This electronic Flight Manual was compiled based upon data relevant to F coded aircraft.

The content of this electronic collection in no way supersedes the current content outlined in the approved Airplane Flight Manual and any revisions thereto. In case of conflict, the hardcopy Airplane Flight Manual takes precedence. Revisions may be published without notice. Verification that copies are the latest version is the responsibility of the user.
HIGHLIGHTS OF REISSUE

The following summary describes the changes that are incorporated with this reissue.

INTRODUCTION

THE MANUAL

Deleted “nine” from first sentence.

FLIGHT MANUAL PERFORMANCE DATA

Added new description/flow charts for effectivity codes.

SERVICE BULLETINS (SB)

Added SB 45-22-5 (Honeywell Phase IV Software Upgrade) & SB 45-72-1 (TFE731-20BR-1B Engine Upgrade).

CUSTOMIZING THE MANUAL FOR U.S. OR METRIC UNITS

Added new description for customizing the manual for U.S. or metric units.

LIMITATIONS

OPERATIONAL LIMITS/REQUIREMENTS

Introduced allowable tailwind components for aircraft modified by SB 45-72-1. Incorporated TFM 2003-13 (Clarify SEAT BELTS AND SHOULDER HARNESS limitation).

SYSTEM LIMITS

Revised PRIMUS 1000 INTEGRATED AVIONICS SYSTEM to address SB 45-22-5.

POWERPLANT LIMITS

Added ENGINE TYPE, ENGINE OPERATING LIMITS, ENGINE TRANSIENT SPEED LIMITS and ENGINE TEMPERATURE LIMITS (ITT) for aircraft modified by SB 45-72-1 and simplified charts/tables.

NORMAL PROCEDURES

Exterior Preflight

Added checks for Oxygen System Service Door and Discharge Indicator that are being installed as provisions for larger oxygen bottle installations.

Starting Engines

Added PACK Switch - OFF step to ensure a valid Anti-Ice System check.

Landing

Added step to ensure spoilers are extended.

ECS FAULT (White)

Revised effectivity to address SB 45-22-5.

WHEEL MSTR (White)

Emphasized nose wheel steering (on the ground) will disengage when the MSW is depressed.

LBS/KGS CONFIG (White)

Revised to be consistent with LBS/KGS CONFIG (Amber) in Abnormal Procedures.

REV FAULT

Provide separate procedures for “on the ground” and “in flight”.

FM-126

Reissued 5-19-2004
Highlights

Cold Weather Operation
Deleted "strike through" text relating to APU starts below -23°C (-10° F).

Pressurization System
Revised Pressurization System logic table to address SB 45-22-5.

Emergency Procedures

Emergency Descent
Revised effectivities in NOTES to address SB 45-22-5.

Engine Failure
Added step to ensure spoilers are extended.
Added NOTE referring to High Energy Stop Inspection.

“OVERSPEED” Voice
Changed “Yaw Damper — Engage” to “Yaw Damper — As required.”

Aborted Takeoff
Added step to ensure spoilers are extended.
Added NOTE referring to High Energy Stop Inspection.

REV UNSAFE
Added step to ensure spoilers are extended.
Added NOTE referring to High Energy Stop Inspection.

Abnormal Procedures

EMER BATT LOW
Reformatted presentation of procedure; content is unchanged.

LR CAB PRESS FAIL
Revised effectivity in NOTE to address SB 45-22-5.

ECS FAIL (Amber)
Revised effectivity to address SB 45-22-5.

ECS FAULT (Amber)
Revised effectivity to address SB 45-22-5.

OXYGEN OFF
Reformatted presentation of procedure. Deleted the reference to location of oxygen bottle pressure regulator.

OXYGEN QTY LOW
Reformatted presentation of procedure; content is essentially unchanged.

OXY PRESS HI
Reformatted presentation of procedure; content is unchanged.

PRI TRIM FAIL
Incorporated TFM 2003-08.

RUD BOOST INOP
Added NOTES to clarify conditions existing when MSW switch is depressed and added step to ensure nose wheel steering is reengaged if aircraft is on the ground.

SEC TRIM FAIL
Incorporated TFM 2003-08.

SPOILERS FAIL
Incorporated TFM 2004-01.

DEFUEL OPEN
Reformatted presentation of procedure; content is unchanged.

-RA-
Added notation that EGPWS is inoperative when -RA- is annunciated.

RA
Incorporated TFM 2003-10.

Highlights-2

FM-126
Reissued 5-19-2004
YD (steady)  Revised procedure to address differences for “on the ground” and “in flight”.

**PERFORMANCE**

The entire Performance Section is updated to add data effective for aircraft modified by SB 45-72-1 and to incorporate effectivity codes. Other changes include:

**GENERAL**  Revised GEOMETRIC HEIGHT CORRECTION for BELOW STANDARD TEMPERATURE Chart.

Added ALTITUDE LIMIT FOR 1.3 G MANEUVER Chart.

**TAKEOFF**  Revised DETERMINATION OF TAKEOFF FLIGHT PATH FOR OBSTACLE CLEARANCE procedure to include the following factors:

- MAXIMUM DISTANCE FOR SECOND SEGMENT CLimb
- ALTITUDE LOSS DURING A STEADY 15° BANK ANGLE TURN IN TAKEOFF FLIGHT PATH
- GROSS LEVEL-OFF HEIGHT

TRANSITION SEGMENT Data is presented as a function of weight and acceleration index. The acceleration index is determined as a function of Gross Level-Off Height and Corrected Second Segment Net Climb Gradient.
This airplane must be operated in compliance with the prescribed limitations in Section I of this manual.

NOTICE

This Airplane Flight Manual is a revised issue of the Airplane Flight Manual dated 5-14-01. This reissue replaces all of the information in the previous issue.

Serial Number ______________________

Registration Number ______________________

For RONALD K. RATHGEBER, MANAGER
AIRCRAFT CERTIFICATION OFFICE
FEDERAL AVIATION ADMINISTRATION
WICHITA, KANSAS

FM-126
IMPORTANT

TO THE OWNER OF THIS AIRPLANE

To ensure that you receive all applicable changes to this manual, please fill in the blanks below and mail to the address at the bottom of the page.

There is no charge for the one Flight Manual assigned to the aircraft and you will receive all changes to the assigned manual at no charge. There is, however, a yearly subscription charge for all Flight Manuals not assigned to the aircraft.

AIRCRAFT SERIAL NUMBER  

MAILING ADDRESS FOR CHANGES:


MAIL THIS SHEET TO:

Learjet Inc.
P.O. Box 7707
Wichita, Kansas 67277-7707

Attn: Document Control MS 71
## AIRCRAFT CONFIGURATION

Assigned to Aircraft Serial Number ____________

This list is intended to assist the flight crew in determining whether configuration changes have been made which affect the use of AFM procedures. Only those configurations which are referenced in the AFM need be listed here. It is the responsibility of the aircraft owner and operator to maintain this list. Insert this list behind the AFM title page.

<table>
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**OTHER ITEMS:**

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*Continued*
**LOG OF TEMPORARY FLIGHT MANUAL CHANGES**

This list is intended to assist the flight crew in determining the applicable AFM temporary flight manual changes for Learjet 45 aircraft. It is the responsibility of the aircraft owner and operator to maintain their basic AFM with the temporary changes applicable to their aircraft. Insert this list after the AIRCRAFT CONFIGURATION page.

<table>
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<td>2003-04 3-11-2003</td>
<td>1-10</td>
<td>Adds operational limitations for precision approaches. <em>(Aircraft 45-002 thru 45-235 only)</em></td>
<td>Active until SB 45-34-11 is accomplished.</td>
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List of Effective Pages

Use this List of Effective Pages to determine the current status of the Airplane Flight Manual. Pages affected by the current change are indicated by an asterisk (*) immediately preceding the page number.

Dates of issue for Original and Changed pages are:

<table>
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<tr>
<td>Reissued ............ 5-1-1998</td>
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The pages in this manual and this list show the aircraft applicability of the pages. Only the pages applicable to the aircraft assigned to this Flight Manual must be retained. Pages not applicable to the aircraft may be removed from the Flight Manual.

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**Abnormal Procedures**

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THIS AIRPLANE FLIGHT MANUAL MUST BE CARRIED IN THE AIRCRAFT AT ALL TIMES.

THE MANUAL

The manual consists of this introduction and the following basic sections:

Section I — LIMITATIONS containing FAA approved operating limitations which must be observed, except where a deviation is specifically authorized, during operation of the aircraft.

Section II — NORMAL PROCEDURES containing FAA approved operating procedures for the aircraft and its systems which may be considered routine in day-to-day operations.

Section III — EMERGENCY PROCEDURES containing FAA approved operating procedures requiring the use of special systems and/or regular systems in order to protect the occupants and the aircraft from harm during a critical condition requiring immediate response. Steps of procedures emphasized by enclosure in a box such as this and boldfaced should be accomplished without the aid of the checklist (memorized). Data that is enclosed in a box but not boldface need not be memorized.

Section IV — ABNORMAL PROCEDURES containing FAA approved operating procedures requiring the use of special systems and/or alternate use of regular systems which, if followed, will maintain an acceptable level of airworthiness or reduce operational risk resulting from a failure condition.

Section V — PERFORMANCE containing FAA approved data defining the aircraft performance under standard performance conditions. CONTAMINATED RUNWAY DATA assists the operator when operating on a contaminated runway. Refer to FLIGHT MANUAL PERFORMANCE DATA in this Introduction.
Introduction

Section VI — WEIGHT AND BALANCE DATA containing FAA approved data intended to assist the operator in ensuring that the aircraft is properly loaded.

Section VII — SUPPLEMENTS & APPENDICES containing Approved Airplane Flight Manual Supplements and Appendices. Supplements contain operating limitations, procedures, and performance data and other necessary data for aircraft conducting special operations and/or equipped with specific equipment requiring the supplement. Appendices contain ancillary information which may or may not be required for the operation of the aircraft.

Section VIII — ADDENDA contains servicing and operational data intended to assist the operator in routine service and operation.

Section I through Section VI is composed of material approved by the Federal Aviation Administration and together with the FAA Approved Airplane Flight Manual Supplements and Appendices in Section VII constitute the FAA Approved Airplane Flight Manual. Section VIII (Addenda) is not FAA approved material but is included in this manual for the operator’s convenience.

- A weight and balance data package, which is not FAA Approved, is provided by the manufacturer at time of initial aircraft delivery. This package provides data specific to one aircraft and although not FAA Approved, may be kept with this manual for operator’s convenience.

- Section VIII (Addenda) contains addendum, each of which covers a separate subject.

REVISING THE MANUAL

The data presented in this manual is the result of extensive flight tests and has been approved by the Federal Aviation Administration. However, development does not stop with the issuance of this manual and as new procedures are developed they will be forwarded to the holder of this manual. Revised material will be in the form of Temporary Flight Manual Changes or Numbered Changes. It is the responsibility of the operator to ensure that the Flight Manual is current at all times. Therefore, it is very important that changes (temporary or numbered) be incorporated in the manual as soon as they are received.
TEMPORARY FLIGHT MANUAL CHANGES

Temporary Flight Manual Changes may be issued against the Flight Manual when required. These changes generally contain material that is not so extensive as to require a Numbered Change and allow Learjet, Inc. to transmit revised data to the operator faster than with the Numbered Change system. Temporary Flight Manual Changes are printed on yellow paper and include all necessary information (Publication Affected, Description of Change, and Filing Instructions) on the change itself. Temporary Flight Manual Changes are to be retained in the Flight Manual until removed by some other authority — usually a superseding Temporary Change or a Numbered Change.

NUMBERED CHANGES

Numbered Changes issued against the Flight Manual differ from Temporary Flight Manual Changes in that the pages contained in the Numbered Change supersede like pages in the Flight Manual. Each page in a Numbered Change has a “Change” number located at the lower corner of the page immediately below the FAA APPROVED date. Portions of the text affected by the change are indicated by a vertical bar at the outer margin of the page. The vertical bars may not appear on pages that contain changes to graphs or tables. Additionally, when a “changed” page is the result of a rearrangement of material due to a change on a previous page no vertical bar will appear.

The List of Effective Pages provides the user with a guide to establish the current effective date of each page in the Flight Manual and an instruction sheet for incorporating the latest Numbered Change into the Flight Manual. Information included in the List of Effective Pages states the current Change Number for each page, the dates of Original issue and Numbered Changes, the airplane effectivity of performance figures, and the Temporary Flight Manual Changes the current Numbered Change supersedes. An asterisk (*) next to a page number indicates pages changed, added, or deleted by the current change.

NOTE

Numbered Changes do not automatically supersede all outstanding Temporary Flight Manual Changes. Follow instructions given in “Note” on List of Effective Pages to determine which Temporary Flight Manual Changes to remove when incorporating a Numbered Change.
FLIGHT MANUAL PERFORMANCE DATA

The performance data in Section V of this manual provides performance data for all aircraft with the same model designation rather than performance data for a specific serial number aircraft. Therefore, due to serial number changes or the incorporation of Service Bulletins, performance charts may be issued against this Flight Manual which are not applicable to the specific aircraft assigned to the Flight Manual. Charts not effective for a particular aircraft may be removed from the Flight Manual for that aircraft and need not be retained. The airplane effectivity of each chart is listed on the page containing the chart and in the List of Effective Pages.

To assure that all charts required for your particular aircraft are retained, use special care and cross-check aircraft effectivities when removing charts or incorporating numbered changes.

Use the following flow charts to determine effectivity codes for Section V pages.

Aircraft 45-170 thru 45-2000

Effectivity Code: SB 45-72-1

- YES: F
- NO

Effectivity Code: SB 45-11-4

- YES: E
- NO

Aircraft Effectivity:

- Aircraft 45-170 thru 45-2000 modified by SB 45-72-1.
- Aircraft 45-170 thru 45-2000 modified by SB 45-11-4 but not modified by SB 45-72-1.
- Aircraft 45-170 thru 45-2000 not modified by SB 45-11-4 or SB 45-72-1.
Aircraft 45-002 thru 45-169

Effectivity Code  Aircraft Effectivity

SB 45-72-1  YES  \[\text{F}\]

Aircraft 45-002 thru 45-169 modified by SB 45-72-1.

SB 45-11-4  YES  \[\text{E}\]

Aircraft 45-002 thru 45-169 modified by SB 45-11-4 but \textit{not} modified by SB 45-72-1.

SB 45-22-4  YES  \[\text{D}\]

Aircraft 45-002 thru 45-169 modified by SB 45-22-4 but \textit{not} modified by SB 45-11-4 or SB 45-72-1.

SB 45-76-2  YES  \[\text{C}\]

Aircraft 45-002 thru 45-169 modified by SB 45-76-2 but \textit{not} modified by SB 45-22-4.

NO

B

Aircraft 45-002 thru 45-169 \textit{not} modified by SB 45-76-2.
NOTES, CAUTIONS, AND WARNINGS

Notes, Cautions, and Warnings are used throughout this manual to focus attention on special conditions or procedures as follows:

**NOTE**

Notes are used to highlight specific operating conditions or steps of a procedure.

**CAUTION**

Cautions are used to call attention to operating procedures which, if not strictly observed, may result in damage to equipment.

**WARNING**

Warnings are used to call attention to operating procedures which, if not strictly adhered to, may result in personal injury or loss of life.
**MANUAL CONVENTIONS**

EICAS (Engine Indicating/Crew Alerting System)

EICAS indications will be presented by all capital letters within their appropriate display fields. The following table lists samples of EICAS text and illustrates terms used in this manual:

<table>
<thead>
<tr>
<th>Sample Text</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>EICAS — Select HYD or SUMRY page.</td>
<td>EICAS is an acronym for Engine Indicating/Crew Alerting System. HYD or SUMRY is illuminated on the system page menu (lower display of EICAS) for applicable page selection.</td>
</tr>
<tr>
<td>An APR green EI indicates that the APR has activated.</td>
<td>EI is an acronym for Engine Indicating and will represent illuminated indications within the engine instruments field in the upper left display of EICAS. APR is illuminated green.</td>
</tr>
<tr>
<td>The MAIN HYD QTY LO white CAS indicates that the main hydraulic quantity is low.</td>
<td>CAS is an acronym for Crew Alerting System and will represent illuminated indications within the CAS window in the upper right display of EICAS. MAIN HYD QTY LO is illuminated white.</td>
</tr>
</tbody>
</table>

---

![EICAS Display](image)

---

**FM-126**  
FAA Approved 5-19-2004
SWITCH INDICATIONS

Normal switch condition will be assumed not illuminated on the “quiet-dark-normal” instrument panel and pedestal. “Quiet-dark-normal” is defined as day, VMC normal system operation in cruise flight. Switch legends will be presented in all capital letters (e.g. PACK Switch). Illuminated switch indications will be also be noted in all capital letters (e.g. PACK Switch — OFF). Switch conditions that are not illuminated will be lead capped (e.g. PACK Switch — On), unless they are part of a longer description. The following table lists samples of text and definitions used in this manual:

<table>
<thead>
<tr>
<th>Sample Text</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUX HYD Switch — ON.</td>
<td>The switch labeled AUX HYD is illuminated ON.</td>
</tr>
<tr>
<td>L or R STBY Switch — Off.</td>
<td>The applicable switch labeled L STBY or R STBY is not illuminated and switch condition is off.</td>
</tr>
</tbody>
</table>

VOICE AND CWP (CREW WARNING PANEL) ANNUNCIATIONS

Voice annunciations will be presented by all capital letters and within quotes. CWP annunciations will be presented by all capital letters and are usually accompanied by a CAS. The following table lists samples of EICAS text and illustrates terms used in this manual:

<table>
<thead>
<tr>
<th>Sample Text</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>“GEAR” Voice.</td>
<td>A “GEAR” voice message will sound.</td>
</tr>
<tr>
<td>GEAR red CAS and CWP.</td>
<td>CWP is an acronym for Crew Warning Panel and will represent illuminated indications of the annunciator panel located in the center of the instrument panel. The GEAR warning light and CAS are illuminated red.</td>
</tr>
</tbody>
</table>
Symbols and “If” Statements

Certain procedures are dependent on prescribed conditions. These conditions are presented in bold as independent “If” statements. “If” statements preceded by a symbol (e.g., ●, ■ or ▲) indicate more than one condition for that step. Other conditions for that step will be indicated by repeating that step and symbol.

The following example shows two options for step 2. and two options for substep c. Procedures completed at any substep level will be noted. (e.g. This checklist is complete.) Procedures not completed at a substep level will direct the user to the next applicable step. (e.g. Go to step 3.) The last procedure of any substep will either state “This checklist is complete.” or “Go to step #.”, or refer the user to another appropriate procedure.

<table>
<thead>
<tr>
<th>Sample Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Airspeed — Reduce to Mach trim off MMO or below.</td>
</tr>
<tr>
<td>2. ●If control force continues with the Control Wheel Master Switch (MSW) depressed:</td>
</tr>
<tr>
<td>a. Malfunctioning PRI PITCH or SEC PITCH Circuit Breaker (respective pilot’s or copilot’s FLIGHT group [TRIM]) — Pull.</td>
</tr>
<tr>
<td>b. Control Wheel Master Switch (MSW) — Release.</td>
</tr>
<tr>
<td>c. ■If the malfunction occurred in the Primary trim:</td>
</tr>
<tr>
<td>(1) PITCH TRIM Switch (pedestal) — SEC. (SEC TRIM white CAS)</td>
</tr>
<tr>
<td>(2) SEC Switch (pedestal [PITCH TRIM]) — As required.</td>
</tr>
<tr>
<td>(3) Go to step.</td>
</tr>
<tr>
<td>c. ■If the malfunction occurred in the Secondary trim:</td>
</tr>
<tr>
<td>(1) PITCH TRIM Switch (pedestal) — PRI.</td>
</tr>
<tr>
<td>(2) Control Wheel Master Switch (MSW) — As required.</td>
</tr>
<tr>
<td>(3) Refer to SEC TRIM FAIL procedure, Section IV.</td>
</tr>
<tr>
<td>2. ●If control force relieves with MSW depressed:</td>
</tr>
<tr>
<td>a. AFCS SERVOS Circuit Breaker (pilot’s FLIGHT group) — Pull.</td>
</tr>
<tr>
<td>b. Control Wheel Trim Switch — As required.</td>
</tr>
<tr>
<td>c. Refer to AP procedure, Section IV.</td>
</tr>
<tr>
<td>3. Maintain 41,000 feet.</td>
</tr>
</tbody>
</table>
Introduction

CIRCUIT BREAKERS

Many procedures involve manipulating circuit breakers. The following criteria should be followed during “Circuit Breaker” steps.

- Circuit breakers that are “Set” should be checked for that normal condition. If the circuit breaker is not “Set”, it may be reset only once. If the circuit breaker opens again, do not reset.
- Circuit breakers that “Pull” should only be pulled and not reset.
- Circuit breakers that “Pull and Reset” should be pulled, delay for several seconds, and reset only once.

Allow sufficient cooling time for circuit breakers that are “Reset” or cycled through a “Pull and Reset.”

OTHER PUBLICATIONS

The following is a list of Learjet publications referenced in this Airplane Flight Manual. Such references in this manual are made by number and do not contain any revision indication. However, such references are to be understood as “the latest revision”.

ENGINEERING CHANGE RECORDS (ECR)

None.

SERVICE BULLETINS (SB)

This issue of the flight manual is effective for aircraft 45-072 & subsequent and prior aircraft modified by SB 45-00-1 (i.e., Performance Enhancement Package). Since all aircraft of this model have been upgraded to this configuration, references to earlier configurations have been removed. The performance enhancement package embodies the following service bulletins. These service bulletins are no longer referenced within this flight manual:

SB 45-00-1 — Installation of Performance Enhancement Package.
SB 45-22-1 — Honeywell Phase II/IIA Software Upgrade.
SB 45-22-3 — Replacement of Autopilot Yaw Servo.
SB 45-32-3 — Nose Wheel Steering Upgrade.
SB 45-74-1 — Conversion of AlliedSignal Engine Configuration.
SB 45-76-1 — DEEC Software Upgrade (1005).
SB 45-78-1 — Activation of Thrust Reversers.
SB 45-78-2 — Replacement of Thrust Reverser Hydraulic Control Valve.
The following service bulletins are referenced within this flight manual:

- SB 45-11-1 — Removal of Anti-Icing Additive Requirement from Placards.
- SB 45-11-4 — Increase Maximum Takeoff Weight to 21,500 Pounds.
- SB 45-22-4 — Honeywell Phase III Software Upgrade.
- SB 45-22-5 — Honeywell Phase IV Software Upgrade.
- SB 45-23-1 — Reroute Bus Circuit for No. 2 Audio Panel.
- SB 45-26-1 — Replacement of Engine Fire Bottles.
- SB 45-28-5 — Fuel Quantity Indication System Improvement.
- SB 45-34-2 — Activation of Primary ADF.
- SB 45-34-4 — Installation of Honeywell Integrated NAV Units.
- SB 45-35-1 — Extended Duration of Oxygen System.
- SB 45-55-6 — Modification of the Rudder and Rudder Trim Tab Assembly Trailing Edge.
- SB 45-72-1 — TFE731-20BR-1B Engine Upgrade.
- SB 45-76-2 — Thrust Reverser Max Thrust Credit.

CUSTOMIZING THE MANUAL FOR U.S. OR METRIC UNITS

This manual may be customized so that data is presented in terms of U.S. units or metric units. This manual is supplied with both sets of pages (U.S. and metric).

Usually if the airplane fuel quantity indicating system is configured to display pounds, this manual would be customized to retain the U.S. units presentation while discarding the metric units. If the airplane fuel quantity indicating system is configured to display kilograms, this manual would be customized to retain the metric units presentation while discarding the U.S. units.
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GENERAL

TYPE OF OPERATION

This airplane is certificated in accordance with FAR 25 in the transport category and is eligible for the following kinds of operations when the appropriate instruments and equipment required by the airworthiness and operating requirements are installed and approved and are in operable condition.

This airplane is approved for:
- VFR (Visual)
- IFR (Instrument)
- Day
- Night
- Icing

Icing conditions exist when outside air temperature (OAT) on the ground and for takeoff is 10°C (50°F) or below, or the static air temperature (SAT) in flight is 10°C (50°F) to -40°C (-40°F), and visible moisture in any form is present (such as clouds, fog with visibility of one mile or less, rain, snow, sleet, or ice crystals).

Icing conditions also exist when the OAT on the ground and for takeoff is 10°C (50°F) or below when operating on ramps, taxiways, or runways where surface snow, ice, standing water, or slush may be ingested by the engines, or freeze on engines, nacelles, or engine sensor probes.

This airplane is not certificated for ditching under FAR 25.801.

PERFORMANCE CONFIGURATION

The airplane configuration must be as presented under Standard Performance Conditions in Section V.

MINIMUM FLIGHT CREW

The minimum flight crew shall consist of pilot and copilot.

WEIGHT AND C.G. LIMITS

On aircraft 45-002 & subsequent not modified by SB 45-11-4:

MAXIMUM RAMP WEIGHT..................................................20,750 Pounds 9412 kg

MAXIMUM CERTIFIED TAKEOFF WEIGHT................................20,500 Pounds 9299 kg

On aircraft 45-002 & subsequent modified by SB 45-11-4:

MAXIMUM RAMP WEIGHT..................................................21,750 Pounds 9865 kg

MAXIMUM CERTIFIED TAKEOFF WEIGHT................................21,500 Pounds 9752 kg
WEIGHT AND C.G. LIMITS (Cont)

MINIMUM FLIGHT WEIGHT .................................................. 14,000 Pounds 6350 kg

MAXIMUM ZERO FUEL WEIGHT ................................. 16,000 Pounds 7258 kg

NOTE All weights in excess of Maximum Zero Fuel Weight must consist of fuel.

MAXIMUM ALLOWABLE TAKEOFF WEIGHT

The takeoff weight is limited by the most restrictive of the following requirements:
- Maximum Certified Takeoff Weight.
- Maximum Takeoff Weight (Climb or Brake Energy Limited) for altitude and temperature as determined from the applicable figure entitled TAKEOFF WEIGHT LIMITS, Section V.
- Maximum Takeoff Weight for the runway and ambient conditions as determined from the applicable figure entitled TAKEOFF DISTANCE, Section V.

MAXIMUM CERTIFIED LANDING WEIGHT ....................... 19,200 Pounds 8709 kg

MAXIMUM ALLOWABLE LANDING WEIGHT

The landing weight is limited by the most restrictive of the following requirements:
- Maximum Certified Landing Weight.
- Maximum Landing Weight for the runway and ambient conditions as determined from the applicable figure entitled ACTUAL LANDING DISTANCE, Section V.
- Maximum Landing Weight (Approach Climb or Brake Energy Limited) for altitude and temperature as determined from the applicable figure entitled LANDING WEIGHT LIMITS, Section V.

NOTE Perform High Energy Stop Inspection (Chapter 5, Learjet 45 Maintenance Manual) if the maximum brake energy weight for landing is exceeded during a landing or rejected takeoff.

CENTER-OF-GRAVITY

The center-of-gravity of the airplane for all flight conditions must be maintained within the applicable figure entitled CENTER-OF-GRAVITY ENVELOPE, this section.
CENTER-OF-GRAVITY ENVELOPE

Effectivity
Aircraft 45-002 & Subsequent
modified by SB 45-11-4

Figure 1-1.3

- Max Ramp Weight
  - 21,750 lb (9865 kg)
- Max Takeoff Weight
  - 21,500 lb (9752 kg)
- Max Landing Weight
  - 19,200 lb (8709 kg)
- Max Takeoff Weight
  - 21,500 lb (9752 kg)
- Max Zero Fuel Weight
  - 16,000 lb (7258 kg)
- Min Flight Weight
  - 14,000 lb (6350 kg)
- 1.0% MAC
  - F.S. 414.64 in. 10,532 mm
- 7.0% MAC
  - F.S. 419.87 in. 10,665 mm
- 25.3% MAC
  - F.S. 435.84 in. 11,070 mm

- 26.2% MAC
  - F.S. 436.62 in. 11,090 mm
- 19.5% MAC
  - F.S. 430.77 in. 10,942 mm
- 18.7% MAC
  - F.S. 430.08 in. 10,924 mm
- 25.3% MAC
  - F.S. 435.84 in. 11,070 mm

- 26.2% MAC
  - F.S. 436.62 in. 11,090 mm
- 28.0% MAC
  - F.S. 438.19 in. 11,130 mm

- 25.0% MAC
  - F.S. 435.57 in. 11,063 mm

LIMITATIONS

FM-126 1-3.3
FAA Approved 5-19-2004
Limitations

AIRSPEED/MACH LIMITS
PRIMARY PITOT-STATIC SYSTEM
EFFECTIVITY
Aircraft 45-002 & Subsequent
modified by SB 45-11-4

Figure 1-2.3

1-4.3

FM-126
FAA Approved 5-19-2004
AIRSPEED/MACH LIMITS

MAXIMUM OPERATING SPEED $V_{MO}/M_{MO}$

Primary Display

$V_{MO}$ ................................................................. 330 KIAS

$M_{MO}$
- with Mach trim operative ........................................ 0.81 Mi
- with Mach trim inoperative and Autopilot engaged .......... 0.81 Mi
- with Mach trim inoperative and Autopilot disengaged
  - 23,400 to 42,000 feet .............................................. 0.76-0.78 Mi
  - Above 42,000 feet .................................................. 0.78 Mi

Standby Instruments

$V_{MO}$ ................................................................. 325 KIAS

$M_{MO}$ ................................................................. 0.75 Mi

MANEUVERING SPEED $V_{A}$

$V_{A}$ is the highest speed that full aileron and rudder control can be applied without overstressing the aircraft, or the speed at which the aircraft will stall with a load factor of 2.9 g's at maximum gross weight, whichever is less.

Refer to applicable figure entitled AIRSPEED/MACH LIMITS, this section, for $V_{A}$.

MAXIMUM LANDING GEAR OPERATING SPEED $V_{LO}$ .......... 200 KIAS

MAXIMUM LANDING GEAR EXTENDED SPEED $V_{LE}$ ............ 260 KIAS

MAXIMUM FLAP EXTENDED SPEED $V_{FE}$

- Flaps 8° ................................................................. 250 KIAS
- Flaps 20° ............................................................... 200 KIAS
- Flaps 40° ............................................................... 150 KIAS
AIRSPEED/ MACH LIMITS (Cont)

MINIMUM CONTROL SPEED AIR VMCA

VMCA is a function of altitude and temperature. During flight tests, the aircraft was controllable down to stall speed. The speed shown is the minimum demonstrated speed corrected for maximum thrust effect with rudder boost on or off.

VMCA
- Flaps 8° ................................................................. 103 KIAS
- Flaps 20° ................................................................. 101 KIAS

MINIMUM CONTROL SPEED GROUND VMCG

VMCG is a function of altitude and temperature. The speed shown is a maximum, which occurs at maximum thrust conditions.

VMCG
- Rudder Boost On, APR On ...................................... 102 KIAS
- Rudder Boost On, APR Off ...................................... 100 KIAS
- Rudder Boost Off, APR On ....................................... 123 KIAS
- Rudder Boost Off, APR Off ....................................... 125 KIAS

MINIMUM CONTROL SPEED LANDING VMCL

VMCL is a function of altitude and temperature. The speed shown is a maximum, which occurs at maximum thrust conditions.

VMCL
- Flaps 8° ................................................................. 105 KIAS
- Flaps 40° ................................................................. 98 KIAS

TAKEOFF DECISION SPEED V1

Refer to applicable figure entitled TAKEOFF SPEEDS, Section V.

ROTATION SPEED VR

Refer to applicable figure entitled TAKEOFF SPEEDS, Section V.

TAKEOFF SAFETY SPEED V2

Refer to applicable figure entitled TAKEOFF SPEEDS, Section V.
OPERATIONAL LIMITS/REQUIREMENTS

TAKEOFF

Maximum Pressure Altitude: 14,000 feet
Ambient Temperature: Refer to Figure 1-3 and Section V
Tailwind Component:
- Aircraft **not modified by SB 45-72-1**: 10 knots
- Aircraft **modified by SB 45-72-1**:
  - 12,000 feet and below: 10 knots
  - Above 12,000 feet: 0 knots

Runway Conditions:
- Takeoff is limited to paved runways.
- Runway water: 3/4 inch (19 mm)
- HI FLOW: OFF
- Fuel Load: Wings balanced within 200 pounds (91 kg)
- EICAS: SUMRY or FLT PAGE
- Rudder Boost: On

EN ROUTE

Maximum Pressure Altitude: 51,000 feet
Ambient Temperature: Refer to Figure 1-3
Fuel Load: Wings balanced within 500 pounds (227 kg)

LANDING

Maximum Pressure Altitude: 14,000 feet
Ambient Temperature: Refer to Figure 1-3 and Section V
Tailwind Component: 10 knots

Runway Conditions:
- Landing is limited to paved runways.
- Runway water: 3/4 inch (19 mm)
- Pressurization: Cabin not pressurized
- Fuel Load: Wings balanced within 200 pounds (91 kg)
- EICAS: SUMRY or FLT PAGE
OPERATIONAL LIMITS/REQUIREMENTS (Cont)

LIMIT MANEUVERING LOAD FACTORS

- Flaps Up ................................................................. +2.9 g to -1.0 g
- Flaps Down .................................................................. +2.0 g to 0.0 g

These acceleration values limit the bank angle in a level coordinated turn to 70° (flaps up) and 60° (flaps down).

BCAS or MFD
SUMRY or FLT page must be selected for takeoff and landing.

FLAPS
Do not extend flaps above 18,000 feet.

GEAR
Do not extend gear above 18,000 feet.

MANEUVERS
No aerobatic maneuvers, including spins, are approved.
Intentional stalls are prohibited above 18,000 feet.

SEAT BELTS AND SHOULDER HARNESS
Seat belts must be worn by all occupants during takeoff and landing.
When a seat is equipped with a shoulder harness, it must be worn by the occupant during takeoff and landing.

The lavatory seat is certified for takeoff and landing using the seat belt only. This seat is not equipped with a shoulder harness.
GROUND OPERATING TEMPERATURE

If the aircraft is cold soaked on the ground for an extended period of time at an ambient temperature colder than -23°C, the aircraft and its components must be warmed to -23°C or above prior to start.

The cabin temperature must be -15°C (+5°F) or warmer prior to takeoff.
LIMITATIONS

AUTOMATIC DIRECTION FINDER (ADF)
(Aircraft 45-006 thru 45-011 not modified by SB 45-34-2)

Do not use the ADF as the sole source for navigation or as a navigation fix. NDB approaches are not approved.

AIR DATA SYSTEM

Air data systems (ADC 1 and 2) must be selected normal (NORM) for takeoff.

To assure proper air data system operation, the ADC Check of the Before Starting Engines procedure must be accomplished in accordance with Section II, this manual.

Reduced Vertical Separation Minimums (RVSM) — This aircraft has been shown to meet the airworthiness requirements for operation in Reduced Vertical Separation Minimum (RVSM) airspace between 29,000 and 41,000 feet inclusive. This does not constitute an operational approval.

ATTITUDE HEADING REFERENCE SYSTEM (AHRS)

Attitude heading reference systems (AHRS 1 and AHRS 2) must be selected normal (NORM) for takeoff.

AUTOPILOT/FLIGHT DIRECTOR

Autopilot must be off for takeoff and landing.

Do not intentionally overpower the autopilot.

Autopilot Minimum Use Height:

Climb, En Route or Descent...........................................................500 feet AGL
Approach..........................................................................................200 feet AGL

Autopilot & Flight director are approved for Category I approaches.
TEMPOARY FLIGHT MANUAL CHANGE

Publication Affected: Learjet Model 45 AFM (FM-126)
Description of Change: Adds operational limitations for precision approaches.
Filing Instructions: Insert this temporary change in the affected AFM adjacent to page 1-10, and retain until further notice.

Erroneous glide slope indications have occurred during ILS approaches. The anomaly only occurs approaching the outer marker. The glide slope stabilizes as the signal strengthens just inside the outer marker.

Add the following limitations to the PRIMUS 1000 INTEGRATED AVIONICS SYSTEM:

Precision approaches are allowed while adhering to the following:

1. When crossing the Outer Marker on glide slope, the altitude must be verified with the value on the published procedure.

2. For aircraft with two operating glide slope receivers, the aircraft may be flown to the published minimums for the approach using normal procedures if both receivers are tuned to the approach and both crew members are monitoring the approach using independent data and displays.

3. For aircraft with single operating glide slope receiver, the approach may be flown using normal procedures no lower than Localizer Only Minimum Descent Altitude (MDA).

FAA APPROVED \\

for RONALD K. RATHGEBER, MANAGER 
AIRCRAFT CERTIFICATION OFFICE 
FEDERAL AVIATION ADMINISTRATION 
WICHITA, KANSAS 

DATE 3/11/03
SYSTEM LIMITS (Cont)

PRESSURIZATION

Delta P ........................................................................+9.9 psid to -0.5 psid

Do not land with the cabin pressurized.

ENVIRONMENTAL CONTROL SYSTEM

HI FLOW must be off with takeoff power selected, or for landing, anti-ice operations, and flight above 30,000 ft.

PRIMUS 1000 INTEGRATED AVIONICS SYSTEM

The appropriate Honeywell PRIMUS 1000 Integrated Avionics System for the Learjet Model 45/40 Pilot’s Manual must be immediately available to the flight crew. The following table lists the approved manuals:

<table>
<thead>
<tr>
<th>EFFECTIVITY</th>
<th>APPROVED MANUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft 45-002 thru 45-235</td>
<td>Pub. No. A28-1146-106-02 (dated October 2000 or appropriate later revision)</td>
</tr>
<tr>
<td>Aircraft 45-236 &amp; subsequent and prior aircraft modified by SB 45-22-5</td>
<td>Pub. No. A28-1146-165-XX (dated March 2003 or appropriate later revision)</td>
</tr>
</tbody>
</table>

ENGINE SYNCHRONIZER

ENG SYNC must be OFF for takeoff, landing, and single-engine operation.

EXTERNAL POWER

The maximum amperage from an external power source must be limited to 1500 amps.

GENERATOR LIMITS

Generator output is limited as follows:

Ground or Flight Operations

- **Continuous** — 300 amps.

  **NOTE** If more electrical load is applied than can be supplied by the generators, the current will be drawn from the aircraft batteries and will not be shown on the DC amps display. If this occurs, DC voltage will be reduced.

- **Transient** — Higher transient loads for cross-starts and battery charging are authorized.
LIMITATIONS

SYSTEM LIMITS (Cont)

OXYGEN SYSTEM

The following aircraft certification requirements are in addition to the requirements of applicable operating rules. The most restrictive requirements (certification or operating) must be observed.

NOTE

Hats and “ear-muff” type headsets must be removed prior to donning crew oxygen masks.

Crew and passenger oxygen masks are not approved for use above 40,000 feet cabin altitude. Prolonged operation of passenger masks above 25,000 feet cabin altitude is not recommended.

WARNING

Passenger masks are intended for use during an emergency descent to an altitude not requiring supplemental oxygen.

RUDDER BOOST

Rudder boost must be on for takeoff.

On aircraft 45-002 thru 45-169 not modified by SB 45-22-4, rudder boost must be OFF when the yaw damper is on.

SPOILERS/AUTOSPOILERS/SPILERONS

Spoilers:

Do not extend spoilers with flaps extended while airborne, except as specified in EMERGENCY and/or ABNORMAL PROCEDURES in Section III and Section IV, this manual.

Autospoilers:

Autospoilers must be armed for takeoff and landing, except, do not arm autospoilers for training maneuvers where engine failure will be simulated above V1 speed or for touch-and-go landings.

STARTER

The following cooling periods must be observed between consecutive uses of the starter:

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<th>After Start Attempt</th>
<th>Wait</th>
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</thead>
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<tr>
<td>1</td>
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<td>2</td>
<td>2 minutes</td>
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<tr>
<td>3</td>
<td>30 minutes</td>
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</tbody>
</table>
Limitations

SYSTEM LIMITS (Cont)

THRUST REVERSERS (IF ACTIVATED)

Thrust reverser system use is limited to ground operations on paved surfaces and attempts to deploy shall not be made in flight.

Thrust reversers must not be used to back up the aircraft.

Thrust reverser circuit breakers must not be intentionally pulled while in flight, except as specified in EMERGENCY and/or ABNORMAL PROCEDURES in Section III and Section IV of this manual.

Thrust reversers must not be used for touch-and-go landings.

On aircraft not modified by SB 45-76-2, thrust reversers are limited to idle deployment only.

**WARNING**

Use of reverse thrust above idle in any normal, emergency or abnormal procedure may result in a significant reduction in directional control.

On aircraft modified by SB 45-76-2, maximum reverse thrust is usable at speeds down to 40 KIAS.

Thrust reversers must be limited to idle reverse when the engines are operating in MANual mode.

TIRES

Tire Limiting Speed (Ground Speed)...........................................165 knots

**NOTE**

The takeoff and landing speeds presented in this manual will not exceed this limit.

YAW DAMPER

On aircraft 45-002 thru 45-169 not modified by SB 45-22-4, rudder boost must be off prior to engaging yaw damper.

On aircraft 45-002 thru 45-225 not modified by SB 45-55-6, the yaw damper must be engaged for all flight operations except takeoff and landing.

On aircraft 45-226 & subsequent and prior aircraft modified by SB 45-55-6, yaw damper use is not required.
Limitations

POWERPLANT LIMITS

ENGINE TYPE

On aircraft 45-002 & subsequent not modified by SB 45-72-1, Honeywell TFE731-20R-1B or TFE731-20AR-1B turbofan propulsion engines.

On aircraft 45-002 & subsequent modified by SB 45-72-1, Honeywell TFE731-20BR-1B turbofan propulsion engines.

ENGINE COMPUTER

The engines must be operated at all times with the ENG CMPTR switches in the ON position, except as specified in NORMAL, EMERGENCY and ABNORMAL PROCEDURES in Sections II, III and IV, this manual.
### Limitations

**POWERPLANT LIMITS (Cont)**

**ENGINE OPERATING LIMITS**

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<td>MCR ④</td>
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<td></td>
<td>Starting</td>
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</table>

① Maximum oil pressure may be exceeded for cold temperature starts for short durations.
② Engine preheat is recommended at temperatures below -28°C.
③ Allow oil temperature to increase to 30°C prior to increasing thrust above idle. If cold ambient conditions prevent oil temperature from obtaining 30°C, idle thrust may be exceeded as required.
④ If altitude is greater than 30,000 feet: Oil Temperature — 140°C.
If altitude is 30,000 feet or less: Oil Temperature — 127°C.
⑤ Manual Mode or RMU — 917°C (amber), Limit — 942°C (red).
⑥ The thrust setting tables, in Section V, may be more limiting than the values listed here.

Figure 1-4.4
LIMITATIONS

1-16 FM-126
FAA Approved 5-19-2004

ENGINE TRANSIENT SPEED LIMITS

N1 LIMITS

Reduce applicable N1 or N2 below limit. Record maximum N1 or N2, and time above limit in engine log book. Refer to Honeywell Engine Light Maintenance Manual for control check and performance calibration.

N2 LIMITS

Reduce applicable N1 or N2 below limit. Record maximum N1 or N2, and time above limit in engine log book. Refer to Honeywell Engine Light Maintenance Manual for overspeed inspection.

N2 may operate for 5 minutes in APR.

NOTE: On aircraft 45-002 & subsequent modified by 45-72-1, there may be a momentary N1 red EI illumination which is allowable.

Figure 1-5
Abort start. Record maximum ITT and time in excess of 991°C in engine log book. Determine cause and correct prior to next start.


Figure 1-6.4
Limitations

ENGINE TEMPERATURE LIMITS (ITT) (Cont)
EXCEPT STARTING

**EFFECTIVITY**
Aircraft 45-002 & Subsequent
modified by SB 45-72-1


*Figure 1-7.4*

1-18.4
FAA Approved 5-19-2004
FUEL LIMITS

FUEL LOAD/BALANCE

Do not takeoff or land with wing fuel imbalance greater than 200 pounds (91 kg).

During flight, wing fuel balance must be maintained within 500 pounds (227 kg).

APPROVED FUELS

The mixing of fuel types is allowed.


FUEL ADDITIVES

ANTI-ICING ADDITIVE

On aircraft 45-002 thru 45-064, not modified by SB 45-11-1:
Anti-icing additive conforming to MIL-I-27686 or MIL-I-85470 is a requirement.

The aircraft may be single-point pressure refueled with approved pre-mixed fuels.

The following products have been approved for blending MIL-I-27686 additive during refueling (gravity fill method only):

- Hi-Flo Prist 20 fluid ounce aerosol blender.
- Quell 20 fluid ounce aerosol blender.
- D-Ice 20 fluid ounce aerosol blender.

The following products have been approved for blending MIL-I-85470 additive during refueling (gravity fill method only):

- Hi-Flash Prist 20 fluid ounce aerosol blender.
- D-Ice Flash 190, 20 fluid ounce aerosol blender.
ANTI-ICING ADDITIVE (Cont)

The anti-icing additive concentrations by volume are as follows:

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<th>Concentration by Volume Maximum</th>
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<tr>
<td>MIL-I-27686</td>
<td>0.06%</td>
<td>0.15%</td>
</tr>
<tr>
<td>MIL-I-85470</td>
<td>0.10%</td>
<td>0.15%</td>
</tr>
</tbody>
</table>

Use not less than 20 fluid ounces (1 can) of MIL-I-27686 per 260 gallons (984 liters) nor more than 20 fluid ounces per 105 gallons (397 liters) of fuel. Use not less than 20 fluid ounces (1 can) of MIL-I-85470 per 155 gallons (587 liters) nor more than 20 fluid ounces per 105 gallons (397 liters) of fuel.

Refer to Addendum I — FUEL SERVICING for additional information.

BIOCIDE ADDITIVE

Biobor JF is approved for use as a biocide additive when premixed with fuel in the fuel supply facility. Blending of Biobor JF and fuel using the gravity fill method of refueling is not approved. Additive concentration is not to exceed 270 ppm. Refer to Addendum I — FUEL SERVICING for additional information.

FUELING

On aircraft 45-002 thru 45-156 not modified by SB 45-28-2, Single-point pressure refueling is limited to 40 psig (2758 hPa) and defueling is limited to -10 psig (-690 hPa).

On aircraft 45-157 & subsequent and prior aircraft modified by SB 45-28-2, Single-point pressure refueling is limited to 55 psig (3792 hPa) and defueling is limited to -10 psig (-690 hPa).

HYDRAULIC FLUID LIMITS

APPROVED HYDRAULIC FLUIDS

Hydraulic fluids conforming to military specification MIL-H-5606 are approved.
LIMITATIONS

FM-126 1-21
FAA Approved 5-19-2004

AUXILIARY POWER UNIT (APU) LIMITS

The APU is limited to ground operations only, up to field pressure altitudes of 10,000 feet, and must be shut down prior to takeoff.

Operation of the APU during gravity fill refueling is prohibited.

Operation of the APU during fluid de-icing/anti-icing is prohibited.

Do not takeoff with an APU FAIL amber CAS illuminated. In the event the APU automatically shuts down due to an APU failure, a visual inspection of the unit must be conducted prior to flight.

APU STARTER LIMITS

APU GENERATOR LIMITS

- Continuous — 300 amps.

If more electrical load is applied than can be supplied by the APU generator, the current will be drawn from the aircraft batteries and will not be shown on the DC amps display. If this occurs, DC voltage will be reduced.

- Transient — Higher transient loads for cross-starts and battery charging are authorized.

APPROVED FUELS

Fuels approved for the main aircraft engines are also approved for the APU.

APPROVED OILS

Refer to Addendum II — ENGINE OIL SERVICING for a listing of approved oils.
TEMPORARY FLIGHT MANUAL CHANGE

Publication Affected: Learjet Model 45 AFM (FM-126)

Description of Change: This is provided to define specific temporary operating procedures or descriptions for unusual design and operating characteristics.

Filing Instructions: This Temporary Change supersedes and replaces TFM 2001-20. Remove superseded Temporary Change and insert this Temporary Change in the affected AFM adjacent to page II-1, and retain until further notice.

TEMPORARY AIRPLANE FLIGHT MANUAL
NORMAL OPERATING INFORMATION

AUTOPilot

On aircraft 45-002 thru 45-169 not modified by SB 45-22-4:
The autopilot (and/or yaw damper) may disconnect without pilot action. An autopilot disconnect will result in a continuous autopilot disconnect tone and may be accompanied by a red flashing AP annunciation on the PFD. Some monitored autopilot disconnects may have the red flashing AP annunciation on the PFD that clears itself after 5 seconds. The autopilot disconnect tone, however, plays continuously for all monitored autopilot failures. These conditions may be cleared by depressing the Control Wheel Master Switch (MSW) then re-engaging the autopilot / yaw damper.

INSTRUMENT/AVIONICS

On aircraft 45-002 thru 45-071 not modified by SB 45-34-4:
Spurious DME indications may be displayed momentarily when tuned to non-DME VORs or localizers. Disregard this indication.

Continued
FLIGHT MANAGEMENT SYSTEM

Missed approach waypoints and course data are displayed on the map whenever an arrival is selected on the FMS. For some approaches where the missed approach holding fix is also the final approach fix, a holding pattern “HOLD” will be displayed on the map at the final approach fix. The FMS CDU NAV page properly identifies whether the displayed “HOLD” is planned at the final approach fix, or at the end of the missed approach.
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**Introduction to Normal Procedures**

The procedures in this section of the manual have been developed by Learjet Inc. for the certification of this aircraft. This section contains those procedures which may be considered routine in day-to-day operations. The presentation includes, but is not limited to, detailed checklist procedures by flight phase.

When white advisory/status CAS messages appear during normal operations, follow the appropriate Normal Procedures, this section.

**Through-Flight Procedures (Both Engines Shut Down)**

Normal preflight procedures (all checklist line items) must be accomplished prior to takeoff at the original departure point of a flight. At each intermediate stop of flight where both engines are shut down, the Through-Flight Checklist may be used for preflight provided certain criteria are met. In the following procedures (Exterior Preflight, Cabin Preflight and Before Starting Engines), steps marked with this symbol (◆) denote Through-Flight Checklist items. When permitted, accomplishment of all Through-Flight Checklist items fulfills a minimum pre-flight requirement.

The Through-Flight Checklist may be used following an intermediate stop with both engines shut down provided the following criteria have been satisfied during that stop:

- There has been no change in flight crew personnel.
- No maintenance has been performed on the aircraft. Routine line servicing is not considered maintenance.
- No more than three (3) hours have elapsed between engine shutdown and engine start.
- Extreme weather conditions (heavy precipitation, ice, snow, extreme cold, etc.) have not occurred which would change the preflight status of the aircraft.

For intermediate stops with one or no engine shut down, completion of the Quick Turn-Around procedure in this section provides the minimum preflight requirements.
Walk-Around Inspection
Figure 2-1
Normal Procedures

Exterior Preflight (Cont)

During Exterior Preflight, check all vents clear, check access doors for security, and all aircraft surfaces for condition.


3. a. Controls Lock — Remove and stow.
   b. Gear — DN.
   c. L and R BATT Switches — On.
   d. EMER BATT Switch — EMER.
   e. APU MASTER (if installed) — ON.
   g. AUX HYD Switch — ON.
   h. SUMRY Page B-ACUM Pressure — 2610-3600 psi.
   i. AUX HYD Switch — Off.
   j. EMERGENCY/PARKING BRAKE — Set.
   k. SUMRY Page B-ACUM Pressure — 1200 psi or greater.
   l. AUX HYD Switch — ON.
   m. AUX HYD Switch — Off.
   n. If night flight is anticipated, check exterior lighting.
      All Exterior Light Switches — On. Check proper illumination, then all exterior light switches — Off.

12. a. Hydraulic Service Panel — Check FILTER (MAIN or AUX) and RESERVOIR (ADD or OVER) lights not illuminated. Access Panel — Secure.

NOTE

Illumination of the BRUSH light indicates the brushes for the auxiliary hydraulic pump are approaching service limits. Flight may be conducted with BRUSH light illuminated, but maintenance should be performed at the next suitable opportunity.

14. a. APU (if installed) — Open tailcone access door, check oil level (refer to Oil Servicing Addendum).
Normal Procedures

Exterior Preflight (Cont)

3. a. APU MASTER (if installed) — Off.
   b. EMER BATT Switch — OFF.
   c. L and R BATT Switches — OFF.

   b. Nose Gear Strut — Extended a minimum of one-half inch (13 mm).
   c. Nose Wheel Well — Hydraulic leakage, condition, and cooling vents clear.
   d. Nose Compartment Doors, Wheel and Tire — Condition and nose gear uplock forward.
   e. Ground Wire — Disconnected.

5. a. Radome and Radome Erosion Shoe — Condition.

   b. Oxygen System Discharge Indicator and Service Door — Check and secure.
   c. Nose Compartment Doors — Secure.
   d. Wing Inspection Light and Lens — Condition.
   e. Standby Pitot and Static Drains — Push up to drain. Required if moisture is known or suspected.

   b. Upper Fuselage Antennas, and Dorsal Inlets — Condition.
   c. Upper Fuselage, Gravity Fueling Door — Check and secure.
   d. Right Engine Inlet and Fan — Clear of obstructions and condition.

   WARNING:
   - If fan is windmilling, stop by pressing on fan spinner. Do not attempt to stop windmilling by grabbing blades.
   - The engine inlet must be free of frost, snow, and ice.

   e. Right Generator and Alternator Cooling Scoops — Clear.
Normal Procedures

Exterior Preflight (Cont)

g. Oxygen System Service Door (if applicable) — Secure.

h. Fuel Drains and Access Door — Drain and secure.

NOTE

The fuel drains are low points in the fuel system. Fuel will drain from these when opened.

i. Toilet Servicing Door — Secure.

j. Right Main Gear — Check:

(1) Wheel Well — Hydraulic/fuel leakage and condition.

(2) Taxi Light and Doors — Condition.

(3) Wheels, Brakes, and Tires — Condition.

a. Right Wing — Check:

(1) Leading Edge, Stall Strips, Triangles, Vortilons and Ice Detect Patch — Condition.

(2) Access Panels — Fuel/Hydraulic leakage.

WARNING

The wing and flight control surfaces must be free of frost, snow, and ice.

a. Right Winglet Navigation Light/Lens and Static Wicks (4) — Condition.

b. Ground Wire — Disconnected.

a. Right Aileron — Check free motion, balance tab linkage and brush seal condition.

b. Right Spoiler and Flap — Condition.

a. Right Brakes and Brake Wear Indicators — Condition.

