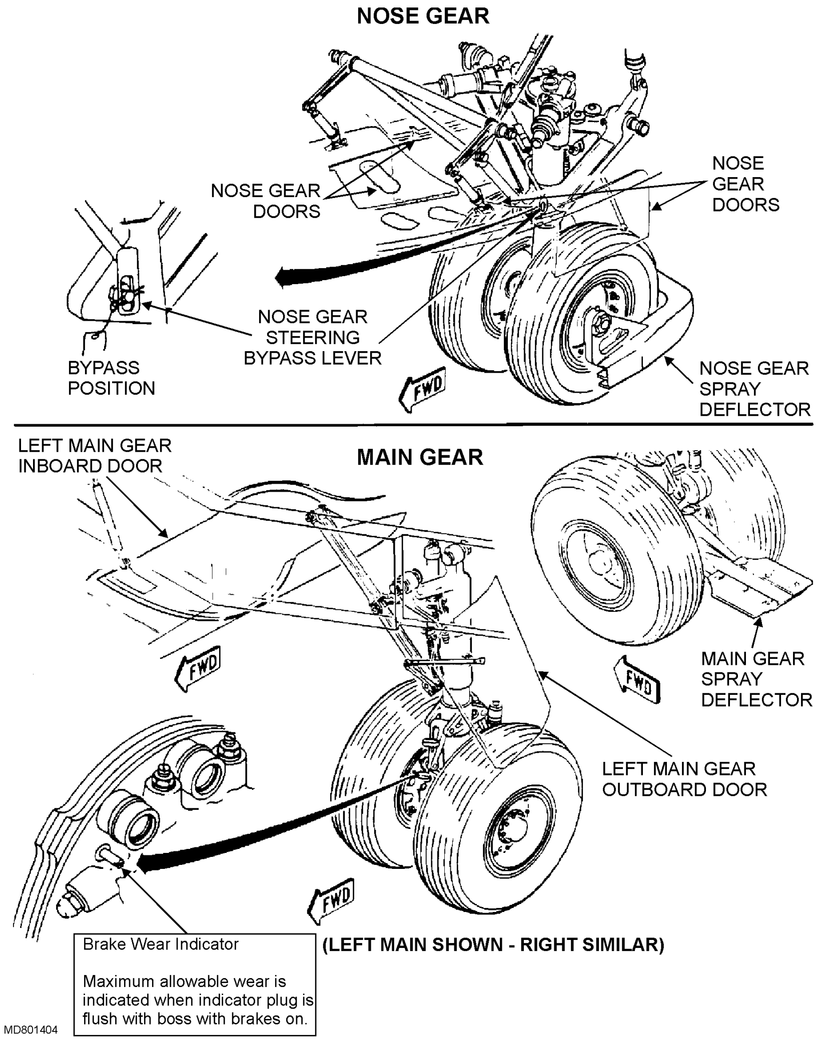
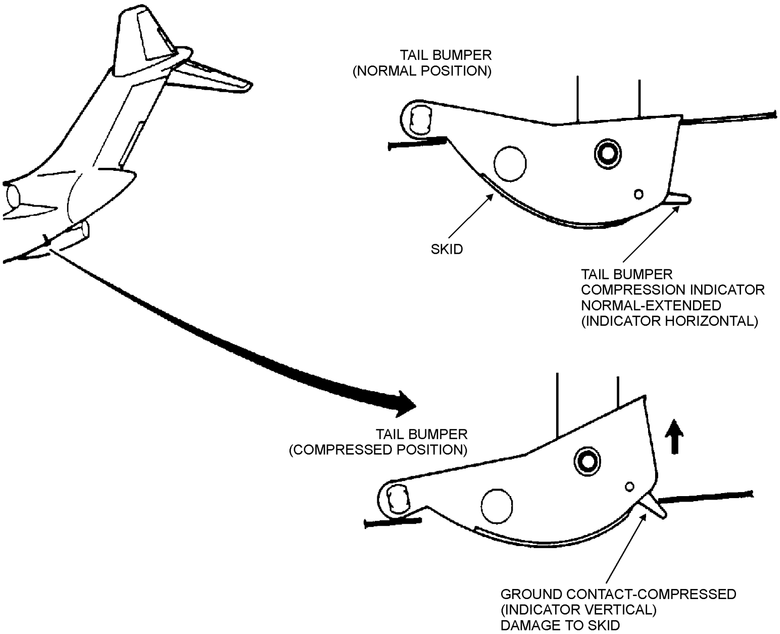


LANDING GEAR - MAJOR COMPONENT LOCATION



DESCRIPTION: During normal operation the tail of the airplane should not contact the ground surface. If early rotation or other normal operation causes the tail to contact the surface, the tail bumper will prevent, or limit structural damage. The bumper extends beyond the skin and is linked to a shock strut that will absorb impact forces.

Tail Bumper Compression Indicator. Tail bumper compression indicator should normally be in the horizontal position. If tail bumper has contacted the ground and has compressed three inches or more, indicator will be driven toward the vertical position. In this event a structural inspection is necessary.

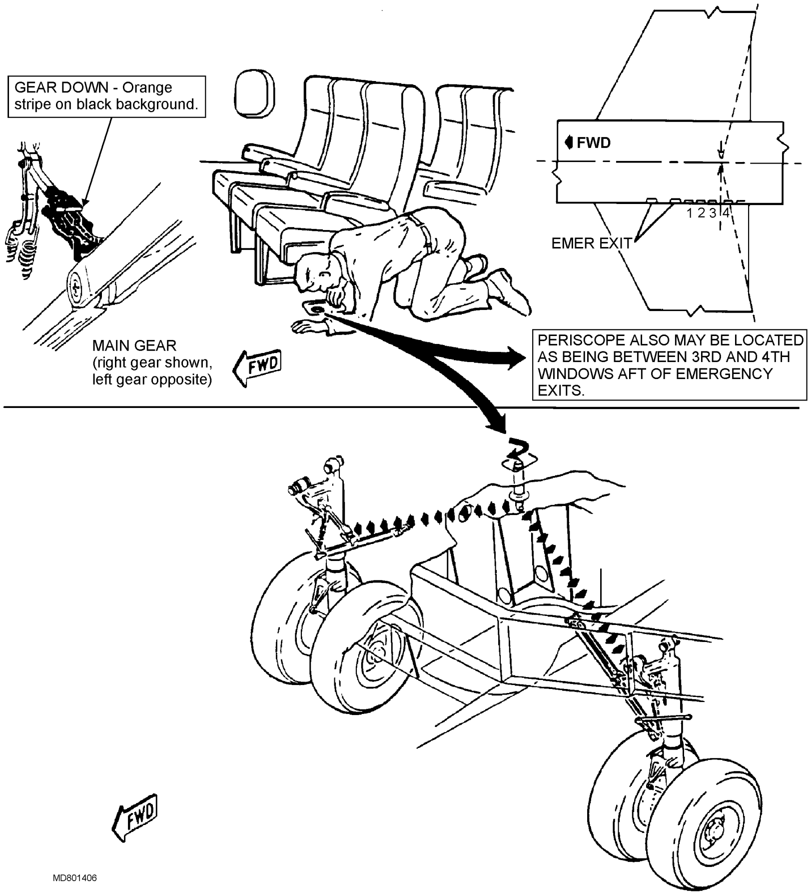
NOTE: If indicator is not in normal horizontal position, and doubt exists as to condition, a visual check for damage of the tail bumper should be made.

MD801405

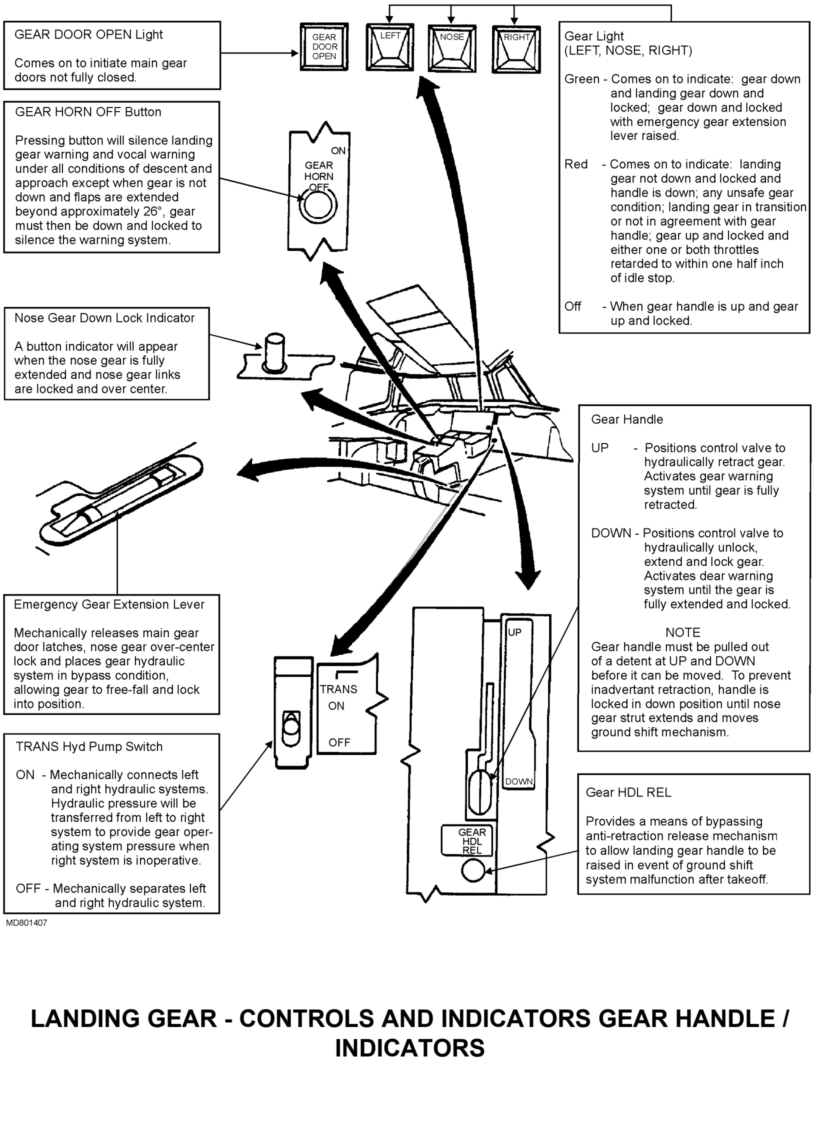
LANDING GEAR - MAJOR COMPONENT LOCATION
TAIL BUMPER AND COMPRESSION INDICATOR

To visually check main gear overcenter linkage, depressurize to below 1 psi differential pressure, raise carpet over periscope, remove cover and dust cap, and turn on wheel well lights (switch located adjacent to periscope). Align periscope with index mark to view desired gear, rotate 180 degrees and align other index mark to view opposite gear. Periscope may be removed to clean mirrors.

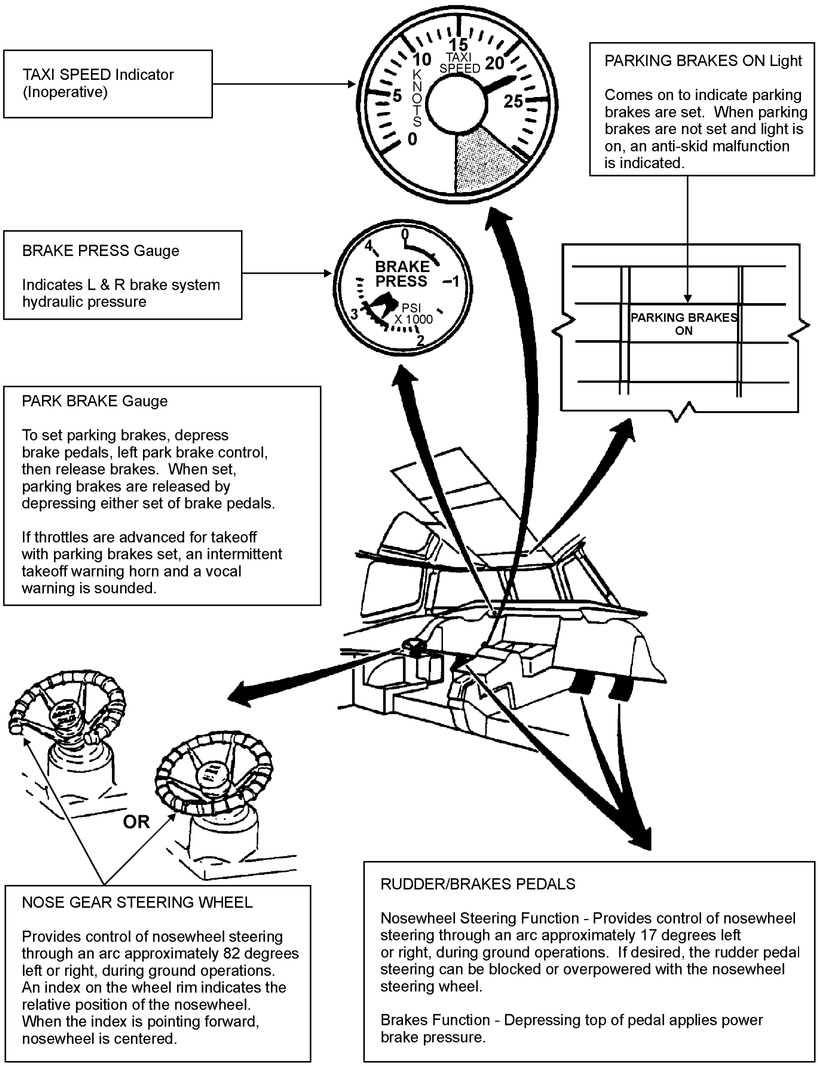
NOTE: Periscope cover may be removed at maximum differential pressure, but causes considerable air noise and has a high air flow.



LANDING GEAR - MAIN GEAR LATCH VISUAL POSITION CHECK



LANDING GEAR - CONTROLS AND INDICATORS GEAR HANDLE / INDICATORS



TAXI SPEED Indicator
(Inoperative)

PARKING BRAKES ON Light

Comes on to indicate parking brakes are set. When parking brakes are not set and light is on, an anti-skid malfunction is indicated.

BRAKE PRESS Gauge

Indicates L & R brake system hydraulic pressure

PARK BRAKE Gauge

To set parking brakes, depress brake pedals, left park brake control, then release brakes. When set, parking brakes are released by depressing either set of brake pedals.

If throttles are advanced for takeoff with parking brakes set, an intermittent takeoff warning horn and a vocal warning is sounded.

NOSE GEAR STEERING WHEEL

Provides control of nosewheel steering through an arc approximately 82 degrees left or right, during ground operations. An index on the wheel rim indicates the relative position of the nosewheel. When the index is pointing forward, nosewheel is centered.

RUDDER/BRAKES PEDALS

Nosewheel Steering Function - Provides control of nosewheel steering through an arc approximately 17 degrees left or right, during ground operations. If desired, the rudder pedal steering can be blocked or overpowered with the nosewheel steering wheel.

Brakes Function - Depressing top of pedal applies power brake pressure.

MD801411

LANDING GEAR - CONTROLS AND INDICATORS
BRAKES / NOSEWHEEL - STEERING / TAXI SPEED

ANTI-SKID Switch

OFF - Anti-skid system inoperative. Foot pressure on brake pedal controls hydraulic pressure on the brakes.

NOTE
The OFF position is also used to recycle the system. Should any anti-skid light remain on with switch at ARM, cycle the switch to OFF and back to ARM to recycle the anti-skid circuit.

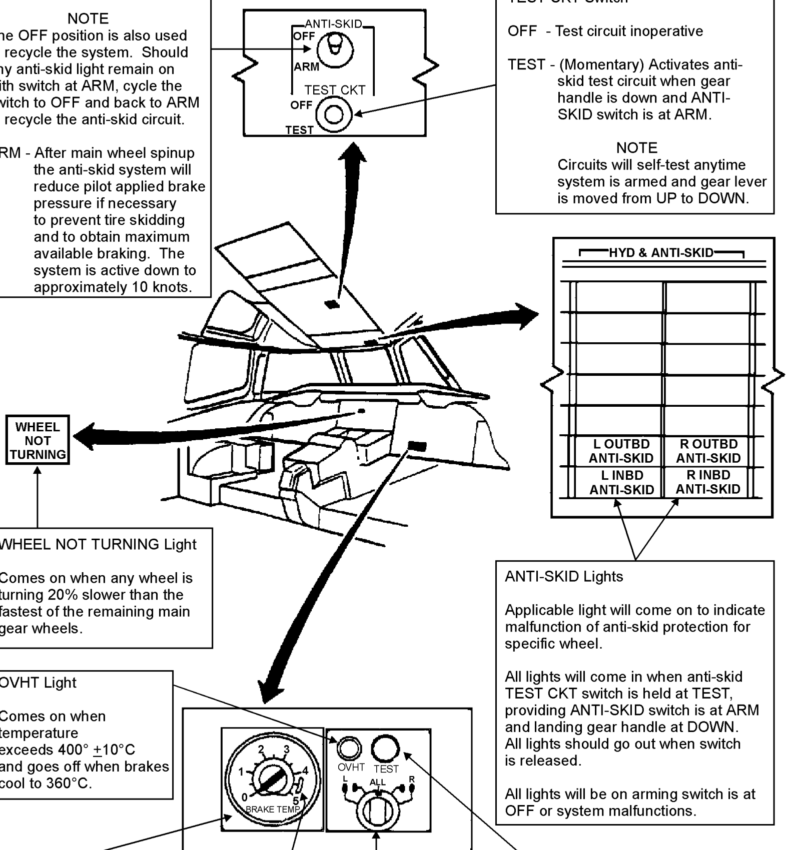
ARM - After main wheel spinup the anti-skid system will reduce pilot applied brake pressure if necessary to prevent tire skidding and to obtain maximum available braking. The system is active down to approximately 10 knots.

TEST CKT Switch

OFF - Test circuit inoperative

TEST - (Momentary) Activates anti-skid test circuit when gear handle is down and ANTI-SKID switch is at ARM.

NOTE
Circuits will self-test anytime system is armed and gear lever is moved from UP to DOWN.



WHEEL NOT TURNING Light

Comes on when any wheel is turning 20% slower than the fastest of the remaining main gear wheels.

ANTI-SKID Lights

Applicable light will come on to indicate malfunction of anti-skid protection for specific wheel.

All lights will come in when anti-skid TEST CKT switch is held at TEST, providing ANTI-SKID switch is at ARM and landing gear handle at DOWN.
All lights should go out when switch is released.

All lights will be on arming switch is at OFF or system malfunctions.

OVHT Light

Comes on when temperature exceeds 400° ±10°C and goes off when brakes cool to 360°C.

BRAKE TEMP Gauge

Indicates selected or hottest brake temperature.

Hot Brakes - 200° - 400°C

Overheated - OVER 400°C

BRAKE TEMP Selector Switch

Selects individual brake for temperature reading. When at ALL, gauge will display temperature of hottest brake.

BRAKE TEMP TEST BUTTON

Test brake electrical circuits and OVHT light. Gauge will indicate in 425°C to 475°C range during test.

MD801409

LANDING GEAR - CONTROLS AND INDICATORS - BRAKE ANTI-SKID

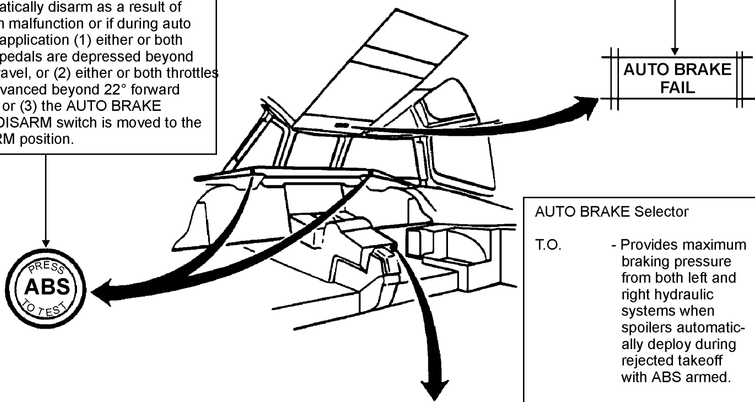
ABS Disarm Light

Comes on anytime the landing gear handle is down and the AUTO BRAKE selector is moved out of the OFF position (AUTO BRAKE ARM/DISARM switch in DISARM).

Comes on anytime ABS is automatically disarmed. The system will automatically disarm as a result of system malfunction or if during auto brake application (1) either or both brake pedals are depressed beyond 25% travel, or (2) either or both throttles are advanced beyond 22° forward travel, or (3) the AUTO BRAKE ARM/DISARM switch is moved to the DISARM position.

AUTO BRAKE FAIL Caution Light

Comes on to indicate ABS malfunction. System will automatically disarm and AUTO BRAKE ARM/DISARM switch will drop to DISARM position. MASTER CAUTION light will also come on.



AUTO BRAKE Selector

T.O. - Provides maximum braking pressure from both left and right hydraulic systems when spoilers automatically deploy during rejected takeoff with ABS armed.

OFF - ABS inoperative. Manual braking available.

LAND MIN - When spoilers are deployed after landing brakes are automatically applied with a minimum force.

LAND MED - When spoilers are deployed after landing, brakes are automatically applied with maximum force.

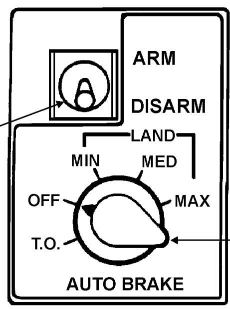
NOTE: In LAND modes, only right hydraulic system brake pressure is used.

AUTO BRAKE ARM/DISARM Switch

ARM - ABS armed for automatic braking when spoilers are deployed during takeoff or landing. Switch magnetically held in ARM position.

NOTE: Takeoff warning horn will sound during takeoff if throttles are advanced and auto-ground spoilers are not armed.

DISARM - ABS inoperative. Manual braking availble.



MD801410

LANDING GEAR - CONTROLS AND INDICATORS
AUTOMATIC BRAKE SYSTEM

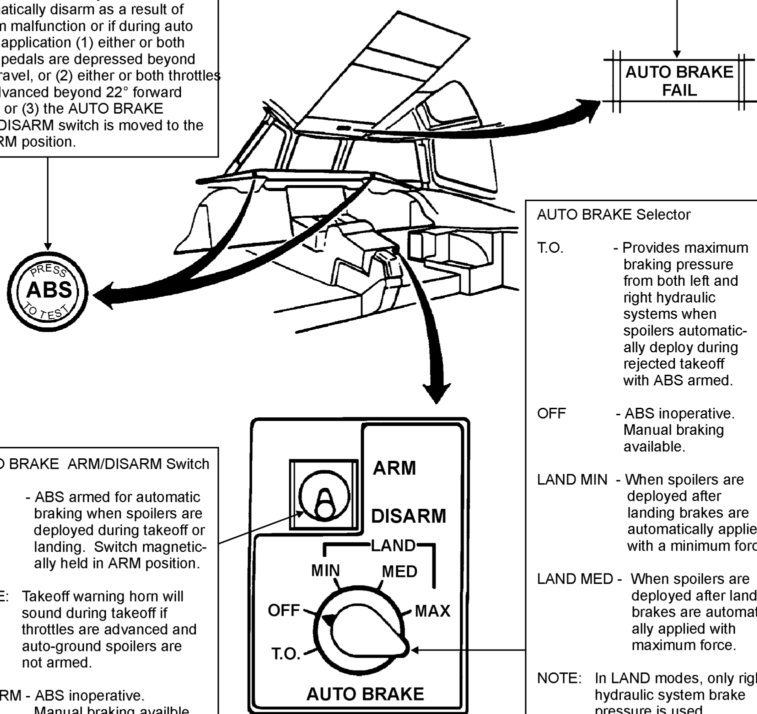
ABS Disarm Light

Comes on anytime the landing gear handle is down and the AUTO BRAKE selector is moved out of the OFF position (AUTO BRAKE ARM/DISARM switch in DISARM).

Comes on anytime ABS is automatically disarmed. The system will automatically disarm as a result of system malfunction or if during auto brake application (1) either or both brake pedals are depressed beyond 25% travel, or (2) either or both throttles are advanced beyond 22° forward travel, or (3) the AUTO BRAKE ARM/DISARM switch is moved to the DISARM position.

AUTO BRAKE FAIL Caution Light

Comes on to indicate ABS malfunction. System will automatically disarm and AUTO BRAKE ARM/DISARM switch will drop to DISARM position. MASTER CAUTION light will also come on.



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NOTE: In LAND modes, only right hydraulic system brake pressure is used.

AUTO BRAKE ARM/DISARM Switch

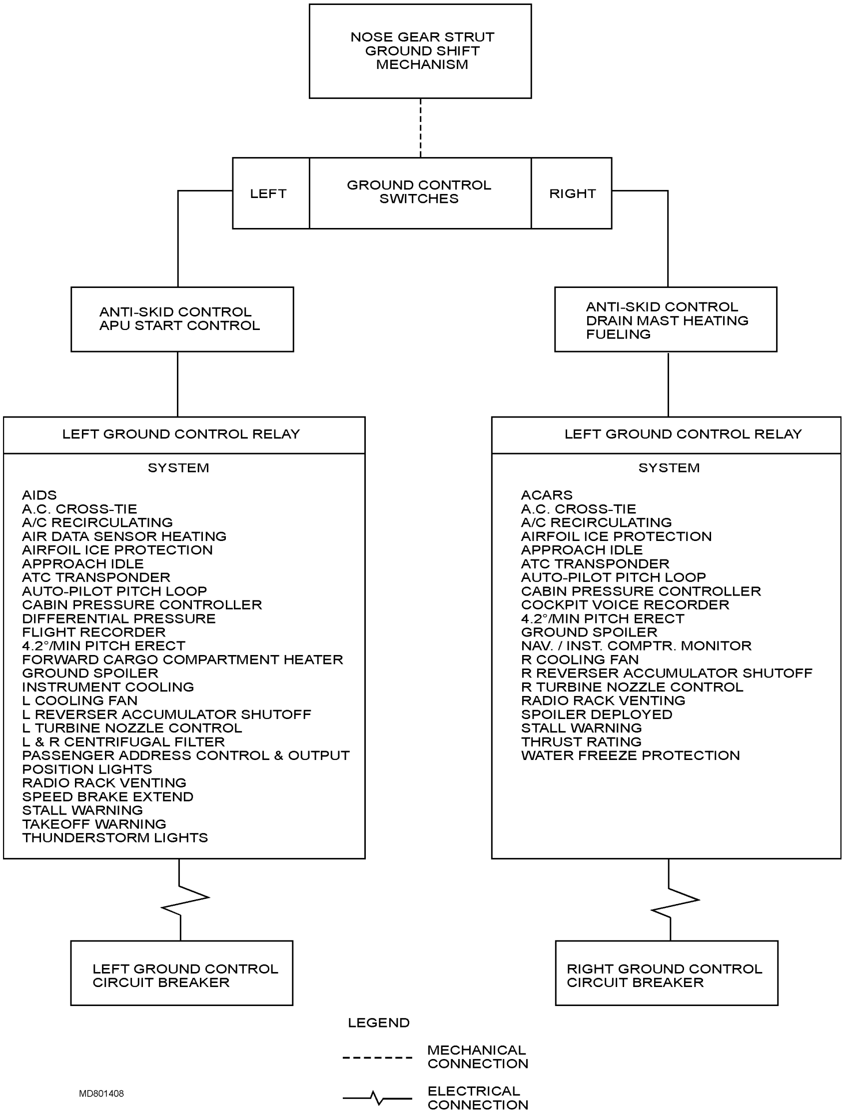
ARM - ABS armed for automatic braking when spoilers are deployed during takeoff or landing. Switch magnetically held in ARM position.

NOTE: Takeoff warning horn will sound during takeoff if throttles are advanced and auto-ground spoilers are not armed.

DISARM - ABS inoperative. Manual braking availble.

MD801410

LANDING GEAR - CONTROLS AND INDICATORS
AUTOMATIC BRAKE SYSTEM
(Installed On Some Aircraft)



LANDING GEAR - GROUND SHIFT MECHANISM FUNCTIONS

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ICE AND RAIN PROTECTION

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ICE AND RAIN PROTECTION

General

The airplane ice protection systems employ hot air and electrical resistance heating for anti-icing and anti-fogging functions. Rain removal is accomplished by chemical repellent and electrically operated windshield wipers. Chemical repellent to be removed and replaced with permanent coatings on windshields.

Heated air for anti-icing of wing leading edge slats, fuselage strakes, air conditioning ram air scoop inlet, and for de-icing the leading edge of the horizontal stabilizer, is supplied by engine bleed air. A crossfeed duct system permits airfoil heat to be supplied from either or both engines.

Engine anti-ice valves control anti-icing of the engine inlet compressor guide vanes, bullet, and the engine nose cowl. Engine bleed air for engine anti-ice is supplied by the respective engine.

Electrical resistance heating elements and appropriate coatings provide heat for anti-icing and anti-fogging the pilot's three windshields and for anti-fogging the clearview and overhead windows. The windshield anti-ice system also provides heating required for bird impact resistance.

Electrical resistance heating elements are used for anti-icing the pitot tubes, static port areas, stall angle of attack vanes, and ram air temperatures probe.

Airfoil Ice Protection

The airfoil ice protection system will either have one switch labeled AIR FOIL or two switches labeled AIR FOIL L SYS / R SYS.

One Switch System

Wing and fuselage strake anti-icing and horizontal stabilizer de-icing are activated by the AIR FOIL switch and the pneumatic crossfeed valves which provide alternating cycles of 15 minutes of wing anti-icing and 2.5 minutes of horizontal stabilizer de-icing. The ram air scoop is anti-iced in both cycles. Any part of the automatic cycle can be overridden by means of a manual override TAIL button which, when pushed, provides for 2.5 minutes of horizontal stabilizer de-icing after which a new wing/tail cycle starts. Placing the AIR FOIL anti-ice switch on OFF position with the pneumatic crossfeed valve(s) open, causes the horizontal stabilizer de-icing cycle to be activated for 2.5 minutes. Closing the pneumatic crossfeed valves during this cycle will cause the de-icing cycle to be deactivated.

Two Switch System

Wing and fuselage strake anti-icing are activated when one or both of the AIR FOIL L SYS / R SYS switches and associated pneumatic crossfeed valves are actuated. De-icing is provided to the horizontal stabilizer leading edge by pushing the TAIL button, which diverts the flow of heated air from the wing ducts to the stabilizer. After 2.5 minutes, heated airflow reverts to the wing ducts. The ram air scoop is anti-iced during both wing and tail operation.

Both Systems

Fuselage strakes anti-icing is accomplished through a wye duct connected to the wing leading edge ducting and controlled by the same switches used for wing slat anti-icing. Interlock of the airfoil ice protection control valves through the ground control relays prevents flow of heated air in the airfoil ice protection systems until the aircraft becomes airborne.

Engine Ice Protection

Engine anti-ice protection is provided by independent systems, controlled by individual switches, located on the ice protection panel. Each system (left and right) provides ice protection for the respective engine's nose cowl, inlet bullet, and compressor inlet guide vanes.

If engine anti-ice is on for takeoff or go-around, there is no EPR penalty to be applied. If it is on for Climb, Cruise, or Maximum Continuous Thrust conditions, the TRI will automatically compute and display the appropriate EPR penalty.

UWAI System Description

Two amber lights on the upper instrument panel (located to the left of the ASSUMED TEMP selector) indicate status of the UWAI system:

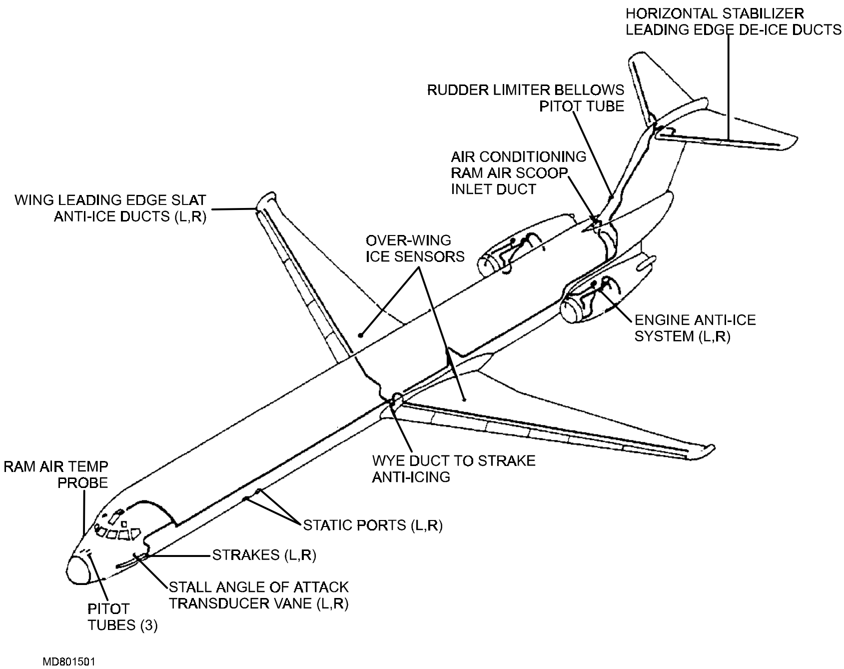
WING ICE ALERT	Indicates the temperature in one or more sensors has fallen below 38°F and there is the possibility of ice formation.
WING HTR INOP	Indicates failure of a heater segment or internal controller failure. The UWAI system is inoperative.

The UWAI system is a very thin electric heater blanket assembly which is bonded to the upper wing surface over the affected area (cold corner). The UWAI system electrically heats the blanket assemblies in essentially the same manner as windshield heat. Temperature sensors embedded in the heater blanket assemblies send upper wing temperature signals to their respective controller unit. The left and right wing controller units (mounted in the fuselage just forward of the slat drive mechanism), regulate electrical power to the heater blanket assemblies to maintain upper wing surface temperature above freezing. The UWAI system does not require any input or control from the flight crew to function.

Electrical bus protection for the UWAI main power circuits is through the #3 galley 35 AMP three phase circuit breakers located on the right generator bus circuit breaker panel, labeled #3 GALLEY POWER AND UPPERWING ANTI-ICE. Electrical bus protection for the UWAI control circuits is through a 1 AMP circuit breaker located at H-26, labeled UPPER WING ANTI-ICE.

Three phase power that is normally routed to galleys #2 and #3, is now routed through an air/ground sense relay. When the aircraft is on the ground, electrical power is removed from galleys #2 and #3 and is applied to the UWAI system. When the aircraft is airborne, electrical power is completely removed from the UWAI system and electrical power to galleys #2 and #3 is restored. During AC crosstie operation, UWAI power along with galley power will load shed automatically. This is done so that aircraft electrical bus limitations are not exceeded. Pulling the 1 AMP UWAI control circuit breaker, (H-26) labeled UPPER WING ANTI-ICE, will remove all power to the UWAI system and will restore power to galleys #2 and #3. Galley power switch position has no effect on UWAI operation.

The UWAI system performs a self test after initial application of electrical power, and 20 seconds after landing. The **WING ICE ALERT** and **WING HTR INOP** lights will flash rapidly 12 to 15 times. If a failure is detected the **WING HTR INOP** light will remain illuminated.



ICE AND RAIN PROTECTION - COMPONENT LOCATION

METER SEL & HEAT Selector
When selector is moved from OFF, all circuits are energized to heat pilots, including rudder limiter, stall probes, static ports and RAT probe. On ground, heat to RAT probe is inhibited through action of ground control relays.

HEATER CUR Meter
Displays current flow to each position as selected by METER SEL & HEAT selector.

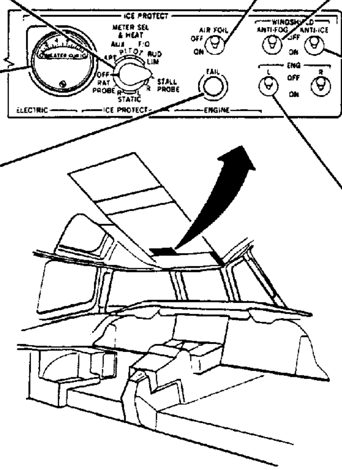
TAIL DE-ICE Pushbutton
Overrides automatic cycling, closes shutoff valve to wing and strakes, and opens shutoff valve to de-ice tail. After a timed period, system automatically reverts to wing anti-ice/tail de-ice cycling.