NOTE

The wear pins should be exposed with the PARKING BRAKE set.

b. Right Engine Oil — Check oil level (normal).

NOTE

If preflight oil level checks low, start and run engine until stabilized at idle. Shut down engine and recheck oil level. If there is no oil level indication, add enough oil to obtain an indication before starting engine to recheck oil level.
Normal Procedures

**Exterior Preflight (Cont)**


   b. Right Thrust Reverser — Condition and completely stowed.

14. a. Tailcone Interior — Open access and check for:
    - Fluid Leaks
    - Main Engine Fire Bottle Pressures
    - Security and Condition of Installed Equipment
    - Remote Circuit Breakers — Set
    - APU (if installed) Fire Bottle Pressure and APU FAN FAIL Indicator

   **NOTE**
   APU may be operated at ambient temperatures up to 38° C (100° F) with an amber APU FAN FAIL indication.

   a. Condition of Door Seal, then close access.
   b. Engine Fire Extinguisher Discharge Indicators — Condition.
   c. Right VOR/LOC Antenna — Condition.
   d. APU Exhaust (if installed) — Clear of obstructions.

15. a. Vertical Stabilizer, Rudder, Horizontal Stabilizer, Elevator, Delta Fins and Logo Lights (if installed) — Condition, drain holes clear.

   **WARNING**
   The vertical and horizontal stabilizer, and flight control surfaces must be free of frost, snow, and ice.

   b. Static Discharge Wicks (6 on elevators, 1 above stinger, and 4 on delta fins) — Condition.
   c. Beacon/Strobe Light and Lens — Condition.
   d. Tailstand — Removed.

16. a. APU Inlet (if installed) — Clear of obstructions.
   b. Left VOR/LOC Antenna — Condition.
   c. Battery Vents — Clear.
   d. Baggage Compartment Door — Open.

   (1) Baggage Heat Switch (if installed) — On, as desired.
   (2) Check condition of door seal, then close.
Normal Procedures

Exterior Preflight (Cont)

17  a. Left Engine Turbine Exhaust Area — Condition, clear of obstructions.
   b. Left Thrust Reverser — Condition and completely stowed.

18  a. Left Engine Oil — Check oil level (normal).
    NOTE
    If preflight oil level checks low, start and run engine until stabilized at idle. Shut down engine and recheck oil level. If there is no oil level indication, add enough oil to obtain an indication before starting engine to recheck oil level.

   b. Left Brakes and Brake Wear Indicators — Condition.
    NOTE
    The wear pins should be exposed with the PARKING BRAKE set.

19  a. Left Spoiler and Flap — Condition.
   b. Left Aileron — Check free motion, balance and trim tab linkage and brush seal condition.

20  a. Left Winglet Navigation Light/Lens and Static Wicks (4) — Condition.
   b. Ground Wire — Disconnected.

21  a. Left Wing — Check:
    (1) Leading Edge, Stall Strips, Triangles, Vortilons and Ice Detect Patch — Condition.
    (2) Access Panels — Fuel/Hydraulic leakage.
    WARNING
    The wing and flight control surfaces must be free of frost, snow, and ice.

22  a. Fuel Drains and Access Door — Drain and secure.
    NOTE
    The fuel drains are low points in the fuel system. Fuel will drain from these when opened.

   b. Left Main Gear — Check:
    (1) Wheel Well — Hydraulic/fuel leakage and condition.
    (2) Taxi Light and Doors — Condition.
    (3) Wheels, Brakes, and Tires — Condition.
Normal Procedures

**Exterior Preflight (Cont)**

- c. Left Engine Inlet and Fan — Clear of obstructions and condition.
  
  **WARNING**
  - If fan is windmilling, stop by pressing on fan spinner. Do not attempt to stop windmilling by grabbing blades.
  - The engine inlet must be free of frost, snow, and ice.
  
  d. Left Generator and Alternator Cooling Scoops — Clear.
  e. Upper Fuselage, Fuel Vent Inlet — Clear of obstructions and condition.
  f. Oxygen System Discharge Indicator (if applicable) — Check.

**Cabin Preflight**

- 1. Cabin Furnishings — Secure.
- 2. Emergency Exit — Aisle clear and handle unobstructed. Remove and stow aft emergency exit door security pin.
- 3. Lavatory Door — Open and access unobstructed.
Before Starting Engines

- All flight deck switches are normally extinguished in normal cruise flight. However, the absence of switch illumination does not preclude a check of the applicable switch condition as noted in the following procedures.

- All flight deck switches will be extinguished, except as noted in the following procedures.

2. Crew Oxygen Masks and Smoke Goggles — Check oxygen flow available. Masks and smoke goggles properly stowed.
3. L and R Circuit Breakers — Set.
4. Gear — DN.
5. Electrical System:
   a. L and R BATT Switches — On, simultaneously.
   b. EMER BATT Switch — EMER.
   c. L and R AV MSTR Switches — On. (OFF for battery starts)
   d. L and R NON-ESS Switches — As desired. (OFF for battery starts)
   e. L and R GEN Switches — OFF.
   f. EXT PWR (if desired) — Connect, green AVAIL, then select EXT PWR.

   Ensure unit is regulated to 28 VDC and limited to 1500 amps maximum.

   APU (if installed) — As desired:
   (1) BCN/STROBE Switch — BCN.
   (2) APU MASTER Switch — ON.
   (3) FIRE DET — Check. Refer to step 20, this procedure.
   (4) APU START/STOP Switch — START.
   (5) EXT PWR Switch (if applicable) — AVAIL and disconnect external power source.
   (6) APU GEN Switch — ON.
   (7) APU BLEED Switch — ON.
   (8) PACK Switch — On.
   h. BUS-TIE Switch — Closed with EXT PWR or APU starts.
      (Open with battery starts.)
7. L and R Audio Panels — Set.
9. ELEV DISC Handle and ROLL DISC Lever — Check stowed.
10. Flight Controls — Check. Full travel on all controls with seat adjusted.

(Continued)
Normal Procedures

Before Starting Engines (Cont)

11. LTS — Test. All switch lights, CWP lights and guidance control panel lights should illuminate.
12. DU and REVERSION Panels — NORM.
   ✷ 13. EICAS — Check.
      a. Engine Instruments
      b. Fuel Quantity
      c. Fuel TOTALIZER RESET (FUEL Page) — Zero.
      ✷ Fuel USED does not include fuel used by APU.
      d. CAS Indications
      e. SUMRY Page
14. ANTI-ICE Panel:
      a. L and R PROBES Switches — OFF.
      b. L and R WSHLD Switches — OFF.
   ✷ 16. GEAR/HYD Panel:
      a. AUX HYD Switch — ON.
      b. SUMRY Page B-ACUM Pressure — 2610-3600 psi.
      c. EMERGENCY/PARKING BRAKE — Set.
      d. AUX HYD Switch — Off.
17. PAX OXYGEN/PRESSURIZATION Panels — Checked:
      a. PACK Switch — OFF. (On, if APU BLEED Switch — ON.)
      ✷ b. LDG ALT Selector — Set landing field elevation of intended destination.
18. ENVIRONMENTAL CONTROL Panel — Checked and set.
   ✷ 19. RUD BOOST Switch — On.
20. SYSTEM TEST Panel — Test.
   ✷ a. FIRE DET — Check, unless already accomplished during APU start procedure.
      - Master WARN tone and light will activate followed by a “LEFT ENGINE FIRE . . . RIGHT ENGINE FIRE” voice.
      - Both red FIRE and all white EXTINGUISHER #1 and #2 ARMED switches (ENGINE panel) will illuminate. Illumination of the FIRE switch indicates continuity of the fire detect systems and illumination of the EXTINGUISHER #1 and #2 ARMED switches indicate continuity of the fire extinguisher squibs.
      - Red FIRE messages in ITTs will flash.
   ✷ Both red FIRE messages on RMU ENGINE PGE 1 will flash next to the N1 display.

(Continued)
Normal Procedures

Before Starting Engines (Cont)

- L and R BLEED AIR LEAK red CAS and CWP. This indicates continuity of the bleed air overheat sensor system.
- WING/STAB LEAK red CAS and CWP. This indicates continuity of the anti-ice bleed air overheat sensor system.
- APU FIRE Switch (if installed) and red CAS will illuminate with the APU MASTER Switch ON. The red CAS only will illuminate with the APU MASTER Switch Off.

**NOTE**

Depressing and holding the SYS TEST/RESET Switch in the FIRE DET position for 15 seconds will result in sounding of the APU fire horn. Holding the switch for 30 seconds will result in an APU FAIL indication and APU shutdown.

If EXT PWR or APU are not used, start one engine and continue checks with an L or R GEN switch — On and L and R AV MSTR switches — On.

b. GEAR — Check.
- Master WARN tone and light will activate followed by a “GEAR …” voice.
- GEAR red CAS and CWP.
- Three (3) white in-transit lights.

c. FLAPS — Check.
- FLAPS FAIL and FLAPS FAULT amber CAS and Master CAUT tone and light will activate.

d. ADC — Check.
- “OVERSPEED” voice.
- Red VMO /MMO limit bar on PFD moves down.

e. STALL — Check.
- Red LSA (Low Speed Awareness) on PFD moves up.
- Angle of Attack Indicator (if installed) — Needle will sweep.
- L (R) AOA HT FAIL amber CAS and Master CAUT tone and light will activate.
- Momentary activation of applicable stick shaker.
- “STALL” voice. The voice and Master CAUT tone may not repeat during right side test.
- Left side first, then repeats for right.

f. ANTI-ICE — Check.
- WG/STAB HT OK white CAS.
- WING OVHT and STAB OVHT red CWP and Master WARN tone and light will activate.

(Continued)
Normal Procedures

**Before Starting Engines (Cont)**

21. Either Master WARN/CAUT Light — Depress and hold until Master CAUT light illuminates. This inhibits the master caution system.

22. Trim System — Check:
   a. PITCH TRIM Switch — Select SEC.
   b. SEC Switch — Trim NDN or NUP.
   c. Copilot’s Control Wheel Master Switch (MSW) — Check cutout of SEC trim.
   d. PITCH TRIM Switch — Select OFF.
   e. Pilot’s or Copilot’s Control Wheel Trim Switch — Trim NDN or NUP. No trim should occur.
   f. PITCH TRIM Switch — Select PRI.
   ◆ g. Copilot’s Control Wheel Trim Switch — Trim NDN or NUP.
   ◆ h. Pilot’s Control Wheel Trim Switch — Trim NDN or NUP.
   ◆ i. Pilot’s Control Wheel Master Switch (MSW) — Check cutout of PRI trim.
   j. Pilot’s Control Wheel Trim Switch — Trim LWD or RWD. Reset to zero (0).
   k. RUDDER TRIM Switch — Trim NOSE LEFT or NOSE RIGHT. Reset to zero (0).

23. FUEL Panel — Check.

24. L and R ENGINE Panels:
   a. L and R ENG CMPTR Switches — ON.
   b. ENG SYNC Switch — OFF.
   ◆ 25. Altimeters — Set pilot, copilot and standby.
      Uncage standby attitude indicator and check.
   ◆ 27. FMS — Set.
   ◆ 28. Takeoff Data (V1, VR, V2, Takeoff Pitch Attitude, Distance) — Computed and speeds set (refer to Section V).
   ◆ 29. Avionics — Set for departure.
Normal Procedures

Starting Engines

Engine starts may be made using either an external power source, APU (if installed), or the airplane batteries. An external power source or APU is recommended when ambient temperature is 0°C or below. Ensure an external power source supply is regulated to 28 VDC, has adequate capacity for engine starting and is limited to 1500 amps maximum. Allow the operating generator amperage to decrease below 300 amps prior to a generator cross-start. Refer to Cold Weather Operation, this section, for additional information when operating in extremely cold weather.

**WARNING**

Airflow into the TFE 731-20 engine is sufficient to draw personnel and equipment into the engine inlet. Personnel in proximity of the engine inlet should maintain a safe distance at all times during engine operation.

1. Cabin Door — Closed and latched.
2. SUMRY Page ELEC VOLTS — Check.
   - Nickel-Cadmium — 23 VDC minimum.
   - Lead Acid — 24 VDC minimum.
3. BCN/STROBE Switch — BCN.
4. EMERGENCY/PARKING BRAKE — Set.
5. Thrust Levers — IDLE.
6. Engine — Start:
   a. START Switch — ON (START green EI).
   b. Monitor the following:
      (1) IGN and FF (fuel flow) — Check.
      (2) N1 — Increasing as N2 increases.
      (3) ITT — 941°C maximum.
   c. Should the engine fail to light off within 10 seconds of starter engagement, move the thrust lever to CUT-OFF.
   (4) Oil Pressure — Indication.
7. Engine Instruments — Check for normal indications.
8. SUMRY Page HYD - MAIN Pressure — 2210-3600 psi.
9. Start other engine by repeating steps 6 and 7.
10. EMER LIGHTS Switch — ON (EMER LIGHT white CAS), check emergency lights illuminated, then ARM.
11. EXT PWR Switch (if applicable) — AVAIL and disconnect external power source.

(Continued)
Starting Engines

(Cont)

12. PACK Switch — OFF.

13. Anti-Ice System:
   a. L BLEED Switch — OFF.
   b. WING/STAB Switch — ON. Check both ITTs rise.
   c. R BLEED Switch — OFF. Check both ITTs reduce.
   d. L BLEED Switch — On. Check both ITTs rise.
   e. R BLEED Switch — On.
   f. WING/STAB Switch — As required.
   g. L and R NAC Switches — ON (NAC green EI), then as required. Engine idle will increase and N1 bugs will shift.

14. PACK Switch — On.

15. Emergency Pressurization System:
   a. EMER PRESS Switch — ON. Verify LR EMER PRESS ON amber CAS illuminates.
   b. EMER PRESS Switch — Off.
Before Taxi

1. Circuit Breakers — Set.
2. VOLTS and AMPS — Check.
3. Manual Mode Governor — Check:
   a. L ENG CMPTR Switch — MAN. (MAN white EI)
   b. Gradually advance left thrust lever until an increase in N1 is observed.
   c. Retard thrust lever and note decrease in N1.
   d. L ENG CMPTR Switch — ON.
   e. Repeat steps a thru d using R ENG CMPTR Switch and Right Thrust Lever.
5. Spoilers — Check:
   a. SPOILER Lever — EXT. Check for equal extension rate and position.
   b. SPOILER Lever — ARM. Check for spoilers retracted. (AUTOSPLR ARM white CAS)
6. FLAPS — Set 8° or 20°.
7. Flight Controls — Check:
   a. During the rudder pedal check, depress rudder pedal firmly against each stop and verify a green RB (not an amber RB) is illuminated on the PFD. Do not takeoff with an amber RB when tested.
8. EICAS — Check.
9. Cabin — Check:
   a. Brief passengers. Briefing to include oxygen system operation, seat belt operation, flotation equipment location & operation, fire extinguisher location, and emergency evacuation.

   - Passengers must be informed that the forward emergency exit is the upper portion of the cabin entry door.
   - Passengers must be informed that smoking is prohibited in the lavatory.
   - Passengers should be advised not to use portable electronic equipment during takeoff, approach and landing.

   b. Seats — Swivel forward or aft and in outboard position. Seat backs upright and locked. Leg restraint of belted lavatory seat (if installed) extended. Headrests in place for occupied aft facing seats.
   c. Work Tables and Toilet Doors — Check stowed.
   d. Emergency Exit — Aisle clear.

(Continued)
Normal Procedures

Before Taxi (Cont)

10. Aircraft Lighting — On, as required.
11. NO SMOKING BELTS Switch — On.
12. NOSE STEER Switch — ON.
13. AUX HYD Switch — ON.

Taxi and Before Takeoff

1. Brakes and Nose Wheel Steering — Check.
2. Flight Instruments — Checked.
3. Thrust Reversers — Check:

   - Use of reverse thrust on poorly cleaned or maintained runway, taxiway, or ramp surfaces may cause foreign object damage to engine fan blades.
   - Deployed time of the thrust reverser should be minimized to prevent foreign object damage. It is recommended that the aircraft be headed into the wind during the thrust reverser ground operational check.

   a. Thrust Levers — IDLE. (REV white EI)
   b. Thrust Reversers — Deploy. (UNL amber EI, then DEP green EI)
   c. Thrust Reversers — Stow. (UNL amber EI, then REV white EI)
4. Engine Instruments and Ni Bugs — Check; verify left and right bugs agree within 1%.
5. Takeoff Data (V1, VR, V2, Takeoff Pitch Attitude, Distance) — Check.
6. Nav Equipment — Check.
7. FLAPS — 8° or 20°, check indication.
8. Trims — Set PIT, AIL, and RUD for takeoff.

<table>
<thead>
<tr>
<th>C. G. ~%</th>
<th>T/O Trim Setting</th>
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<tbody>
<tr>
<td>1 to 10</td>
<td>8.7  8.1  7.6  7.0  6.4  5.9  5.3</td>
</tr>
<tr>
<td>12</td>
<td>14    16    18    20    22 to aft limit</td>
</tr>
</tbody>
</table>

Figure 2-2

(Continued)
Taxi and Before Takeoff (Cont)

10. HI FLOW Switch — Off.
11. Radar — As required.

**Do not** transmit radar energy if personnel are within 9 feet (3 meters) radially from the nose of the aircraft, within 100 feet (30 meters) of large metallic objects including aircraft or during refueling. The radar does transmit in test (TST) mode.

12. Anti-Ice Systems:
   a. WING/STAB Switch — As required.
   b. L and R NAC Switches — As required.

**WARNING**

The wings, vertical and horizontal stabilizers, flight control surfaces, and engine inlets must be free of frost, snow, and ice.

**CAUTION**

Select WING/STAB Switch — ON at least 2 minutes prior to selecting takeoff thrust, to minimize transient ITT exceedances.

**NOTE**

Anti-ice systems should be turned on prior to flight into visible moisture and Static Air Temperature of 10°C to -40°C.

13. APU (if installed) — Shut down:
   a. APU START/STOP Switch — Off.
   b. APU MASTER Switch — Off.
   c. FMS Fuel Quantity — Update.

**NOTE**

Delay 30 seconds between APU STOP and selecting the APU MASTER Off to allow completion of the APU shutdown sequence.

Runway Lineup

1. Transponder — On.
2. L and R PROBES Switches — On.
3. RECOG and L and R LDG-TAXI Light Switches — On.
4. BCN/STROBE Switch — STROBE.
5. APR Switch — ARM. (APR white EL)
6. EICAS/SUMRY or FLT Page — Check.
After Takeoff

NOTE

If taxi and/or takeoff were on ice, snow, or slush, allow the wheels to spin down prior to gear retraction to throw off as much slush as possible.

1. Gear — UP after positive rate of climb.
2. FLAPS — UP at V2 + 25.
3. On aircraft 45-002 thru 45-169 not modified by SB 45-22-4, RUD BOOST Switch — OFF.
4. Yaw Damper — As required.
5. SPOILER Lever — RET.
6. Anti-Ice Systems — As required.
   a. Thrust Levers — MCT, unless a critical thrust situation exists.
   b. WING/STAB Switch — ON.
   c. L and R NAC Switches — ON. (NAC green EL)

NOTE

Anti-ice systems should be turned on prior to flight into visible moisture and Static Air Temperature of 10°C to -40°C.

7. L and R LDG-TAXI Light Switches — OFF.

NOTE

During periods of heavy precipitation, set L and R IGN Switches ON to prevent possible engine flame-out due to large quantities of water entering the engine.

9. APR Switch — Off.
Climb

10,000 Ft Checks:
1. NO SMOKING BELTS Switch — As required.

Transition Altitude (or 18,000 Ft) Checks:
2. Altimeters — Set pilot, copilot, and standby to 29.92” Hg (1013 hPa).
3. RECOG Light Switch — OFF.

Descent

1. Pressurization — LDG ALT set.
2. Anti-Ice Systems — As required.
   a. Thrust Levers — MCT, unless a critical thrust situation exists.
   b. WING/STAB Switch — ON.
   c. L and R NAC Switches — ON. (NAC green EI)

   Anti-ice systems should be turned on prior to flight into visible moisture and Static Air Temperature of 10°C to -40°C.

Transition Level (or FL 180) Checks:
3. Altimeters — Set pilot, copilot and standby, and cross-check.
4. RECOG Light Switch — On.
5. Cabin Check:
   a. Brief passengers.
   b. Seats — Swivel forward or aft and in outboard position. Seat backs upright and locked. Leg restraint of belted lavatory seat (if installed) extended. Headrests in place for occupied aft facing seats.
   c. Work Tables and Toilet Doors — Check stowed.
   d. Emergency Exit — Aisle clear.
6. NO SMOKING BELTS Switch — On.
7. Fuel Quantities and Balance — Check.
Normal Procedures

Approach
1. Landing Data (VREF, VAPP, Distance) — Computed and speeds set. Refer to Section V.
   a. Avionics and Radios — Set.
   b. MIN — Set.
   c. Crew Approach Briefing — Complete.

   On aircraft 45-002 thru 45-071 not modified by SB 45-34-4, spurious DME may be displayed momentarily when tuned to non-DME VORs or localizers. Disregard this indication.

3. HI FLOW Switch — Off.
4. ENG SYNC Switch — Off.

Before Landing
1. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
2. FLAPS — 8° or 20°.
3. AUX HYD Switch — ON.
4. Gear — DN. Check for three green DOWN indications.
5. L and R LDG -TAXI Light Switches — On as required.
6. FLAPS — DN, check indication.
7. EICAS/SUMRY or FLT Page — Check.

Go Around
1. Autopilot — Disengaged.

   NOTE: Depressing GO-AROUND button in left thrust lever handle will disengage autopilot and select flight director go-around mode.

2. Thrust Lever(s) — Select T/O detent or as required.
3. FLAPS — 8°.
4. Gear — UP after positive rate of climb is established.
5. Climb at VAPP.
6. When clear of obstacles, accelerate to VAPP + 20 and retract flaps.
7. SPOILER Lever — RET.
Landing

1. Brakes — As required.
2. Spoilers — Verify extended.
   **If spoilers are not extended automatically:**
   a. SPOILER Lever — EXT.
3. Thrust Reversers — Deploy if desired.
   a. With nose wheel on runway, lift both thrust reverser levers to the deploy detent. A REV white EI will change to a UNL amber EI illumination.
   b. The thrust reversers are deployed when the DEP green EI illuminates. Smoothly pull thrust reverser levers to the desired reverse thrust.

   **WARNING**
   When landing on snow covered runways, apply reverse thrust with caution as visibility may be impaired.

   c. At 40 KIAS, return the thrust reverser levers to reverse idle.
      - Use of reverse thrust on poorly cleaned or maintained runway, taxiway, or ramp surfaces may cause foreign object damage to engine fan blades.
      - If full reverse thrust is maintained below 40 KIAS, reingestion of exhaust gases in the engine and foreign object damage may occur.

   d. When reverse thrust is no longer required, return thrust reverser levers to the stow position. Check for the DEP green EI to change to a UNL amber EI, then to a REV white EI illumination once the thrust reversers are stowed.
Normal Procedures

After Landing/Clearing Runway

1. Standby Attitude Indicator — Cage.
2. Transponder — Off.
3. L and R PROBES Switches — OFF.
4. Anti-Ice Systems:
   a. WING/STAB Switch — As required.
   b. L and R NAC Switches — As required.
5. Lights — As desired.
6. SPOILER Lever — RET.
7. FLAPS — UP or set for next takeoff.
9. APU (if installed) — As desired:
   a. APU MASTER Switch — ON.
   b. APU START/STOP Switch — START.
   c. APU GEN Switch — ON.
   d. APU BLEED Switch — ON.
10. Thrust Lever — CUTOFF (optional).

**NOTE**

Idle engine for 1 minute prior to thrust lever
cutoff.
Shutdown

1. **EMERGENCY/PARKING BRAKE and/or Chocks — Set.**

   If heavy braking was used during landing, setting the emergency/parking brake will decrease brake cooling efficiency and increase the possibility of wheel fuse plug release. Therefore, use of chocks is recommended.

   2. L and R AV MSTR Switches — OFF.
   3. L and R WSHLD Switches — OFF.
   5. EMER LIGHTS Switch — OFF.
   6. NOSE STEER Switch — Off.
   7. AUX HYD Switch — Off.
   8. Thrust Lever(s) — CUTOFF.
   9. PACK Switch — OFF.
   10. FMS — OFF.
   12. APU (if installed) — Shut down:
       a. APU START/STOP Switch — Off.
       b. APU MASTER Switch — Off.
   13. BCN/STROBE Light Switch — OFF.
   14. EMER BATT Switch — OFF.
   15. L and R BATT Switches — OFF.

Quick Turn-Around (One or No Engine Shutdown)
Before Taxi

1. **LDG ALT Selector — Set landing field elevation of intended destination.**
3. FMS — Set.
4. Takeoff Data (V1, VR, V2, Takeoff Pitch Attitude, Distance) — Computed and speeds set. Refer to Section V.
5. Avionics — Set for departure.
7. Engine — Start. (both engines running)
8. Engine Instruments and N1 Bugs — Check; verify left and right bugs agree within 1%.
9. PACK Switch — On.
12. L and R WSHLD Switches — On.

(Continued)
Quick Turn-Around (Cont)

13. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
14. FLAPS — Set 8° or 20°, check indication.
15. RUD BOOST Switch — On.
16. Flight Controls — Check.
17. Passengers Briefed/Cabin Check:
   a. Swivel Seats — Forward or aft and in outboard position.
   b. Headrests in place for occupied aft facing seats.
   c. Work Tables and Toilet Door — Check stowed.
   d. Emergency Exit — Aisle clear.
18. NO SMOKING BELTS Switch — On.

Taxi

1. Flight Instruments — Check.
2. FLAPS — Set 8° or 20°, check indication.
3. Trims — Set PIT, AIL, and RUD for takeoff.
5. HI FLOW Switch — Off.
6. Radar — As required.

**WARNING**
Do not transmit radar energy if personnel are within 9 feet (3 meters) radially from the nose of the aircraft, within 100 feet (30 meters) of large metallic objects including aircraft or during refueling. The radar does transmit in test (TST) mode.

7. Anti-Ice Systems:
   a. WING/STAB Switch — As required.
   b. L and R NAC Switches — As required.

**WARNING**
The wings, vertical and horizontal stabilizers, flight control surfaces, and engine inlets must be free of frost, snow, and ice.

**CAUTION**
Select WING/STAB Switch — ON at least 2 minutes prior to selecting takeoff thrust, to minimize transient ITT exceedances.

**NOTE**
Anti-ice systems should be turned on prior to flight into visible moisture and Static Air Temperature of 10°C to -40°C.

8. APU (if installed) — Shut down:
   a. APU START/STOP Switch — Off.
   b. APU MASTER Switch — Off.
   c. FMS Fuel Quantity — Update.
9. Go to Runway Lineup Check.
Advisory/Status Annunciations

All of the following CAS and EI illuminations are white unless otherwise indicated.

Takeoff and landing inhibits of certain caution (amber) and advisory (white) CAS messages are used to reduce pilot distractions during critical phases of flight. Warning (red) messages are not inhibited. Advisory messages associated with pilot selection are not inhibited.

A white CAS TAKEOFF INHIBIT or CAS LANDING INHIBIT is displayed within the EICAS page menu window when the inhibit function is enabled. During this phase, the inhibited CAS messages cannot change state (either display or be removed from display). The Master CAUT will not trigger for an inhibited CAS message. When the inhibit logic is disabled, inhibited CAS messages (with the Master CAUT, as appropriate) will trigger on the CAS.

CAS TAKEOFF INHIBIT (Page Menu)

The takeoff inhibit logic is **enabled** by:
- Weight on wheels, and
- Airspeed above 40 KIAS, and
- Both thrust levers at MCR or above.

The takeoff inhibit logic is **disabled** by:
- Takeoff and climb above 400 feet radio altitude, or
- Weight off wheels plus 30 seconds, or
- Abort, airspeed less than 40 KIAS, or
- 60 seconds after enable.

CAS LANDING INHIBIT (Page Menu)

The landing inhibit logic is **enabled** by:
- Gear down while airborne, and
- Both thrust levers below MCR, and
- Radio altitude below 400 feet.

The landing inhibit logic is **disabled** by:
- Weight on wheels below 40 KIAS, or
- Weight on wheels plus 30 seconds, or
- Climb above 400 feet radio altitude.
Normal Procedures

**ICE DETECTED**

Ice is being detected with the WING/STAB and L & R NAC heat anti-ice systems selected ON.

**L WSHLD HT FAULT**

**R WSHLD HT FAULT**

**LR WSHLD HT FAULT**

The temperature modulating function of the windshield system is operating in a degraded mode. The system will automatically operate in a full on/off mode. The system will provide effective anti-icing.

**STAB TMP FAULT**

One of the two horizontal stabilizer temperature sensors has failed. The stabilizer anti-ice system should function normally using the opposite stabilizer sensor.

**WG/STAB HT OK**

The wing and horizontal stabilizer anti-ice controller and sensors have been properly tested with pilot activation of the SYS TEST/RESET switch.

**WING TMP FAULT**

One or more of the four wing temperature sensors have failed. The wing anti-ice system should function normally using the opposite wing sensor.
Normal Procedures

AP ELEV MISTRIM

The autopilot pitch servo is holding excessive torque and the pitch trim system is not operating normally.

If the autopilot is to be disengaged with this CAS illuminated:

1. Flight Controls — Hold firmly.

   When autopilot is disengaged in a mistrim condition, expect an abrupt change in control force.

2. Autopilot — Use control wheel trim switch to disengage.

3. Retrim aircraft if necessary.

4. Autopilot — Engage as desired.

MACH TRIM FAIL

The Mach trim function is disabled and the Mach number is less than 0.76 M1. The Mach trim disabled MMO may be greater than 0.76 M1 at some altitudes. (Refer to Section I)

1. PITCH TRIM Switch — PRI.

2. PRI PITCH Circuit Breaker (pilot’s FLIGHT group [TRIM]) — Set.

If autopilot disengagement is desired:

3. Airspeed — Mach trim off MMO or below.


   The MACH TRIM FAIL white CAS will change to amber above the Mach trim off MMO.

RUD BOOST INOP

Rudder boost is selected OFF. Do not takeoff.

APU AVAILABLE (If Installed)

(Aircraft 45-002 thru 45-169 not modified by SB 45-22-4)

The auxiliary power unit is operating and is available for bleed air and electrical power.

ENTRY DOOR PIN

There is a disagreement between one or more entry door pins with the door open. This CAS will only appear while the aircraft is on the ground and will also be accompanied by an ENTRY DOOR red CAS and CWP.
Normal Procedures

**BUS TIE C L S D**

BUS TIE switch is closed (either automatically or manually). The BUS TIE switch will illuminate with a white bar.

**BUS TIE M A N U A L**

Pilot has manually selected the MAN position of the BUS TIE switch. The bus tie position changes and prevents automatic operation of the bus tie. MAN and a white bar (if generator buses are tied) on the switch will illuminate. Pressing the BUS TIE switch a second time restores automatic control; MAN on the switch and BUS TIE MANUAL white CAS will extinguish.

**L E S S B U S F A U L T**

**R E S S B U S F A U L T**

**L R E S S B U S F A U L T**

The respective essential bus contactor has failed open in flight.

**E X T E R N A L P O W E R**

The external power source is connected to the aircraft (regardless of whether it is powering the aircraft).

The external power source is powered if the EXT PWR switch on the ELEC panel has a green AVAIL illuminated.
Normal Procedures

**L APR FAULT**  
**R APR FAULT**  
**LR APR FAULT**

The respective DEEC has detected a fault within the APR function of the computer. Refer to APR OFF performance data, Section V.

**L ENG FIRE FAIL**  
**R ENG FIRE FAIL**  
**LR ENG FIRE FAIL**

The engine fire detection system has detected a fault during flight that may not allow the detection system to indicate a fire.

**L ENG SHUTDOWN**  
**R ENG SHUTDOWN**  
**LR ENG SHUTDOWN**

This collector message indicates the engine is shutdown with the thrust lever at CUTOFF. The respective OIL PRESS LOW (red), FUEL PRESS LOW (red), GEN FAIL (amber), and HYD PUMP LO (white) CAS are inhibited. When the thrust lever is moved out of CUTOFF, the inhibited CAS will flash and may be reset with the Master WARN/CAUT switches.

**LR ENG SHUTDOWN**

LR GEN FAIL (red) CAS will be inhibited on the ground and will illuminate in flight.

**L ENG VIB MON**  
**R ENG VIB MON**  
**LR ENG VIB MON**

A higher than normal level of vibration has been sensed in the respective engine.

1. Engine Instruments — Monitor for abnormal indications (oil temperature/pressure, N1, ITT and N2) or unusual sounds or vibrations.

If ENG VIB MON remains illuminated for more than 30 seconds and if conditions permit:

2. Respective Thrust Lever — Adjust.

3. Refer problem to maintenance personnel for correction after landing.

**NOTE**  
Engine shutdown is not recommended unless there are other indications of severe engine abnormalities.
Normal Procedures

**L ENG CMPTR FAULT**
**R ENG CMPTR FAULT**
**LR ENG CMPTR FAULT**

The respective DEEC has detected a minor malfunction on the ground. The engine computer retains engine control and operation is not affected. This procedure may be used prior to takeoff to clear the fault.

1. Respective Thrust Lever — IDLE.
2. Respective ENG CMPTR Switch — OFF, then ON.

**L ENGINE CHIP**
**R ENGINE CHIP**
**LR ENGINE CHIP**

Metal particles have been detected in the oil during flight.

**L OIL FILTER**
**R OIL FILTER**
**LR OIL FILTER**

The engine oil filter has an impending bypass during flight.

1. Monitor oil pressure and temperature.
The following green illuminations appear in the EI displays outboard of the N1 digital display of the EICAS.

**APR**
The associated thrust lever is in the Automatic Performance Reserve (APR) detent.

**MCR**
The associated thrust lever is in the Maximum Cruise (MCR) detent.

**MCT**
The associated thrust lever is in the Maximum Continuous Thrust (MCT) detent.

**TO**
The associated thrust lever is in the Takeoff (TO) detent.
Normal Procedures

The following green or white illuminations appear in the EI displays of the EICAS.

**APR ON**
A green APR ON indicates that the Automatic Performance Reserve (APR) has activated.

**APR**
A white APR indicates that APR is armed in both DEECs.

**DEP**
A green DEP indicates that the thrust reverser is deployed with aircraft on the ground.

**IGN**
A green IGN indicates that the ignition is ON (either manually or automatically).
A white IGN indicates that the ignition is ON, either manually or automatically, and one ignitor plug has failed. The other plug is functioning normally.

**MAN**
A white MAN indicates that the DEEC is in the MANual mode or OFF mode as selected by the pilot.

- When operating in MAN above 30,000 feet, maintain N₁ greater than 66%. When operating above 46,000 feet, maintain N₁ greater than 80%. If N₁ is allowed to decelerate below these values, the engine acceleration may not occur when commanded. In that event, increasing aircraft speed and/or decreasing altitude will restore normal engine function.
- Thrust reversers must be limited to idle reverse when the engines are operating in MANual mode.

**NAC**
A green NAC indicates that the NAC anti-ice switch is ON and the system is functioning normally.
Normal Procedures

REV
A white REV indicates that the thrust reverser hydraulic control unit is receiving hydraulic pressure and the thrust reversers are armed with aircraft on the ground.

START
A green START indicates that the engine starter is engaged.

SYNC
A green SYNC indicates that the ENG SYNC is ON (adjacent to either N1 or N2).
Normal Procedures

**L CAB PRESS FAIL**

**R CAB PRESS FAIL**

The left or right pressurization control has failed and will automatically switch operation to the opposite control.

1. Respective L or R PRESS Circuit Breaker (respective ENVIRONMENTAL or ENVIR group) — Set, or pull and reset.

**CAB PRESS MAN**

The crew has selected manual rate control of the pressurization system.

**L ECS FAULT**

**R ECS FAULT**

*(Aircraft 45-236 & subsequent and prior aircraft modified by SB 45-22-5)*

A fault has been detected in the respective channel of the ECS controller during flight.

1. Respective L or R BLEED Circuit Breaker (respective ENVIRONMENTAL or ENVIR group) — Set, or pull and reset.

**EMER DEPRESS**

Emergency depressurization has been selected by the crew. Emergency depressurization commands both outflow valves full open, but will attempt to limit the cabin altitude to approximately 13,700 ft.

**PACK HIGH FLOW**

HI FLOW has been selected ON.

**PAX OXY DEPLOY**

An electrical command (automatic or manual) has been provided to the passenger oxygen deploy valve to deploy the masks.
TEMPORARY FLIGHT MANUAL CHANGE

Publication Affected: Model 45 FAA Approved AFM (FM-126).
Description of Change: Revise PRI TRIM FAULT procedure.
Filing Instructions: Insert this temporary change in the affected AFM adjacent to page 2-35, and retain until further notice. Record this temporary change in the “Log of Temporary Flight Manual Changes” at the front of the AFM.

Replace the PRI TRIM FAULT procedure with the following:

PRI TRIM FAULT

An IC-600 (integrated computer) trim fault has been detected. Primary trim may be available, however, operation may be at a lower trim rate. The configuration and Mach trim will be inoperative.

1. If primary pitch trim is available:
   a. PRI PITCH Circuit Breaker (Pilot’s FLIGHT group [TRIM]) — Pull and reset.
   b. Control Wheel Master Switch (MSW) — Depress and release to attempt to clear fault.

1. If primary pitch trim is not available:
   a. Refer to PRI TRIM FAIL procedure, Section IV.
AUTOSPLR ARMED

Autospoilers have been armed.

ELEVATOR DISC

The elevator disconnect has split the elevator controls during flight. Do not reconnect.

The pilot’s control column moves the left elevator. The copilot’s control column moves the right elevator. Autopilot will disengage and not re-engage.

PITTRIM BIAS

The pitch trim bias system is moved from the normal position. PIT TRIM BIAS should only be used for jammed stabilizer conditions in flight.

If the pitch trim bias system has moved from the normal position without pilot action, a normal landing may be accomplished.

PITTRIM MSCMP

The stabilizer pitch trim indications between IC600s (integrated computers) do not agree while on the ground.

PITCH TRIM OFF

PITCH TRIM selector switch is OFF. Autopilot, configuration trim and Mach trim will be inoperative.

PRI TRIM FAULT

An IC-600 (integrated computer) trim fault has been detected. Primary trim is available, however, operation may be at a lower trim rate. The configuration and Mach trim will be inoperative.

If conditions permit:

1. PRI PITCH Circuit Breaker (Pilot’s FLIGHT group [TRIM]) — Pull and reset.
2. Control Wheel Master Switch (MSW) — Depress and release to attempt to clear fault.

ROLL DISC

Roll disconnect has occurred during flight.

The pilot’s control wheel controls the spoilerons and the copilot’s control wheel controls the ailerons. Autopilot will disengage and not re-engage.
Normal Procedures

**SEC PITCH TRIM**

Secondary pitch trim has been selected. Autopilot is available.

**SEC TRIM FAULT**

A power-up stabilizer actuator fault has been detected.

**If conditions permit:**
1. SEC PITCH Circuit Breaker (copilot’s FLIGHT group [TRIM])—Pull and reset.
2. Control Wheel Master Switch (MSW) — Depress and release, to attempt to clear the fault.
3. SEC TRIM — As desired. Trim will operate normally even if CAS remains illuminated.

**SPOILERS EXT**

Spoilers are not fully retracted. Spoileron extension will not activate this CAS.

**TAKE OFF TRIM**

Pitch, aileron, or rudder trim is not set for takeoff while the aircraft is on the ground and thrust levers are less than MCR.

**WHEEL MSTR**

The Control Wheel Master Switch (MSW) has been depressed or power to one of the MSWs has been lost. This CAS will be accompanied by the PRI TRIM FAULT white CAS.

The MSW will interrupt the pitch, aileron, rudder trims, configuration trim, Mach trim, PIT TRIM BIAS, and rudder boost systems. The autopilot, yaw damper and nose wheel steering (on the ground) will disconnect. The spoiler control valve will close which causes the spoiler and spoilerons to retract to the float position. The MACH TRIM FAIL white and amber CAS messages will not illuminate, and the MMO overspeed red limit bar on the PFD will not reduce to the Mach trim off MMO.

1. Respective L or R WHL MSTR Circuit Breaker (respective FLIGHT group) — Set.

   **If either WHL MSTR circuit breaker remains pulled:**
   a. The following systems are inoperative: autopilot, yaw damper, rudder boost, Mach trim and configuration trim. Refer to the appropriate system failed procedures. The primary manual trim will be in the slow mode. The respective MSW will be inoperative.
L FUEL BAY LOW  
R FUEL BAY LOW  
LR FUEL BAY LOW  

A float switch has detected low fuel in the collector bay. This may be an indication of a scavenge pump (motive flow) system failure or sideslip. The CAS will be displayed with the respective engine shut down.

1. Minimize sideslips and uncoordinated maneuvering.

FUEL XFLO OPEN  
The wing fuel crossflow valve is open.

L FUEL FILTER  
R FUEL FILTER  
LR FUEL FILTER  

Either the respective engine or aircraft fuel filter has an impending bypass during flight.

1. Respective L or R STBY Switch — ON.

L FUEL HEATER  
R FUEL HEATER  
LR FUEL HEATER  

The respective fuel heater/oil cooler has failed to the hot condition.

L FUEL QTY FAULT  
R FUEL QTY FAULT  

Indicates the left or right channel has detected a fault or a loss of compensation.

FUEL QTY FAULT  
The FUEL QTY FAULT indicates that the attitude input from the AHRS is inoperative and the quantity may not be as accurate as normal, or that a fuselage probe is inoperative or invalid. This CAS will also illuminate during AHRS alignment.

A probe failure may result in a FUEL IMBALANCE amber CAS due to calculation in the fuel quantity indicating conditioner.
Normal Procedures

L FWSOV CLSD  
R FWSOV CLSD  
LR FWSOV CLSD

The respective fuel firewall shutoff valve is closed.

L STBY PUMP ON  
R STBY PUMP ON  
LR STBY PUMP ON

Electrical power has been provided to the respective standby pump. The pumps may be turned on manually, and will automatically turn on during starter-assisted engine starts. The right standby pump will automatically turn on during APU starts (if installed) and will remain on during APU operation.
HYD XFLOW ON
Hydraulic crossflow valve is open.

L HYD PUMP LOW
R HYD PUMP LOW
LR HYD PUMP LOW

The left or right engine hydraulic pressure is less than 1900 psi. The hydraulic pump symbol on the HYD page will be amber with this CAS message displayed.

This CAS may normally be illuminated during gear extensions with single engine operation.

1. EICAS — Select HYD or SUMRY page.
2. Monitor MAIN hydraulic pressure.

MAIN HYDQTY LO
Main hydraulic quantity is low.
Normal Procedures

**AHRS 1 BASIC**
**AHRS 2 BASIC**
**AHRS 1-2 BASIC**

The Attitude Heading Reference System, AHRS 1 or 2, has reverted to basic mode due to a loss of true airspeed from both air data computers. The attitude displays, autopilot, FMS, and radar stabilization will operate normally. Minimize sustained shallow bank turns (less than 6° bank) to minimize small AHRS errors.

**CKLST MISMATCH**

Indicates that the checklists loaded in IC 1 and IC 2 do not match.

**DAU A REV**
**DAU B REV**

Pilot has selected DAU Reversion to Channel A or B. In reversion, both ICs use the same channel (A or B) of both DAUs. Some loss of redundancy and comparison monitoring occurs during reversion, and DAU REV should not be selected unless a DAU fault or failure is detected.

**DU 1 FAN FAIL**
**DU 2 FAN FAIL**
**DU 1-2 FAN FAIL**

Indicates that the respective Display Unit (DU) cooling fan has failed.

**If conditions permit:**

**DU 1 FAN FAIL**
1. DU 2 Reversion Switch — PFD.
   EICAS will automatically revert to DU 3.
2. DU 1 Circuit Breaker (pilot’s INSTRUMENTS/INDICATIONS group [DISPLAY]) — Pull.

**DU 2 FAN FAIL**
1. DU 2 Reversion Switch — OFF.
   EICAS will automatically revert to DU 3.
2. DU 2 Circuit Breaker (pilot’s INSTRUMENTS/INDICATIONS group [DISPLAY]) — Pull.

**DU 1-2 FAN FAIL**
1. DU 2 Reversion Switch — OFF.
   EICAS will automatically revert to DU 3.
2. DU 1 and DU 2 Circuit Breakers (pilot’s INSTRUMENTS/INDICATIONS group [DISPLAY]) — Pull. Rely on the copilot’s flight displays and standby instruments.
Normal Procedures

DU 3 FAN FAIL
DU 4 FAN FAIL
DU 3-4 FAN FAIL

Indicates that the respective Display Unit (DU) cooling fan has failed.

DU 3 FAN FAIL

1. DU 3 Reversion Switch — Press (EICAS REV) if DU 3 is presently in EICAS format.
2. DU 3 Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group [DISPLAY]) — Pull.

DU 4 FAN FAIL

1. DU 3 Reversion Switch — PFD. EICAS will automatically revert to DU 2.
2. DU 4 Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group [DISPLAY]) — Pull.

DU 3-4 FAN FAIL

1. DU 3 Reversion Switch — Press as required to get EICAS on DU 2.
2. DU 3 and DU 4 Circuit Breakers (copilot’s INSTRUMENTS/INDICATIONS group [DISPLAY]) — Pull. Rely on the pilot’s flight displays and standby instruments.

IC 1 CNFG FAIL
IC 2 CNFG FAIL

(Aircraft 45-170 & subsequent and prior aircraft modified by SB 45-22-4)

A communication failure has occurred between the IC-600 (Integrated Computer) and IM-600 (Integrated Computer Configuration Module). The IC-600 will continue to function properly, and will power up with the configuration stored at the last power-down.

IC 1 FAN FAIL
IC 2 FAN FAIL
IC 1-2 FAN FAIL

The respective IC (Integrated Computer) 1 or 2 cooling fan has failed. Monitor for deteriorating IC functionality and select IC/SG REVERSION as necessary.
Normal Procedures

IC 1 WOW INOP
IC 2 WOW INOP
IC 1-2 WOW INOP

The respective IC (Integrated Computer) has tripped the Weight-On-Wheel monitor by a detected mismatch between the Weight-On-Wheel inputs and airspeed logic. Weight-On-Wheel logic is used by the IC for internal logic tests and external tests. The monitor check is performed once after takeoff, and once after landing.

On the ground:

1. Respective IC/SG 1 or 2 Circuit Breaker (pilot’s or copilot’s INSTRUMENTS/INDICATIONS group) — Pull and reset. If the cause for the IC WOW INOP no longer exists, this CAS will extinguish.

In flight:

1. Continue flight.

INSTR PNL TEMP

An instrument panel thermal switch has tripped.

1. INSTR FAN Circuit Breaker (pilot’s ENVIRONMENTAL group) — Set, or pull and reset.

LBS/KGS CONFIG

The pounds/kilograms configuration of the IC-600 (integrated computer) disagrees with the configuration of the DAU 1 or DAU 2 during flight.

NOSE BAY TEMP

A nose bay thermal switch has tripped.
Normal Procedures

Multi-Function Display (MFD) Annunciation

DGx

Located to the right of the heading readout and indicates the respective HEADING switch is in the unslaved (FREE) mode.

Primary Flight Display (PFD) Annunciation

DGx

Located to the right of the heading readout and indicates the respective HEADING switch is in the unslaved (FREE) mode.
Normal Procedures

**BRAKE FAULT**

A brake system fault has been sensed that results in minor system degradation. Refer to Section V for increased takeoff and landing distance. Fault must be repaired within five (5) flights.

**EMER/PARK BRK**

The emergency brake is being used or the parking brake valve is not fully released, and thrust levers are less than MCR.

**NWS FAULT**

Nose wheel steering system faults have been sensed that result in system degradation. Steering authority may be limited. A significantly larger turning radius may result and must be planned for.

NWS FAULT may indicate a loss of pedal force steering,

1. NOSE STEER Switch — Off then ON.
CVR FAIL
The cockpit voice recorder has failed.

1. CVR Circuit Breaker (pilot’s INSTRUMENTS/INDICATIONS panel) — Set.

   If circuit breaker remains pulled:
   2. The CWP tone/voice volume will be at a fixed (high) level.

EMER LIGHTS
The emergency lights are on.

FDR FAIL (if installed)
The flight data recorder has failed.

1. FDR Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group) — Set.

   If DAU 1A amber CAS is also illuminated, the FDR may still operate.

L CHECK EDS
R CHECK EDS
LR CHECK EDS

One of the following conditions of the applicable Engine Diagnostic System (EDS) (part of the Engine Condition Trend Monitor (ECTM) system) has occurred.

- The EDS has lost power.
- The EDS built-in test equipment (BITE) has detected a system failure.
- The EDS memory is 85% full.
- The system has detected an engine condition which was out of acceptable parameters.
Normal Procedures

**L REV AUTOSTOW**
**R REV AUTOSTOW**
**LR REV AUTOSTOW**

The respective thrust reverser autostow function has activated and applied hydraulic pressure to the stow side of the actuator.

**L REV FAULT**
**R REV FAULT**
**LR REV FAULT**

A fault has been detected in the respective thrust reverser system.

**On the ground:**
1. Respective DEPLOY, ANN and STOW Circuit Breakers (ENGINE group [L or R REVERSER]) — Pull and reset.
2. If respective REV FAULT remains illuminated:
   a. Do not take off. Refer the problem to maintenance personnel for correction.
2. If respective REV FAULT extinguishes:
   a. This checklist is complete.

**In flight:**
1. Land as soon as practical.

**L WARN PWR FAIL**
**R WARN PWR FAIL**

The respective Crew Warning Panel (CWP) power supply has failed or lost power. The CWP is still operational from the opposite power supply; however, the CWP annunciators may look dim.

1. Respective L or R WARN PANEL Circuit Breaker (respective INSTRUMENTS/INDICATIONS group) — Set.

**WARN AUDIO**

The Crew Warning Panel (CWP) has detected a fault in either one of the output audio channels, or in the Automatic Gain Control (AGC) input. The CWP is still operational, and the tone/voice volume will be at a fixed (high) level.
Autopilot

The autopilot (AP) is a fail passive fully monitored digital autopilot. The yaw damper is integrated with the autopilot for a 3-axis control system. Control and monitoring of the autopilot/yaw damper is performed within the IC #2. Each IC has a separate and independent flight director. A trim-in-motion clacker will alert the crew of autopilot trim operation longer than 2-3 seconds. There is no trim-in-motion clacker for any trim operation other than autopilot. Refer to LIMITATIONS, Section I, on use of the autopilot.

Flight Director

The autopilot is “coupled” to either Flight Director #1 (FD1) or #2 (FD2) by the XFR button on the Guidance Controller (GC). The default, on power up, is FD1. The coupled FD command bars and modes are displayed on both PFDs. The command bars and modes on the non-coupled side can be selected off with the FD button on the GC. With any vertical or lateral modes engaged, selecting XFR will result in all modes dropped to basic pitch (PIT) and roll (ROL). Selecting XFR with the autopilot not engaged will cause the flight director cues to clear.

Yaw Damper / Rudder Boost

The autopilot cannot be engaged without the yaw damper also being engaged. Disengaging the yaw damper will also disengage the autopilot. The rudder boost (RB) system is an integral part of the yaw damper. A monitored failure of either the RB or YD will disable the entire system. The capability exists for the pilot to clear some monitored failures. If the failure cannot be cleared, some system limitations may apply. Refer to LIMITATIONS, Section I, on use of the yaw damper/rudder boost.

Disengagement

The disengagement of the autopilot, whether manually by the pilot or by a monitored disconnect, is normally annunciated on the PFD and by an aural “cavalry charge” alert. Monitored disconnects result in a continuous “cavalry charge” that can only be silenced by depressing the control wheel master switch (MSW) for a short duration and releasing. This is usually accompanied by a red AP (autopilot fail) annunciation on the PFD.
Normal Procedures

Autopilot (Cont)

Depending upon the cause of the disconnect, depressing the MSW will reset the system (and allow normal re-engagement), “acknowledge” the failure and change the red AP annunciation to amber, or clear the red AP. Yaw damper (YD) and rudder boost (RB) monitored disconnect announcements are amber and change to steady after initially flashing. These are not accompanied by an aural alert. Engagement of the autopilot is not possible unless the monitored indication is acknowledged by depressing the MSW and the system resets.

Overspeed

The autopilot incorporates an overspeed protection mode that is functional in several vertical modes (on aircraft 45-002 thru 45-169 not modified by SB 45-22-4: VS, FLC and SPD; on aircraft 45-170 and subsequent and prior aircraft modified by SB 45-22-4: VS, FLC, SPD and PIT). When overspeed protection mode is active, MAXSPD is annunciated on the PFD and the system attempts to prohibit excursions beyond VMO/MMO. The engaged vertical mode status and reference on the PFD do not change, even though the computer is not providing guidance to this selected value. Once the overspeed state is exited, the MAXSPD annunciation is removed and the autopilot resumes the previous mode.

The FMS provides overspeed protection, with the same PFD annunciation, when in the VNAV mode. FMS overspeed protection is provided for VMO/MMO as well as VFE (flap overspeed). FMS overspeed protection will deviate away from the selected vertical path. Pilot action should be taken to reduce airspeed below VMO/MMO.
Cold Weather Operation

Operational problems related to cold weather may occur unless proper preflight and inspection procedures are accomplished. Additionally, operational difficulties due to ice, snow, slush, or water accumulation may be encountered. The following instructions supplement the normal procedures and, when followed, will help ensure satisfactory operation of the aircraft and its systems in cold climatic conditions.

Preflight Preparation

It is essential to take off with an aerodynamically clean airplane. Low temperatures and precipitation associated with cold weather operation create problems while the airplane is on the ground, in that frost, ice and snow adhere to and accumulate on the surfaces of the airplane. All surfaces of the airplane (wing, vertical and horizontal stabilizers, flight controls, spoilers and flaps) must be free of frost, ice and snow before takeoff. During periods of precipitation, once the airplane has been de-iced, anti-icing is likely to be required to ensure that the airplane remains aerodynamically clean for departure. De-icing/anti-icing must be accomplished at the last possible time prior to takeoff to maximize the time that anti-icing will be able to provide protection (holdover time). Refer to Learjet Addendum — DE-ICING/ANTI-ICING for de-icing/anti-icing procedures.