AIR FOIL Anti-ice Switch
OFF – Activates a 2.5 minute horizontal stabilizer de-ice cycle with one or both PNEU X-FEED VALVE levers in open position. At completion of cycle, pressure regulator is closed to stop flow of air to system and augmentation valve (s) temperature control is deactivated.
ON – Opens pressure regulator valve to provide temperature controlled air to system. One or both x-feed valves must be open prior to actuating switch. On ground, air foil anti-ice is inhibited.

WINDSHIELD ANTI-FOG Switch
OFF – Deactivates anti-fog system.
ON – Prevents or removes condensation on inside surface of windshields, clearview, and overhead windows.

WINDSHIELD ANTI-ICE Switch
OFF – Deactivates windshield anti-ice system.
ON – Provides anti-ice heat to three windshields.

ENG Anti-ice Switches (L, R)
OFF – Closes valves to shut off air to engine anti-ice system.
ON – Opens three valves to provide regulated temperature controlled air to anti-ice engine nose cowl, bullet, and inlet compressor guide vanes.



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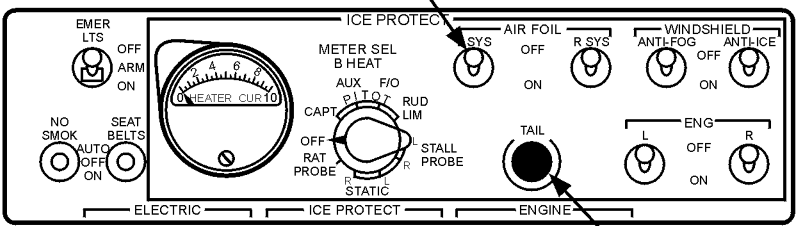
ICE AND RAIN PROTECTION - CONTROLS AND INDICATORS

AIR FOIL Anti-ice Switch (L, R)

OFF – Closes pressure regulator valve to stop flow of air to system and deactivates temperature control of augmentation valves.

ON – Opens pressure regulator valve to provide temperature controlled air to system. One or both x-feed valves must be open prior to actuating switch. On ground air foil anti-ice is inhibited.



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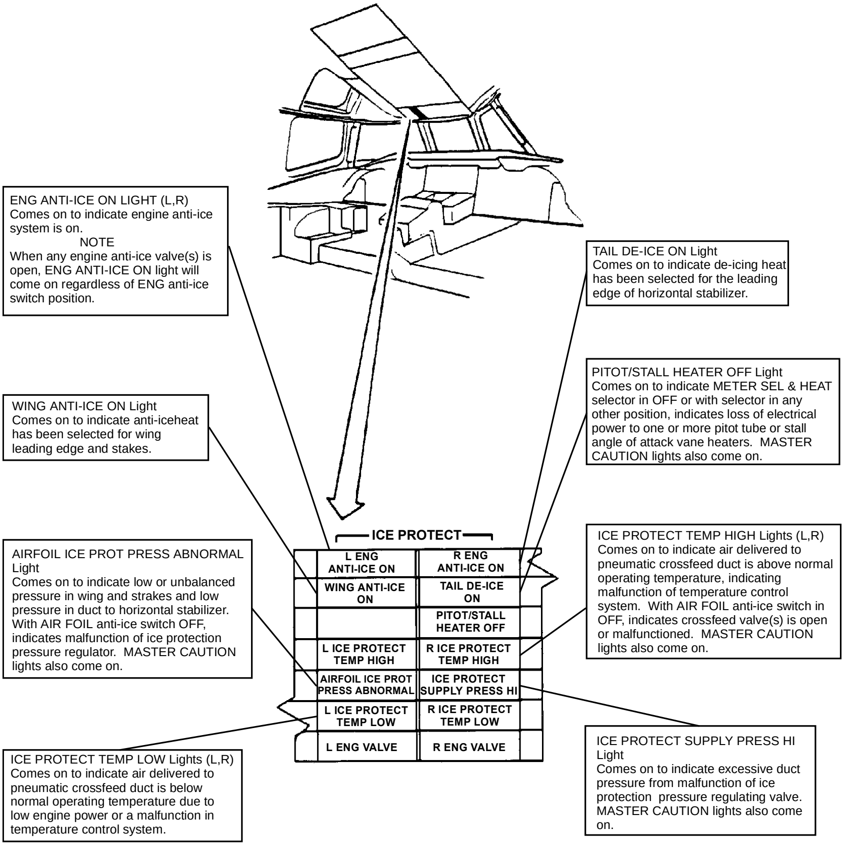
TAIL DE-ICE Pushbutton

Closes shutoff valve to wing and strakes and opens shutoff valve to de-ice horizontal stabilizer. After 2.5 minutes the system automatically reverts to wing and strake anti-ice function.



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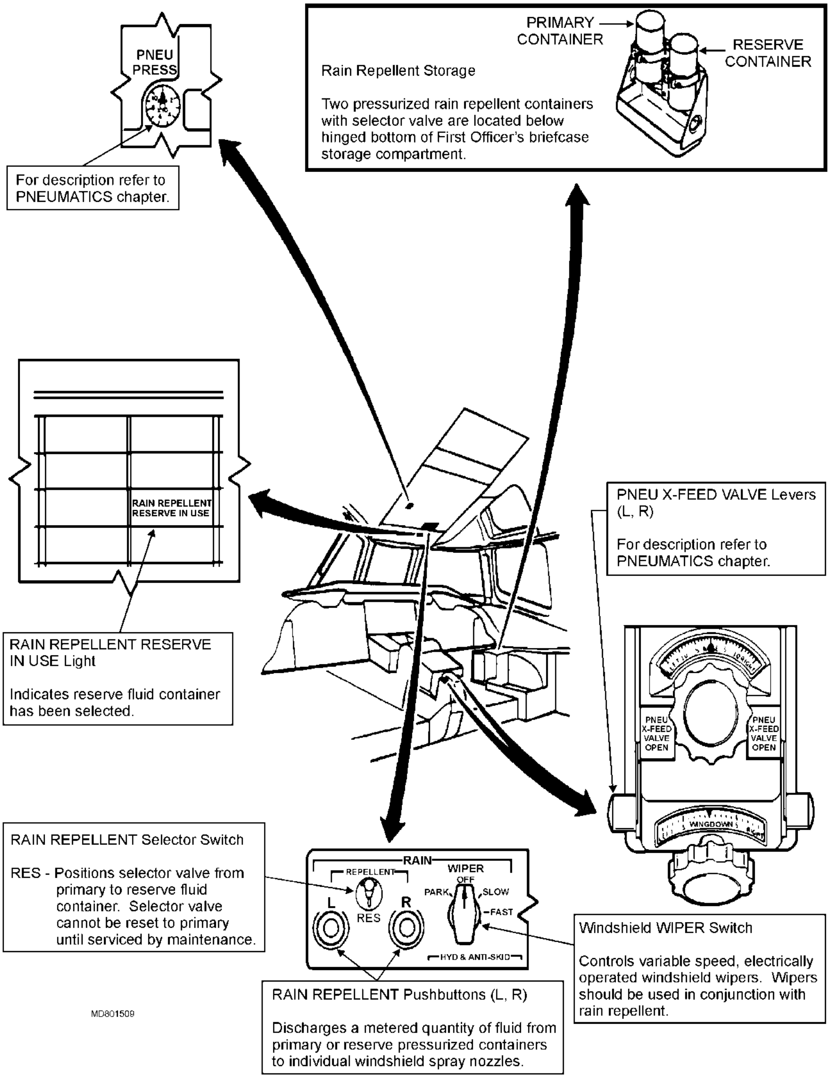
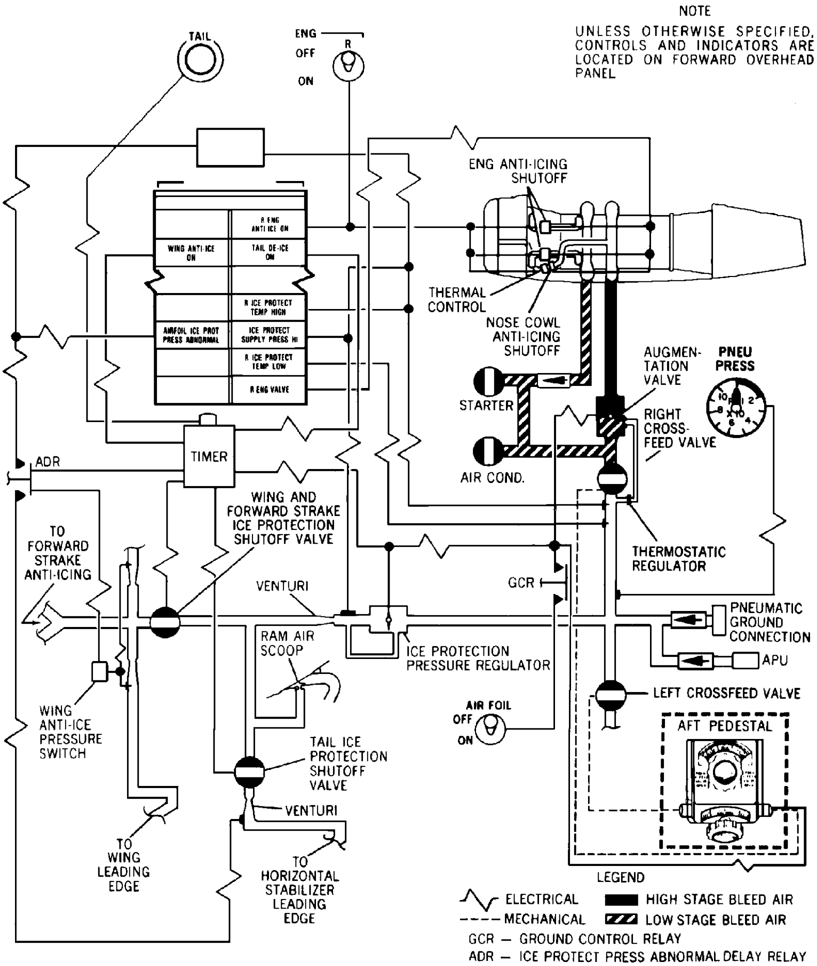
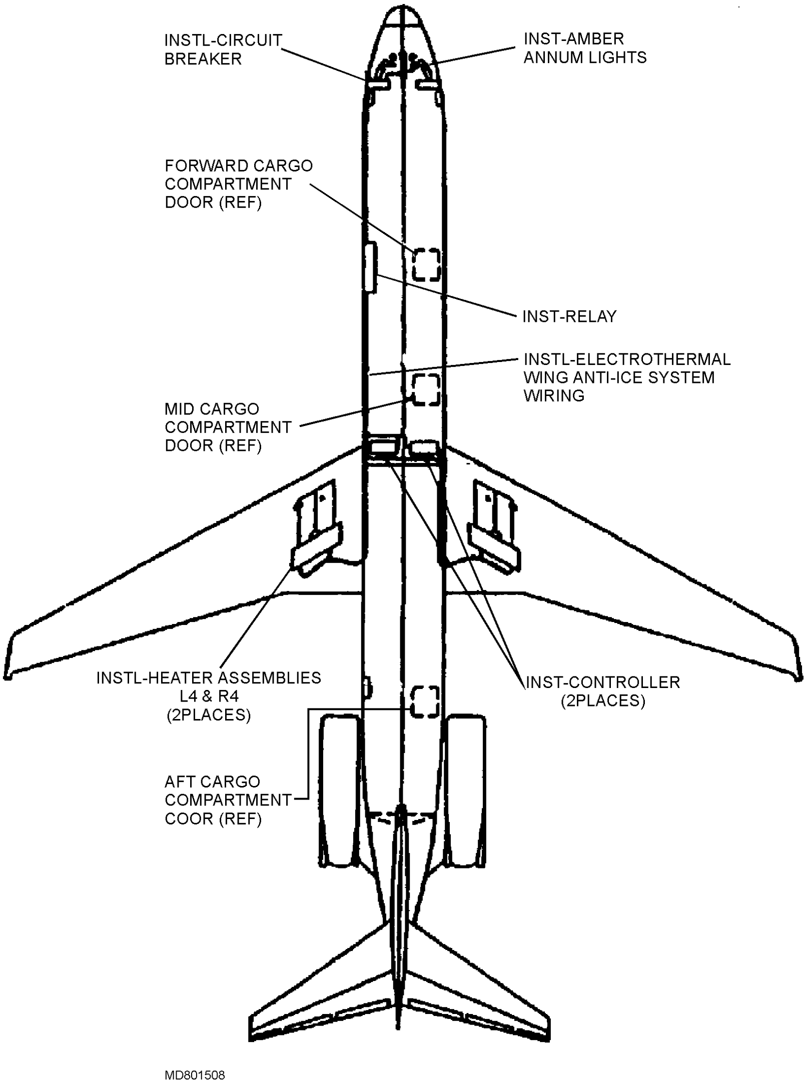
ICE AND RAIN PROTECTION - CONTROLS AND INDICATORS



ICE AND RAIN PROTECTION - CONTROLS AND INDICATORS



FUNCTIONAL SCHEMATIC - AIRFOIL AND ENGINE ANTI-ICING SYSTEM



UWAI SYSTEM CONFIGURATION

LIST OF EFFECTIVE PAGES

	PAGE	DATE	PAGE	DATE	PAGE	DATE
*	TOC-1	12/01/00				
*	TOC-2	12/01/00				
*	1	12/01/00				
*	2	12/01/00				
*	3	12/01/00				
*	4	12/01/00				
*	5	12/01/00				
*	6	12/01/00				
*	7	12/01/00				
*	8	12/01/00				
*	9	12/01/00				
*	10	12/01/00				
*	LEP-1	12/01/00				
*	LEP-2	12/01/00				

* Asterisk indicates page(s) revised or added by the current revision.

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INSTRUMENTATION / NAVIGATION / COMMUNICATION

TABLE OF CONTENTS

INSTRUMENTATION AND NAVIGATION

General

Flight instrumentation and navigation equipment and systems are covered in this section. The navigation equipment and systems encompass both ground dependent and independent systems. The equipment and systems provide instrument and annunciator displays for airplane attitude, airspeed, altitude, vertical speed, heading, direction, course, and time.

Pitot / Static Systems

During normal operation, the Captain's pitot / static systems provide outside variable pressure inputs to digital Central Air Data Computer (CADC) 1, and the F/O's pitot / static systems provide inputs to CADC 2. The CADCs provide computed air data outputs of airspeed, Mach, altitude, and vertical speed for display, automatic flight, and other functions. A CADC selector is provided to select normal operation, or to select from CADC 1 or CADC 2. The CADC selector only affects the delivery of signals to the flight instruments and does not affect signal delivery to other functions.

A third system, auxiliary pitot / alternate static, provides direct inputs to the standby altimeter / airspeed indicator. There is no CADC associated with the Auxiliary system. A Static Source selector (on each pilot's instrument panel) provides the capability to shut off the normal static source to the Captain's and/or F/O's static system, if required, and utilize the alternate static source. Static pressure for the cabin pressure controllers and cabin differential pressure indicator is provided by the auxiliary and cabin static systems.

Primary Flight Instruments

The primary flight instruments are the Mach / airspeed indicator, vertical speed indicator, and altimeter. Input to the primary flight instruments is derived from CADC 1 or 2 as selected on the CADC selector.

Overspeed Warning

When the CADC detects that the airplane has reached maximum operating airspeeds, a signal is sent to the central aural warning system. The central aural warning system will then generate a "clacking" sound, alternating with the spoken word "OVERSPEED" or "SLAT OVERSPEED" (as applicable), until the airspeed is within prescribed limits. A test switch is provided for simulating the overspeed warning condition.

TAS / SAT Indicator (Installed On Some Aircraft)

The TAS / SAT indicator provides a digital readout of the true airspeed, static air temperature and total air temperature. True airspeed and SAT are normally supplied to the indicator by CADC 2 or if selected CADC 1. Total air temperature may be read in the SAT readout by pushing the TAT button.

Standby Magnetic Compass

The standby magnetic compass provides a heading reference in relation to magnetic north. The compass is enclosed in a housing in the right rear overhead corner of the cockpit. The Captain's and F/O's viewing mirrors are mounted on hinged brackets to permit them to be folded down against the glareshield when desired. The compass is lighted by internal and external lights. Both lights are controlled by a switch located on the overhead panel. Compass lighting is not available on Emergency Power.

Clock

Two 8-day, stem-wound, elapsed time clocks are installed, one for the Captain and one for the First Officer.

Directional Indicating Systems

There are two independent directional indicating systems, compass system 1 and compass system 2. Each compass system is stabilized by an associated directional gyro and receives magnetic heading inputs from an associated flux valve. Compass heading is displayed on the RMIs and HSIs at all times.

Compass system 1 provides magnetic heading to the F/O's RMI, Captain's HSI, VOR/LOC 1 and digital flight guidance computers (DFGC's) 1 and 2. Compass system 2 provides magnetic heading to the Captain's RMI, F/O's HSI, VOR/LOC 2, and DFGC's 1 and 2.

On some aircraft, A compass selector is provided to select NORM (normal) BOTH ON 1 (compass system 1), or BOTH ON 2 (compass system 2). When NORM is selected, function is as described above. When BOTH ON 1 or BOTH ON 2 is selected, the selected compass provides magnetic heading to all instruments. An amber **COMP** (compass) light is provided on the Captain's and F/O's instrument panels to indicate that the compass selector is out of NORM and switching has occurred.

MD83 Attitude and Heading Reference System (AHRS)

General

There are two independent Attitude and Heading Reference Systems (AHRS) installed in the MD83 aircraft. They replace all conventional vertical and directional gyros. The AHRS uses a platform similar to that used by an inertial navigation system. It consists of two gyros (each giving two independent outputs) and three accelerometers. All of these are rigidly mounted in the black box, which is carefully aligned to the aircraft's vertical, longitudinal, and lateral axes. The platform requires input from the flux valve for heading reference and a TAS input from the CADC.

Modes of Operation

There are two modes of operations, normal and basic. The normal mode is the expected mode of operation. It provides highly accurate and stable heading signals in addition to attitude reference with no turning or acceleration errors. If the system reverts from the normal mode, it will operate in the basic mode. In this mode, the AHRS functions the same as a standard attitude and heading system. Operation in the basic mode is indicated by the appropriate blue annunciator light. **Basic mode is certified for all flight regimes and modes including autoland.** Once in the basic mode, the AHRS will remain in this mode until the next power up. The system will revert to basic mode if power is lost for more than 1/2 second.

In addition, if any of the following occur inflight, AHRS will revert to the basic mode:

- CADC failure
- A true airspeed of less than 102 knots
- Loss of the TAS output from the CADC
- Any AHRS internal failures.

AHRS 1 (or 2) Basic Mode Light

The blue lights are located on the annunciator panel. It will illuminate when the associated AHRS has automatically downgraded to the Basic mode.

AHRS Output Signal

The number 1 AHRS provides attitude signals to the Captain's ADI, and HSI and the F/O's RMI. The number 2 AHRS provides attitude signals to the F/O's ADI and heading signals to the F/O's HSI and the Captain's RMI. If either system fails, the applicable attitude and heading flaps will come into view and inform you of the failure.

Power Supply

The number 1 AHRS normally receives power from the left radio bus while the number 2 AHRS always receives power from the right radio bus. If power is removed from a system, in addition to the flags, the ADI will rotate 90 degrees to the right. When the EMER PWR switch is turned ON, the number 1 AHRS receives its power from the 115 volt AC emergency bus and will align in the normal mode.

AHRS Power Up

When power is first applied, the AHRS goes through an alignment similar to an inertial reference system. It will take 45 seconds to complete the automatic alignment mode. During this period, the attitude and heading fail flags will be in view and the ADI spheres will be rotated.

Caution: During the 45 second automatic alignment mode (if the flags are in view and the ADI spheres are rotated), the aircraft **MUST NOT BE MOVED**. If the aircraft is moved or bumped (by the jetway, a service truck, or the tow bar connected to a tug), you MUST power down and restart the 45 second alignment mode.

Note: Wind buffet, passenger loading, and cargo loading will not appreciably affect the alignment process.

At the end of the 45 second period, the flags will be removed from view, the ADI spheres will be erected, and the AHRS will align in the normal mode.

Note: The results of the Autoland Pre-flight test is modified on the AHRS aircraft. See section 4 for more information.

VHF Navigation Systems

There are two independent VHF navigation systems, VOR/LOC 1 and VOR/LOC 2. VOR/LOC 1 is controlled by the Captain's VHF NAV control panel, and VOR/LOC 2 is controlled by the F/O's VHF NAV control panel.

VOR/LOC 1 provides VOR/LOC/GS deviation signals to the Captain's HSI, LOC/GS deviation signals to the F/O's ADI, VOR bearing to the #1 pointer on both RMI's, and input to DFGC's 1 & 2.

VOR/LOC 2 provides VOR/LOC/GS deviation signals to the F/O's HSI, and LOC/GS deviation signals to the Captain's ADI, VOR bearing to the #2 pointer on both RMI's, and input to DFGC's 1 & 2.

On some aircraft, a radio navigation selector is provided to select NORM (normal), BOTH ON 1 (VOR/LOC/GS 1), or BOTH ON 2 (VOR/LOC/GS 2). When NORM is selected, function is as described above. When BOTH ON 1 or BOTH ON 2 is selected, the selected system provides VOR/LOC/GS deviation signals to both HSIs and ADIs. An amber **NAV** (navigation) light is provided on the Captain's and F/O's instrument panels to indicate that the radio navigation selector is out of NORM and switching has occurred.

Audio for VOR/LOC 1 and 2 is selected on the audio control panel. Refer to the Communications chapter for description of audio control panel.

VHF Navigation radio #1 operates on Emergency Power.

Marker Beacon System

The pre-tuned marker beacon system provides visual and aural signals to the flight crew. Three dimmable lights on the Captain's and F/O's instrument panels provide visual position indications when passing over an outer, middle, or an airway marker. An aural tone will sound simultaneously with a light. Volume for the marker beacon is controlled on the audio control panel. The Marker Beacon system does not operate on Emergency Power.

Distance Measuring Equipment

There are two Distance Measuring Equipment (DME) units, DME 1 and DME 2. DME 1 is tuned with VOR/LOC 1, and DME 2 is tuned with VOR/LOC 2. MILE NO 1 and MILES NO 2 indicators will digital readouts are provided on each HSI. Maximum range, at maximum altitude is 200 miles. The DME system does not operate on Emergency Power.

Automatic Direction Finding System

There are two automatic direction finding systems, ADF 1 and ADF 2. One dual control panel provides separate tuning and mode selection for each ADF system. Each ADF system provides bearing input to the pointers on the Captain's and F/O's compass indicator. Two VOR/ADF selector knobs are provided on each compass indicator. When the selector knob on the left is in ADF, bearing is displayed on VOR/ADF 1 pointer. When the selector knob on the right is in ADF, ADF bearing is displayed on VOR/ADF 2 pointer. Audio for ADF 1 and 2 is selected on the audio control panel. Neither ADF radio operates on Emergency Power.

Attitude Director Indicator

Two vertical gyros, VG 1 and VG 2, supply attitude information to the Captain's and F/O's respective ADI's and both DFGC's. VG 1 operates on Emergency Power.

On some aircraft, an AUX VG is installed to provide backup in the event of failure of VG 1 or VG 2. A VERT GYRO selector with positions NORM, L ON AUX, and R ON AUX is provided. When in NORM, operation is as described above. When in L ON AUX, the AUX VG supplies attitude information to the Captain's ADI. When in R ON AUX the AUX VG supplies attitude information to the F/O's ADI.

In addition, the ADI provides displays, which are used for navigation, approach, and speed. A V-command bar provides computed pitch and roll attitude commands. During approach, LOC deviation is displayed by a rising runway symbol, and deviation from glideslope is shown on a glideslope deviation display. The rising runway symbol commences to rise when actuated by the radio altimeter at approximately 200 feet AGL. A **DH** (decision height) light is provided on the ADI to advise the crew that the airplane is at decision height

Standby Attitude Director Indicator

A standby attitude director indicator is provided. The indicator is powered by the DC transfer bus and will operate if generator power is lost.

Weather Radar System

MD-80 aircraft are equipped with a Collins WXR-700 weather radar receiver/transmitter and a Bendix PPI-4B indicator intended to interface with the Bendix TCAS II system. Controls to operate the weather radar are located on the indicator. The following are descriptions of the controls.

A color weather radar system displays weather and ground targets with selective ranges of 10, 20, 40, 80, 160, and 320 nautical miles. All controls for the weather radar system are located on the top perimeter of the weather radar indicator.

Controls are provided to initiate power to the system, to select antenna stabilization, and to select desired mode of operation, range, and display variation. Control knobs are provided to adjust antenna tilt angle, system gain, and brightness of the indicator display. A test mode is provided for testing the system. A TCAS pushbutton switch alternately selects TCAS only display, or combined weather TCAS display, or weather-only display. A message pushbutton switch operates in conjunction with ACARS. Switch is not functional.

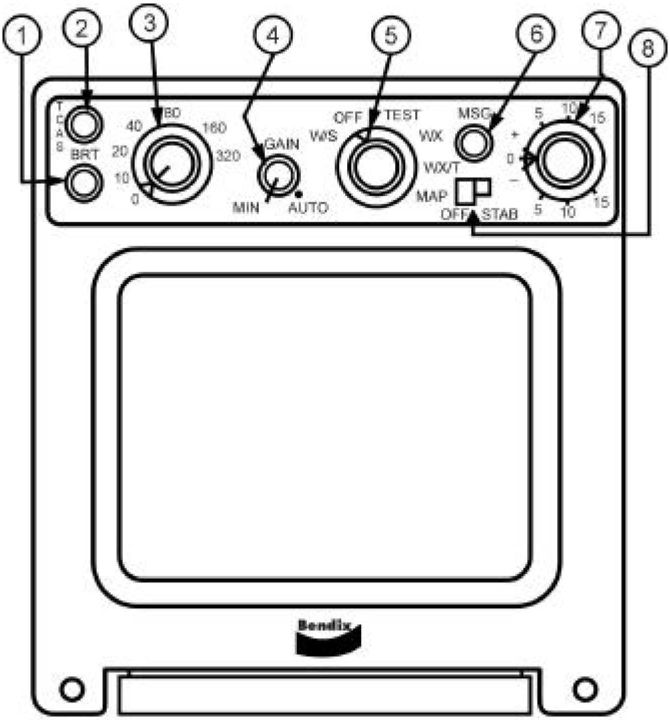
The radar antenna is normally stabilized in pitch and roll by VG 2, and is controllable from 15 degrees up to 15 degrees down in 0.25-degree increments. If required, the aux vertical GYRO (if installed) can be selected for input to the antenna by placing VERT GYRO selector in R ON AUX.

When operating in WX (weather) mode, the digital indicator presents weather in red, yellow, green, and black colors. Red represents areas of high density precipitation. Yellow represents areas of lower density precipitation. Green represents areas of light precipitation. Black represents areas of extremely light precipitation.

When operating in the MAP (mapping) mode, the indicator presents ground targets in yellow, green and black colors. Yellow represents targets with high level reflectivity, green represents targets with lower level reflectivity, and black represents targets with low level reflectivity.

The indicator displays messages for selected mode of operation, system faults, stabilization status, clutter suppression, and gain. The indicator also displays readouts for selected up or down antenna tilt angle and for selected range.

Radar Controls



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① Bright Knob

Adjusts indicator display intensity.

② TCAS Pushbutton Switch

Alternately selects TCAS-only display, or combined weather/TCAS display, or weather-only display.

③ Range/Marks Selector

10	-	10 nautical mile (NM) range / 2 1/2 NM marks.
20	-	20 nautical mile (NM) range / 5 NM marks.
40	-	40 nautical mile (NM) range / 10 NM marks.
80	-	80 nautical mile (NM) range / 20 NM marks.
160	-	160 nautical mile (NM) range / 40 NM marks.
320	-	320 nautical mile (NM) range / 80 NM marks.

④ Gain Knob

AUTO - Used in weather (WX) mode. Gain is pre-adjusted.

MANUAL (MIN/MAX) - Controls gain when in MAP mode or in WX mode when auto gain malfunctions.

⑤ Mode Selector

OFF - Radar system is de-energized.

TEST - Turns system on and displays test pattern. System is not radiating energy.

WX - Normal position for weather detection.

WX/T - Weather detection with turbulence detection.

MAP - Used for terrain mapping. Use manual gain to achieve best picture.

⑥ Message Pushbutton Switch

Operates in conjunction with ACARS. Switch is not functional.

⑦ Antenna Tilt Knob

Adjusts antenna tilt up (+) or down (-) 15° from horizontal.

⑧ Stabilization Off Switch

Disables antenna stabilization.

Fault Indications

Fault annunciations will appear on the radar screen automatically if a system fault is detected. Faults may be either Soft Failures or Hard Failures.

Soft Failures are those that can cause limited system operation. Radar data will continue to be displayed, but the flight crew should be aware that the display does not accurately represent the weather.

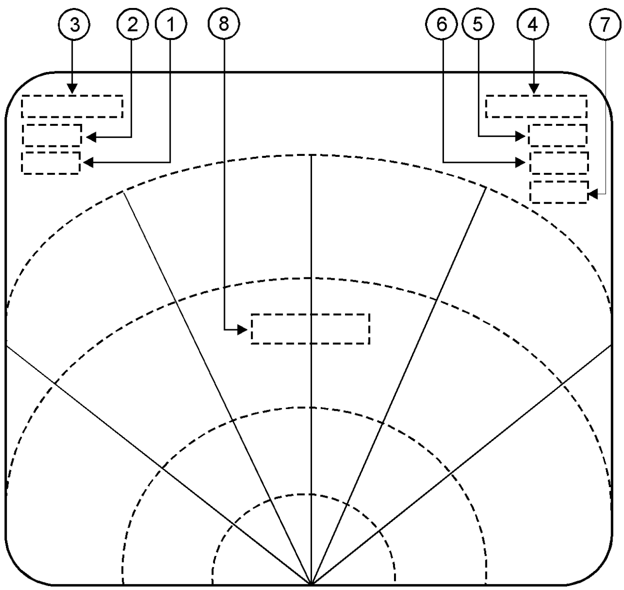
Hard Failures are those that occur when a major function of the system is lost. Hard Failures are typically a total loss of transmitter power, receiver gain, or no antenna scan. Should a Hard Failure occur, the system should be turned off or further damage to other system components could occur.

When the system is in WX, WX/T, or MAP mode, Soft Failures will appear as yellow caution annunciations. The radar display will be maintained during a Soft Failure. A Hard Failure will cause the radar display to disappear entirely and the name of the component that failed will appear on the screen. If a failure occurs when in the test mode, the test pattern will disappear and be replaced by the name of the component that failed.

Soft Failure Annunciations (Yellow)

Annunciation	Failure	Effects
CAL	Receiver / Transmitter out of calibration.	Weak targets, use with caution.
STAB	Stabilization input.	No pitch or roll stabilization.
COOL	No Receiver / Transmitter cooling.	System may fail if continued operation allowed. Shut down system unless required for weather avoidance.

Alphanumeric Display



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① Receiver/Transmitter Cooling Warning (Yellow)

COOL is displayed if receiver transmitter experiences a cooling fault.

② Mode Selected (Blue)

WX, WX/T or MAP as selected.

③ Range (Blue)

Displays selected range.

④ Range Marks (Blue)

Displays range mark intervals.

⑤ Antenna Tilt (Blue)

Displays selected degrees of tilt angle and an up or down vertical arrow.

STAB (Yellow)

Indicates stabilization fault.

STAB (Blue)

Stabilization switch is off or attitude plus tilt setting exceeds excursion limits.

⑥ CAL (Yellow)

Out of calibration. Receiver / transmitter performance below calibration level.

CAL (Blue)

Out of calibration. Gain Control not set to AUTO in WX, WX/T or MAP mode.

⑦ GAIN (Blue)

Indicates relative position of GAIN control when out of AUTO in WX or WX/T mode.

MIN - minimum gain.

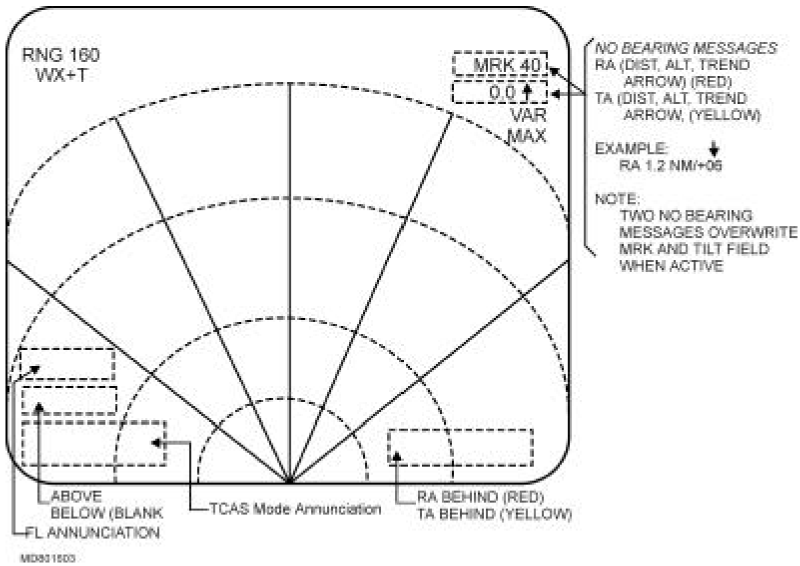
1 - 9 Relative gain in increasing increments.

MAX - maximum gain.

⑧ LRU Fault Warning Location (Yellow)

Identifies faulty line replaceable unit (system component).

Weather Modes Message Format



The weather modes message format is shown below.

TCAS STBY	(Blue)	TCAS system in standby
TEST	(Blue)	TCAS system in TEST
TA/RA	(Blue)	TA/RA Mode
TA/RA AUTO	(Blue)	TA/RA Pop-Up Mode
TA ONLY	(Blue)	TA Only Mode
TA AUTO	(Blue)	TA Only Pop-Up Mode
TD FAIL	(Yellow)	Indicator Failure
NO TCAS	(Blue)	TCAS not operational. Place Function Selector to TCAS for a list of faults.
TCAS FAIL	(Yellow)	Failures include: TCAS Processor or Top or Bottom TCAS Antenna. Place Function Selector to TCAS for a list of faults.
FLXXX	(Cyan)	ABSOLUTE ALTITUDE where XXX is own altitude. Field is bland for relative altitude.

PREDICTIVE WINDSHEAR SYSTEM

Introduction

FAR 121.358 requires installation of an airborne windshear warning and flight guidance system, an approved airborne detection and avoidance system, or an approved combination of these systems. Since 1990, Continental in association with Allied Signal Corporation, has participated in the development of the RDR-4B Forward Looking Windshear Detection / Avoidance Weather Radar System.

RDR-4B Radar System Theory

Like all modern radar systems, the RDR-4B operates by emitting short intense pulses of microwave energy which are reflected by objects having reflective characteristics within the range of the system. The reflected signals are processed to produce visual displays that are representative of the size, intensity, bearing and distance of the targets. The RDR-4B incorporates an advanced microprocessor design which utilizes the Doppler principle to identify areas of moderate and higher turbulence as well as low level windshear (microburst) activity. The RDR-4B system is designed to operate in the windshear mode automatically any time the aircraft is below 1500' AGL, at least one engine is running, and the **transponder** is not in OFF or STBY, REGARDLESS OF RADAR MODE SELECTED. The system also operates in the windshear mode below 1500' AGL using an alternate scan technique if the radar is operating in any mode (WX / TURB, WX, MAP). The windshear mode is activated at 2300' AGL. However, no alerts or displays are annunciated above 1500' AGL.

WARNING: Failure to return the transponder to STBY after landing or selecting any mode except STBY prior to leaving the ramp area allows the radar to operate in the windshear mode creating a radiation hazard to personnel on the ground. The RDR-4B radiation hazard area extends 13.4 feet from the radar antenna in a 120 degree arc left and right of the aircraft centerline. This hazard exists even if the radar mode is selected OFF or TEST.

RDR-4B System Operation

General

The RDR-4B radar system operates in the same way as previous radar systems installed in Continental aircraft for weather and mapping modes.

Windshear Mode

The Windshear mode is intended to be transparent to the pilot unless an alert occurs. The windshear mode is activated any time the aircraft is below 1500' AGL, at least one engine is operating, and the transponder is not OFF or STBY.

The system will generate 3 levels of alerts when it detects hazardous windshear activity in front of the aircraft. The level of the alert (warning, caution or advisory) is dependent on several factors including actual altitude, phase of flight (landing or takeoff) and proximity to the windshear event. All levels of windshear alert are inhibited on the ground above 100 KIAS until 50' AGL.