Preflight Inspection

1. Conduct normal exterior inspection.
2. Check the entire aircraft (including top surface of horizontal stabilizer) for ice, snow, and frost. Brush off light snow. Remove all frost, encrusted snow, and ice.
3. Remove ice, snow, and dirt from landing gear shock struts and wheel wells. Check gear doors, position switches, squat switches, wheels, brakes, and tires.
4. Carefully inspect engines for frozen precipitation in fan duct and tailpipe. Under certain climatic conditions, ice can form on the back of fan blades and cause vibration during start.
Cold Weather Operation (Cont)

APU and Engine Start

Refer to Ambient Temperature Limits and Engine Operating Limits, Section I.

Battery starts of the APU have been demonstrated at -23°C (-10°F).

For engine starts at or below an ambient temperature of 0°C (32°F), it is recommended that an EXT PWR source or APU (if installed) be used. If an external power source is used, ensure it is regulated to 28 VDC, has adequate capacity for engine starting and is limited to 1500 amps maximum. Allow the operating generator amperage to decrease below 300 amps prior to a generator cross-start.

If the engines are exposed to temperatures below -28°C (-18.4°F) for an extended period, the engines should be preheated prior to attempting a start. Direct warm air flow into each engine and oil service door prior to engine start. Ensure that the engine oil temperature indicators indicate above -28°C (-18.4°F) before attempting a start.

During engine starts in cold weather, engine acceleration is slower than normal. Additionally, higher than normal oil pressure can be expected.

BATT TEMPS digits (if equipped with Ni-Cad batteries), on EICAS, will be amber dashes if the battery temperature is colder than -25°C.

Taxiing

Use normal taxi procedures if the ramp and taxiways are clean and dry. If it is necessary to taxi on ice, snow, slush, or water, taxi at reduced speed and allow greater distance for decreased braking efficiency.

If taxi is to be accomplished through slush or snow, use the brakes to create some friction induced heating of the brake discs to prevent the brakes from freezing.

Use both engines for taxi on slippery surfaces. Directional control may be difficult to maintain during one-engine taxi on a slick surface.

Use anti-ice systems as required.

Insofar as possible, taxi should be accomplished with the flaps up on snow or slush covered surfaces.

Avoid taxiing in the exhaust wake or propeller wash of other aircraft on other than hard packed or dry surfaces.
Cold Weather Operation (Cont)

Thrust reversers should be used with extreme caution on slippery surfaces and only when absolutely necessary to maintain directional control.

Do not use thrust reversers if taxiways and ramps are covered with slush, ice, standing water or snow except in the interest of safety.

Use of reverse thrust on surfaces treated with sand or other materials may cause foreign object damage to engine fan blades.

Takeoff

If anti-ice systems are required for takeoff, the systems should be energized prior to setting takeoff thrust.

Refer to the CONTAMINATED RUNWAY DATA pertaining to takeoff on a contaminated runway.

Do not take off with frost, snow, or ice on the wings or aircraft control surfaces, including the horizontal stabilizer and elevators.

Even small accumulations of ice on the wing leading edge can cause an increase in stall speed and possibly, a degradation in stall characteristics. Accumulation of ice on the horizontal stabilizer may degrade pitch characteristics, and result in elevator buffet or stick pumping.

After Takeoff

After takeoff from a snow-covered or slush-covered runway, delay retracting landing gear to allow residual slush to be thrown or blown off.

Landing

Refer to the CONTAMINATED RUNWAY DATA pertaining to landing on a contaminated runway.

After Clearing Runway

For taxi after landing on a slush or snow covered field, it is recommended that the flaps not be retracted above 20°. This will protect flaps and wing from damage in the event ice or snow has accumulated on the flaps.
Normal Procedures

Cold Weather Operation (Cont)

Shutdown and Postflight

When the aircraft must be parked outside in extremely cold or fluctuating freeze/thaw temperatures, perform the following in addition to the normal shutdown and postflight procedures:

1. Chock main gear wheels before releasing parking brake. Do not leave aircraft parked in sub-freezing weather with parking brake set.
2. Remove ice, snow, and dirt from landing gear shock struts and wheel wells. Check gear doors, position switches, squat switches, wheels, and tires.
3. Remove ice, snow, and dirt from flaps and flap tracks before retracting flaps.
4. If the aircraft is to be parked for an extended period at ambient temperatures of -5°C or below, it is recommended that the oxygen be turned off, or the crew oxygen masks be disconnected and stowed in a heated room, or the cabin should be warmed to at least -5°C before use.
5. If the aircraft is to remain in subfreezing temperatures for an extended period, remove water and beverage containers from the aircraft. Disconnect water supply tank, depress faucet cold tap and pump water from the line. Ensure the toilet is serviced to prevent freezing of the flush fluid.
6. Install aircraft protective covers.
7. If the aircraft will be exposed to extremely cold temperatures for an extended period, it is recommended that the batteries be removed and stored in a warm area if possible.
Crew Warning Panel (CWP)

The CWP is located on the center instrument panel. All red lights located in the CWP are duplicated by independent red CAS messages. The only exceptions are the engine fire indicators and APU fire indicator (if installed) which are located in the pedestal. The REV UNSAFE lights of the CWP are expanded into multiple EI illuminations. The CWP also generates tones and voices which are transmitted through the audio system to both pilots’ headphones and cockpit speakers.

The CWP lights are all red except for the white EMER BATT. The white EMER BATT light is illuminated whenever the emergency battery is being discharged. Each light incorporates multiple lighting elements which are powered from the L and R ESS buses. The CWP is dimmed by day/night logic controlled by the NAV lights switch.

A CWP light will illuminate when triggered by the associated system fault and remain illuminated as long as the fault condition exists. If the condition is corrected, the light will extinguish. If the condition recurs, the light will again illuminate.

Refer to the LTS Check of the SYSTEM OPERATIONAL CHECKS EXPANDED procedures, this section, for testing CWP annunciations.
Normal Procedures

Electrical

**EMER BATT Illuminated on CWP**

The emergency battery is being discharged. This illumination is normal during engine start, and when operating without generator or external power. If battery discharge condition persists, the EMER BUS VOLTS amber CAS will illuminate. All services provided by the emergency battery may be lost after 1 hour. The following conditions will exist when the emergency battery has discharged:

- Inboard brakes inoperative. Refer to Emergency Braking procedure, Section III.
- Passenger oxygen deploy function inoperative. Deploy masks prior to power loss or descend to 15,000 feet or minimum safe altitude. Refer to PAX OXY FAIL procedure, Section IV.
- Normal landing gear function inoperative. Refer to Landing Gear Free Fall procedure, Section IV.
- DAU 1 Channels 1A and 2A are inoperative. Select DAU Switch [REVERSION] — Channel B.
- Standby attitude inoperative. Do not reference this instrument, pull and cage.
- Standby altimeter vibrator inoperative. Do not reference this instrument for primary altitude.

Engines

**Automatic Performance Reserve (APR)**

Automatic performance reserve (APR) provides a change in thrust on the operating engine in the event of opposite engine thrust loss. The APR is controlled by the APR switch located on the aft portion of the pedestal. Depressing the switch illuminates ARM on the switch. An APR white EI will then illuminate once the system is armed by the DEECs. When armed, each DEEC monitors the opposite engine in order to automatically increase the maximum available thrust if the opposite engine fails. An APR ON green EI will illuminate during automatic APR activity or manual activation. APR may be manually activated by advancing the thrust lever to the APR detent. APR does not need to be armed for manual activation. The engine synchronizers will not function during APR operation. An L or R APR FAULT white CAS will illuminate during APR malfunctions.

If APR has been automatically activated, depressing the APR switch will deactivate the system. If APR has manually been activated, moving the thrust lever out of the APR detent will deactivate the system.
Environmental/Pressurization

Pressurization System

The cabin climb and descent rates are based upon the takeoff altitude, aircraft rate of climb or descent, the set landing altitude and maximum allowable cabin differential pressure schedule. The rate will vary depending upon these conditions. Selection of MANUAL PRESS allows manual control of the climb or descent rate only using the MANUAL DN UP control.

The pressurization system provides the capability to operate at high-altitude fields (8000 - 13,700 ft elevation) without triggering annunciations and emergency pressurization. The logic employed for this feature is as follows:

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Pressurization system will:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TAKEOFF</strong></td>
<td></td>
</tr>
<tr>
<td>Takeoff from field elevation less than 8000 ft</td>
<td>Annunciate loss of cabin pressure if cabin altitude exceeds 8750 ft. - Activate emergency pressurization if cabin altitude exceeds 9500 ft. - Activate cabin altitude warning voice if cabin altitude exceeds 10,000 ft. - Aircraft 45-236 &amp; subsequent and prior aircraft modified by SB 45-22-5, activate CABIN ALTITUDE red CAS and CABIN ALT red CWP if cabin altitude exceeds 10,000 ft.</td>
</tr>
<tr>
<td>Takeoff from field elevation greater than 8000 ft</td>
<td>Annunciate loss of cabin pressure if cabin altitude exceeds 14,500 ft. - Activate emergency pressurization if cabin altitude exceeds 14,500 ft. - Activate cabin altitude warning voice if cabin altitude exceeds 14,500 ft. - Aircraft 45-236 &amp; subsequent and prior aircraft modified by SB 45-22-5, activate CABIN ALTITUDE red CAS and CABIN ALT red CWP if cabin altitude exceeds 14,500 ft. When the aircraft climbs above 24,500 ft: Resume settings specified in &quot;Takeoff from field elevation less than 8000 ft&quot;.</td>
</tr>
<tr>
<td><strong>LANDING</strong></td>
<td></td>
</tr>
<tr>
<td>Landing at field elevation less than 8000 ft (as selected on LDG ALT)</td>
<td>Annunciate loss of cabin pressure if cabin altitude exceeds 8750 ft. - Activate emergency pressurization if cabin altitude exceeds 9500 ft. - Activate cabin altitude warning voice if cabin altitude exceeds 10,000 ft. - Aircraft 45-236 &amp; subsequent and prior aircraft modified by SB 45-22-5, activate CABIN ALTITUDE red CAS and CABIN ALT red CWP if cabin altitude exceeds 10,000 ft.</td>
</tr>
<tr>
<td>Landing at field elevation greater than 8000 ft (as selected on LDG ALT)</td>
<td>Maintain the settings specified in &quot;Landing at field elevation less than 8000 ft (as selected on LDG ALT)&quot; until the aircraft descends below 24,500 ft. When the aircraft descends below 24,500 ft: Annunciate loss of cabin pressure if cabin altitude exceeds 14,500 ft. - Activate emergency pressurization if cabin altitude exceeds 14,500 ft. - Activate cabin altitude warning voice if cabin altitude exceeds 14,500 ft. - Aircraft 45-236 &amp; subsequent and prior aircraft modified by SB 45-22-5, activate CABIN ALTITUDE red CAS and CABIN ALT red CWP if cabin altitude exceeds 14,500 ft.</td>
</tr>
</tbody>
</table>

Applicable operating rules, pertaining to the use of oxygen at high cabin altitude, must be observed.

The optional cabin 110 vac/60 hz (or 230 vac/50 hz) AC electrical power is automatically disabled when the cabin altitude exceeds 9500 ft.
Normal Procedures

Oxygen System

Smoking is prohibited while oxygen system is in use.

Oxygen Duration

Figure 4-3, in Section IV, shows oxygen supply duration as a function of quantity, cabin altitude and number of occupants using the system. Prior to extended overwater flights, plan oxygen requirements to provide sufficient oxygen for all occupants in the event of a pressurization failure. Additional oxygen may be required to assure that both oxygen duration and range (fuel) requirements are satisfied.

Passenger Oxygen

1. With the PAX OXY/AUTO switch OFF, no oxygen is supplied to the cabin.
2. With the passenger oxygen valve in the automatic mode (PAX OXY/AUTO switch not illuminated), oxygen is available to the passenger oxygen distribution system and the passenger oxygen masks will drop from their storage compartments if the cabin altitude reaches 14,500 feet. Whenever the oxygen masks deploy, the overhead lights will illuminate to provide maximum visibility for donning masks.
3. With DEPLOY Switch (PAX OXYGEN) ON, the passenger oxygen masks will drop from their storage compartments. The passengers must don the masks and pull the attached lanyards to start the flow of oxygen. This should be used if automatic presentation of the masks does not occur.
4. Deploy passenger oxygen if pressurization irregularities are encountered above 10,000 feet MSL.

NOTE

The rebreather bag may not inflate even though oxygen is flowing. This is normal.
Crew Oxygen

The flight crew oxygen masks are stowed in accessible stowage cups over each crew member’s outboard shoulder. The pneumatic harness oxygen crew mask contains a mask mounted automatic diluter-demand regulator with controls for normal diluter, 100% or emergency oxygen. The mask is normally stowed with 100% selected. The mask can be donned and functioning within 5 seconds by using one hand.

On some masks, a “comfort control” feature allows the tension in the harness to be adjusted by adding or reducing pressure in the harness.

1. **If oxygen is required by the crew only:**
   a. PAX OXY/AUTO Switch — OFF.
   b. DEPLOY Switch (PAX OXYGEN) — Off.

2. When oxygen masks are worn by the crew:
   a. Pilot and Copilot MIC/MASK Selector Switches — MASK.
   b. Pilot and Copilot INPH Selector Switches — INPH.

   **NOTE**
   
   With the MIC/MASK switches in the MASK position and the INPH selector switches out (enabled), both cockpit speakers, phone and interphone functions will be activated, enabling the crew to communicate via the interphone.
Normal Procedures

Oxygen System (Cont)

Puritan-Bennett Sweep-On 2000 Crew Oxygen Mask

Preflight

1. Turn control knob to EMER and verify oxygen flow.
2. Turn control knob to 100%.
3. Place hose in seat pocket.

Operation

1. Remove hats and “ear muff” type headsets.
2. Grasp mask by the regulator with the palm of the hand against the control knob.
3. Pull mask from the stowage cup.
4. Place the thumb and middle fingers on the black and red tabs located on opposite sides of the regulator.
5. Depress and hold the red inflation control tab firmly to inflate the harness assembly.
6. Place the harness over the head and lower it until the black head pad contacts the top of the head.
7. Place the face seal over the nose and mouth.
8. Release the red inflation control tab. The harness assembly will deflate and assume a safe, secure and tight position on the head and face.
9. Ensure the mask is properly sealed. Adjust mask fit if required.

NOTE

Beards worn by crew members may make proper sealing of the mask more difficult.

10. Pilot and Copilot MIC/MASK Selector Switches — MASK.
11. Pilot and Copilot INPH Selector Switches — INPH.

NOTE

With the MIC/MASK switches in the MASK position and the INPH selector switches out (enabled), both cockpit speakers, phone and interphone functions will be activated, enabling the crew to communicate via the interphone.

If positive pressure breathing is necessary:

12. Turn red control knob to EMER.

Donning Smoke Goggles (if required)

1. Smoke Goggles — Don.
2. Turn red control knob to EMER. A purge valve will automatically bias open.
Oxygen System (Cont)

Puritan-Bennett Sweep-On 2000 Crew Oxygen Mask (Cont)

Adjusting Harness Tension (if applicable)
1. After the harness assembly has deflated, depress the red inflation control tab firmly in a pulsing manner until a desirable fit is reached.
2. If the harness over inflates, depress the red inflation control tab for a slightly longer time to deflate the harness and increase the tension.

Mask Removal
1. Depress and hold the red inflation control tab until the harness fully inflates.
2. Remove the mask and release the red inflation control tab.

NOTE
Do not tuck harness inside face cone. Crew masks should be stowed with 100% selected.

Puritan-Bennett Crew Oxygen Mask Packing Instructions
Figure 2-3
Normal Procedures

**Oxygen System (Cont)**

**EROS Crew Oxygen Mask**

**Preflight**

1. Press the red control knob on bottom of regulator and verify oxygen flow.
2. Push the N-100% red control lever to 100%.
3. Place hose in seat pocket.

**If adjustable crew mask is installed:**

   a. Set the black adjustable harness toggle to NORM and turn the roller control up to MAX.

**Operation**

1. Remove hats and “ear muff” type headsets.

   **NOTE**

   Headsets and eyeglasses worn by crew members may interfere with quick-donning capabilities.

2. With the mask in the stowage cup, grasp the regulator firmly by the red tabs with the thumb and forefinger and depress the red inflation control tab.
3. Pull mask from the stowage cup. Ensure the mask-regulator slides along the slots of the stowage cup.
4. While holding the inflation control tab depressed, position the harness over the head. Lower the mask onto the head in a wide arc from the brow to the chin.
5. Grasp the mask firmly and pull the mask away from the face until the harness is against the back of the head.
6. Release the thumb or forefinger from the red inflation control tab to deflate the harness. Guide the mask into position on the face.
7. Ensure the mask is properly sealed. Adjust mask fit if required.

   **NOTE**

   Beards worn by crew members may make proper sealing of the mask more difficult.

8. Pilot and Copilot MIC/MASK Selector Switches — MASK.
9. Pilot and Copilot INPH Selector Switches — INPH.

   **NOTE**

   With the MIC/MASK switches in the MASK position and the INPH selector switches out (enabled), both cockpit speakers, phone and interphone functions will be activated, enabling the crew to communicate via the interphone.

**If positive pressure breathing is necessary:**

10. Push the red N-100% lever to 100% and turn the red control knob on bottom of regulator to EMERGENCY.
Normal Procedures

Oxygen System (Cont)

EROS Crew Oxygen Mask (Cont)

Donning Smoke Goggles (if required)
1. Smoke Goggles — Don.
2. OPEN purge valve on top of oxygen mask.
3. Turn the red control knob on bottom of regulator to EMERGENCY.

Adjusting Mask
1. After the harness has deflated, depress the inflation control tab to partially inflate the harness until the mask can be easily moved.
2. Adjust the mask for optimum fit and release the inflation control tab.

Adjusting Harness Tension (if applicable)
1. Switch the toggle to COMF.
2. Turn the roller control up to MAX.
3. Depress the inflation control tab to slowly inflate the harness.
4. Release the inflation control tab when a comfortable mask tension is achieved.
5. Rotate the roller control down to reduce the harness residual pressure.
6. To relax the harness and readjust the mask, depress the inflation control tab to obtain a comfortable setting.

Emergency with Toggle in COMF Position (if applicable)
1. If an emergency occurs while the harness is relaxed, switch the toggle back to NORM. The harness will immediately deflate and apply full tension to the head.

Mask Removal (if applicable)
1. Switch the toggle to NORM.
2. Depress the red inflation control tab to inflate the harness.
3. Remove the mask and harness while depressing the inflation control tab.
Normal Procedures

Oxygen System (Cont)

EROS Crew Oxygen Mask (Cont)

1) GRASP MASK-REGULATOR, POSITION HARNESS BEHIND MASK.

2) PRESS HARNESS INTO STOWAGE CUP, BACK OF HARNESS FIRST.

3) PLACE MASK-REGULATOR INTO STOWAGE CUP. ENSURE THE MASK-REGULATOR SLIDES ALONG SLOTS OF STOWAGE CUP.

4) ENGAGE REGULATOR COVERPLATE WITH STOWAGE CUP SLOT.

5) PRESS REGULATOR INTO STOWAGE CUP UNTIL RED TAB CLICKS.

6) ENSURE MASK-REGULATOR IS FULLY SEATED IN STOWAGE CUP.

CAUTION

Do not damage the tabs on the regulator.

NOTE

Crew masks should be stowed with 100% selected.

EROS Crew Oxygen Mask Packing Instructions
Figure 2-4
Flight Controls

ELEV DISC

Do not intentionally disconnect the elevators except as specified in EMERGENCY PROCEDURES in Section III, this manual.

ROLL DISC

Do not intentionally disconnect the flight controls for roll except as specified in EMERGENCY PROCEDURES in Section III, this manual.
Normal Procedures

Fuel System

Ground Operation
Indicated fuel quantities, with engines running (motive flow operating), are accurate for all steady state ground operations. Partial wing quantities require engines running (motive flow operating) for best accuracy.

Inflight Operation

Fuselage Tank
Indicated fuel quantity for the fuselage tank is accurate throughout the flight envelope.

Wing Tank
Indicated fuel quantities for full wings are accurate for steady state, unaccelerated cruise flight conditions.

During climb, the indicated fuel quantity for full wings will decrease by up to 200 pounds (91 kilograms) per wing, depending on pitch attitude, with a corresponding decrease in total fuel quantity. After level off, the indicated fuel quantity will return to full wings, with a corresponding increase in total fuel quantity.

When the fuselage fuel is empty, the indicated fuel quantities for partial wing fuel are accurate for coordinated, unaccelerated flight conditions between -2° and +5° pitch, with the following exceptions:

- Indicated wing fuel quantities between approximately 1500 and 1200 pounds (681 and 544 kilograms) will generally indicate low (less than actual fuel quantity) by up to 200 pounds (91 kilograms) per wing. Up to two separate step increases of 100-200 pounds (45-91 kilograms) per wing may be noted in this fuel quantity range as the indicated wing quantities return to a more accurate value. Below approximately 1200 pounds (544 kilograms) per wing, indicated fuel quantities are accurate. Crossflow operations between 1500 and 1200 pounds (681 and 544 kilograms) may create a fuel imbalance due to indication inaccuracies.

Avoid fuel crossflow operations when wing quantities indicate between 1500 and 1200 pounds (681 and 544 kilograms), when practical.

- Small rudder out-of-trim condition may cause indicated fuel quantity imbalances. Prior to fuel crossflow operations, check and adjust rudder trim as necessary to ensure trimmed flight condition. (A quarter of a ball out may result in approximately 300 pound (136 kilogram) imbalance.)
Fuel System

Ground Operation
Indicated fuel quantities, with engines running (motive flow operating), are accurate for all steady state ground operations. Partial wing quantities require engines running (motive flow operating) for best accuracy.

Inflight Operation
Indicated fuel quantities are accurate for steady state, coordinated, un-accelerated flight conditions between -2° and +5° pitch.

NOTE
Small rudder out-of-trim condition may cause indicated fuel quantity imbalances. Prior to fuel cross-flow operations, check and adjust rudder trim as necessary to ensure coordinated flight.
Icing

Anti-Ice Systems

Anti-ice systems should be turned on prior to operation in icing conditions. Icing conditions exist when the SAT is 10°C to -40°C, and visible moisture in any form is present (e.g. clouds, rain, snow, sleet, ice crystals, or fog with visibility of 1 mile or less).

Due to the increased idle schedule of the engines with anti-ice systems on, use of spoilers may be required for descents and/or decelerations. Descents with any anti-ice system on may need to be planned and initiated further from the destination. Also, radar returns may be affected by ice accumulations on the nose. Normal weather displays are masked by dark spots on the display due to the ice, which are similar to no weather returns. Additional care should be taken when in icing conditions to properly interpret the weather display.

Minimize the duration of icing encounters as much as practical. Minimize holding in icing conditions with flaps extended. This includes requesting an altitude above or below icing conditions, if practical.

Intermittently operating with the autopilot off will allow more readily detectable changes in flight control feel.

If flight has been conducted in icing conditions, remove any accumulated ice prior to next flight.

Aircraft anti-icing is accomplished through the use of electrically heated anti-ice systems and engine bleed-air heated systems. Electrically heated systems include pitot-static probes, total temperature probe, stall warning vanes, engine inlet air temperature/pressure sensors, and the windshields. Engine bleed air is used to heat the wing leading edge, horizontal stabilizer leading edge and nacelle inlets.

When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

System controls are as follows:

WING/STAB Switch — Controls wing and horizontal stabilizer heat system. High pressure bleed air is modulated automatically to maintain a constant leading edge temperature. The switch illuminates ON.

Select WING/STAB switch — ON at least 2 minutes prior to selecting takeoff power for takeoff.
Normal Procedures

Icing (Cont)

L and R NAC Switches — Control engine inlet high pressure bleed air and engine air temperature/pressure sensor electric heaters. The switch illuminates ON.

L and R PROBES Switches — Control electric pitot-static probe, total temperature probe, and stall warning vane heaters. The switches illuminate OFF.

L and R WSHLD Switches — Control the electric heaters in the windshield for exterior anti-ice and interior defog. The switches illuminate OFF.

Ice Detection

Illumination of an ICE DETECTED white CAS indicates that ice has been detected when the anti-ice systems are on. Illumination of an ICE DETECTED amber CAS indicates that ice has been detected when the anti-ice systems are off, in which case the pilot should immediately select the anti-ice systems on.

In addition to the ice detect probe, during daylight operations, a visual inspection of the lower forward corner of each windshield (below the windshield heat bus bar) or the wing leading edge can be made.

During night operations, the wing inspection light may be used to visually inspect the right wing leading edge for ice accumulation. The light is illuminated by pressing the WING INSP light button on the LIGHTS panel. The light illuminates a black dot on the outboard leading edge to enhance visual detection of ice accumulation.

- The wings, vertical and horizontal stabilizers, flight control surfaces, and engine inlets must be free of frost, snow, and ice prior to flight.

- Even small accumulations of ice on the wing leading edge can cause an increase in stall speed and possibly, a degradation in stall characteristics. Accumulation of ice on the horizontal stabilizer may degrade pitch characteristics, and result in elevator buffet or stick pumping.

Anti-ice systems should be turned on prior to flight into visible moisture and Static Air Temperature of 10°C to -40°C.
Nose Wheel Steering System

Nose wheel steering can be selected ON by momentarily depressing the NOSE STEER switch. Nose wheel steering can be disengaged by either momentarily depressing the NOSE STEER switch or depressing the control wheel master switch (MSW). The nose wheel steering system receives commands through the rudder pedal position and rudder force sensors. Once a rudder pedal has reached its stop, further nose wheel displacement is generated by additional force being applied to that rudder pedal.

Reduced Vertical Separation Minimums (RVSM)

This aircraft has been shown to meet the airworthiness requirements for operation in Reduced Vertical Separation Minimum (RVSM) airspace between 29,000 and 41,000 feet inclusive. This does not constitute an operational approval.

Before Starting Engines

1. Altimeters — Set pilot, copilot and standby. Verify the pilot’s and copilot’s altimeters agree within 75 feet of the local field elevation.

Cruise

The autopilot Altitude Hold (ALT) mode should be operative and engaged during level cruise except when circumstances such as the need to retrim the aircraft or turbulence require disengagement. If autopilot is coupled to the pilot’s flight director, select ATC 1 as the active transponder. If autopilot is coupled to the copilot’s flight director, select ATC 2 as the active transponder.
System Operational Checks Expanded

SYS TEST/RESET Switch Amplified Checks:

Lights (LTS)

1. LTS — Check.

   Depressing and holding the SYS TEST/RESET Switch in the LTS position results in the following indications:
   - Illumination of all switch indicator lights.
   - Illumination of all CWP annunciators.
   - Progressive illumination of all Guidance Control panel green lights

   If the SYS TEST/RESET Switch is held for more than 15 seconds and released, the following voice messages and tone alerts will sound:
   - OVERSPEED
   - STALL
   - CABIN ALTITUDE
   - CONFIGURATION
   - Cavalry Charge (autopilot disconnect tone)
   - GEAR (warning)
   - LEFT ENGINE FIRE
   - RIGHT ENGINE FIRE
   - LEFT REVERSER UNSAFE
   - RIGHT REVERSER UNSAFE
   - BRAKES FAIL
   - Single Tone (altitude alert)
   - MINIMUMS MINIMUMS
   - Triple Chime (Master Warning)
   - GEAR (caution)
   - Single Chime (Master Caution)
   - Alarm Clock Tone
   - SELCAL Alert*

* This test function aural is not disabled, even though the system may be inoperative or not installed.

(Continued)
System Operational Checks Expanded (Cont)

Air Data Computer (ADC)

1. ADC — Check.
   - “OVERSPEED” voice.
   - Red ADC TEST message in upper left of the ADI sphere.
   - Airspeed — 330 knots.
   - Altitude — 1000 feet.
   - Vertical speed — +5000 feet per minute.
   - Mach — 0.81.
   - Overspeed warning bar at 330 knots and above.

   **NOTE** If flaps are not at 0°, the overspeed warning bar will be less than 330 knots due to a flap overspeed.

   - Altitude trend vector at 1500 ft.
   - TAS on MFD at 466 knots.
   - SAT on MFD at -45 degrees.
Normal Procedures

**Turbulent Air Penetration**

Flight through severe turbulence should be avoided. When flying at 30,000 feet or higher, it is not advisable to avoid a turbulent area by climbing over it unless it is obvious that it can be overflown well in the clear. For turbulence of the same intensity, greater buffet margins are achieved by flying the recommended speeds at reduced altitude.

1. Airspeed — 250 KIAS or 0.73 M I, whichever is less. Severe turbulence will cause large and often rapid variations in indicated airspeed. **Do not chase the airspeed.**
2. Thrust — L & R IGN Switches — ON. Make an initial thrust setting for the target airspeed. **Change thrust only in the case of extreme airspeed variation.**
3. Attitude — Maintain wings level and desired pitch attitude. Use attitude indicator as the primary instrument. In extreme drafts, large altitude changes may occur. **Do not use sudden large control movements.**
4. Stabilizer — Maintain control of the airplane with the elevators. After establishing the trim setting for penetration speed, **do not change the stabilizer trim.**
5. Altitude — Allow the 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.**
6. Autopilot and Yaw Damper:
   a. Yaw Damper — Engaged.
   b. If severe turbulence is penetrated with autopilot engaged, use attitude hold mode.
## SECTION III — EMERGENCY PROCEDURES

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Introduction to Emergency Procedures

The procedures in this section of the manual have been developed by Learjet Inc. for certification of this aircraft. This section contains those operating procedures requiring the use of special systems and/or regular systems in order to protect the occupants and the aircraft from harm during a critical situation requiring immediate response. Procedures or parts of procedures in this section emphasized by enclosure in a box such as this and boldfaced should be accomplished without reference to this manual (memorized). Data that is enclosed in a box but not boldface need not be memorized.

The procedures located in this section are to be used when an emergency condition exists. Sound judgement as well as thorough knowledge of the aircraft, its characteristics, and the flight manual procedures are essential in the handling of any emergency situation.

OVERRIDING CONSIDERATIONS

In all emergencies, the overriding consideration must be to:

- Maintain Airplane Control
- Analyze the Situation
- Take Proper Action

Terminology

Many emergencies require some urgency in landing the aircraft. The degree of urgency required varies with the emergency; therefore, the terms “land as soon as possible” and “land as soon as practical” are employed. These terms are defined as follows:

Land as soon as possible — A landing should be accomplished at the nearest suitable airfield considering the severity of the emergency, weather conditions, field facilities, ambient lighting, and aircraft gross weight.

Land as soon as practical — Emergency conditions are less urgent, and although the mission is to be terminated, the degree of the emergency is such that an immediate landing at the nearest adequate airfield may not be necessary.

EICAS

EICAS illuminations described in this section should be considered red unless otherwise indicated.

Refer to the INTRODUCTION Section for additional definition and explanation of manual format.
Emergency Procedures

**STAB OVHT**

A stabilizer anti-ice overheat condition exists. This indication can activate even if the WING/STAB switch is selected off.

1. WING/STAB Switch — Off.
2. Fly out of icing conditions.
3. L and R WING/STAB HT Circuit Breakers (respective ANTI-ICE group) — Pull.

If approach and landing must be made with any ice or suspected ice:

a. Refer to Abnormal Landings, Wing and Stabilizer Heat Failure Landing procedure, Section IV.

**WARNING**

Even small accumulations of ice on the wing leading edge can cause an increase in stall speed, and possibly, a degradation in stall characteristics. Elevator buffet or stick pumping indicate ice may have formed on the stabilizer.

**WING OVHT**

A wing anti-ice overheat condition exists. This indication can activate even if the WING/STAB switch is selected off.

1. WING/STAB Switch — Off.
2. Fly out of icing conditions.
3. L and R WING/STAB HT Circuit Breakers (respective ANTI-ICE group) — Pull.

If approach and landing must be made with any ice or suspected ice:

a. Refer to Abnormal Landings, Wing and Stabilizer Heat Failure Landing procedure, Section IV.

**WARNING**

Even small accumulations of ice on the wing leading edge can cause an increase in stall speed, and possibly, a degradation in stall characteristics. Elevator buffet or stick pumping indicate ice may have formed on the stabilizer.
WING/STAB LEAK
A leak detection sensor along the ducting for the wing or stabilizer anti-ice system has activated.

1. WING/STAB Switch — Off.
2. Fly out of icing conditions.
3. L and R WING/STAB HT Circuit Breakers (respective ANTI-ICE group) — Pull.

If approach and landing must be made with any ice or suspected ice:

a. Refer to Abnormal Landings, Wing and Stabilizer Heat Failure Landing procedure, Section IV.

Even small accumulations of ice on the wing leading edge can cause an increase in stall speed, and possibly, a degradation in stall characteristics. Elevator buffet or stick pumping indicate ice may have formed on the stabilizer.

APU FIRE (If Installed)
Indicates an APU fire. The system should automatically shut the APU down and activate the fire extinguisher. An external APU fire horn will sound.

On the ground:

1. APU FIRE Switch — Lift guard, FIRE PUSH.
2. APU MASTER Switch — Off.
3. Stop the aircraft.
4. EMERGENCY/PARKING BRAKE Handle — Set.
5. Thrust Levers — CUTOFF.
6. EMER LIGHTS Switch — ON.
7. EMER BATT, L and R BATT Switches — OFF.
8. Evacuate the aircraft.
   a. Cabin Entry Door — Open and exit the aircraft.
   b. Aft Emergency Exit — Open and exit using the wing step area.

In flight:

1. APU FIRE Switch — Lift guard, FIRE PUSH.
2. R STBY Switch (Fuel) — Off, unless required for engine operation or fuel transfer.
3. Land as soon as possible.
Emergency Procedures

Cabin/Cockpit Fire, Smoke or Fumes

1. Crew Oxygen Masks — Don. Select 100% oxygen.
2. Smoke Goggles — Don.
3. EMER DEPRESS Switch — Lift guard, ON.
4. Pilot and Copilot MIC/MASK Switches — MASK.
5. Pilot and Copilot INPH Selector Switches — INPH. (enabled)

- It may be necessary to select EMER on the crew oxygen mask regulator if mask does not seal properly.
- The cabin altitude will climb to aircraft altitude or approximately 13,700 feet which ever is lower and stabilize with EMER DEPRESS switch ON.

Whether or not smoke has dissipated, if it cannot be visibly verified that the fire has been extinguished:

6. Cockpit Door/Curtain — Open.
7. Land as soon as possible.

8. **Source Is Not Known**
   a. Isolate source of smoke or fumes, and go to one of the following procedures:
      - Bleed Air System,
      - Normal Electrical System,
      - Emergency Electrical System.

8. **Source Is Known**
   a. Extinguish fire using hand-held extinguisher or eliminate the source of smoke or fumes.

   **NOTE**: Crew exposure to high levels of Halon fire extinguisher vapors may result in dizziness, impaired coordination and reduced mental alertness.

   b. **If fire is not extinguished:**
      (1) Land as soon as possible.
      (2) This checklist is complete.

   b. **If fire is extinguished and can visibly be verified:**
      (1) Land as soon as practical. At the crew’s discretion, the pressurization and oxygen systems may be returned to normal.
      (2) This checklist is complete.
Emergency Procedures

Cabin/Cockpit Fire, Smoke or Fumes (Cont)

Bleed Air System Is Suspected Source

1. R BLEED Switch — OFF.
2. ● If smoke or fumes continue:
   a. R BLEED Switch — On.
   b. L BLEED Switch — OFF.
   c. ● If smoke or fumes continue:
      1) L BLEED Switch — On.
      2) Refer to one of the following procedures:
         - Normal Electrical System Is Suspected Source,
         - Emergency Electrical System Is Suspected Source.
   c. ● If smoke or fumes are eliminated:
      1) Maintain 41,000 feet or below. Avoid flight in icing conditions. At the crews discretion, the pressurization and oxygen systems may be returned to normal.
      2) Land as soon as practical.
      3) This checklist is complete.

NOTE ➤ When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

(Continued)

Normal Electrical System Is Suspected Source

1. L and R NON-ESS Switches — OFF.
2. FLOOD Light Switch — On for night operation.
3. L and R MAIN Switches — OFF.

(Continued)
Cabin/Cockpit Fire, Smoke or Fumes (Cont)

The following conditions will exist (L and R MAIN Switches — OFF):
- L and R pitot heat inoperative (avoid visible moisture); STBY pitot heat operative.
- Recognition and taxi/landing lights inoperative.
- COM 2, NAV 2, ATC 2 inoperative.
- L CAB PRESS FAIL white CAS.

4. If smoke or fumes continue, operate on EMER BATT as follows:

Operative equipment associated with flight:
- Standby airspeed, altimeter & vibrator, and lighting.
- Standby attitude and lighting.
- RMU 1 Engine Display: N1, N2, OIL °C and EMER (bus volts). (RMU ENGINE PAGE 2 AMP display may indicate up to 15 amps with the generators off.)
- Right cabin pressure control, use MANUAL rate control.
- Nacelle heat fails ON.
- Landing gear.

Inoperative equipment associated with flight:
- Primary displays.
- Pitch, aileron, and rudder trims.
- Flaps.
- Spoilers/spoilerons.
- Probe heats.
- Wing/Stab and windshield heat.
- External lights.
- Transponder.
- Stall warning system.

a. On aircraft 45-002 thru 45-225 not modified by SB 45-55-6, maintain 33,000 ft or below.

b. Airspeed — Reduce to the slower of 200 KIAS or 0.7 M1, or slower if necessary.

(Continued)
Cabin/Cockpit Fire, Smoke or Fumes (Cont)

c. If conditions permit, select flaps 20° (maximum) and retrim as necessary for landing.
d. L and R ENG CMPTR Switches — MAN.
e. L and R GEN Switches — OFF.
f. L and R BATT Switches — OFF.
g. Refer to LR GEN FAIL procedure, Figure 3-1, this section, for emergency battery duration.

On aircraft 45-006 thru 45-011 not modified by SB 45-23-1, interphone (INPH) communication will not be available between pilot and copilot when L and R BATT switches are selected OFF.

h. RADIO CTL HOT BUS Switch — ON.
i. CLR DLY MODES Switch — EMRG.
j. Use the clearance delivery radio.
k. Use RMU 1 for engine pages.
l. **If smoke or fumes continue:**
   The malfunctioning system is connected to the EMER BATT bus.
   (1) L and R BATT Switches — On.
   (2) L and R GEN Switches — On.
   (3) L and R MAIN Switches — On.
   (4) L and R ENG CMPTR Switches — ON.
   (5) Allow attitude and air data display flags to clear.
   (6) Refer to Emergency Electrical System Is Suspected Source procedure, next page.

m. **If smoke or fumes dissipate:**
   (1) Land as soon as possible. At the crew’s discretion, the pressurization and oxygen systems may be returned to normal.
   (2) Refer to Abnormal Landings, Normal Electrical System Failure Landing procedure, Section IV.

**4. If smoke or fumes dissipate:**
a. Land as soon as possible. At the crew’s discretion, the pressurization and oxygen systems may be returned to normal.
b. This checklist is complete.
Cabin/Cockpit Fire, Smoke or Fumes (Cont)

Emergency Electrical System is Suspected Source

1. EMER BATT Switch — OFF.
2. BUS Circuit Breaker (pilot’s ELECTRICAL group [EMER BUS]) — Pull.

NOTE

All components on the emergency battery have been shut off. R CAB PRESS FAIL, DAU 2A FAIL or DAU 1A FAIL, white CAS will illuminate.

3. Standby Instruments — Cage attitude indicator, use primary instruments.
4. DAU Switch [REVERSION] — Channel B. (DAU 1 channel A is inoperative.)
5. Yaw Damper — As required.
6. Land as soon as practical. At the crew’s discretion, the pressurization and oxygen systems may be returned to normal.
7. Refer to Landing Gear Free Fall procedure, Section IV, to extend landing gear prior to landing.
8. Refer to Abnormal Landings, Emergency Brake Landing procedure, Section IV.
ENTRY DOOR

One or more of the locking pins in the entry door may not be fully engaged.

Door failure may be indicated by loud noise, pressurization leak, or rumble emanating from door area. **Do not approach door.**

**ENTRY DOOR Accompanied by Evidence of Door Failure**

1. NO SMOKING BELTS Switch — On.
2. EMER DEPRESS Switch — Lift guard, ON. The cabin altitude will climb to approximately 13,700 feet and stabilize.
3. Airspeed — Reduce to the slower of 250 KIAS or 0.7 M I, or slower if necessary.
4. Establish descent to reduce cabin delta pressure, but not lower than the minimum safe altitude.
5. Land as soon as practical.

**NOTE** Applicable operating rules pertaining to the use of oxygen at high cabin altitude must be observed.

**ENTRY DOOR Not Accompanied by Evidence of Door Failure**

1. NO SMOKING BELTS Switch — On.
2. Continue flight. The most probable cause is a latch pin switch malfunction.

**L BATT OVHT**

**R BATT OVHT** *(Nickel-Cadmium Batteries Only)*

The respective battery internal temperature has exceeded 70°C. The battery should switch off automatically.

1. EICAS — Select ELEC or SUMRY page. Monitor battery temperature.
2. Respective L or R BATT Switch — Verify OFF.

**If battery temperature does not decrease:**

   a. Land as soon as possible.
Emergency Procedures

LR GEN FAIL

Both engine driven generators are off-line. NON-ESS and MAIN buses are automatically deactivated in flight. MAIN buses can be selected on if desired, but will significantly reduce battery endurance.

The GEN FAIL red CAS will not illuminate with a dual generator failure during ground operation only, if the engine shutdown (ENG SHUTDOWN white CAS is illuminated).

1. L and R GEN Circuit Breakers (respective ELECTRICAL group) — Set.
2. Electrical Load — Reduce.
3. Engine N2 — 80% or above.
4. L and R GEN Switches — One at a time, depress for approximately 1 second.

Depressing and holding the GEN switch longer than 1 second or multiple activations may cause damage to the electrical system.

If a generator does not come on-line:

5. FLOOD Light Switch — On for night operations.
6. Use standby attitude indicator for attitude and magnetic compass for directional reference. Use standby airspeed/Mach indicator and altimeter.

When using the standby indications, refer to AIRSPEED/MACH CALIBRATION and ALTITUDE POSITION CORRECTION — STANDBY SYSTEM, Section V.

7. RMU 1 — Select PGE, ENGINE PAGE 1 for engine indications.

- RMU fuel quantity indicates left and right wing fuel only. Fuselage fuel is not indicated.
- RMU ENGINE PAGE 2 AMP display may indicate up to 15 amps with the generators off.

8. RMU 2:
   a. Select [1/2] for side 1 radios (COM 2, NAV 2, ADF 2, ATC 2 inoperative).
   b. Select PGE, NAVIGATION for NAV 1 course indication and tuning.
   c. Tune COM 1 as required using clearance delivery radio.
9. L and R AV MSTR Switches — OFF.
10. L and R ENG CMPTR Switches — MAN.
11. DU 2 — OFF.

With all displays off, the Master Caution is still active and will trigger if a new CAS illuminates. The crew should not select DU 2 back On for the purpose of viewing caution messages because battery duration will be shortened.

Electrical

CAUTION

NOTE

NOTE

NOTE
LR GEN FAIL (Cont)

12. L and R WSHLD Switches — OFF (Switch On prior to landing - maximum 5 minutes.)
13. EMER LIGHTS Switch — OFF. (Switch ON prior to landing - maximum 10 minutes.)
14. Standby Pitot Heat (R PROBES Switch) — Use as required (L PROBES inoperative).
15. The following conditions will exist (L and R MAIN Switches — OFF):
   - L and R pitot heat inoperative (avoid visible moisture); standby pitot heat operative.
   - Recognition and landing/taxi lights inoperative.
   - COM 2, NAV 2, ATC 2 inoperative.
   - Automatic temperature control inoperative.
   - Use MANUAL TEMP Switch — ON.

Battery duration with the generators off is as follows:

<table>
<thead>
<tr>
<th>Size</th>
<th>Time</th>
<th>Size</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amp-hr</td>
<td>(min)</td>
<td>Amp-hr</td>
<td>(h)</td>
</tr>
<tr>
<td>27 (Ni-Cad)</td>
<td>30</td>
<td>10 (Lead-Acid)</td>
<td>1.0</td>
</tr>
<tr>
<td>28 (Lead-Acid)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>38 (Ni-Cad)</td>
<td>1.0</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

1 Time durations predicated upon operation on batteries only.
2 Time duration predicated upon the following conditions:
   - DU 2 — OFF.
   - Standby Pitot Heat (R PROBES Switch) — ON for no more than 30 minutes.
   - L and R AV MSTR Switches — OFF.
   - EMER LIGHTS Switch — ON for no more than 10 minutes.
   - L and R MAIN Switches — Remain OFF.
   - L and R ENG CMPTR Switches — MAN.

Any deviation in these conditions will significantly reduce the battery duration.

Figure 3-1

16. On aircraft 45-002 thru 45-225 not modified by SB 45-55-6, maintain 33,000 feet or below.
LR GEN FAIL (Cont)

17. If time to the landing airport will exceed main battery duration:
   a. Airspeed — Reduce to the slower of 200 KIAS or 0.7 M
c, or slower if necessary.
   b. Provided adequate fuel is available, prior to depleting the
      main batteries; select flaps 20° (maximum) and trim as
      desired for landing.
   c. Once the main batteries are depleted, the emergency bat-
      tery will provide power to emergency bus services.

The following conditions will exist (EMER BATT
   only):

Operative equipment associated with flight:
   - Standby airspeed, altimeter & vibrator, and
     lighting.
   - Standby attitude and lighting.
   - RMU1 Engine Display: N1, N2, OIL °C and EMER
     (bus volts). (RMU ENGINE PAGE 2 AMP display
     may indicate up to 15 amps with the generators
     off.)
   - Right cabin pressure control, use MANUAL rate
     control.
   - Nacelle heat fails ON.
   - Landing gear.
   - Inboard brakes only.

Inoperative equipment associated with flight:
   - Primary displays.
   - Pitch, aileron, and rudder trims.
   - Flaps.
   - Spoilers/spoilerons.
   - Probe heats.
   - Wing/Stab and windshield heat.
   - External lights.
   - Transponder.
   - Stall warning system.

   d. Land as soon as possible.
   e. Refer to Abnormal Landings, Normal Electrical System
      Failure procedure, Section IV.

17. If time to the landing airport will NOT exceed main battery
   duration:
   a. This checklist is complete.
Emergency Procedures

**Emergency Descent**

“CABIN ALTITUDE” Voice Activates

CABIN ALTITUDE (if applicable)

CABIN ALT (CWP) (if applicable)

or Cabin Altitude Exceeds 10000 Feet

---

**NOTE**

On aircraft 45-236 & subsequent and prior aircraft modified by SB 45-22-5, a CABIN ALTITUDE red CAS and CABIN ALT red CWP are installed.

1. Crew Oxygen Masks — Don. Select 100% oxygen.
2. Thrust Levers — IDLE.
3. Autopilot — Disengage.
4. SPOILER Lever — EXT.
5. Descend at MMO/VMO, but not below minimum safe altitude.
6. DEPLOY Switch (PAX OXYGEN) — Lift guard, ON.
7. Pilot and Copilot MIC/MASK Selector Switches — MASK.
8. Pilot and Copilot INPH Selector Switches — INPH.

---

**WARNING**

If structural failure is evident, limit speeds and maneuvering loads as much as possible in descent.

- Descent from 51,000 feet to 15,000 feet requires approximately 4 minutes 20 seconds (descent from 49,000 to 15,000 feet requires 4 minutes).
- Selecting IAS on PFD for airspeed below FL 310 will minimize inadvertent overspeed.
- Hats and “ear-muff” type headsets must be removed prior to donning crew oxygen masks.
- The thrust lever MUTE button will mute the “CABIN ALTITUDE” voice for 60 seconds.
- On aircraft 45-236 & subsequent and prior aircraft modified by SB 45-22-5, pressing either Master WARN switch will also mute the “CABIN ALTITUDE” voice for 60 seconds.

---

9. Yaw Damper — As required.

**If time and conditions permit:**

11. Notify controlling agency.
12. Check condition of passengers and provide assistance if conditions permit.

**NOTE**

- Communication with passengers can be accomplished by using the PA function of the Audio Control Panel.

(Continued)
Emergency Procedures

Emergency Descent (Cont)

- The optional cabin 110 vac/60 hz (230 vac/ 50 hz) AC electrical power is automatically disabled when the cabin altitude exceeds 9500 feet.

Emergency Evacuation

1. EMERGENCY/PARKING BRAKE — Set.
2. Thrust Levers — CUTOFF.
3. EMER LIGHTS Switch — ON.
4. EMER BATT, L and R BATT Switches — OFF.
5. Evacuate the aircraft:
   a. Cabin Entry Door — Open and exit aircraft. The upper door is openable with the landing gear retracted.
   b. Aft Emergency Exit — Open and exit using the wing step area.

   NOTE: APU (if installed) will shut down when the R BATT is selected OFF.

“ENGINE FIRE” Voice Activates

Engine FIRE

Illumination of the FIRE red EI displayed in the ITT indicator, the FIRE PUSH red indication in the FIRE switch (ENGINE), or a “L” or “R ENGINE FIRE” voice message indicates that the engine fire detection loop has activated. An engine fire is usually accompanied by other indications, such as: excessive ITT, erratic or rough engine operation, fluctuating engine indications, or smoke in the cabin.

   NOTE: The FIRE switch (ENGINE) stops the flow of fuel and hydraulic fluid to the engine, shuts off bleed air from the engine, shuts down generator, alternator and ignition, arms the engine fire extinguishing system and illuminates the WSHLD HT FAIL amber CAS.

Affected Engine:

1. Thrust Lever — IDLE, unless a critical thrust situation exists.
2. If fire continues more than 15 seconds or there are other indications of fire:
   a. Thrust Lever — CUTOFF.
   b. Applicable FIRE Switch (ENGINE) — Lift guard, FIRE PUSH.
   c. EXTINGUISHER #1 Switch (ENGINE) — Lift guard, ARMED push.

(Continued)
d. If fire continues:
   (1) EXTINGUISHER #2 Switch (ENGINE) — Lift guard, ARMED push.
   (2) Land as soon as possible.
   (3) Go to step e.

d. If fire extinguishes:
   (1) Land as soon as practical.
   (2) Go to step e.

e. ENG SYNC Switch — OFF.
f. Rudder Trim — As required.
g. Yaw Damper — As required.
h. Autopilot — As desired.
i. Applicable STBY Switch (FUEL) — Off.
j. Refer to Engine Shutdown in Flight procedure, Section IV.

2. If fire extinguishes in less than 15 seconds:

a. Leave thrust lever at IDLE, unless a critical thrust situation exists.
b. ENG SYNC Switch — OFF.
c. Rudder Trim — As required.
d. Yaw Damper — As required.
e. Autopilot — As desired.
f. Monitor fuel balance. Crossflow as required. STBY pump may be used.
g. Land as soon as practical.
h. Refer to Abnormal Landings, Single Engine Landing, Section IV.
Emergency Procedures

LOIL PRESS LOW
ROIL PRESS LOW

Oil pressure for the respective engine is low.

1. Respective Engine OIL PSI and OIL °C — Check.
2. If OIL PSI is below 50 PSI and/or OIL °C is high:
   a. Reduce affected engine to idle.
      - If flight conditions permit:
        A precautionary engine shutdown is advised, refer to
        Engine Shutdown in Flight procedure, Section IV.
      a. Land as soon as practical.
      c. Refer to Abnormal Landings, Single Engine Landing proce-
        dure, Section IV.
2. If OIL PSI is between 50 and 65 PSI and OIL °C is normal:
   a. Reduce affected engine to idle.
   b. Land as soon as practical.
   c. Refer to Abnormal Landings, Single Engine Landing proce-
      dure, Section IV.
2. If OIL PSI and OIL °C are normal, the most likely cause is a
   failure of the pressure switch:
   a. Continue and monitor OIL PSI and OIL °C.

   An oil pressure below 65 psi is undesirable and should only be allowed for the completion of the
   flight, preferably at a reduced thrust setting to maintain the oil temperature within limits. Steady state
   operation with less than 50 psi could result in engine damage.
Engine Failure

During takeoff:

Below V1 Speed

1. Brakes — Apply.
2. Thrust Levers — IDLE.
   If spoilers are not extended automatically:
   a. SPOILER Lever — EXT.
4. Thrust Reversers — Deploy, if necessary.

Perform High Energy Stop Inspection (Chapter 5, Learjet 45 Maintenance Manual) if the maximum brake energy weight for landing is exceeded during a rejected takeoff.

Above V1 Speed

1. Attitude Control — As required.
2. Accelerate to VR. Keep nose wheel on the ground.
3. Rotate at VR to target takeoff pitch attitude; Climb at V2.
4. Gear — UP, when positive rate of climb is established.
5. Climb to 1500 feet, accelerate to V2 + 25, retract flaps, then accelerate to 200 KIAS en route climb speed.
6. Refer to Engine Shutdown in Flight procedure, Section IV.

In flight:

1. Control Wheel Master Switch (MSW) — Depress and release. Yaw damper and autopilot will disengage. Spoilers will blow down while the MSW is depressed.
2. Attitude Control — As required.
3. Thrust Lever (operative engine) — Increase as required.
4. ENG SYNC Switch — OFF.
5. Rudder Trim — As required.
6. Yaw Damper — As required.
7. Autopilot — As desired.
8. Refer to Engine Shutdown in Flight procedure, Section IV.
Emergency Procedures

**Engine Failure (Cont)**

During approach:

1. Control Wheel Master Switch (MSW) — Depress and release. Yaw damper and autopilot will disengage. Spoilers will blow down while the MSW is depressed.
2. Attitude Control — As required.
3. Thrust Lever (operative engine) — Increase as required.
4. FLAPS — 8°
5. Airspeed — VAPP.
6. ENG SYNC Switch — OFF.
7. Rudder Trim — As required.
8. Yaw Damper — As required.
9. Autopilot — As desired.
10. Refer to either of the following procedures as applicable:
    - Abnormal Landings, Single Engine Landing, Section IV.
    - Go Around, Section II and Engine Shutdown in Flight, Section IV.
Immediate Engine Airstart

Do not attempt an airstart following an engine failure which was accompanied by indications of internal engine damage or fire.