The areas covered, the level of alert generated and warnings associated with each are presented in the following table and illustrations.

	Advisory	Caution	Warning
VISUAL	ICON	ICON and Amber Lamps.	ICON and Red Lamps.
AURAL	NONE	Chimes	Take Off: "WINDSHEAR AHEAD, WINDSHEAR AHEAD" Landing: "GO AROUND, WINDSHEAR AHEAD"

WINDSHEAR VISUAL AND AURAL MESSAGES

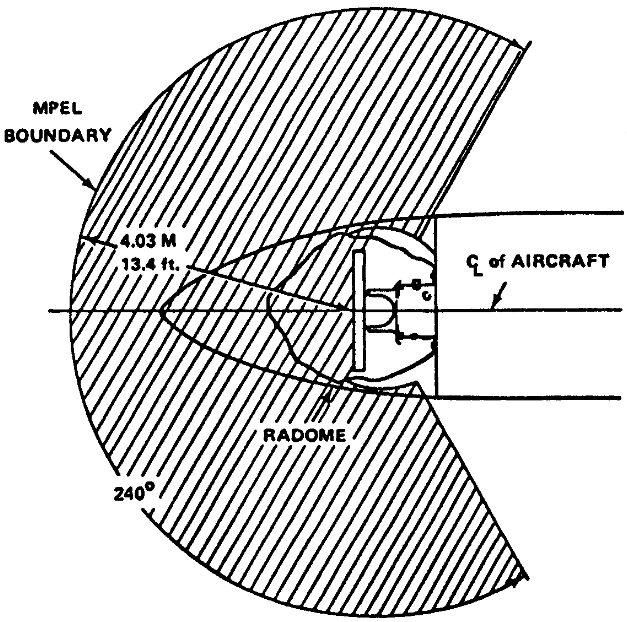
Note: Although the windshear mode is intended to be transparent unless an alert is generated, the crew may notice that the radar update rate is delayed when both radar and windshear modes are active. This delay of up to 12 seconds is caused by the sharing of antenna and processing between the weather and windshear modes in an alternate scan technique.

Alternate Scan

When the radar is operated in a weather mode and the conditions for windshear mode operation are satisfied, the radar switches to the alternate scan function. In an alternate scan operation, the radar uses one sweep for radar mode, the next sweep for windshear mode. On the radar sweep, gain and tilt are controlled by the settings in the flight deck. On the windshear sweep gain and tilt is automatically set by the R/T units programming for optimum windshear detection.

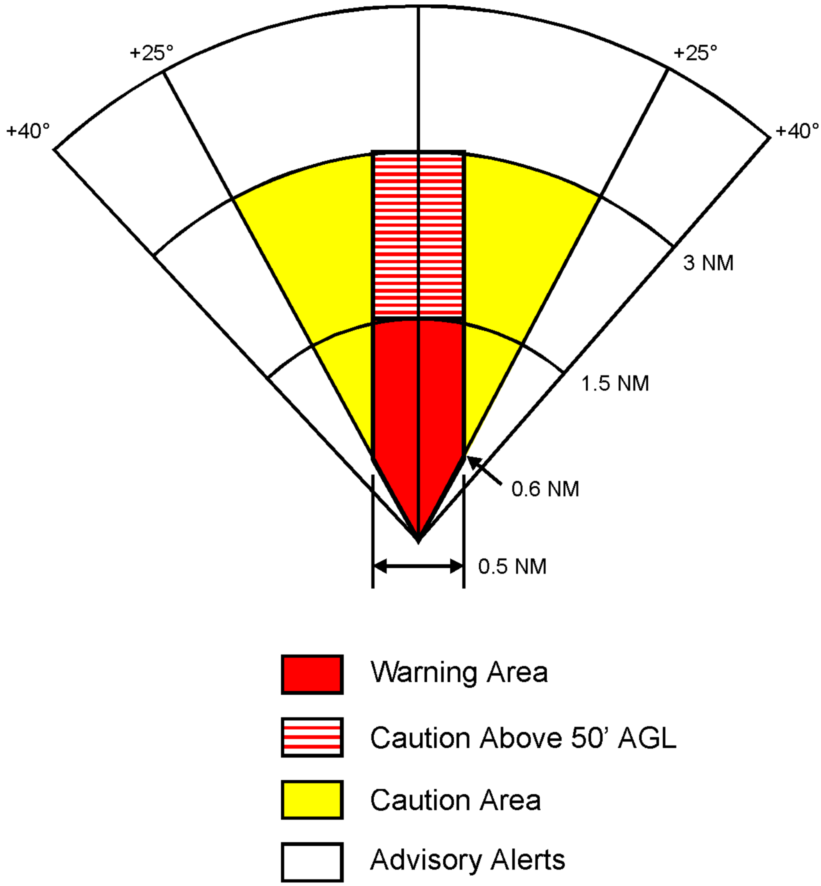
Maximum Permissible Exposure Level (MPEL)

In order to avoid the envelope in which the radiation level may exceed the U.S. Government standard of 10 milliwatt per square centimeter, all personnel should remain beyond the distance indicated in the illustration below. The distance to the MPEL boundary is determined by calculating the near field/far field intersection per FAA Advisory Circular 20-68B.



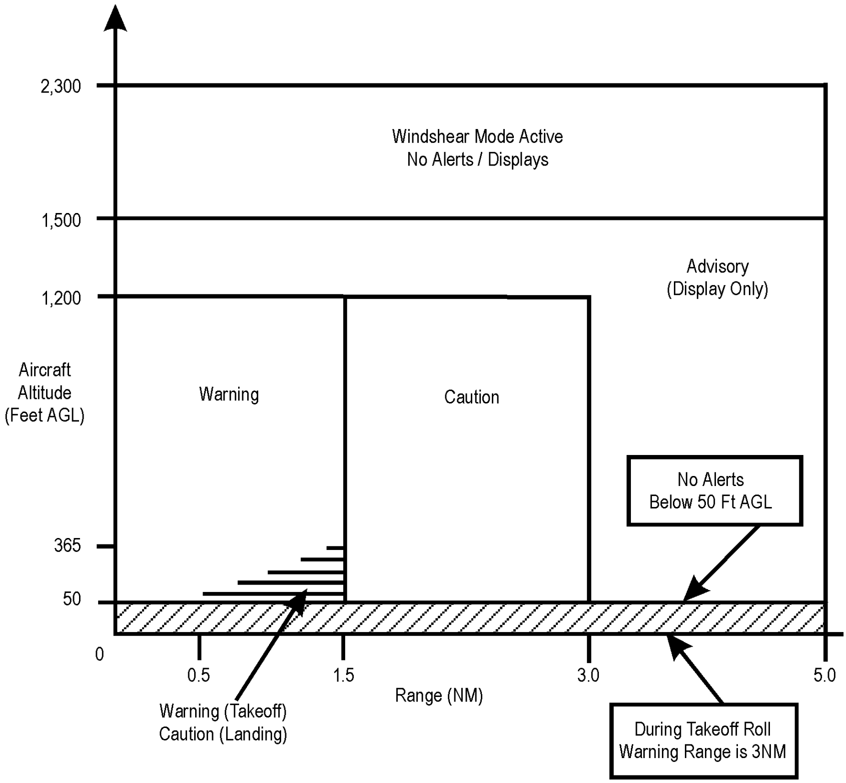
MPEL BOUNDARY

Caution: Failure to place the transponder to ALT ON, TA or TA/RA prior to taking the runway will prevent operation of the radar in the windshear mode unless the radar is selected to an active mode.



LANDING

WINDSHEAR ALERT / WARNING AREAS



WINDSHEAR ALERT RANGES AND ALTITUDES

System Annunciator Lights

Red and amber **WINDSHEAR** annunciator lights are installed on the forward instrument panel in front of each pilot. The red lights illuminate in conjunction with a warning level alert and the aural warning of "WINDSHEAR AHEAD, WINDSHEAR AHEAD" on takeoff, or "GO AROUND WINDSHEAR AHEAD" on approach. The amber lights illuminate in conjunction with a caution level alert and a two tones aural warning.

An amber **WINDSHEAR INOP** annunciator is installed on the annunciator panel. This light illuminates any time the windshear systems detects a fault which renders the system inoperative. The windshear annunciator circuit breaker is located on the right radio DC bus, E-4.

Windshear Icon

The windshear icon consists of red and black bands with straight sides formed by the radials from the aircraft which bound the event. The arcs closest and furthest from the aircraft depict the minimum and maximum range of the event.

Yellow radial lines appear at the edges beyond the event and extend to the edge of the display to provide directional information for the event.

Procedures

The following procedural chart applies to the predictive windshear system. Continental policy is to avoid all windshear and other hazardous weather.

Note: Windshear alerts are inhibited on the ground above 100 KIAS to 50 feet AGL.

Phase of Operation	Warning Alert	Caution Alert	Advisory Alert	System Failure
Before Takeoff	Advise ATC of the location of the Warning Alert. Delay takeoff until the warning is no longer present.	Advise ATC of the location of the Caution Alert. At the Captain's discretion, delay the takeoff, or takeoff and maneuver to avoid the hazard.	Advise ATC of the location of the windshear hazard. After takeoff, maneuver to avoid the windshear hazard area.	Select the alternate radar system if available. If no alternate system is available, use standard windshear avoidance procedures.
Takeoff Prior to V_1	Reject the takeoff. Advise ATC of the location of the windshear hazard.	Assure maximum rated thrust is applied. Continue the takeoff, and advise ATC of the hazard and maneuver around the hazard.	Assure maximum rated thrust is applied. Continue the takeoff, and advise ATC of the hazard, and maneuver around the hazard.	Same as above.
After Takeoff	Assure maximum rated thrust is applied. If the windshear is penetrated, utilize windshear recovery procedures.	Assure maximum rated thrust is applied. If the windshear is penetrated, utilize windshear recovery procedures.	Continue the climb out and monitor the windshear hazard.	Same as above.
During Approach	Initiate a normal go around. If the windshear hazard is penetrated, utilize windshear recovery procedures.	At the Captain's discretion, maneuver around the windshear hazard if a safe stabilized approach can be continued after the maneuver, or initiate a normal go around.	Continue the approach, monitor the location of the windshear event.	Same as above.

Ground Proximity Warning System

The ground proximity warning system (GPWS) interfaces with the radio altimeter, CADC, landing gear lever switch, VOR/LOC/GS receiver, and flap position switch. The system utilizes radio altitude, barometric rate (vertical speed), Mach, DH, and glideslope deviation information to determine adverse proximity to the ground.

The system provides warning annunciations for the following conditions: excessive rate of descent; excessive terrain closure rate, altitude loss after takeoff, descent in wrong configuration, descent below the glideslope, and descent below DH. A **GPWS** warning light or a **BELOW G/S** warning light, located on the Captain's and F/O's instrument panel, will illuminate, accompanied by aural annunciation, to advise the crew of adverse proximity to the ground. The GPWS does not operate on Emergency Power.

The GPWS computer provides an additional warning applicable to the decision height warning system. A vocal annunciation, "MINIMUMS-MINIMUMS" is generated whenever the airplane passes through the selected DH as set by the DH "bug" (between 1000 feet to 50 feet). The mode will not function again until 1000 feet or 50 feet AGL has been transitioned.

Radio Altimeters

Two radio altimeters, radio altimeter 1 and radio altimeter 2, are installed in the airplane. A radio altimeter indicator on the Captain's instrument panel provides radio altimeter 1 indications, and a radio altimeter indicator on the F/O's instrument panel provides radio altimeter 2 indications. Each indicator provides radio altitude indications to a maximum of 2500 feet AGL.

During an ILS approach, the radio altimeters actuate the rising runway symbol on the respective ADI at approximately 200 feet AGL. A SET/TEST knob on each indicator permits preselection of a desired decision height (DH) that is set in a digital readout. Each radio altimeter has a test function that is activated when the respective SET/TEST knob is pushed. Each indicator contains a **DH** light that illuminates at 2500 feet and when the airplane reaches the selected DH. The function of the **DH** light on the Captain's ADI is associated with the function of the **DH** light on the Captain's radio altimeter indicator, and the function of the **DH** light on the F/O's ADI is associated with the function of the **DH** light on the F/O's radio altimeter indicator. Radio altimeter 1 and 2 interface with DFGC 1 and 2. The Radio Altimeters do not operate on Emergency Power.

Air Traffic Control Transponders

Two ATC transponders are installed. One control panel allows selection of either transponder, ATC 1 or ATC 2, for transmission. The other transponder remains in a standby status. The control panel also contains controls for function and mode selection, and test and altitude reporting.

Altitude information for ATC 1 is provided by CADC 1, and altitude information for ATC 2 is provided by CADC 2. The transponders do not operate on Emergency Power.

Flight Recorder

The flight recorder is a digital flight data recorder (DFDR). The DFDR stores the last 25 hours of flight operations on a crash survivable magnetic tape.

The Flight Recorder operates when the aircraft is inflight - or - if on the ground, the recorder operates if the Parking Brake is released and at least one Fuel Control Lever is ON. The flight recorder does not operate on Emergency Power.

A **FLIGHT RECORDER OFF** light illuminates when the recorder is not powered or has malfunctioned.

TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM

General

The traffic alert and collision avoidance system (TCAS) is an aircraft-based system that provides information, independent of ground stations, on the status of nearby traffic within a specified range. By interrogating other aircraft transponders, the system analyzes the replies to determine range, bearing, and if reporting altitude, the relative altitude of the intruder. Should the system processor determine that a possible collision hazard exists, it issues visual and audio advisories to the crew for appropriate vertical avoidance maneuvers. TCAS is unable to detect any aircraft without an operating transponder.

ATC procedures and the “see and avoid” concept continue to be the primary means of ensuring aircraft separation. However, TCAS adds a significant backup for collision avoidance.

TCAS can display up to 30 aircraft at a time. The system uses range relative bearing, and altitude of the intruder (if reported) to predict the time to and the vertical separation of the intruder at the closest point of approach (CPA). If the system predicts that safe boundaries may be violated, it issues a traffic advisory (TA) to alert the crew. If the intruder continues to close and unsafe separation will occur, a resolution advisory (RA) is issued.

For two TCAS equipped aircraft, the systems coordinate the resolution advisories using the Mode S transponder data links. This ensures complementary advisories are issued in each aircraft. Generation of the alarm is based on a 5 second crew reaction time and a .25 G maneuvering force to achieve adequate separation. Increase or reversal of an RA requires a reaction in 2½ seconds with a .35 G maneuvering force.

Symbology and Indication

There are two TCAS displays: the traffic advisory (TA) display (on weather radar), and the resolution advisory (RA) display (on the VSI). The RA indication is incorporated into the VSI with illuminated red and green arcs around the dial indicating the required vertical speed to avoid a possible collision. The TA indications are displayed as four different traffic symbols on the radar PPI indicator. The symbols change shape and color to represent increasing levels of urgency.

The traffic symbols may have an altitude tag, which shows relative altitude in hundreds of feet, and a trend arrow. A plus (+) sign and number above the symbol means the intruder is above your altitude. A minus (-) sign and number below the symbol indicates the intruder is below your altitude. A trend arrow indicates whether the intruder is climbing or descending at a rate of 500 FPM or greater.

If the intruder is non-altitude reporting, the traffic symbol appears without an altitude number or trend arrow. An RA is not generated for non-altitude reporting aircraft since TCAS does not know the intruder's altitude.

The type of symbol is based on the intruder's location and closing rate. Should TCAS direction finding techniques fail to locate the azimuth of an aircraft causing a TA or RA, a **NO BEARING** message appears on the radar.

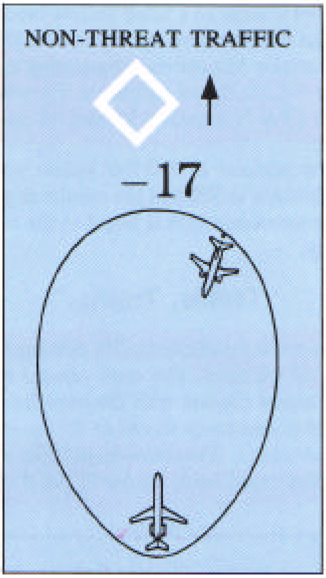
The presence of TA or RA aircraft that are beyond the selected display range is indicated by one half of the appropriate traffic symbol at the edge of the radar display. The position of the half-symbol represents the bearing of the intruder.

Resolution advisories are grouped as corrective advisories or preventive advisories. Corrective advisories require a positive action by the crew and are accompanied by a green arc on the VSI showing fly-to guidance, plus a red arc on the VSI for the vertical speeds to be avoided.

Preventative advisories require no action be taken to alter the flight path of the aircraft. The vertical speeds to be avoided are indicated by the red arcs. Preventative advisories do not have the green arc fly-to guidance.

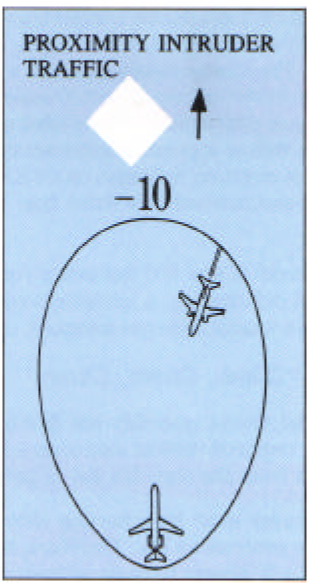
An RA may be presented for as many as three threat aircraft simultaneously. For example, a do-not-descend indication may be visible at the same time a do-not-climb indication appears because of threat aircraft above and below your own aircraft.

Synthesized voice announcements are issued by TCAS over the aircraft audio system.



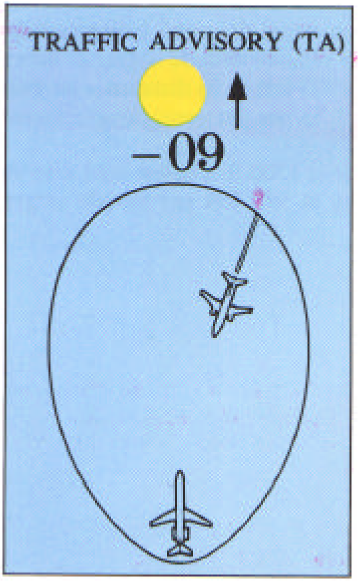
An open white diamond indicates that an intruder's relative altitude is greater than plus or minus 1200 feet or its distance is beyond 6 nm range. It is not yet considered a threat.

This one is 1700 feet below your own altitude, climbing at 500 feet per minute or greater.



A filled white diamond indicates that the intruding aircraft is within plus or minus 1200 feet and within 6 nm range, but is still not considered a threat.

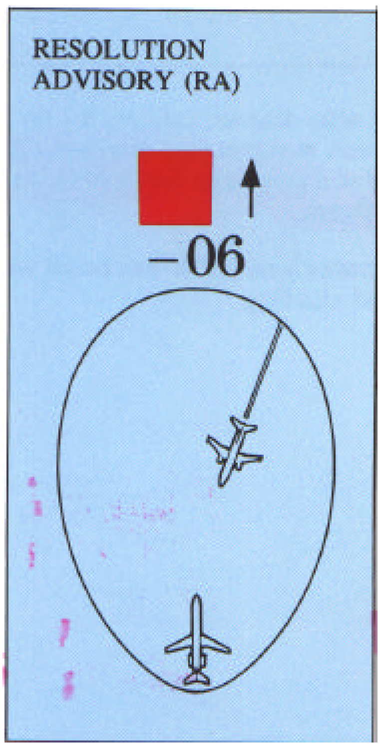
This intruder is now 1000 feet below your aircraft and climbing.



A symbol change to a filled yellow circle indicates that the intruding aircraft is considered to be potentially hazardous. Depending on your altitude TCAS will display a TA when the time to CPA is between 35 and 45 seconds.

Here the intruder is 900 feet below your aircraft, climbing at 500 FPM or greater. A voice announcement is heard in the cockpit advising: "TRAFFIC, TRAFFIC."

Under normal conditions a TA will precede an RA by 15 seconds. The crew should attempt to gain visual contact with the intruder and be prepared to maneuver should an RA be sounded. The crew should take no evasive action based solely on the TCAS display.



A solid red square indicates that the intruding aircraft is projected to be a collision threat. TCAS calculates that the intruder has reached the point where an RA is necessary. The time to closest approach with the intruder is now between 20 and 30 seconds depending on your altitude. The symbol appears together with an appropriate audio warning and a vertical maneuver indication on the RA/VSI.

This aircraft is now 600 feet below you altitude and still climbing. A synthesized voice announces a vertical maneuver command such as: "CLIMB, CLIMB, CLIMB."

The pilot should smoothly but firmly initiate any required vertical maneuver within 5 seconds from the time the RA is issued.

An intruder must be reporting altitude in order to generate an RA. Therefore, an RA symbol will always have an altitude tag.

TCAS SYNTHESIZED VOICE ANNOUNCEMENTS	
CONDITION	**ADVISORY MESSAGE**
TRAFFIC ADVISORY	“TRAFFIC, TRAFFIC”
RA CLEARED	“CLEAR OF CONFLIGHT”
SELF-TEST PASSED	“TCAS SYSTEM TEST OK”
SELF-TEST FAILED	“TCAS SYSTEM TEST FAIL”

TCAS RESOLUTION ADVISORIES		
RA CATEGORY	**CORRECTIVE**	**PREVENTIVE**
CLIMB	“CLIMB, CLIMB, CLIMB”	“MONITOR VERTICAL SPEED”* “MONITOR VERTICAL SPEED”
DESCENT	“DESCEND, DESCEND, DESCEND”	“MONITOR VERTICAL SPEED”* “MONITOR VERTICAL SPEED”
CROSSOVER CLIMB	“CLIMB, CROSSING CLIMB” “CLIMB, CROSSING CLIMB”	“MONITOR VERTICAL SPEED”* “MONITOR VERTICAL SPEED”
CROSSOVER DESCENT	“DESCEND, CROSSING DESCEND” “DESCEND, CROSSING DESCEND”	“MONITOR VERTICAL SPEED”* “MONITOR VERTICAL SPEED”
INCREASE CLIMB RATE	“INCREASE CLIMB” “INCREASE CLIMB”	(N/A)
INCREASE DESCENT RATE	“INCREASE DESCEND” “INCREASE DESCEND”	(N/A)
CHANGE FROM CLIMB TO DESCENT	“DESCEND, DESCEND NOW” “DESCEND, DESCEND NOW”	(N/A)
CHANGE FROM DESCENT TO CLIMB	“CLIMB, CLIMB NOW” “CLIMB, CLIMB NOW”	(N/A)
VERTICAL SPEED RESTRICTED (CLIMBING)	“REDUCE CLIMB, REDUCE CLIMB”	“MONITOR VERTICAL SPEED” “MONITOR VERTICAL SPEED”
VERTICAL SPEED RESTRICTED (DESCENDING)	“REDUCE DESCENT, REDUCE DESCENT”	“MONITOR VERTICAL SPEED” “MONITOR VERTICAL SPEED”
* “Monitor Vertical Speed” is spoken once if softening from a previous corrective advisory.		

TCAS/TRANSPAONDER FUNCTION SELECTOR
Moving the spring loaded knob to TEST position for one second initaites a comprehensive self test lasting approximately twelve seconds. Inflight selecting TEST will inhibit both TCAS and transponder for approximately 12 seconds.

STBY Paces mode sincerely transponder and the TCAS system in standby.

ALT ON activates transponder without altitude reporting. TCAS system is in standby.

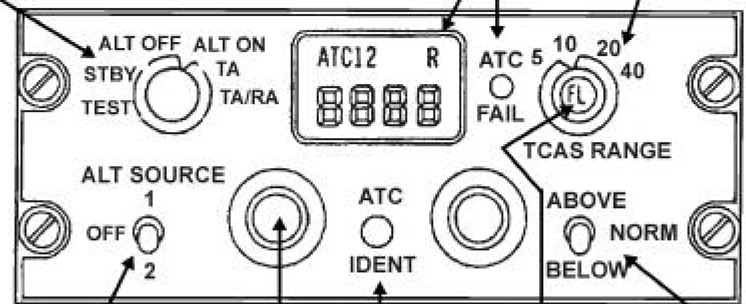
TA (Traffic Advisory) Present traffic location appears on displays. Transponder and Altitude Reporting are active.

TA/RA (Traffic Advisory and Resolution Advisory) Presents traffic location on displays and issues audio and visual Resolution Advisories for traffic determined to be a threat. TA/RA mode annunciation appears on TA displays. Transponder and Altitude Reporting are active.

CODE INDICATOR
Indicates code selected with the code selectors. ATC 1/ 2 indicates which of the transponders is currently active. The interrogation of ATCRBS transponder only.

RANGE SELECTOR
Selects range to be displayed.

ATC FAIL
Lamp indicates failure of the selected transponder.



ATC 1 / 2
Selects one of two mode sincerely transponders to be active. The other unit is placed in standby.

CODE SELECTORS
Selects the transponder code. Left and Right selectors consist of a large knob and a small knob. Each controls one digit of the code.

ATC-IDENT
Button initiates the IDENT feature for ATC.

FL SWITCH
Changes relative altitude to flight level of the intruder for 15 seconds. Displays own aircraft flight level in the upper left hand corner of the screen. Inhibited below 18,000 feet.

ABOVE / BELOW / NORMAL
Selects altitude display limits.

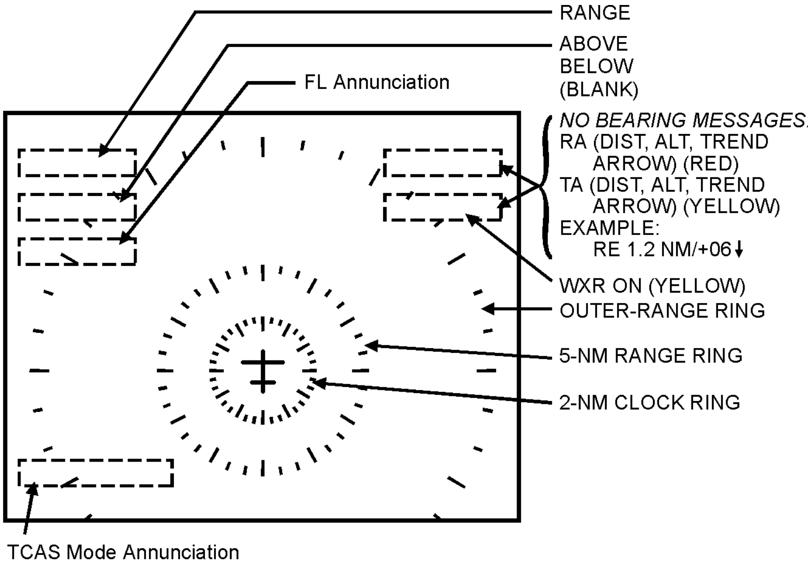
ABOVE	8700ft. above and 2700ft. below
NORMAL	2700ft. above and 2700ft. below
BELOW	2700ft. Above and 8700ft. below

MD801604

TRANSPONDER / TCAS CONTROL PANEL

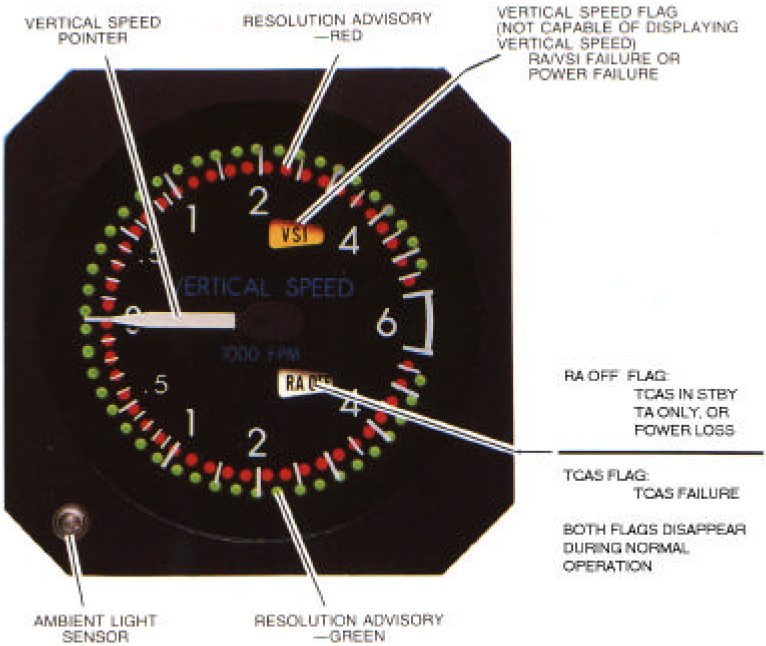
TCAS Mode Message Format

The TCAS mode message format is shown below.



MD801608

TCAS STBY	(Blue)	TCAS system in standby
TEST	(Blue)	TCAS system in TEST
TA/RA	(Blue)	TA/RA Mode
TA/RA AUTO	(Blue)	TA/RA Pop-Up Mode
TA ONLY	(Blue)	TA Only Mode
TA AUTO	(Blue)	TA Only Pop-Up Mode
TD FAIL	(Yellow)	Indicator Failure
FLXXX	(Cyan)	ABSOLUTE ALTITUDE where XXX is own altitude. Field is bland for relative altitude.


VERTICAL SPEED POINTER
RESOLUTION ADVISORY —RED
VERTICAL SPEED FLAG (NOT CAPABLE OF DISPLAYING VERTICAL SPEED) RA/VSI FAILURE OR POWER FAILURE
VSI
VERTICAL SPEED
1000 FPM
RA OFF FLAG: TCAS IN STBY TA ONLY, OR POWER LOSS
TCAS FLAG: TCAS FAILURE
BOTH FLAGS DISAPPEAR DURING NORMAL OPERATION
AMBIENT LIGHT SENSOR
RESOLUTION ADVISORY —GREEN

TCAS RA/VSI

INTENTIONALLY LEFT BLANK

COMMUNICATIONS

VHF Communications Systems

The VHF communication systems are three separate, identical systems designated VHF-1, VHF-2, and VHF-3 (some aircraft) which can be operated separately or simultaneously. The systems provide communication between the airplane and ground and/or another aircraft. The transmitting and receiving frequency selection is controlled from the VHF COMM control panels. Each panel has two frequency selectors and a transfer switch to select either frequency selected.

The audio control panels control volume level of receiver audio. Selection of the desired VHF communication system on the audio control panel is made by pushing the applicable microphone selector button and placing the corresponding volume control lever toward increased volume. The microphone and the headset of the flight interphone system will then be connected to the desired VHF communication system transceiver.

The microphone switch on the outboard horn of either control wheel, or the push-to-talk (PTT) switch on either hand microphone, can be used to place the selected transmitter in operation.

Selective Calling System

The selective calling (SELCAL) system operates in conjunction with the VHF communication systems, and provides visual and aural indication when the airplane is being called. The system enables ground facilities to call individual airplanes selectively. The airplane system includes a decoder with dual channels (SELCAL-1 and SELCAL–2) and a control panel containing the SELCAL indicating lights (**SELCAL-1** and **SELCAL–2** lights). VHF-1 receiver is monitored by the SELCAL-1 decoder circuit, and VHF-2 (and VHF-3 if installed) is monitored by the SELCAL-2 decoder circuit. Each decoder circuit is tuned to a preselected tone signal. The tone signal will be received by all aircraft tuned to the assigned frequency of the tone signal, however, only the SELCAL decoder of the aircraft being called will respond to the signal. When the tone signal is detected by the decoder, the applicable SELCAL light comes on and the central aural warning system (CAWS) provides a chime sound to indicate that the ground station is calling the aircraft. When the call is acknowledged, the system is reset by pushing the applicable SELCAL light on the control panel.

The volume control lever on the audio control panel permits control of the receiver volume without affecting the operation of the SELCAL system. In the event of SELCAL system failure, the VHF communications systems will continue to operate normally.

Flight Interphone System

The flight interphone system provides for communications between positions (stations) within the aircraft, selection and monitoring of the audio outputs of the communications transceivers and navigation receivers, and for selection and transmission with the communications transceivers. Audio selection function is provided and permits the operator to select and monitor the audio output of one or more communications transceivers and navigation receivers. Microphone selection function enables the operator to select and control the desired communications transceiver. The microphone switch on the outboard horn of either control wheel, or a switch on each audio panel provide two means to key transmissions while using the boom or mask microphone. The PTT switch on each hand microphone provides a third means for keying transmissions.

Audio control panels are included for the Captain and F/O, and are also located on the overhead panel for the Observer, and in the electrical / electronics compartment.

A hand microphone jack and a headset jack are installed at the Captain's, F/O's, and Observer's stations. Hand microphone and headset jacks are located in the electrical / electronics compartment for use by maintenance personnel. In addition, a handset jack is located on the external electrical power receptacle panel. Two speaker assemblies are installed overhead in the flight compartment to monitor audio signals selected by the Captain and F/O respectively. Both flight compartment speakers are muted if any microphone is keyed from the Captain or F/O's station, or if the pedestal handset is keyed on passenger address (PA). The speakers do not mute if a microphone is keyed at the Observer's station or if the pedestal handset is keyed on service interphone.

Service Interphone System

The service interphone system provides intercommunication between various service and maintenance areas, flight compartment, and cabin attendants. Telephone type handsets in the flight compartment and at the forward, mid and aft attendant's panels are used for both the service interphone and passenger address system. A switch located in the flight compartment turns off all maintenance interphone jacks when in OFF. All maintenance interphone jacks are connected to the service interphone system when the switch is in ON.

Call System

The call system consists of call lights, aural signals, and call switches which provide both visual and/or aural signals to alert the flight crew of a call from the cabin attendants or ground maintenance, to alert cabin attendants or ground maintenance of a call from the flight crew, and to alert one cabin attendant station of a call from another cabin attendant's station. The call system also provides a visual and aural signal to alert the cabin attendants of passenger(s) requiring assistance at the passenger seats or in the lavatories.

Passenger Address And Passenger Entertainment Systems

The passenger address (PA) system enables the pilots and cabin attendants to address passengers through speakers located throughout the cabin and in the lavatories. The same handsets installed in the flight compartment and at the forward, mid, and aft attendant's panels for the service interphone system are used for the passenger address system. PA announcements from the flight compartment station have priority over PA announcements from the cabin stations and the passenger entertainment system. Refer to Chapter 6, Aircraft General, for further description of PA and entertainment systems.

Voice Recorder System

The voice recorder system records all sounds and voice conversations audible in the cockpit, communications through the Captain's and F/O's audio panels, and the cockpit handset. The recorder contains a 30-minute continuous loop tape, which unless erased, preserves the last 30 minutes of sound and communication. The cockpit monitor unit contains controls for testing the recorder and erasing previous recordings. It also contains a monitor microphone and a headset jack. The voice recorder system operates continuously when electrical power is on the right radio bus.

Automatic Communications Addressing and Reporting System (ACARS)

ACARS is a data link communications system with air-to-ground (down-link) and ground-to-air (up-link) capability. The system can handle a large volume of data communications in a few seconds with a resulting reduction of VHF communications requirements. ACARS equipment, installed in the aircraft, operates in conjunction with special ground-based, remote stations and a central computer that is used for message processing. Data is subsequently distributed via dedicated land lines for further dissemination as required.

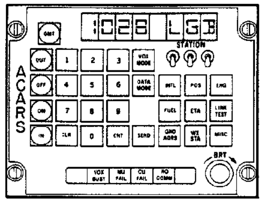
The system provides a digital data (data link) mode that uses a discrete VHF frequency of 131.55. ACARS will automatically record and transmit aircraft OUT, OFF, ON, and IN event times in GMT time. In addition, fuel load information and other necessary data can be manually entered and transmitted.

A voice mode can be selected for conducting normal VHF voice communications. Desired frequencies for VHF voice communications are selected on the VHF-2 (VHF-3 on some aircraft) COMM panel.

The ACARS equipment installed in the aircraft includes a control unit (CU) and management unit (MU). A clock is also included in the ACARS to provide time in GMT.

The CU is located on the pedestal and provides controls and alpha-numeric display for selecting and displaying data before entering the data into the MU. Controls are also provided on the CU to enter data into the MU and to send the data. Status annunciator lights are provided on the CU to indicate failure of the CU or MU and to indicate temporary delays of ACARS operation.

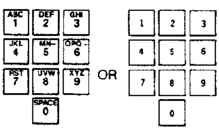
The MU and GMT clock are located in the avionics compartment. ACARS is interfaced with the SELCAL decoder, engine oil pressure switches, forward and aft passenger doors and cargo doors proximity switches, parking brake switch, FDAU, and VHF-2 (VHF-3 some aircraft) communication system. Data that is manually or automatically entered into the MU for processing and memory storage is distributed automatically, or when manually called up, as applicable. The system provides for automatic updating of GMT time.



ACARS CONTROL UNIT

ACARS Control Unit Functions

ALPHA-NUMERIC Display 	The display consists of 8 segments. The control unit keyboard or the management unit control the characters displayed. When no other function is being operated, the display is the GMT if GMT function is activated with GMT key, and the display is blank if GMT function is deactivated with GMT key.
GMT key	When pushed, GMT is displayed on alpha-numeric display. GMT function overrides other functions. When GMT key is pushed again, GMT function is deactivated, and the alpha-numeric display will be blank or will display applicable characters for another function that is selected. The GMT key is back-lighted only.
OUT/OFF/ ON/IN Key	When OUT, OFF, ON, or IN key is pushed, the applicable key light comes on and the GMT that the applicable event occurred is displayed on the alpna-numeric display. Other functions that are displayed are overridden. Releasing the key clears the time of the event from the display and the applicable key light goes off. GMT time is captured for OUT, OFF, ON, and IN events and the time is automatically transmitted and recorded when following conditions occur:
	OUT – Forward and aft cabin doors closed, engine oil pressure up, and parking brake released.
	OFF – Ground control relay senses that airplane is off the ground (10 seconds after wheels are off the ground).
	ON – Ground control relay senses that airplane is on the ground (10 seconds after wheels are on the ground).
	IN – Forward or aft cabin doors open or parking brake set.
ALPHA-NUMERIC Keys (0 thru 9 and A thru Z) OR NUMERIC Keys (0 thru 9)	When an alpha-numeric or numeric key is pushed, that number will appear in the right segment of the alpha-numeric display and will shift left as more numbers are entered. If overfill occurs, only the digits displayed are entered into the system memory. Certain combinations of keys are used with the MISC key to select a function. The alpha-numeric or numeric keys are back-lighted only.



RA1-2471A

MD801652

COMMUNICATIONS – CONTROLS AND INDICATORS
ACARS

ACARS Control Unit Functions

CLR Key	CLR	When pushed, the displayed data associated with any selected function key (key light on) is cleared to blanks or zeros. Activation of CLR function permits corrections to be made before entering the displayed data into memory. The CLR key is back-lighted only.
ENT key	ENT	When pushed, the displayed data is entered into memory. Activation of ENT function causes the SEND key light to come on flashing when any one of the following keys are activated: MISC (for certain stored data), WX STA, GND ADRS, ETA, POS, or ENG. The ENT key is back-lighted only.
VOX MODE Key and DATA MODE Key	VOX MODE DATA MODE	VOX MODE or DATA MODE is activated at all times (key light for applicable mode will be on). When VOX MODE key is pushed, VOX mode key light comes on, DATA MODE key light goes off, and VHF COMM 3 can be utilized for normal VHF communications. VOX MODE overrides and makes LINK TEST and SEND functions inactive. Two minutes after VOX MODE is selected, DATA MODE key light will come on flashing. Pushing VOX MODE key again will cause the flashing DATA MODE key light to go off. A digital data message can be compiled for DATA MODE while in VOX MODE, but if an attempt is made to SEND the message, the DATA MODE key light will come on flashing and the SEND key light will remain off. When DATA MODE key is pushed, DATA MODE key light goes off and digital data can be transmitted by pushing SEND key or will be transmitted automatically.
SEND Key	SEND	When SEND key is pushed or when sending an automatically queued message when in DATA MODE, any message previously entered (but not acknowledged) is transmitted and the SEND key light comes on for a minimum of 2 seconds. The SEND key light will go off at the end of 2 seconds if an acknowledgement has been received from the ground station. If the system determines that the message cannot be delivered after six attempts (approximately 1-1/2 to 2 minutes), the NO COMM status annunciator light comes on and the SEND key light goes off. If SEND key is pushed with VOX MODE selected, the system remains in the state displayed prior to activation and the DATA MODE key light comes on flashing. The SEND key light comes on flashing if a MISC (for certain stored data), WX STA, GND ADRS, ETA, POS, or ENG message has been entered.

RA1-2472A

MD801653

COMMUNICATIONS – CONTROLS AND INDICATORS
ACARS

ACARS Control Unit Functions

Function key (General)	INTL POS ENG FUEL ETA LINK TEST GND ADRS WX STA MISC	Only one of the function key lights will be on at a time. The function key light of the last function key pushed comes on, and the function key light that was on goes off. Any data partially compiled and not entered for the other function is erased. When the INTL key is activated, all other key operations except LINK TEST are inhibited until DEP (departure) and DES (destination) characters are entered.
INTL key	INTL	When pushed, INTL (initialization) key light comes on, any data presently stored FOR INTL function is called up from memory, and SEND key light stops flashing if SEND function is in that state. When INTL key is pushed again, the INTL key light goes off and INTL function is cancelled. INTL function permits ENT (entry) or change of standard normal data prior to flight. Data consisting of flight number, fuel on board, departure station, and destination station is sequenced by successive pushing of the ENT key. After ENT of the destination station, the INTL routine is completed. INTL function must be activated and the DEP and DES alpha characters entered before any other key, except LINK TEST, will function after first power up or after the IN event and FUEL data is entered. When CLR key is activated, the display associated with activated INTL function is cleared.
WX STA Key	WX STA	WX STA key is functional only when the optional Printer is installed.
FUEL key	FUEL	When pushed, FUEL key light comes on, data presently stored for FUEL function is called up from memory, and SEND key light stops flashing if in that state. The data entry of FOB, PL, and CAT is sequenced by successive pushing of the ENT key. When FUEL key is pushed again, FUEL key light goes off and FUEL function is cancelled. The fuel display value is cleared after the IN event has been completed. When the fuel value is sent in a message, the value is cleared from the message and is not sent in any future messages unless re-entered; however, the value remains available for display. When the CLR key is activated, the display associated with the FUEL key is cleared.
GND ADRS Key	GND ADRS	When pushed, GND ADRS light comes on, data presently stored for GND ADRS function is called up from memory, and SEND key light stops flashing if in that state. When GND ADRS key is pushed again, GND ADRS key light goes off and GND ADRS function is cancelled. A two-digit code, corresponding to a company telephone number, is used for ground address. ENT and SEND keys must be pushed in that order after the ground address number has been entered. When the ground address message has been acknowledged by the central ground station and the party is on the line, the SELCAL light comes on and the chime sounds. VOX MODE key light comes on flashing, and DATA MODE key light and SEND key lights go off. Pushing VOX MODE key stops the VOX MODE key light from flashing and the transceiver voice frequency is displayed, preceded by an "F". If GND ADRS telephone is busy, VOX BUSY status annunciator light comes on to indicate that line is busy. GND ADRS display number is cleared after the IN event has been completed. When the GND ADRS number is successfully sent in a message, the number is cleared from the message and is not sent in any future messages unless re-entered; however, the number remains available for display. When the CLR key is activated, the display associated with the GND ADRS key is cleared.

RA1-3269

MD801654

COMMUNICATIONS – CONTROLS AND INDICATORS
ACARS

ACARS Control Unit Functions

MICS Key [MISC]

When pushed, MISC key light comes on and one of 99 two-digit coded messages can be selected by pushing two applicable numeric keys. Activation of any MISC two-digit code calls up for display from memory any data presently stored for this function. When MISC key is pushed again, MISC key light goes off and MISC function is cancelled.

The display associated with MISC function is cleared after the IN event has been completed.

When MISC data is sent in a message, the data is cleared and is not sent in any future messages unless re-entered; however, the data remains available for display. When the CLR key is activated, the display associated with the MISC key is cleared.

ETA Key [ETA]

When pushed, ETA key light comes on and the destination from the INTL entry is recalled. Subsequent activation of the ENT key recalls the previous ETA data entered after the last IN event. If the destination is changed, a diversion report is queued. A diversion report queues up a fuel-on-board entry.

New ETA data can be entered to overwrite prior ETA data. ETA data entry is followed by pushing the SEND key.

POS Key [POS]

When pushed, POS key light comes on and permits entry of position report data that follows: Position (PPOS), present time (PGMT), estimated time of arrival (ETA), altitude (ALT), temperature (TEMP), wind vector (WV), and turbulence (TURB). The data entry is sequenced by successive pushing of the ENT key. The position report entry is followed by pushing the SEND key.

ENG Key [ENG]

The engine data report may be initiated any time in flight. When pushed, the ENG key light comes on, and entries for engine data report are in the order that follows:

1. GWT (Gross Weight)
2. ALT (Altitude)
3. SAT (Static Air Temperature)
4. TAT (Total Air Temperature)
5. TAS (True Airspeed)
6. IAS (Indicated Airspeed)
7. MACH (Mach Number)
8. ISO 12 (Pneumatic Isolation Valve)
9. ISO 13 (Pneumatic Isolation (Valve)
10. PAC 1 (Pack Valve Air Conditioning)
11. PAC 2 (Pack Valve Air Conditioning)

NOTE: In the following entries. "X" represents engine 1 or 2.

12. XN1 (Fan RPM)
13. XEGT (Exhaust Gas Temperature)
14. XN2 (Compressor RPM)
15. XFF (Fuel Flow)
16. XTL (Throttle Lever Position)
17. XEPR (Engine Pressure Ratio)
18. XOILP (Oil Pressure)
19. XOILT (Oil Temperature)
20. XBLD (Bleed)
21. XFQ (Fuel Quantity)

The engine data report entries are sequenced by successive pushing of the ENT key. Engine data report entries are followed by pushing the SEND key.

RA1-3270

MD801655

COMMUNICATIONS – CONTROLS AND INDICATORS
ACARS

ACARS Control Unit Functions

LINK TEST Key

DATA MODE must be selected to perform LINK TEST function.

When LINK TEST key is pushed, LINK TEST key light comes on, and the four left-hand display segments, four right-hand display segments, and all keys containing key lights will come on in sequence for five seconds maximum for each component.

The LINK TEST key light remains on while a message is transmitted to the ground station and until a return message is received from the ground station. If the airplane is in the gate, the transmitted message is a request for an update to the ACARS GMT clock installed in the airplane. If out of the gate, a link test message is transmitted but the GMT clock is not updated.

During the link test, the ACARS self-test circuitry is activated. If the self-test detects a defect in the CU (Control Unit), the CU FAIL annunciator light will come on to indicate a CU failure. IF a defect in the MU (Management Unit) is detected, the MU Fail annunciator light will come on to indicate a MU failure.

The other keys on the CU cannot be operated while LINK TEST is activated. The test can be stopped by pushing the LINK TEST key again.

Status Annunciators

VOX BUSY – Comes on when a ground address telephone number has been initiated by the crew and the ground station voice frequency or the requested company telephone number is in use.

MU FAIL – Comes on to indicate failure of Management Unit.

CU FAIL – Comes on to indicate failure of Control Unit.

NO COMM – Comes on to indicate that message transmitted manually or automatically has not been received and acknowledge by the ground station. This does not indicate a failure of the system; the message is stored in the MU memory for later transmission. Reasons for NO COMM include antenna shadow, out of range, or ground station down.

STATION Slew Switches

When a STATION slew switch is held forward or aft for 0.5 of a second or longer, alpha characters are slewed at a rate of five characters per second. If switch is held in either direction for 0.2 to 0.5 of a second, alpha characters are slewed at the rate of one character per closure.

The display segment controlled by each STATION switch is directly above each switch on right-hand side of the display.

Use of a numeric key is necessary to shift the three alpha characters to the left on the display. Successive numeric keying shifts the three alpha characters further left on the display.

BRT Control

The BRT control is a dual brightness control that is used to adjust the desired brightness of the bright lighting and the back-lighting.

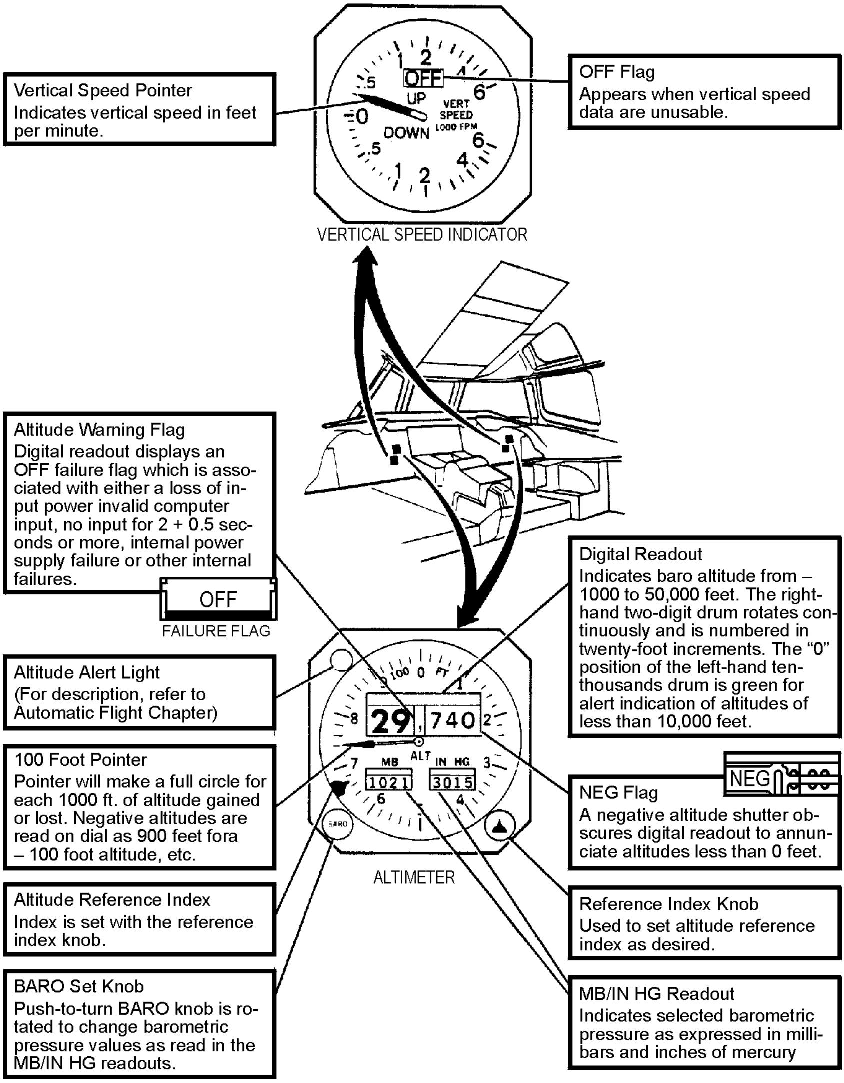
The outer (large) knob controls the bright lighting of the alpha-numeric display, status annunciator lights, and functions keys.

The inner (small) control knob controls the brightness of all CU back-lighting.

RA1-3271

MD801656

COMMUNICATIONS – CONTROLS AND INDICATORS
ACARS



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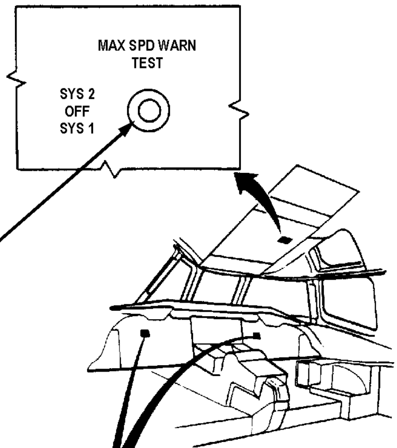
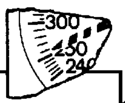
INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
PITOT / STATIC SYSTEMS

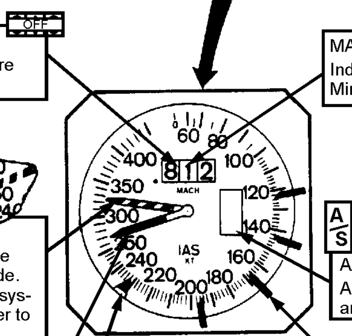


MAX SPD WARN TEST Switch
SYS 1 - (Momentary) Tests Captain's overspeed warning system. A clacking sound will be heard.
OFF - Test mode of overspeed warning system is deactivated. Switch is spring-loaded to OFF.
SYS 2 - (Momentary) Tests F/O's overspeed warning system. Same as SYS 1 above.

OFF Flag
Appears when Mach data are unusable.

MACH Readout
Indicates Mach number. Minimum Mach readout is 150.





VMO Pointer
Reads maximum permissible airspeed as related to altitude. Failure of the VMO advisory system will drive the VMO pointer to 257.5 kts.

A/S Flag
Appears when airspeed data are unusable.

MACH/AS INDICATOR

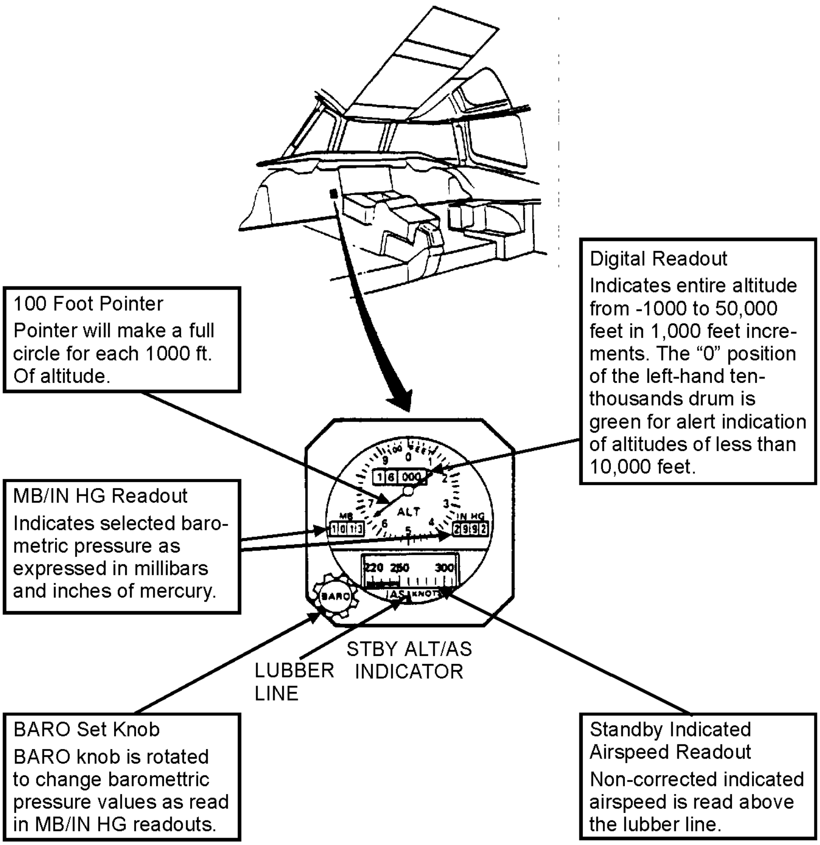
Airspeed Pointer
Reads indicated airspeed.

Airspeed Command Bug
Refer to Automatic Flight Chapter for description.

Airspeed Command Bug
Refer to Automatic Flight Chapter for description.

MD801617

INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
PITOT / STATIC SYSTEMS



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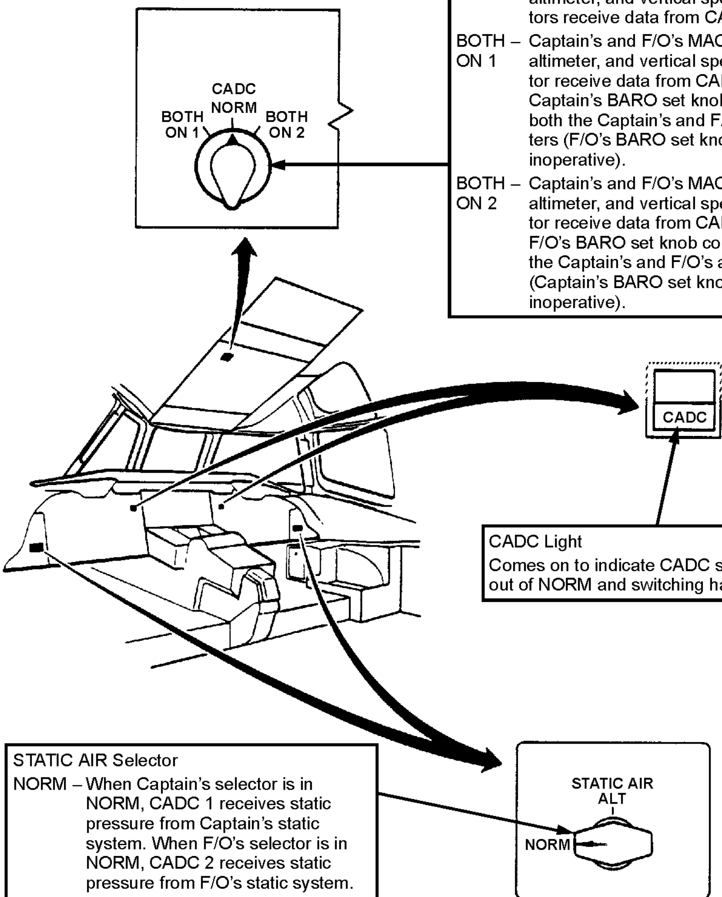
INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
PITOT / STATIC SYSTEMS



CADC Selector

NORM – Captain's MACH/AS, altimeter, and vertical speed indicators receive data from CADC 1. F/O's MACH/AS, altimeter, and vertical speed indicators receive data from CADC 2.

BOTH ON 1 – Captain's and F/O's MACH/AS, altimeter, and vertical speed indicator receive data from CADC 1. Captain's BARO set knob controls both the Captain's and F/O's altimeters (F/O's BARO set knob is inoperative).

BOTH ON 2 – Captain's and F/O's MACH/AS, altimeter, and vertical speed indicator receive data from CADC 2. F/O's BARO set knob controls both the Captain's and F/O's altimeters (Captain's BARO set knob is inoperative).

CADC Light

Comes on to indicate CADC selector is out of NORM and switching has occurred.

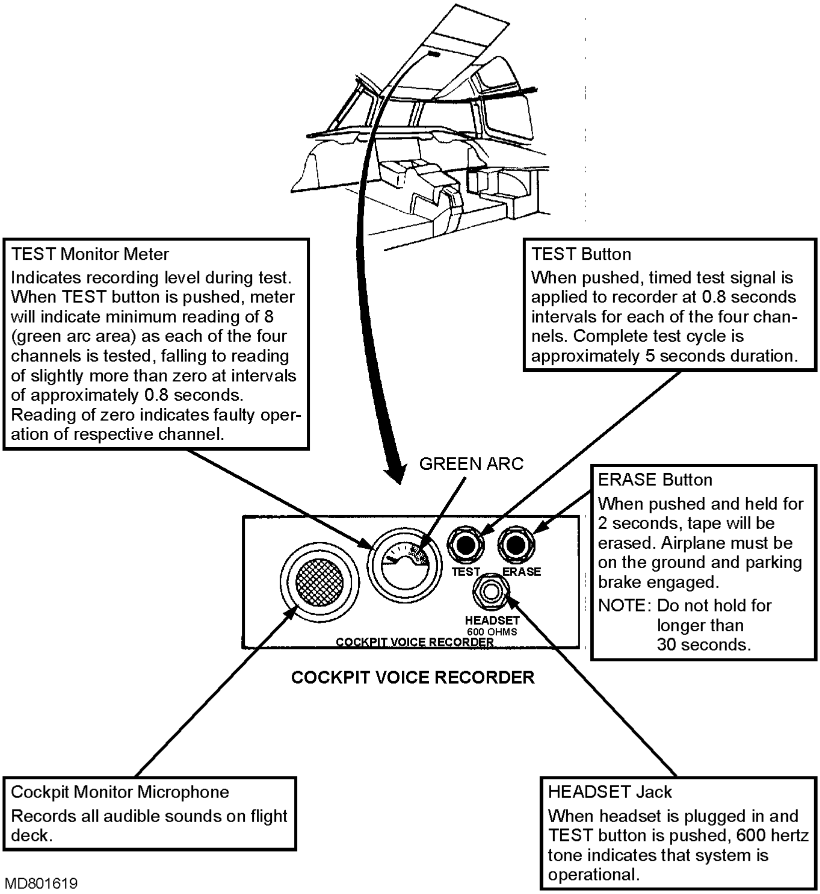
STATIC AIR Selector

NORM – When Captain's selector is in NORM, CADC 1 receives static pressure from Captain's static system. When F/O's selector is in NORM, CADC 2 receives static pressure from F/O's static system.

ALT – When Captain's or F/O's selector is in ALT, respective CADC receives static pressure from alternate static system.

MD801618

INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
PITOT / STATIC SYSTEMS



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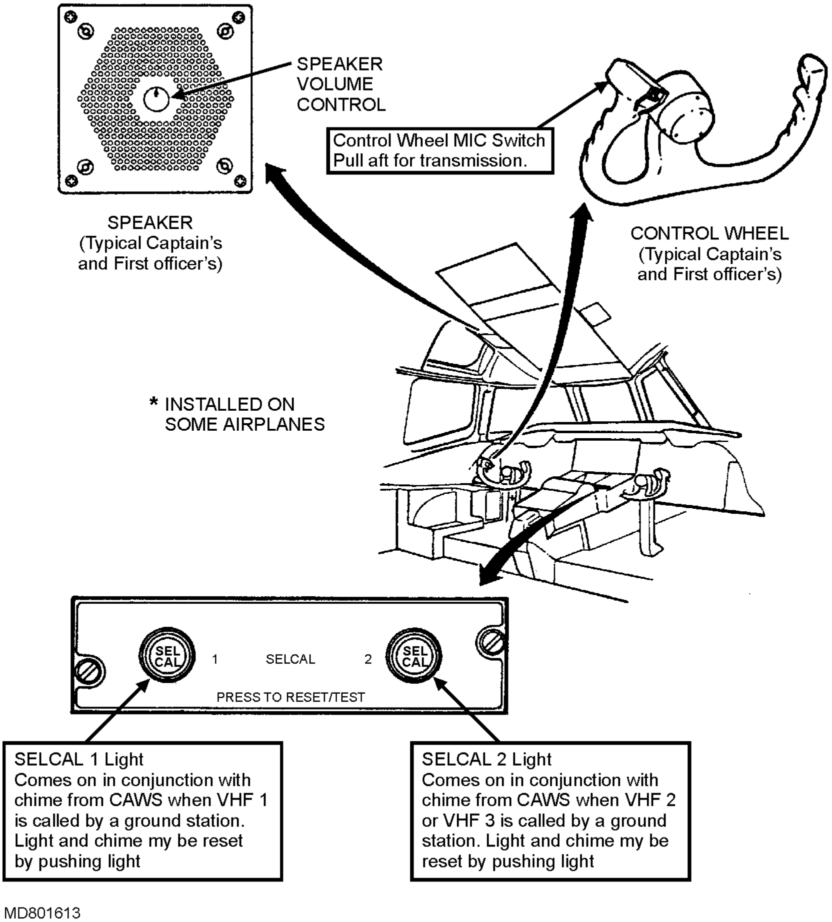
INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
COMMUNICATIONS



COMMUNICATIONS – CONTROLS & INDICATORS

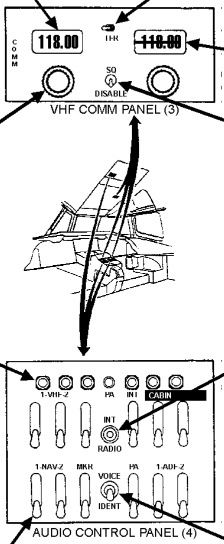
VHF Frequency Readout (2)
Readout indicates selected VHF frequency.

VHF TFR Switch
Permits operator to communicate on either of the selected VHF frequencies.

VHF COMM Selector Bar
Appears when VHF frequency is not in use.

VHF Frequency Selector (2)
Large outer selector knob controls second and third digits of VHF frequency. First digit is not selectable.
Small, inner selector knob controls fourth and fifth digits of VHF frequency.

VHF SQ DISABLE Switch
Disables squelch circuit to verify VHF receiver reception.



RADIO/INT Switch
Momentary in RADIO only.
RADIO - Keys radio transmissions circuit for mask or boom microphone as selected by the microphone selector buttons.
INT - Keys flight interphone transmission for mask or boom microphone.

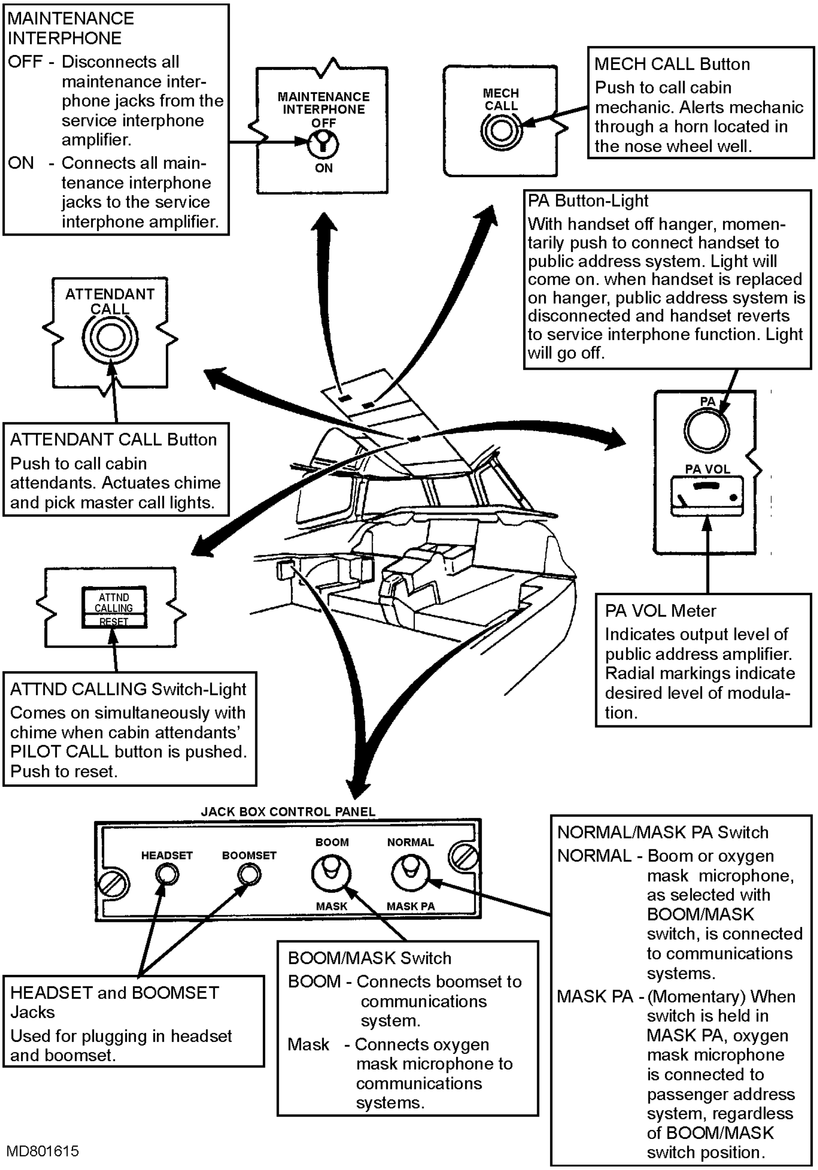
Microphone Selector Button (7)
Push to select transmission medium. Integral light comes on to indicate selection. Because of mechanical interlock, only one button can be latched down at a time.

VOICE/IDENT Switch
VOICE - Filters out audio code Signals.
IDENT - Unfiltered reception. Permits reception of both code and voice signals.

Volume Control Lever (12)
Move lever to adjust volume. All receiving media can be monitored at the same time.

MD801614

COMMUNICATIONS – CONTROLS & INDICATORS



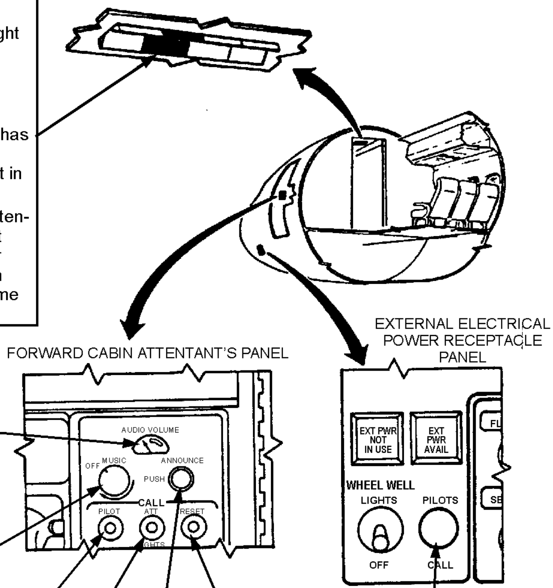
COMMUNICATIONS – CONTROLS & INDICATORS

Attendant's Master Call Lights – (Typical for forward, mid, and aft call lights)

Amber - Comes on to indicate lavatory call switch has been actuated. Chime sounds and individual light over lavatory door also comes on.

Blue - Comes on to Indicate passenger call switch in overhead stowage rack has been actuated. Chime sounds and integral light in switch also comes on.

Pink - Comes on to Indicate attendants call switch in flight compartment or at other cabin attendant's station has been actuated. Chime also sounds



AUDIO VOLUME Meter (Typical forward and aft attendant's panels)

For description, refer to AIRPLANE GENERAL Chapter.

MUSIC On/off Volume Control

For description, refer to AIRPLANE GENERAL Chapter.

PILOT CALL Button (Typical forward, mid, and aft attendant's panels)

Push for to actuates chime and ATTND CALLING light in flight compartment.

Mechanic To PILOTS CALL Button

Push to call pilot. alerts pilot through a chime in flight compartment.

ATT CALL Button (Typical forward, mid, and aft attendant's panels)

Push for attendant to attendant call. Actuates chime and pink call lights.

ANNOUNCE Button-Light (Typical forward, mid, and aft attendant's panels)

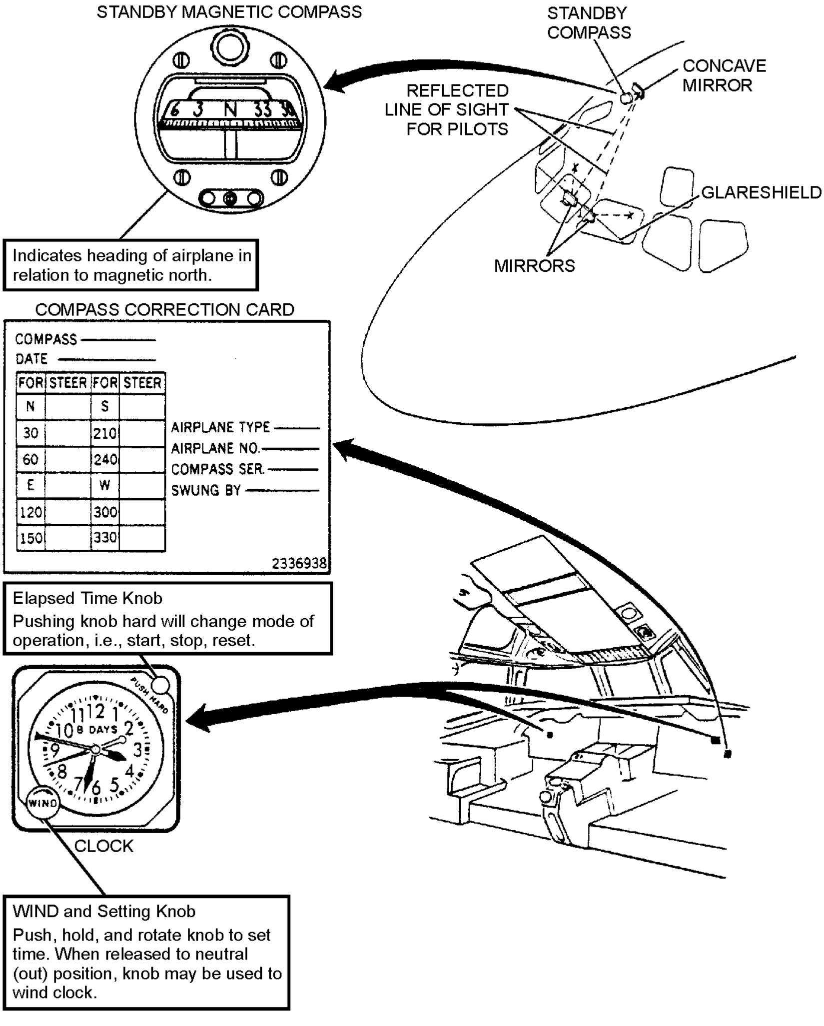
For description, refer to AIRPLANE GENERAL Chapter.