Successful immediate relights have been accomplished at 60% N2 at altitudes up to 45,000 feet, 40% N2 at altitudes up to 41,000 feet, and 20% N2 at altitudes up to 35,000 feet. Immediate relight attempts at lower N2s may result in a restart which stabilizes below idle and does not respond to thrust lever movement. Increasing airspeed should allow the engine to accelerate to idle.

Affected Engine:

1. Thrust Lever — IDLE.
   IGN will automatically activate.
2. STBY Switch (FUEL) — ON.

3. If ITT is approaching the limit and rising rapidly:
   a. Thrust Lever — CUTOFF.
   b. Perform Engine Airstart procedure or Engine Shutdown in Flight procedure, Section IV.
   c. This checklist is complete.

3. If no indication of light-off is obtained within 20 seconds:
   a. Thrust Lever — CUTOFF.
   b. Perform Engine Airstart procedure or Engine Shutdown in Flight procedure, Section IV.
   c. This checklist is complete.

3. If airstart is complete:
   a. Thrust Lever — Advance.
   b. This checklist is complete.
Emergency Procedures

L BLEED AIR LEAK
R BLEED AIR LEAK
LR BLEED AIR LEAK

A leak detection sensor along the bleed-air ducting has activated.

On the ground:

L or R BLEED AIR LEAK, or LR BLEED AIR LEAK illuminated

1. APU START/STOP Switch (if installed) — Off.

   NOTE
   The APU will automatically shut down with a bleed air leak detected.

2. Respective L or R BLEED Switch — OFF.

   IF BLEED AIR LEAK remains illuminated:
   a. Shut down respective engine.

In flight:

L or R BLEED AIR LEAK illuminated

The leak will be upstream of the shutoff valve.

1. Respective L or R BLEED Switch — OFF.

   NOTE
   When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

2. Maintain 41,000 feet or below. Avoid flight in icing conditions.

   NOTE
   When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

3. Land as soon as possible.

LR BLEED AIR LEAK illuminated

The leak is downstream of the shutoff valves:

1. EMER PRESS Switch — ON.

   NOTE
   When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

2. One L or R BLEED Switch — OFF.

3. Adjust engine N1 on engine supplying EMER air to modulate cabin temperature.

4. Maintain 41,000 feet or below. Avoid flight in icing conditions.

5. Land as soon as possible.
A leak detection sensor in the engine pylon or tailcone (before the shut-off valve) has activated.

**L or R ENG PYLON OVHT**

1. Respective L or R NAC Switch — Off.
2. Reduce engine N1 on respective engine.
3. Fly out of icing conditions.

**If L or R ENG PYLON OVHT remains illuminated:**
   
a. Shut down respective engine. Refer to Engine Shutdown in Flight procedure, Section IV.

**LR ENG PYLON OVHT**

1. L and R NAC Switches — Off.
2. Reduce engine N1 on both engines as low as possible, unless a critical thrust situation exists.
3. Fly out of icing conditions.

**If LR ENG PYLON OVHT remains illuminated:**
   
a. Land as soon as possible.
Emergency Procedures

PIT TRIM BIAS
The pitch trim bias system is moved from the normal position and illumination of the PIT TRIM BIAS red CAS will be accompanied by the takeoff “CONFIGURATION” voice warning.

1. Refer to Takeoff “CONFIGURATION” Voice Activates procedure, this section.

PIT TRIM MSCMP
The stabilizer pitch trim indications between the IC-600s (Integrated Computers) do not agree while on the ground. Illumination of the PIT TRIM MSCMP red CAS will be accompanied by the takeoff “CONFIGURATION” voice warning.

1. Refer to Takeoff “CONFIGURATION” Voice Activates procedure, this section.

SPOILERS EXT
The spoilers have moved from the stowed position. Illumination of the SPOILERS EXT red CAS will be accompanied by the takeoff “CONFIGURATION” voice warning.

1. Refer to Takeoff “CONFIGURATION” Voice Activates procedure, this section.

TAKEOFF TRIM
The trim system is not in the takeoff configuration. Illumination of the TAKEOFF TRIM red CAS will be accompanied by the takeoff “CONFIGURATION” voice warning.

1. Refer to Takeoff “CONFIGURATION” Voice Activates procedure, this section.
Aileron Control Jam

1. Attitude Control — As required. Use rudder and thrust as necessary.
2. ROLL DISC Lever — Pull.
   (ROLL DISC white CAS)
   a. Pilot — Control aircraft with the spoilerons.
   b. Do not use the copilot control.
   c. Do not use AIL TRIM.
   The pilot's roll control force will be lighter and the aircraft response will be different than normal.
   d. Do not reconnect. The most likely occurrence of a jam would be expected in the aileron control system (copilot's control wheel).
3. Airspeed — Reduce as necessary to control the aircraft.
   Flap extension will improve controllability. Flaps DN (40°) will minimize control wheel deflection and provide the most effective and sensitive roll control.
4. Land as soon as possible.
5. Refer to Abnormal Landings, Aileron Jammed Landing, Section IV.
   The autopilot will disconnect when roll disconnect is activated.

Elevator Control Jam

1. Attitude Control — As required. Use pitch trim and thrust as necessary.
2. ELEV DISC Handle — Pull and rotate.
   (ELEVATOR DISC white CAS). The pilot will control the left elevator and the copilot will control the right elevator.
3. Determine elevator without the jam and transition flight control to that pilot.
   a. Do not apply additional control force to the jammed control.
   b. Do not use PIT TRIM BIAS.
   c. Do not reconnect.
4. Land as soon as possible.
5. Refer to Abnormal Landings, Elevator Jammed Landing procedure, Section IV.
   The autopilot will disconnect when the elevator disconnect is activated.
Pitch Axis Uncommanded Motion

1. Control Wheel Master Switch (MSW) — Depress and hold.
2. Attitude Control — As required.
3. Thrust Levers — As required.

4. Airspeed — Reduce to Mach trim off MMO or below, but not less than 0.65Mi.

The following conditions will exist when the MSW switch is depressed.

- Autopilot and yaw damper will disengage.
- Pitch, aileron, rudder, Mach and configuration trims will be inoperative while the switch is depressed. The MACH TRIM FAIL white and amber CAS messages will not illuminate.
- Rudder boost will be inoperative while the switch is depressed.
- Spoilers and spoilerons will be inoperative while the switch is depressed. (Spoilerons will be operative if a spoiler jam [SPOILER JAM amber CAS] has been detected or if a roll disconnect [ROLL DISC white CAS] has been activated with the MSW depressed.)

5. If control force continues with the Control Wheel Master Switch (MSW) depressed:

The malfunction is most likely a trim malfunction. An amber PRI TRIM FAIL or white PRI TRIM FAULT, or an amber SEC TRIM FAIL or white SEC TRIM FAULT may be illuminated.

a. PITCH TRIM Switch (pedestal) — OFF. (PITCH TRIM OFF white CAS)

b. Malfunctioning PRI PITCH or SEC PITCH Circuit Breaker (respective pilot’s or copilot’s FLIGHT group [TRIM]) — Pull.

c. Control Wheel Master Switch (MSW) — Release.

d. Yaw Damper — Engage.

(Continued)
Emergency Procedures

**Pitch Axis Uncommanded Motion**

**EFFECTIVITY**

Aircraft 45-226 & Subsequent and prior aircraft modified by SB 45-55-6

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1. Control Wheel Master Switch (MSW) — Depress and hold.
2. Attitude Control — As required.
3. Thrust Levers — As required.
4. Airspeed — Reduce to Mach trim off MMO or below.

**NOTE**

The following conditions will exist when the MSW switch is depressed.

- Autopilot and yaw damper will disengage.
- Pitch, aileron, rudder, Mach and configuration trims will be inoperative while the switch is depressed. The MACH TRIM FAIL white and amber CAS messages will not illuminate.
- Rudder boost will be inoperative while the switch is depressed.
- Spoilers and spoilerons will be inoperative while the switch is depressed. (Spoilerons will be operative if a spoiler jam [SPOILER JAM amber CAS] has been detected or if a roll disconnect [ROLL DISC white CAS] has been activated with the MSW depressed.)

5. *If control force continues with the Control Wheel Master Switch (MSW) depressed:*
   The malfunction is most likely a trim malfunction. An amber PRI TRIM FAIL or white PRI TRIM FAULT, or an amber SEC TRIM FAIL or white SEC TRIM FAULT may be illuminated.
   a. PITCH TRIM Switch (pedestal) — OFF. (PITCH TRIM OFF white CAS)
   b. Malfunctioning PRI PITCH or SEC PITCH Circuit Breaker (respective pilot’s or copilot’s FLIGHT group [TRIM]) — Pull.
   c. Control Wheel Master Switch (MSW) — Release.
   d. Yaw Damper — As desired.

(Continued)
Pitch Axis Uncommanded Motion (Cont)

e. If the malfunction occurred in the Primary trim:
   (1) PITCH TRIM Switch (pedestal) — SEC. (SEC TRIM) white CAS)
   (2) SEC Switch (pedestal [PITCH TRIM]) — As required.
   (3) Refer to PRI TRIM FAIL procedure, Section IV.
   (4) This checklist is complete.

f. If the malfunction occurred in the Secondary trim:
   (1) PITCH TRIM Switch (pedestal) — PRI.
   (2) Control Wheel Trim Switch — As required.
   (3) Refer to SEC TRIM FAIL procedure, Section IV.
   (4) This checklist is complete.

5. If control force relieves with MSW depressed:
   The malfunction is most likely the autopilot. This may be indicated by a red or amber AP illumination or trim-in-motion tone.
   a. AFCS SERVOS Circuit Breaker (pilot’s FLIGHT group) — Pull.
   b. Control Wheel Master Switch (MSW) — Release.
   c. Control Wheel Trim Switch — As required.
   d. Maintain 33,000 feet or below.
   e. Airspeed — Maintain 0.65 Mi or greater until below 33,000 feet.
   f. Land as soon as practical.
   g. This checklist is complete.

NOTE

The maximum altitude loss during an autopilot malfunction is:

- Cruise & Maneuvering ........ 230 feet (70 meters)
- ILS (two engine).................... 80 feet (24 meters)
Pitch Axis Uncommanded Motion (Cont)

**EFFECTIVITY**
Aircraft 45-226 & Subsequent and prior aircraft modified by SB 45-55-6

- If the malfunction occurred in the Primary trim:
  1. PITCH TRIM Switch (pedestal) — SEC. (SEC TRIM) white CAS
  2. SEC Switch (pedestal [PITCH TRIM]) — As required.
  3. Refer to PRI TRIM FAIL procedure, Section IV.
  4. This checklist is complete.

- If the malfunction occurred in the Secondary trim:
  1. PITCH TRIM Switch (pedestal) — PRI.
  2. Control Wheel Trim Switch — As required.
  3. Refer to SEC TRIM FAIL procedure, Section IV.
  4. This checklist is complete.

5. If control force relieves with MSW depressed:
   The malfunction is most likely the autopilot. This may be indicated by a red or amber AP illumination or trim-in-motion tone.
   a. AFCS SERVOS Circuit Breaker (pilot’s FLIGHT group) — Pull.
   b. Control Wheel Master Switch (MSW) — Release.
   c. Control Wheel Trim Switch — As required.
   d. Refer to AP procedure, this section or Section IV as appropriate.
   e. This checklist is complete.

**NOTE**

The maximum altitude loss during an autopilot malfunction is:

- Cruise & Maneuvering ........ 230 feet (70 meters)
- ILS (two engine) .................. 80 feet (24 meters)
Emergency Procedures

“OVERSPEED” Voice Activates Recovery from Inadvertent Overspeed

If the aircraft exceeds VMO/MMO, the “OVERSPEED” voice will sound.

1. Thrust Levers — IDLE.
2. Autopilot — Disengage.
3. SPOILER Lever — EXT.
4. Identify aircraft pitch and roll attitude.
5. Level wings.
6. Elevator and Pitch Trim — As required to raise the nose.

**NOTE**

Do not apply elevator force until bank angle is reduced to less than 90°. A pull elevator force when the bank angle is greater than 90° will increase the nose-down attitude.

7. Yaw Damper — As required.
Roll or Yaw Axis Uncommanded Motion

&EFFECTIVITY

Aircraft 45-002 thru 45-225 not modified by SB 45-55-6

1. Control Wheel Master Switch (MSW) — Depress and hold.
2. Attitude Control — As required.

3. Airspeed — Reduce to Mach trim off MMO or below, but not less than 0.65M.

The following conditions will exist when the MSW switch is depressed.
- Autopilot and yaw damper will disengage.
- Pitch, aileron, rudder, Mach and configuration trims will be inoperative while the switch is depressed. The MACH TRIM FAIL white and amber CAS messages will not illuminate.
- Rudder boost will be inoperative while the switch is depressed.
- Spoilers and spoilerons will be inoperative while the switch is depressed. (Spoilerons will be operative if a spoiler jam [SPOILER JAM amber CAS] has been detected or if a roll disconnect [ROLL DISC white CAS] has been activated with the MSW depressed.)

4. If accompanied by SPOILERS FAIL amber CAS or SPOILER JAM amber CAS:
   a. Control Wheel Master Switch (MSW) — Release.
   b. Yaw Damper — Engage.
   c. Refer to respective SPOILERS FAIL or SPOILER JAM procedure, Section IV.
   d. This checklist is complete.

(Continued)
Emergency Procedures

Roll or Yaw Axis Uncommanded Motion

1. Control Wheel Master Switch (MSW) — Depress and hold.
2. Attitude Control — As required.
3. Airspeed — Reduce to Mach trim off MMO or below.

The following conditions will exist when the MSW switch is depressed.
- Autopilot and yaw damper will disengage.
- Pitch, aileron, rudder, Mach and configuration trims will be inoperative while the switch is depressed. The MACH TRIM FAIL white and amber CAS messages will not illuminate.
- Rudder boost will be inoperative while the switch is depressed.
- Spoilers and spoilerons will be inoperative while the switch is depressed. (Spoilerons will be operative if a spoiler jam [SPOILER JAM amber CAS] has been detected or if a roll disconnect [ROLL DISC white CAS] has been activated with the MSW depressed.)

4. If accompanied by SPOILERS FAIL amber CAS or SPOILER JAM amber CAS:
   a. Control Wheel Master Switch (MSW) — Release.
   b. Yaw damper — As desired.
   c. Refer to respective SPOILERS FAIL or SPOILER JAM procedure, Section IV.
   d. This checklist is complete.
Roll or Yaw Axis Uncommanded Motion (Cont)

4. ● If control force continues with MSW depressed:
   The malfunction is most likely a trim malfunction.
   a. EICAS/SUMRY or FLT Page — Select, check trims.
   b. AIL or RUD Circuit Breaker (respective copilot’s or pilot’s
      FLIGHT group [TRIM]) — Pull affected axis.
   c. Control Wheel Master Switch (MSW) — Release.
   d. Use asymmetric thrust and decrease airspeed as required to
      minimize mistrim.
   e. Autopilot — As desired.
   g. Refer to Abnormal Landings for the respective Rudder or
      Aileron Trim Tab Jammed Landing procedure, Section IV.
   h. This checklist is complete.

4. ● If control force relieves with MSW depressed:
   The malfunction is most likely in the autopilot, yaw damper or
   rudder boost systems. The failed system may indicate by dis-
   playing a red or amber AP, an amber YD or RB, or white RUD
   BOOST INOP.
   a. AFCS SERVOS Circuit Breaker (pilot’s FLIGHT group) —
      Pull.
   b. RUDDER BOOST Switch — OFF.
   c. Control Wheel Master Switch (MSW) — Release.
   d. Maintain 33,000 feet or below.
   e. Airspeed — Maintain 0.65 Mi or greater until below 33,000
      feet
   f. Land as soon as practical.
   g. This checklist is complete.

(Continued)
Emergency Procedures

Roll or Yaw Axis Uncommanded Motion (Cont)

4. **If control force continues with MSW depressed:**
   The malfunction is most likely a trim malfunction.
   a. EICAS/SUMRY or FLT Page — Select, check trims.
   b. AIL or RUD Circuit Breaker (respective copilot’s or pilot’s FLIGHT group [TRIM]) — Pull affected axis.
   c. Control Wheel Master Switch (MSW) — Release.
   d. Use asymmetric thrust and decrease airspeed as required to minimize mistrim.
   e. Autopilot — As desired.
   f. Yaw Damper — As desired.
   g. Refer to Abnormal Landings for the respective Rudder or Aileron Trim Tab Jammed Landing procedure, Section IV.
   h. This checklist is complete.

4. **If control force relieves with MSW depressed:**
   The malfunction is most likely in the autopilot, yaw damper or rudder boost systems. The failed system may indicate by displaying a red or amber AP, an amber YD or RB, or white RUD BOOST INOP.
   a. AFCS SERVOS Circuit Breaker (pilot’s FLIGHT group) — Pull.
   b. RUD BOOST Switch — OFF.
   c. Control Wheel Master Switch (MSW) — Release.
   d. Refer to AP procedure, this section or Section IV as appropriate.
   e. This checklist is complete.

(Continued)
Roll or Yaw Axis Uncommanded Motion (Cont)

**NOTE**
- On aircraft 45-002 thru 45-169 not modified by SB 45-22-4, an autopilot monitored disconnect is not always accompanied by a yaw damper system failure/disconnect.
- On aircraft 45-170 and subsequent and prior aircraft modified by SB 45-22-4, an autopilot monitored disconnect is not always accompanied by a yaw damper or rudder boost system failure/disconnect.
- Depressing the MSW will cancel the AP disconnect aural warning. The red AP will either disappear or turn steady amber. If the yaw damper was not disconnected initially, depressing the MSW will disconnect the YD.

Rudder Control Jam

1. **Attitude Control** — As required. Use roll control and thrust as necessary.

2. **Yaw Damper** — Off. Use glareshield control button to disengage. Use of the MSW switch will cause the spoilers/spoilerons to blow down which will reduce roll control effectiveness.
3. **RUDDER BOOST Switch** — OFF.
4. Do not use RUDDER TRIM.
5. Use asymmetric thrust if required to minimize sideslip.
6. **Airspeed** — Reduce as necessary to control the aircraft.
7. Land as soon as possible.
8. Refer to Abnormal Landings, Rudder Jammed Landing, Section IV.
Emergency Procedures

**L FUEL PRESS LOW**
**R FUEL PRESS LOW**
**LR FUEL PRESS LOW**

A loss of fuel pressure to the engine has been sensed.

**Affected Engine:**
1. STBY Switch (FUEL) — ON.
2. IGN Switch — ON. (IGN green EI)
3. XFLOW Switch (FUEL) — Closed.

**If FUEL PRESS LOW remains illuminated:**
- A descent to a lower altitude, but not below the minimum safe altitude, is recommended. This will improve the suction feed capability of the engine driven fuel pump.
- Flight can be continued at altitude if engines are operating properly. Make thrust lever movements slow and cautious at high altitudes.

**NOTE**

The altitude for suction feed cannot be specifically stated since it varies with fuel temperature and type.

**Multi-Function Display (MFD) Annunciations**

**HDG FAIL**

Indicates an invalid heading source and illuminates in the center of the heading display. Most likely cause is an AHRS fault or failure. Refer to Loss of Attitude or Heading Displays procedure, Section IV.

**HDG TEST**

Indicates the AHRS is in the power-up alignment mode and illuminates in the center of the heading display. Alignment requires approximately 2 minutes on the ground or 20 seconds in flight.
Primary Flight Display (PFD) Annunciations

**AP**
The red AP above the attitude sphere indicates a monitored autopilot disconnect. This may be accompanied by a steady amber YD (yaw damper disconnect) or a steady amber RB (rudder boost monitored disconnect). The red AP will flash for 5 seconds, then turn steady.

1. Control Wheel Master Switch (MSW) — Depress and hold until WHEEL MSTR white CAS is illuminated, then release.
   - An autopilot monitored disconnect is not always accompanied by a yaw damper system failure/disconnect.
   - Depressing the MSW will cancel the AP disconnect aural warning. The red AP will either disappear or turn steady amber. If the yaw damper was not disconnected initially, depressing the MSW will disconnect the YD.
   - An amber AP indicates the autopilot cannot be re-engaged normally. A full IC 2 (integrated avionics computer) power down cycle may clear the fault and allow re-engagement.

2. If the amber AP remains illuminated, and is accompanied by an amber YD:
   a. Maintain 33,000 feet or below.
   b. Airspeed — Maintain 0.65 Ml or greater until below 33,000 feet.
   c. Land as soon as practical.
   d. This checklist is complete.

2. If the amber AP remains illuminated, and is not accompanied by an amber YD:
   b. This checklist is complete.

2. If the amber AP extinguishes:
   b. Autopilot — Engage, as desired.
   c. This checklist is complete.

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**EFFECTIVITY**

| Aircraft 45-170 thru 45-225 not modified by SB 45-55-6, and prior aircraft modified by SB 45-22-4 but not modified by SB 45-55-6 |

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Primary Flight Display (PFD) Annunciations

AP

The red AP above the attitude sphere indicates a monitored autopilot disconnect. This may be accompanied by a steady amber YD (yaw damper disconnect) or a steady amber RB (rudder boost monitored disconnect). The red AP will flash for 5 seconds, then turn steady.

1. Control Wheel Master Switch (MSW) — Depress and hold until WHEEL MSTR white CAS is illuminated, then release.
   - An autopilot monitored disconnect is not always accompanied by a yaw damper system failure/disconnect.
   - Depressing the MSW will cancel the AP disconnect aural warning. The red AP will either disappear or turn steady amber. If the yaw damper was not disconnected initially, depressing the MSW will disconnect the YD.
   - An amber AP indicates the autopilot cannot be re-engaged normally. A full IC 2 (integrated avionics computer) power down cycle may clear the fault and allow re-engagement.

2. If the amber AP remains illuminated, and is accompanied by an amber YD:
   a. This checklist is complete.

2. If the amber AP remains illuminated, and is not accompanied by an amber YD:
   a. Yaw Damper — As desired.
   b. This checklist is complete.

2. If the amber AP extinguishes:
   a. Yaw Damper — As desired.
   b. Autopilot — As desired.
   c. This checklist is complete.
Primary Flight Display (PFD) Annunciations (Cont)

ATT FAIL
Indicates an invalid attitude source and illuminates in the center of the attitude sphere. Most likely cause is an AHRS fault or failure. Refer to Loss of Attitude or Heading Displays procedure, Section IV.

HDG FAIL
Indicates an invalid heading source and illuminates in the center of the heading display. Most likely cause is an AHRS fault or failure. Refer to Loss of Attitude or Heading Displays procedure, Section IV.

NOTE
The RMU NAVIGATION page indicates HDG FAIL during alignment.

HDG TEST
Indicates the AHRS is in the power-up alignment mode and illuminates in the center of the heading display. Alignment requires approximately 2 minutes on the ground or 20 seconds in flight.
Emergency Procedures

EMER/PARK BRAKE

The emergency/parking brake is engaged and illumination of the EMER/PARK BRAKE red CAS will be accompanied by the takeoff “CONFIGURATION” voice warning.

1. Refer to Takeoff “CONFIGURATION” Voice Activates procedure, this section.

“GEAR” Voice Activates

GEAR

GEAR (CWP)

Illumination of the GEAR red CAS and GEAR red CWP indicates the landing gear is not down and locked for landing. This illumination will be accompanied by a “GEAR” voice that is not mutable.

The warning will occur if the gear is not down and locked and:
- the flaps are extended greater than 25°,
- a valid Radio Altimeter is less than 500 feet, and both thrust levers are less than MCR.

1. If adequate time is available to extend gear:
   a. AUX HYD Switch — ON.
   b. Gear — DN.
   c. This checklist is complete.

1. If adequate time is not available to extend gear:
   a. Execute a go-around.
   b. This checklist is complete.
“BRAKES FAIL” Voice Activates
NORM BRK FAIL
NORMAL BRAKES FAIL (CWP)

Illumination of the NORM BRK FAIL red CAS and NORMAL BRAKES
FAIL red CWP indicates that all normal brakes have failed. This illu-
mination will be accompanied by a “BRAKES FAIL” voice. Use Emergen-
cy Braking.

1. ● If failure occurs just after gear extension and conditions
   permit:
   a. Gear — UP.
   b. INBD BRAKES (pilot’s GEAR/HYDRAULICS group) and
      OUTBD BRAKES (copilot’s GEAR/HYD group) Circuit
      Breakers — Set, or pull and reset.

   The BRAKE FAULT white CAS will be illuminated
   after cycling the circuit breakers. Refer to BRAKE
   FAULT procedure, Section II.

   c. AUX HYD Switch — ON.
   d. Gear — DN.
   e. ● If NORM BRK FAIL red CAS and NORMAL BRAKES
      FAIL red CWP extinguish:
      (1) This checklist is complete.
   e. ● If NORM BRK FAIL red CAS and NORMAL BRAKES
      FAIL red CWP remain illuminated:
      (1) Go to step 2.

1. ● If failure is not associated with gear extension:
   a. Go to step 2.

2. Refer to one of the following:
   - Emergency Braking procedure, this section.
   - Abnormal Landings, Emergency Brake Landing procedure,
     Section IV.

   Emergency brakes should be operational if the brake
   accumulator is properly charged. (BRK ACUM
   PRESS amber CAS not illuminated.)
Emergency Braking

When using emergency braking, anti-skid protection is not available. The Anti-Skid OFF corrections, Performance Data, Section V apply. The B-ACUM must be properly charged (BRK ACUM PRESS amber CAS not illuminated) for effective emergency braking. Emergency Brake Landing procedure, Section IV, applies for landing with emergency brakes.

1. **EMERGENCY/PARKING BRAKE Handle — Pull smoothly.**
   (EMER/PARK BRK white CAS)

   **WARNING**

   Apply the brake smoothly with small movements to increase braking. Heavy brake pressure may skid the tires and cause tire blow-out, or cause loss of directional control. Do not pump the brake handle.

Nose Wheel Steering Malfunction

A nose wheel steering malfunction may be accompanied by an unwanted swerve in either direction and may or may not be accompanied by a NWS FAIL amber CAS. Any uncommanded aircraft directional deviation with nose wheel steering engaged must be treated as a nose wheel steering malfunction.

1. **Control Wheel Master Switch (MSW) — Depress and release.**
2. **Thrust Levers — IDLE.**

3. Brake to a stop. Use differential brakes as necessary.
4. Taxi using differential brakes and thrust.
Ditching

Ditching of this airplane has not been demonstrated, and this airplane has not been certified for ditching. However, the following procedure should enhance the probability of a successful ditching.

Plan the descent to ensure minimum fuel remaining and improve buoyancy. Ensure sufficient fuel for controlled, power-on approach.

1. **If time and conditions permit:**
   a. Head toward nearest land or vessel.
   b. Notify controlling agency.
   c. Transponder — Emergency 7700.
   d. ELT Switch (if installed) — ON.
   e. Life Vests — On.
   f. Shoulder Harnesses — Locked.
   
   **NOTE**
   Inform passengers not to inflate life vests while inside aircraft.
   
   g. Brief passengers as required.
      1. Use of available flotation equipment.
      2. Location and operation of emergency exits. **Do not** open lower half of cabin door.
      3. All loose items — Secure.
      4. Emergency landing brace position.
      5. Several impacts may be felt, depending on the sea conditions. **Do not** release seat belts after first impact is felt.
   h. NO SMOKING BELTS Switch — On.
   i. Seat belts — On until aircraft comes to a complete stop.

2. Gear — UP.
3. FLAPS — DN.

**NOTE**

The gear warning will sound and will not be mutable with any landing gear not down and flaps full down. Pulling the L and R WARN PANEL circuit breakers will eliminate the warning. This will fail the CWP (LR WARN PWR FAIL and WARN AUDIO amber CASes will illuminate).

4. PACK Switch — OFF. The aircraft should be depressurized prior to landing.
Emergency Procedures

**Ditching (Cont)**

5. Perform normal approach at \( V_{REF} \).
   
   Plan landing direction as follows:
   
   - **CAUTION**
   - b. Moderate Swells — Parallel to swells.
   - c. High Winds — Into wind, attempting to land on upwind (far) side of swell.

7. L and R FIRE Switches (ENGINE) — Lift guard and depress.
8. EMER BATT, L and R BATT Switches — OFF.
9. Emergency Exit(s) — Open after airplane comes to a complete stop. **Do not** open lower half of cabin door.
Forced Landing — Both Engines Inoperative

Recommended airplane best glide speed is 160 KIAS with the gear and flaps up. The still-air gliding distance is approximately 2 nm per 1000 feet of altitude.

1. **If time and conditions permit:**
   a. Transponder — Emergency 7700.
   b. Advise controlling agency.
   c. Prepare passengers for emergency landing.
   d. NO SMOKING BELTS Switch — On.
2. GEAR FREEFALL Handle — PUSH DOWN and lock forward.
3. AUX HYD Switch — ON.
4. Gear — DN.
5. HYD XFLOW Switch — ON.
6. FLAPS — DN.
7. HYD XFLOW Switch — Off.
8. Shoulder Harnesses — Locked.
9. L and R FIRE Switches (ENGINE) — Lift guard, FIRE PUSH.
10. Touch down in normal landing attitude.

**After airplane comes to a complete stop:**
11. EMERGENCY/PARKING BRAKE — Set.
12. Thrust Levers — CUTOFF.
13. EMER LIGHTS Switch — ON.
14. EMER BATT, L and R BATT Switches — OFF.
15. Evacuate the aircraft:
   a. Cabin Entry Door — Open and exit aircraft. The upper door is openable with the landing gear retracted.
   b. Aft Emergency Exit — Open and exit using the wing step area.

**“STALL” Voice Activates**

The stall warning computer has sensed a limit angle of attack. This warning will also be accompanied with the activation of the control column stick shaker.

1. Lower the pitch attitude to reduce angle of attack.
2. Thrust Levers — TO (manual APR if required).
3. Level the wings.
4. Accelerate out of stall condition.
Aborted Takeoff

1. Brakes — Apply.
2. Thrust Levers — IDLE.
   If spoilers are not extended automatically:
   a. SPOILER Lever — EXT.
4. Thrust Reversers — Deploy, if necessary.

Perform High Energy Stop Inspection (Chapter 5, Learjet 45 Maintenance Manual) if the maximum brake energy weight for landing is exceeded during a rejected takeoff.

Takeoff “CONFIGURATION” Voice Activates

The takeoff configuration warning monitor will activate if the aircraft is not in the takeoff configuration and either thrust lever has been advanced (MCR or above) with the aircraft on the ground. While on the ground (thrust levers not advanced), any parameters (flaps, spoilers, all three trims) not properly configured for takeoff will be displayed on the EICAS/MFD with a white box around the digital value. These boxed values will turn red if not set properly and the configuration warning triggers. CAS advisory messages associated with the takeoff configuration will also turn red when the configuration warning triggers.

The “CONFIGURATION” warning will activate if any of the following conditions are detected during takeoff:

- Flaps not 8° or 20°. (digits, pointers, and box red)
- Thrust reversers not stowed (UNL or DEP red EI)
- Parking brake not fully released. (EMER/PARK BRK red CAS)
- Pitch, aileron or rudder trim not in the takeoff band. (digits, pointer, and box red; TAKEOFF TRIM red CAS)
- Spoilers not fully retracted. (digits, pointers, and box red; SPOILERS EXT red CAS)
- Pitch trim miscompare monitor triggered. (PIT TRIM MSCMP red CAS)
- Abnormal PIT TRIM BIAS configuration. (PIT TRIM BIAS red CAS)

1. Brakes — Apply.
2. Thrust Levers — IDLE.
3. After stopping, check takeoff configuration.
“LEFT” or “RIGHT REVERSER UNSAFE” Voice Activates

L REV UNSAFE
R REV UNSAFE;
UNL or DEP

Illumination of either the L or R REV UNSAFE red CWP, or a UNL or DEP red EI indicates an inadvertent thrust reverser deployment. This indication will be accompanied by a “LEFT” or “RIGHT REVERSER UNSAFE” voice. The affected engine thrust lever should automatically move to the IDLE detent. The autostow function will attempt to stow the reverser doors.

During takeoff:

Below V1 Speed

1. Brakes — Apply.
2. Thrust Levers — IDLE.
   If spoilers are not extended automatically:
   a. SPOILER Lever — EXT.

   - Directional control will be improved with both thrust reversers deployed.

   - Perform High Energy Stop Inspection (Chapter 5, Learjet 45 Maintenance Manual) if the maximum brake energy weight for landing is exceeded during a rejected takeoff.

Above V1 Speed

1. Attitude Control — As required.
2. Accelerate to VR. Keep nose wheel on the ground.
3. Rotate at VR; Climb at V2.
4. Gear — UP, when positive rate of climb is established.
5. When clear of obstacles, accelerate to V2 + 25 and retract flaps.

   - Directional control is improved if the nose wheel is kept on the runway until VR.

6. Respective Engine Thrust Lever — IDLE.
7. Respective DEPLOY Circuit Breaker (ENGINE group [L or R REVERSER]) — Pull.
8. Respective ANN and STOW Circuit Breakers (ENGINE group [L or R REVERSER]) — Set.

(Continued)
9. If REV UNSAFE red CWP, and UNL or DEP red EI remain illuminated:
   a. Respective Thrust Lever — CUTOFF. Refer to Engine Shutdown in Flight procedure and Abnormal Landings, Thrust Reverser Deployed Landing procedure, Section IV.
   b. This checklist is complete.

9. If REV UNSAFE red CWP, and UNL or DEP red EI extinguish:
   a. Respective Thrust Lever — As required.
   b. This checklist is complete.

In flight:
1. Control Wheel Master Switch (MSW) — Depress and release. Yaw damper and autopilot will disengage. Spoilers will blow down while the MSW is depressed.
2. Attitude Control — As required.
3. Thrust Lever (operative engine) — Increase as required.
4. Thrust Lever (deployed engine) — IDLE.
5. Airspeed — Reduce to 160 KIAS or below as required to maintain flight.
6. Maintain 30,000 feet or below, or minimum safe altitude.
7. Respective DEPLOY Circuit Breaker (ENGINE group [L or R REVERSER]) — Pull.
8. Respective ANN and STOW Circuit Breakers (ENGINE group [L or R REVERSER]) — Set.
10. If REV UNSAFE red CWP, and UNL or DEP red EI remain illuminated:
    a. Thrust Lever (deployed engine) — CUTOFF.
    b. ENG SYNC Switch — OFF.
    c. Rudder Trim — As required.
    d. Yaw Damper — As required.
    e. Refer to Engine Shutdown in Flight procedure and Abnormal Landings, Thrust Reverser Deployed Landing procedure, Section IV.
    f. This checklist is complete.
10. If REV UNSAFE red CWP, and UNL or DEP red EI extinguish:
    a. Thrust Levers — As required.
    b. Yaw Damper — As required.
    c. This checklist is complete.
**SECTION IV — ABNORMAL PROCEDURES**

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Introduction to Abnormal Procedures

The procedures in this section of the manual have been developed by Learjet Inc. for certification of this aircraft. This section contains those operating procedures requiring the use of special systems and/or alternate use of regular systems which, if followed, will maintain an acceptable level of airworthiness or reduce operational risk resulting from a failure condition.

The procedures located in this section are to be used when a failure condition exists. Sound judgement as well as thorough knowledge of the aircraft, its characteristics, and the flight manual procedures are essential in the handling of any failure condition.

OVERRIDING CONSIDERATIONS

In all emergencies, the overriding consideration must be to:

- Maintain Airplane Control
- Analyze the Situation
- Take Proper Action

Terminology

Some abnormal procedures require that a landing be made as soon as practical. Refer to Emergency Procedures, Section III, for complete definitions of the terms “land as soon as possible” and “land as soon as practical”.

Refer to the Introduction section for additional definition and explanation of manual format.

EICAS

EICAS illuminations described in this section should be considered amber unless otherwise indicated.
Abnormal Procedures

**L AOA HT FAIL**
**R AOA HT FAIL**
**L R AOA HT FAIL**

The respective angle-of-attack vane heater has failed.

1. Respective AOA Circuit Breaker (ANTI-ICE group [L or R PROBES HT]) — Set, or pull and reset.

If AOA HT FAIL remains illuminated:
   a. Fly out of icing conditions as soon as practical.

**NOTE**
Respective stall warning stick shaker and LSA may be unreliable in icing conditions.

**ICE DET FAIL**

The ice detect system has failed.

1. ICE DETECT Circuit Breaker (copilot’s ANTI-ICE group) — Set, or pull and reset.

If SAT is between +10°C and -40°C, and visible moisture or night:
   a. Thrust Levers — MCT (or less), unless a critical thrust situation exists.
   b. WING/STAB Switch — ON.
   c. L and R NAC Switches — ON. (NAC green EI)

**ICE DETECTED**

Ice has been detected and one of the nacelle or wing/stab anti-ice systems is not selected on.

1. Thrust Levers — MCT (or less), unless a critical thrust situation exists.
2. WING/STAB Switch — ON.
3. L and R NAC Switches — ON. (NAC green EI)
4. L and R WSHLD Switches — Check On. (not illuminated)
5. HI FLOW Switch — Off.
Bleed air pressure to the respective nacelle is too low for effective anti-icing, or the electrically heated PT2 heater has failed when the respective L or R NAC switch is ON.

**Affected Engine:**
1. IGN Switch — ON. (IGN green EI)
2. Engine N1 — Increase to improve airflow.
3. NAC Circuit Breaker (ANTI-ICE group [L or R HEAT]) — Set, or pull and reset.

**If NAC HT remains illuminated:**
   a. Fly out of icing conditions as soon as possible.

Bleed air pressure to the respective nacelle is present and has not been commanded ON.

**Affected Engine:**
1. NAC Circuit Breaker (ANTI-ICE group [L or R HEAT]) — Set, or pull and reset.
**L PITOT HT**

The respective pitot-static mast heater has failed, or the respective L or R PROBES switch is OFF.

1. Respective L or R PROBES Switch — Check On. (not illuminated)
2. Respective PITOT Circuit Breaker (ANTI-ICE group [L or R PROBES HT]) — Set, or pull and reset.

If PITOT HT remains illuminated:

a. Fly out of icing conditions as soon as possible.

b. Cross-check the three pitot-static systems.

If PITOT HT is accompanied by erroneous pitot-static indications:

(1) Refer to Erroneous Pitot-Static Indications procedure, this section.

**NOTE**

PITOT circuit breaker (pilot’s ANTI-ICE group [L PROBES HT]) powers:
- L Pitot-Static Heat
- L AOA Heat

PITOT circuit breaker (copilot’s ANTI-ICE group [R PROBES HT]) powers:
- R Pitot-Static Heat
- R AOA Heat
- Standby Pitot-Static Heat
- SAT Probe Heat

**SAT HT FAIL**

The SAT probe heater has failed.

1. SAT Circuit Breaker (copilot’s ANTI-ICE group [R PROBES HT]) — Set, or pull and reset.

If SAT HT FAIL remains illuminated:

a. Fly out of icing conditions as soon as practical.

**NOTE**

The SAT probe heat is inhibited on the ground.
**STAB TEMP LOW**

Horizontal stabilizer leading edge temperature is too low for effective anti-icing.

1. Engine N1 — Increase to increase bleed air temperature.
2. L and R WING/STAB HT Circuit Breaker (ANTI-ICE group) — Set, or pull and reset.

**If STAB TEMP LOW remains illuminated:**

a. Fly out of icing conditions as soon as possible.
b. Do not extend flaps beyond 8°.

c. Refer to Abnormal Landings, Stabilizer Heat Failure Landing procedure, this section.

---

**STBY PITOT HT**

Pitot-static mast heater has failed, or the R PROBES switch is OFF.

1. R PROBES Switch — Check On. (not illuminated)
2. STBY PITOT Circuit Breaker (copilot’s ANTI-ICE group [R PROBES HT]) — Set, or pull and reset.

**If STBY PITOT HT remains illuminated:**

a. Fly out of icing conditions as soon as practical.
b. Cross-check the three pitot-static systems.

c. The standby pitot-static mast may be visible from the copilot’s seat. Visually check mast for ice or damage.

**If STBY PITOT HT is accompanied by erroneous pitot-static indications:**

(1) Refer to Erroneous Pitot-Static Indications procedure, this section.
WING TEMP LOW

The wing leading edge temperature is too low for effective anti-icing.

1. L and R IGN Switch — ON. (IGN green EI)
2. Engine N1 — Increase to increase bleed air temperature.
3. L and R WING/STAB HT Circuit Breaker (ANTI-ICE group) — Set, or pull and reset.

If WING TEMP LOW remains illuminated:
   a. Fly out of icing conditions as soon as possible.
   b. Do not extend flaps beyond 8°.

- Low speed flight should be approached with care so that detection of abnormal flying qualities can be obtained. Increased buffet may indicate ice formation on the wing leading edge.

- Even small accumulations of ice on the wing leading edge can cause an increase in stall speed and possibly, a degradation in stall characteristics.

   c. Refer to Abnormal Landings, Wing Heat Failure Landing procedure, this section.
   d. Visually inspect wing for ice accumulation if possible. Use WING INSPI light at night.
L WSHLD HT FAIL
R WSHLD HT FAIL
LR WSHLD HT FAIL

The respective windshield system or engine driven alternator has failed and the temperature is too low or too high (if accompanied by WSHLD OVHT amber CAS). A failure may also be indicated by the formation of ice or condensation (fog) on the windshield.

1. Respective L or R IGN Switch — ON (IGN green EI), if in icing conditions.
2. Respective WSHLD Circuit Breaker (ANTI-ICE group [L or R HEAT]) — Set, or pull and reset.
3. Respective L or R WSHLD Switch — OFF, then On.

4. **If WSHLD HT FAIL remains illuminated:**
   a. Fly out of icing conditions as soon as possible.

   **NOTE**
   - Descent into conditions with a small split between the temperature and dewpoint may result in interior windshield condensation (fogging).
   - If either WSHLD switch is OFF or inoperative, circling approaches are not recommended in icing or fogging conditions.

   b. Moving the COCKPIT and CABIN TEMPERATURE knobs to HOT will help reduce fogging.
   c. This checklist is complete.

4. **If respective L or R WSHLD OVHT amber CAS is also illuminated:**
   a. Refer to WSHLD OVHT procedure, this section.
Abnormal Procedures

L WSHLD OVHT
R WSHLD OVHT
LR WSHLD OVHT

The respective windshield heat system has failed and gone into an overheat condition.

1. Respective L or R WSHLD Switch — OFF.
2. Fly out of icing conditions as soon as practical.

**NOTE**
- Descent into conditions with a small split between the temperature and dewpoint may result in interior windshield condensation (fogging).
- If either WSHLD switch is OFF or inoperative, circling approaches are not recommended in icing or fogging conditions.

3. Moving the COCKPIT and CABIN TEMPERATURE knobs to HOT will help reduce fogging.

Windshield Outer Ply Shattered or Cracked

Windshield structural integrity is maintained (outer ply is not structural).

1. Respective L or R WSHLD Switch — OFF.
2. Respective L or R IGN Switch — ON (IGN green EI), if in icing conditions.
3. Fly out of icing conditions as soon as practical.

**NOTE**
- Descent into conditions with a small split between the temperature and dewpoint may result in interior windshield condensation (fogging).
- If either WSHLD switch is OFF or insufficient windshield visibility exists, circling approaches are not recommended.

4. Maintain 25,000 feet or below or minimum safe altitude.
5. MANUAL PRESS Switch — ON, to select manual rate control.
6. MANUAL Rate Control — UP, as required to reduce differential pressure to 6.5 psi or less without exceeding 8,000 feet cabin altitude.
7. Moving the COCKPIT and CABIN TEMPERATURE knobs to HOT will help reduce fogging.
8. Land as soon as practical.
Engine Ice Ingestion

Engine ice ingestion can result in fan damage and abnormal engine operation. Engine ice ingestion can be suspected whenever ice is shed from the wing, windshield, or nacelle. This may occur when anti-ice systems are energized after significant ice accumulation has occurred on the above surfaces. Ice ingestion may be evident by a change in engine sound or frequency, audible report, sharp rise in ITT, N1 or N2 hang-up. Illumination of an L or R ENG VIB MON white CAS may indicate ice ingestion or damage to the respective engine.

Experience to date has shown that, if proper procedures are observed, there is a very high probability of satisfactory engine operation after experiencing foreign object damage from ice in the engine fan. Such damage can reduce the compressor stall margin so that the engine could become more sensitive to rapid thrust lever movements, inlet pressure profile variation due to maneuvering, and high N1/N2 operation. Compressor stalls may result in engine flameout.

1. L and R IGN Switch — ON. Leave ON for the duration of the flight. (IGN green EI)
2. Avoid any abrupt changes in pitch, yaw, or roll.

To determine extent of engine damage due to ice ingestion, proceed as follows:

a. Thrust Levers (one at a time) — Slowly and cautiously retard to IDLE, then slowly and cautiously advance and check for any vibration or abnormal noise on each engine.

   If compressor stall is encountered, retard thrust lever until smooth operation is obtained. (If any of the fan blades have been damaged, the noise level and frequency will increase with an increase of N1).

If either engine flames out:
   (1) Airstart in accordance with Engine Airstart procedure, this section. After restart, repeat step 2, but stay below engine speed at which engine flamed out.

If ice damage has been experienced:
   (1) Engine N1 — Set as low as possible. Maintain sufficient N1 for anti-icing heat and cabin pressure.
   (2) Land as soon as practical.

3. Fly out of icing conditions as soon as possible.
Inadvertent Icing Encounter

Icing conditions have been encountered and the nacelle and/or wing/stab anti-ice systems are not selected on.

1. Thrust Levers — MCT (or less), unless a critical thrust situation exists.
2. WING/STAB Switch — ON.
3. L and R NAC Switches — ON. (NAC green EI)
4. L and R WSHLD Switches — Check On. (not illuminated)
5. HI FLOW Switch — Off.
6. Do not extend flaps beyond 8° until the wing/stab anti-ice system has been on for 2 minutes.

- Low speed flight should be approached with care so that detection of abnormal flying qualities can be obtained. Elevator buffet or stick pumping indicate ice may have formed on the stabilizer. Increased buffet may indicate ice formation on the wing leading edge.

- Even small accumulations of ice on the wing leading edge can cause an increase in stall speed and possibly, a degradation in stall characteristics.
AP AIL MISTRIM

The autopilot roll servo is holding excessive torque.

If condition persists:
1. Flight Controls — Hold firmly.

When autopilot is disengaged in a mistrim condition, expect an abrupt change in control force.

2. Autopilot — Use control wheel trim switch to disengage.
3. Retrim aircraft if necessary.
4. Fuel Balance — Check and correct imbalance if necessary.
5. Autopilot — As desired.

AP ELEV MISTRIM

The autopilot pitch servo is holding excessive torque.

If condition persists:
1. Flight Controls — Hold firmly.

When autopilot is disengaged in a mistrim condition, expect an abrupt change in control force.

2. Autopilot — Use control wheel trim switch to disengage.
3. Retrim aircraft if necessary.
APU AMPS HIGH (If Installed)

APU generator load is above limits.

- **On aircraft 45-002 thru 45-169 not modified by SB 45-22-4**, this CAS is not suppressed during or after APU or engine start, and the APU AMPS digits on EICAS will display limit colors.

- **On aircraft 45-170 & subsequent and prior aircraft modified by SB 45-22-4**, this CAS is temporarily suppressed after APU or engine start.

1. Electrical Load — Check. Reduce, if required to observe generator limits.

   - If the load limit for the APU generator exceeds 550 amps, the APU AMPS digits on EICAS will become amber dashes.

   - The APU control panel displays APU amps up to and including 500 amps. Therefore, APU generator loads in excess of 500 amps will be displayed as 500 amps on the APU control panel.

APU FAIL (If Installed)

APU engine control unit has detected a failure and has shut down the APU.

1. APU MASTER Switch — Off.

2. If APU FAIL indication extinguishes:
   a. Inspect the APU and aircraft tailcone area prior to flight to ensure airworthiness.
   b. Check APU fire bottle for proper pressure.

2. If APU FAIL indication remains illuminated:
   The APU fuel shut off valve is not closed.
   a. Do not take off.
EMERGENCY EXIT

Either of the two pins on the emergency exit hatch are not fully latched. The hatch is a plug type hatch; therefore, pressurization loads will hold the hatch closed.

WARNING

Do not approach hatch. Hatch failure may be indicated by a loud noise, pressurization leak, or rumble emanating from hatch area.

1. NO SMOKING BELTS Switch — BELTS.

EXTERNAL DOORS

Either the baggage door or the tailcone door switches have not made contact. There are two switches on each door. The primary purpose is to indicate a door open condition prior to takeoff. If the doors were properly latched prior to takeoff and the light illuminates in flight, the most probable cause is a switch failure.

In flight:
1. Avoid slips or skids that could open doors.

L BAT TOVHT
R BAT TOVHT
LR BAT TOVHT (Nickel-Cadmium Batteries Only)

The respective battery temperature is greater than 60°C.

1. Respective L or R BAT Switch — OFF.
2. EICAS — Select ELEC or SUMRY page. Monitor battery temperature.

If the respective battery temperature continues to increase:

a. Land as soon as practical.
Abnormal Procedures

**EMER BATT LOW**

Emergency battery is taking a charge in excess of 10 amps, and has not recovered from a previous discharge. This CAS is temporarily suppressed after an engine start.

**On the ground:**
1. EICAS — Select ELEC or SUMRY page.
2. In order to ensure adequate emergency power endurance in the event of a dual generator failure, allow time for battery to charge and EMER BATT LOW illumination to extinguish prior to flight.
3. This checklist is complete.

**In flight:**

NOTE The EMER BATT LOW illumination may occur after any use of the emergency battery (e.g. Engine Airstart).

1. EICAS — Select ELEC or SUMRY page.
2. Land as soon as practical.

**If conditions permit:**
1. Pull circuit breakers, pilot’s and copilot’s circuit breaker panels, with red rings (EMER BATT bus) one at a time to isolate a possible faulted component. Allow time after pulling each circuit breaker for battery to recharge.
3. This checklist is complete.
EMER BUS VOLTS

The EMER bus voltage is less than 22 VDC or greater than 29.6 VDC.

1. EICAS — Select ELEC or SUMRY page.

2. If EMER-V bus voltage is greater than 29.6 VDC:
   a. On the ground:
      (1) Respective L or R, or APU (if installed) GEN Switch — OFF or, EXT PWR Switch — AVAIL or adjust EXT PWR source.
      (2) This checklist is complete.
   a. In flight:
      (1) Respective L or R GEN Switch — OFF.
      (2) Land as soon as practical.
      (3) This checklist is complete.

2. If EMER-V bus voltage is less than 22 VDC:
   a. On the ground:
      (1) Allow time for EMER BATT to recharge prior to flight.
      (2) This checklist is complete.
   a. In flight:
      (1) BUS Circuit Breaker (pilot’s ELECTRICAL group [EMER BUS]) — Set.
      (2) EMER BATT Switch — On. (EMER illuminated)
      (3) Land as soon as practical.

If flight time will exceed the emergency battery duration, refer to LR GEN FAIL procedure, Figure 3-1, Section III, for emergency battery duration.

   (4) Notify passengers of oxygen mask deployment. Instruct passengers to “Do not pull lanyard. Do not use the masks unless instructed otherwise”.
   (5) DEPLOY Switch (PAX OXYGEN panel) — ON.
   (6) DAU Switch (REVERSION panel) — Select B.
   (7) Standby Attitude — Pull and cage. Standby attitude will be inoperative.
   (8) Standby altimeter vibrator will be inoperative. Do not reference this instrument for primary altitude.
   (9) Refer to Landing Gear Free Fall procedure, Section IV. Normal landing gear control will be inoperative.
   (10) Refer to Emergency Braking procedure, Section III. Inboard brakes are inoperative.
   (11) This checklist is complete.
LESS BUS FAULT
RESS BUS FAULT
LR ESS BUS FAULT

The respective ESS bus contactor has failed open on the ground.

LESS BUS VOLTS
RESS BUS VOLTS
LR ESS BUS VOLTS

The respective ESS bus voltage is less than 22 VDC or greater than 29.6 VDC. This CAS is temporarily suppressed during engine start.

1. EICAS — Select ELEC or SUMRY page.
2. If respective L or R ESS bus voltage is greater than 29.6 VDC:
   a. ■ On the ground:
      (1) Respective L or R, or APU (if installed) GEN Switch — OFF or, EXT PWR Switch — AVAIL or adjust EXT PWR source.
      (2) This checklist is complete.
   a. ■ In flight:
      (1) Respective L or R GEN Switch — OFF.
      (2) Refer to LR GEN FAIL procedure, Section III, or single (L or R) GEN FAIL procedure, this section.
      (3) Land as soon as practical.
      (4) This checklist is complete.

2. If respective L or R ESS bus voltage is less than 22 VDC:
   a. ■ On the ground:
      (1) Connect an EXT PWR source or switch on a generator to charge the batteries. Allow time for batteries to recharge prior to flight.
      (2) This checklist is complete.
   a. ■ In flight:
      (1) BUS Circuit Breaker (pilot’s or copilot’s ELECTRICAL group [L or R ESS BUS]) — Set.
      (2) Respective L or R GEN Switch — Check On.
      (3) Land as soon as practical.
      (4) This checklist is complete.
Abnormal Procedures

L GEN AMPS HIGH
R GEN AMPS HIGH
LR GEN AMPS HIGH

Load limit for the respective generator has been exceeded. This CAS is temporarily suppressed after engine start.

1. EICAS — Select ELEC or SUMRY page.
2. Respective L or R NON-ESS Switch — OFF.
3. Respective Electrical Load — Reduce.
   If GEN AMPS HIGH remains illuminated and the AMPS are greater than 350 and the aircraft load has been reduced:
   a. Respective L or R BATT Switch — OFF.
   If GEN AMPS HIGH remains illuminated and the AMPS are greater than 350:
      (1) Respective L or R GEN Switch — OFF.
      (2) BUS-TIE Switch — Open. The respective main and main avionics buses will not be powered.

NOTE
- If the load limit for the respective generator exceeds 550 amps, the AMPS digits on EICAS will become amber dashes and the respective GEN AMPS HIGH amber CAS will not be illuminated.
- RMU ENGINE PAGE 2 AMP display may indicate up to 15 amps with the generators off.
Abnormal Procedures

**L GEN FAIL**

**R GEN FAIL**

The respective generator is off-line. The BUS-TIE will automatically close and, in-flight, non-essential buses will not be powered. Non-essential buses can be selected on, if desired. Also indicated as amber L or R symbols on the ELEC page.