CALL RESET Button (Typical forward, mid, and aft attendant's panels)

Push to cancel attendant master call lights which come on as result of a pilot to attendant or attendant to attendant call.

MD801616

COMMUNICATIONS – CONTROLS & INDICATORS



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INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
NAVIGATION SYSTEMS

ADF 1 Function Selector
Used for selecting desired function of ADF 1 system.

- OFF – Power is removed from system.
- ANT – Used for range navigation or monitoring commercial broadcast.
- ADF – Selects automatic direction finding mode. Relative bearing to selected facility is displayed by the respective VOR/ADF pointer on compass indicators.
- TEST – An aural tone may be heard and the respective VOR/ADF pointer on compass indicators will indicate a 225 degree relative bearing.

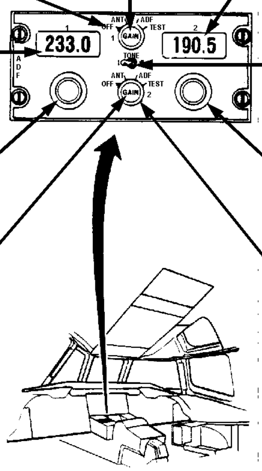
ADF 1 GAIN Control
Adjusts gain of ADF 1 for fine tuning and reception.

ADF 2 Frequency Readout
Digital readout of frequency selected with ADF 2 tune selector knobs.

ADF 2 Frequency Readout
Digital readout of frequency selected with ADF 2 tune selector knobs.

TONE Switch

1 – Superimposes an aural signal on unmodulated carrier waves to aid in precise frequency selection for ADF 1.
2 – Same function as 1. except for ADF 2.



ADF CONTROL PANEL

ADF 1 Tune Selector Knobs
Rotate to select desired frequency for ADF 1.

ADF 2 Tune Selector Knobs
Rotate to select desired frequency for ADF 2.

ADF 1 GAIN Control
Adjusts gain of ADF 1 for fine tuning and reception.

ADF 2 Function Selector
Used for selecting desired function of ADF 2 system. Functions are the same as described for ADF 1 Function Selector.

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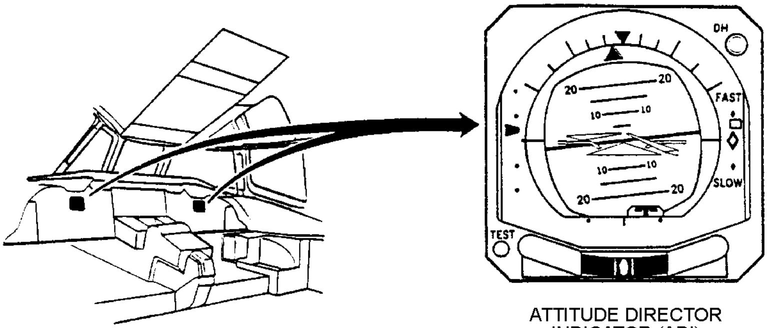
INSTRUMENTATION AND NAVIGATION – CONTROLS AND INDICATIONS
NAVIGATION SYSTEMS



ATTITUDE DIRECTOR
INDICATOR (ADI)

(For description refer to Automatic Flight Chapter)

INSTRUMENTATION AND NAVIGATION - Controls and Indicators Navigation Systems

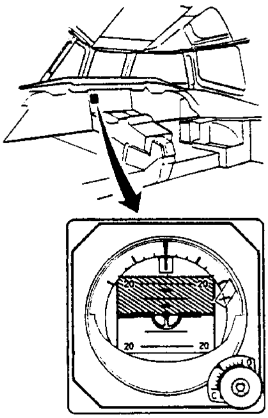
Power Off Flag
Appears when power to indicator is lost.

NOTE

Gyro will continue to run for approximately seven minutes after power is lost.

Roll Attitude Pointer
Indicates roll attitude on fixed roll index marks. Index marks are in 10 degree increments.

Pitch Attitude Scale
Indicates pitch attitude in 5 degree increments up and 10 degrees increments down.



STANDBY HORIZON
INDICATOR

Airplane Symbol
Indicates pitch attitude referenced against horizon drum pitch attitude scale.

Caging/Pitch Trim Knob
When pulled out, fast erection of gyro occurs. Turning knob adjusts airplane symbol for line of sight reference against horizon drum.

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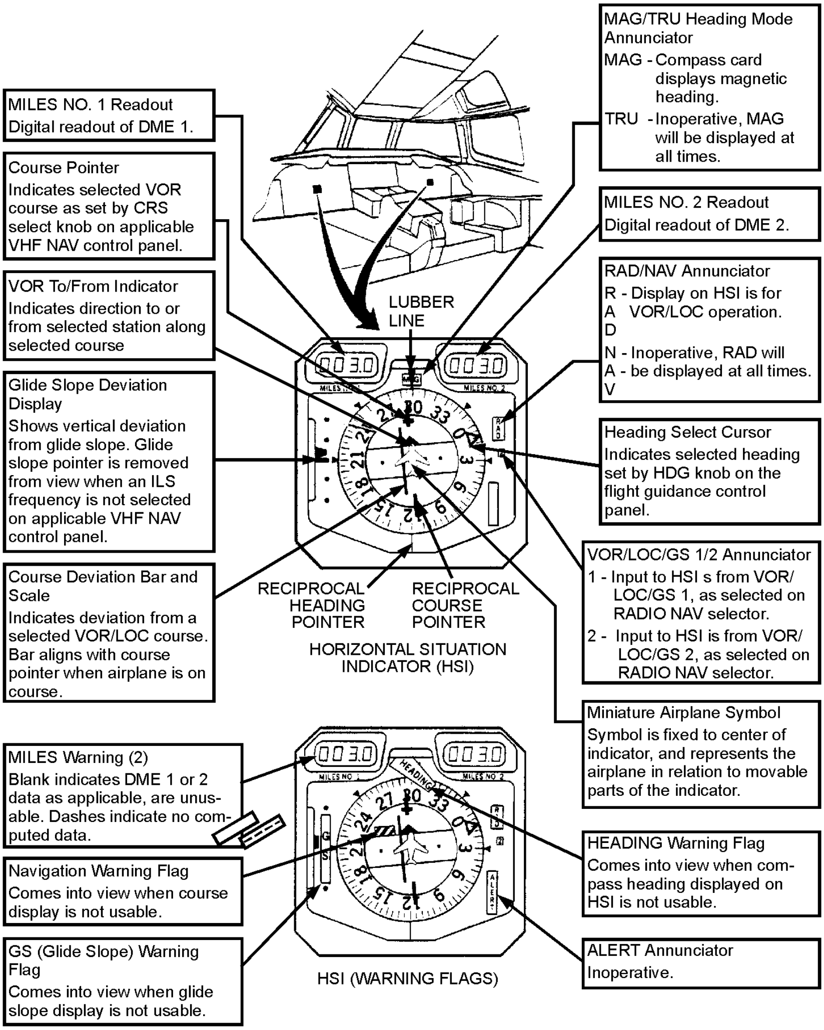
INSTRUMENTATION AND NAVIGATION – CONTROLS AND INDICATIONS NAVIGATION SYSTEMS



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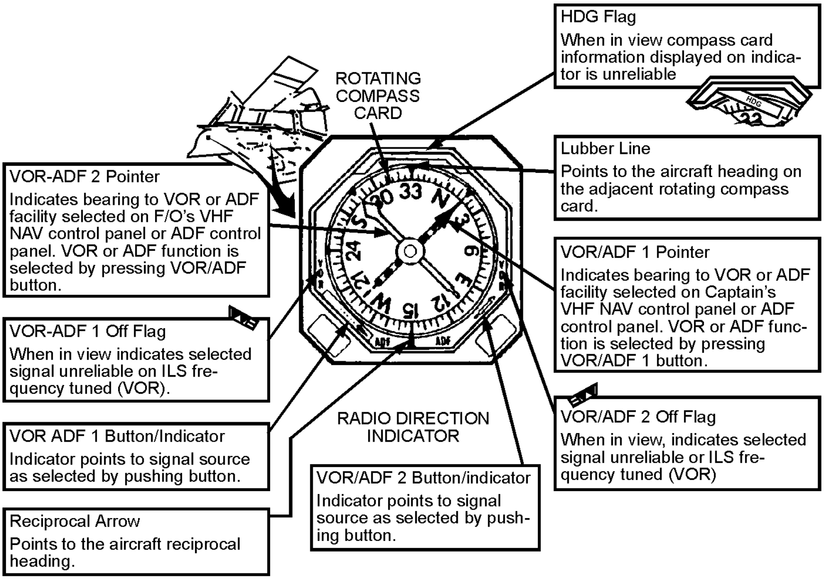
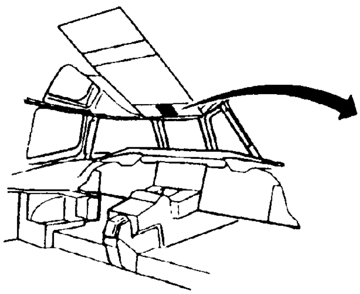
INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS NAVIGATION SYSTEMS





AHRS 1,2 BASIC MODE Annunciator
Indicates respective AHRS system has automatically down-graded to basic mode. Input to ADI and HSI subject to reduced accuracy and attitude input to ADI subject to airplane movement inducted errors

RUDDER TRAVEL UNRESTRICTED	AUTO SPOILER DO NOT USE
AHRS 1 BASIC MODE	AHRS 2 BASIC MODE
STALL INDICATION FAILURE	RAIN REPELLENT RESERVE IN USE
MACH TRIM INOP	APU OIL TEMP HIGH
FIRE DERECTOR LOOP	APU OIL PRESS LOW
L AIR COND SUPPLY TEMP HI	R AIR COND SUPPLY TEMP HI
RADIO FAN OFF	FLT RECORDER OFF

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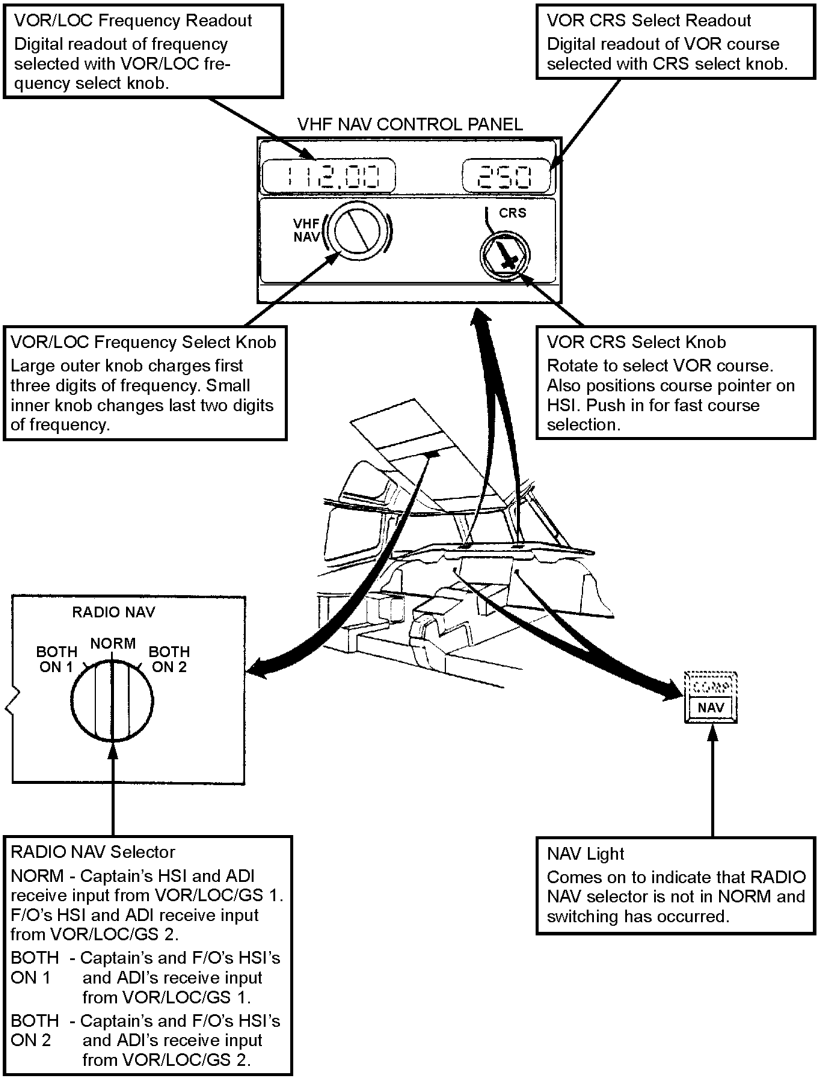
INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
NAVIGATION SYSTEMS



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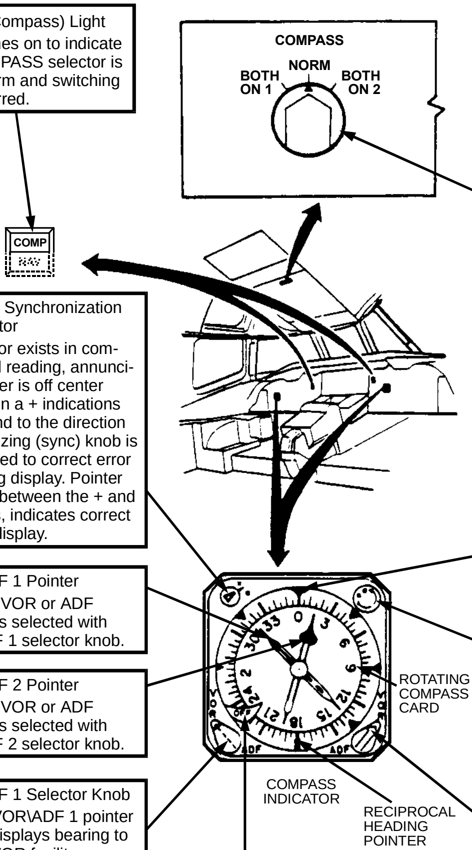
INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
NAVIGATION SYSTEMS



COMPASS Selector

NORM - Heading information from DG 1 is displayed on F/O's compass indicator and Captain's HSI. Heading informa-- tion from DG 2 is displayed on Captain's compass indicator and F/O's HSI.

BOTH ON 1 - Heading information from DG 1 is displayed on Captain's and F/O's compass indicators and HSI's.

If heading displayed on Captain's compass indicator and Captain's HSI disagree, the sync knob on the Captain's compass indicator must be used to adjust heading displayed on Captain's compass indicator to agree with heading displayed on Captain's HSI.

BOTH ON 2 - Heading information from DG 2 is displayed on Captain's and F/O's compass indicators and HSI's.

If heading displayed on F/O's compass indicator and F/O's HSI disagree, the sync knob on the F/O's compass indicator must be used to adjust heading displayed on F/O's compass indicator to agree with heading displayed on F/O's HSI.

COMP (Compass) Light

Light comes on to indicate that COMPASS selector is not in Norm and switching has occurred.

Compass Synchronization Annunciator

When error exists in compass card reading, annunciator pointer is off center resulting in a + indications correspond to the direction synchronizing (sync) knob is to be turned to correct error in heading display. Pointer centered between the + and • symbols, indicates correct heading display.

LUBBER LINE

Rotating compass card is read against lubber line.

VOR /ADF 1 Pointer

Indicates VOR or ADF bearing as selected with VOR/ADF 1 selector knob.

Synchronizing (Sync) Knob

To synchronize compass, push and turn in direction indicated by annunciator indicates + turn knob clockwise. When pointer indicates • turn Knob counter-clockwise.

VOR /ADF 2 Pointer

Indicates VOR or ADF bearing as selected with VOR/ADF 2 selector knob.

VOR /ADF 1 Selector Knob

VOR - VOR\ADF 1 pointer displays bearing to VOR facility selected on Captain's VHF NAV control panel.

ADF - VOR\ADF 1 pointer displays bearing to ADF 1 on ADF control panel.

OFF Warning Flag

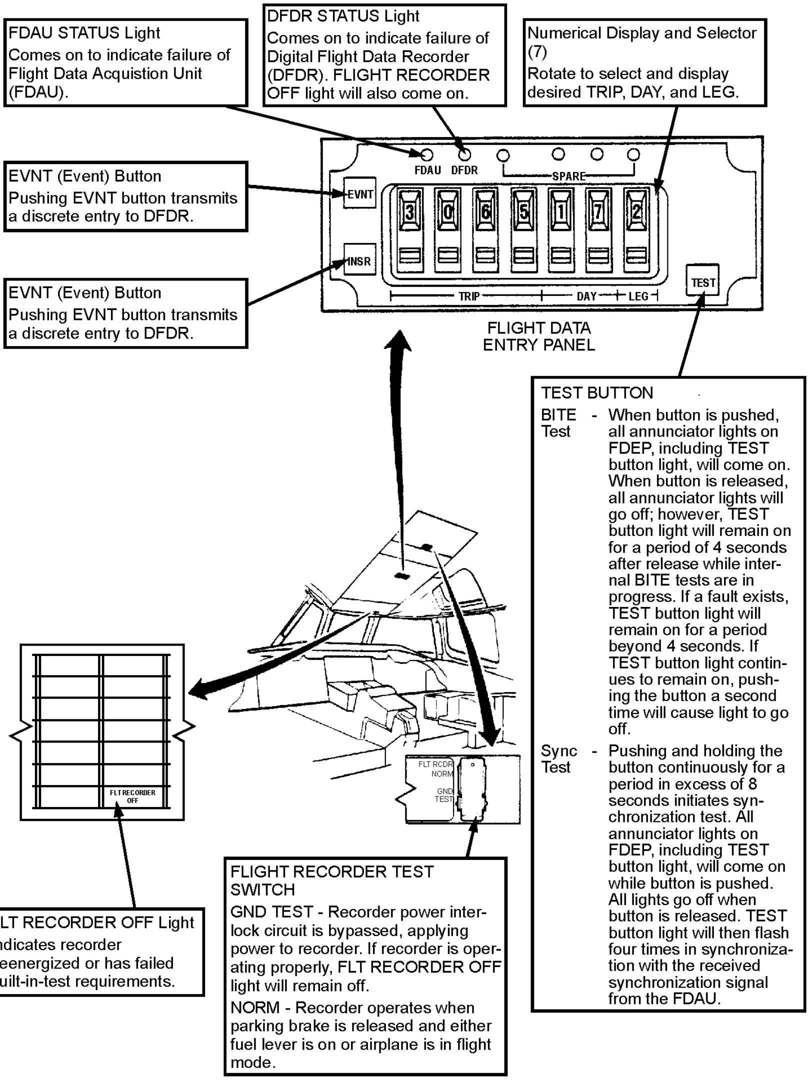
When in view compass card information displayed on indicator is unusable.

VOR /ADF 2 Selector Knob

VOR - VOR\ADF 2 pointer displays bearing to VOR facility selected on F/O's VHF NAV control panel.

ADF - VOR\ADF 2 pointer displays bearing to ADF 2 on ADF control panel.

MD801625



MD801626

INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
NAVIGATION SYSTEMS

Code Readout
Digital readout of code numbers selected with code selector knobs.

Function Selector
OFF - Removes power from transponder.
STBY - Supplies power to transponder but does not allow transponder to reply to interrogation signals.

NOTE

on the ground, transponder is in standby operation when function selector is in either STBY or ON. ground control relays keep transponder in standby operation until liftoff, when function selector is ON. At liftoff, function selector in ON, ground control relays automatically switch transponder from standby operation to on operation. At touchdown, function selector is ON, ground control relays automatically switch transponder to standby operation.

In flight, transponder may be returned to standby operation by rotating function selector to STBY or back to on operation by rotating function selector to ON.

LO SENS - Reduces sensitivity of transponder receiver section to reduce sensitivity to interrogation signals.

NORM/TEST Switch
NORM - Monitor light comes on when transponder is being interrogated by a ground station.
TEST - If transponder is operating correctly the monitor light will come on.

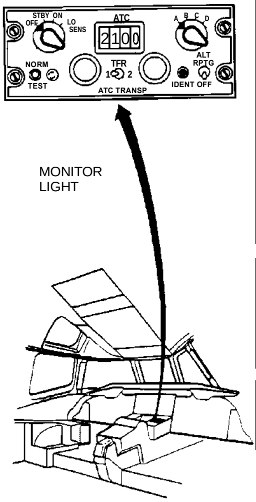
NOTE

In center off position, monitor light is inoperative.

IDENT (Identification) Button
Used only on request of ground controller. when pushed, an identification signal is transmitted for approximately 20 seconds.

Mode Selector
Will usually be set to mode A. Mode B may be requested at the option of the ground controller. The selector is locked out of the C and D positions.

ATC TRANSPONDER CONTROL PANEL



ALT RPTG (Altitude Reporting) Switch
OFF - Disables altitude reporting function.

NOTE

With switch in off, transponder will transmit an invalid data reply of "000" in response to interrogation.

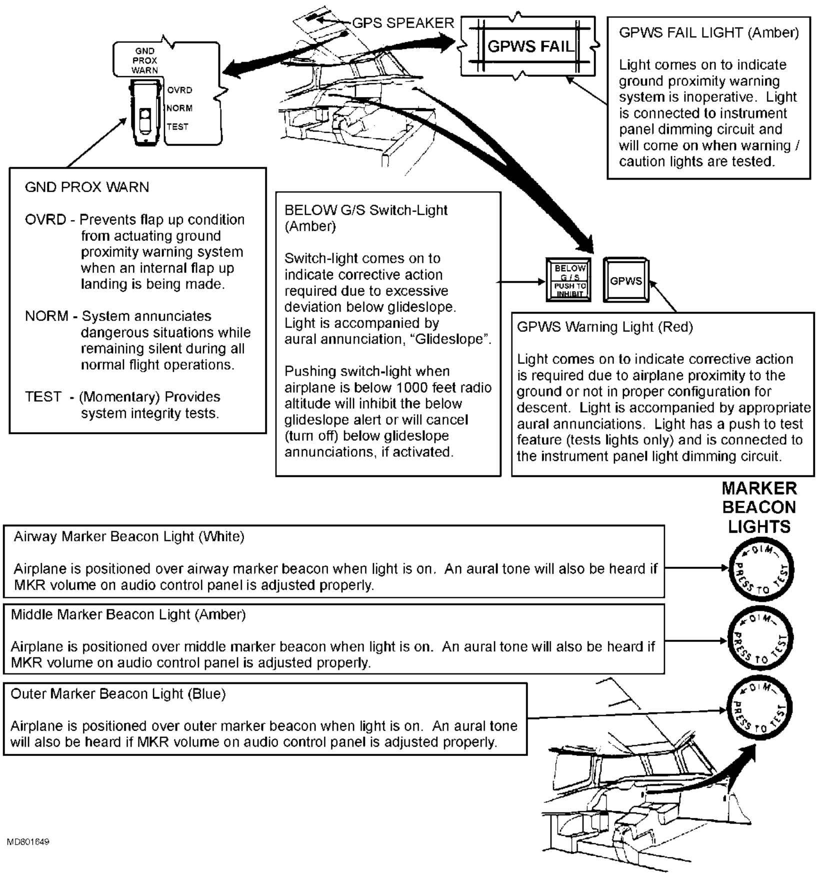
ALT RPTG - Transponder will transmit a reply giving altitude of airplane in response to interrogation.

CODE Selector Knobs (2)
Used to select desired reply code which is visible in CODE readout. Left knobs select first and second digits. Right knobs select third and fourth digits.

TFR (Transfer) Switch
Used to select either ATC transponder 1 or ATC transponder 2.

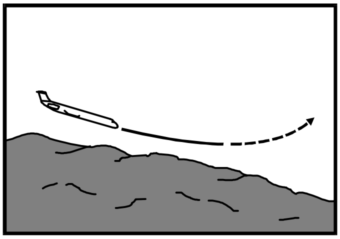
MD801627

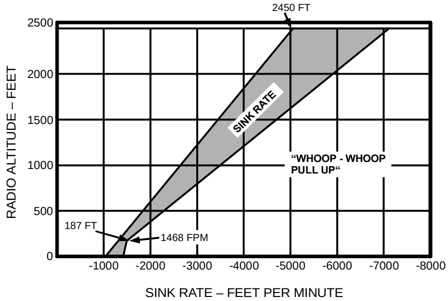
INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
NAVIGATION SYSTEMS



INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
NAVIGATION SYSTEMS

MODE 1 - EXCESSIVE DESCENT RATE

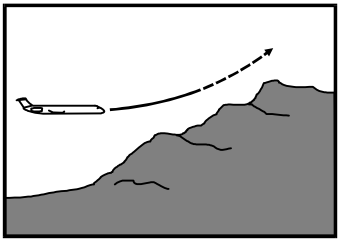


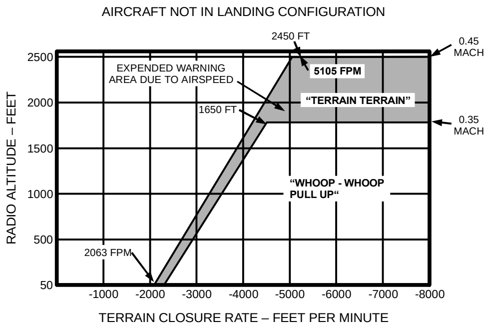


VISUAL INDICATION - GPWS light on.
AURAL/VOCAL ANNUNCIATION -
"SINK RATE, SINK RATE" (Repeated every 0.75 seconds.)
"WHOOP WHOOP-PULL UP" (Continuous)

This mode indicates rate of descent for given altitude excessive and condition should be corrected. Any excessive sink rate (barometric altitude) below 2450 feet radio altitude actuates aural/vocal annunciation. Mode is independent of aircraft configuration and is functional to without feet terrain.

MODE 2 - EXCESSIVE DESCENT RATE



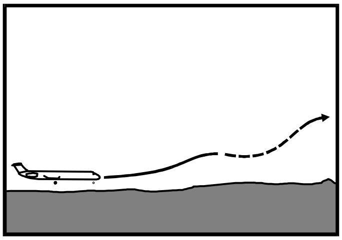


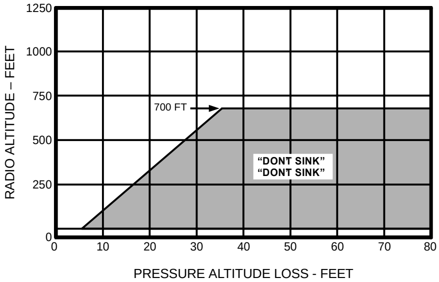
VISUAL INDICATION - GPWS light on.
AURAL/VOCAL ANNUNCIATION -
"TERRAIN - TERRAIN" (Rapid succession.)
"WHOOP WHOOP-PULL UP" (Repeated every 0.75 seconds.)
"TERRAIN - TERRAIN" will be activated first. If rate of descent continues or increases, "WHOOP WHOOP-PULL UP" will be activated.

After closure continuation ceases, and "PULL UP" annunciation has stopped, a barometric altitude gain of 300 feet is required before the "TERRAIN" annunciation (repeated in 0.75 second cycle) is shutoff. during an approach, when gear or flaps are extended, the altitude gain function is inhibited and the "PULL UP" annunciation is replaced by "TERRAIN".

MD801628

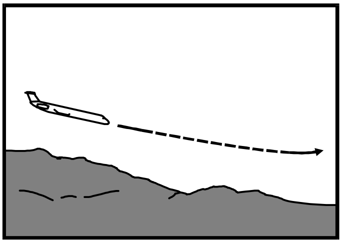
MODE 3 - Altitude Loss After Takeoff

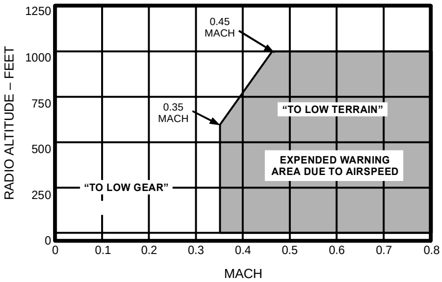




VISUAL INDICATION - GPWS light on.
AURAL/VOCAL ANNUNCIATION -
“DON’T SINK , DON’T SINK ”
(Repeated every 0.75 seconds interval until positive rate of climb is established.)
“DON’T SINK” message repeats until positive rate of climb established. At that point, the warning stops but GPWS computer continues to compare aircraft barometric altitude to the altitude of initial descent. If aircraft should descend again before climbing to initial altitude, another warning will be generated, based on original altitude. The warning threshold is when 10% (approx.) of the active from 65 feet to 700 feet AGL during takeoff or when either flaps or gear is raised during a missed approach from below 200 feet AGL. Above 700 feet, the GPWS computer automatically switches to TERRAIN CLEARANCE Mode.

MODE 4A - TERRAIN CLEARANCE
(Descent In Wrong Configuration - Gear Up)





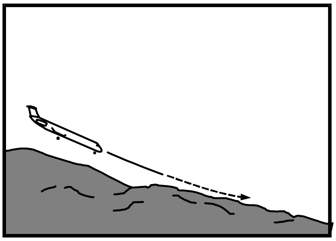
VISUAL INDICATION - GPWS light on.
AURAL/VOCAL ANNUNCIATION -
“TOO LOW GEAR” (Repeated in 0.75 second interval cycle.)
“TOO LOW TERRAIN” (Repeated in 0.75 second interval cycle.)

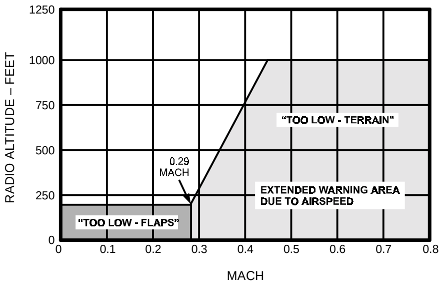
This mode s activated upon clearing 700 feet AGL after takeoff. Below 0.35 Mach, “TOO LOW GEAR” is announced. Above 0.35 Mach, TOO LOW TERRAIN” is announced. Warning is inhibited below 50 feet.

MD801629

INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
GROUND PROXIMITY WARNING SYSTEM WARNING ANNUNCIATION

MODE 4B - TERRAIN CLEARANCE
(Descent in Wrong Configuration - Gear Down, Flaps Not in Landing Position)

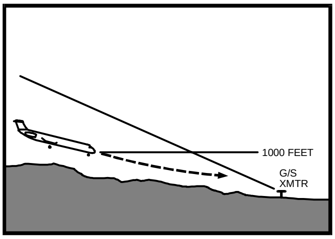


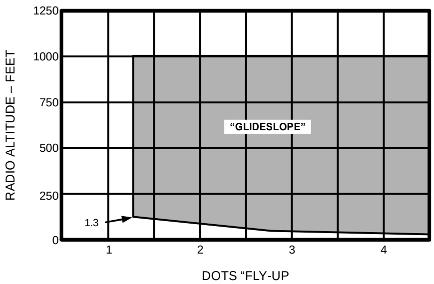


VISUAL INDICATION - GPWS light on.
AURAL/VOCAL ANNUNCIATION -
"TOO LOW FLAP" (Repeated in 0.75 seconds interval cycle.)
"TOO LOW TERRAIN" (Repeated in 0.75 seconds interval cycle.)

This Mode is activated upon clearing 700 feet AGL after takeoff. Below 0.29 Mach, with the flaps not extended for landing, "TOO LOW FLAPS" is announced.
Above 0.29 Mach, "TOO LOW TERRAIN" is announced. If gear is extended and then retracted and then retracted, "TOO LOW GEAR" will be announced at 200 feet AGL if still retracted. Warning is inhibited below 50 feet and reverts to Mode 3 (with both gear and flaps down).

MODE 5 - DESCENT BELOW GLIDESLOPE





VISUAL INDICATION - BELOW G/S light on.
AURAL/VISUAL ANNUNCIATION - "GLIDESLOPE".

This mode warns of excessive low ILS glide slope deviation when aircraft is below 1000 eet radio altitude and a valid ILS frequency iisreceived. When the glideslope advisory region is penetrated, a soft warning is given by illumination of the BELOW G/S light and voice annunciation "GLIDESLOPE". As the altitude is decreased and the DOTS "FLY-UP" glideslope deviation is increased, the glideslope voice warning audio output level and repeat rate will increase.

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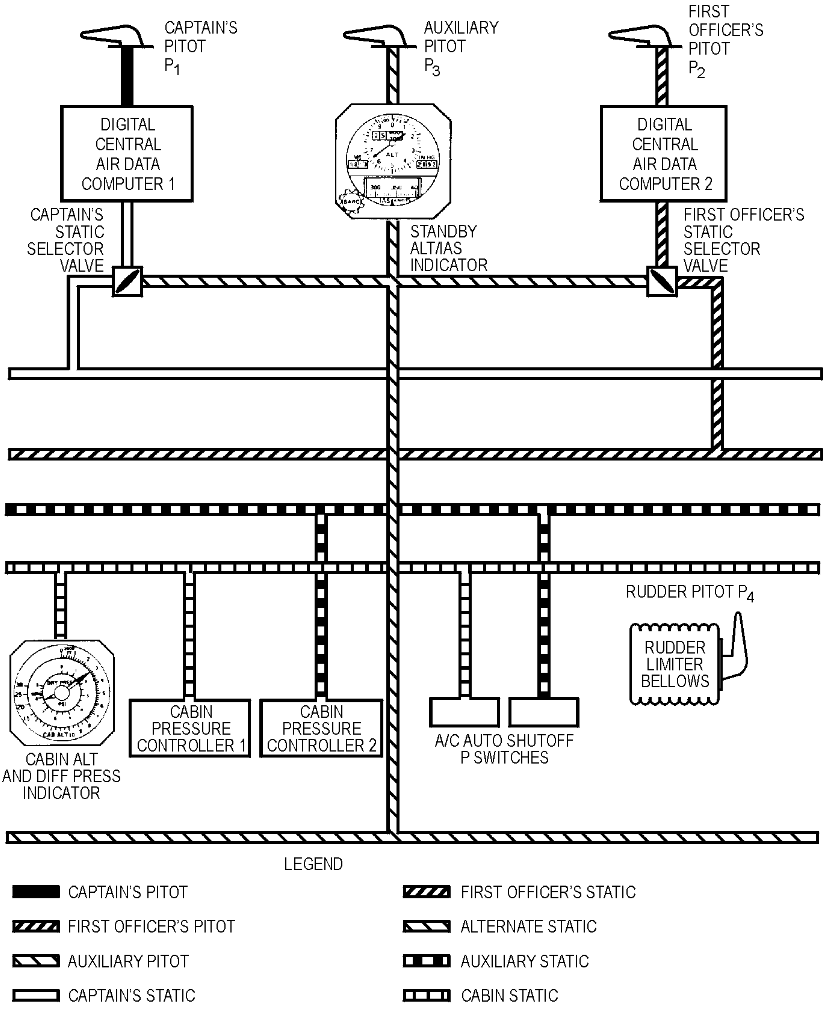
INSTRUMENTATION AND NAVIGATION - CONTROLS AND INDICATORS
GROUND PROXIMITY WARNING SYSTEM WARNING ANNUNCIATION



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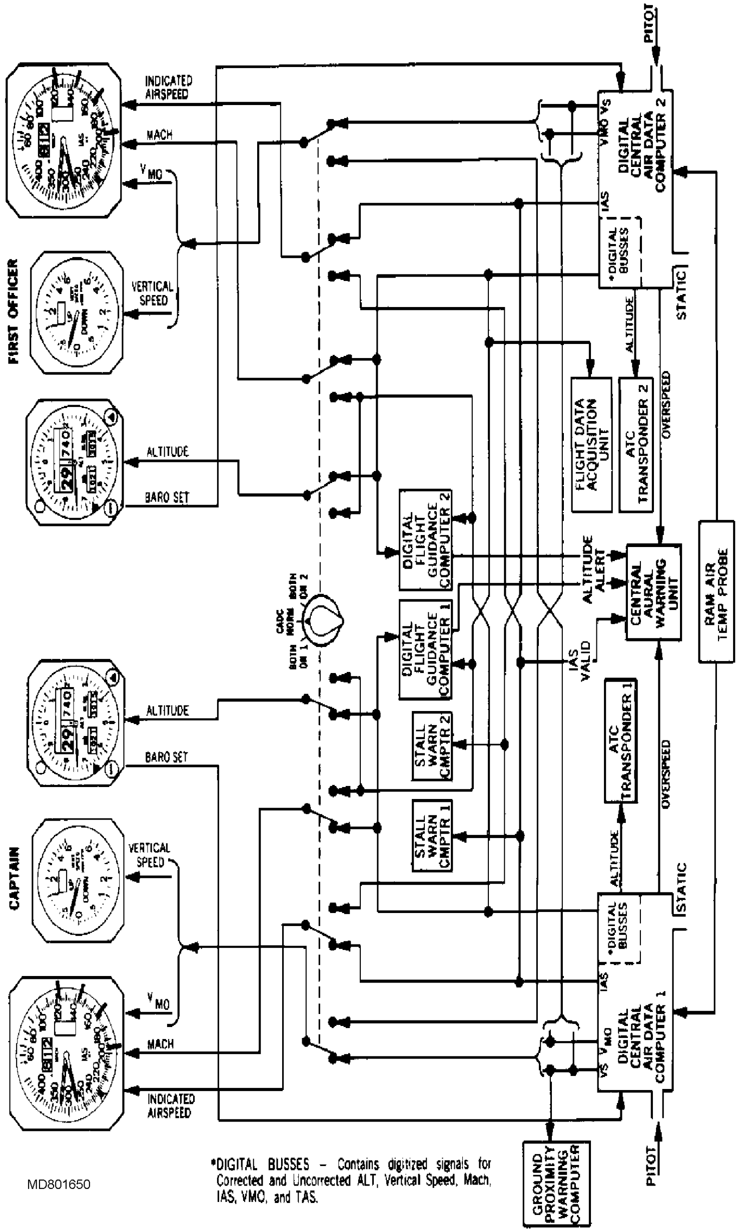
INSTRUMENTATION AND NAVIGATION – FUNCTIONAL SCHEMATIC PITOT / STATIC SYSTEMS



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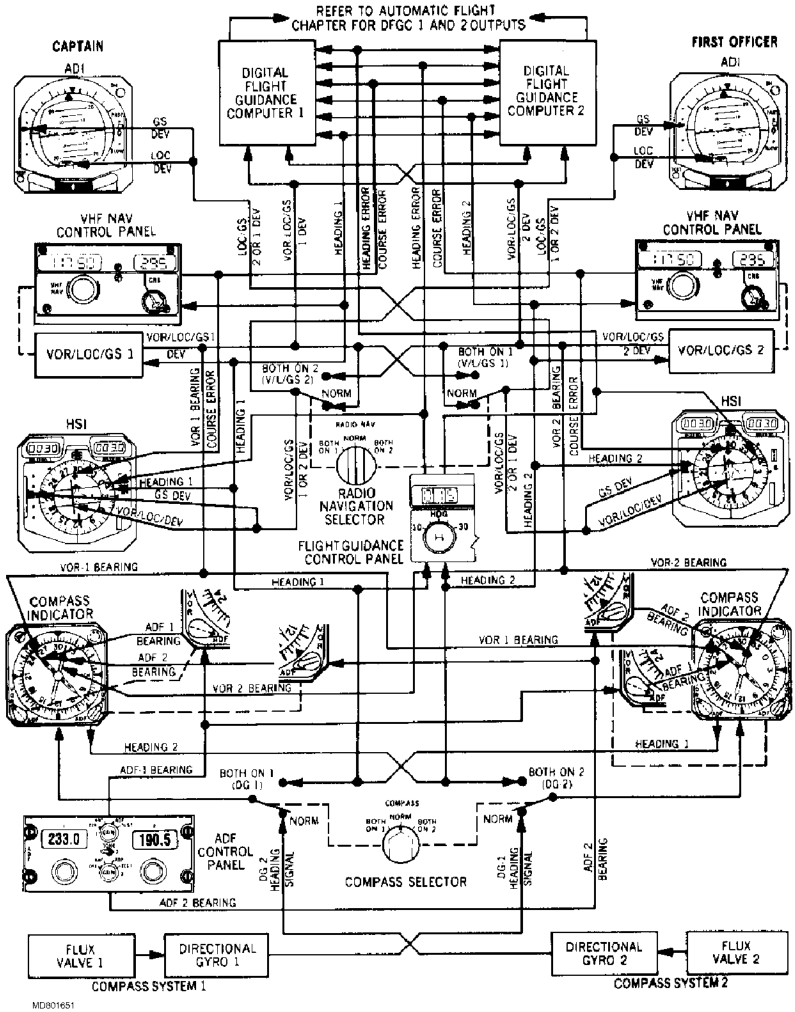
*DIGITAL BUSSES – Contains digitized signals for Corrected and Uncorrected ALT, Vertical Speed, Mach, IAS, VMO, and TAS.

INSTRUMENTATION AND NAVIGATION - FUNCTIONAL SCHEMATIC
CENTRAL AIR DATA COMPUTER / PITOT / STATIC INTERFACE



INSTRUMENTATION AND NAVIGATION - FUNCTIONAL SCHEMATIC
NAVIGATION SYSTEMS

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OXYGEN SYSTEM

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OXYGEN SYSTEMS

General

Two independent oxygen systems are installed in the airplane: one in the flight compartment for the flight crew and one in the passenger compartment for the passengers and cabin attendants.

The flight crew oxygen system provides oxygen to the flight crew members for normal sustained flight in the event of cabin decompression or for protection from the effects of smoke and harmful gases. Oxygen for the flight crew is supplied from a supply cylinder located in the flight compartment. The masks used with the crew oxygen system are oronasal with an integral microphone. The masks can also be used with the crew portable oxygen cylinder if necessary. Smoke goggles are located at each of the flight crew stations.

Note: If goggles are required, they must be worn over the outside of the mask. This allows an oxygen flow into the goggles to clear any existing smoke or fumes trapped in the goggles.

The passenger oxygen system supplies oxygen required during descent and recovery following high-altitude cabin decompression. Oxygen for the cabin, lavatories, and attendant stations is supplied by self-contained chemical oxygen generating/dispensing units.

Portable oxygen cylinders are also provided in the flight compartment and cabin. Passenger continuous flow type masks are attached to the cabin portable oxygen bottles.

Flight Crew Oxygen System

Oxygen for the flight crew system is supplied from a high-pressure gaseous oxygen supply cylinder. The cylinder shutoff valve controls oxygen supply to the system. The cylinder pressure regulator reduces the supply cylinder pressure to approximately 65 psi.

Oxygen flows from the pressure reducing regulator to the individual regulators/control panels at each flight station. The pressure gauge of each regulator indicates the regulated pressure in the system.

Controls on the regulators permit the selection of different methods of supplying oxygen to the masks. There are no controls on the mask itself.

For normal operation of the system, the supply toggle must be in the ON position, with the diluter control and TEST MASK/NORMAL/EMERGENCY control in the 100% and NORMAL position respectively. This supplies oxygen to the mask upon demand. A dilution of oxygen with air is controlled by an aneroid within the regulator. In the event of cabin decompression at altitudes above 28,000 feet, aneroids within the regulators automatically sense the change in cabin pressure and supply pure oxygen at a positive pressure to the masks by closing the air valve and overriding the demand valve. For protective breathing purposes (smoke in the cabin, etc.) the diluter control must be in the 100% OXYGEN position. This closes the air valve in the regulator, permitting only pure oxygen to reach the mask.

In the event of regulator failure, the diluter control must be placed in the 100% OXYGEN position and the TEST MASK/NORMAL/EMERGENCY control must be in the EMERGENCY position. This feeds only pure oxygen to the masks. The TEST MASK/NORMAL/EMERGENCY control is guarded by a safety pin which must be removed before the control can be placed in the emergency position. The emergency position mechanically overrides the demand diaphragm in the regulator unit. This position is basically a means of supplying positive oxygen pressure to masks if the automatic feature of the regulator fails.

The flight crew oxygen system has a thermal expansion discharge feature. The indicator is a green plastic disc and is located below the First Officer’s side window. Absence of this disc requires inspection of the flight crew oxygen supply cylinder.

Passenger Oxygen System

Passenger oxygen is provided by oxygen generating canisters. There is one canister unit over each set of seats (left and right), in each lavatory, and at each Flight Attendant station. Each unit includes a chemical oxygen generator, oxygen mask(s) with reservoir bags, flow indicator, and hose(s) to convey oxygen from the generator to the masks.

Passenger mask units are installed in the overhead stowage rack utility panel above each seat row. There are six masks on each row alternating in the following pattern: on one row there are 3 masks on the left and 3 on the right; on the next row there are 2 masks on the left and 4 on the right. This pattern (3-3, 2-4) continues throughout the cabin.

Two mask units are installed at the forward and aft cabin attendant stations and in each lavatory. A single mask unit is installed above the mid cabin attendant seat.

All oxygen compartment doors open automatically if the cabin altitude exceeds approximately 14,000 feet. All passenger masks are retained on the utility box doors by a plastic holder and must be manually removed. Removing any one mask from a multiple mask unit compartment and pulling the mask toward the face so that the lanyard separates from the generator initiates the oxygen generating process and oxygen automatically flows through all masks in that compartment. The generators provide sufficient oxygen for at least 15 minutes continuous use.

Caution: The oxygen generator surface temperature may reach 500° F (260° C) when generating oxygen. Do not touch or attempt to remove generator. Burn injury can result. If an active generator is inadvertently removed from the compartment, it must be placed in a metal container such as a lavatory or galley sink. Heat will scorch other materials or fabrics.

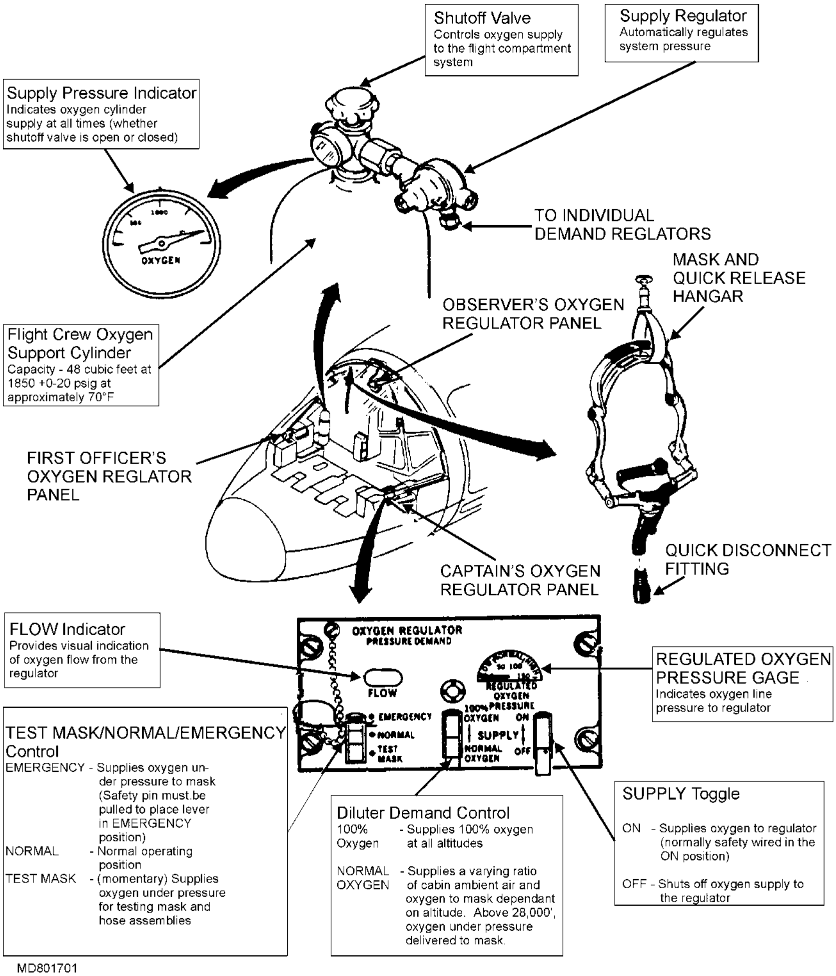
Note: Odor similar to scorched cloth may be created by activation of generators. The odor does not affect the purity of the oxygen and there is no fire hazard.

Masks are continuous flow type with no shutoff valves provided. Oxygen flow rates are low, so oxygen reservoir bas may not inflate fully between breathing cycles. Inflation rate is dependent on cabin altitude and elapsed time since generator activation. An inflation indicator (small green compartment at the inlet end of mask reservoir bag) inflates providing evidence of oxygen flow. The oxygen delivered to a mask is supplemental to ambient air provided by air valves on front of the mask.

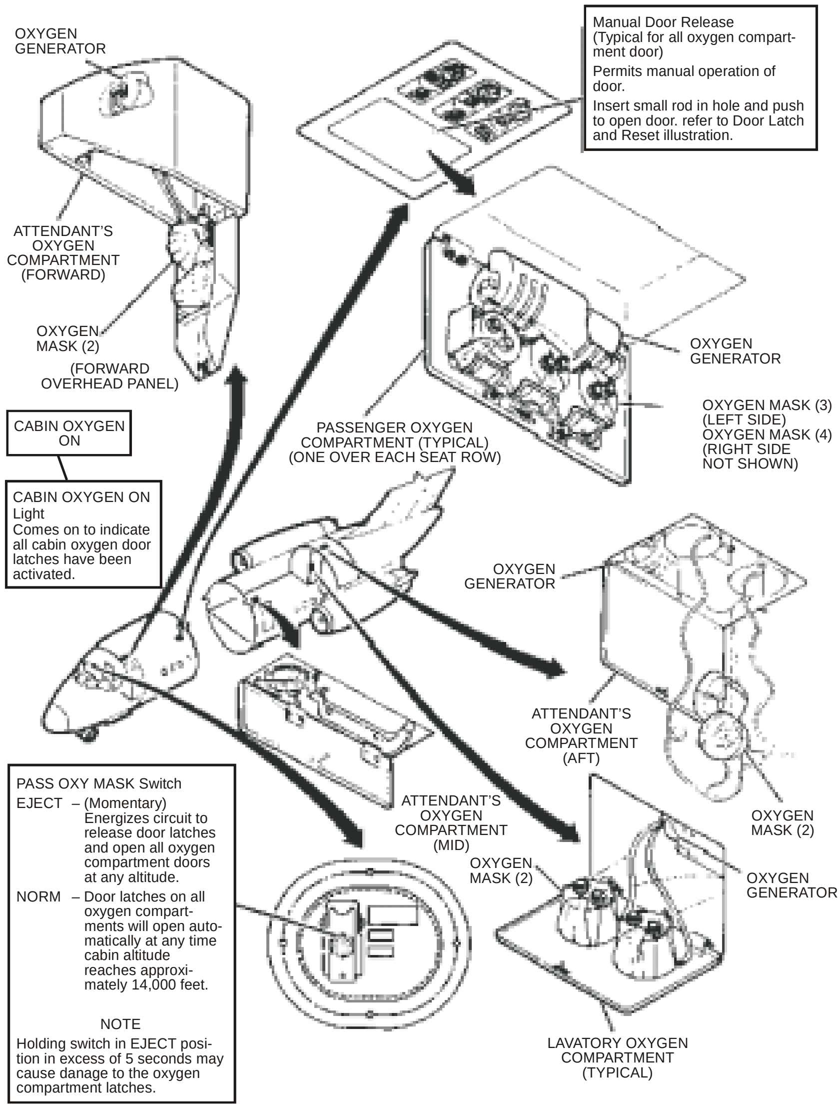
As a backup to the automatic system, a PASS OXY MASK switch, on the right side of the bulkhead behind the F/O's seat, provides a manual override for releasing the masks. Moving the switch to EJECT will open all oxygen compartment doors.

Power for releasing the door latches is normally provided by the left AC and DC electrical busses. If the left AC and DC busses are deenergized for any reason, an alternate power source is provided automatically from the right AC and DC electrical busses. A blue **CABIN OXYGEN ON** light on the annunciator panel will illuminate when all of the door latches in the passenger compartment have be activated. If normal left or right electrical power is not available, the door latches must be opened manually.

Individual oxygen compartment doors can be opened manually by inserting a small diameter rod (paper clip) into the hole in the door. Make contact with the latch opening mechanism, apply pressure, and push the object to release the latch.



OXYGEN - FLIGHT COMPARTMENT



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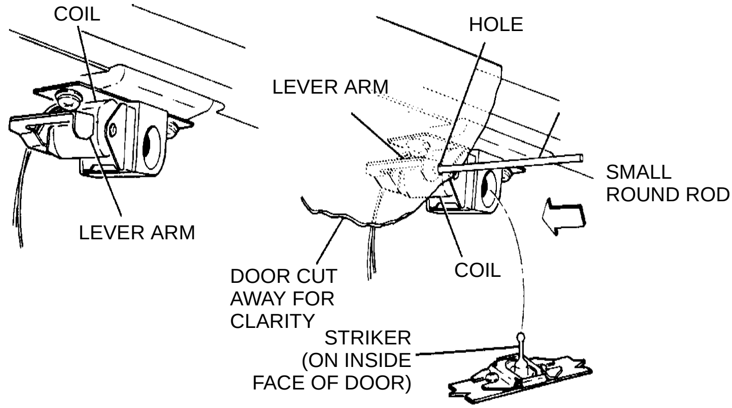
OXYGEN – PASSENGER COMPARTMENT



TO OPEN DOOR

LATCHED (WITH DOOR CLOSED)
OR RESET (WITH DOOR OPEN)

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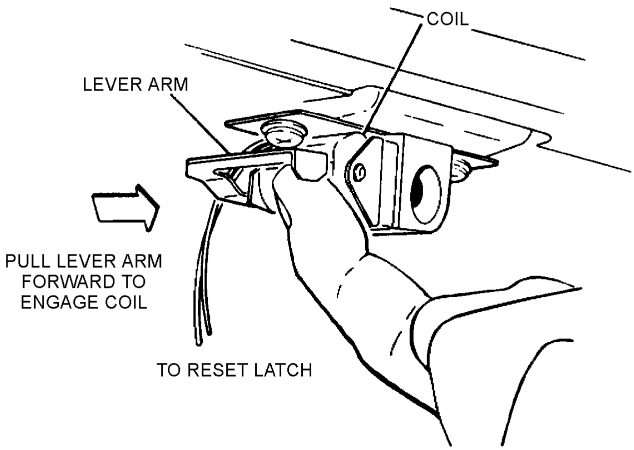


TO RESET LATCH

MD801702a

OXYGEN COMPARTMENTS - DOOR LATCH RELEASE AND RESET
(BAYONET - TYPE LATCH)

Portable Oxygen Cylinders

Flight Compartment

One portable oxygen cylinder is located in the flight compartment. The cylinder weighs approximately 10 pounds and has a capacity of 11 cubic feet.

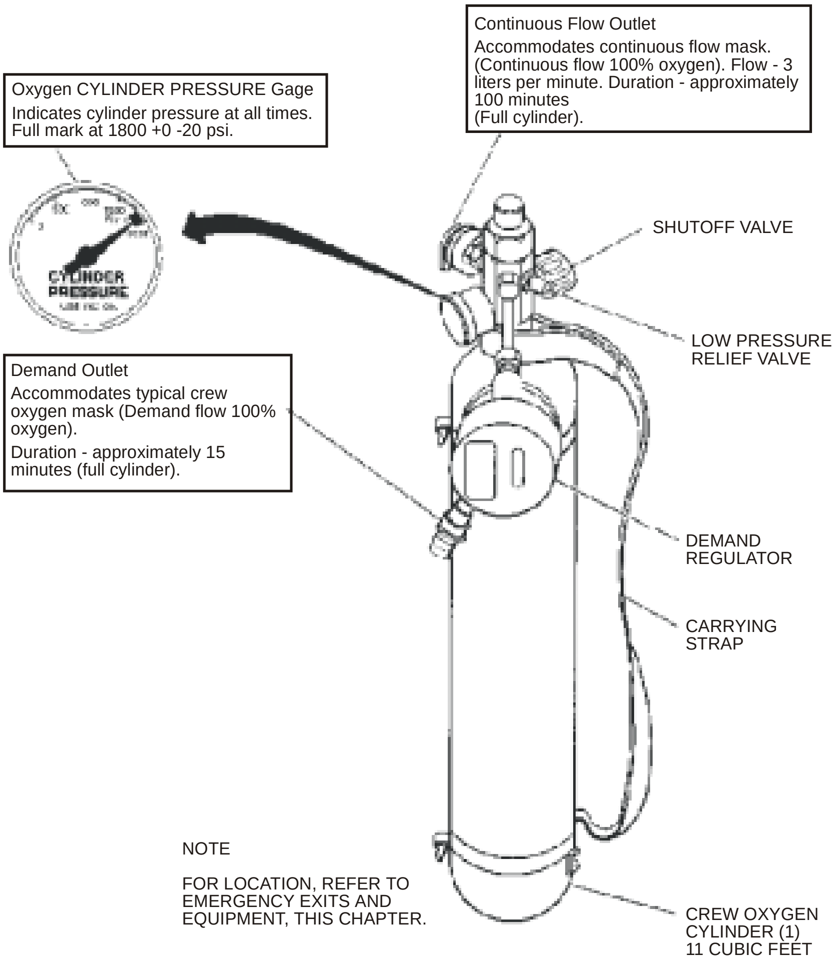
The cylinder contains a hand shutoff valve, gauge, pressure regulator, demand regulator, pressure relief valve, carrying strap, demand outlet, and a 3-liter-per-minute continuous-flow outlet.

Passenger Compartment

Four portable 4.25 cubic feet oxygen cylinders and oxygen masks are located in the passenger compartment for use by the cabin attendants. Each cylinder contains a hand shutoff valve, relief valve, and carrying strap. Cylinders also have outflow valves coded for flow (liter-per-minute) at specified pressure altitude (thousands of feet). The mask hose must be connected to the outlet, and the shutoff valve opened to supply oxygen to the mask. See following table for number and type of oxygen cylinders.

CABIN COMPARTMENT PORTABLE OXYGEN								
CYLINDER		OXYGEN FLOW OUTLETS				DURATION		
NO.	SIZE (CU FT)	TOTAL NUMBER OF FLOW OUTLETS	FLOW RATE (liters/min)	NUMBER OF OUTLETS	FLOW OUTLET CODE (RATE-ALTITUDE)	NUMBER OF FLOW OUTLETS USED	TYPE OF FLOW OUTLET(S) USED	*TIME (MIN) (APPROX)
4	4.25	2	2.0	1	2.0-20	1	2.0-20	60
			4.0	1	4.0-20	1	4.0-20	30
						1 1	2.0-20 4.0-20	20

* Assuming a constant flow at a pressure altitude of 20,000 feet. Actual time will vary with actual altitude, i.e., less at altitudes above 20,000 feet, more at altitudes below 20,000 feet.



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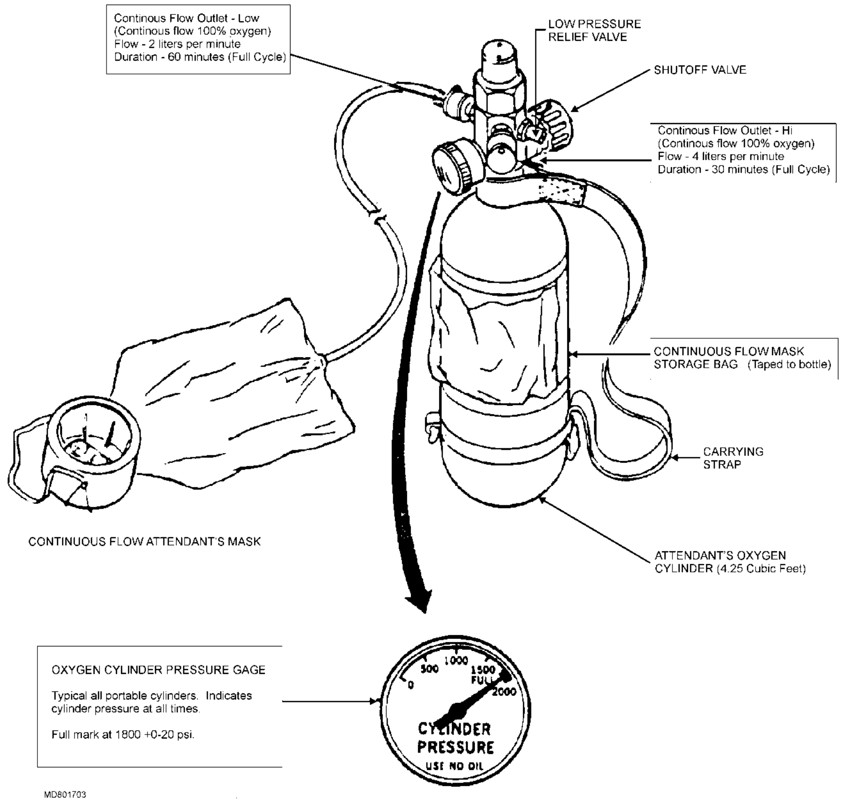
PORTABLE OXYGEN CYLINDER – FLIGHT COMPARTMENT



Note: For location, refer to Emegency Exits, this chapter.

PORTABLE OXYGEN CYLINDERS - PASSENGER COMPARTMENT

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POWER PLANT

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POWER PLANT

General

The airplane is equipped with two axial-flow, bypass, turbofan Pratt and Whitney engines. The JT8D-217, -217A and – 217C (-219 operated as -217A) engines have a normal static takeoff thrust rating of 20,000 pounds and a maximum takeoff thrust rating of 20,850 pounds.

An automatic reserve thrust (ART) system is installed. In the event of an engine failure, the ART system, when operating, increases the thrust on the remaining engine.

Each engine is equipped with an acoustic treatment in specific areas for noise suppression. The engine nacelles are supported from horizontal pylons by vibration-isolating side mount systems. The nacelles are isolated from the fuselage by a firewall within the pylon and by a secondary fireseal at the pylon fuselage interface. To provide additional protection, the secondary fireseal extends above and below the pylon on the fuselage surface. To achieve necessary nacelle compartmentation, a fireseal is installed aft of the rear engine mount, which provides separation of the accessory compartment from the reverser section. The nacelle ventilation system is designed to provide adequate cooling of engine and accessories and to prevent accumulation of combustible mixtures.

For monitoring engine operation, an EPR (engine pressure ratio) gauge, thrust rating indicator, N_1 and N_2 tachometers, EGT (exhaust gas temperature) gauge, FUEL FLOW gauge with a FUEL USED readout, oil pressure gauge, oil temperature gauge, and fuel temperature gauge are provided for each engine.

The left and right engine EPR gauges receive sensing signals from the respective engine air inlet pressure (P_{t2}) probe and the low pressure turbine discharge pressure (P_{t7}) probes. Engine pressure ratio (P_{t7}/P_{t2}) is a measure of thrust being developed by the engine that is displayed on the EPR gauge. Power to operate these gauges is provided by the respective AC bus.

The thrust rating indicator is interfaced with the ram air temperature probe and digital flight guidance computer (DFGC) 1 and 2. Ram air temperature (RAT) and EPR LIM (limit) are displayed on the indicator. Mode buttons are provided on the indicator for selection of desired mode (T.O., T.O.FLX, GA, MCT, CL, and CR). The DFGC's supply data to the indicator for automatic display of EPR LIM for mode selected.

The left and right N_1 tachometers indicate the respective engine low-pressure compressor rotor RPM as a percentage. The left and right N_2 tachometers indicate the respective engine high-pressure compressor rotor RPM as a percentage. Power to operate these gauges is self-generated.

The left and right EGT gauges indicate in degrees centigrade the temperature of the exhaust gas of the respective engine. Each gauge receives signals from temperature probes located in the exhaust gas path of each engine. Power to operate these gauges is provided by the Emergency DC bus.

The left and right FUEL FLOW gauges indicate the rate of flow in pounds per hour that fuel is being delivered to the respective engine. A FUEL USED readout on each gauge displays a digital readout of fuel used in pounds by the respective engine. A FUEL USED RESET switch is provided to reset the FUEL USED readout on both gauges to 00000. For further description of FUEL FLOW gauge/FUEL USED readout and FUEL USED RESET switch, refer to Fuel section. Power to operate these gauges is provided by the respective AC bus.

Engine Starting

Either engine may be started by using a pneumatic ground supply or by pneumatic supply from the auxiliary power unit. When one engine is operating, the opposite engine may be started by using the pneumatic crossfeed system.

An electrically controlled, pneumatically actuated starter air shutoff valve on each engine controls the starter of the respective engine. The starter air shutoff valve regulates pneumatic pressure to maintain a predetermined air pressure to the engine starter.

L and R (left and right) START switches with ON/OFF positions, are provided on the ENG (engine) panel located on the overhead. When either START switch is held in ON, the respective engine starter air shutoff valve opens. (On some aircraft, the operation of the Start switch is inhibited unless the ignition selector is not in the OFF position.) The **L** or **R VALVE OPEN** light on the annunciator panel illuminates to indicate that the applicable engine starter air shutoff valve is open. When either START switch is released, the respective engine starter air shutoff valve closes, and the **L** or **R VALVE OPEN** light, as applicable, extinguishes. To extend starter life and reduce chance of failure of the starter shear section, do not re-engage the starter (except for an abnormal or emergency condition) when the compressors are rotating.

Ignition Systems

Rotary Switch Ignition

The standard five position Rotary switch system is powered by AC power. Two independent 20-Joule ignition systems (A and B) are provided for each engine. The dual systems for each engine are controlled by a single IGN (ignition) selector located on the ENG panel. The selector has five positions, SYS A / OFF / SYS B / BOTH / OVRD, for ignition system selection.

The SYS A or SYS B positions operate the associated igniter, and BOTH position operates both igniters, if the respective engine's FUEL lever is ON. The OVRD position will operate the both igniters of both engines, regardless of the position of the FUEL levers. Igniters are normally powered by left and right AC. If normal power is not available, the emergency inverter will automatically provide the power to the selected ignition, as long as the Battery Switch is ON.

SYS A or SYS B positions are normally used for engine starting and for operating ignition when using engine anti-ice. BOTH position is used for approach when one engine has been shutdown. This position will not provide power to the ignition of the engine with the FUEL lever in OFF. OVRD position is used for takeoff, landing, and emergency conditions.

Toggle Switch Ignition

On some airplanes two ignition systems, one 20-Joule (high-energy ignition system) and one four-Joule (low-energy continuous ignition system) are provided for each engine. An IGN (ignition) switch, with OVRD (override) / OFF / GRD START & CONTIN (ground start and continuous) positions, is provided on the ENG panel for ignition system selection.

For starting engines on the ground, the IGN switch is placed in GRD START & CONTIN. The applicable START (L or R) switch is then held in ON to open the respective engine starter air shutoff valve. To supply high-energy ignition power to both igniters on the respective engine, the respective FUEL lever is then moved to ON. When the START switch is released after engine start, continuous ignition power is supplied to one igniter on the respective engine for continuous low-energy engine ignition.

For starting engines inflight, or for other conditions inflight that require high-energy ignition, the IGN switch is placed in OVRD position to supply high energy ignition power to both igniters on both engines. Engine ignition power supplied to the IGN switch for OVRD function bypasses the START switches and the fuel shutoff switches.

OVRD and GRD START modes are powered by the DC Transfer bus. CONTIN mode is powered by left and right AC. With a loss of normal AC power, the IGN switch must be moved to the OVRD mode to provide engine ignition. There is no automatic supply of energy from the Emergency Inverter on this system.

The CONTIN mode is used for takeoff, landing, and when using engine anti-ice. The OVRD mode is used for inflight emergencies or engine restart.

Engine Oil System

Oil is pumped from the oil tank by the main oil pump and delivered to the system through an oil filter. Oil quantity is sensed in the oil tank and displayed on the OIL QUANTITY gauge. A differential pressure transmitter senses pressure on both sides of the filter. When the differential pressure reaches a predetermined value, the **OIL STRAINER CLOGGING** annunciator light and the **MASTER CAUTION** light illuminate to indicate excessive differential pressure. A pressure regulating valve maintains engine oil system pressure at approximately 45 psi. The oil is cooled as it flows through the fuel / oil heat exchanger. Oil temperature is then sensed by an oil temperature sensor, and the oil temperature is displayed on the OIL TEMP gauge. Oil pressure is sensed by a pressure transmitter, and oil pressure is displayed on the OIL PRESS gauge. If oil pressure drops below normal, a pressure switch is actuated and the **OIL PRESS LOW** annunciator light and the **MASTER CAUTION** light illuminate to indicate a low pressure condition.

Engine Fuel System

Fuel pressure into the engine is monitored by an inlet pressure switch. When the inlet pressure is too low the **INLET FUEL PRESS** annunciator light and **MASTER CAUTION** light illuminate. Fuel from the fuel supply system passes through the engine driven first stage centrifugal pump.

From the pump, fuel flows through the air / fuel heat exchanger. Bleed air (13^{th} stage) is supplied to the air / fuel heat exchanger through a shutoff valve. The shutoff valve is controlled by a FUEL HEAT switch and timer. When the FUEL HEAT switch is placed to ON (momentary), the valve will open, and bleed air is supplied to the air / fuel heat exchanger for one minute. After one minute, the timer automatically closes the shutoff valve. The **FUEL HEAT ON** annunciator light illuminates when the valve is open and extinguishes when the valve is closed. Fuel heat is used to prevent or remove ice on the fuel filter. Fuel temperature is sensed downstream from the air / fuel heat exchanger, and temperature is displayed on the FUEL TEMP gauge.

Fuel is filtered before entering the fuel control. If the differential pressure switch senses clogging at the filter, the **FUEL FILTER PRESS DROP** annunciator light and **MASTER CAUTION** light illuminate. A bypass valve allows fuel to bypass a clogged filter.

Fuel flow is shut off at the fuel control unit until the FUEL lever is moved out of the OFF position. An engine driven second stage high pressure gear pump pressurizes fuel prior to entering the fuel control unit. The fuel flow transmitter measure fuel delivered to the engine from the fuel control. Fuel flow is displayed on the FUEL FLOW gauge. Heat from engine oil is transferred to the fuel through the fuel / oil heat exchanger.

Thrust Reversers

The thrust reversers are used on the ground only. The reversers are hydraulically powered, target type, and actuation time is approximately 2 seconds. The thrust reverser on each engine consists of two doors (deflectors), which form the aft nacelle fairing when stowed. The door linkage system overcenters to provide positive locking in the stowed position. When extended, the doors direct exhaust gases over and under the nacelle. To prevent accidental extension, separate hydraulically actuated latches prevent the reversers from moving out of the stowed position until the thrust reverser lever is moved toward the reverse thrust position.

As the thrust reverser unlatches, a latch switch turns on an **ENG REVERSE UNLOCK** light on the center instrument panel. When the reversers are extended, a reverse extended switch turns on an **ENG REVERSE THRUST** light, also on the center instrument panel.

On the ground, each reverser system receives hydraulic pressure from the respective hydraulic system. Inflight, the hydraulic system is isolated from the reverser system. Each reverser system is equipped with an accumulator, which keeps the reverser locked in flight, and provides energy for one extend actuation after landing. A **L** or **R REVERSER ACCUMULATOR LOW** light illuminates if the associated reverser accumulator pressure is below normal.

Engine Synchronizer System

The engine synchronizer system automatically matches the N_1 or N_2 speed or EPR of left engine to match right engine. The system includes a three position (N_1, OFF, N_2) ENG SYNC selector, **ENG SYNC ON** annunciation, and control system with actuator to trim left engine fuel control. The pilot can override the system at any time with throttles.

When the ENG SYNC selector is placed in N1 or N2, signals from the tachometer generators causes engine synchronizer system to trim left engine fuel control until left engine RPM (N_1 or N_2) matches right engine.

On airplanes with the – 904 DFGC, the DFGC provides signals to match EPR of left engine to right engine when ENG SYNC selector is in OFF and autothrottle system is engaged in EPR LIM mode.

On airplanes with a -906 or -930 DFGC, the DFGC provides signals to match EPR of left engine to right engine when ENG SYNC selector is in OFF, autothrottle system is engaged, both EPRs are valid, and one EPR is greater than 1.1 EPR.

The engine synchronizer actuator is centered in its range of motion when both ENG SYNC selector and autothrottles are OFF. An **ENG SYNC ON** annunciation on the overhead panel will come on when landing gear handle is in the down position and the ENG SYNC selector is in N_1 or N_2 position.