1. Respective L or R GEN Circuit Breaker (ELECTRICAL group) — Set, or pull and reset.
2. Engine N2 — 80% or greater.
3. Respective L or R GEN Switch — Depress, for approximately 1 second.

**CAUTION**

Depressing and holding the GEN switch longer than 1 second or multiple activations may cause damage to the electrical system.

If GEN FAIL remains illuminated:

a. L and R NON-ESS Switches — As desired.
   b. Remaining (non-affected) GEN AMPS — Monitor.

**NOTE**

- During ground operation, if respective CAS is accompanied by a GEN FAIL red CWP illumination, refer to LR GEN FAIL procedure, Section III.
- RMU ENGINE PAGE 2 AMP display may indicate up to 15 amps with the generators off.

**EMER LIGHTS**

Indicates the emergency lights are not armed.

1. EMER LIGHTS Switch — ARM.

**L ENG FIRE FAIL**

**R ENG FIRE FAIL**

**LR ENG FIRE FAIL**

The engine fire detection system has detected a fault on the ground that may not allow the detection system to indicate a fire.
A malfunction has occurred in the Digital Electronic Engine Computer (DEEC).

The DEEC may revert control of engine to MAN mode depending on the level of the fault. Engine operation may be affected. The DEEC still provides electronic overspeed protection with ENG CMPTR switch in MAN. Mechanical overspeed protection is provided with ENG CMPTR switch in OFF.

   - A MAN amber EI illuminates if the ENG CMPTR switches control of engine to manual mode.

2. ENG SYNC Switch — OFF.
3. Respective Thrust Lever — MCR or below.
   - When operating in MAN above 30,000 feet, maintain N1 greater than 66%. When operating above 46,000 feet, maintain N1 greater than 80%. If N1 is allowed to decelerate below these values, the engine acceleration may not occur when commanded. In that event, increasing the aircraft speed and/or decreasing altitude will restore normal engine function.

4. Respective L or R ENG CMPTR Switch — OFF, then ON.

If ENGCMPTR FAULT remains illuminated:
   a. Respective L or R ENG CMPTR Switch — MAN and continue flight. Engine acceleration and deceleration in manual mode will be slower than normal. The slower response should be considered in a go-around condition. Refer to applicable thrust setting performance data, Section V, to obtain rated thrust. The thrust lever detents do not automatically set thrust in MAN mode.
      - The CHECK EDS white CAS will illuminate.
      - Thrust reversers must be limited to idle reverse when the engines are operating in MANual mode.
Metal particles have been detected in the oil while on the ground.

The engine oil filter has an impending bypass while on the ground.
Engine Airstart

**ENG CMPTR ON (Auto Mode)**

**WARNING**

Do not attempt an airstart following an engine failure which was accompanied by indications of internal engine damage or fire.

**CAUTION**

Do not attempt an airstart without an indication of N1 rotation.

**NOTE**

Master Caution will trigger when thrust lever is moved to IDLE.

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**Figure 4-1**

Auto Mode Airstart Envelope
Engine Airstart (Cont)

ENG CMPTR ON (Auto Mode) (Cont)

Before Start

Affected Engine:

1. Assure that aircraft is within appropriate Airstart Envelope as shown in Figure 4-1, this section.
2. ENG CMPTR Switch — ON.
3. Fuel Supply — Check.
   a. Fuel available from wing tank.
4. FUEL Panel — As follows:
   a. XFLOW Switch (FUEL) — Closed. (not illuminated)
   b. STBY Switch (FUEL) — ON.
5. FIRE Switch (ENGINE) — Check Open. (not illuminated)
6. WSHLD Switch — OFF.
7. Electrical Load — Reduce. (BUS TIE should automatically close.)
8. WING/STAB Switch — Off.
9. NAC Switch — Off.
10. BLEED Switch — OFF.
11. Conduct the following windmill or starter assisted airstart.

Start

Windmill Airstart

Affected Engine:

1. Thrust Lever (at minimum 10% N2) - IDLE.

   **NOTE**
   
   If stabilized N2 is less than 10%, do not attempt a windmill start. Increase airspeed until N2 reaches 10% (if thrust and altitude permit), or conduct starter assisted airstart.

2. IGN and FUEL FLOW — Check.
3. ITT — Check rise. (941°C maximum)

If no indication of light-off is obtained within 20 seconds of achieving thrust lever movement to idle:

   a. Thrust Lever — CUTOFF.
   b. Repeat airstart or refer to Engine Shutdown in Flight procedure, this section.
Abnormal Procedures

Bombardier Learjet 45

Engine Airstart (Cont)

ENG CMPTR ON (Auto Mode) (Cont)

Start (Cont)

Starter Assisted Airstart

Affected Engine:

1. START Switch — ON. (START green EI)
2. Thrust Lever (at minimum 10% N2) — IDLE.
3. IGN and FUEL FLOW — Check.
4. ITT — Check rise. (941°C maximum)

If no indication of light-off is obtained within 20 seconds of achieving thrust lever movement to idle:
   a. Thrust Lever — CUTOFF.
   b. Repeat airstart or refer to Engine Shutdown in Flight procedure, this section.

After Start

Affected Engine:

1. FUEL Panel — As follows:
   a. STBY Switch (FUEL) — Off, as desired.
   b. XFLOW Switch (FUEL) — As desired.
2. GEN Switch — On.
3. WSHLD Switch — On.

If a WSHLD HT FAIL amber CAS occurs, switch WSHLD OFF, wait one minute and switch WSHLD On.

4. WING/STAB Switch — As required.
5. NAC Switch — As required.
6. BLEED Switch — On.
Engine Airstart (Cont)

ENG CMPTR - MAN or OFF

**WARNING**

Do not attempt an airstart following an engine failure which was accompanied by indications of internal engine damage or fire.

**CAUTION**

Do not attempt an airstart without an indication of N1 rotation.

**NOTE**

Master Caution will trigger when thrust lever is moved to IDLE.

Manual Mode Airstart Envelope

![Graph showing Manual Mode Airstart Envelope](image)

**Figure 4-2**
Engine Airstart (Cont)

ENG CMPTR - MAN or OFF (Cont)

Before Start

Affected Engine:

1. Assure that aircraft is within appropriate Airstart Envelope as shown in Figure 4-2, this section.
2. ENG CMPTR Switch — MAN or OFF (MAN mode recommended).
3. Fuel Supply — Check.
   a. Fuel available from wing tank.
4. FUEL Panel — As follows:
   a. XFLOW Switch (FUEL) — Closed. (not illuminated)
   b. STBY Switch (FUEL) — ON.
5. FIRE Switch (ENGINE) — Check Open. (not illuminated)
6. WSHLD Switch — OFF.
7. Electrical Load — Reduce. (BUS TIE should automatically close.)
8. WING/STAB Switch — Off.
9. NAC Switch — Off.
10. BLEED Switch — OFF.
11. Conduct the following windmill or starter assisted airstart.

Start

Windmill Airstart

Affected Engine:

1. IGN Switch — ON. (IGN green EI)
2. Thrust Lever (at minimum 10% N2) — IDLE.

If stabilized N2 is less than 10%, do not attempt a windmill start at that condition. Increase airspeed until N2 reaches 10% (if thrust and altitude permit), or conduct starter assisted airstart.

3. IGN and FUEL FLOW — Check.
4. ITT — Check rise. (941° C maximum)

If no indication of light-off is obtained within 20 seconds of achieving thrust lever movement to idle:

a. Thrust Lever — CUTOFF.
   b. IGN Switch — Off.
   c. Repeat airstart or refer to Engine Shutdown in Flight procedure, this section.
Abnormal Procedures

Engine Airstart (Cont)

ENG CMPTR - MAN or OFF (Cont)

Start (Cont)

Starter Assisted Airstarts

Affected Engine:
1. IGN Switch — ON. (IGN green EI)
2. START Switch — ON. (START green EI)
3. Thrust Lever (at minimum 10% N2) — IDLE.
4. IGN and FUEL FLOW — Check.
5. ITT — Check rise. (941°C maximum)

If no indication of light-off is obtained within 20 seconds of achieving thrust lever movement to idle:
   a. Thrust Lever — CUTOFF.
   b. START Switch — Off.
   c. IGN Switch — Off.
   d. Repeat airstart or refer to Engine Shutdown in Flight procedure, this section.


After Start

Affected Engine:
1. IGN Switch — Off.
2. FUEL Panel — As follows:
   a. STBY Switch (FUEL) — Off, as desired.
   b. XFLOW Switch (FUEL) — As desired.
3. GEN Switch — On.
4. WSHLD Switch — On.

If a WSHLD HT FAIL amber CAS occurs, switch WSHLD OFF, wait one minute and switch WSHLD On.

5. WING/STAB Switch — As required.
6. NAC Switch — As required.
7. BLEED Switch — On.
Engine Instrument Indications (EIs)

IGN

Manual or Auto ignition is ON, and both ignitor plugs have failed.
1. CH A and CH B Circuit Breakers (respective L or R IGN group (ENGINE)) — Set, or pull and reset.

If IGN remains illuminated:
   a. Airstarts will not be possible.

MAN

ENG CMPTR is operating in manual mode because an ENGCMPTR FAULT has occurred. Refer to L or R ENGCMPTR FAULT procedure, this section.

- When operating in MAN above 30,000 feet, maintain N1 greater than 66%. When operating above 46,000 feet, maintain N1 greater than 80%. If N1 is allowed to decelerate below these values, the engine acceleration may not occur when commanded. In that event, increasing aircraft speed and/or decreasing altitude will restore normal engine function.

- Thrust reversers must be limited to idle reverse when the engines are operating in MANual mode.

NAC

NAC switch is selected ON and nacelle heat has failed, or NAC switch is selected off and has failed to ON. Refer to L or R NAC HT or L or R NAC HT FAIL ON procedure, this section.

REV

Thrust reverser is armed in flight or on the ground with a TLA (thrust lever angle) greater than MCR.

In flight:
1. Respective Thrust Reverser Lever — STOW.
2. Respective DEPLOY Circuit Breaker (ENGINE group) — Pull.
3. Continue Flight.
Engine Instrument Indications (EIs) (Cont)

**START**

The starter is engaged with N2 > 51%.

**Ground Start**

1. Respective START Switch — Off.

   **If START remains illuminated**, the starter is still engaged.
   
   **Affected Engine:**
   
   a. Thrust Lever — CUTOFF.
   
   b. Turn off all electrical power.

**Starter-Assisted Airstart**

1. Complete airstart procedure.

   **If START remains illuminated**, the starter is still engaged.

   a. Continue flight.

   **At shutdown:**

   b. L and R BATT Switches — OFF (to disengage the starter).

**SYNC**

Main gear is not locked up with ENG SYNC switch selected N1 or N2.

1. Select ENG SYNC — OFF.

**UNL**

On the ground, the thrust reverser is in transition between stow and deploy. It will temporarily illuminate during normal thrust reverser deployment. If illumination continues for more than several seconds, an abnormal condition exists and the master caution is tripped.

**Engine Overspeed**

**Affected Engine:**

1. Thrust Lever — Retard.

   **If engine does not respond:**

   a. Thrust Lever — CUTOFF.

   **If engine does not respond:**

   1. FIRE Switch (ENGINE) — Lift guard, FIRE PUSH. (respective FWSOV CLSD white CAS)
   2. After engine has shut down, ENG CMPTR Switch — MAN. It is allowable to push the FIRE Switch (ENGINE) allowing hydraulic fluid and fuel to the pumps to minimize damage to the pumps.
   3. Refer to Engine Shutdown in Flight procedure, this section.
Engine Shutdown in Flight

Affected Engine:

1. ENG SYNC Switch — OFF.
2. Thrust Lever — CUTOFF.

The engine fuel and hydraulic pumps will continue to operate with a windmilling engine. Prolonged operation without fluid available to the pumps may cause damage. Therefore, the FIRE switch (ENGINE) should not be pushed unless a fuel or hydraulic leak is suspected.

3. Rudder Trim — As required.
4. Yaw Damper — As required.
5. Autopilot — As desired.
7. WSHLD Switch — OFF. Avoid flight in icing conditions.
8. BLEED Switch — OFF.
10. Land as soon as practical.
11. Refer to En Route Climb Gradient — Single Engine chart, Section V.
12. Refer to Engine Airstart, if applicable, or Single-Engine Landing procedure, or Thrust Reverser Deployed Landing procedure, this section, as appropriate.

- When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

- Descent into conditions with a small split between temperature and dew point may result in interior windshield condensation (fogging).

- If either WSHLD switch is OFF or inoperative, circling approaches are not recommended in icing or fogging conditions.
Abnormal Procedures

L BLEED OVHT
R BLEED OVHT
LR BLEED OVHT

An excessive bleed air temperature has been sensed in the bleed air duct.

L or R BLEED OVHT Illuminates

1. Respective L or R BLEED Switch — OFF. Allow time for system to cool.
2. If BLEED OVHT continues:
   a. Reduce N1 on respective engine.
   b. Maintain 41,000 feet or below. Avoid flight in icing conditions.

   NOTE When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

   c. Land as soon as practical.
   d. This checklist is complete.

2. If BLEED OVHT extinguishes:
   a. Respective BLEED Switch may be selected On.

   NOTE When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

   (3) This checklist is complete.

LR BLEED OVHT Illuminates

1. L BLEED Switch — OFF.
2. Reduce N1 on right engine. Allow time for system to cool.
3. If LR BLEED OVHT continues:
   a. L BLEED Switch — On.
   b. Right engine N1 — As required.
   c. R BLEED Switch — OFF.
   d. Reduce N1 on left engine. Allow time for system to cool.

(Continued)
Abnormal Procedures

L BLEED OVHT
R BLEED OVHT
LR BLEED OVHT (Cont)

e. ■ If LR BLEED OVHT continues:
   (1) Maintain 41,000 feet or below. Avoid flight in icing conditions.

   ![NOTE]

   When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

   (2) Land as soon as practical.
   (3) This checklist is complete.

   e. ■ If either L or R BLEED OVHT extinguishes:
      (1) L or R BLEED Switch (on side that caution extinguished) — On.
      (2) Refer to the L or R BLEED OVHT procedure above.

3. ■ If either L or R BLEED OVHT extinguishes:
   a. L or R BLEED Switch (on side that caution extinguished) — On.
   b. Refer to the L or R BLEED OVHT procedure above.

CAB DELTA P

Cabin differential pressure has exceeded 9.5 psid or the cabin differential pressure is less than -0.5 psid. The ECS page value on CAS will also be amber and the PRESSURIZATION panel value will flash. If 9.9 psid is exceeded, the ECS page value will be red and the PRESSURIZATION panel will flash.

1. EICAS — Select ECS page. Check DELTA P.
2. L and R PRESS Circuit Breakers (pilot’s and copilot’s ENVIRONMENTAL and ENVIR group) — Pull and reset.

3. ■ If DELTA P is greater than 9.5 psid:
   a. MANUAL PRESS Switch — ON, to select manual rate control.
   b. MANUAL Rate Control — UP, as required to reduce differential pressure.

   If CAB DELTA P remains illuminated:
      (1) One L or R BLEED Switch — OFF.
      (2) Adjust N1 on opposite engine to control cabin pressurization.
      (3) Maintain 41,000 feet or below. Avoid flight in icing conditions.

(Continued)
Abnormal Procedures

CAB DELTA P (Cont)

When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

(4) This checklist is complete.

If still unable to regulate the overpressurization:

(i) EMER DEPRESS Switch — Lift guard, ON.
(ii) Descend to reduce differential pressure, but not below minimum safe altitude.
(iii) This checklist is complete.

NOTE
Applicable operating rules pertaining to the use of oxygen at high cabin altitude must be observed.

3. If DELTA P is less than -0.5 psid:
   a. MANUAL PRESS Switch — ON, to select manual rate control.
   b. MANUAL Rate Control — DN, as required to increase differential pressure.

If CAB DELTA P remains illuminated:

(1) Decrease aircraft descent rate.
(2) This checklist is complete.

CAB DUCT OVHT

An excessive cabin air temperature has been sensed in the cabin air distribution duct. The applicable temperature control valve should have automatically closed.

1. EICAS — Select ECS page.
2. MANUAL TEMP Switch — ON.
3. CABIN TEMPERATURE COLD-HOT Knob — Rotate to full COLD.
4. TEMP CONT (ECS Page) — Verify CAB is moving to or at the C (cold) position.

If CAB DUCT OVHT remains illuminated:

   a. L BLEED Circuit Breaker (pilot’s ENVIRONMENTAL group) — Pull. Allow time for air to cool.
   b. Maintain 41,000 feet or below. With the L BLEED Switch On, anti-ice airflow is available to the respective anti-ice valves.

(Continued)
CAB DUCT OVHT (Cont)

When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

If CAB DUCT OVHT remains illuminated:
(1) R BLEED Circuit Breaker (copilot’s ENVIR group) — Pull. Allow time for air to cool. Avoid flight in icing conditions.
(2) Adjust N1 to control cabin pressurization. Spoilers may be required for descent.

If thrust levers are reduced to idle, pressurization airflow will reduce and cabin altitude will climb.

If CAB DUCT OVHT remains illuminated or icing conditions cannot be avoided:
(i) L and R BLEED Circuit Breakers (respective ENVIRONMENTAL and ENVIR group) — Set.
(ii) EMER PRESS Switch — Lift guard, ON.
(iii) One L or R BLEED Switch — OFF.
(iv) Reduce N1 on engine with bleed air on.

- If thrust levers are reduced to idle with EMER PRESS ON, pressurization airflow will reduce and cabin altitude will climb.
- When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

LR CAB PRESS FAIL

Both channels of the cabin pressure controller have failed. The pressurization will go to maximum differential pressure and displays for cabin pressurization parameters will become amber dashes. PRESSURIZATION panel will blank.

1. L and R PRESS Circuit Breakers (pilot’s and copilot’s ENVIRONMENTAL and ENVIR group) — Pull and reset.

If LR CAB PRESS FAIL remains illuminated:
   a. Maintain below 8000 feet or minimum safe altitude. Land below 8000 feet field elevation, if possible.

(Continued)
Abnormal Procedures

LR CAB PRESS FAIL (Cont)

When below 8,000 feet:

b. PACK Switch — OFF, to depressurize the aircraft prior to landing.

- If LR CAB PRESS FAIL amber CAS is accompanied by a DAU 1A FAIL amber CAS, the cabin pressurization system may not have failed. Refer to DAU 1A FAIL procedure, this section.

- Applicable operating rules pertaining to the use of oxygen at high cabin altitude must be observed.

- “CABIN ALTITUDE” voice warning, EMER PRESS and EMER DEPRESS may be inoperative. On aircraft 45-236 & subsequent and prior aircraft modified by SB 45-22-5, CABIN ALTITUDE red CAS and CABIN ALT red CWP may also be inoperative.

CAB PRESS MAN

The cabin pressure controller has reverted from automatic rate control to manual rate control due to the loss of all air data input.

1. MANUAL Rate Control — As required.

CABIN ALTITUDE or
Cabin Altitude Exceeds 8500 Feet

Cabin altitude is high for conditions.

1. Crew Oxygen Masks — Don, select 100% oxygen.

- Hats and “ear-muff” type headsets must be removed prior to donning crew oxygen masks.

2. If aircraft is climbing, stop climbing and level off at (or descend to) the nearest appropriate altitude.

3. Pilot and Copilot MIC/MASK Selector Switches — MASK.

4. Pilot and Copilot INPH Selector Switches — INPH.

5. PACK Switch — Check On. (not illuminated)

6. L and R BLEED Switches — Check On. (not illuminated)

7. EICAS — Select ECS page. Check CABIN ALT.

8. If cabin altitude continues to climb:

a. MANUAL PRESS Switch — ON, to select manual rate control.

b. MANUAL Rate Control Knob — DN, as required to maintain satisfactory pressurization.

(Continued)
CABIN ALTITUDE or Cabin Altitude Exceeds 8500 Feet (Cont)

If cabin altitude continues to climb:

(1) EMER PRESS Switch — Lift guard, ON.

- The emergency pressurization valves will automatically reposition to the emergency mode if cabin altitude increases above limits and route low-stage bleed air into cabin and LR EMER PRESS ON amber CAS will illuminate.
- The wing and stabilizer bleed air anti-ice and nacelle inlet anti-ice will be available with emergency pressurization on.

8. **If cabin altitude stabilizes at a safe altitude:**
   a. Continue flight. Continued use of the oxygen system is at the crew’s discretion.

CKPT DUCT OVHT

An excessive cockpit air temperature has been sensed in the cockpit air distribution duct. The applicable temperature control valve should have automatically closed and the APU BLEED air valve will close (if installed).

1. EICAS — Select ECS page.
2. MANUAL TEMP Switch — ON.
3. COCKPIT TEMPERATURE COLD-HOT Knob — Rotate to full COLD.
4. TEMP CONT (ECS Page) — Verify CKPT is moving to, or is at the C (cold) position.

**If CKPT DUCT OVHT remains illuminated:**

a. L BLEED Circuit Breaker (pilot’s ENVIRONMENTAL group) — Pull. Allow time for air to cool.
b. Maintain 41,000 feet or below. With the L BLEED Switch On, anti-ice airflow is available to the respective anti-ice valves.

**NOTE**

When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

(Continued)
Abnormal Procedures

CKPT DUCT OVHT (Cont)

If CKPT DUCT OVHT remains illuminated:
(1) R BLEED Circuit Breaker (copilot’s ENVIR group) — Pull. Allow time for air to cool. Avoid flight in icing conditions.
(2) Adjust N1 to control cabin pressurization. Spoilers may be required for descent.

If thrust levers are reduced to idle, pressurization airflow will reduce and cabin altitude will climb.

If CKPT DUCT OVHT remains illuminated or icing conditions cannot be avoided:
(i) L and R BLEED Circuit Breakers (respective ENVIRONMENTAL and ENVIR group) — Set.
(ii) EMER PRESS Switch — Lift guard, ON.
(iii) One L or R BLEED Switch — OFF.
(iv) Reduce N1 on engine with bleed air on.

If thrust levers are reduced to idle with EMER PRESS ON, pressurization airflow will reduce and cabin altitude will climb.

- When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

LR ECS FAIL
(Aircraft 45-236 & subsequent and prior aircraft modified by SB 45-22-5)
Both channels of the ECS controller have failed and emergency pressurization is lost.

1. L and R BLEED Circuit Breakers (respective ENVIRONMENTAL and ENVIR group) — Set, or pull and reset.

If LR ECS FAIL remains illuminated:
a. Maintain 41,000 feet or below.

If thrust levers are reduced to idle, pressurization airflow will reduce and cabin altitude will climb.

L ECS FAULT
R ECS FAULT
(Aircraft 45-236 & subsequent and prior aircraft modified by SB 45-22-5)
A fault has been detected in the respective channel of the ECS controller.

1. Respective L or R BLEED Circuit Breaker (respective ENVIRONMENTAL or ENVIR group) — Set, or pull and reset.
The respective emergency pressurization valve has been electrically commanded to open either manually or automatically at a cabin altitude of 9500 (or 14,500 feet high altitude landing).

**Inadvertent Activation of Emergency Airflow**

If cabin altitude is below 9500 feet:

1. EMER PRESS Switch — Off.
2. ● If L or R EMER PRESS ON remains illuminated:
   a. Respective L or R BLEED Switch — OFF. If emergency flow stops, leave switch OFF.
   b. Maintain 41,000 feet or below. Avoid flight in icing conditions.

**NOTE**

When operating with only one engine supplying bleed air, maintaining N₁ greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

c. This checklist is complete.

2. ● If LR EMER PRESS ON remains illuminated:
   a. One L or R BLEED Switch — OFF.
   b. Adjust N₁ on engine supplying EMER air to modulate cabin temperature.
   c. Maintain 41,000 feet or below. Avoid flight in icing conditions.

**NOTE**

When operating with only one engine supplying bleed air, maintaining N₁ greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

d. Land as soon as practical.

**If emergency airflow continues:**

(1) Reduce N₁ on respective engine as low as practical.  

*(Continued)*
(2) Respective L or R BLEED Circuit Breaker (respective ENVIRONMENTAL or ENVIR group) — Pull. Emergency pressurization may not be available through the affected side. The corresponding EMER PRESS ON amber CAS will extinguish, however, the emergency valve may not close.

(3) Respective L or R BLEED Switch — On. This will allow anti-ice airflow to the respective anti-ice valves.

(4) Land as soon as possible.

(5) This checklist is complete.

**OXYGEN OFF**

The oxygen line pressure is low or the oxygen bottle is off.

**On the ground:**

1. Select Oxygen Bottle Pressure Regulator — ON prior to flight or service oxygen bottle.
2. This checklist is complete.

**In flight:**

The OXYGEN OFF amber CAS should not normally be seen in flight unless there is an electrical malfunction of a pressure switch. An oxygen line failure or a complete loss of oxygen bottle pressure would also be accompanied by the OXYGEN QTY LOW amber CAS.

1. EICAS — Select ECS page.
2. OXY QTY — Check.
   Refer to Oxygen Duration chart, Figure 4-3.
3. Crew Masks — Test. Rotate mask regulator knob to the EMER position and note oxygen flow, then reset to 100% position.

4. **If oxygen quantity is satisfactory:**
   a. Continue flight. The OXYGEN OFF amber CAS is most likely a result of a pressure switch malfunction.
   b. This checklist is complete.

4. **If oxygen quantity is not satisfactory:**
   a. Maintain below 25,000 feet or minimum safe altitude. The OXYGEN PRESS amber CAS should be illuminated. Replan flight as necessary.
   b. This checklist is complete.
Abnormal Procedures

**Oxygen Duration Chart**

for

**PURITAN-BENNET SWEEP-ON 2000**
or **EROS Crew Masks**

**EFFECTIVITY**
Aircraft 45-002 thru 45-169 not modified by SB 45-35-1

Example:
OXY QTY . . . . . . . . . . . . . . . . . . . 500 LTR
Number of Passengers . . . . . . . . . . . . . . 6
Cabin Altitude . . . . . . . . . . . . . . . . . 25,000 feet
Duration . . . . . 13.5 minutes @ 100%; 14 minutes @ NORM

- Crew and passenger masks are not approved for use above 40,000 feet cabin altitude. Prolonged operation of passenger masks above 25,000 feet cabin altitude is not recommended.
- Prior to extended flight, plan oxygen requirements to provide sufficient oxygen for all occupants in the event of a pressurization failure. Additional oxygen may be required to assure that both oxygen duration and range (fuel) requirements are satisfied.

Figure 4-3
Abnormal Procedures

Oxygen Duration Chart for PURITAN-BENNETT SWEEP-ON 2000 or EROS Crew Masks

Example:

- Crew and passenger masks are not approved for use above 40,000 feet cabin altitude. Prolonged operation of passenger masks above 25,000 feet cabin altitude is not recommended.
- Prior to extended flight, plan oxygen requirements to provide sufficient oxygen for all occupants in the event of a pressurization failure. Additional oxygen may be required to assure that both oxygen duration and range (fuel) requirements are satisfied.

Figure 4-3.1

EFFECTIVITY

Aircraft 45-170 & Subsequent and prior aircraft modified by SB 45-35-1
**OXGEN QTY LOW**

Oxygen quantity is low.

**On the ground:**
1. EICAS — Select ECS page.
2. OXY QTY — Check.
3. Using the oxygen quantity mission planning table in the Pilot’s Manual, determine if the oxygen quantity is sufficient for the planned mission.

**If oxygen quantity is not satisfactory:**
4. Refer the problem to maintenance personnel for correction.

**In flight:**
1. EICAS — Select ECS page.
2. OXY QTY — Check.
3. Using the oxygen duration chart in this section of the AFM, determine if the oxygen quantity is sufficient based on the cabin altitude and number of passengers.

**If oxygen quantity is not satisfactory:**
4. Maintain below 25,000 feet or minimum safe altitude.
5. Replan flight as necessary.

**OXY PRESS HI**

Oxygen bottle is overserviced. Oxygen quantity digits will be amber dashed.

**On the ground:**
1. Refer the problem to maintenance personnel for correction.

**In flight:**
1. Continue flight.
PACK OVHT

The pack compressor discharge air temperature is high.

1. HI FLOW Switch — Off.
2. APU BLEED Switch (if installed) — Off.

If PACK OVHT remains illuminated:
   a. L or R BLEED Switch — Select one OFF.
   b. Reduce N1 on opposite engine as low as practical.
   c. Maintain 41,000 feet or below. Avoid flight in icing conditions.

   - Descending to a lower altitude may reduce the PACK compressor discharge air temperature.
   - When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing while exiting icing conditions.

If PACK OVHT remains illuminated:
   (1) EMER PRESS Switch — Lift guard, ON.
   (2) PACK Switch — OFF.
   (3) Adjust thrust lever on engine supplying EMER PRESS air to modulate cabin temperature.

PAX OXY FAIL

The electric deploy valve has failed and may not allow automatic or manual oxygen mask deployment.

1. Notify passengers of mask deployment and mask use if necessary.

   - Do not pull lanyard pins if oxygen is not required.

2. DEPLOY Switch (PAX OXYGEN) — Lift guard, ON.

3. ● If passenger oxygen masks deploy:
   a. Continue flight.
   b. This checklist is complete.

3. ● If passenger oxygen masks do not deploy:
   a. Maintain below 25,000 feet or minimum safe altitude.
   b. Replan flight as necessary.
   c. This checklist is complete.
Abnormal Procedures

ELEVATOR DISC
The elevator disconnect has split the elevator controls on the ground.
1. Obtain maintenance prior to flight.

FLAPS FAIL
The flap system has shut down due to a detected failure. The flaps asymmetry or uncommanded movement failures are not resettable.
1. EICAS — Select FLT page.
2. FLAP CTRL Circuit Breaker (copilot’s FLIGHT group) — Set.
3. FLAPS — Select detent to agree with closest flap position.
4. SYS TEST/RESET Switch (FLAP RESET) — Press.
5. SYS TEST/RESET Switch (FLAPS) — Press.
6. SYS TEST/RESET Switch (FLAP RESET) — Press.
If FLAPS FAIL remains illuminated:
   a. Refer to Partial Flaps Landing procedure, this section.

FLAPS FAULT
The flaps are operating in a degraded mode. The fault may be resettable in some conditions, by movement of the flap selector handle.
1. EICAS — Select FLT page.
2. FLAP CTRL Circuit Breaker (copilot’s FLIGHT group) — Set.
3. FLAPS — Select a new detent, then select a detent to agree with closest flap position.
4. If FLAPS FAULT extinguishes:
   a. Select flaps as desired.
   b. This checklist is complete.
4. If FLAPS FAULT remains illuminated:
   a. SYS TEST/RESET Switch (FLAP RESET) — Press.
   b. This checklist is complete.
Abnormal Procedures

MAC H TRIM FAIL

The Mach trim function is disabled and the Mach number is greater than the allowable Mach trim off MMO. The “OVERSPEED” voice will sound if the autopilot is not engaged.

1. PITCH TRIM Switch — PRI.
2. PRI PITCH Circuit Breaker (pilot’s FLIGHT group [TRIM]) — Set.

If MACH TRIM FAIL remains illuminated:

a. **If autopilot is disengaged:**
   (1) Airspeed — Reduce to Mach trim off MMO or below.
   (2) This checklist is complete.

a. **If autopilot disengagement is desired:**
   (1) Airspeed — Reduce to Mach trim off MMO or below.
   (2) Autopilot — Disengage. Yaw damper as required.
   (3) This checklist is complete.

PRI TRIM FAIL

The primary pitch trim has failed.

1. PITCH TRIM Switch — SEC. (SEC PITCH TRIM white CAS)

   **NOTE** The Mach and configuration trim will be inoperative with the secondary trim selected.

2. SEC NDN-NUP Switch — Operate as required to maintain trim.
3. PRI PITCH Circuit Breaker (pilot’s FLIGHT group [TRIM]) — Pull.

If neither PRI nor SEC pitch trim is available:
4. Refer to Jammed Stabilizer procedure, this section.

ROLL DISC

Roll disconnect has occurred on the ground.

1. Align control wheels.
2. Push the small roll disconnect lever forward.
3. Verify ROLL DISC CAS extinguishes. Slight movement of the control wheels may be required to reconnect the controls.
RUD BOOST INOP
Rudder boost is inoperative and not selected off.

On the ground:
1. AFCS SERVOS Circuit Breaker (pilot’s FLIGHT group) — Set, or pull and reset.
2. Control Wheel Master Switch (MSW) — Depress and release.

NOTE
The following conditions will exist when the MSW switch is depressed. Nose wheel steering and yaw damper (if engaged) will disconnect.

3. NOSE STEER Switch — ON.

If RUD BOOST INOP remains illuminated:
a. RUD BOOST Switch — OFF. Refer to RUD BOOST INOP procedure, Section II.

In flight:
1. AFCS SERVOS Circuit Breaker (pilot’s FLIGHT group) — Set, or pull and reset.
2. Control Wheel Master Switch (MSW) — Depress and release.

NOTE
The following conditions will exist when the MSW switch is depressed. Autopilot and yaw damper will disconnect.Spoilers and spoilerons will be inoperative while the switch is depressed.

3. Yaw Damper — As required.
SEC TRIM FAIL
The secondary pitch trim has failed.

1. PITCH TRIM Switch — PRI.
2. Control Wheel Trim Switch — Operate as required to maintain trim.
3. SEC PITCH Circuit Breaker (copilot’s FLIGHT group [TRIM])—Pull.
4. Do not engage autopilot.

If neither PRI nor SEC pitch trim is available:
5. Refer to Jammed Stabilizer procedure, this section.

SPOILERS EXT
The spoilers are extended, the flaps are extended more than 3° and weight is off wheels.

Depending upon conditions:
1. Perform one of the following:
   - SPOILER Lever — RET,
   or:
   - FLAPS — UP.
**SPOILERS FAIL**
The spoileron monitor system has detected a failure. If the spoilers were deployed, they will retract down to a float position of approximately 10°. The spoilers will not float up. Spoilers may be resettable if the condition clears.

**On the ground:**

1. Complete Starting Engines procedure, Section II.
2. SPOILER Lever — RET.
3. SPLR CTRL and SPLR IND Circuit Breakers (respective pilot’s and copilot’s FLIGHT panel) — Pull, wait 5 seconds and reset. Allow 20 seconds for the system to restart.
4. EICAS — Select FLT page.
5. SPOILER Lever — EXT. Check for equal extension rate and position.
6. SPOILER Lever — ARM. Check for spoilers retracted. (AUTOSPLR ARM white CAS)

**If SPOILERS FAIL remains illuminated:**
   a. Do not take off. Refer the problem to maintenance personnel for correction.

**In flight:**
1. SPOILER Lever — RET.
2. SPLR CTRL and SPLR IND Circuit Breakers (respective pilot’s and copilot’s FLIGHT panel) — Set.
3. EICAS — Select FLT page. Check spoiler positions.
4. SYS TEST/RESET Switch — SPLRN RESET. Depress and release.

**If SPOILERS FAIL remains illuminated:**
   a. Spoilers and spoilerons will be inoperative in flight. Maintain 35,000 feet or below.
   b. Refer to Abnormal Landings, Spoilers Extended Landing procedure, this section.
L SPOILER JAM
R SPOILER JAM
LR SPOILER JAM

The spoiler monitor system has detected a jam of the respective spoiler panel. The system will attempt to stow the jammed spoiler. Autospoil-ers are inoperative.

L or R SPOILER JAM Illuminated

1. Control aircraft with roll control.
2. Autopilot — Disengage. Use control wheel trim switch to disen-
gage. Do not use MSW switch to disengage.
3. SPOILER Lever — Deploy as required to minimize roll.
4. EICAS — Select FLT page. Check SPOILER positions.
5. Slow aircraft as necessary to reduce roll control forces.

Do not reset spoiler system with SYS TEST/RESET (SPLRN RESET).

6. Land as soon as possible.
7. Refer to Abnormal Landings, Spoiler Jammed Landing proce-
dure, this section.

LR SPOILER JAM Illuminated

1. Refer to SPOILER FAIL procedure, this section.
The respective stall warning system has failed.

1. Respective L or R STALL WARN Circuit Breaker (FLIGHT group) — Set, or pull and reset.
2. Maintain airspeed at least 25 knots above stall speeds shown in Section V. VREF may be maintained on final approach in the landing configuration.
3. Limit bank angles to 30° maximum.

NOTE The respective airspeed indicator on the PFD will illuminate an amber AOA adjacent to the airspeed scale. The Low Speed Awareness (LSA) cue will not be displayed.
Abnormal Procedures

Jammed Stabilizer
PRI TRIM FAIL and SEC TRIM FAIL

This procedure would be used for a failure or jam of the PRI and SEC pitch trim.

Elevator Pull Force Is Encountered

If the stabilizer jams during a high-speed condition:
1. Delay reducing airspeed as long as possible to minimize the time out of trim. Do not re-engage autopilot.
2. Move C.G. aft if possible.
3. Land as soon as possible to minimize forward C.G. movement.
4. PIT TRIM BIAS Switch — NUP. (PIT TRIM BIAS white CAS.)
   Hold switch to trim out and reduce elevator force. The bias will reduce the elevator force approximately 50 pounds. Maximum bias will be obtained by holding the switch approximately 15 seconds. Only nose up elevator force can be provided by the system from the normal position. The switch can be held NDN to remove the bias. PIT TRIM BIAS will extinguish when all of the bias has been removed. The system works in the same sense as the pitch trim.
5. Refer to Stabilizer Jammed Landing procedure, this section.

Elevator Push Force Is Encountered

If the stabilizer jams during a low-speed condition:
1. Do not increase airspeed to minimize the time out of trim. Do not re-engage autopilot.
2. Move C.G. forward if possible.
3. Land as soon as possible.

NOTE: The PIT TRIM BIAS will not provide additional nose down elevator trim from the normal position.
4. Refer to Stabilizer Jammed Landing procedure, this section.
Abnormal Procedures

DEFUEL OPEN
The defueling valve is not closed.

On the ground:
1. Check DEFUEL on Refueling Panel — OFF.
   
   If DEFUEL OPEN remains illuminated:
   a. Close defuel valve (tailcone) prior to takeoff.
   b. This checklist is complete.

In flight:
1. Check EICAS or select FUEL page.
3. This checklist is complete.

L FUEL FILTER
R FUEL FILTER
LR FUEL FILTER
Either the respective engine or aircraft fuel filter has an impending by-pass on the ground.

L FUEL HEATER
R FUEL HEATER
LR FUEL HEATER
The fuel is less than 10°C and the oil temperature is above 86°C.

NOTE
If this is accompanied by an L, R, or both FUEL FILTER white CAS, there is a possibility of fuel icing.

1. Fly to warmer conditions if possible.
2. Respective L or R STBY Switch (FUEL) — ON.
FUEL IMBALANCE

The wing fuel imbalance is greater than 500 lb (227 kg) with flaps up or greater than 200 lb (91 kg) with flaps greater than 3°.

1. Check EICAS or select FUEL page.
2. Check trim.
3. Fuel Quantities — Check. Correct fuel distribution, if required:
   a. XFLOW Switch (FUEL) — Open.
   b. L or R STBY Switch (FUEL) (Heavy Wing) — ON.
   c. Monitor wing fuel quantity.

When fuel balance is achieved:
   d. L or R STBY Switch (FUEL) — Off.
   e. XFLOW Switch (FUEL) — Close.

NOTE

On aircraft 45-002 thru 45-194 not modified by SB 45-28-5, if a fuel imbalance occurs with 1200 to 1500 lb (544 to 680 kg) in each wing, monitor fuel for a short period of time before starting fuel transfer.

L FUEL QTY LOW
R FUEL QTY LOW
LR FUEL QTY LOW

(Aircraft 45-195 & subsequent and prior aircraft modified by SB 45-28-5)

The respective wing fuel tank level is approximately 350 lb (159 kg) when the aircraft is in unaccelerated, level flight.

1. Check EICAS or select FUEL page.
2. Fuel Quantities — Check.
3. Respective L or R STBY Switch (FUEL) — ON.
4. Replan flight if necessary.
**Abnormal Procedures**

**FUEL XFLO**

The wing fuel crossflow valve is not fully opened or closed as commanded.

1. Check EICAS or select FUEL page.
2. Fuel Quantities — Check.
3. XFLO Switch — Cycle.
4. **If XFLO valve fails to open:**
   a. Maintain wing fuel balance by adjusting power setting, if possible.
   b. This checklist is complete.
4. **If XFLO valve fails to close:**
   a. Maintain wing fuel balance by selecting appropriate L or R STBY Switch (FUEL) — ON.
   b. This checklist is complete.

**L FWSOV FAULT**

**R FWSOV FAULT**

**LR FWSOV FAULT**

The respective engine firewall fuel shutoff valve is not fully opened or closed as commanded.

1. Respective L or R STBY Switch (FUEL) — Off.

**STBY PUMP Fails ON**

The fuel will normally remain balanced without opening the FUEL XFLO valve. The fuel balance can be maintained by use of the FUEL XFLO and the PWR and CTRL circuit breakers [respective L or R STBY PUMP group] on the “failed ON” pump.
AUX HYD PMP LO

The auxiliary hydraulic pump is ON and the pressure is less than 1900 psi. May indicate that auxiliary hydraulic pressure is lost. An amber A pump symbol will also be displayed on the HYD page.

1. EICAS — Select HYD or SUMRY page.
2. HYD XFLOW Switch — Off.
3. PWR Circuit Breaker [pilot’s AUX HYD PUMP group] — Set.
4. Check B-ACUM pressure.
5. **If B-ACUM pressure is normal:**
   a. Emergency/parking brakes will operate normally.
   b. This checklist is complete.
5. **If B-ACUM pressure is low (BRK ACUM PRESS amber CAS):**
   a. Emergency/parking brakes may not be operational.
   b. Chock aircraft prior to engine shutdown to prevent aircraft movement.
   c. This checklist is complete.
A low auxiliary hydraulic reservoir quantity is indicated. HYD XFLOW valve will automatically close and is inhibited from opening which will prevent the auxiliary hydraulic system from operating the landing gear and flaps. If any auxiliary hydraulic fluid remains, then fluid will still be available to the brakes and brake accumulator. An amber LOW within the AUX reservoir schematic on the HYD page will also be displayed.

1. HYD XFLOW Switch — Off.
2. EICAS — Select HYD or SUMRY page.
3. Check B-ACUM pressure.
4. ● If B-ACUM pressure is normal:
   a. Emergency/parking brakes will operate normally.
   b. This checklist is complete.
4. ● If B-ACUM pressure is low (BRK ACUM PRESS amber CAS):
   a. Emergency/parking brakes may not be operational.
   b. AUX HYD Switch — ON to charge B-ACUM pressure.
   c. This checklist is complete.

NOTE
Chock aircraft prior to engine shutdown to prevent aircraft movement.


**BRK ACUM PRESS**

The emergency brake accumulator pressure is less than 1200 psi or greater than 3600 psi.

1. EICAS — Select HYD or SUMRY page.
2. Check B-ACUM pressure.
3. **If B-ACUM pressure is accompanied with an AUX HYD QTY LO amber CAS:**
   a. Landing gear extension or free fall will turn the AUX HYD pump ON.
   b. HYD XFLOW Switch — Off.
   c. AUX HYD Switch — Off.
   d. AUX HYD Switch — ON, just before landing.
   e. This checklist is complete.

3. **If B-ACUM pressure is high:**
   a. AUX HYD Switch — Off.
   b. Cycle EMERGENCY/PARKING BRAKE handle to reduce pressure.
   c. This checklist is complete.

3. **If B-ACUM pressure is low:**

   **NOTE**
   Brake accumulator pressure will normally change with temperature. Normally the pressure will drop as temperature drops. A recharge of the accumulator is not necessary unless there are hydraulic pressure failures.

   a. AUX HYD Switch — ON.

   If B-ACUM pressure remains low, reduced emergency/parking brake capability will exist.

   (1) This checklist is complete.

   **NOTE**
   Chock aircraft prior to engine shutdown to prevent aircraft movement.
MAIN HYD PRESS

The main hydraulic pressure is less than 1500 psi or greater than 3600 psi.

1. EICAS — Select HYD or SUMRY page.
2. Check MAIN and B-ACUM hydraulic pressures.
3. ● If MAIN pressure is high:
   a. Obtain maintenance prior to next flight.
   b. This checklist is complete.
3. ● If MAIN pressure is low:
   a. Do not use HYD XFLOW system to retract gear or flaps.
   b. Maintain 35,000 feet or below.
   c. Refer to Abnormal Landings, Main Hydraulic System Failure Landing procedure, this section.
Abnormal Procedures

**AHRS 1 OVHT**

**AHRS 2 OVHT**

**AHRS 1-2 OVHT**

*(Aircraft 45-002 thru 45-174)*

The respective Attitude Heading Reference System (AHRS) has reached an overheat condition. The AHRS will continue to operate with this CAS. If the temperature continues to increase, the AHRS may shut down.

If the AHRS shuts down, the autopilot and yaw damper will disengage and will not re-engage and rudder boost will be inoperative.

1. **AHRS NORM Switch (REVERSION panel)** — Select operative AHRS.

   **NOTE**

   Failure of AHRS 1 will cause illumination of the weather radar STAB amber MFD indication and a FUEL QTY FAULT white CAS. Fuel quantity will be correct at 0° pitch attitude.

2. Monitor standby attitude and heading indicator.

3. **AHRS 1 OVHT**
   a. # 1 PRI and # 1 SEC Circuit Breaker (respective pilot’s and copilot’s INSTRUMENTS group [AHRS PWR]) — Pull.
   b. Refer to Loss of PFD Attitude or Heading Displays procedure, this section.

3. **AHRS 2 OVHT**
   a. # 2 SEC and # 2 PRI Circuit Breaker (respective pilot’s and copilot’s INSTRUMENTS group [AHRS PWR]) — Pull.
   b. Refer to Loss of PFD Attitude or Heading Displays procedure, this section.

3. **AHRS 1-2 OVHT**
   a. # 2 SEC and # 2 PRI Circuit Breaker (respective pilot’s and copilot’s INSTRUMENTS group [AHRS PWR]) — Pull.
   b. # 1 PRI and # 1 SEC Circuit Breaker (respective pilot’s and copilot’s INSTRUMENTS group [AHRS PWR]) — Pull.
   c. Refer to Loss of PFD Attitude or Heading Displays procedure, this section.

**CNFG MISMATCH**

*(Aircraft 45-170 & subsequent and prior aircraft modified by SB 45-22-4)*

The configuration strapping, between the IM-600s (Integrated Computer Configuration Modules), does not agree. Obtain maintenance.
**DAU 1A FAIL**  
**DAU 1B FAIL**  
**DAU 1A-1B FAIL**

This indicates that the respective DAU (Data Acquisition Unit) channel 1A, 1B, or combination of 1A and 1B has failed.

1. Respective CH A and/or CH B Circuit Breaker(s) (pilot’s INSTRUMENTS/INDICATIONS group [DAU 1]) — Set.

2. **DAU 1A FAIL**
   a. DAU NORM Switch (REVERSION panel) — Select channel B.
   b. This checklist is complete.

   **NOTE**
   If DAU 1A channel has failed, an LR CAB PRESS FAIL amber CAS will illuminate even though the cabin pressurization system has not failed. This CAS will extinguish when DAU 1B channel is selected. Selection of DAU B reversion will result in an erroneous FDR FAIL white CAS.

   The left engine oil temperature, left battery temperature (Ni-Cad only), and aileron trim indications will be dashed invalid and cannot be recovered.

   All RMU left engine data will be invalid in addition to other RMU system parameter indications, which include:
   - Left fuel quantity
   - Main hydraulic pressure
   - Flaps
   - Aileron and pitch trim
   - SAT

2. **DAU 1B FAIL**
   a. Do not revert to DAU B.
   b. This checklist is complete.

   **NOTE**
   DAU Channel 1A and 2B are normally displayed. The loss of DAU 1B does not affect the displayed data unless reverted to DAU B.
   
   *(Continued)*
DAU 1A FAIL
DAU 1B FAIL
DAU 1A-1B FAIL (Cont)

2. DAU 1A -1B FAIL
   a. Match left thrust lever to the right.
   b. Monitor right engine displays.
   c. Land as soon as practical.
   d. This checklist is complete.

NOTE

The following engine/system parameter indications will be invalid and cannot be recovered:
- All left engine data (EICAS and RMU)
- Left DEEC N1 bug/digits (ENG CMPTR remains in automatic)
- LEFT and TOTAL fuel quantity (FMS total fuel on board will function properly)
- Total fuel used. (FMS fuel used will function properly)
- Aileron and pitch trim
- Left flap position select bug
- Main hydraulic pressure
- Left hydraulic pump icon
- Left generator amps and icon
- Cabin altitude, selected landing altitude, differential pressure, manual rate, and cabin rate on EICAS (CABIN PRESSURE CONTROL display will function properly)
- Cockpit air supply temperature

CWP and EICAS warning messages are operational. Some CAS may be affected by the loss of the associated DAU outputs. Monitor remaining system parameter indications.
DAU 2A FAIL
DAU 2B FAIL
DAU 2A-2B FAIL

This indicates that the respective DAU (Data Acquisition Unit) channel 2A, 2B, or combination of 2A and 2B has failed.

1. Respective CH A and/or CH B Circuit Breaker(s) (copilot’s INSTRUMENTS/INDICATIONS group [DAU 2]) — Set.

2. DAU 2A FAIL
   a. Do not revert to DAU B (DAU 2A not normally displayed).
   b. This checklist is complete.

   **NOTE**

   Right engine oil temperature, right battery temperature (Ni-Cad only), rudder trim and cabin temperature indications will be dashed invalid and cannot be recovered.

   All RMU right engine data will be invalid in addition to other RMU system parameter indications, which include:

   - Right fuel quantity
   - Brake accumulator pressure
   - Spoiler
   - Emergency volts
   - Rudder trim

2. DAU 2B FAIL
   a. DAU NORM Switch (REVERSION panel) — Select channel A.
   b. This checklist is complete.

   *(Continued)*
DAU 2A FAIL
DAU 2B FAIL
DAU 2A-2B FAIL (Cont)

2. **DAU 2A -2B FAIL**
   a. Match right thrust lever to the left.
   b. Monitor left engine displays.
   c. Land as soon as practical.
   d. This checklist is complete.

**NOTE**

The following engine/system parameter indications will be invalid and cannot be recovered:

- All right engine data (EICAS and RMU)
- Right DEEC N1 bug/digits (ENG CMPTR remains in automatic)
- RIGHT and FUSELAGE fuel quantity (FMS total fuel on board will function properly)
- Rudder trim
- Spoiler position
- Right flap position select bug
- Brake accumulator pressure
- Right and AUX HYD pump icons
- Emergency DC volts, right generator amps and icon
- Oxygen quantity
- Cabin air supply temperature
- Cabin temperature
- APU AMPS

CWP and EICAS warning messages are operational. Some CAS may be affected by the loss of the associated DAU outputs. Monitor remaining system parameter indications.
L DAU ENG MISC MP
R DAU ENG MISC MP

The respective IC (integrated computer) has detected a primary engine miscompare between channel A and B of its on-side DAU (N1, ITT and N2).

1. DAU NORM Switch (REVERSION panel) — Select Channel A, then B. Compare engine data between left and right N1, ITT, and N2 indications to determine which channel is presenting good data.

   During DAU reversion, the miscompare CAS will extinguish. The DAU A REV or DAU B REV white CAS will be illuminated.

2. If valid channel is known:
   a. DAU NORM Switch (REVERSION panel) — Select valid channel.
   b. This checklist is complete.

2. If valid channel is not known:
   a. DAU NORM Switch (REVERSION panel) — NORM.
   b. This checklist is complete.
L DAU SYS MISCMP
R DAU SYS MISCMP

The respective IC (integrated computer) has detected a system page parameter miscompare between channel A and B for its on-side DAU (DC Bus Volts, Emergency Bus Volts, DC Bus Amps, Battery Temperature, Main Hydraulic Pressure, Brake Accumulator Pressure, Oxygen Quantity).

1.  EICAS — Select SUMRY page.
2.  DAU NORM Switch (REVERSION panel) — Select Channel A, then B. Evaluate system parameters to determine which channel is presenting valid data.

**NOTE**

During DAU reversion, the DAU SYS MISCMP illumination will extinguish. The DAU A REV or DAU B REV white CAS will be illuminated.

3.  **If valid channel is known:**
   a.  DAU NORM Switch (REVERSION panel) — Select valid channel.
   b.  This checklist is complete.

3.  **If valid channel is not known:**
   a.  DAU NORM Switch (REVERSION panel) — NORM.
   b.  This checklist is complete.
An overheat condition has been reached on the Display Unit(s). The affected DU(s) will continue to operate with this CAS.

1. INSTR FAN Circuit Breaker (pilot’s ENVIRONMENTAL group) — Set, or pull and reset.

If the temperature continues to increase, the display will blank. It is recommended to perform the following procedure, conditions permitting, prior to the display blanking.

2. **DU 1 OVHT**

   DU 1 MINIMUMS and BARO controls will control onside PFD.
   
   a. DU 2 Reversion Switch — PFD. EICAS will automatically revert to DU 3.
   b. DU 1 Circuit Breaker (pilot’s INSTRUMENTS group [DISPLAY]) — Pull.
   c. This checklist is complete.

2. **DU 2 OVHT**

   a. DU 2 Reversion Switch — OFF. EICAS will automatically revert to DU 3.
   b. DU 2 Circuit Breaker (pilot’s INSTRUMENTS group [DISPLAY]) — Pull.
   c. This checklist is complete.

2. **DU 1-2 OVHT**

   a. DU 2 Reversion Switch — OFF. EICAS will automatically revert to DU 3.
   b. DU 1 and DU 2 Circuit Breakers (pilot’s INSTRUMENTS group [DISPLAY]) — Pull. Rely on the copilot’s flight displays and standby instruments.
   c. This checklist is complete.

2. **DU 3 OVHT**

   a. DU 3 Reversion Switch — Push (if DU 3 is presently in EICAS format).
   b. DU 3 Circuit Breaker (copilot’s INSTRUMENTS group [DISPLAY]) — Pull.
   c. This checklist is complete.

   (Continued)

MFD may be displayed on DU 2. Engine indications may be displayed on an RMU.
Abnormal Procedures

DU 1 OVHT
DU 2 OVHT
DU 3 OVHT
DU 4 OVHT (Cont)

2. DU 4 OVHT

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DU 4 MINIMUMS and BARO controls will control on-side PFD.</td>
</tr>
</tbody>
</table>

a. DU 3 Reversion Switch — PFD. EICAS will automatically revert to DU 2.
b. DU 4 Circuit Breaker (copilot’s INSTRUMENTS group [DISPLAY]) — Pull.
c. This checklist is complete.