Thrust Recoveries for Engine Failure During Takeoff

In takeoff mode, two separate systems attempt to provide maximum available thrust when the performance of one engine significantly differs from the other. These systems are automatic reserve thrust (ART) and automatic thrust restoration (ATR).

Automatic Reserve Thrust (ART) System

The ART system combines features of the digital flight guidance computer (DFGC) and the JT8D-200 fuel control to provide maximum rated thrust in the event of an engine failure during a normal thrust takeoff. Upon actuation of the ART system, thrust is increased without throttle movement by the opening of a solenoid-operated fuel valve in the engine fuel controls of both engines.

The ART system is READY when the airplane is on the ground, the ART switch is in AUTO, either slat is extended, both engines are operating at or near idle, and the ART system self-test is complete. The ART system is subsequently armed when the N_1 on both engines reaches 64% RPM.

The ART system is actuated when the DFGC detects any one of the following: 30.2% differential in N_1 RPM, invalid N_1, DFGC failure, electrical power loss, or manual DFGC switching. Upon actuation, the ART system increases the EPR of the operating engine(s) from normal takeoff EPR to maximum takeoff EPR (an increase of approximately .05 EPR) by opening the solenoid-operated fuel valve in the engine fuel control. Once ART is actuated, the maximum takeoff EPR limit is displayed on the thrust rating indicator, and the EPR gauge. Once actuated, the ART system is latched (ART fuel valve remains open) until the ART switch is moved to OFF.

The ART has an automatic self-test feature. If the ART system fails the self-test, the **ART INOP** annunciation illuminates. Dispatch is allowed with a failed self-test; however, the ART switch must be moved to OFF to disable the ART system.

The ART switch, with AUTO and OFF positions, is on the upper instrument panel. Two annunciator lights are on the center instrument panel. The **READY** light indicates ART has successfully passed the self-test. The **ART** light indicates the system has successfully activated.

Automatic Thrust Restoration (ATR) System

The Digital Flight Guidance Computer (DFGC) automatic thrust restoration (ATR) is a feature, separate from the ART system, that increases thrust under certain conditions in the event of an engine failure during takeoff. Once activated, the ATR will unclamp the throttles (if the autothrottle system is engaged) and move both of them equally until one of the engines reaches the Go-Around EPR Limit.

The ATR is armed if:

- The flight director pitch axis is in takeoff mode,
- The airplane is above 350 feet radio altitude, and
- Both engine EPRs are below the Go-Around EPR limit.

After arming, the system will activate if the differences between the engines are greater than or equal to 0.25 EPR and 7% N_1 (in the same direction), or (for DFGC models -930) the airplane's vertical speed decreases to less than zero for 5 seconds. In these cases, the throttles will unclamp (if the autothrottle system is engaged) and move to the Go-Around EPR limit.

If ART is armed and the ATR is activated, the EPR limit will be the maximum inflight takeoff rating reduced by the same amount that the ART is designed to provide. This correction prevents overboosting the engine if the ART system subsequently actuates.

Thrust Settings for Takeoff

These are the four settings available for takeoff thrust in ascending order:

Reduced Thrust (FLEX T.O.)

This is the preferred thrust setting for takeoff, as its use will greatly extend engine service life. An assumed temperature is dialed into the ASSUMED TEMP selector, the ART switch is selected to OFF, and TO FLX is selected on the TRI. The autothrottles are used if operational.

Normal Thrust

Normal thrust is used whenever a reduced thrust takeoff is not authorized. The ART system must be operational. The ASSUMED TEMP selector should be set to 00, the ART switch is selected to ON, and TO is selected on the TRI. The autothrottles are used if operational.

Maximum Thrust

Maximum thrust is used only when the ART system is inoperative and a reduced thrust takeoff is not authorized. The ASSUMED TEMP selector should be set to 00, the ART switch is selected to OFF, and TO is selected on the TRI. The autothrottles are used if operational. A logbook entry is required.

Denver Bump Thrust (217A Engines Only)

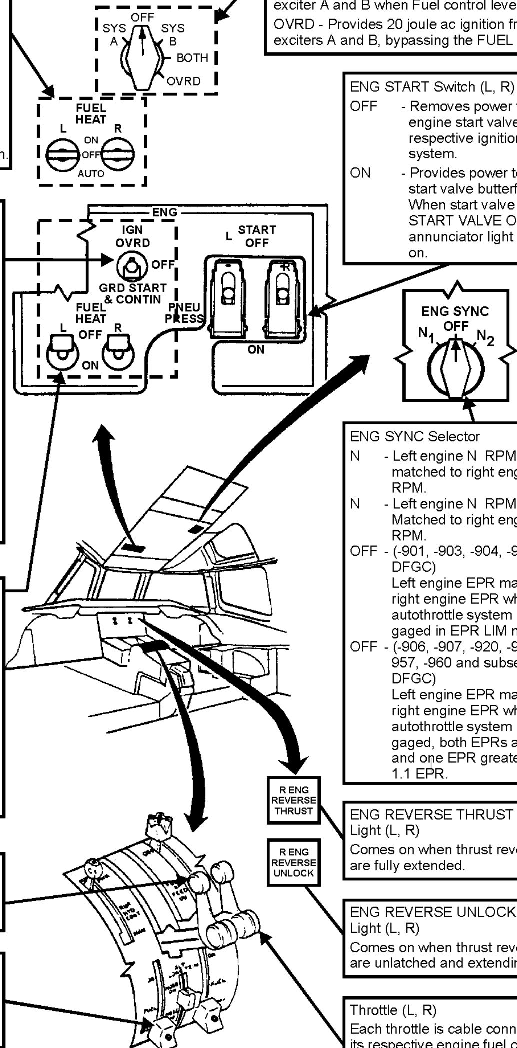
Denver Bump Thrust is used only on – 217A equipped aircraft and when taking off from Denver International Airport. The ASSUMED TEMP selector should be set to 00, the ART switch is selected to OFF, and TO is selected on the TRI. The Denver Bump EPR setting is manually set with the EPR set knobs. The autothrottles must not be used, takeoff thrust is set manually to the preset value. A logbook entry is required.

FUEL HEAT Switch (L, R)
ON - (Momentary) Timer is energized for one minute, which opens respective pneumatic shutoff valve, supplying hot air to air/ fuel heat exchanger FUEL HEAT ON annunciator light comes on during one-minute interval timer is energized.
OFF - Removes power from fuel heat circuit.
AUTO - Provides fuel heat in flight when engine fuel filter ac cumulates ice. FUEL FILTER PRESS DROP and FUEL HEAT ON annunciator lights come on.

ENG IGN Selector
OFF - System deenergized.
SYS A - Provides 20 joule ac ignition from exciter A when FUEL control lever is ON.
SYS B - Provides 20 joule ac ignition from exciter B when FUEL control lever is ON.
BOTH - Provides 20 joule ac ignition from exciter A and B when Fuel control lever is ON.
OVRD - Provides 20 joule ac ignition from exciters A and B, bypassing the FUEL control.

ENG START Switch (L, R)
OFF - Removes power from engine start valve and respective ignition system.
ON - Provides power to open start valve butterfly. When start valve is open, START VALVE OPEN annunciator light comes on.

ENG IGN Switch
OVRD - Provides dc power to ignitors in both engines, bypassing start control and fuel control switches.
OFF - Removes dc power from all ignitors.
GRD START & CONTIN - Provides power to all ignitors with START switch and fuel control lever in ON. Also provides power to ignitor plug with START switch OFF and fuel control lever ON.



ENG SYNC Selector
N - Left engine N RPM is matched to right engine N RPM.
N - Left engine N RPM is Matched to right engine N RPM.
OFF - (-901, -903, -904, -905, -953 DFGC) Left engine EPR matched to right engine EPR when autothrottle system is engaged in EPR LIM mode.
OFF - (-906, -907, -920, -930, -957, -960 and subsequent DFGC) Left engine EPR matched to right engine EPR when autothrottle system is engaged, both EPRs are valid, and one EPR greater than 1.1 EPR.

FUEL HEAT Switch (L, R)
ON - (Momentary) Timer is energized for one minute, which opens respective pneumatic shutoff valve, supplying hot air to air/fuel heat exchanger. FUEL HEAT ON annunciator light comes on during one-minute interval timer is energized.
OFF - Removes power from fuel heat circuit.

ENG REVERSE THRUST Light (L, R)
Comes on when thrust reversers are fully extended.

Thrust Reverser Lever (L, R)
Moving thrust reverser lever aft actuates deployment of thrust reverser.

ENG REVERSE UNLOCK Light (L, R)
Comes on when thrust reversers are unlatched and extending.

FUEL Control Lever (L, R)
ON - Completes ignition circuit first, then turns on fuel.
OFF - Shuts off fuel first, then shuts off ignition.

Throttle (L, R)
Each throttle is cable connected to its respective engine fuel control unit to regulate engine thrust.
RA-173E

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ENGINES - CONTROLS AND INDICATORS

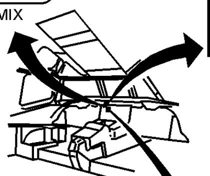
ASSUMED TEMP Selector
Rotate thumbwheels to set assumed temperature for derated takeoff flexible (TO FLX) mode operation. Temperatures from 1°C to 59°C can be selected.
The EPR displayed will be based on the maximum thrust EPR limit at the assumed temperature. However, if an assumed temperature of 00°C is selected and the T.O. FLX Mode Button is pushed, the EPR displayed will be based on the normal thrust EPR limit.

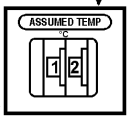
NOTE

When using the T.O. FLX mode of operation, the ART switch must be on.

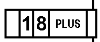
ENGINE INTERMIX PLACARD
Do not use AUTOTHROTTLE
Add .05 EPR to -217 If above
2500 FT Press ALT & OAT
below -8° C. See FLT MAN

ENGINE INTERMIX PLACARD





RAT Readout
Displays digital readout of ram air temperature.
When a temperature below 0° C is displayed, the word MINUS precedes the numerical value. When a temperature above 0°C is displayed, the word PLUS follows the numerical value.
RAT flag appears when ram air temperature data are unusable



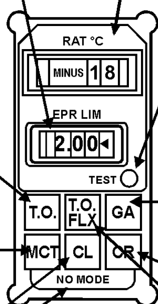
EPR LIM Readout
Displays the readout of EPR limit for selected operating mode.
EPR LIM flag appears when EPR limitdata are unusable.

TEST Button
Pushing button causes the following readout displays:

ENGINE	RAT	EPR
JT8D-217	12 Plus	1.94
JT8D-217A	12 Plus	2.04
JT8D-219	12 Plus	2.08

All lights including the NO MODE light should be off. When button is released, EPR LIM flag will appear, the NO MODE light will come on and all mode button lights will be off.

T.O. Button
Pushing button will cause EPR limit for takeoff thrust to be displayed in the EPR LIM readout and automatically position the EPR reference bug on the EPR gage. After airplane reaches 50KIAS, computer will stop changing EPR limit, and at 60 KIAS the throttles will clamp (if auto throttle is engaged). Computer is re-activated when another thrust mode is selected.



THRUST RATING INDICATOR

GA Mode Button
Pushing the button will cause EPR limit for go-around thrust mode to be displayed in the EPR LIM readout and automatically position the EPR reference bug on the EPR gage.

MCT Button
Pushing button will cause EPR limit for max continous thrust mode to be displayed in the EPR LIM readout and automatically position the EPR reference bug on the EPR gage.

CR Mode Button
Pushing the button will cause EPR limit for cruise thrust mode to be displayed in the EPR LIM readout and automatically position the EPR reference bug on the EPR gage.

CL Mode Button
Pushing button will cause WPR limit for climb thrust mode to be displayed in the EPR LIM readout and automatically position the EPR reference bug on the EPR gage.

NO MODE Annunciator Light
Comes on to indicate that EPR limit mode has not been selected on uncertified engine bleed has been selected.

T.O. FLX Mode Button
Pushing button will cause a reduced EPR limit for flexible takeoff thrust mode to be displayed in the EPR LIM readout and automatically position the EPR reference bug on the EPR gage. Reduced EPR limit is determined by selecting an assumed temperature that is higher than the ambient temperature.

NOTE

When using the T.O. FLX mode of operation, the ART switch must be OFF.

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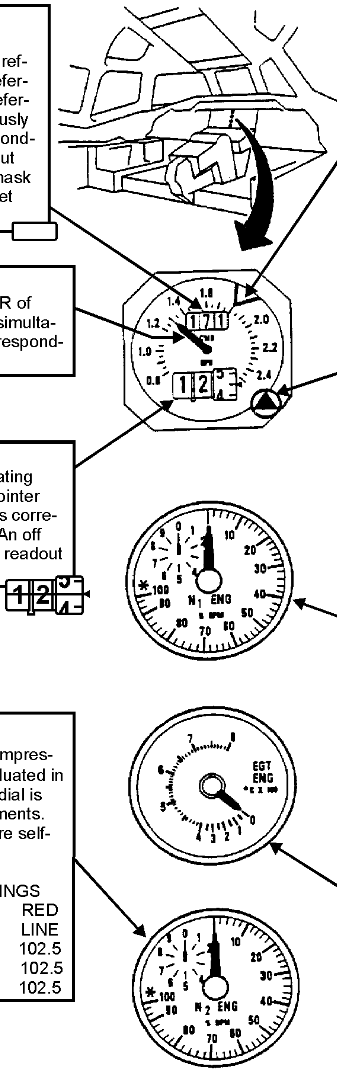
ENGINES - ENGINE INTERMIX

** Engine Intermix Placard Installed on Some Airplanes



CMD EPR Reference Readout
Digital readout of EPR reference set with EPR reference set knob. EPR reference bug is simutaneously positioned to a corresponding EPR value. Readout will be covered witha mask when EPR reference set knob is pushed in.

EPR Pointer
Indicates operating EPR of engine. EPR readout simultaneously displays a corresponding EPR value.

EPR Readout
Digital readout of operating EPR of engine. EPR pointer simultaneously displays corresponding EPR value. An off flag (bar) will cover the readout if a failure occurs.

N_2 Tachometer (L, R)
Indicates RPM of N_2 compressor. Small dials is graduated in 1% increments. Large dial is graduated in 2% increments. Tachometer systems are self-generating.

* % RPM LIMIT MARKINGS

TYPE ENGINE	ORANGE LINE	RED LINE
-217	100.3	102.5
-217A	100.9	102.5
-219	100.9	102.5

EPR Reference Bug
Indicates EPR reference, manually set with EPR reference set knob, or automatically set to an EPR value applicable for EPR limit thrust mode selected on thrust rating indicator. When manually set with EPR reference knob, CMD EPR reference readout will be set to a corresponding EPR value.

EPR Reference Set Knob
Pull knob out to unmask CMD EPR reference readout, and rotate knob to set desired EPR reference in CMD EPR reference readout. EPR reference bug is simultaneously positioned to display a corresponding EPR value. When knob is pushed in, mask will cover CMD EPR reference readout, and EPR reference bug will automatically be positioned to an EPR value applicable for EPR limit thrust mode selected on thrust rating.

N_1 Tachometer (L, R)
Indicates RPM of N_1 compressor. Small dial is graduated in 1% increments. Large dial is graduated in 2% increments. Tachometer systems are self-generating.

* % RPM Limit Markings

Type Engine	Orange Line	Red Line
-217	94.5	99.2
-217A	98.3	101.6
-219	98.8	101.6

EGT Gage (L, R)
Indicates exhaust gas temperature in °C.

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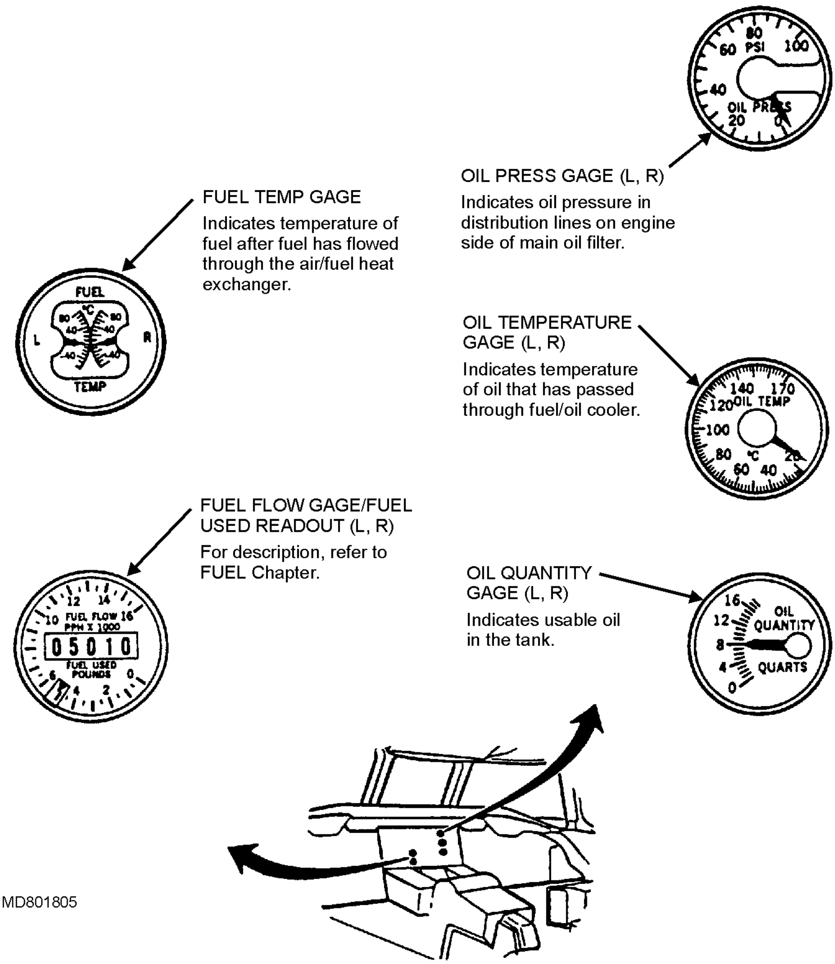
ENGINES – EPR, N_1, N_2, AND EGT GAGES



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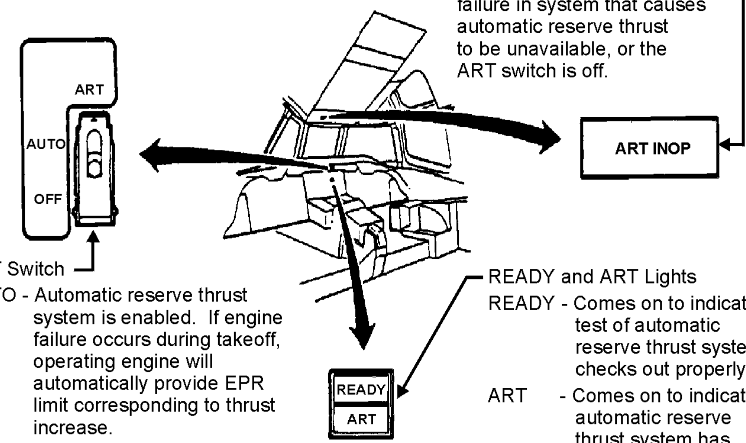
ENGINES - CONTROLS AND INDICATORS



ART INOP Light
Comes on to indicate a failure in system that causes automatic reserve thrust to be unavailable, or the ART switch is off.

ART Switch
AUTO - Automatic reserve thrust system is enabled. If engine failure occurs during takeoff, operating engine will automatically provide EPR limit corresponding to thrust increase.
OFF - Automatic reserve thrust system is disabled.

READY and ART Lights
READY - Comes on to indicate test of automatic reserve thrust system checks out properly.
ART - Comes on to indicate automatic reserve thrust system has been actuated.

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FUEL HEAT ON Light (L,R)
Comes on to indicate shutoff valve in engine bleed air supply line to air/fuel heat exchanger is open.

ENG SYNC ON Light (L,R)
Comes on to indicate ENG SYNC selector is in N_1 or N_2 position when landing gear handle is in down position.

START VALVE OPEN Light (L,R)
Comes on to indicate engine starter valve butterfly is open.

OIL STRAINER CLOGGING Light (L,R)
Comes on to indicate an excessive differential pressure across main engine oil system fliter. MASTER CAUTION lights also come on.

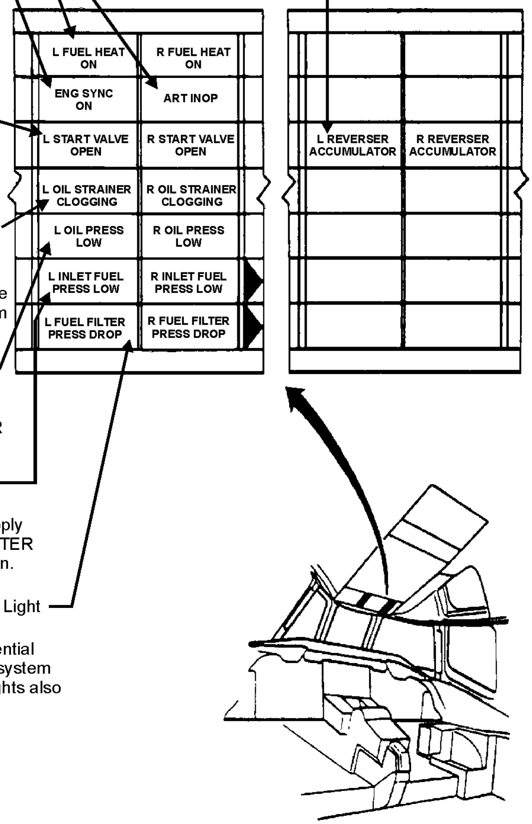
OIL PRESS LOW Light (L,R)
Comes on to indicate low engine oil pressure. MASTER CAUTION also comes on.

INLET FUEL PRESS LOW Light (L,R)
Comes on to indicate fuel supply low pressure at engine. MASTER CAUTION Lights also come on.

FUEL FILTER PRESS DROP Light (L,R)
Comes on to indicate a differential pressure at main engine fuel system filter. MASTER CAUTION Lights also come on.

ART INOP Light
Comes on to indicate a failure in system that causes automatic reserve thrust to be unavailable, or ART switch is OFF.

REVERSER ACCUMULATOR LOW Light (L, R)
Comes on to indicate hydraulic pressure at reverser accumulatoris low.



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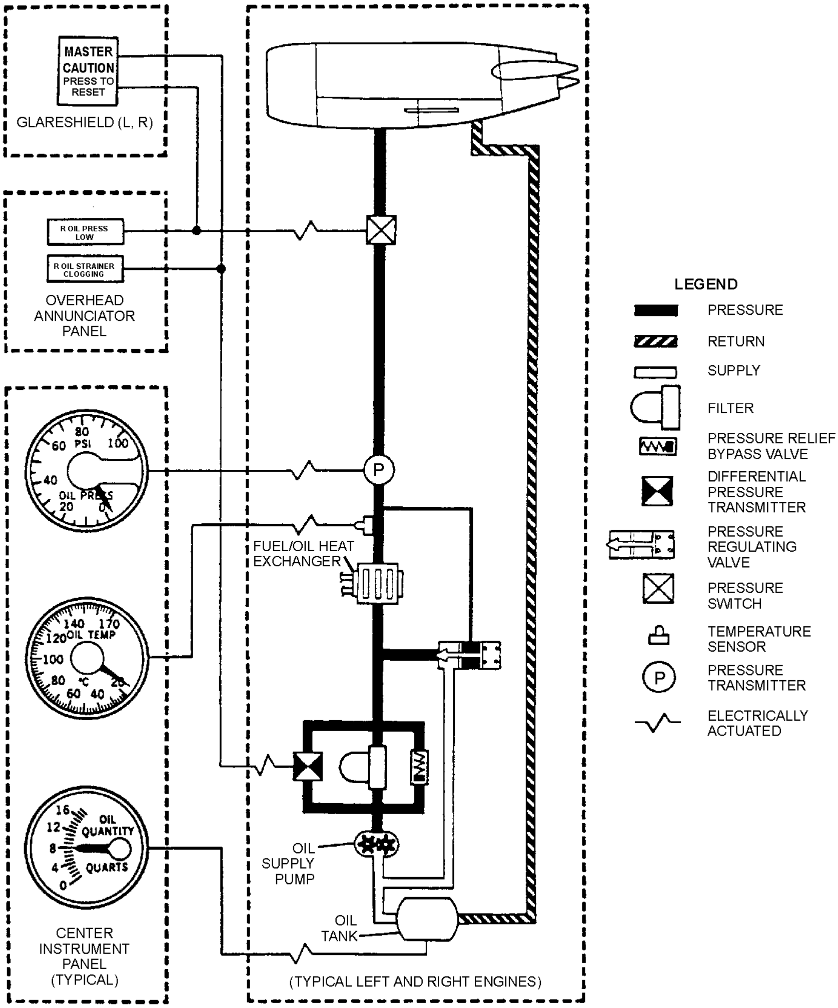
ENGINES - CAUTION LIGHTS



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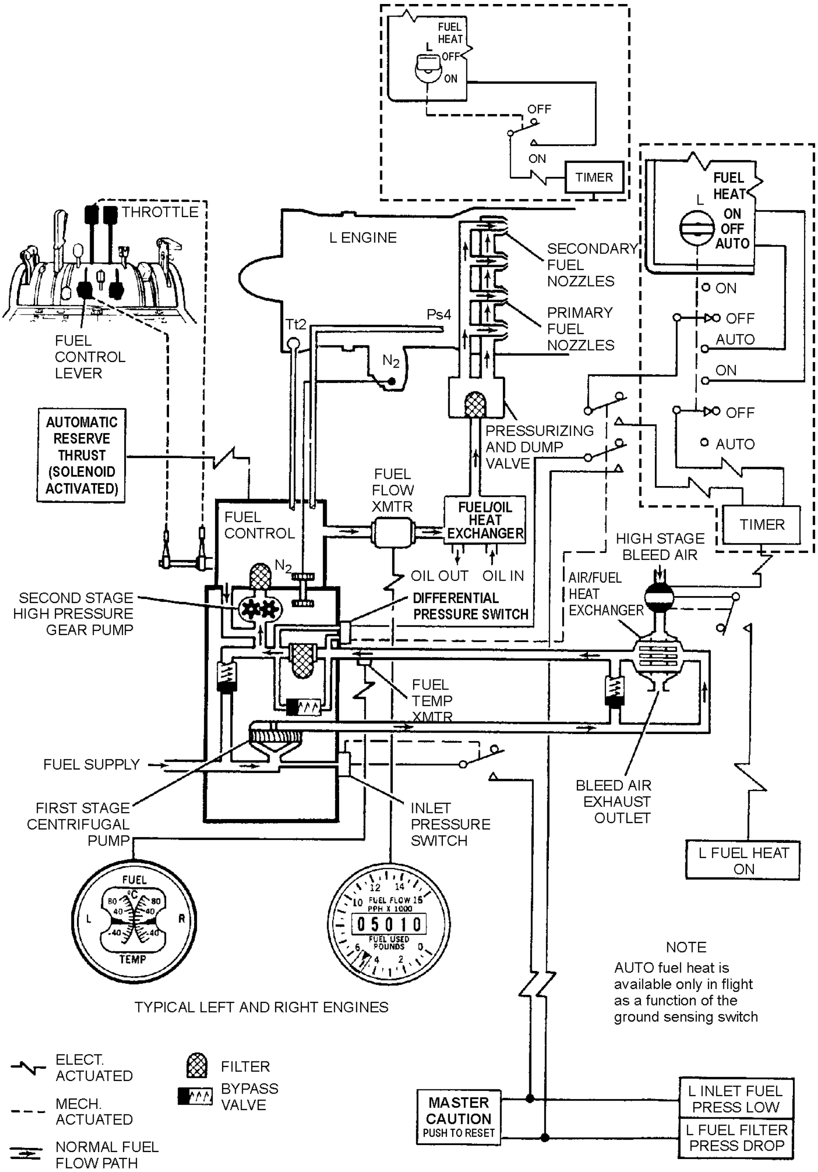
ENGINES - OIL SYSTEM FUNCTIONAL SCHEMATIC



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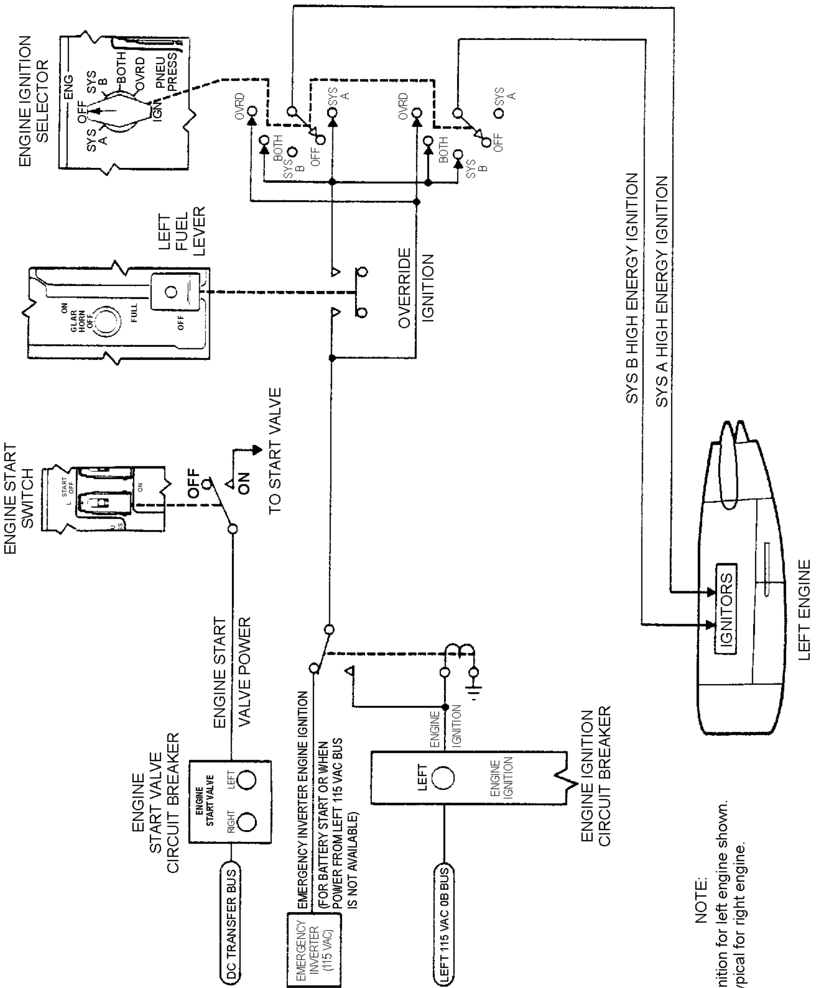
ENGINES - FUEL SYSTEM FUNCTIONAL SCHEMATIC



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ENGINES - FUNCTIONAL SCHEMATIC IGNITION SYSTEM

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TRAINING BULLETIN

Issued by FLIGHT STANDARDS

MD-80-99-10 **October 22, 1999**

ILS PRM
Simultaneous Close Parallel ILS (ILS PRM) Approaches

Overview

Airline crews that have been through the ILS PRM training may participate in ILS PRM approaches. Continental's approved program consists of the video RDU: ILS PRM that was shown in Day 1 Recurrent Training a couple of years ago and this new Training Bulletin. Additionally, an updated ILS PRM video will be shown in Day 1 for the year 2000 and in all new Basic Indoctrination classes. However, because all of the pilots have not seen the video (new hires after 1997) only Captains will be allowed to execute ILS PRM approaches until August 1, 2000.

ILS PRM approaches are designed for major airports with closely spaced parallel runways. They can increase IMC arrival rates at these airports to the same level attained when visual approaches are being conducted.

ILS PRM approaches were first introduced operationally at Minneapolis - St, Paul International Airport (MSP) in November 1997. During the introductory phase, the approaches were restricted to weather conditions equal to or better than 5000' ceilings and 5 miles visibility. Selected airline crews flew more than 1000 ILS PRM approaches between November 1997 and March 1998. The FAA temporarily suspended ILS PRM approaches pending review of the data. After a thorough evaluation, the FAA fine tuned some of the original procedures and is now ready to reinstate the program.

The FAA Air Traffic facilities have been conducting ILS approaches to parallel runways for some time. These approaches are categorized as:

- Simultaneous Parallel ILS Approaches
- Parallel ILS approaches with staggered aircraft line-up

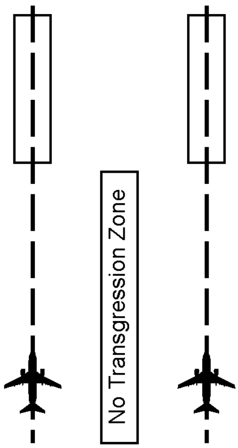
A new category, available to all qualified operators (including Part 91), features two approach controllers ("final monitor controllers") each equipped with high update radar and high resolution ATC radar displays, collectively called a Precision Runway Monitor (PRM) system. The PRM system displays almost instantaneous radar information. Automated tracking software provides the final monitor controllers with aircraft identification, position, and projected position. Visual and aural alerts are also provided for the controllers. The approaches conducted using this new system are categorized as:

- Simultaneous Close Parallel ILS (ILS PRM) Approaches (see Figure A).

ILS PRM approach operations demand heightened pilot situational awareness. A thorough crew briefing and review of the Jeppesen approach plate and to the Attention All Users' page (Jeppesen 11-0, see Figure C) must be conducted. Pilots will be advised, via ATIS, when ILS PRM approaches are in use.

ILS Approaches to Parallel Runways

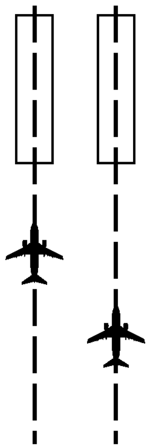
Simultaneous Parallel ILS Approaches



- Established System
- Runway centerlines 4300 feet or greater
- Wing tip approaches
- Two final monitor controller
- No Transgression Zone (NTZ)
- Descending breakouts possible

Figure A.1

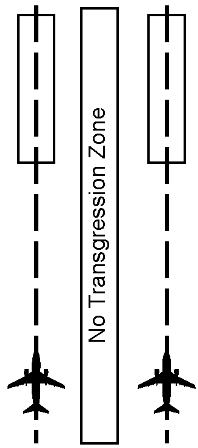
Parallel ILS Approaches



- Established system
- Runway centerlines 2500 feet or greater
- Staggered approaches
- Final monitor controller not required

Figure A.2

Simultaneous Close Parallel ILS Approaches (ILS PRM)



- New system
- Runway centerlines less than 4300 feet
- Precision Runway Monitor (PRM)
- Wing tip approaches
- Two final monitor controllers
- No Transgression Zone (NTZ)
- Descending breakouts possible
- One radio tuned to tower and one radio tuned to final monitor controller at MSP
- TCAS in TA ONLY (during approach)
- Hand flown breakouts
- Pilots require special training

Figure A.3

FIGURE A

Situational Awareness

The close proximity of adjacent aircraft conducting these approaches mandates strict and immediate pilot reaction to and compliance with all ATC clearances, assigned airspeeds, altitudes, and headings.

Breakouts

ILS PRM approaches require precise localizer tracking to minimize intervention by the final monitor controller and to avoid penetration of the No Transgression Zone (NTZ). The NTZ is an area a minimum of 2,000 feet wide between the simultaneous parallel approach courses. If an aircraft on one of the parallel approach courses deviates off course and does not respond to controller advisories/corrections, the "on course" aircraft MAY be directed to breakout. If the deviating aircraft (referred to as the "blundering aircraft") penetrates the NTZ, the on course aircraft MUST be directed to breakout.

The breakout directions will include a heading and an altitude. The breakout MAY involve a descent. However, ATC will not assign a breakout altitude lower than the Minimum Vectoring Altitude (MVA). Also, controllers will not expect a descent rate exceeding 1,000 feet per minute. It is important to note that because of the rapid response time required, ILS PRM breakouts must be hand flown.

WARNING: Crews must comply with breakout instructions immediately. The aircraft blundering off course may be only seconds from the on course aircraft.

Communication

To avoid blocked transmissions, each runway will have two frequencies, a primary and a monitor frequency. The tower controller and monitor controller will transmit on both frequencies. Pilots will only transmit on the primary frequency, but will listen to both frequencies. Specific frequencies are listed on the airport approach charts.

Strict radio discipline is essential during ILS PRM operations. This includes an alert listening watch and the avoidance of lengthy or unnecessary transmissions. Call signs or controller directions may be clipped by other aircraft radio transmissions. Pilots must be alert to unusually long periods of silence or unusual background noise. A stuck transmit button or two buttons keyed simultaneously may block critical instructions from the final monitor or tower controller. Pilots must notify ATC immediately of any degradation to aircraft communication or navigation systems.