2. DU 3-4 OVHT

a. DU 3 Reversion Switch — Push as required to get EICAS on DU 2.
b. DU 3 and DU 4 Circuit Breakers (copilot’s INSTRUMENTS group [DISPLAY]) — Pull. Rely on the pilot’s flight displays and standby instruments.
c. This checklist is complete.

IC 1 OVHT
IC 2 OVHT

This indicates that the IC (integrated computer) 1, 2, or both has reached an overheat condition. The IC, located in the nose avionics compartment, will continue to operate at temperatures up to 60°C (140°F).

If the temperature continues to increase above 60°C (140°F), the IC will shut down and both on-side DUs will blank. The EICAS format will automatically revert to the other side.

If conditions permit (before IC shutdown, or after IC shutdown has occurred):

1. Autopilot — Disengage. Yaw damper as required.
2. Monitor standby instruments.
3. IC/SG NORM Switch (REVERSION panel) — Select other (unaffected) IC/SG.
4. Respective IC/SG 1 or 2 Circuit Breaker (INSTRUMENTS/INDICATIONS group) — Pull.
5. Refer to IC 1 or 2 Failure procedure, this section.
IC 1 or 2 Failure Procedure

A failure of an IC (integrated computer) is indicated by blanking of both on-side display units (DU), a large red X on one or both DUs, or erroneous/erratic displayed data on either or both failed-side DUs.

IC 1 Failure

The autopilot will disengage, red AP on the PFD, with an IC 1 failure. The MSW must be used to cancel the monitored disconnect and to cancel the cavalry charge. The yaw damper and rudder boost should remain operational. The PRI TRIM FAULT white CAS will be illuminated. Flight director operation will be available from IC 2, however, the transfer arrow will not be displayed.

1. Control Wheel Master Switch (MSW) — Depress and release.
2. Monitor standby instruments.
3. Yaw Damper — As required.
4. Airspeed — Reduce to Mach trim off MMO or below.
5. IC/SG 1 Circuit Breaker (INSTRUMENTS/INDICATIONS group) — Set, or pull and reset.

If IC 1 remains failed:

a. IC/SG NORM Switch (REVERSION panel) — Select 2. Use copilot’s PFD and EICAS bezel controls. MFD display and functions will not be available.
b. Airspeed — Maintain Mach trim off MMO or below.

IC 2 Failure

The autopilot and yaw damper will disengage with an IC 2 failure. There will not be an AP or YD PFD disconnect annunciation. The MSW must be used to cancel the monitored disconnect and to cancel the cavalry charge. The PFD transfer arrow will be removed, but the flight director operation will be available from IC 1.

1. Control Wheel Master Switch (MSW) — Depress and release.
2. Monitor standby instruments.
3. IC/SG 2 Circuit Breaker (INSTRUMENTS/INDICATIONS group) — Set, or pull and reset.
4. Yaw Damper — As required.

Do not re-engage the autopilot, even if IC 2 is restored.

(Continued)
IC 1 or 2 Failure Procedure (Cont)

If IC 2 remains failed:
   a. IC/SG NORM Switch (REVERSION panel) — Select 1. Use pilot’s PFD and EICAS bezel controls. MFD display and functions will not be available.
   b. Maintain 33,000 feet or below.
   c. Airspeed — Maintain 0.65 Mf or greater until below 33,000 feet.
   d. Land as soon as practical.

IC BUS FAIL

The communication bus between the left and right IC (integrated computer) is invalid or an IC has failed. If an IC has failed, refer to the IC 1 or 2 Failure procedure, this section.

The autopilot will disengage and will not re-engage.

Yaw damper and Mach trim should remain operational.

The flight directors will be independent.

2. IC/SG NORM Switch (REVERSION panel) — Select to pilot flying side. Use pilot flying side PFD/EICAS bezel controls.

LBS/KGS CONFIG

The pounds/kilograms configuration of the IC-600 (integrated computer) disagrees with the configuration of the DAU 1 or DAU 2 on the ground.
IC 1 or 2 Failure Procedure (Cont)

**IC BUS FAIL**

The communication bus between the left and right IC (integrated computer) is invalid or an IC has failed. If an IC has failed, refer to the IC 1 or 2 Failure procedure, this section.

The autopilot will disengage and will not re-engage.

Yaw damper and Mach trim should remain operational.

The flight directors will be independent.

1. Yaw Damper — As desired.
2. IC/SG NORM Switch (REVERSION panel) — Select to pilot flying side. Use pilot flying side PFD/EICAS bezel controls.

**LBS/KGS CONFIG**

The pounds/kilograms configuration of the IC-600 (integrated computer) disagrees with the configuration of the DAU 1 or DAU 2 on the ground.

If IC 2 remains failed:

a. IC/SG NORM Switch (REVERSION panel) — Select 1. Use pilot’s PFD and EICAS bezel controls. MFD display and functions will not be available.
The respective DU (display unit), displaying a valid PFD format, has detected a mismatch with pitch or roll attitude, Mach, indicated air-speed, altitude, or baro set data.

**NOTE**
This CAS will normally illuminate with an AV MSTR Switch — OFF.

1. DU 2 (or DU 3 for R PFD CHECK) Reversion Switch — PFD. EICAS will be displayed on the opposite inboard DU.

**NOTE**
The failed DU bezel buttons/knobs will continue to be operational and will set the selected values on the reverted DU.

If condition remains:

a. DU 2 (or DU 3 for R PFD CHECK) Reversion Switch — NORM.

b. Monitor opposite PFD and standby instruments.

c. AP XFR Switch — Select to functioning PFD side.

d. Autopilot — As desired.

e. Land as soon as practical.

**WARN AUDIO**

The crew warning panel audio output function has failed. All alerts and voice messages are disabled, including the master warning and caution aural, with the exception of the trim-in-motion clicker. CAS messages and the CWP annunciators, including the master warning/caution light, are not affected by this failure.

1. Monitor EFIS/CAS displays for related visual warning indications.

**LR WARN PWR FAIL**
Both left and right CWP power supplies have failed. All functions of the CWP, including master warning/caution, all aural alerts, and the red ENGINE FIRE PUSH and ENGINE EXTINGUISHER ARMED lights in the ENGINE panel are inoperative.

1. L and R WARN PANEL Circuit Breakers (pilot’s and copilot’s INSTRUMENTS/INDICATIONS group) — Set.

If LR WARN PWR FAIL remains illuminated:

a. Monitor EFIS/CAS displays and pressurization controller for related visual warning indications.

b. Land as soon as practical.
Abnormal Procedures

**Air Data Computer (ADC) Failure — Single**

Air data computer (ADC) failure is indicated by failure flags and loss of air data on the corresponding PFD.

1. ADC NORM Switch (REVERSION panel) — Select operational ADC. Air data references on both PFDs and the FD will be controlled by the selected Air Data. Degraded autopilot performance may be experienced with loss of ADC 2. The failed side PFD STD button and BARO knob will be inoperative. Both PFDs BARO set will be controlled by the operational side PFD bezel.

If time and conditions permit:

2. Respective ADC Circuit Breaker (INSTRUMENTS group)—Set, or pull and reset.
3. ADC NORM Switch (REVERSION panel) — NORM.
4. Cross-check airspeed and altitude indications with the standby instruments. Refer to Airspeed/Mach Calibrations — Standby System or Altitude Position Corrections — Standby System charts, Section V.

If air data computer is not recovered:

a. ADC NORM Switch (REVERSION panel) — Select operational ADC.

b. Airspeed — Reduce to Mach trim off MMO or below, prior to disengaging the autopilot.

The failure of an ADC will result in the following on-side CAS indications:

<table>
<thead>
<tr>
<th>CAS</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>L ENGCMPTR FAULT</td>
<td>amber (DEEC operation in auto mode)</td>
</tr>
<tr>
<td>R ENGCMPTR FAULT</td>
<td></td>
</tr>
<tr>
<td>L CHECK EDS</td>
<td>white</td>
</tr>
<tr>
<td>R CHECK EDS</td>
<td></td>
</tr>
<tr>
<td>L STALLWARN FAIL</td>
<td>amber</td>
</tr>
<tr>
<td>R STALLWARN FAIL</td>
<td></td>
</tr>
<tr>
<td>MACH TRIM FAIL</td>
<td>amber or white (depending on Mach number)</td>
</tr>
<tr>
<td>PRI TRIM FAULT</td>
<td>white</td>
</tr>
<tr>
<td>RUD BOOST INOP</td>
<td>amber (white RUD BOOST INOP CAS will be posted if RUD BOOST switch is selected off)</td>
</tr>
</tbody>
</table>

No pilot action is required for the above CAS, except the MACH TRIM FAIL and STALLWARN FAIL amber CAS.

(Continued)
Abnormal Procedures

Air Data Computer (ADC) Failure — Single (Cont)

- The autopilot does not disengage with an ADC failure and may continue to be used. The PRI TRIM FAULT and MACH TRIM FAIL amber CAS will not illuminate if the autopilot is engaged when the ADC fails. When the autopilot is disconnected, these CAS will illuminate. Speed should be below Mach trim off MMO prior to disconnecting the autopilot.

- Failure of the ADC when above the Mach trim off MMO will result in the MACH TRIM FAIL amber CAS illuminating. This cannot be cleared until after the flight.

- Transponder mode C and TCAS will function when an ADC is reverted.

- The LR ENGCMPTR FAULT amber and/or LR CHECK EDS white CAS may be displayed, but the engines will operate normally in automatic mode as long as a MAN white or amber EI is not illuminated in the Ni display.

- The rudder boost system is failed with a single ADC failure and the RUD BOOST INOP amber CAS will illuminate.

- Yaw damper (and autopilot, if engaged) disconnects may occur with an ADC failed. Disconnects will be more frequent at slower speeds. These conditions may be cleared by depressing the Control Wheel Master Switch (MSW), then re-engaging the autopilot/yaw damper.
Air Data Computer (ADC) Failure — Dual

Air data computer (ADC) failure is indicated by failure flags and loss of air data on the PFDs.

1. Maintain aircraft control by reference to the standby airspeed/Mach indicator and altimeter. Roll control authority may be less than normal.

2. Pilot’s and copilot’s ADC 1 and 2 Circuit Breakers (respective INSTRUMENTS/INDICATIONS group) — Set, or pull and reset.

If neither ADC operation is restored:

a. Monitor the standby attitude indicator.

b. Airspeed — Reduce to Mach trim off MMO or below, prior to disengaging the autopilot.

c. Autopilot — As desired, only in the following modes: PIT, ROL, HDG, NAV and APP. (Autopilot cannot be coupled to the FMS for NAV or APP.)

d. MANUAL Rate Control (PRESSURIZATION) — As required to control cabin.

e. Land as soon as possible.

Failure of the ADCs will result in the following on-side CAS indications:

<table>
<thead>
<tr>
<th>CAS</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>L ENGCMPTR FAULT</td>
<td>amber (DEEC operation in auto mode)</td>
</tr>
<tr>
<td>R ENGCMPTR FAULT</td>
<td></td>
</tr>
<tr>
<td>L CHECK EDS</td>
<td>white</td>
</tr>
<tr>
<td>R CHECK EDS</td>
<td></td>
</tr>
<tr>
<td>L STALLWARN FAIL</td>
<td>amber</td>
</tr>
<tr>
<td>R STALLWARN FAIL</td>
<td></td>
</tr>
<tr>
<td>MACH TRIM FAIL</td>
<td>amber or white (depending on Mach number)</td>
</tr>
<tr>
<td>PRI TRIM FAULT</td>
<td>white</td>
</tr>
<tr>
<td>RUD BOOST INOP</td>
<td>amber (white RUD BOOST INOP CAS will be posted if RUDDER BOOST switch is selected OFF.)</td>
</tr>
</tbody>
</table>

No pilot action is required for the above CAS, except the MACH TRIM FAIL and STALLWARN FAIL amber CAS.

(Continued)
Air Data Computer (ADC) Failure — Dual (Cont)

NOTE

The following system and instrument indications will be inoperative:

- Temperature displays.
- Altitude alert.
- Low-speed awareness cue.
- “OVERSPEED” voice and cue.
- GEAR amber CAS.
- Functions of the FMS requiring air data.
- Encoded altitude function of the transponders.
- TCAS (if installed) encoded altitude function.
- Reverse thrust scheduling as a function of airspeed. Maximum reverse thrust available will be 65% N1. The pilot must modulate the thrust reverser levers down to idle as the aircraft slows.
- Rudder boost.

The LR ENGCMPTR FAULT amber and/or LR CHECK EDS white CAS may be displayed, but the engines will operate normally in automatic mode as long as a MAN white or amber EI is not illuminated in the N1 display.
Abnormal Procedures

Display Unit Failure

A display unit (DU) failure would be the loss of any of the four DUs. The two outboard DUs (DU 1 and DU 4) are normally referred to as the PFDs. The two inboard DUs (DU 2 and DU 3) are normally referred to as the EICAS and the MFD, depending upon the data displayed on the DU.

If the MFD cannot be displayed, all MFD functions will be lost. MAP and weather radar (Wx) are available on the PFDs. The TCAS system (if installed) status will continue to be displayed on the PFD, aural alerts are annunciated and TCAS II (if installed) RAs will be displayed on the PFD, even though the MFD TCAS display is not available.

- **DU 1 Failure**
  1. DU 2 Reversion Switch — PFD. The pilot’s PFD will be displayed on DU 2, the EICAS will be displayed on DU 3 and the MFD will not be available.

  **NOTE**
  L PFD CHECK amber CAS may be illuminated. No pilot action is required.

- **DU 2 Failure**
  1. DU 2 Reversion Switch — OFF. The EICAS will be displayed on DU 3 and the MFD will not be available.

- **DU 3 Failure**
  1. **If DU 3 is displaying EICAS:**
     a. DU 3 Reversion Switch — Push. The EICAS will be displayed on DU 2 and the MFD will not be available.
  1. **If DU 3 is displaying MFD:**
     a. Continue. The MFD will not be available.

  **NOTE**
  Pushing the DU 2 or DU 3 Reversion switch may, depending upon the failure, remove the EICAS and display the MFD on DU 2. The EICAS should normally be displayed.

- **DU 4 Failure**
  1. DU 3 Reversion Switch — PFD. The copilot’s PFD will be displayed on DU 3, the EICAS will be displayed on DU 2 and the MFD will not be available.

  **NOTE**
  R PFD CHECK amber CAS may be illuminated. No pilot action is required.
**Erroneous Pitot-Static Indications**

An air data computer (ADC) failure is indicated by failure flags and loss of air data on the corresponding PFD. Refer to Single or Dual Air Data Computer Failure procedures, as appropriate, this section.

Erroneous air data indications or discrepancies between the pilot’s or copilot’s or standby airspeed, Mach and/or altimeter indications, may be a result of a pitot-static line blockage or leak or the failure of a standby indicator. Air data comparators (amber ALT or IAS on the PFD) may be illuminated. Refer to PFD Annunciations procedures, this section.

1. Maintain safe aircraft attitude and thrust setting. Using the autopilot in PIT, ROLL, HDG, NAV or APP modes will help reduce work load. Do not use ALT, SPD, FLC, VS or VNAV modes. Minimize large changes in thrust setting unless they are necessary to control the aircraft.

   If an L or R PITOT HT or STBY PITOT HT amber CAS is illuminated, that system should be the suspected system:
   a. L and R PROBES Switches — On.
   b. PITOT and STBY PITOT Circuit Breakers (respective ANTI-ICE group [L and R PROBES HT]) — Set.
   c. Fly out of icing conditions as soon as possible.

2. Compare pilot’s, copilot’s and standby airspeed, Mach, and altitude.

A static pressure malfunction in one probe can affect airspeed, Mach, altitude and vertical speed indications on the pilot’s and copilot’s ADCs. Transponder Mode C and TCAS (if installed) will also be affected.

A pitot pressure malfunction will affect airspeed and Mach indications in the on-side ADC system only.

- The “OVERSPEED” voice will sound if either the pilot’s or copilot’s airspeed indication is above the overspeed cue (VMO/MMO).
- The stall warning stick shaker does not depend upon airspeed inputs. Stall warning is biased with altitude. If the stick shaker is active, the aircraft is near stall. The low speed awareness is displayed relative to airspeed.

*(Continued)*
**Erroneous Pitot-Static Indications (Cont)**

The standby system indications must be corrected before comparison to the ADC indications. Refer to AIRSPEED/MACH CALIBRATIONS and ALTITUDE POSITION CORRECTIONS — STANDBY SYSTEM, Section V.

The standby pitot-static mast is visible from the copilot’s seat. Visually check mast for ice or damage.

3. **If the malfunction is known or suspected in the pilot’s or copilot’s pitot-static system:**
   a. ADC NORM Switch (REVERSION panel) — Select valid ADC.
   b. Autopilot — As desired.
   c. Land as soon as practical.
   d. This checklist is complete.

3. **If the malfunction is known or suspected in both the pilot’s and copilot’s pitot-static systems:**
   a. Refer to the standby system. The standby system indications must be corrected before comparison to the ADC indications. Refer to AIRSPEED/MACH CALIBRATIONS and ALTITUDE POSITION CORRECTIONS — STANDBY SYSTEM, Section V.
   b. Autopilot — As desired. Use PIT, ROLL, HDG, NAV or APP modes. Do not use ALT, SPD, FLC, VS or VNAV modes.
   c. Land as soon as possible.
   d. This checklist is complete.

3. **If the malfunction is known or suspected in the standby pitot-static system:**
   a. Refer to the normal ADC displays.
   b. Autopilot — As desired.
   c. Land as soon as practical.
   d. This checklist is complete.
Abnormal Procedures

Loss of PFD Attitude or Heading Displays

1. AHRS Switch (REVERSION panel) — Select operative AHRS.
   - Failure of AHRS 1 will cause illumination of the FUEL QTY FAULT white CAS. Fuel quantity will be correct at 0° pitch attitude. The weather radar STAB amber MFD indication may also illuminate.
   - The autopilot and yaw damper will disengage and not reengage with a failure of an AHRS. The flight director will be available on the operable AHRS side.
   - A RUD BOOST INOP amber CAS will illuminate.
2. Monitor standby attitude and heading indicator.
3. Maintain 33,000 feet or below.
4. Airspeed — Maintain 0.65 Mi or greater until below 33,000 feet.
5. Land as soon as practical.

If time and conditions permit:

   On aircraft 45-002 thru 45-174, allow the AHRS time to cool (5 to 10 minutes) if the failure was a result of an AHRS 1, 2 or 1-2 OVHT.

6. Establish aircraft in straight and level, unaccelerated flight.

7. If the loss is associated with the pilot’s PFD:
   a. Pilot’s #1 PRI and Copilot’s #1 SEC Circuit Breakers (respective INSTRUMENTS/INDICATIONS group [AHRS PWR]) — Pull both.
   b. Pilot’s #1 PRI and Copilot’s #1 SEC Circuit Breakers — Set.
   c. Go to step 8.

7. If the loss is associated with the copilot’s PFD:
   a. Pilot’s #2 SEC and Copilot’s #2 PRI Circuit Breakers (respective INSTRUMENTS/INDICATIONS group [AHRS PWR]) — Pull both.
   b. Pilot’s #2 SEC and Copilot’s #2 PRI Circuit Breakers — Set.
   c. Go to step 8.

   If AHRS #2 is lost, the RMU 1 and 2 NAV pages will display invalid heading.

(Continued)
Loss of PFD Attitude or Heading Displays

1. AHRS Switch (REVERSION panel) — Select operative AHRS.
   - Failure of AHRS 1 will cause illumination of the FUEL QTY FAULT white CAS. Fuel quantity will be correct at 0° pitch attitude. The weather radar STAB amber MFD indication may also illuminate.
   - The autopilot and yaw damper will disengage and not reengage with a failure of an AHRS. The flight director will be available on the operable AHRS side.
   - A RUD BOOST INOP amber CAS will illuminate.

2. Monitor standby attitude and heading indicator.
3. Land as soon as practical.

If time and conditions permit:

4. Establish aircraft in straight and level, unaccelerated flight.
5. If the loss is associated with the pilot’s PFD:
   a. Pilot’s #1 PRI and Copilot’s #1 SEC Circuit Breakers (respective INSTRUMENTS/INDICATIONS group [AHRS PWR]) — Pull both.
   b. Pilot’s #1 PRI and Copilot’s #1 SEC Circuit Breakers — Set.
   c. Go to step 6.
5. If the loss is associated with the copilot’s PFD:
   a. Pilot’s #2 SEC and Copilot’s #2 PRI Circuit Breakers (respective INSTRUMENTS/INDICATIONS group [AHRS PWR]) — Pull both.
   b. Pilot’s #2 SEC and Copilot’s #2 PRI Circuit Breakers — Set.
   c. Go to step 6.

If AHRS #2 is lost, the RMU 1 and 2 NAV pages will display invalid heading.

(Continued)
Loss of PFD Attitude or Heading Displays (Cont)

8. AHRS Switch (REVERSION panel) — NORM to monitor initialization. Maintain aircraft attitude by monitoring the operating side flight display and the standby attitude indicator. Initialization should occur within approximately 20 seconds. Successful initialization is indicated by attitude and heading displays.

If initialization does not occur within approximately 20 seconds:
   a. AHRS Switch (REVERSION panel) — Select operative AHRS.

Loss of Standby Attitude Indicator

Loss of the standby attitude indicator may be indicated by an “OFF” flag or, a tumbled or erroneous attitude display.

If EMER BUS VOLTS amber CAS is illuminated, refer to the EMER BUS VOLTS procedure, this section.
   1. EMER BATT Switch — On.
   2. BUS Circuit Breaker (pilot’s ELECTRICAL group [EMER BUS]) — Set.
   3. Establish aircraft in straight and level, unaccelerated flight.
   4. Standby Attitude Indicator — Cage then uncage.

If standby attitude is not recovered:
   a. Standby Attitude Indicator — Cage.
   b. Land as soon practical.

Multi-Function Display (MFD) Annunciations

EICAS CHK

Located to the left of the heading readout, this illumination indicates that the IC/SG displaying the EICAS engine data (N1, ITT or N2) has detected an error in the displayed data compared to the inputs from the DAU.
   1. DU 2 or DU 3 Reversion Switch — Push.
   2. If EICAS CHK extinguishes:
      a. Leave EICAS display on current DU until landing.
      b. This checklist is complete.

(Continued)
Loss of PFD Attitude or Heading Displays (Cont)

6. AHRS Switch (REVERSION panel) — NORM to monitor initialization. Maintain aircraft attitude by monitoring the operating side flight display and the standby attitude indicator. Initialization should occur within approximately 20 seconds. Successful initialization is indicated by attitude and heading displays.

If initialization does not occur within approximately 20 seconds:
   a. AHRS Switch (REVERSION panel) — Select operative AHRS.

Loss of Standby Attitude Indicator

Loss of the standby attitude indicator may be indicated by an “OFF” flag or, a tumbled or erroneous attitude display.

If EMER BUS VOLTS amber CAS is illuminated, refer to the EMER BUS VOLTS procedure, this section.

   1. EMER BATT Switch — On.
   2. BUS Circuit Breaker (pilot’s ELECTRICAL group [EMER BUS]) — Set.
   3. Establish aircraft in straight and level, unaccelerated flight.
   4. Standby Attitude Indicator — Cage then uncage.

If standby attitude is not recovered:
   a. Standby Attitude Indicator — Cage.
   b. Land as soon practical.

Multi-Function Display (MFD) Annunciations

EICAS CHK

Located to the left of the heading readout, this illumination indicates that the IC/SG displaying the EICAS engine data (N1, ITT or N2) has detected an error in the displayed data compared to the inputs from the DAU.

   1. DU 2 or DU 3 Reversion Switch — Push.
   2. If EICAS CHK extinguishes:
      a. Leave EICAS display on current DU until landing.
      b. This checklist is complete.

(Continued)
Multi-Function Display (MFD) Annunciations (Cont)

2. If EICAS CHK remains illuminated:
   a. Monitor engine instruments (N1, ITT or N2) for abnormal indications.
   b. This checklist is complete.

   **NOTE** Viewing the RMU engine page(s) may assist in determining the abnormal indication on EICAS.

**DGx**
Located to the right of the heading readout, this illumination indicates AHRS or IC/SG reversion has been selected and the respective HEADING switch is in the unslaved (FREE) mode.

**MAGx**
Located to the right of the heading readout, this illumination indicates the source of AHRS data. MAGx will be displayed with AHRS or IC/SG reversion, indicating a single AHRS source being displayed to both pilots’ displays.

**MENU INOP**
Located above the bezel controller, this illumination indicates the MFD bezel menu is inoperative.

   1. L and R CTRL Circuit Breaker (pilot’s and copilot’s INSTRUMENTS/INDICATIONS group [DISPLAY]) — Set.

   **If condition persists:**
   2. DU 2 or DU 3 Reversion Switch — Push, if MFD functionality is required. The EICAS will now have the MENU INOP condition.

**STAB**
Located on the lower left of the heading display, this illumination indicates weather radar stabilization is off.

**TGT**
Located on the lower left of the heading display, this illumination indicates a weather radar target alert is activated. Take appropriate action to verify the weather radar alert.

**WX**
Located on the lower left of the heading display, this illumination indicates an invalid weather radar.
Primary Flight Display (PFD) Annunciations

ADCx
Located to the left of the attitude sphere, this illumination indicates both pilot and copilot displayed air data sources are the same.

ALT
Illuminates a vertical ALT within the altitude tape at the upper corner. Indicates a mismatch of the pilot’s and copilot’s altitude data.

1. Check that both pilot’s altimeters are set to the same value.

If mismatch persists:
   a. Refer to Erroneous Pitot-Static Indications procedure, this section.

AOA
Located next to the airspeed scale, this illumination indicates invalid angle-of-attack data. The Low Speed Awareness (LSA) cue will not be displayed. Cross reference the other PFD LSA cue. This illumination may be accompanied by an L (R) STALLWARN FAIL amber CAS (refer to the L (R) STALLWARN FAIL procedure, this section).

AP (flash)
Illuminates above the attitude sphere for 5 seconds and clears. Indicates the autopilot has disengaged and is accompanied by the aural “cavalry charge” alert.
Primary Flight Display (PFD) Annunciations (Cont)

AP (steady)
Located above the attitude sphere, this illumination indicates the autopilot has failed and is disengaged.

1. If accompanied by an amber YD:
   a. Maintain 33,000 feet or below.
   b. Airspeed — Maintain 0.65 Mi or greater until below 33,000 feet.
   c. If conditions permit:
      1) IC/SG 2 Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group) — Pull and reset to regain autopilot.
      DU 3 and DU 4 will blank until power-up is completed.
   d. If amber YD remains illuminated:
      1) Land as soon as practical.
      2) This checklist is complete.
   d. If amber YD extinguishes:
      1) Yaw Damper — Engage.
      2) This checklist is complete.
1. If not accompanied by an amber YD:
   b. This checklist is complete.
Primary Flight display (PFD) Annunciations (Cont)

AP (steady)

Located above the attitude sphere, this illumination indicates the autopilot has failed and is disengaged.

1. ● If accompanied by an amber YD and conditions permit:
   a. IC/SG 2 Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group) — Pull and reset to regain autopilot.

   NOTE

   DU 3 and DU 4 will blank until power-up is completed.

   b. ■ If amber YD remains illuminated:
      (1) This checklist is complete.
   b. ■ If amber YD extinguishes:
      (1) Yaw Damper — As desired.
      (2) This checklist is complete.

1. ● If not accompanied by an amber YD:
   a. Yaw Damper — As desired.
   b. This checklist is complete.
Primary Flight Display (PFD) Annunciations (Cont)

AP FAIL

Located above the attitude sphere, this illumination indicates failure of the autopilot, yaw damper or the rudder boost system during power-up test.

1. AFCS SERVOS Circuit Breaker (pilot’s FLIGHT group) — Set.
2. IC/SG 2 Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group) — Pull and reset.

AP TEST

Located above the attitude sphere, this illumination indicates test mode for the AP during ground power-up of the AHRS.

ATT

Illumination of an ATT amber message inside the left side of the PFD attitude sphere indicates a mismatch of the pilot’s and copilot’s attitude data.

1. Compare indications with standby attitude indicator to determine faulty system.
2. Autopilot and Yaw Damper — Disengage.
3. AHRS Reversion Switch — Select operative AHRS.
4. Do not re-engage autopilot or yaw damper.
   - Failure of AHRS 1 will cause illumination of the FUEL QTY FAULT white CAS. Fuel quantity will be correct at 0° pitch attitude. The weather radar STAB amber MFD indication may also illuminate.
   - The flight director on the failed side will not be operative. Select XFR on the guidance controller to the operative side for flight director cues. Refer to Loss of PFD Attitude or Heading Displays procedure, this section.
   - A RUD BOOST INOP amber CAS will illuminate.
5. Maintain 33,000 feet or below.
6. Airspeed — Maintain 0.65 MI or greater until below 33,000 feet.
7. Land as soon as practical.
Primary Flight Display (PFD) Annunciations (Cont)

AP FAIL

Located above the attitude sphere, this illumination indicates failure of the autopilot, yaw damper or the rudder boost system during power-up test.

1. AFCS SERVOS Circuit Breaker (pilot’s FLIGHT group) — Set.
2. IC/SG 2 Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group) — Pull and reset.

AP TEST

Located above the attitude sphere, this illumination indicates test mode for the AP during ground power-up of the AHRS.

ATT

Illumination of an ATT amber message inside the left side of the PFD attitude sphere indicates a mismatch of the pilot’s and copilot’s attitude data.

1. Compare indications with standby attitude indicator to determine faulty system.
2. Autopilot and Yaw Damper — Disengage.
3. AHRS Reversion Switch — Select operative AHRS.
4. Do not re-engage autopilot or yaw damper.

- Failure of AHRS 1 will cause illumination of the FUEL QTY FAULT white CAS. Fuel quantity will be correct at 0° pitch attitude. The weather radar STAB amber MFD indication may also illuminate.
- The flight director on the failed side will not be operative. Select XFR on the guidance controller to the operative side for flight director cues. Refer to Loss of PFD Attitude or Heading Displays procedure, this section.
- A RUD BOOST INOP amber CAS will illuminate.
Abnormal Procedures

Primary Flight Display (PFD) Annunciations (Cont)

CAS MSG
Located below the attitude sphere on the left side, this illumination indicates a comparison mismatch of IC 1 and IC 2 CAS messages.

1. Note existing CAS messages.
2. DU 2 or DU 3 Reversion Switch — Push. Compare the CAS messages on the reverted EICAS.
3. Take the appropriate CAS message action for any new messages.

DGx
Located to the right of the heading readout, this illumination indicates AHRS or IC/SG reversion has been selected and the respective HEADING switch is in the unslaved (FREE) mode.

FD FAIL
Located above the attitude sphere, this illumination and removal of the flight director steering commands indicate a failure in the flight director system or loss of sensor data required for the active modes on that side.

If FD FAIL appears because of internal failure, loss of AHRS data, or selection of AHRS reversion, the autopilot will disconnect. If FD FAIL appears because of invalid sensor data, the autopilot will not disconnect.

If the autopilot remains engaged to the failed flight director, operation will be in basic PIT and ROL mode:
1. Monitor aircraft attitude.
2. Select XFR on the guidance controller to the opposite side.

**NOTE**

The opposite flight director may be operational, and fully usable with the autopilot.

If conditions permit:

a. Respective IC/SG 1 or 2 Circuit Breaker (INSTRUMENTS/INDICATIONS group) — Pull and reset to regain autopilot.

**NOTE**

The respective DUs will blank until power-up is completed.

b. Yaw Damper — As required.

GS
Indicates a comparator mismatch of the pilot’s and copilot’s glideslope data. Illuminates below the attitude sphere on the left side.

1. NAV Source — Determine correct NAV source and select as necessary.

If unable to determine correct source:

a. Use localizer approach minimums.
Primary Flight Display (PFD) Annunciations (Cont)

**HDG**
Located above the HSI (right side), this illumination indicates a mismatch of the pilot’s and copilot’s AHRS heading data.

1. Establish aircraft in straight and level, unaccelerated flight.
2. Compare indications with magnetic compass.
3. **If single system is in error:**
   a. Autopilot — Disengage. Yaw damper as required.
   b. Associated HEADING Switch — FREE, then Slave.

   **If heading split cannot be corrected:**
   (1) AHRS Reversion Switch — Select AHRS displaying the correct heading.
   (2) This checklist is complete.

4. **If heading cannot be determined:**
   a. Autopilot — Disengage. Yaw damper as required.
   b. Both HEADING Switches — FREE, then Slave.
   c. This checklist is complete.

**IAS**
Vertically illuminated within the airspeed tape at the upper corner, this illumination indicates a mismatch of the pilot’s and copilot’s airspeed data. Refer to Erroneous Pitot-Static Indications procedure, this section.

**ILS**
Located below the attitude sphere on the left side, this illumination indicates a comparator mismatch of the pilot’s and copilot’s localizer and glideslope data.

1. NAV Source — Determine correct NAV source and select as necessary.

   **If unable to determine correct source:**
   a. Execute missed approach.

**LOC**
Located below the attitude sphere on the left side, this illumination indicates a comparator mismatch of the pilot’s and copilot’s localizer data.

1. NAV Source — Determine correct NAV source and select as necessary.

   **If unable to determine correct source:**
   a. Execute missed approach.

**MACH**
Vertically illuminated within the Mach tape at the upper corner, this illumination indicates a mismatch of the pilot’s and copilot’s Mach number data. Refer to Erroneous Pitot-Static Indications procedure, this section.
MAGx
Located to the right of the heading readout, this illumination indicates the source of AHRS data. MAGx will be displayed with AHRS or IC/SG reversion, indicating a single AHRS source being displayed to both pilots’ displays.

MAXSPD
Vertically illuminated left of the attitude sphere, this illumination indicates the autopilot overspeed mode is active.

MIN
Located in the lower right corner of the attitude sphere, this illumination indicates capture of the BARO or RA minimums when the barometric altitude is equal to or less than the BARO minimums readout, or the radio altitude is equal to or less than the RA minimums readout (whichever one, BARO or RA, is displayed on the PFD).

PIT
Illumination of a PIT amber message inside the left side of the PFD attitude sphere indicates a mismatch of the pilot’s and copilot’s pitch attitude data.

1. Compare indications with standby attitude indicator to determine faulty system.
2. Autopilot and Yaw Damper — Disengage.
3. AHRS Reversion Switch — Select operative AHRS.
4. Do not re-engage autopilot or yaw damper.

- Failure of AHRS 1 will cause illumination of the FUEL QTY FAULT white CAS. Fuel quantity will be correct at 0° pitch attitude. The weather radar STAB amber MFD indication may also illuminate.
- The flight director on the failed side will not be operative. Select XFR on the guidance controller to the operative side for flight director cues. Refer to Loss of PFD Attitude or Heading Displays procedure, this section.
- A RUD BOOST INOP amber CAS will illuminate.

5. Maintain 33,000 feet or below.
6. Airspeed — Maintain 0.65 M1 or greater until below 33,000 feet.
7. Land as soon as practical.
Primary Flight Display (PFD) Annunciations (Cont)

MAGx
Located to the right of the heading readout, this illumination indicates the source of AHRS data. MAGx will be displayed with AHRS or IC/SG reversion, indicating a single AHRS source being displayed to both pilots’ displays.

MAXSPD
Vertically illuminated left of the attitude sphere, this illumination indicates the autopilot overspeed mode is active.

MIN
Located in the lower right corner of the attitude sphere, this illumination indicates capture of the BARO or RA minimums when the barometric altitude is equal to or less than the BARO minimums readout, or the radio altitude is equal to or less than the RA minimums readout (whichever one, BARO or RA, is displayed on the PFD).

PIT
Illumination of a PIT amber message inside the left side of the PFD attitude sphere indicates a mismatch of the pilot’s and copilot’s pitch attitude data.

1. Compare indications with standby attitude indicator to determine faulty system.
2. Autopilot and Yaw Damper — Disengage.
3. AHRS Reversion Switch — Select operative AHRS.
4. Do not re-engage autopilot or yaw damper.

NOTE
- Failure of AHRS 1 will cause illumination of the FUEL QTY FAULT white CAS. Fuel quantity will be correct at 0° pitch attitude. The weather radar STAB amber MFD indication may also illuminate.
- The flight director on the failed side will not be operative. Select XFR on the guidance controller to the operative side for flight director cues. Refer to Loss of PFD Attitude or Heading Displays procedure, this section.
- A RUD BOOST INOP amber CAS will illuminate.
Primary Flight Display (PFD) Annunciations (Cont)

RA
Located below the attitude sphere on the left side, this illumination indicates a comparator mismatch of the displayed pilot’s and copilot’s radio altitude.

1. Use BARO minimums for approach.

—RA—

Illuminated and boxed at the bottom of the attitude sphere, this illumination indicates invalid radio altitude. RA minimums, TCAS (if installed), and EGPWS (if installed) are inoperative. The radio altitude function of the gear warning system is inoperative.

1. RAD ALT 1 or 2 (if installed) Circuit Breaker (pilot’s or copilot’s INSTRUMENTS/INDICATIONS group) — Set.
2. Refer to GEAR amber CAS procedure, this section. The takeoff and landing CAS inhibit function is disabled.

RB
Located above the attitude sphere, this illumination indicates the rudder boost system has disengaged due to a monitor. Do not takeoff.

1. RUD BOOST Switch — OFF.
2. Control Wheel Master Switch (MSW) — Depress and release.
3. ■If RB extinguishes:
   b. This checklist is complete.
3. ■If RB remains illuminated:
   a. Maintain 33,000 feet or below. Yaw damper is not operative.
   b. Airspeed — Maintain 0.65 MI or greater until below 33,000 feet.
   c. If conditions permit:
      (1) IC/SG 2 Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group) — Pull and reset to regain autopilot.

DU 3 and DU 4 will blank until power-up is completed.

3. ■If RB remains illuminated:
   (1) Land as soon as practical.
   (2) This checklist is complete.
3. ■If RB extinguishes:
   (1) Yaw Damper — Engage.
   (2) This checklist is complete.
RA
Located below the attitude sphere on the left side, this illumination indicates a comparator mismatch of the displayed pilot’s and copilot’s radio altitude.

1. Use BARO minimums for approach.
2. RA indications may be encountered on climb out through 2500 feet AGL. This indication should clear on descent through 2500 feet AGL if no failure is present.

--- RA ---
Illuminated and boxed at the bottom of the attitude sphere, this illumination indicates invalid radio altitude. RA minimums, TCAS (if installed), and EGPWS (if installed) are inoperative. The radio altitude function of the gear warning system is inoperative.

1. RAD ALT 1 or 2 (if installed) Circuit Breaker (pilot’s or copilot’s INSTRUMENTS/INDICATIONS group) — Set.
2. Refer to GEAR amber CAS procedure, this section. The takeoff and landing CAS inhibit function is disabled.

RB
Located above the attitude sphere, this illumination indicates the rudder boost system has disengaged due to a monitor. Do not takeoff.

1. RUD BOOST Switch — OFF.
2. Control Wheel Master Switch (MSW) — Depress and release.
3. ● If RB extinguishes:
   a. Yaw Damper — As desired.
   b. This checklist is complete.
3. ● If RB remains illuminated and conditions permit:
   a. IC/SG 2 Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group) — Pull and reset to regain autopilot.
      DU 3 and DU 4 will blank until power-up is completed.
   b. If RB remains illuminated:
      (1) This checklist is complete.
   b. If RB extinguishes:
      (1) Yaw Damper — As desired.
      (2) This checklist is complete.
Abnormal Procedures

Primary Flight Display (PFD) Annunciations (Cont)

**EFFECTIVITY**

Aircraft 45-002 thru 45-225 not modified by SB 45-55-6

**ROL**

Illumination of a ROL amber message inside the left side of the PFD attitude sphere indicates a mismatch of the pilot’s and copilot’s roll attitude data.

1. Compare indications with standby attitude indicator to determine faulty system.
2. Autopilot and Yaw Damper — Disengage.
3. AHRS Reversion Switch — Select operative AHRS.
4. Do not re-engage autopilot or yaw damper.

- Failure of AHRS 1 will cause illumination of the FUEL QTY FAULT white CAS. Fuel quantity will be correct at 0° pitch attitude. The weather radar STAB amber MFD indication may also illuminate.
- The flight director on the failed side will not be operative. Select XFR on the guidance controller to the operative side for flight director cues. Refer to Loss of PFD Attitude or Heading Displays procedure, this section.
- A RUD BOOST INOP amber CAS will illuminate.

5. Maintain 33,000 feet or below.
6. Airspeed — Maintain 0.65 Ml or greater until below 33,000 feet.
7. Land as soon as practical.

**SGx**

Located to the left of the attitude sphere and accompanied by the ADCx and ATTX annunciators, this illumination indicates both pilot and copilot are displaying the same AHRS, air data, and navigation sources from one IC/SG.

**TGT**

Located on the lower left of the heading display, this illumination indicates a weather radar target alert is activated. Take appropriate action to verify the weather radar alert.

**WX**

Located on the lower left of the heading display, this illumination indicates an invalid weather radar.
Primary Flight Display (PFD) Annunciations (Cont)

**EFFECTIVITY**

Aircraft 45-226 & Subsequent and prior aircraft modified by SB 45-55-6

**ROL**

Illumination of a ROL amber message inside the left side of the PFD attitude sphere indicates a mismatch of the pilot’s and copilot’s roll attitude data.

1. Compare indications with standby attitude indicator to determine faulty system.
2. Autopilot and Yaw Damper — Disengage.
3. AHRS Reversion Switch — Select operative AHRS.
4. Do not re-engage autopilot or yaw damper.

**NOTE**

- Failure of AHRS 1 will cause illumination of the FUEL QTY FAULT white CAS. Fuel quantity will be correct at 0° pitch attitude. The weather radar STAB amber MFD indication may also illuminate.
- The flight director on the failed side will not be operative. Select XFR on the guidance controller to the operative side for flight director cues. Refer to Loss of PFD Attitude or Heading Displays procedure, this section.
- A RUD BOOST INOP amber CAS will illuminate.

**SGx**

Located to the left of the attitude sphere and accompanied by the ADCx and ATTx annunciators, this illumination indicates both pilot and copilot are displaying the same AHRS, air data, and navigation sources from one IC/SG.

**TGT**

Located on the lower left of the heading display, this illumination indicates a weather radar target alert is activated. Take appropriate action to verify the weather radar alert.

**WX**

Located on the lower left of the heading display, this illumination indicates an invalid weather radar.
Primary Flight Display (PFD) Annunciations (Cont)

**YD (flash)**
Illuminates above the attitude sphere for 5 seconds and clears. This illumination indicates the yaw damper has been disengaged by the pilot.

**YD (steady)**
Located above the attitude sphere, this illumination indicates the yaw damper has failed and is disengaged. Autopilot and rudder boost are inoperative.

**On the ground:**
1. Control Wheel Master Switch (MSW) — Depress and release.
   - The following conditions will exist when the MSW switch is depressed. Nose wheel steering will disconnect.

2. IC/SG 2 Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group) — Pull and reset.
   - DU 3 and DU 4 will blank until power-up is completed.

3. NOSE STEER Switch — ON.
4. **If amber YD extinguishes:**
   a. This checklist is complete.

4. **If amber YD remains illuminated:**
   a. Do not take off. The yaw damper and rudder boost are inoperative.

**In flight:**
1. Control Wheel Master Switch (MSW) — Depress and release.
   - The following conditions will exist when the MSW switch is depressed. Spoilers and spoilerons will be inoperative while the switch is depressed.

2. **If amber YD extinguishes:**
   b. This checklist is complete.

(Continued)
Primary Flight Display (PFD) Annunciations (Cont)

YD (flash)
Illuminates above the attitude sphere for 5 seconds and clears. This illumination indicates the yaw damper has been disengaged by the pilot.

YD (steady)
Located above the attitude sphere, this illumination indicates the yaw damper has failed and is disengaged. Autopilot and rudder boost are inoperative.

On the ground:
1. Control Wheel Master Switch (MSW) — Depress and release.

   The following conditions will exist when the MSW switch is depressed. Nose wheel steering will disconnect.

2. IC/SG 2 Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group) — Pull and reset.

   DU 3 and DU 4 will blank until power-up is completed.

3. NOSE STEER Switch — ON.
4. If amber YD extinguishes:
   a. This checklist is complete.

4. If amber YD remains illuminated:
   a. Do not take off. The yaw damper and rudder boost are inoperative.

In flight:
1. Control Wheel Master Switch (MSW) — Depress and release.

   The following conditions will exist when the MSW switch is depressed. Spoilers and spoilerons will be inoperative while the switch is depressed.

2. If amber YD extinguishes:
   a. Yaw Damper — As desired.
   b. This checklist is complete.

(Continued)
Primary Flight Display (PFD) Annunciations (Cont)

YD (steady) (Cont)

2. If amber YD remains illuminated:
   a. Maintain 33,000 feet or below.
   b. Airspeed — Maintain 0.65 M or greater until below 33,000 feet.
   c. If conditions permit:
      (1) IC/SG 2 Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group) — Pull and reset.

   DU 3 and DU 4 will blank until power-up is completed.

d. If amber YD remains illuminated:
   (1) Land as soon as practical.
   (2) This checklist is complete.

d. If amber YD extinguishes:
   (1) Yaw Damper — Engage.
   (2) This checklist is complete.
Primary Flight Display (PFD) Annunciations (Cont)

2. If amber YD remains illuminated and conditions permit:
   a. IC/SG 2 Circuit Breaker (copilot’s INSTRUMENTS/INDICATIONS group) — Pull and reset.
      DU 3 and DU 4 will blank until power-up is completed.
   b. If amber YD remains illuminated:
      (1) This checklist is complete.
   b. If amber YD extinguishes:
      (1) Yaw Damper — As desired.
      (2) This checklist is complete.

EFFECTIVITY

Aircraft 45-226 & Subsequent and prior aircraft modified by SB 45-55-6

NOTE
Radio Management Unit (RMU) Failure

1. Respective PRI and SEC Circuit Breakers (AVIONICS group [COMMUNICATIONS - RMU 1 or 2 PWR]) — Pull and reset.

   If RMU failure remains:
2. Tune radios using the cross-side RMU’s 1/2 function or through the FMS CDU, or use the Clearance Delivery Radio (Com1 and Nav1 only, no DME is available with Clearance Delivery Radio in EMRG).

   - The COM, NAV, ADF and transponder remain tuned to the last selected value.
   - If both RMUs are failed, backup engine display pages and the backup navigation page will not be available.
ANTI-SKID FAIL

A failure of the anti-skid is indicated, or the ANTI-SKID switch is OFF. When anti-skid (for any wheel) is inoperative, care must be used during brake application and stopping distances will be increased.

1. ANTI-SKID Switch — OFF, then On.
2. Refer to Section V for increased stopping distances for anti-skid OFF landing.
3. Cautiously apply brakes as required.

WARNING

With anti-skid inoperative, heavy brake pressures may skid the tires and cause tire blow-out, or cause loss of directional control.

NOTE

Use of thrust reversers is recommended.

CPLT BRK FAULT

One or more of the copilot’s brake pedal transducers has failed.

1. Use pilot’s brakes.

NOTE

Normal anti-skid braking should be available on all brakes.
Abnormal Procedures

GEAR

This indicates that:
- The gear is in transit and airspeed is greater than 210 KIAS.
- The Radio Altimeter is inoperative, airspeed is less than 170 KIAS, altitude is below 14,500 feet, thrust levers are less than MCR and the landing gear is not down and locked.

This CAS will be accompanied by a single “GEAR” voice.

1. **If the gear is in transit and airspeed is greater than 210 KIAS:**
   a. Slow to below 200 KIAS.
   b. This checklist is complete.

1. **If the Radio Altimeter is inoperative, airspeed is less than 170 KIAS, altitude is below 14,500 feet, thrust levers are less than MCR, and the landing gear is not down and locked:**
   a. RAD ALT 1 Circuit Breaker (pilot’s INSTRUMENTS/INDICATIONS group) — Set.
   b. Extend gear prior to landing.
   c. This checklist is complete.

LINBD BRK FAIL
R INBD BRK FAIL
LR INBD BRK FAIL

The respective (left, right or both) inboard normal system brake has failed.

1. **If failure occurs just after gear extension and conditions permit:**
   a. Gear — UP.
   b. INBD BRAKES Circuit Breaker (pilot’s GEAR/HYDRAULICS group) — Set, or pull and reset.

**NOTE**

The BRAKE FAULT white CAS will be illuminated after cycling the circuit breaker. Refer to BRAKE FAULT procedure, Section II.

   c. AUX HYD Switch — ON.
   d. Gear — DN.
   e. **If INBD BRK FAIL remains illuminated:**
      1) Go to step 2.
   e. **If INBD BRK FAIL extinguishes:**
      1) This checklist is complete.

1. **If failure is not associated with gear extension:**
   a. Go to step 2.

2. Refer to Emergency Braking procedure, Section III, or Abnormal Landings, Emergency Brake Landing procedure, this section. Emergency brakes should be available on ALL brakes.
NWS FAIL

The nose wheel steering system has failed.

In the event the nose wheel steering system malfunctions, internal monitors should disconnect the system. A nose wheel steering malfunction may be accompanied by an unwanted swerve.

**During Taxi:**
1. Maintain directional control using differential braking.
2. Nose Wheel Steering — Disengage (use MSW).
3. Thrust Levers — IDLE.
4. Brake to a stop.
5. NOSE STEER Switch — ON.

**NOTE**

Taxi without steering is possible using differential braking and thrust. Avoid sharp turns, since it may not be possible to straighten the nose wheel by differential braking.

**During Takeoff or Landing:**
1. Maintain directional control using rudder and differential braking.
2. Nose Wheel Steering — Disengage (use MSW).

**NOTE**

Thrust reversers may be used for stopping.

**Inflight:**
1. After gear is DN, NOSE STEER Switch — ON.

   **If NWS FAIL remains illuminated:**
   a. Maintain directional control using rudder and differential braking on landing.

**NOTE**

Thrust reversers may be used for stopping.
Abnormal Procedures

**L OUTBD BRK FAIL**

**R OUTBD BRK FAIL**

**LR OUTBD BRK FAIL**

The respective (left, right or both) outboard normal system brake has failed.

1. **If failure occurs just after gear extension and conditions permit:**
   a. Gear — UP.
   b. OUTBD BRAKES Circuit Breaker (copilot’s GEAR/HYD group) — Set, or pull and reset.

   **NOTE** The BRAKE FAULT white CAS will be illuminated after cycling the circuit breaker. Refer to BRAKE FAULT procedure, Section II.

   c. AUX HYD Switch — ON.
   d. Gear — DN.
   e. **If OUTBD BRK FAIL remains illuminated:**
      (1) Go to step 2.
   e. **If OUTBD BRK FAIL extinguishes:**
      (1) This checklist is complete.

1. **If failure is not associated with gear extension:**
   a. Go to step 2.

2. Refer to Emergency Braking procedure, Section III, or Abnormal Landings, Emergency Brake Landing procedure, this section. Emergency brakes should be available on ALL brakes.

**PLT BRK FAULT**

One or more of the pilot’s brake pedal transducers has failed.

1. Use copilot’s brakes.

   **NOTE** Normal anti-skid braking should be available on all brakes.
Landing Gear AUX HYD Extension

The Landing Gear Free Fall procedure should be used to extend the landing gear in case of electrical or hydraulic problems. Use of landing gear free fall is recommended to reserve hydraulic pressure for flaps and brakes.

The AUX HYD pump and HYD XFLOW valve can also operate the landing gear system. If the main hydraulic system has failed, do not use the AUX HYD system to retract the landing gear, unless a critical performance situation exists.

To use AUX HYD system to extend landing gear:

1. Airspeed — 180 KIAS recommended.
2. GEAR FREEFALL Lever (copilot’s side pedestal) — Check normal UP position.
3. HYD XFLOW Switch — ON.
4. AUX HYD Switch — ON.
5. Gear — DN.

After gear has extended:

6. HYD XFLOW Switch — Off.
7. AUX HYD Switch — Off.

- If a brake failure (INBD or OUTBD BRK FAIL amber CAS or NORM BRK FAIL red CAS occurs while conducting this procedure, cycle the appropriate INBD BRAKES, OUTBD BRAKES, or both circuit breaker(s) (respective pilot’s or copilot’s GEAR/HYDRAULICS group) to clear the failure. If normal braking is not available upon landing, use Emergency Braking procedure, Section III.

- The BRAKE FAULT white CAS will be illuminated after cycling the circuit breaker(s). Refer to BRAKE FAULT procedure, Section II.
Landing Gear Free Fall

The Landing Gear Free Fall procedure should be used to extend the landing gear in case of electrical or hydraulic problems. Use of landing gear free fall is recommended to reserve hydraulic pressure for flaps and brakes.

1. Airspeed — 180 KIAS recommended.
2. Gear — DN.
3. AUX HYD Switch — Off.

4. If Landing Gear Free Fall is conducted because of an electrical problem:
   a. GEAR Circuit Breaker (pilot’s GEAR/HYDRAULICS group) — Pull.
   b. Go to step 5.

5. If Landing Gear Free Fall is conducted because of a hydraulic system problem:
   a. GEAR Circuit Breaker (pilot’s GEAR/HYDRAULICS group) — Set.
   b. Go to step 5.

5. GEAR FREEFALL Lever (copilot’s side pedestal) — Push full down and latch forward.

- Side slips or increasing airspeed may be required to lock the landing gear down. The main gear may require up to 1 minute to lock down.
- If the landing gear switch is down and gear free-fall is not selected down within 10 seconds, a BRAKE FAULT white CAS will illuminate. This CAS will extinguish once the gear is locked down.

6. Gear — Check for three green DOWN and two white (main gear) in-transit lights. Illumination indicates the inboard gear doors remain open.

- If a brake failure (INBD or OUTBD BRK FAIL amber CAS or NORM BRK FAIL red CAS occurs while conducting this procedure, cycle the appropriate INBD BRAKES, OUTBD BRAKES, or both circuit breaker(s) (respective pilot’s or copilot’s GEAR/HYDRAULICS group) to clear the failure. If normal braking is not available upon landing, use Emergency Braking procedure, Section III.
- The BRAKE FAULT white CAS will be illuminated after cycling the circuit breaker(s). Refer to BRAKE FAULT procedure, Section II.

(Continued)
Landing Gear Free Fall (Cont)

If any of the three green DOWN lights fail to illuminate:

a. Refer to Abnormal Landings, Gear Up Landing, this section.

a. If there is no indication of a hydraulic system fluid loss, the landing gear AUX HYD Extension procedure, this section may be attempted.
Abnormal Procedures

Abnormal and Overweight Landings

Abnormal and overweight landings typically require high brake energies at maximum braking to bring the aircraft to a full stop within the distances prescribed in this section. When the landing brake energy defined in Section V is exceeded, wheel fuse plugs may release. When the maximum takeoff brake energy is approached, the possibility of a wheel fire due to the energy absorbed by the brakes exists.

An overweight landing conducted in the normal landing configuration may exceed the landing brake energy limit. Refer to Section V.

An abnormal landing will not exceed the maximum takeoff brake energy (demonstrated in flight tests) if the following weight/altitude parameters are observed:

- Landing weight is 16,000 pounds (7,258 kg) or less, and the landing altitude is 4,000 feet or less.
- Landing weight is between 16,000 and 18,000 pounds (7,258 to 8,164 kg) and the landing altitude is 2,000 feet or less.
- Landing weight is between 18,000 and 19,200 pounds (8,164 to 8,709 kg) and the landing altitude is sea level or less.

An abnormal landing will exceed the maximum takeoff brake energy (demonstrated in flight tests) if the landing weight is greater than 19,200 pounds (8,709 kg).

If the available field length is greater than the requirements prescribed, gradual or reduced braking should be utilized to stop the aircraft with lower brake energies and within the available field length.

The landing weights, altitudes, landing distance factors and brake energy limits do not take into account the use of thrust reversers. Use of thrust reversers can significantly reduce the amount of energy absorbed by the brakes.
### Approach Speeds — Abnormal Landings

#### EFFECTIVITY

Aircraft 45-002 & Subsequent modified by SB 45-11-4

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#### GEAR DOWN

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Figures in shaded area are above maximum certified landing weight.

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[FM-126](#) 4-99.3

FAA Approved 5-19-2004

Figure 4-4.3
Abnormal Procedures

**Stabilizer Heat Failure Landing**
*(STAB TEMP LOW)*

If approach and landing must be made with any ice (or suspected ice) on the horizontal stabilizer:

> **NOTE** Elevator buffet or stick pumping indicates ice may have formed on the horizontal stabilizer.

1. Complete Descent procedure, Section II.
2. Final Approach Speed — VLND8 + 30, computed and set. Refer to Approach Speeds — Abnormal Landings, this section.
3. Normal Landing Distance — Multiply by 2.2
5. ENG SYNC Switch — OFF.
6. HI FLOW Switch — Off.
7. FLAPS — 8°, check indication.
8. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
9. AUX HYD Switch — ON.
11. L and R LDG/TAXI Lights Switch — On as required.
12. L and R IGN Switches — ON. (IGN green EI)
13. EICAS/SUMRY Page — Check.

> **NOTE** Use of thrust reversers is recommended.
Wing and Stabilizer Heat Failure Landing  
(STAB and WING TEMP LOW)

If approach and landing must be made with any ice on the wing leading edge and any ice on the horizontal stabilizer:

Even small accumulations of ice on the wing leading edge can cause an increase in stall speed and possibly, a degradation in stall characteristics.

Elevator buffet or stick pumping indicates ice may have formed on the horizontal stabilizer.

1. Complete Descent procedure, Section II.
2. Final Approach Speed — VLND8 + 30, computed and set. Refer to Approach Speeds — Abnormal Landings, this section.
3. Normal Landing Distance — Multiply by 2.2
5. ENG SYNC Switch — OFF.
6. HI FLOW Switch — Off.
7. FLAPS — 8°, check indication.
8. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
9. AUX HYD Switch — ON.
11. L and R LDG/TAXI Lights Switch — On as required.
12. L and R IGN Switches — ON. (IGN green EI)
13. EICAS/SUMRY Page — Check.

Use of thrust reversers is recommended.
Wing Heat Failure Landing
(WING TEMP LOW)

If approach and landing must be made with any ice (or suspected ice) on the wing leading edge:

**WARNING**

Even small accumulations of ice on the wing leading edge can cause an increase in stall speed and possibly, a degradation in stall characteristics.

1. Complete Descent procedure, Section II.
2. Final Approach Speed — Vlnd8 + 30, computed and set. Refer to Approach Speeds — Abnormal Landings, this section.
3. Normal Landing Distance — Multiply by 2.2
5. ENG SYNC Switch — OFF.
6. HI FLOW Switch — Off.
7. FLAPS — 8°, check indication.
8. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
9. AUX HYD Switch — ON.
11. L and R LDG/TAXI Lights Switch — On as required.
12. L and R IGN Switches — ON. (IGN green EI)
13. EICAS/SUMRY Page — Check.

**NOTE**

Use of thrust reversers is recommended.
Normal Electrical System Failure Landing

This procedure would be used for landing with a normal electrical system failure and operation on emergency battery.

- Landing on a wide runway of sufficient length with minimum turbulence and crosswind is recommended.

- Roll control authority will be less than normal. Directional control on the runway will be limited without nose wheel steering.

- **Operative equipment associated with landing:**
  - Right cabin pressure control, use MANUAL Rate to control.
  - Standby airspeed, altimeter & vibrator, and lighting.
  - Standby attitude.
  - RMU 1 engine display: N1, N2, OIL °C and EMER (bus volts).
  - Inboard brakes with anti-skid.
  - Emergency brakes.

- **Inoperative equipment associated with landing:**
  - Windshield heat.
  - All external and LDG/TAXI lights.
  - Pitch, aileron and rudder trim.
  - Flaps.
  - Spoilers/spoilerons.
  - Outboard brakes.
  - Thrust reversers.
  - Nose wheel steering.
  - Stall warning system.

(Continued)
Normal Electrical System Failure Landing (Cont)

1. MANUAL Rate Control — As required to depressurize cabin prior to landing.
2. Standby Altimeter — Set.
3. Cabin Check:
   a. Brief passengers.
      Passenger address system, NO SMOKING BELTS sign and PAX BRIEF (if installed) are inoperative. It may be necessary to turn towards the cabin and shout instructions, including no smoking and seat belt requirements.
   b. Seats — Swivel forward or aft and in outboard position. Seat backs upright and locked. Leg restraint of belted lavatory seat (if installed) extended. Headrests in place for occupied aft facing seats.
   c. Work Tables and Toilet Doors — Check stowed.
   d. Emergency Exit — Aisle clear.
4. Final Approach Speed — VLNDX for the flap extension obtained, computed. Refer to Abnormal Landings, Approach Speeds, this section.
5. Normal Landing Distance — Multiply by 2.2
   This landing distance factor is derived for any flap setting and no spoilers.
7. Gear — DN. Check for three green DOWN indications.

After touchdown:
8. EMERGENCY/PARKING BRAKE Handle — Pull smoothly, increasing extension increases brake pressure. (EMER/PARK BRK white CAS)
   Apply the brake smoothly with small movements to increase braking. Heavy brake pressure may skid the tires and cause tire blow-out, or cause loss of directional control. Do not pump the brake handle.
Emergency Brake Landing
(NORM BRK FAIL red CAS)
(INBD BRK FAIL amber CAS)
(OUTBD BRK FAIL amber CAS)

This procedure would be used for landing with emergency brake for stopping. All other systems (flaps, spoilers, etc.) are operational. This procedure may be used in association with the following CAS procedures: red NORM BRK FAIL (or NORMAL BRAKES FAIL red CWP), amber INBD BRK FAIL, and amber OUTBD BRK FAIL.

1. Complete Descent procedure, Section II.
2. Final Approach Speed — VREF, computed and set. Refer to Performance Data, Section V.
3. Normal Landing Distance — Use Anti-Skid OFF corrections. Refer to Performance Data, Section V.
5. ENG SYNC Switch — OFF.
6. HI FLOW Switch — Off.
7. FLAPS — 8° or 20°.
8. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
9. AUX HYD Switch — ON.
12. L and R IGN Switches — ON. (IGN green EI)
13. FLAPS — DN, check indication.
14. EICAS/SUMRY Page — Check.

After touchdown:
15. EMERGENCY/PARKING BRAKE Handle — Pull smoothly, increasing extension increases brake pressure. (EMER/PARK BRK white CAS)

WARNING
Apply the brake smoothly with small movements to increase braking. Heavy brake pressure may skid the tires and cause tire blow-out, or cause loss of directional control. Do not pump the brake handle.

NOTE
Use of thrust reversers is recommended.
Abnormal Procedures

Single-Engine Landing

1. Complete Descent procedure, Section II.
3. Normal Landing Distance — Multiply by 1.2
5. ENG SYNC Switch — OFF.
6. HI FLOW Switch — Off.
7. FLAPS — 20°.
8. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
9. AUX HYD Switch — ON.
11. L and R LDG/TAXI Lights Switches — On as required.
12. Operating Engine IGN Switch — ON. (IGN green EI)
13. EICAS/SUMRY Page — Check.

**NOTE**

- Idle reverse thrust is available on operative engine.
- The LR HYD PUMP LOW white CAS may illuminate during landing gear extensions with single engine operations.
- When operating with only one engine supplying bleed air, maintaining N1 greater than 75% should provide adequate bleed air for anti-icing. Lower N1s may be required for descent and landing.
Aileron Jammed Landing  
(ROLL DISC white CAS)

This procedure would be used for landing with an aileron jammed and after roll disconnect (ROLL DISC) has been used. The roll control forces with roll disconnected are very light and roll control is sensitive. Roll rates may be reduced with large deflection of jammed aileron.

1. Complete Descent procedure, Section II.
2. Final Approach Speed — V_{ref}, computed and set. Refer to Section V.
3. Normal Landing Distance — Computed.
5. ENG SYNC Switch — OFF.
6. HI FLOW Switch — Off.
7. FLAPS — 8° or 20°.
8. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
9. AUX HYD Switch — ON.
12. L and R IGN Switches — ON. (IGN green EI)
13. FLAPS — DN, check indication.
14. EICAS/SUMRY Page — Check.
Aileron Trim Tab Jammed Landing

This procedure would be used for landing with an aileron (roll) trim tab jammed or failed in a non-trimmed condition.

- Landing on a wide runway of sufficient length with minimum turbulence and crosswind is recommended.
- Landings have been demonstrated with the trim at the maximum value. A roll force of approximately 20 pounds on final approach with the trim tab at full travel may be experienced.

1. Complete Descent procedure, Section II.
2. Final Approach Speed — VREF, computed and set. Refer to Section V.
3. Normal Landing Distance — Computed.
5. ENG SYNC Switch — OFF.
6. HI FLOW Switch — Off.
7. FLAPS — 8° or 20°.
8. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
9. AUX HYD Switch — ON.
12. L and R IGN Switches — ON. (IGN green EI)
13. FLAPS — DN, check indication.
14. EICAS/SUMRY Page — Check.
Abnormal Procedures

**Elevator Jammed Landing**
*(ELEVATOR DISC white CAS)*

This procedure would be used for landing with an elevator jammed and after elevator disconnect (ELEVATOR DISC) has been used.

**NOTE**
- Landing on a wide runway of sufficient length with minimum turbulence and crosswind is recommended.
- The aft elevator control column stop may be hit on the landing flare.

1. Complete Descent procedure, Section II.
2. Final Approach Speed — VLND8 + 10, computed and set. Refer to Abnormal Landings, Approach Speeds, this section.
3. Normal Landing Distance — Multiply by 1.6
5. ENG SYNC Switch — OFF.
6. HI FLOW Switch — Off.
7. FLAPS — 8°, check indication.
8. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
9. AUX HYD Switch — ON.
12. L and R IGN Switches — ON. (IGN green EI)
13. EICAS/SUMRY Page — Check.
Abnormal Procedures

**Partial Flap Landing**
*(FLAPS FAIL)*

1. Complete Descent procedure, Section II.
2. Final Approach Speed — VLNDX for the flap deflection obtained (0°, 8° or 20°), computed and set. Refer to Abnormal Landings, Approach Speeds, this section. Use the lesser flap deflection VLNDX speed for flap settings between the detent values.
3. Normal Landing Distance — Multiply by 1.3
5. ENG SYNC Switch — OFF.
6. HI FLOW Switch — Off.
7. FLAPS — As obtained.
8. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
9. AUX HYD Switch — ON.
12. L and R IGN Switches — ON. (IGN green EI)
13. EICAS/SUMRY Page — Check.

**NOTE**
- A higher than normal nose-up pitch attitude will be required with partial flaps.
- The aircraft may tend to float or balloon if over-rotated on flare with lesser flap deflections.
- Use of thrust reversers is recommended.
Abnormal Procedures

Rudder Jammed Landing

This procedure would be used for landing with a rudder jammed.

- Landing on a wide runway of sufficient length with minimum turbulence and crosswind is recommended.
- Use asymmetric power if required to minimize sideslip.

1. Complete Descent procedure, Section II.
2. Final Approach Speed — $V_{REF}$, computed and set. Refer to Section V.
3. Normal Landing Distance — Computed.
5. ENG SYNC Switch — OFF.
6. HI FLOW Switch — Off.
7. FLAPS — 8° or 20°.
8. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
9. AUX HYD Switch — ON.
11. NOSE STEER Switch — Check Off.
13. L and R IGN Switches — ON. (IGN green EI)
14. FLAPS — DN, check indication.
15. EICAS/SUMRY Page — Check.
16. Carry power down to touchdown to aid in directional control.
17. Yaw Damper — Off.

After landing:

NOTE

Thrust reversers may be used at idle reverse. Stow the thrust reversers if directional control is lost.
Abnormal Procedures

Rudder Trim Tab Jammed Landing

This procedure would be used for landing with a rudder trim tab jammed or failed in a non-trimmed condition.

- Landing on a wide runway of sufficient length with minimum turbulence and crosswind is recommended.
- Landings have been demonstrated with the trim at the maximum value. A rudder force of approximately 50 pounds on final approach with the trim tab at full travel may be experienced.

1. Complete Descent procedure, Section II.
2. Final Approach Speed — VREF, computed and set. Refer to Section V.
3. Normal Landing Distance — Computed.
5. ENG SYNC Switch — OFF.
6. HI FLOW Switch — Off.
7. FLAPS — 8° or 20°.
8. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
9. AUX HYD Switch — ON.
12. L and R IGN Switches — ON. (IGN green EI)
13. FLAPS— DN, check indication.
14. EICAS/SUMRY Page — Check.
Spoilers Extended Landing
(SPOILER EXT or SPOILER FAIL)

This procedure would be used for landing with both spoilers failed extended or floating.

- Landing on a runway of sufficient length with minimum turbulence and crosswind is recommended.
- Roll control authority will be less than normal.

1. Complete Descent procedure, Section II.
2. SPOILER Lever — RET.
3. Final Approach Speed — VLND8 + 5, computed and set. Refer to Abnormal Landings, Approach Speeds, this section.
6. ENG SYNC Switch — OFF.
7. HI FLOW Switch — Off.
8. FLAPS — 8°, check indication.
9. AUX HYD Switch — ON.
12. L and R IGN Switches — ON. (IGN green EI)
13. EICAS/SUMRY Page — Check.

- The SPOILER EXT amber CAS will be illuminated with flaps extended, no pilot action is required. Extending the flaps may reduce the spoiler float angle.
- There will be a nose-high attitude on approach and landing. The aircraft may tend to float or balloon if over-rotated on flare with lesser flap deflections.
- Use of thrust reversers is recommended.
Spoiler Jammed Landing
(L SPOILER JAM)
(R SPOILER JAM)

This procedure would be used for landing with a jammed spoiler.

1. Complete Descent procedure, Section II.
2. SPOILER Lever — Deploy, as required to minimize roll.
3. Final Approach Speed — VLND8 + 5, computed and set. Refer to Abnormal Landings, Approach Speeds, this section.
6. ENG SYNC Switch — OFF.
7. HI FLOW Switch — Off.
8. FLAPS — 8°, check indication.
9. AUX HYD Switch — ON.
12. L and R IGN Switches — ON. (IGN green EI)
13. EICAS/SUMRY Page — Check.

- A SPOILER EXT amber CAS will be illuminated with flaps extended, no pilot action is required.
- There will be a nose-high attitude on approach and landing. The aircraft may tend to float or balloon if over-rotated on flare with lesser flap deflections.
- Use of thrust reversers is recommended.
Abnormal Procedures

Stabilizer Jammed Landing

If elevator pull force is encountered — Stabilizer jammed in nose-down trim position (aircraft in climb, cruise, or descent configuration):

- Heavy control column pull forces will be encountered. Copilot assistance is recommended during the approach and landing to relieve pull force on the column, and manage thrust lever control.

- If the stabilizer jams during a high-speed condition, delay reducing airspeed as long as possible to minimize the time out of trim.

1. Complete Jammed Stabilizer (PRI TRIM FAIL and SEC TRIM FAIL) procedure, this section.
2. Complete Descent procedure, Section II.
3. Final Approach Speed — VLND0, computed and set. Refer to Abnormal Landings, Approach Speeds, this section.
4. Normal Landing Distance — Multiply by 1.3
6. ENG SYNC Switch — OFF.
7. HI FLOW Switch — Off.
8. FLAPS — UP (0°), check indication.
9. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
10. AUX HYD Switch — ON.
13. L and R IGN Switches — ON. (IGN green EI)
14. EICAS/SUMRY Page — Check.

If elevator push force is encountered — Stabilizer jammed in nose-up trim position (aircraft in takeoff or landing configuration):

2. Complete Descent procedure, Section II.
3. Complete Approach procedure, Section II.
4. Complete Before Landing procedure, Section II.
Main Hydraulic System Failure Landing  
(MAIN HYD PRESS)

This procedure would be used for landing with a loss of the main hydraulic system pressure (MAIN HYD PRESS). Spoiler will not be available, and roll control authority will be less than normal. Thrust reversers will not be available.

1. Complete Descent procedure, Section II.
2. Complete Landing Gear Free Fall procedure, this section.

If AUX HYD is available:
   a. AUX HYD Switch — ON, to charge B-ACUM pressure.
   b. HYD XFLOW Switch — ON.
   c. FLAPS — 20°, check indication. (Do not extend beyond 20°.)

When flaps reach their maximum extension:
   d. HYD XFLOW Switch — Off.
   e. AUX HYD Switch — Off.
3. Final Approach Speed — VLNDX for the flap extension obtained, computed and set. Refer to Abnormal Landings, Approach Speeds, this section.
4. Normal Landing Distances:
   a. ●If emergency braking is used:
      (1) Multiply by 2.2
      (2) Go to step 5.
   a. ●If normal braking is used with AUX HYD pressure available:
      (1) Multiply by 1.4 (If loss of AUX HYD pressure is anticipated, multiply by 2.2 for planning purposes.)
      (2) Go to step 5.

   NOTE: These landing distance factors are derived for any flap setting and no spoilers.

6. ENG SYNC Switch — OFF.
7. HI FLOW Switch — Off.
8. Gear — Check for three green DOWN indications. The two white (main gear) intransit lights may also be illuminated.
10. L and R IGN Switches — ON. (IGN green EI)
11. EICAS/SUMRY Page — Check.

Prior to touchdown:
   12. AUX HYD Switch — ON.  

(Continued)
Main Hydraulic System Failure Landing (Cont)
(MAIN HYD PRESS)

After touchdown:

13. If AUX HYD pressure is available, normal anti-skid braking should be available from the auxiliary pump. Be prepared to use EMERGENCY BRAKING. This checklist is complete.

13. If AUX HYD pressure is not available, use EMERGENCY BRAKING.
   a. EMERGENCY/PARKING BRAKE Handle — Pull smoothly, increasing extension increases brake pressure. (EMER/PARK BRK white CAS)

   WARNING: Apply the brake smoothly with small movements to increase braking. Heavy brake pressure may skid the tires and cause tire blow-out, or cause loss of directional control. Do not pump the brake handle.

   b. Rudder and Nose Wheel Steering — As required for directional control.
   c. This checklist is complete.
Gear Up Landing

If a gear up landing must be made, select a long, wide runway with as little crosswind as possible. If time and conditions permit, plan the descent to ensure minimum fuel remaining on the aircraft. Ensure sufficient fuel for controlled, power-on approach.

1. Brief passengers as required.
   a. Location and operation of emergency exits.
   b. All loose items — Secure.
   c. Shoulder harness and seat belts — Secure.
   d. Emergency landing brace position.
2. Complete Descent procedure, Section II.
3. PACK Switch — OFF. The aircraft should be depressurized prior to landing.
4. FLAPS — DN.

**NOTE**

The gear warning will sound and will not be mutable with any landing gear not down and flaps full down. Pulling the L and R WARN PANEL circuit breakers will eliminate the warning. This will fail the CWP (LR WARN PWR FAIL and WARN AUDIO amber CAses will illuminate).

5. Perform normal power-on approach at VREF and touch down at the lowest possible airspeed with minimum sink rate. Do not decelerate below shaker speed.

6. **If no landing gear has extended**:
   a. Plan to land slightly nose high.
   b. Go to step 7.

6. **If the nose gear fails to extend**:
   a. Relocate passengers aft to obtain aft C.G., if possible.
   b. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS.)
   c. AUX HYD Switch — ON.
   d. EICAS/SUMRY Page — Check.
   e. Hold the nose off the runway as long as elevator control is available.

f. **If hydraulic pressure is not available**:
   (1) Use EMERGENCY/PARKING BRAKE.
   (2) Go to step 7.

f. **If hydraulic pressure is available**:
   (1) Normal braking may be used and spoilers deployed. Use rudder and/or brakes for directional control. Be prepared to use EMERGENCY/PARKING BRAKE.
   (2) Go to step 7.

(Continued)
Gear Up Landing (Cont)

6. If a main gear fails to extend:
   a. Plan to land on the same side of the runway as the extended gear.
   b. ANTI-SKID Switch — OFF. Heavy brake pressures may skid the tires and cause tire blow-out.
   c. NOSE STEER Switch — Check ON to assist in maintaining directional control.
   d. AUX HYD Switch — ON.
   e. EICAS/SUMRY Page — Check.
   f. Hold the applicable wing up as long as possible. Maintain directional control with rudder and nose wheel steering.
   g. If hydraulic pressure is not available:
      (1) Use EMERGENCY/PARKING BRAKE.
      (2) Go to step 7.
   g. If hydraulic pressure is available:
      (1) Normal braking may be used and spoilers deployed. Use rudder and/or brakes for directional control. Be prepared to use EMERGENCY/PARKING BRAKE.
      (2) Go to step 7.

At touchdown:
7. Thrust Levers — CUTOFF.
8. FIRE Switches (L and R ENGINE) — Lift guard, FIRE PUSH.

After aircraft stops:
9. EMER LIGHTS Switch — ON.
10. EMER BATT, L and R BATT Switches — OFF.
11. Evacuate the aircraft:
   a. Cabin Entry Door — Open and exit aircraft. The upper door may be opened with the landing gear retracted.
   b. Aft Emergency Exit — Open and exit using the wing step area.
Abnormal Procedures

**Thrust Reverser Deployed Landing**

**WARNING**
Go-around may not be possible with a deployed thrust reverser.

**NOTE**
Landing on a wide runway of sufficient length with minimum turbulence and crosswind is recommended.

1. Complete Descent procedure, Section II.
2. Final Approach Speed — VLND8 + 10, computed and set. Refer to Approach Speeds — Abnormal Landings, this section.
3. Normal Landing Distance — Multiply by 1.6
5. ENG SYNC Switch — OFF.
6. HI FLOW Switch — Off.
7. FLAPS — 8°, check indication.
8. SPOILER Lever — ARM. (AUTOSPLR ARMED white CAS)
9. AUX HYD Switch — ON.
12. Operating Engine IGN Switch — ON. (IGN green EI)
13. EICAS/SUMRY Page — Check.

**NOTE**
After landing, use of the operative thrust reverser is allowable.
PERFORMANCE DATA FOR AIRCRAFT WITH
EFFECTIVITY CODE

45-002 thru 45-2000 when modified by
SB 45-72-1 (TFE731-20BR-1B Engine Upgrade)

U.S. UNITS
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- **Anti-Ice — Off**
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  - Dry Runway (Figure 5-64A) .............................................. 5-83A
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  - Wet Runway (Figure 5-63) .................................................. 5-82
- **Anti-Ice — On**
  - Dry Runway (Figure 5-61A) .............................................. 5-80A
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**APR — Off**
- **Anti-Ice — Off**
  - Dry Runway (Figure 5-65) .................................................. 5-84
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INTRODUCTION TO PERFORMANCE DATA

STANDARD PERFORMANCE CONDITIONS

All performance in this section is based on flight test data and the following performance conditions:

1. Pertinent thrust ratings less installation, bleed air, and accessory losses.
2. Full temperature and altitude accountability within the operational limits for which the airplane is certified.

- Should OAT or altitude be below the lowest value shown on the performance charts, use performance at the lowest value shown.
- Performance data may be interpolated, or use the next higher weight, temperature and/or altitude.

3. Wing flap positions are as follows:
   - Takeoff: 8° or 20°
   - En Route: UP — 0°
   - Approach: 8°
   - Landing: DN — 40°

4. Thrust settings (N1) from the appropriate tables and indicated by the N1 bugs.

5. All takeoff and landing performance is based on a paved runway.

6. Autospoilers are armed.

7. Wet runway takeoff performance accounts for the use of thrust reversers.

STANDARD PERFORMANCE PROCEDURES

ENGINE-OUT TAKEOFF — ACCELERATE GO

a. Set thrust levers to takeoff (T/O) thrust detent, then release the brakes.

b. The pilot recognizes the engine failure at V1.

c. Continue to accelerate to V2. Rotate at 3° to 5° per second to the target takeoff pitch attitude while accelerating to achieve V2 at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude corrections may be required to maintain V2.

d. Retract landing gear when a positive rate of climb is established.

The flight director GO-AROUND mode does not always provide the target takeoff pitch attitude.
Performance Data

ENGINE-OUT TAKEOFF — ACCELERATE STOP
a. Set thrust levers to takeoff (T/O) thrust detent, then release the brakes.
b. The pilot recognizes the engine failure and initiates maximum braking at V1.
c. Reduce both thrust levers to IDLE.
d. Deploy thrust reversers, if necessary.
e. Spoilers are automatically deployed.
f. Maintain maximum braking until airplane comes to a complete stop.

MULTI-ENGINE TAKEOFF
a. Set thrust levers to takeoff (T/O) thrust detent, then release the brakes.
b. Rotate at 3° to 5° per second at V\textsubscript{R} to the target takeoff pitch attitude while accelerating to achieve V\textsubscript{2} + 10 KIAS at a height of 35 feet above the runway. A continuous rotation to +5° above the target takeoff pitch attitude may be necessary to achieve V\textsubscript{2} + 10 KIAS. Maintain V\textsubscript{2} + 10 once achieved. Small pitch corrections may be required to maintain V\textsubscript{2} + 10.
c. Retract the landing gear when a positive rate of climb is established.

The flight director GO-AROUND mode does not always provide the target takeoff pitch attitude.

LANDING
a. Approach at V\textsubscript{REF} with flaps and gear down using thrust to maintain a 3.5° glideslope.
b. Briskly reduce the thrust levers to IDLE at 55 feet above the touchdown altitude.
c. A firm touchdown with little or no flare should be accomplished.
d. Apply maximum braking after touchdown until airplane comes to a complete stop.
e. Spoilers are automatically deployed.
VARIABLE FACTORS AFFECTING PERFORMANCE

Some performance data presented in this section exceed the weight/temperature/altitude limits established in Section I of this manual. These data are presented for reference only.

Details of variables affecting performance are given with the charts to which they apply. Conditions which relate to all performance calculations are:

1. PACK Switch — ON; HI FLOW Switch — Off.
2. Effect of humidity.
3. Winds, for which graphical correction is presented on the charts, are to be taken as the reported winds. Factors for 50% headwind component and 150% tailwind component have been applied as prescribed in pertinent regulations.
DEFINITIONS
These definitions apply to terms used throughout this manual.

AIRSPEEDS

CAS  Calibrated Airspeed — The airspeed indicator reading corrected for instrument and position error. KCAS is calibrated airspeed expressed in knots.

IAS  Indicated Airspeed — The airspeed indicator reading as installed in the airplane. KIAS is indicated airspeed expressed in knots. The information in this manual is presented in terms of indicated airspeed, unless otherwise stated, and assumes zero instrument error. The ground airspeed calibration was adjusted to account for the lag in the electronic airspeed indicator.

M  Calibrated Mach Number — The Mach number reading corrected for instrument and position error.

MI  Indicated Mach Number — The Machmeter reading as installed in the airplane. Zero instrument error is assumed for presentations in this manual.

VA  Maneuvering Speed — Va is the highest speed that full aileron and rudder control can be applied without overstressing the aircraft, or the speed at which the aircraft will stall with a load factor of 2.9 g’s, whichever is less.

VFE  Maximum Flap Extended Speed — The maximum speed permissible with the wing flaps in a prescribed extended position.

VLE  Maximum Landing Gear Extended Speed — The maximum speed at which the aircraft can be flown with the landing gear extended.

VLO  Maximum Landing Gear Operating Speed — The maximum speed at which the landing gear can be extended or retracted.

VMO/MMO  Maximum Operating Limit Speed — The speed that may not be deliberately exceeded in any flight condition except where specifically authorized for flight test or pilot training. VMO is expressed in knots. MMO is expressed in Mach number.
DEFINITIONS (Cont)

VMCA Minimum Control Speed, Air — The minimum flight speed at which the airplane is controllable with up to 5° of bank when one engine suddenly becomes inoperative and the remaining engine is operating at takeoff or APR thrust.

VMCG Minimum Control Speed, Ground — The minimum speed on the ground at which control can be maintained using aerodynamic controls alone and wings level, when one engine suddenly becomes inoperative and the remaining engine is operating at takeoff or APR thrust.

VMCL Minimum Control Speed, Landing — The minimum flight speed during landing approach at which the airplane is controllable with up to 5° of bank when one engine suddenly becomes inoperative and the remaining engine is operating at takeoff thrust.

V1 Takeoff Decision Speed — The speed at which the distance to continue the takeoff to 35 feet (15 feet for wet and contaminated runways) or the distance to stop will not exceed the scheduled takeoff distance provided the brakes are applied at V1.

VR Rotation Speed — The speed at which rotation is initiated during takeoff to attain takeoff performance.

V2 Takeoff Safety Speed — The actual speed at 35 feet above the runway surface as demonstrated in flight during single-engine takeoff.

VAPP Approach Climb Speed — The airspeed used for approach climb gradient (airplane in the approach configuration).

VLNDX Landing approach speed for abnormal operations in which flaps are not full down. Values are presented for flaps 0°, 8°, and 20°. These speeds provide the same margin above stall as when flying a normal approach with flaps full down at VREF.

VREF Landing Approach Speed — The airspeed used for landing climb gradient (airplane in the landing configuration).
DEFINITIONS

WEIGHTS

Maximum Allowable Takeoff Weight

- Maximum Certified Takeoff Weight.
- Maximum Takeoff Weight (Climb or Brake Energy Limited) for altitude and reported surface temperature as determined from the applicable figure entitled TAKEOFF WEIGHT LIMITS in this section.
- Maximum Takeoff Weight for the runway and ambient conditions as determined from the applicable figure entitled TAKEOFF FIELD LENGTH in this section.

Maximum Allowable Landing Weight

- Maximum Certified Landing Weight.
- Maximum Landing Weight for the runway and ambient conditions as determined from the applicable ACTUAL LANDING DISTANCE chart in this section.
- Maximum Landing Weight (Approach Climb or Brake Energy Limited) for altitude and reported surface temperature as determined from the applicable figure entitled LANDING WEIGHT LIMITS in this section.

DISTANCES

Accelerate-Stop Distance

The accelerate-stop distance is the horizontal distance traversed from brake release to the point at which the airplane comes to a complete stop on a takeoff during which the pilot applies the brakes at or below V1.

Engine-Out Accelerate-Go Distance

The engine-out accelerate-go distance is the horizontal distance traversed from brake release to the point at which the airplane attains a height of 35 feet (15 feet for wet and contaminated runways) above the runway surface, on a takeoff during which one engine fails, recognition occurs at or above V1 and the pilot elects to continue.
DEFINITIONS (Cont)

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
</table>
| Takeoff Field Length | The takeoff field lengths presented on the TAKEOFF FIELD LENGTH charts in this section are based on a smooth, paved runway. The takeoff field length given for each combination of airplane weight, atmospheric temperature, altitude, wind, and runway gradient is the greatest of the following:  
1. 115% of the all-engine takeoff distance from start to a height of 35 feet (15 feet for wet and contaminated runways) above the runway surface.  
2. The accelerate-stop distance.  
3. The engine-out accelerate-go distance.  
No specific identification is made on the charts as to which of the above distances governs a specific case. |
| Actual Landing Distance | The actual landing distances presented in this section are based on a smooth, paved runway. The actual landing distance is equal to the horizontal distance from a point 50 feet above the touchdown point on the runway surface to the point at which the airplane would come to a full stop on the runway. |
| Factored Landing Distance | The factored dry landing distances presented in this section are equal to the actual landing distance divided by 0.60 (multiplied by 1.67). The factored wet landing distance is the factored dry landing distance multiplied by 1.15. |
DEFINITIONS (Cont)

METEOROLOGICAL

ISA
International Standard Atmosphere.

OAT
Outside ambient air temperature obtained from ground meteorological sources. (OAT is equivalent to SAT.)

SAT
Static Air Temperature — The total air temperature obtained from onboard temperature measurement adjusted for compressibility effects. (SAT is equivalent to OAT.)

Altitude
All altitudes given in this section are pressure altitudes unless otherwise stated.

Wind
The wind velocities, in knots, recorded as variables on the charts of this section are to be understood as the headwind or tailwind components of the actual winds at 10 meters above the runway surface (tower winds).

Demonstrated Crosswind
The demonstrated crosswind velocity of 22 knots is the velocity of the reported tower winds (measured at a 10 meter height) for which adequate control of the airplane during takeoff and landing (including the use of thrust reversers) was actually demonstrated on a dry runway during certification tests. Consideration for reduced ground controllability should be made for crosswinds on wet and contaminated runways.

MISCELLANEOUS

Position Correction
Static Position Correction — A correction applied to indicated airspeed, Mach number or altitude to eliminate the effect of the location of the static pressure source on the instrument reading. Any change in the airspeed-altitude system external to the airplane, or locating any external object near the pressure pickup sources, requires calibration of the system and revision of the charts.
### Definitions (Cont)

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Takeoff Brake Energy</td>
<td>The brake energy with maximum effort braking at weights associated with the takeoff brake energies shown on the TAKEOFF WEIGHT LIMITS charts. Distances expressed on the TAKEOFF FIELD LENGTH charts will be achieved if the takeoff is aborted and brakes are applied at $V_1$. However, after the stop, wheel fuse plugs may release and brake and tire damage will occur.</td>
</tr>
<tr>
<td>Maximum Landing Brake Energy</td>
<td>The brake energy with maximum effort braking at weights associated with the landing brake energies shown on the LANDING WEIGHT LIMITS charts. Stopping distances expressed on the ACTUAL LANDING DISTANCE chart will be achieved. Landings in which brake energy is kept below this value can be accomplished without wheel fuse plug release or tire damage. Maximum effort stops in which brake energy exceeds this value may cause excessive brake wear, and after the stop, may cause wheel fuse plug release and damage tires.</td>
</tr>
<tr>
<td>Runway Gradient</td>
<td>Change in runway elevation per 100 feet of runway length. The values given are positive for uphill gradients and negative for downhill gradients.</td>
</tr>
<tr>
<td>Gradient of Climb</td>
<td>The ratio of the change in height during a portion of the climb to the horizontal distance traversed in the same time interval.</td>
</tr>
<tr>
<td>Gross Climb Gradient</td>
<td>The climb gradient that the airplane can actually achieve given ideal conditions.</td>
</tr>
<tr>
<td>Net Climb Gradient</td>
<td>The gross climb gradient reduced by 0.8% during the takeoff phase and 1.1% en route.</td>
</tr>
</tbody>
</table>
Performance Data

DEFINITIONS (Cont)

First Segment Climb: Climb from the point at which the airplane becomes airborne to the point at which the landing gear is fully retracted. This requirement is satisfied by observing the TAKEOFF WEIGHT LIMITS Chart.

Second Segment Climb: Second segment climb for takeoff weight limits is calculated at a height of 400 feet. This requirement is satisfied by observing the TAKEOFF WEIGHT LIMITS Chart. Second segment climb for obstacle clearance is calculated at a height of 1,000 feet. These data are shown on the second segment climb gradient tables. Airspeed for this segment is V2.

En Route Climb: Climb with flaps UP (0°), landing gear retracted and maximum continuous thrust on one engine. Airspeed is presented in EN ROUTE CLIMB SPEED SCHEDULE Chart.

Approach Climb: Climb from a missed or aborted approach with approach (8°) flaps, landing gear retracted, and takeoff thrust on one engine. This requirement is satisfied by observing the LANDING WEIGHT LIMITS Chart. Airspeed for this segment is VAPP.

Landing Climb: Climb from an aborted landing with landing flaps DN (40°), landing gear extended, and takeoff thrust on both engines. This requirement is satisfied by observing the LANDING WEIGHT LIMITS Chart. Airspeed for this segment is VREF.

The configurations referred to by name in the charts correspond to the following settings:

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Engines Operating</th>
<th>Thrust Setting</th>
<th>Flap Setting</th>
<th>Gear</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Segment</td>
<td>1</td>
<td>Takeoff</td>
<td>8° or 20°</td>
<td>DOWN</td>
</tr>
<tr>
<td>Takeoff Climb</td>
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</tr>
<tr>
<td>2nd Segment</td>
<td>1</td>
<td>Takeoff</td>
<td>8° or 20°</td>
<td>UP</td>
</tr>
<tr>
<td>Takeoff Climb</td>
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<td>En Route Climb</td>
<td>1</td>
<td>Max. Cont.</td>
<td>UP-0°</td>
<td>UP</td>
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<td>Approach Climb</td>
<td>1</td>
<td>Takeoff</td>
<td>8°</td>
<td>UP</td>
</tr>
<tr>
<td>Landing Climb</td>
<td>2</td>
<td>Takeoff</td>
<td>DN-40°</td>
<td>DOWN</td>
</tr>
</tbody>
</table>
The noise levels are in compliance with the requirements of FAR 36 (Stage 3) which are essentially equivalent to the requirements outlined in ICAO Annex 16, Chapter 3.

No determination has been made by the Federal Aviation Administration that the noise levels in this manual are or should be acceptable or unacceptable for operation at, into, or out of any airport.

These noise values are stated for reference conditions of standard atmospheric pressure at sea level, 25°C ambient temperature, 70% relative humidity, and zero wind.

CERTIFIED NOISE LEVELS

Takeoff and sideline noise levels were determined at the maximum takeoff weights listed below, 141 KIAS climb speed, 8° flaps, and anti-ice systems off. Thrust was reduced at 2427 feet AGL to an N1 that in the event of an engine failure, level flight would be maintained.

Landing approach noise levels were determined with gear down, maximum landing weights listed below, approach speed of 133 KIAS, and 40° flaps. No special noise abatement procedures were used.

The noise levels established in compliance with FAR 36 (Stage 3) are:

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>ACTUAL</th>
<th>MAXIMUM</th>
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<tr>
<td>Sideline</td>
<td>85.1</td>
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<td>Takeoff</td>
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<td>Approach</td>
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</table>
SUPPLEMENTAL NOISE LEVELS

The following noise levels provide additional information to the certified noise levels.

Takeoff and sideline noise levels were determined at the maximum takeoff weights listed below, 140 KIAS climb speed, 8° flaps, anti-ice systems off, and all engine takeoff with takeoff thrust setting.

The noise levels established in compliance with FAR 36 (Stage 3) are:

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<td>Sideline</td>
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<tr>
<td>Takeoff</td>
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| EFFECTIVITY CODE | E F |
### RELATION OF TEMPERATURE (°C) TO ISA

#### EFFECTIVITY

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**Figure 5-1**
To convert from Celsius to Fahrenheit, find, in bold face columns, the number representing the Celsius temperature to be converted. The equivalent Fahrenheit temperature is read in the adjacent column headed °F.

To convert from Fahrenheit to Celsius, find, in bold face columns, the number representing the Fahrenheit temperature to be converted. The equivalent Celsius temperature is read in the adjacent column headed °C.

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Note: TEMP provided for reference only.
To convert from meters to feet, find, in the bold face columns, the number of meters to be converted. The equivalent number of feet is read in the adjacent column headed FEET.

To convert from feet to meters, find, in the bold face columns, the number of feet to be converted. The equivalent number of meters is read in the adjacent column headed METERS.

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Figure 5-3
### Performance Data

#### VOLUME CONVERSIONS

**EFFECTIVITY**

- To convert from liters to gallons, find, in the bold face column, the number of liters to be converted. The equivalent number of gallons is read in the adjacent column headed GALLONS.
- To convert from gallons to liters, find, in the bold face column, the number of gallons to be converted. The equivalent number of liters is read in the adjacent column headed LITERS.

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Figure 5-4

FM-126
FAA Approved 5-19-2004

5-16
WEIGHT CONVERSIONS

To convert from kilograms to pounds, find, in the bold face columns, the number of kilograms to be converted. The equivalent number of pounds is read in the adjacent column headed POUNDS.

To convert from pounds to kilograms, find, in the bold face columns, the number of pounds to be converted. The equivalent number of kilograms is read in the adjacent column headed KILOGRAMS.

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Figure 5-5

FM-126
FAA Approved 5-19-2004
AIRSPEED CALIBRATION — PRIMARY SYSTEM
FLAPS — UP, GEAR — UP

EXAMPLE:
1. Indicated Airspeed ............ 200 KIAS
2. Calibrated Airspeed ........... 199.5 KCAS
- Position Correction ......... (minus) -0.5 Knots

Figure 5-6
AIRSPEED CALIBRATION — PRIMARY SYSTEM
FLAPS — 8°, 20°, or DN/GEAR — UP or DOWN

EXAMPLE:
1. Indicated Airspeed ............... 200 KIAS
2. Calibrated Airspeed ............. 199 KCAS
   Position Correction ........ (minus) -1 Knot

NOTE: Data is invalid below
V_{2} for Flaps 8° and 20° and V_{REF} for Flaps 40°

Figure 5-7
Example:
1. Standby Indicated Airspeed ............... 200 KIAS
2. Standby Indicated Altitude .............. 25,000 FT
3. Calibrated Airspeed ..................... 200 KCAS
   Position Correction ..................... 0 Knot
AIRSPEED CALIBRATION — STANDBY SYSTEM
FLAPS — 8°, 20°, or DN/GEAR — UP or DOWN

EXAMPLE:
1. Standby Indicated Airspeed .......... 200 KIAS
2. Calibrated Airspeed ............... 199 KCAS
   + Position Correction ........... (minus) -1 Knot

NOTE: Data is invalid below
V_{2} for Flaps 8° and 20°
and V_{REF} for Flaps 40°
GROUND AIRSPEED CALIBRATION — PRIMARY SYSTEM
FLAPS — 8° OR 20°/GEAR — DOWN

EXAMPLE:
1. Indicated Airspeed . . . . . . . . . . . . . . . . . 110 KIAS
2. Calibrated Airspeed . . . . . . . . . . . . . . . . 112 KCAS
   - Position Correction . . . . . . . . . . . . . . . 2 Knots

Figure 5-10
MACH CALIBRATION — PRIMARY SYSTEM
FLAPS — UP GEAR — UP

EXAMPLE:
1. Indicated Mach No. . . . . . . . . . . . . . . . . . . . . . . . . 0.75 M_i
2. Calibrated Mach No. . . . . . . . . . . . . . . . . . . . . . . . . 0.75 M_c
   - Position Correction . . . . . . . . . . . . . . . . . . . . . . . . . 0.00

Figure 5-11
Performance Data

SCHRAIDER
LEARJET 45

MACH CALIBRATION — STANDBY SYSTEM
FLAPS — UP GEAR — UP

EXAMPLE:
1. Standby Indicated Mach No. . . . . . . . . . 0.75 M
2. Calibrated Mach No. . . . . . . . . . . . . . . . . 0.76 Mc
   + Position Correction . . . . . . . . . . . . . . (plus) 0.01

Figure 5-12
Performance Data

LEARJET 45

ALTIMETER POSITION CORRECTION — PRIMARY SYSTEM
FLAPS — UP GEAR — UP

EXAMPLE:
1. Indicated Airspeed . . . . . . . . . . . . . . . . .200 KIAS
2. Indicated Altitude . . . . . . . . . . . . . . . . .45,000 FT
3. Position Correction . . . . . . . . . . . . . . . . .(minus) -7 FT
   * Actual Altitude . . . . . . . . . . . . . . . . .44,993 FT

Figure 5-13

EFFECTIVITY

All

{graph image}

5-25
FAA Approved 5-19-2004
ALTITUDE POSITION CORRECTION — PRIMARY SYSTEM
RAPS — 8°, 20° or DN/GEAR — UP or DOWN

EXAMPLE:
1. Indicated Airspeed .............. 190 KIAS
2. Indicated Altitude .............. 15,000 FT
3. Position Correction .......... (minus) -21 FT
   Actual Altitude .............. 14,979 FT

Figure 5-14
**Performance Data**

**LEARJET 45**

**ALTIMETER POSITION CORRECTION — STANDBY SYSTEM**

**FLAPS — UP, GEAR — UP**

**EFFECTIVITY**

*All*

**EXAMPLE:**

1. Standby Indicated Airspeed . . . . . . . . . 220 KIAS
2. Standby Indicated Altitude . . . . . . . . . 40,000 FT
3. Position Correction . . . . . . . . . . . . (plus) 161 FT
4. Actual Altitude . . . . . . . . . . . . . . . . . 40,161 FT

**Figure 5-15**

[Graph showing performance data for Altimeter Position Correction—Standby System, including a chart with lines for Standby Indicated Airspeed in Knots and Altimeter Position Correction in Feet.]

---

**Footnotes:**

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5-27
ALTIMETER ATTITUDE CORRECTION — STANDBY SYSTEM
FLAPS — 8°, 20° or DN/GEAR — UP or DOWN

EXAMPLE:
1. Standby Indicated Airspeed .......... 190 KIAS
2. Standby Indicated Altitude .......... 15,000 FT
3. Position Correction ............... (minus) -23 FT
   Actual Altitude .................. 14,977 FT

Figure 5-16
WIND COMPONENTS

CONDITIONS:
- Wind Velocity .................. 35 Knots
- Wind Direction .................. 300°
- Runway Heading .................. 340°

EXAMPLE:
1. Wind Direction from Runway (See Note) .................. 40°
2. Wind Velocity .................. 35 Knots
3. Headwind Component ............. 26.7 Knots
4. Crosswind Component .......... 22.5 Knots

NOTE: To calculate wind direction from runway, subtract wind direction from runway heading. Enter the chart at the absolute value of wind direction from runway.

Figure 5-17

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EXAMPLE:
1. Temperature: -20°C
2. Runway Elevation: 8,000 FT
3. Desired Geometric Height Above Runway: 4,000 FT
4. Corrected Altitude Above Runway: 4,300 FT

Note: Indicated altitude for obstacle clearance or Decision Height (or Minimum Descent Altitude) may be determined by adding the Corrected Altitude Above Runway from this chart to the Runway Elevation and applying the appropriate altitude position correction. This assumes that the altimeter is set to the local altimeter setting (QNH).
EXAMPLE:
1. Weight .............................................. 16,000 lb (7,258 kg)
2. Flap Setting ........................................ 20°
3. Altitude Reference Line
4. Altitude .................................................. 3,000 ft
5. Stall Speed ............................................. 95 KCAS

Figure 5-19.3
EXAMPLE:
1. Bank Angle 20°
2. Weight 38,000 lb (8,164 kg)
3. Flap Setting 40°
4. Altitude Reference Line
5. Altitude 10,000 ft
6. Stall Speed 102 KCAS

Figure 5-20.3
Performance Data

BUFFET BOUNDARY
FORWARD C.G.

EFFECTIVITY CODE
E F

EXAMPLE:
1. Indicated Mach .............. 0.76 M
2. Altitude .................. 45,000 ft
3. Weight .................. 18,000 lb (8,164 kg)
4. For 1 "G" Flight

5. High Speed Buffet M = Above MMO
6. Low Speed Buffet M = 0.60
7. Indicated Airspeed = 157
8. For Maneuvering Flight
   Bank Angle = 49°

Figure 5-21.3
EXAMPLE:
1. Weight: 15,876 lb (7,200 kg)
2. Indicated Mach: 0.70 M I
3. Altitude Limit for 1.3 G Absolute Maneuver = 50,400 ft
THRUST SETTING PROCEDURE

**TAKEOFF**

Move thrust lever to the Takeoff (T/O) position. Operation at a specific N1 should always be within the ITT Limits. ITT Limit must be observed.

The DEEC will determine the proper takeoff N1 and position the N1 bug to that value. The left and right N1 bugs should agree within 1%. The N1 needle should align with the N1 bug when the thrust lever is placed in the T/O position. If left and right N1 bugs do not agree within 1%, refer to the applicable Takeoff Thrust Setting table for the proper thrust setting. The takeoff N1 bug will be displayed with any flap extension.

**MAXIMUM CLimb**

Move thrust lever to the Maximum Continuous Thrust (MCT) position. Operation at a specific N1 should always be within the ITT Limits. ITT Limit must be observed.

When airborne with the flaps up, the DEEC will determine the proper maximum continuous thrust N1 and position the N1 bug to that value. When airborne with the flaps up, the N1 needle should align with the N1 bug when the thrust lever is placed in the MCT position.
TAKEOFF OR GO AROUND
THRUST SETTING
ANTI-ICE — OFF

NOTE:
If temperature falls within shaded area,
determine Takeoff N1 from the Limit Table.

EXAMPLE:
1. Altitude = 3600 feet.
2. Temperature = 15° C.
3. At 3000 feet, the temperature is below the shaded area. Interpolate between 15° C and 20° C.
4. At 3000 feet, power setting is 91.5% N1.
5. At 4000 feet, the temperature is below the shaded area. Interpolate between 15° C and 20° C.
6. At 4000 feet, power setting is 92.8% N1.
7. Interpolate between power settings for 3000 feet and 4000 feet in order to obtain power setting.
8. Power setting is 92.3% N1.

Figure 5-23.4
### TAKEOFF THRUST — %N₁

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### NOTE:
- If temperature falls within shaded area, determine Takeoff N₁ from the Limit Table.
- Example: Altitude = 5400 feet.
- Temperature = 4° C.
- At 5000 feet, the temperature is not shaded. Interpolate between 0° C and 5° C.
- At 6000 feet, the temperature is not shaded. Interpolate between 0° C and 5° C.
- At 6000 feet, power setting is 92.7% N₁.
- Power setting is 92.0% N₁.

### EXAMPLE:
1. Altitude = 5400 feet.
2. Temperature = 4° C.

### EFFECTIVITY CODE
- F

Figure 5-24.4

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5-37.4
APR THRUST − % N₁

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**NOTE:** If temperature falls within shaded area, determine Takeoff N₁ from the Limit Table.

**EXAMPLE:**
1. Altitude = 2400 feet.
2. Temperature = 22°C.
3. At 2000 feet, interpolate between 20°C and 25°C; power setting is 92.4% N₁.
4. At 3000 feet, interpolate between 20°C and 25°C; power setting is 93.7% N₁.
5. Interpolate between power settings for 2000 feet and 3000 feet in order to obtain power setting.
6. Power setting is 92.9% N₁.

Figure 5-25.4
### APR THRUST SETTING

**ANTI-ICE — ON**

**EFFECTIVITY CODE**

### Performance Data

**FM-126 5-39.4**  
**FAA Approved 5-19-2004**

**APR THRUST SETTING**

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**NOTE:** If temperature falls within shaded area, determine Takeoff N1 from the Limit Table.

**EXAMPLE:**

1. Altitude = 7000 feet  
2. Temperature = -5°C
3. At 7000 feet, the temperature is not in shaded area. Interpolate between -5°C and 0°C.
4. Takeoff N1 = 95.0% N1.

**Figure 5-26.4**
### Performance Data

**FM-126 5-40.4**

**FAA Approved 5-19-2004**

**5/28/04**

<table>
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<th>MAXIMUM CONTINUOUS THRUST FOR CLIMB (N1) ALL ENGINE ENG SYNC — OFF</th>
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- **EFFECTIVITY CODE:** F
- **ANTI-ICE OFF**
  - CLIMB SPEED: 250 KIAS up to 32,000 FT
  - 0.70 MI above 32,000 FT

**ALTITUDE ~ 1000 FT**

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**STATIC AIR TEMPERATURE (SAT) ~ °C**

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**Figure 5-27.4**
### Performance Data

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FAA Approved 5-19-2004

#### MAXIMUM CONTINUOUS THRUST FOR TRANSITION and CLIMB (N1)

**SINGLE ENGINE**

**ENG SYNC — OFF**

**EFFECTIVITY CODE**

**F**

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<td>200 KIAS up to 21,000 FT</td>
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<td>170 KIAS from 29,000 to 49,000 FT</td>
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| xxx.xx ANTI-ICE OFF |
| xxx.xx FULL ANTI-ICE |

<table>
<thead>
<tr>
<th>STATIC AIR TEMPERATURE (SAT) — °C</th>
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**Figure 5-28.4**

**SPEED SCHEDULE**

**TRANSITION SEGMENT**
Speed — V2

**EN ROUTE CLIMB SEGMENT**

200 KIAS up to 21,000 FT

0.45 M from 21,000 to 29,000 FT

170 KIAS from 29,000 to 49,000 FT

0.70 M from 49,000 to 51,000 FT

xxx.xx ANTI-ICE OFF

xxx.xx FULL ANTI-ICE
USE OF TAKEOFF CHARTS

MAXIMUM TAKEOFF WEIGHT

The charts on the following pages present the information necessary to determine the maximum allowable takeoff weight as limited by gross climb performance or brake energy limits. The climb limitations portion of the charts do not specify the limiting climb segment, only that any one or a combination of the climb segments (first, second, final, approach or landing) are limiting.

Takeoff must be made within the limitations of the maximum certified takeoff weight determined from TAKEOFF WEIGHT LIMITS chart and the performance determined from the TAKEOFF FIELD LENGTH chart.