TCAS

The Traffic Collision Avoidance System (TCAS) provides an additional element of safety during ILS PRM operations. However, if the TCAS is set to the Resolution Advisory (**RA**) mode there is a good chance that the Resolution Advisory feature may conflict with breakout instructions if given early in the approach. Therefore, TCAS equipped aircraft must fly the ILS PRM approach with the system set to **TA** only.

Pilots must remember to switch back to the **TA/RA** mode as soon as practicable after initiating a breakout or missed approach maneuver.

ATC Roles And Responsibilities

Air Traffic Control must:

- Notify inbound aircraft when ILS PRM operations are in effect. This will normally be accomplished with the ATIS; e.g.,

  "Simultaneous ILS/PRM Approaches Runway (XX) in use."

- Provide proper longitudinal or 1,000-foot vertical separation during the turn on to close parallel final approach courses (see Figure B).
- Utilize the Precision Runway Monitor system to ensure that prescribed separation standards are met during the approaches.
- Instruct aircraft observed overshooting the turn-on to final or continuing on a track which will penetrate the No Transgression Zone (NTZ) to return to the correct final approach course immediately; e.g.,

  "(Aircraft call sign) You have crossed the final approach course. Turn (left/right) immediately and return to the localizer/azimuth course."

Breakout Phraseology

If a deviating aircraft penetrates the No Transgression Zone it is mandatory for the controller to breakout the endangered aircraft on the adjacent approach course. The phraseology for the breakout maneuver is:

> "TRAFFIC ALERT, (aircraft call sign) turn (left/right) immediately heading (degrees); climb/descend and maintain (altitude)."

Simultaneous Close Parallel ILS Approaches

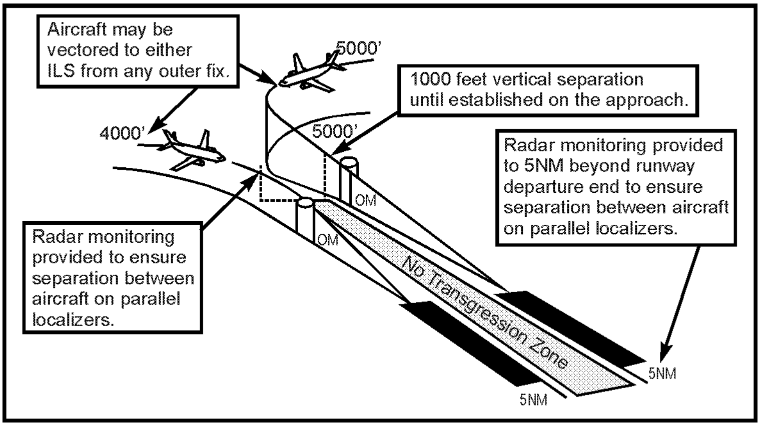


FIGURE B

Pilots'Roles And Responsibilities

The FAA intends to publish a NOTAM stating, in part:

> "Aircraft operators are expected to notify Minneapolis ARTCC Traffic Management Unit at 1-800-677-6466 prior to departure (not more than two hours) if unable to participate in PRM approaches. This does not apply to scheduled commercial aircraft operators who do not have PRM in their OPS SPECS, or departures outside the North American continent." (Continental Airlines does have ILS PRM in our OPS SPECS.)

Continental's compliance with this NOTAM must be accomplished primarily through Dispatch. PIC's who determine before departure that they will not be able to accomplish an ILS PRM approach (because of MEL considerations, etc.) should notify Dispatch. As a last resort (e.g., by virtue of an inflight equipment malfunction) and/or backup notification, crew should also advise ATC.

In addition, pilots must:

- Conduct a Simultaneous Close Parallel ILS (ILS PRM) approach briefing (see below).
- Recognize the importance of flying a precise approach. If the autopilot and auto approach coupler are operative, pilots must utilize the autopilot to commence the ILS PRM approach.
- Immediately comply with correcting or breakout ("Traffic Alert ... ") instructions.
- Hand fly (autoflight systems disengaged) all breakouts.

ILS PRM General Procedures

Until August 1, 2000, only Captains may fly an ILS PRM approach.

Monitor ATIS as early as possible. If unable to fly an ILS PRM approach, advise ATC as soon as possible (within 200 miles of the airport of intended landing if possible).

Aircraft with equipment placarded with MEL sticker (or inoperative) must evaluate whether Close Simultaneous ILS PRM approaches can be conducted. The following systems are the minimum that will be needed:

- Instrument Landing System (CAT I)
- TCAS and/or Transponder
- Two (or more) VHF radios.

Note: Most Continental aircraft are equipped with three VHF radios. Number three VHF radio is normally used by the ACARS. ACARS capability should be maintained at all times. Aircraft may be dispatched with one VHF radio inoperative (or a VHF radio may malfunction during flight). In either case, with one or more VHF radios inoperative, two are not available for ILS PRM approaches. Thus ILS PRM approaches cannot be flown unless ACARS capability is temporarily suspended.

Approach Briefing

Use the ILS PRM approach chart published for the runway in use [e.g., "Minneapolis - St. Paul] International (SIMULTANEOUS CLOSE PARALLEL) ILS PRM Runway 12L"] - see Figure C. In addition, use the "ATTENTION ALL USERS..." page [e.g., Jeppesen 11-0 Minneapolis - Minn] - see Figure D.

The Pilot Flying (PF) the ILS PRM approach should brief it in the same manner as other ILS approaches. Include the topics listed in the Flight Manual. Pay particular attention to ILS limitations and the Notes included on the ILS PRM approach chart and associated ATTENTION ALL USERS page. Because of the unique nature of ILS PRM operations, briefings should cover the following topics:

- The proximity of parallel traffic.
- Selection and monitoring of VHF frequencies.
  - VHF Comm #1 radio tuned to the tower frequency.
  - VHF Comm #2 radio tuned to the monitor frequency.

    Note: While the monitor controllers frequency should be tuned (on VHF#2) as early as practicable, monitoring this frequency may be delayed until directed by Approach Control to "contact tower" (on VHF#1). This technique will avoid the reception of early and non-applicable tower transmissions heard through the monitor's frequency.

  - Both pilots monitor both frequencies (set volume to same levels so as to minimize chances of missed transmissions) after directed to contact tower.
  - Pilots transmit on the tower (VHF Comm #1) frequency only.
- PM to select TCAS modes.
- Potential breakout maneuver.
  - The need for immediate initiation and heading change.
  - Breakout must be hand flown.
  - If directed, descent rate not to exceed 1,000 feet per minute.
  - Descent will not be flown (and should not be directed to be flown) below Minimum Vectoring Altitude (MVA).

CONTINENTAL AIRLINES
ILS PRM

29 OCT 99 11-0

MINNEAPOLIS, MINN
MINNEAPOLIS-ST PAUL INTL

ATTENTION ALL USERS OF ILS PRECISION RUNWAY MONITOR (PRM)

ILS PRM RWY 12L
ILS PRM RWY 12R
ILS PRM RWY 30L
ILS PRM RWY 30R

A. ILS PRM Approaches will only be flown by the Captain.
B. Monitored Approach Procedures will not be used.
C. Before initiating a simultaneous close parallel ILS PRM approach, both pilots are expected to have read the ILS PRM Training Bulletin and the ILS PRM section of the Aircraft Flight Manual.
D. When ILS PRM Approaches are in use the following procedures will be in effect:

1. **Atis:** When the ATIS broadcast advises ILS PRM approaches are in progress, pilots will NOTIFY ATC on initial contact if they can not meet all the requirements on this information page.

2. **Dual VHF Communication required:** To avoid blocked transmissions, each runway will have two frequencies, a primary and a monitor frequency. The tower controller and monitor controller will *transmit* on *both* frequencies. *Pilots* will ONLY transmit on the primary frequency, but will listen to both frequencies. It is important that pilots switch to the Monitor frequency no later than when instructed by ATC to contact the Tower. When on the Tower and Monitor frequency, the volume levels should be set about the same on both radios so that the pilots will be able to hear transmissions on at least one frequency if the other is blocked.

3. **TCAS:** To avoid ATC giving instructions directly opposite to a TCAS RA, the TCAS will be placed in TA mode when entering the monitored PRM airspace at:
   ILS PRM RWY 12L ALGIN INT
   ILS PRM RWY 12R WAYZA INT
   ILS PRM RWY 30L SISSY INT
   ILS PRM RWY 30R BONNA INT
   If a pilot is broken out from the ILS the TCAS should be reset to the TA/RA mode as soon as practicable.

4. **All ATC directed "breakouts" are to be HAND FLOWN:** Pilots, when directed to break off an approach, must assume that an aircraft is blundering toward their course and a breakout must be initiated *immediately.* The break out *must be hand flown* to assure it is accomplished in the shortest amount of time. Controllers may give a descending breakout but in no case will the descent be below minimum vectoring altitude (MVA) which provides at least 1,000 feet obstacle clearance. The MVA is 2,500 feet at Minneapolis-St Paul International.

5. **Phraseology - "TRAFFIC ALERT":** If an aircraft enters the "NO TRANSGRESSION ZONE" (NTZ), the controller will breakout the threatened aircraft on the adjacent approach. The phraseology for the breakout will be:

   TRAFFIC ALERT, (aircraft call sign) TURN (left/right) IMMEDIATELY, HEADING (degrees). CLIMB/DESCEND AND MAINTAIN (altitude).

NOTE: For additional information refer to ILS PRM in the Aeronautical Information Manual (AIM) or the Aeronautical Information Publication (AIP).

Supplied by Jeppesen Sanderson

FIGURE C

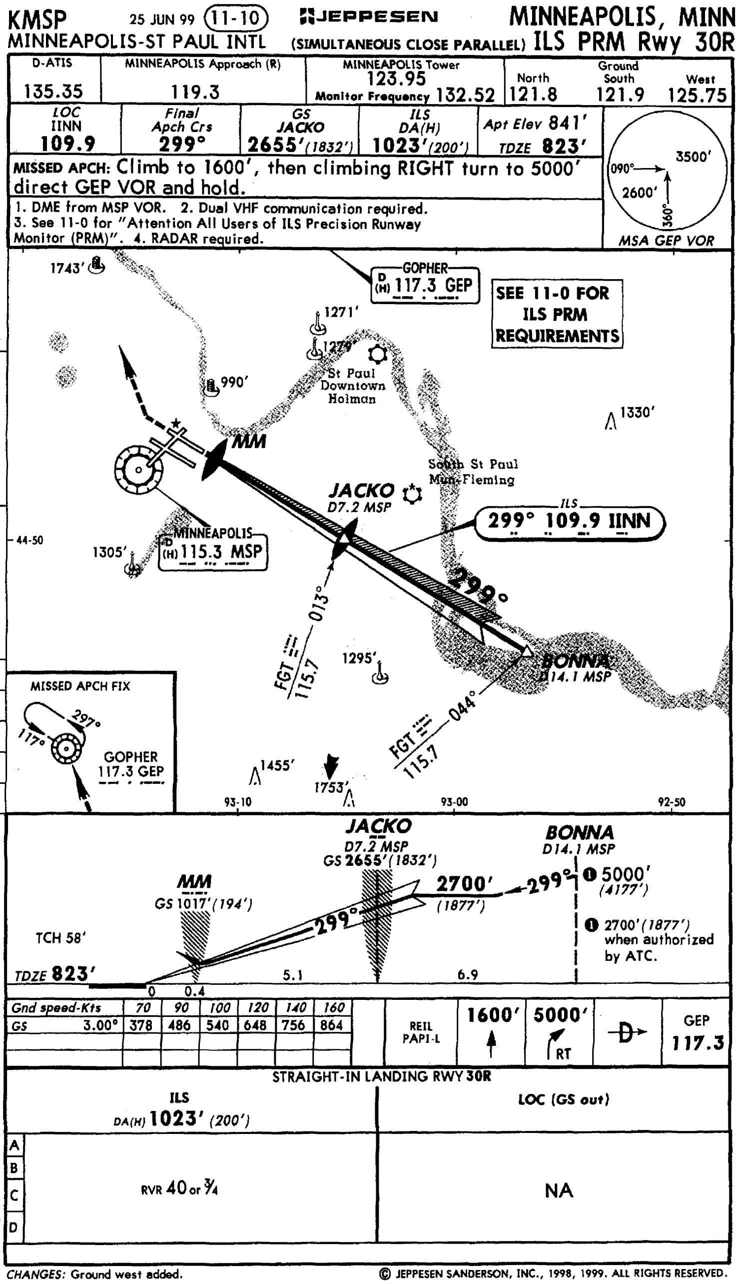

KMSP 25 JUN 99 (11-10) JEPPESEN MINNEAPOLIS, MINN
MINNEAPOLIS-ST PAUL INTL (SIMULTANEOUS CLOSE PARALLEL) ILS PRM Rwy 30R
D-ATIS 135.35
MINNEAPOLIS Approach (R) 119.3
MINNEAPOLIS Tower 123.95 Monitor Frequency 132.52
Ground North 121.8 South 121.9 West 125.75
LOC IINN 109.9
Final Apch Crs 299°
GS JACKO 2655'(1832')
ILS DA(H) 1023'(200')
Apt Elev 841' TDZE 823'
MISSED APCH: Climb to 1600', then climbing RIGHT turn to 5000' direct GEP VOR and hold.
1. DME from MSP VOR. 2. Dual VHF communication required.
3. See 11-0 for "Attention All Users of ILS Precision Runway Monitor (PRM)". 4. RADAR required.
090° 3500' 2600' 360°
MSA GEP VOR
GOPHER D (H) 117.3 GEP
SEE 11-0 FOR ILS PRM REQUIREMENTS
1743'
1271'
1279'
St Paul Downtown Holman
990'
1330'
MM
South St Paul Mun-Fleming
JACKO D7.2 MSP
ILS 299° 109.9 IINN
44-50
1305'
MINNEAPOLIS D (H) 115.3 MSP
299°
013°
FGT 115.7
1295'
BONNA D14.1 MSP
MISSED APCH FIX
297° 117°
GOPHER 117.3 GEP
1455'
1753'
044°
FGT 115.7
93-10 93-00 92-50
1 in=5 NM
JACKO D7.2 MSP GS 2655'(1832')
BONNA D14.1 MSP
MM GS 1017'(194')
2700' (1877')
299°
5000' (4177')
2700'(1877') when authorized by ATC.
TCH 58'
TDZE 823'
0 0.4 5.1 6.9
Gnd speed-Kts 70 90 100 120 140 160
GS 3.00° 378 486 540 648 756 864
REIL PAPI-L
1600' 5000' RT
GEP 117.3
STRAIGHT-IN LANDING RWY 30R
ILS DA(H) 1023' (200')
LOC (GS out)
A B C D
RVR 40 or ¾
NA
AMEND 4
CHANGES: Ground west added.
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FIGURE D

Breakout Procedures

Breakout maneuvers differ from missed approach maneuvers. Missed approaches commence at fixed, predetermined places (Missed Approach Points) and, in most cases, follow predetermined, published courses and altitudes. Any instrument approach (including ILS PRM) may, depending on weather, runway traffic, etc., end with a missed approach. Pilots should follow well-established procedures in a timely manner in conducting missed approaches.

Breakout initiation points, tracks, and altitudes are not usually predetermined. Pilots may be directed to break out of any type of approach or traffic pattern under various circumstances and weather conditions.

WARNING: TURN IMMEDIATELY! Pilots must immediately react to a breakout command. Altering the aircraft track is the most effective escape maneuver.

The autopilot must be disengaged if an ILS PRM breakout is directed. Simulation studies have shown that hand flown breakouts are consistently performed more quickly than breakouts flown using the autopilot.

Do not change aircraft configuration (flap/slat or landing gear position) until established on the breakout heading.

Descending breakouts, while always a possibility, have rarely been used with previous categories of ILS approaches. A greater chance exists that the final monitor controller may need to issue a descending breakout command during the early portion of an ILS PRM approach because a blundering aircraft from the adjacent approach course may be crossing the path of the on course aircraft.

In no case will the controller direct a descent below the minimum vectoring altitude (2,500 feet MSL at MSP). This restriction provides a minimum of 1,000 feet clearance above obstacles.

Pilots are not expected to exceed a 1,000 feet per minute rate of descent while performing a descending breakout.

The following Training Bulletins are current and should be retained.
Any specific Bulletin not listed below should be discarded.

MD-80 PILOTS: MD-80-95-04, 96-04, 98-01, 98-02, 98-04, 98-08, 98-09, 98-10, 98-11, 99-01, 99-02, 99-03, 99-04, 99-05, 99-06, 99-07, 99-08, 99-09 and **99-10**.

Jay Ellzey

Captain Jay Ellzey
DC9 / MD80 Fleet Manager

Continental
Airlines

TRAINING BULLETIN

Issued by FLIGHT STANDARDS

MD-80-00-01 **February 10, 2000**

STABILIZER TRIM INOPERATIVE/MALFUNCTION

RECOMMENDATIONS

- If a horizontal stabilizer trim system malfunction is encountered, complete the MD-80 Flight Manual checklist(s). Do not attempt additional actions beyond that contained in the checklist(s).
- If completing the checklist procedures does not result in an operable trim system, consider landing at the nearest suitable airport.
- If an operable trim system is restored, the Captain should consider proceeding to an airport where suitable maintenance is available, or to the original destination based on such factors as distance, weather, etc.

TRIM MOTOR OVERHEAT / THERMAL CUTOFF

The Primary and Alternate trim motors are each equipped with a thermal cut-off device which interrupts electrical current to the motor if that trim motor overheats. Repeated or continuous use of the trim motor may cause a thermal cutoff. After the motor cools, it will automatically restore trim function when the thermal cutoff resets. Excessive or prolonged testing of the trim system on the ground before departure may generate enough heat to produce a thermal cutoff during routine trimming shortly after takeoff.

An overheat cutoff in one trim motor does not affect the functions of the other motor. If the alternate trim motor overheats, the primary trim system may be used to retrim the stabilizer; the reverse is also true.

If the flight crew uses the primary trim system repeatedly to resist a runaway in the alternate trim system, the primary motor could overheat, and the crew may be left with a runaway alternate trim if the primary trim thermal cutoff occurs. This action could also cause both trim motors to overheat, and result in a temporarily inoperative stabilizer. Also, if a runaway trim motor overheats and stops, it could again runaway once it has cooled and the thermal cutoff resets.

(Continued)

If the crew determines that the stabilizer is inoperative, and suspects that they may have a thermal cutoff, and if flight conditions permit, the Captain may delay the diversion to an alternate airfield long enough to allow for a cooling period/thermal reset. After a reset, the crew should refer to the RECOMMENDATIONS above.

The following Training Bulletins are current and should be retained. Any specific Bulletin not listed below should be discarded.

MD-80 PILOTS: MD-80-96-04, 98-02, 98-10, 98-11, 99-03, 99-04, 99-07, 99-08, 99-09, 99-10, and **00-01**.

Captain Jay Ellzey
DC9 / MD80 Fleet Manager

Continental
Airlines

TRAINING BULLETIN

Issued by FLIGHT STANDARDS

MD-80-00-07 **November 28, 2000**

**TEMPORARY DISABLING OF
THE UPPER WING ANTI-ICE SYSTEM**

The Upper Wing Anti-Ice system will be disabled and placarded inoperative on all MD-80 aircraft for the next few months.

Maintenance and Engineering have identified a potential for shorting out of electrical components in the UWAI system in the wing area.

A fix to the problem is underway and should be completed on all aircraft by the spring of 2001.

This will require a close-up check of the upper wing surface for ice build-up prior to all flights as detailed in the Flight Manual, Section 4, pages 255-260.

The UWAI system is a great aid in handling the MD-80 wing ice condition, and the system will be returned to operation as quickly as is possible.

In the meantime, please take extra care during the coming winter months to ensure that wing ice inspections are completed before all flights.

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*The following Training Bulletins are current and should be retained.
Any specific Bulletin not listed below should be discarded.*

MD-80-99-08, 99-10, 00-01, 00-02, 00-03, 00-04, 00-05, 00-06 and **00-07**.

Jay Ellzey

Captain Jay Ellzey
DC9 / MD80 Fleet Manager

Continental
Airlines

TRAINING BULLETIN

Issued by FLIGHT STANDARDS

MD-80-01-01 **May 9, 2001**

COMPASS SYSTEM ERRORS

The MD-80 fleet (except aircraft 878 & 879) is equipped with mechanical gyros for heading reference. Mechanical gyros can produce heading error even when functioning perfectly. The following table shows heading disagreement between the two compass systems, RMI to RMI. The HSI's can add or subtract up to another 2°.

Maneuver	Typical Error	Worst Case Error
During a 20° Bank turn	4°	10°
During a 30° Bank turn	5.5°	14°
After rollout from a 180° turn at 30° angle of bank [1]	3°	7°
Accelerating/decelerating more than .4 knots/second for 5 minutes	4°	10°
Normal Cruise	2°	5°

1 Correction to normal cruise error takes 3 to 5 minutes.

These figures are for a normally functioning system. Compass errors that are within the worst-case amount are possible without any system failure. Errors greater than those in the table should be written up in the logbook.

The following MD-80 Training Bulletins are current and should be retained. Any specific MD-80 Bulletin not listed below should be discarded.

MD-80-99-08, 99-10, 00-01, 00-03, 00-06, 00-07 and **01-01**.

Captain H.J. Fruchtnicht
MD-80 Fleet Manager

Continental Airlines

TRAINING BULLETIN

Issued by FLIGHT STANDARDS

MD-80-01-02 **May 15, 2001**

PUSHBACK SAFETY CHANGE

There have been a number of instances where MD-80 aircraft have been severely damaged as a result of towbar detachment or failure just as pushback commences. The towbar usually impacts the nosewheel tires and is forced upward into the gear doors and aircraft structure.

A quick, simple step is being added to the MD-80 pushback process to prevent damage to the aircraft in the event of towbar detachment or failure. **Effective May 21st, the aircraft will be towed forward one foot prior to beginning pushback**. This verifies proper operation of the towbar prior to applying force toward the aircraft. In the event of failure, the force of the towbar is directed away from the aircraft.

If a failure does occur, the flight crew will immediately be advised over interphone or via hand signal to apply the brakes.

The following MD-80 Training Bulletins are current and should be retained. Any specific MD-80 Bulletin not listed below should be discarded.

MD-80-99-08, 99-10, 00-01, 00-03, 00-06, 00-07, 01-01 and **01-02**.

Captain H.J. Fruchtnicht
MD-80 Fleet Manager

TRAINING BULLETIN

Issued by FLIGHT STANDARDS

MD-80-01-03 **June 11, 2001**

MD-80 DAY II TRAINING

Day II for year 2001 is upon us. We have gone to great length this year to make the material informative and interesting. The format has changed from previous years in response to requests from pilots.

Day II is still an 8 hr. class on the aircraft systems and operation, but for your convenience, it now can be accomplished in two segments. One segment is a 4 hour classroom presentation and the other 4 hour segment is an individual computer portion (CBT). The 4 hr. classroom may be accomplished independent of the CBT segment of training. Day II can be completed in one day, or on two separate days at the pilot's discretion. You may take the two segments in your early (except June 2001), due, or grace months. All Day II training must be completed during your eligibility months. You will receive pay credit for Day II training when the classroom segment has been completed.

The classroom segment of Day II (4 hours) allows the scheduling of two classes per available day. Most of the designated days will have two classes scheduled. The first class will be scheduled from 8AM until Noon, and a second class from 1PM to 5PM. This scheduling will allow all pilots more flexibility in attending the class. This will eliminate extra commuting and cost for out of town pilots. DC-10 and MD-80 pilots can attend the same class. You can schedule yourself for the classroom segment of Day II on the computer in same manner as previous years.

The CBT segment of Day II can be taken at any time in the pilots due, early (except June 2001) or grace months without any scheduling. The CBT will be available on the training computers at all crew bases and in the Flight simulator Facility at IAH. To access Day II on the Computers, follow these procedures:

1. The computer should be at the "Enter Network Password" screen. If at the "Work Hard, Fly Right" logo screen, go to Step #3 below.
2. On "Enter Network Password" screen, enter the following information:
   User Name: **training**
   Password: **pilot**
   Domain: **iah**, **ewr**, **cle**, **gum**, or **hnl** (must match the base where computer is located) and press **Enter**
3. On the "Work Hard, Fly Right" screen enter your **5-digit employee ID** in the logon box. Enter your **5-digit employee ID** for your password. Press **OK**.

4. The MD-80 Day 2 course will be available for your selection if you are due.
5. When finished, press the "**Quit**" button, then select the "**Sign Off**" button (Your progress will only be recorded if you press the "Quit" button then the "Sign Off" button).

There is an inline volume control located on the headset. Report any computer problems to the Chief Pilot's office, and/or contact the PC Help Desk (there should be Help Desk phone numbers posted in the CBT labs).

You must complete both segments of Day II in the 90-day window before you will receive credit. Should you not complete Day II in your early or due month, you will be scheduled by training scheduling to complete both segments of Day II in your grace month.

Day II completion can be verified in CCS by selecting Pilot Qualification from the Main Menu. The Pilot Qualification Summary Screen will display Pilot Qualifications data based on earliest expiration date. Should you not complete both segments of Day II in the 90-day window you will be placed in a lost qualification status.

The following MD-80 Training Bulletins are current and should be retained. Any specific MD-80 Bulletin not listed below should be discarded.

MD-80-99-08, 99-10, 00-01, 00-03, 00-06, 00-07, 01-01, 01-02 and **01-03**.

Captain H.J. Fruchtnicht
MD-80 Fleet Manager

Continental
Airlines

TRAINING BULLETIN

Issued by FLIGHT STANDARDS

MD-80-01-04 **June 13, 2001**

NON-PRECISION APPROACH WITH NO DEPICTED FAF

Some non-precision approaches do not have a final approach fix depicted. See the Fort Lauderdale VOR 27R, or Nassau, Bahamas VOR Rwy 09 for example. These approaches have an on-airport VOR with no DME, and require a procedure turn.

The Final Approach Point (FAP) is the point where the aircraft is established inbound on the final approach course from the procedure turn. The FAP serves as the FAF and identifies where the final approach descent may be commenced.

These approaches require a standardized technique to make use of our constant rate descent procedures. The following guidelines should be used when flying a non-precision approach with no depicted FAF.

- Cross the VOR outbound for the procedure turn with gear down, flaps 28°, and speed at 140 KIAS. Descend as required to the procedure turn minimum altitude. Time for 2 minutes outbound.
- After two minutes are up, perform the procedure turn with a 45 second leg outbound. The aircraft should remain within 10 NM from the VOR.
- Intercept the final approach course inbound. As soon as the aircraft is established inbound on the final approach course, select flaps 40°, slow to target airspeed, and set vertical speed to 700 FPM down. (On approaches with a procedure turn minimum altitude HAT of 2000 feet AGL or higher, use 1000 FPM down.)
- The aircraft should arrive at DDA at a point short of a normal glidepath to the runway.
- Descent below DDA requires visual conditions. If visual conditions do not exist at DDA (no visual contact with the surface), accomplish missed approach.
- If visual conditions exist at DDA (visual contact with the surface), continue the approach for landing. If below a normal glidepath to the runway, level off by setting vertical speed to zero or using ALT HLD. The aircraft may be flown level (no more than 50 feet below DDA) until intercepting a normal glidepath to the runway.

- Execute a missed approach at the MAP if adequate visual reference is not attained, or the aircraft is not in a position to make a safe landing.

The following MD-80 Training Bulletins are current and should be retained. Any specific MD-80 Bulletin not listed below should be discarded.

MD-80-99-08, 99-10, 00-01, 00-06, 00-07, 01-01, 01-02, 01-03 and **01-04**.

Captain H.J. Fruchtnicht
MD-80 Fleet Manager

Continental
Airlines

TRAINING BULLETIN

Issued by FLIGHT STANDARDS

MD-80-01-05 **June 15, 2001**

JEPP BRICK

A Jeppesen Alternate Airport Chart Manual (brick) will be placed in the flight deck gear pin stowage compartment of all MD-80's. The brick will contain approach plates for seldom-used alternate airports.

The airports contained in the brick will be listed on the brick cover, and on a page in the pilot's Jeppesen manual. Spare bricks will be available in EWR, CLE, and IAH. Use the following procedures with the brick:

1. If your flight is diverted to an alternate airport:
   - Check your pilot Jeppesen Manual for the appropriate charts.
   - If the charts are not in your pilot Jeppesen Manual, open the brick to obtain the charts.
   - When finished using the charts, place them back in the brick, securing the brick with the rubber band.
   - During the in-range radio call to a hub, advise Ops that your aircraft requires a new brick.
2. If during the preflight inspection a pilot discovers the aircraft's brick is open:
   - If in EWR, CLE, or IAH advise Ops and a brick will be delivered to the aircraft.
   - In other cities or if a new brick is not available, the pilot should verify that the charts for the alternate airports are onboard in either the brick or in the pilots' Jeppesen manual.
   - If the charts for an alternate airport are not onboard advise your dispatcher. Appropriate charts may be faxed from dispatch or a different alternate may be selected.
3. If the aircraft brick is missing:
   - If in EWR, CLE, or IAH advise Ops and a brick will be delivered to the aircraft.
   - If the charts for an alternate airport are not onboard advise your dispatcher. Appropriate charts may be faxed from dispatch or a different alternate may be selected.
   - Advise your dispatcher that your aircraft will need a brick upon arrival at the next hub city.

The brick program is being launched on a trial basis. If a pilot has an empty chart binder due to this chart reduction, **do not discard the binder**.

Bricks will be updated as necessary, usually every 8 weeks. If a chart becomes unusable, a "Brick" NOTAM will be printed on the flight papers advising the pilot not to use that chart.

There may be times when the charts for an airport will be in both the brick and the Pilots' Jeppesen manual. This will occur when the charts for an airport in the brick become unusable due to a change in the instrument procedure. When this occurs Jeppesen may issue the charts to the pilots' manual until the next brick is issued. If Jeppesen does not issue new charts to the Pilots' manual, then a brick notam will be on the flight papers advising the crew of unusable charts in the brick. **When looking for a chart, always check the Pilots' Jeppesen manual first, and then the brick. If a chart is located in both the brick and the pilots' manual, the pilots' manual will have the most current chart.**

The following MD-80 Training Bulletins are current and should be retained. Any specific MD-80 Bulletin not listed below should be discarded.

MD-80-99-08, 99-10, 00-01, 00-06, 00-07, 01-01, 01-02, 01-03, 01-04 and **01-05**.

Captain H.J. Fruchtnicht
MD-80 Fleet Manager

Continental Airlines

TRAINING BULLETIN

Issued by FLIGHT STANDARDS

MD-80-01-06 **August 16, 2001**

FLIGHT CONTROL JAM

An MD-80 (at another airline) experienced a high speed rejected takeoff when the pilot was unable to rotate the aircraft at Vr. The aircraft stopped on the runway with no damage other than hot brakes. Subsequent investigation revealed that while the right elevator operated normally, the left elevator was jammed in the full-nose-down position.

The night prior, the aircraft had been subjected to strong quartering tailwinds, with gusts approaching 100 MPH. It is believed that the left elevator was forced into a trailing edge down position beyond the design limits, which caused it to jam.

Maintenance and the flight crew checked the flight controls prior to the attempted flight by exercising them from the cockpit. (A physical inspection of the elevators to ensure freedom of movement was not accomplished.) It is believed that the control tabs responded properly to the cockpit input, but that the 'feel' with one elevator jammed was not sufficiently different from the norm to alert the crew to the problem.

If there is any possibility that the aircraft has been subjected to winds in excess of 75 mph, verification of the proper functioning of the flight controls prior to flight is essential. Maintenance should perform visual and physical inspections (moving the surfaces by hand) of all flight controls, and an operational check of the systems.

If weather conditions are such that this cannot be safely performed, an acceptable alternative would be to turn the airplane into the wind and visually observe that both elevators move to a faired position; this check should then be followed by a flight control check from the cockpit, with the surfaces and tabs visually verified to move properly in response to control column input.

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MD-80-99-10, 00-01, 00-07, 01-01, 01-02, 01-03, 01-04, 01-05 and **01-06**.

H.J. Fruchtnicht

Captain H.J. Fruchtnicht
MD-80 Fleet Manager

Continental Airlines

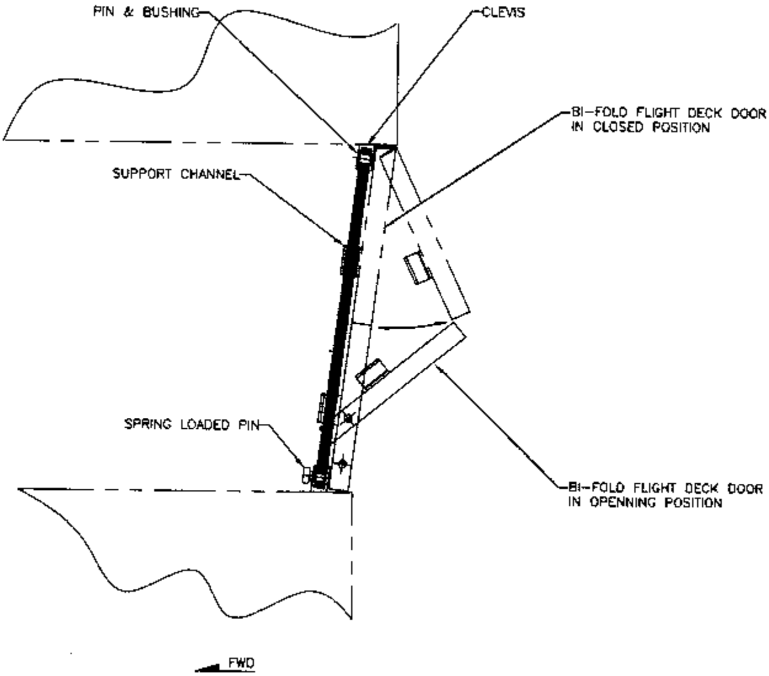
TRAINING BULLETIN

Issued by FLIGHT STANDARDS

MD-80-01-07 **October 8, 2001**

COCKPIT DOOR SECURITY MODIFICATIONS

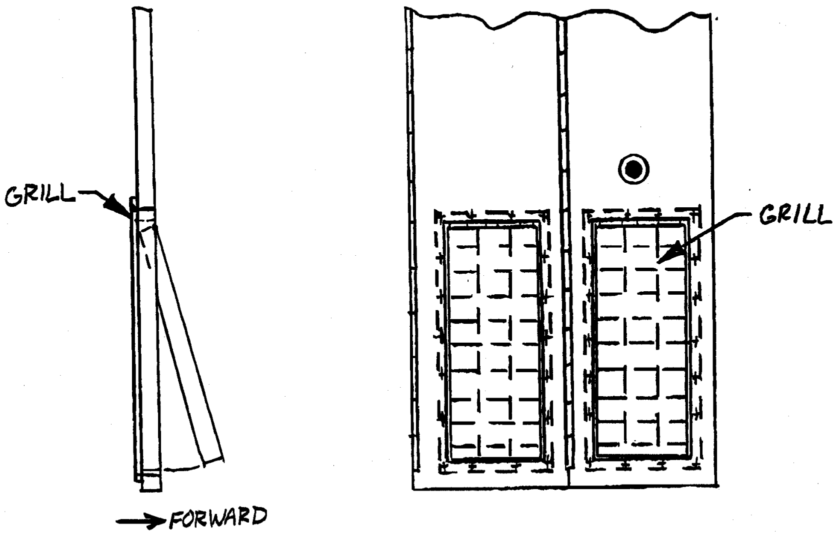
A locking bar will be added to secure the MD-80 cockpit door. The closed door is secured by lowering the locking bar into the U-shaped support channels and inserting the spring loaded pin.



Top View of Bar Installation

The door should be secured with the locking bar any time the cockpit door is closed during flight. The locking bar is stowed by pulling out on the spring loaded pin, lifting the bar out of the support channels, opening the door, and lowering the bar to a vertical position hanging from the clevis pin.

A protective grill will be installed over the blow out panels in the cockpit doors. There are no moving parts, and the grill will not impede the function of the blow out panels.



Grill Installation

The following MD-80 Training Bulletins are current and should be retained. Any specific MD-80 Bulletin not listed below should be discarded.

MD-80-99-10, 00-01, 00-07, 01-01, 01-02, 01-03, 01-04, 01-05, 01-06 and **01-07**.

Captain H.J. Fruchtnicht
MD-80 Fleet Manager