Example:
1. Maximum certified takeoff weight.
2. From the applicable TAKEOFF WEIGHT LIMITS chart, determine maximum takeoff weight for airport altitude and reported surface temperature.
3. From the applicable TAKEOFF FIELD LENGTH chart, determine the maximum takeoff weight for the runway and ambient conditions.
4. The lowest of the weights from steps 1, 2, and 3 is the heaviest allowable weight at which the airplane can take off.

TAKEOFF FIELD LENGTH CHARTS

The TAKEOFF FIELD LENGTH charts in this manual are presented for 8° or 20° flap settings (APR armed and off) and show the takeoff distance in terms of altitude, temperature, and weight, and also include corrections for wind, runway gradient, anti-skid on or off, and anti-ice systems on or off. Distances are presented for both dry and wet runways. These charts may be used to determine either of the following:

1. The runway length required given the pressure altitude, airplane weight, surface temperature, runway gradient, and wind.
   The example on the applicable chart illustrates determination of runway length required.
2. The maximum airplane takeoff weight corresponding to a specific runway length, runway gradient, pressure altitude, surface temperature, and wind. Takeoff weight for runway length available may be determined by working through the chart in the opposite manner as finding runway length.
TAKEOFF FROM WET RUNWAY

A runway is considered to be wet when it has a shiny appearance due to a thin layer of water on it, but without significant areas of standing water.

A runway with greater than 0.125 inch (3 mm) of standing water would be a contaminated runway.

When operating on wet runways, ground handling characteristics will not be as good as can be achieved on dry runways. The variability of surface conditions and crosswinds should be taken into consideration.

In case of an aborted takeoff: if directional control reduces while in reverse thrust, reduce reverse thrust to reverse idle or stow the reversers to improve directional control. Reverse thrust may be reapplied after directional control is reestablished.

STANDARD PERFORMANCE CONDITIONS

All wet runway takeoff performance in this section is based on the following performance conditions:

- Rudder Boost — On
- Anti-Skid System — On
- Thrust Reversers:
  - Aircraft 45-002 thru 45-169 not modified by SB 45-76-2 or SB 45-22-4 — Idle deploy or stowed.
  - Aircraft 45-170 & subsequent and prior aircraft modified by SB 45-76-2 or SB 45-22-4 — Maximum or stowed.

To account for reduced braking coefficients during initial takeoff power setting, release brakes and rapidly move thrust lever into the takeoff detent.

TAKEOFF FROM CONTAMINATED RUNWAY

Refer to the CONTAMINATED RUNWAY DATA pertaining to takeoff on a contaminated runway.

TAKEOFF PROCEDURE

PERFORMANCE TAKEOFF PROCEDURE

Refer to the Standard Performance Conditions in the INTRODUCTION TO PERFORMANCE DATA at the beginning of this section.
Performance Data

ROMLING TAKEOFF PROCEDURE

From runway centerline:
3. Follow the performance takeoff procedure.

From taxiway turning onto runway:
2. Turn onto active runway aligning with centerline.
4. Follow the performance takeoff procedure.

TAKEOFF FLIGHT PATH CHARTS

The takeoff flight path is divided into segments defined by changes in the airplane configuration. The terms used in flight path plotting are defined as follows and illustrated on the TAKEOFF PROFILE figure.

Reference Zero: A point 35 feet above the runway surface at the final point of the takeoff run (takeoff distance).

First Segment: Segment extending from the 35-foot height at the end of the takeoff run (Reference Zero) to the height at the end of gear retraction.

The First Segment of the Takeoff Flight Path represents only a portion of the First Segment Climb as shown on the TAKEOFF PROFILE figure.

Second Segment: Segment beginning at the end of gear retraction (end of first segment) and continuing until obstacle clearance is achieved or 1500 feet above the runway, whichever is higher. For obstacle clearance, maintain second segment climb (gear up, flaps at takeoff setting, takeoff thrust, and V2) until reaching gross level-off height. This procedure will produce the performance shown in the Takeoff Flight Path Charts.

Gross Level-off Height: The height above the runway or above reference zero at which the climb gradient increment of 0.8% over the net height (obstacle height) will be realized. This height, when corrected for below standard temperatures and altitude position correction, can be added to the departure elevation to determine the indicated level-off altitude for obstacle clearance.
The TAKEOFF FLIGHT PATH Charts presented in this manual are separated into CLOSE-IN and DISTANT flight paths for 8° and 20° flap settings. The CLOSE-IN TAKEOFF FLIGHT PATH Chart facilitates determination of required gradients within approximately two miles horizontal distance from reference zero. The DISTANT TAKEOFF FLIGHT PATH Chart facilitates determination of required gradients to ten nautical miles from reference zero.

On these charts, each flight path line is marked with numbers showing the net climb gradients required for obstacle clearance at the end of the first and second segment climb. The origin of each line is reference zero, and the slope of the line segments (scale vertical distance divided by scale horizontal distance) are the slopes of the required climb segments in space in zero wind conditions. Since the zero wind first and second segment climbs are uniquely related to each other for each airplane weight and environment, it can be seen that the actual flight path in still air can be obtained from the TAKEOFF FLIGHT PATH Charts by knowing only one of the applicable gradients.

**CLIMB GRADIENT CHARTS**

Climb performance charts are presented in terms of altitude, outside air temperature, weight, wind, anti-ice systems on or off, and APR system armed or not armed. The gradients for First and Second Segments are read at the temperature and pressure altitude for the departure airport and are the net gradients that will be achieved at the appropriate segment of the Takeoff Flight Path. Conditions for achieving presented climb gradients are listed on the appropriate chart.

These charts show the net gradients available and are to be used with the TAKEOFF FLIGHT PATH Charts which show the required net gradients when flight planning for obstacle clearance.
DETERMINATION OF TAKEOFF FLIGHT PATH FOR OBSTACLE CLEARANCE

The weight used for the following determination is defined as the airplane weight at the beginning of the takeoff roll. Using this weight for each climb segment will result in some small conservatism, since the gradients are presented in terms of instantaneous gross weight rather than the weight at the beginning of takeoff roll.

The weight determined for obstacle clearance may not be the limiting weight. Takeoff weight is also limited by the maximum certified takeoff weight, the takeoff weight for the runway length available and applicable takeoff climb or brake energy takeoff weight limit.

When flight path planning for obstacle clearance is desired, the following procedure may be used:

1. From the applicable TAKEOFF FIELD LENGTH Chart, determine the takeoff field length required.
2. Determine the horizontal distance of the obstacle from reference zero.
3. Determine the maximum allowable horizontal distance from reference zero using the MAXIMUM DISTANCE FOR SECOND SEGMENT CLIMB Chart.
   - For determining obstacle clearance in step 5 below, assume the obstacle is located at the shorter of the two distances determined in step 2 (actual horizontal distance) and step 3 (maximum allowable distance) above.
4. If a turn is required in the Takeoff Flight Path, increase the obstacle height by the amount determined from the ALTITUDE LOSS DURING A STEADY 15° BANK ANGLE TURN IN TAKEOFF FLIGHT PATH Chart.
5. From the applicable TAKEOFF FLIGHT PATH Chart, for the first or second segment, depending on where the critical obstacle is located, determine the required climb gradient for obstacle clearance and the Gross Level-off Height. To maintain a 35-foot obstacle clearance, assume obstacle height is height above reference zero.

The Gross Level-off Height is a geometric height. For below standard temperature conditions, the indicated altitude for level-off may be determined from the GEOMETRIC HEIGHT CORRECTION FOR BELOW STANDARD TEMPERATURE chart and the appropriate altitude position correction chart.
6. From the applicable CLIMB GRADIENT Chart, determine the aircraft climb gradient performance.

**NOTE**
It is noted at this point that a headwind serves to increase climb gradient performance, whereas a tailwind decreases climb gradient performance.

7. If step 6 (climb gradient performance) is more than step 5 (required gradient), obstacle clearance is satisfactory.

7. If step 6 (climb gradient performance) is less than step 5 (required gradient), obstacle clearance is unsatisfactory and procedures must be repeated using a lesser weight. When weight is reduced to achieve obstacle clearance, note that the horizontal distance between the obstacle and reference zero increases, since the takeoff field length is less. Consequently an interpolative process is required to find the exact minimum gradient and maximum weight for obstacle clearance.

8. From the TRANSITION SEGMENT table, determine the distance required to accelerate from V2 to en route climb speed. This distance is added to that determined at the end of second segment, which is at the obstacle distance from reference zero.

9. Further flight planning beyond the takeoff flight path may by accomplished using the EN ROUTE CLIMB GRADIENT Chart.
This section presents an example of how the TAKEOFF FLIGHT PATH charts are used in determining a typical flight path.

Example:

Associated Conditions:

- Desired Aircraft Weight = 20,000 lb (8618 kg)
- Airport Pressure Altitude = 8000 ft
- Runway Length = 7000 ft
- Ambient Temperature = -20ºC
- Reported Wind = 4 knot (tailwind)
- Flaps = 8º
- Required Heading Change in Takeoff Path = 60º
- Anti-Ice = On
- APR = Armed
- Obstacle Distance from Runway = 9 nm
- Obstacle Height = 3700 ft

1. From the DRY RUNWAY TAKEOFF FIELD LENGTH (Flaps - 8º, APR - Armed, Anti-Ice - On) and the DRY RUNWAY TAKEOFF FIELD LENGTH CORRECTION Chart (Flaps - 8º, APR - Armed, Anti-Ice - On), required takeoff field length with 4 knot tailwind is 5910 feet (1801 m).
2. Obstacle distance from reference zero = 9 nm + (7000 - 5910) / 6080 = 9.2 nm
3. Maximum allowable obstacle distance from the MAXIMUM DISTANCE FOR SECOND SEGMENT CLIMB for -20 ºC and 8000 feet = 8.25 nm.
4. For the required heading change of 60º, increase the assumed obstacle height by 60 feet, as determined from the ALTITUDE LOSS DURING A STEADY 15º BANK ANGLE TURN IN TAKEOFF FLIGHT PATH Chart.
5. Enter the DISTANT TAKEOFF FLIGHT PATH Chart with an obstacle height of 3760 feet (3700 ft obstacle + 60 ft increase for 60° turn) at a distance from reference zero of 8.25 nm. Note that a 2nd Segment Net Climb Gradient of 8.3% is required, and the Gross Level-off Height is 4150 feet.
   - Enter the GEOMETRIC HEIGHT CORRECTION FOR BELOW STANDARD TEMPERATURE Chart at 8000 ft, -20°C and determine that corrected altitude above runway for 4150 feet is 4460 feet. To calculate indicated altitude for level-off, add 8000 feet (departure elevation) + 4460 feet (corrected altitude above runway) + 10 ft (altitude position correction), which equals 12,470 feet.
6. Determine available 2nd segment net climb gradient from the SECOND SEGMENT CLIMB GRADIENT Chart (Flaps 8°, Anti-Ice - On) = 5.2%.
7. Required gradient (8.3%) at desired weight (20,000 lb/8618 kg) exceeds available gradient (5.2%). Weight must be reduced to 16,770 lb (7606 kg) to obtain an available gradient of 8.3% and therefore achieve obstacle clearance.
8. From the TRANSITION SEGMENT Chart (Distance to accelerate from V2 to 200 KIAS), using the corrected second segment climb gradient (8.3%) and gross level-off height (4150 ft), the applicable acceleration index is 5.6. Using this index and the aircraft weight (16,770 lb/7606 kg), it can be determined that a horizontal distance of 5.1 nm will be required to accelerate to the single engine en route climb speed of 200 KIAS. Thus, the aircraft will be fully transitioned for en route climb at 13.35 nm from reference zero (8.25 nm to level-off and 5.1 nm to accelerate and retract flaps).
9. Further flight planning beyond the takeoff flight path may be accomplished using the EN ROUTE CLIMB GRADIENT Chart (Single Engine, Anti-Ice - On).
This chart was prepared for the following conditions:

- Flaps — 8°
- Autospoilers — Armed
- Anti-Ice — Off

**EXAMPLE:**
1. Temperature . . . . . . . 30 ° C (86 ° F)
2. Altitude . . . . . . . . . . . 10,000 ft
3. APR System Reference line
4. APR System . . . . . . . . Armed
5. Climb Weight Limit . . . . 20,793 lb (9,432 kg)

Correction for 0% Runway Gradient . . . . None
6. Wind Reference Line
7. Tailwind . . . . . . . . . . . 5 kt
8. Runway Gradient Reference Line
9. Runway Gradient . . . . . 0%
10. Brake Energy Weight Limit . . . . 19,450 lb (8,822 kg)

The most limiting condition is Brake Energy Weight Limit.
• Takeoff Weight Limit . . . . 19,450 lb (8,822 kg)

**NOTE:** The value obtained from this chart may not be the limiting weight. Takeoff weight is also limited by the maximum certified takeoff weight, the takeoff weight for the runway length available and obstacle clearance considerations.

Takeoff above 12,000 feet with a tailwind is prohibited.
This chart was prepared for the following conditions:

- Flaps — 8°
- Autospoilers — Armed
- Anti-ice — ON

**EXAMPLE:**

1. Temperature .............. 0°C (32°F)
2. Altitude .................. 12,000 ft
3. APR System Reference line
4. APR System ................ Armed
5. Climb Weight Limit ........ 20,875 lb (9,469 kg)

Correction for +0.8% Runway Gradient .......... None
6. Wind Reference Line
7. Tailwind .................... 4 kt
8. Runway Gradient Reference Line
9. Runway Gradient ............. 0.8% (UP)
10. Brake Energy Weight Limit ........ 19,418 lb (8,808 kg)

The most limiting condition is Brake Energy Weight Limit:
- Takeoff Weight Limit ........ 19,418 lb (8,808 kg)

**NOTE:** The value obtained from this chart may not be the limiting weight. Takeoff weight is also limited by the maximum certificated takeoff weight, the takeoff weight for the runway length available and obstacle clearance considerations. Takeoff above 12,000 feet with a tailwind is prohibited.

The **TAKEOFF WEIGHT LIMIT** chart for anti-ice ON must be used whenever NAC Anti-ice, WING/STAB Anti-ice or both are ON.

Figure 5-31.4
### Performance Data

**Dry Runway**

**Takeoff Field Length**

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This table was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- AutoSpoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Dry
- Anti-Ice — Off
- Thrust Reversers — Slowed
- Zero Wind
- Zero Runway Gradient

* For conditions other than these, apply the result from this table to the correction chart in Figure 5-33.3.

**Note:** If BRAKE FAULT CAS illuminated, add 300 feet to takeoff field length.

---

**Figure 5-32.4**

---

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FAA Approved 5-19-2004
This chart was prepared for the following conditions:
- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-Ice — Off
- Thrust Reversers — Stowed

**EXAMPLE:**
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 3,600 ft (1,097 m)
2. Tailwind. . . . . . . . . . . . . . . . . . . . . . . . . 5 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . 1.5% (UP)
5. Anti-Skid System Reference Line
6. Anti-Skid System . . . . . . . . . . . . . . . . . ON
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . . 2,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . . . . . . . . . 5,430 ft (1,655 m)
### Performance Data

#### UNCORRECTED TAKEOFF FIELD LENGTH — FT

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#### Takeoff Length

This table was prepared for the following conditions:
- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On*  
- Anti-Ice — On  
- Runway Surface — Dry
- Thrust Reversers — Stowed
- Zero Wind*  
- Zero Runway Gradient*

* For conditions other than these, apply the result from this table to the correction chart in Figure 5-33B.3.

**NOTE:** The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

---

**NOTE:** If BRAKE FAULT CAS illuminated, add 500 feet to takeoff field length.
This chart was prepared for the following conditions:
- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-Ice — On
- Thrust Reversers — Stowed

**EXAMPLE:**
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 3,600 ft (1,097 m)
2. Tailwind . . . . . . . . . . . . . . . . . . . . . . . . . 5 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . 1.5% (UP)
5. Anti-Skid System Reference Line
6. Anti-Skid System . . . . . . . . . . . . . . . . . ON
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . . . . . 2,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 5,430 ft (1,655 m)
### WET RUNWAY

#### TAKEOFF FIELD LENGTH

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<th>FLAPS — 8°</th>
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<th>ANTI-ICE — OFF</th>
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</thead>
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<table>
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</table>

This table was prepared for the following conditions:
- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — Off
- Thrust Reversers — Max*
- Zero Wind*
- Zero Runway Gradient*

* For conditions other than these, apply the result from this table to the correction chart in Figure 5-35.3.

**NOTE:** If BRAKE FAULT CAS illuminated, add 600 feet to takeoff field length.

Figure 5-34.4  
5-53.4
Performance Data

WET RUNWAY
TAKEOFF FIELD LENGTH CORRECTION CHART

FLAPS — 8°
APR — ARMED
ANTI-ICE — OFF

This chart was prepared for the following conditions:
- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — Off

EXAMPLE:
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 4,300 ft (1,311 m)
2. Tailwind . . . . . . . . . . . . . . . . . . . . . . . . 10 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . 1.0% (UP)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . STOWED
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . 5,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . 7,520 ft (2,292 m)

Figure 5-35.3
## Performance Data

### Uncorrected Takeoff Field Length — FT

| ALT (ft) | WT | APR | Anti-Ice ON | 95°F | 80°F | 70°F | 60°F | 50°F | 40°F | 30°F | 20°F | 10°F | -10°F | -20°F | -30°F | -40°F |
|----------|----|-----|-------------|------|------|------|------|------|------|------|------|------|------|--------|--------|--------|--------|
| 1,000    | 14,000 |       |             | 3630 | 3730 | 3830 | 3930 | 4030 | 4130 | 4230 | 4330 | 4430 | 4530 | 4630   | 4730   | 4830   |
| 1,500    | 14,000 |       |             | 3630 | 3730 | 3830 | 3930 | 4030 | 4130 | 4230 | 4330 | 4430 | 4530 | 4630   | 4730   | 4830   |
| 2,000    | 15,000 |       |             | 3690 | 3790 | 3890 | 3990 | 4090 | 4190 | 4290 | 4390 | 4490 | 4590 | 4690   | 4790   | 4890   |
| 2,500    | 16,000 |       |             | 3750 | 3850 | 3950 | 4050 | 4150 | 4250 | 4350 | 4450 | 4550 | 4650 | 4750   | 4850   | 4950   |
| 3,000    | 17,000 |       |             | 3810 | 3910 | 4010 | 4110 | 4210 | 4310 | 4410 | 4510 | 4610 | 4710 | 4810   | 4910   | 5010   |
| 3,500    | 18,000 |       |             | 3870 | 3970 | 4070 | 4170 | 4270 | 4370 | 4470 | 4570 | 4670 | 4770 | 4870   | 4970   | 5070   |
| 4,000    | 19,000 |       |             | 3930 | 4030 | 4130 | 4230 | 4330 | 4430 | 4530 | 4630 | 4730 | 4830 | 4930   | 5030   | 5130   |
| 4,500    | 20,000 |       |             | 3990 | 4090 | 4190 | 4290 | 4390 | 4490 | 4590 | 4690 | 4790 | 4890 | 4990   | 5090   | 5190   |
| 5,000    | 21,000 |       |             | 4050 | 4150 | 4250 | 4350 | 4450 | 4550 | 4650 | 4750 | 4850 | 4950 | 5050   | 5150   | 5250   |

### Takeoff Field Length (FT)

| ALT (ft) | WT | APR | Anti-Ice ON | 95°F | 80°F | 70°F | 60°F | 50°F | 40°F | 30°F | 20°F | 10°F | -10°F | -20°F | -30°F | -40°F |
|----------|----|-----|-------------|------|------|------|------|------|------|------|------|------|------|--------|--------|--------|--------|
| 1,000    | 14,000 |       |             | 3630 | 3730 | 3830 | 3930 | 4030 | 4130 | 4230 | 4330 | 4430 | 4530 | 4630   | 4730   | 4830   |
| 1,500    | 14,000 |       |             | 3630 | 3730 | 3830 | 3930 | 4030 | 4130 | 4230 | 4330 | 4430 | 4530 | 4630   | 4730   | 4830   |
| 2,000    | 15,000 |       |             | 3690 | 3790 | 3890 | 3990 | 4090 | 4190 | 4290 | 4390 | 4490 | 4590 | 4690   | 4790   | 4890   |
| 2,500    | 16,000 |       |             | 3750 | 3850 | 3950 | 4050 | 4150 | 4250 | 4350 | 4450 | 4550 | 4650 | 4750   | 4850   | 4950   |
| 3,000    | 17,000 |       |             | 3810 | 3910 | 4010 | 4110 | 4210 | 4310 | 4410 | 4510 | 4610 | 4710 | 4810   | 4910   | 5010   |
| 3,500    | 18,000 |       |             | 3870 | 3970 | 4070 | 4170 | 4270 | 4370 | 4470 | 4570 | 4670 | 4770 | 4870   | 4970   | 5070   |
| 4,000    | 19,000 |       |             | 3930 | 4030 | 4130 | 4230 | 4330 | 4430 | 4530 | 4630 | 4730 | 4830 | 4930   | 5030   | 5130   |
| 4,500    | 20,000 |       |             | 3990 | 4090 | 4190 | 4290 | 4390 | 4490 | 4590 | 4690 | 4790 | 4890 | 4990   | 5090   | 5190   |
| 5,000    | 21,000 |       |             | 4050 | 4150 | 4250 | 4350 | 4450 | 4550 | 4650 | 4750 | 4850 | 4950 | 5050   | 5150   | 5250   |

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**For conditions other than these, apply the result from this table to the correction chart in Figure 5-35B.3.**

**NOTE:** The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-ice or both are ON.

---

If BRAKE FAULT CAS illuminated, add 600 feet to takeoff field length.
Figure 5-35B.3

This chart was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — On

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 4,300 ft (1,311 m)
2. Tailwind . . . . . . . . . . . . . . . . . . . . . . . . 10 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . 1.0% (UP)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . STOWED
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . 5,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . . 7,520 ft (2,292 m)
### Performance Data

#### DRY RUNWAY

**FLAPS — 8°**  
**APR — OFF**  
**ANTI-ICE — OFF**

#### UNCORRECTED TAKEOFF FIELD LENGTH — FT

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</table>

#### EFFECTIVITY CODE

- **F**

This table was prepared for the following conditions:
- **Flaps — 8°**
- **APR — Off**
- **Autospoilers — Armed**
- **Rudder Boost — On**
- **Anti-Skid — Off**
- **Runway Surface — Dry**
- **Anti-Ice — Off**
- **Thrust Reversers — Stowed**
- **Zero Wind**
- **Zero Runway Gradient**

* For conditions other than these, apply the result from this table to the correction chart in Figure 5-37.3.

**NOTE:** If BRAKE FAULT CAS illuminated, add 500 feet to takeoff field length.
This chart was prepared for the following conditions:

- Flaps — 8°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-Ice — Off
- Thrust Reversers — Stowed

**EXAMPLE:**
1. Uncorrected Takeoff Field Length (from table)  . . . . . . . . . . 3,600 ft (1,097 m)
2. Tailwind . . . . . . . . . . . . . . . . . . . . . . . . . 5 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . . . . . . . . . . 1.5% (UP)
5. Anti-Skid System Reference Line
6. Anti-Skid System . . . . . . . . . . . . . . . . . . . . . ON
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . . . . 2,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . . . . . . . . 5,610 ft (1,710 m)
### DRY RUNWAY TAKEOFF FIELD LENGTH

**FLAPS — 8°**

**APR — OFF**

**ANTI-ICE — ON**

#### Uncorrected Takeoff Field Length — FT

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<th>WT (LB)</th>
<th>FLAPS</th>
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<th>ANTI-ICE</th>
<th>EFFECTIVITY</th>
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</table>

This table was prepared for the following conditions:

- Flaps — 8°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-Ice — On
- Thrust Reversers — Stowed
- Zero Wind

* For conditions other than these, apply the result from this table to the correction chart in Figure 5-37B.3.

**NOTE:** The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.
This chart was prepared for the following conditions:
- Flaps — 8°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-Ice — On
- Thrust Reversers — Stowed

**EXAMPLE:**
1. Uncorrected Takeoff Field Length
   (from table) . . . . . . . . . . 3,600 ft (1,097 m)
2. Tailwind . . . . . . . . . . . . . . . . . . . . . . . . 5 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . 1.5% (UP)
5. Anti-Skid System Reference Line
6. Anti-Skid System . . . . . . . . . . . . . . . . . ON
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . .2,000 ft
9. Corrected Takeoff Field Length . . . . . . 5,610 ft (1,710 m)
### Performance Data

#### WET RUNWAY TAKEOFF FIELD LENGTH

| FLAPS — 8° | APR — Off | Anti-Ice — Off |

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#### TAKEOFF FIELD LENGTH — FT

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### Figures in shaded area are above engine temperature limits and are provided for interpolation only.

If BRAKE FAULT CAS illuminated, add 600 feet to takeoff field length.
This chart was prepared for the following conditions:
Flaps — 8°
APR — Off
Autospoilers — Armed
Rudder Boost — On
Anti-Skid — On
Runway Surface — Wet
Anti-Ice — Off

EXAMPLE:
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 4,700 ft (1,433 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . . . . . MAX
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . 11,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . 4,580 ft (1,396 m)

Figure 5-39.3
### Performance Data

### Wet Runway Takeoff Field Length

**Flaps — 8°**  
**APR — Off**  
**Anti-Ice — On**

#### Effectivity Code

This table was prepared for the following conditions:
- Flaps — 8°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — On
- Thrust Reversers — Max*
- Zero Wind*
- Zero Runway Gradient*

*For conditions other than these, apply the result from this table to the correction chart in Figure 5-39B.3.

**NOTE:** The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

---

**Table:**

<table>
<thead>
<tr>
<th>FLAPS (°)</th>
<th>APR (°)</th>
<th>ANTI-ICE (°)</th>
<th>CODE</th>
</tr>
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<td>0</td>
<td>F</td>
</tr>
</tbody>
</table>

**NOTE:** If BRAKE FAULT CAS illuminated, add 600 feet to takeoff field length.
This chart was prepared for the following conditions:
- Flaps — 8°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — On

EXAMPLE:
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 4,700 ft (1,433 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . . . . . MAX
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . 11,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . 4,580 ft (1,396 m)
### Performance Data

#### Vi — KIAS

| ALT FT | WT | FLAPS — 8° | 45 | 30 | 25 | 20 | 17 | 15 | 13 | 11 | 9 | 7 | 5 | 3 | 1 | 0 |
|--------|----|------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1000   | 1/2 | 1/2         | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| 1500   | 1/2 | 1/2         | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| 2000   | 1/2 | 1/2         | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| 2500   | 1/2 | 1/2         | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| 3000   | 1/2 | 1/2         | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| 3500   | 1/2 | 1/2         | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| 4000   | 1/2 | 1/2         | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| 4500   | 1/2 | 1/2         | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| 5000   | 1/2 | 1/2         | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| 5500   | 1/2 | 1/2         | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |
| 6000   | 1/2 | 1/2         | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 | 1/2 |

This table was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autopilots — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-ice — Off
- Anti-Skid — On or Off
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

Figures in shaded area are above engine temperature limits and are provided for interpolation only.

---

**Figure 5-404**

5-9.4
This table was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-Ice — On
- Anti-Skid — On or Off
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

NOTE: The TAKEOFF SPEEDS table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.
### Performance Data

#### TARGET TAKEOFF PITCH ATTITUDE — DEGREES

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### DRY RUNWAY

<p>| Flaps — 8° |</p>
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</tbody>
</table>

#### EFFECTIVITY CODE

- **OFF**

### NOTE:

The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

---

*Figures in shaded area are above engine temperature limits and are provided for interpolation only.*

---

**FM-126**

FAA Approved 5-19-2004
<table>
<thead>
<tr>
<th>ALT (FT)</th>
<th>WT (LB)</th>
<th>APR</th>
<th>FLAPS (°)</th>
<th>ANTI-ICE</th>
<th>EFFECTIVITY</th>
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<tbody>
<tr>
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<td>8</td>
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<td>ON</td>
<td>9</td>
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NOTE: The TARGET TAKEOFF PITCH ATTITUDE table can be used for the same conditions as listed on the appropriate DRY RUNWAY TAKEOFF SPEEDS table. Small pitch attitude changes may be required to maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2 once achieved.
### Performance Data

#### Takeoff Speeds

| V1 (KIAS) | VT/V2 (KIAS) | Temperature
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FLAPS — 8°</strong></td>
<td><strong>APR — Armed</strong></td>
<td><strong>ANTI-ICE — OFF</strong></td>
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</table>

**Figures in shaded area are above engine temperature limits and are provided for interpolation only.**

---

**WET RUNWAY EFFECTIVITY CODE**

- **FM-126 5-61.4**
- **5/28/04**

---

This table was prepared for the following conditions:
- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — Off
- Thrust Reversers — Max or Slowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

---

**Figure 5-42.4**
## Performance Data

### WET RUNWAY TAKEOFF SPEEDS

<table>
<thead>
<tr>
<th>FLAPS — 8°</th>
<th>APR — ARMED</th>
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</tr>
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<tbody>
<tr>
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<td></td>
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</tbody>
</table>

The table was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Auto spoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — On
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

**NOTE:** The TAKEOFF SPEEDS table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.
### Performance Data

**Target Takeoff Pitch Attitude**

<table>
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<th>Temperature</th>
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<th>Target Pitch Attitude</th>
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</tr>
</tbody>
</table>

**NOTE:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled \( V_2 \) speed at a height of 35 feet above the runway. Maintain \( V_2 \) once achieved. Small pitch attitude changes may be required to maintain \( V_2 \).

This table was prepared for the same conditions as listed on the appropriate WET RUNWAY TAKEOFF SPEEDS table.

---

*Figures in shaded area are above engine temperature limits and are provided for interpolation only.*

---

**Figure 5-43.4**

**FM-126**

FAA Approved 5-19-2004

5-62.4
### Performance Data

**TARGET TAKEOFF PITCH ATTITUDE DEGREES**

<table>
<thead>
<tr>
<th>WT</th>
<th>0°F</th>
<th>30°F</th>
<th>60°F</th>
<th>90°F</th>
<th>120°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>40</td>
<td>40</td>
<td>40</td>
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<td>36</td>
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<td>36</td>
<td>36</td>
</tr>
</tbody>
</table>

**NOTE:**

The Target Takeoff Pitch attitude is the approximate Pitch attitude required to achieve the scheduled V_{2}, once cleared for takeoff. Maintain V_{2} once achieved. During the initial climb, pitch attitude changes may be required to maintain V_{2} or to use the Takeoff Speeds Table. The Target Takeoff Pitch attitude table for Anti-Ice On must be used whenever NAC Anti-Ice, STAB Anti-Ice or both are On.

This table was prepared by the same contractor who prepared the Takoff Speeds Table.
### TAKEOFF SPEEDS

**PERFORMANCE DATA**

<table>
<thead>
<tr>
<th>Alt</th>
<th>WT</th>
<th>C</th>
<th>FLAPS</th>
<th>APR</th>
<th>ANTI-ICE</th>
<th>SEA</th>
<th>+30 knots</th>
<th>EFFECTIVITY CODE</th>
</tr>
</thead>
<tbody>
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<td>10,000</td>
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<td>103</td>
<td>103</td>
<td>103</td>
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<td>103</td>
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<td>15,000</td>
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</tr>
</tbody>
</table>

**Figures in shaded area are above engine temperature limits and are provided for interpolation only.**

*Figure 5-44.4*
### Performance Data

#### DRY RUNWAY

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Alt</th>
<th>WT</th>
<th>APR</th>
<th>Rudder Boost</th>
<th>Anti-Ice</th>
<th>Effectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>°F</td>
<td>FT</td>
<td>LB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-40</td>
<td>10,000</td>
<td>10,000</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>3000</td>
</tr>
<tr>
<td>-20</td>
<td>15,000</td>
<td>15,000</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>6000</td>
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<tr>
<td>0</td>
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<td>16,000</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>8000</td>
</tr>
<tr>
<td>20</td>
<td>17,000</td>
<td>17,000</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>9000</td>
</tr>
<tr>
<td>40</td>
<td>18,000</td>
<td>18,000</td>
<td>On</td>
<td>On</td>
<td>On</td>
<td>10,000</td>
</tr>
</tbody>
</table>

### NOTE:
- The TAKEOFF SPEEDS table for anti-ice ON must be used whenever anti-ice are ON.

---

Figure 5-44A.4

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FAA Approved 5-19-2004 5/28/04
### Performance Data

#### Target Takeoff Pitch Attitude — Degrees

| ALT (FT) | TEMPERATURE | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 |
|----------|-------------|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 11,000   | -40         | 14| 14| 14  | 14| 14 | 14 | 14 | 14 | 14 | 14 | 14 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
|          | -20         | 16| 16| 16  | 16| 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
|          | 0           | 18| 18| 18  | 18| 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
|          | 20          | 20| 20| 20  | 20| 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
|          | 40          | 40| 40| 40  | 40| 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |

**NOTE:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled $V_2$ speed at a height of 35 feet above the runway. Maintain $V_2$ once achieved. Small pitch attitude changes may be required to maintain $V_2$.

---

**Figure 5-45.4**
### Performance Data

#### ATTITUDE

<table>
<thead>
<tr>
<th>Altitude (Feet)</th>
<th>Effectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>14,000</td>
<td>14</td>
</tr>
<tr>
<td>15,000</td>
<td>14</td>
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<td>14</td>
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<tr>
<td>17,000</td>
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<tr>
<td>18,000</td>
<td>14</td>
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<td>19,000</td>
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<td>20,000</td>
<td>14</td>
</tr>
<tr>
<td>21,000</td>
<td>14</td>
</tr>
</tbody>
</table>

**NOTE:**

- The target takeoff pitch attitude is the height of 57 feet above the runway.

- The TARGET TAKEOFF PITCH attitude is used when NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

- When the temperature is below 18°C and ANTICE-ON or both NAC and WING/STAB Anti-Ice are ON, the effectivity is at least 99%.

- When the temperature is below 18°C and ANTICE-ON or both NAC and WING/STAB Anti-Ice are OFF, the effectivity is at least 94%.

- When the temperature is below 18°C and NAC Anti-Ice are ON and either WING/STAB Anti-Ice or both are OFF, the effectivity is at least 98%.

- The effectivity is at least 97% at 18°C and higher when either NAC Anti-Ice or WING/STAB Anti-Ice are OFF.

- The effectivity is at least 98% at 18°C and higher when either NAC Anti-Ice or WING/STAB Anti-Ice are ON.

- The effectivity is at least 99% at 18°C and higher when both NAC Anti-Ice and WING/STAB Anti-Ice are OFF.

- The effectivity is at least 99% at 18°C and higher when both NAC Anti-Ice and WING/STAB Anti-Ice are ON.

---

This table was prepared for the same conditions as listed on the appropriate DRY RUNWAY TAKEOFF SPEEDS table.

**NOTE:**

- The target takeoff pitch attitude is the height of 57 feet above the runway.

- The TARGET TAKEOFF PITCH attitude is used when NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

- When the temperature is below 18°C and ANTICE-ON or both NAC and WING/STAB Anti-Ice are ON, the effectivity is at least 99%.

- When the temperature is below 18°C and ANTICE-ON or both NAC and WING/STAB Anti-Ice are OFF, the effectivity is at least 94%.

- When the temperature is below 18°C and NAC Anti-Ice are ON and either WING/STAB Anti-Ice or both are OFF, the effectivity is at least 98%.

- The effectivity is at least 97% at 18°C and higher when either NAC Anti-Ice or WING/STAB Anti-Ice are OFF.

- The effectivity is at least 98% at 18°C and higher when either NAC Anti-Ice or WING/STAB Anti-Ice are ON.

- The effectivity is at least 99% at 18°C and higher when both NAC Anti-Ice and WING/STAB Anti-Ice are OFF.

- The effectivity is at least 99% at 18°C and higher when both NAC Anti-Ice and WING/STAB Anti-Ice are ON.

---

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### Performance Data

#### TAKEOFF SPEEDS

<table>
<thead>
<tr>
<th>APR</th>
<th>OFF</th>
<th>ANTI-ICE</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**FLAPS — 8°**

<table>
<thead>
<tr>
<th>Alt (FT)</th>
<th>V1 (KIAS)</th>
<th>V2 (KIAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>103</td>
<td>103</td>
</tr>
<tr>
<td>15,000</td>
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<td>103</td>
</tr>
<tr>
<td>16,000</td>
<td>103</td>
<td>103</td>
</tr>
</tbody>
</table>

**APR — OFF**

<table>
<thead>
<tr>
<th>Alt (FT)</th>
<th>V1 (KIAS)</th>
<th>V2 (KIAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>103</td>
<td>103</td>
</tr>
<tr>
<td>15,000</td>
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<td>103</td>
</tr>
<tr>
<td>16,000</td>
<td>103</td>
<td>103</td>
</tr>
</tbody>
</table>

**ANTI-ICE — OFF**

<table>
<thead>
<tr>
<th>Alt (FT)</th>
<th>V1 (KIAS)</th>
<th>V2 (KIAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>103</td>
<td>103</td>
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<td>15,000</td>
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<td>103</td>
</tr>
<tr>
<td>16,000</td>
<td>103</td>
<td>103</td>
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</table>

**EFFECTIVITY**

<table>
<thead>
<tr>
<th>Alt (FT)</th>
<th>V1 (KIAS)</th>
<th>V2 (KIAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
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<td>103</td>
</tr>
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<td>15,000</td>
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<tr>
<td>16,000</td>
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<td>103</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- Flaps — 8°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — Off
- Thrust Reversers — Max or Stowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

Figures in shaded area are above engine temperature limits and are provided for interpolation only.

---

**WET RUNWAY TAKEOFF SPEEDS**

**FLAPS — 8°**

<table>
<thead>
<tr>
<th>APR</th>
<th>OFF</th>
<th>ANTI-ICE</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

**APR — OFF**

<table>
<thead>
<tr>
<th>Alt (FT)</th>
<th>V1 (KIAS)</th>
<th>V2 (KIAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
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<td>103</td>
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<td>103</td>
</tr>
<tr>
<td>16,000</td>
<td>103</td>
<td>103</td>
</tr>
</tbody>
</table>

**ANTI-ICE — OFF**

<table>
<thead>
<tr>
<th>Alt (FT)</th>
<th>V1 (KIAS)</th>
<th>V2 (KIAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>103</td>
<td>103</td>
</tr>
<tr>
<td>15,000</td>
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<td>103</td>
</tr>
<tr>
<td>16,000</td>
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<td>103</td>
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</table>

**EFFECTIVITY**

<table>
<thead>
<tr>
<th>Alt (FT)</th>
<th>V1 (KIAS)</th>
<th>V2 (KIAS)</th>
</tr>
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<tbody>
<tr>
<td>10,000</td>
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<td>16,000</td>
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</tr>
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</table>

This table was prepared for the following conditions:

- Flaps — 8°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — Off
- Thrust Reversers — Max or Stowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

Figures in shaded area are above engine temperature limits and are provided for interpolation only.

---

**Figure 5-46.4**
## Performance Data

### Takeoff Speeds

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<th>Temperature</th>
<th>Takeoff Speeds</th>
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<tr>
<td>-20</td>
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<tr>
<td>0</td>
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<tr>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

### Effectivity Code

- **F**

This table was prepared for the following conditions:

- Flaps — 8°
- APR — Off
- Auto spoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — On
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

**NOTE:** The TAKEOFF SPEEDS table for anti-ice ON must be used whenever NAC Anti-ice, WING/STAB Anti-ice or both are ON.

---

For more details and conditions, please refer to the FAA Approved document dated 5-19-2004, page 5-65A.4.
<table>
<thead>
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<th>ALT</th>
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<td>21,000</td>
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<td>14</td>
</tr>
</tbody>
</table>

**Note:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled \( V_2 \) speed at a height of 35 feet above the runway. Maintain \( V_2 \) once achieved. Small pitch attitude changes may be required to maintain \( V_2 \).
### Performance Data

**WET RUNWAY**

**TARGET TAKEOFF PITCH ATTITUDE — DEGREES**

<table>
<thead>
<tr>
<th>ALT FT</th>
<th>WT LB</th>
<th>FLAPS — 8°</th>
<th>APR — OFF</th>
<th>ANTI-ICE — ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
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<td>14 14 14 14 14 14</td>
<td>14 14 14 14 14 14</td>
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</tbody>
</table>

**TARGET TAKEOFF PITCH ATTITUDE TEMPERATURE**

<table>
<thead>
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<th>ALT FT</th>
<th>WT LB</th>
<th>FLAPS — 8°</th>
<th>APR — OFF</th>
<th>ANTI-ICE — ON</th>
</tr>
</thead>
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<td>10,000</td>
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<td>14 14 14 14 14 14</td>
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<td>14 14 14 14 14 14</td>
<td>14 14 14 14 14 14</td>
</tr>
<tr>
<td>18,000</td>
<td>18,000</td>
<td>14 14 14 14 14 14</td>
<td>14 14 14 14 14 14</td>
<td>14 14 14 14 14 14</td>
</tr>
</tbody>
</table>

**NOTE:**

- The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

- The TARGET TAKEOFF PITCH ATTITUDE table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.
## Performance Data

### First Segment Climb Gradient

**FLAPS — 8°**

<table>
<thead>
<tr>
<th>Temperature °F</th>
<th>Uncorrected First Segment Net Climb Gradient %</th>
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</thead>
<tbody>
<tr>
<td>-40</td>
<td>8.5</td>
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<tr>
<td>-20</td>
<td>7.7</td>
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<td>0</td>
<td>7.0</td>
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<tr>
<td>20</td>
<td>6.4</td>
</tr>
<tr>
<td>40</td>
<td>5.9</td>
</tr>
</tbody>
</table>

### Conditions:
- Single Engine
- Thrust: Takeoff
- Gear: DOWN
- Flaps: 8°
- Speed: Vc

### Example:
- Uncorrected Net Climb Gradient (from table): .85%
- Headwind: 10 kt

---

**EFFECTIVITY CODE**

1. **ARMED**
2. **OFF**

---

**REFERENCE LINE**

- **SEA**
- **LEVEL**
- **FOOT**

---

**Examples:**
- **21,000**
  - Uncorrected: 5.3%
  - Corrected: 3.2%

---

**Headwind:**
- **.10 kt**

---

**FM-126 5-67.4**

**FAA Approved 5-19-2004**

---

**Figure 5-48.4**

---

**References:**
- S-19-2004
**First Segment Climb Gradient**

*Flaps — 8°*  
*Anti-Ice — On*

### Example:
1. Uncorrected Net Climb Gradient (from table) ........... 8.5%
2. Headwind ........................................... 10 kts
3. APR System Reference Line
4. APR System ................................... ARMED
5. Corrected Net Climb Gradient ........... 8.8%

**Note:** The FIRST SEGMENT CLIMB GRADIENT table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

**Conditions:**
- Single Engine
- Thrust .................................. Takeoff
- Gear .................................. DOWN Flaps  . . . . . . . . . . . . . . . . . . . . . . . . . . 8°
- Speed .................................. VLOF

---

**Table:**

<table>
<thead>
<tr>
<th>Altitude (FT)</th>
<th>Temperature °F</th>
<th>Reference Line ARMED</th>
<th>APR System ARMED</th>
</tr>
</thead>
<tbody>
<tr>
<td>14,000</td>
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<td>12.2</td>
<td>12.2</td>
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**Diagram:**

- **Diagram of First Segment Climb Gradient**
- **Effectivity Code**

---

*Performance Data*
### Performance Data

#### UNCORRECTED SECOND SEGMENT NET CLimb GRAdIENT — %

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<th>WT</th>
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<th>LEVEL</th>
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<td>115</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>100</td>
<td>10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 9.3 8.0 6.7</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>115</td>
<td>12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 9.3 8.0 6.7</td>
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<tr>
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<tr>
<td>115</td>
<td>12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 9.3 8.0 6.7</td>
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<td>115</td>
<td>12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 9.3 8.0 6.7</td>
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<tr>
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<td>115</td>
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<td></td>
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<td>100</td>
<td>10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 9.3 8.0 6.7</td>
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<tr>
<td>115</td>
<td>12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 9.3 8.0 6.7</td>
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<td></td>
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<tr>
<td>115</td>
<td>12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 12.3 9.3 8.0 6.7</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>100</td>
<td>10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 10.2 9.3 8.0 6.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Conditions:
- Single Engine
- Thrust: Takeoff
- Gear: UP
- Flaps: 8°
- Speed: V2

### Example:
1. Un corrected Net Climb Gradient (from table) = 8.5%
2. Headwind = 10 kt

---

**Figures in shaded area are above engine temperature limits and are provided for interpolation only.**
SECOND SEGMENT CLIMB GRADIENT
FLAPS — 8°
ANTI-ICE — ON

EXAMPLE:
1. Uncorrected Net Climb Gradient
   (from table) ........................................ 8.5%
2. Headwind .......................................... 10 kt
3. APR System Reference Line
4. APR System .......................................... ARMED
5. Corrected Net Climb Gradient ................. 8.8%

NOTE: The SECOND SEGMENT CLIMB GRADIENT table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

Conditions:
- Single Engine
- Thrust ............................................ Takeoff
- Gear .............................................. UP
- Flaps ............................................. 8°
- Speed ............................................. V2

Figure 5-49A.4
This chart was prepared for the following conditions:

Flaps — 20°
Autospoilers — Armed
Anti-Ice — Off

**EXAMPLE:**

1. Temperature . . . . . . . 30°C (86°F)
2. Altitude . . . . . . . . . . . . . . . . 8,000 ft
3. APR System Reference line
4. APR System . . . . . . . . . . . . Armed
5. Climb Weight Limit . . . . . 19,723 lb

Correction for -1.0%
Runway Gradient . . . . . . None
6. Wind Reference Line
7. Tailwind . . . . . . . . . . . . . . . . . . 5 kt
8. Runway Gradient Reference Line
9. Runway Gradient . . . . . . -1.0% (DN)
10. Brake Energy Weight Limit . . . . . . 21,057 lb (9,551 kg)

The most limiting condition is Takeoff Climb
- Takeoff Weight Limit . . . . . 19,723 lb
  (8,946 kg)

**NOTE:** The value obtained from this chart may not be the limiting weight. Takeoff weight is also limited by the maximum certified takeoff weight, the takeoff weight for the runway length available, and obstacle clearance considerations.

Takeoff above 12,000 feet with a tailwind is prohibited.
This chart was prepared for the following conditions:
Flaps — 20°
Autospoilers — Armed
Anti-Ice — On

**EXAMPLE:**
1. Temperature . ... 0 ° C (32 ° F)
2. Altitude . . . . . . . . 12,000 ft
3. APR System Reference line Armed
4. Runway Gradient . . . . . . . . None
5. Climb Weight Limit . . . . . . . . 19,160 lb
   (8,690 kg)
6. Wind Reference Line
7. Tailwind . . . . . . . . . . . . . . . . . . . 4 kt
8. Wind Reference Line
9. Runway Gradient . . . . . . . . . . . . . . . 0.8% (UP)
10. Brake Energy Weight
    Limit . . . . . . . . 20,580 lb (9,335 kg)

The most limiting condition is **Takeoff Climb**

**NOTE:** The value obtained from this chart may not be the limiting weight. Takeoff weight is also limited by the maximum certified takeoff weight, the takeoff weight for the runway length available and obstacle clearance considerations.
Takeoff above 12,000 feet with a tailwind is prohibited.
The **TAKEOFF WEIGHT LIMIT** chart for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.
### Performance Data

#### Uncorrected Takeoff Field Length — FT

| WT | ALT | Temperature | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 60 | 75 | 90 | 105 | 120 |
|----|-----|-------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15,000 | 9600 | 16600 | 20800 | 26100 | 32600 | 40100 | 48600 | 59100 | 72600 | 89100 | 108600 | 131600 | 158600 | 190600 | 228600 | 272600 | 322600 |
| 17,000 | 9900 | 17300 | 21900 | 27700 | 33600 | 40600 | 48700 | 60200 | 74700 | 92200 | 113200 | 138200 | 168200 | 204200 | 246200 | 293200 | 346200 |
| 20,000 | 10400 | 17800 | 23800 | 29000 | 34500 | 41500 | 50000 | 62000 | 77000 | 95000 | 117000 | 143000 | 174000 | 210000 | 251000 | 301000 | 357000 |

#### DRY RUNWAY TAKEOFF FIELD LENGTH

<table>
<thead>
<tr>
<th>FLAPS — 20°</th>
<th>APR — ARMED</th>
<th>ANTI-ICE — OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Effectivity Code</strong></td>
<td><strong>P</strong></td>
<td><strong>P</strong></td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:
- Flaps — 20°
- APR — Armed
- Auto-spoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Dry
- Anti-Ice — Off
- Thrust Reversers — Stowed
- Zero Wind*
- Zero Runway Gradient**

* For conditions other than these, apply the result from this table to the correction chart in Figure 5-53.3.

** Figures in shaded area are above engine temperature limits and are provided for interpolation only.

** Figures in shaded area are above engine temperature limits and are provided for interpolation only.

* BRAKE FAULT CAS illuminated, add 300 feet to takeoff field length.

---

** Figure 5-52.4**

FM-126
FAA Approved 5-19-2004

5-71.4
This chart was prepared for the following conditions:
- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-Ice — Off
- Thrust Reversers — Stowed

**EXAMPLE:**
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . . . . . . 4,300 ft (1,311 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . . . . . . . 1.0% (UP)
5. Anti-Skid System Reference Line
6. Anti-Skid System . . . . . . . . . . . . . . . . . . Off
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . 11,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . . . . . 7,714 ft (2,351 m)
### DRY RUNWAY

#### TAKEOFF FIELD LENGTH

**FLAPS — 20°**

**APR — ARMED**

**ANTI-ICE — ON**

#### EFFECTIVITY CODE

![Effectivity Code](5-72A.4)

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On*
- Runway Surface — Dry
- Anti-Ice — On
- Thrust Reversers — Slowed
- Zero Wind* or Zero Runway Gradient*

* For conditions other than these, apply the result from this table to the correction chart in Figure 5-53B.3.

**NOTE:** The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

---

### PERFORMANCE DATA

#### UNCORRECTED TAKEOFF FIELD LENGTH — FT

| ALT FT | WT Lb | 05 | 07 | 09 | 11 | 13 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |
|--------|--------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

| ALT FT | WT Lb | 09 | 11 | 13 | 15 | 17 | 03 | 05 | 07 | 09 | 11 | 13 | 21 | 23 | 25 | 27 | 31 | 33 | 35 | 37 | 41 | 43 | 47 | 51 | 57 | 61 |

**NOTE:** If BRAKE FAULT CAS illuminated, add 500 feet to takeoff field length.

---

FM-126
FAA Approved 5-19-2004
This chart was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-Ice — On
- Thrust Reversers — Stowed

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . .4,300 ft (1,311 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . 1.0% (UP)
5. Anti-Skid System Reference Line
6. Anti-Skid System . . . . . . . . . . . . . . . . . . Off
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . 11,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . .7,714 ft (2,351 m)
**Performance Data**

**WET RUNWAY TAKEOFF FIELD LENGTH**

**FLAPS — 20°**

**APR — ARMED**

**ANTI-ICE — OFF**

<table>
<thead>
<tr>
<th>Effectivity Code</th>
<th>Code</th>
<th>1000</th>
<th>2000</th>
<th>3000</th>
<th>5000</th>
<th>7000</th>
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<th>20,000</th>
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</tr>
</tbody>
</table>

**NOTE:** If BRAKE FAULT CAS illuminated, add 600 feet to takeoff field length.

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospillers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — Off
- Thrust Reversers — Max*
- Zero Wind*
- Zero Runway Gradient*

* For conditions other than these, apply the result from this table to the correction chart in Figure 5-55.3.

Figures in shaded area are above engine temperature limits and are provided for interpolation only.
WET RUNWAY TAKEOFF FIELD LENGTH CORRECTION CHART

This chart was prepared for the following conditions:
- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — Off

EXAMPLE:
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 4,700 ft (1,433 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . . . . . . 1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . . . . . MAX
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . 11,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . . . . . . 4,580 ft (1,396 m)
### Performance Data

**WET RUNWAY**

**TAKEOFF FIELD LENGTH**

**FLAPS — 20°**

**APR — ARMED**

**ANTI-ICE — ON**

**EFFECTIVITY CODE**

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospillers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — On
- Thrust Reversers — Max*
- Zero Wind* Zero Runway Gradient*

* For conditions other than these, apply the result from this table to the correction chart in Figure 5-55B.3.

**NOTE:** The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

---

**Figure 5-55A.4**

**FM-126**

FAA Approved 5-19-2004
This chart was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — On

EXAMPLE:
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 4,700 ft (1,433 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . . . . . MAX
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . 11,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . 4,580 ft (1,396 m)
## Performance Data

### DRY RUNWAY

#### TAKEOFF FIELD LENGTH

<table>
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<tr>
<th>FLAPS — 20°</th>
<th>APR — OFF</th>
<th>ANTI-ICE — OFF</th>
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</thead>
</table>

### Effectivity Code

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On*
- Runway Surface — Dry
- Anti-Ice — Off
- Thrust Reversers — Stowed
- Zero Wind
- Zero Runway Gradient*

* For conditions other than these, apply the result from this table to the correction chart in Figure 5-57.3.

**NOTE:** If BRAKE FAULT CAS illuminated, add 500 feet to takeoff field length.

---

### UNCORRECTED TAKEOFF FIELD LENGTH — FT

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<th>T+70 °F</th>
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</table>

### Figures in shaded area are above engine temperature limits and are provided for interpolation only.

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* 5/28/04

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FAA Approved 5-19-2004

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**Figure 5-56.4**

5-73.4
This chart was prepared for the following conditions:

- Flaps — 20°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-Ice — Off
- Thrust Reversers — Stowed

**EXAMPLE:**
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 4,700 ft (1,433 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . 0.5% (UP)
5. Anti-Skid System Reference Line
6. Anti-Skid System . . . . . . . . . . . . . . . . . OFF
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . 12,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . . . . 6,150 ft (1,875 m)
### Performance Data

**DRY RUNWAY**

#### TAKEOFF FIELD LENGTH

**FLAPS — 20°**

**APR — OFF**

**ANTI-ICE — ON**

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<tr>
<th><strong>EFFECTIVITY CODE</strong></th>
<th><strong>ALT FT</strong></th>
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#### UNCORRECTED TAKEOFF FIELD LENGTH — FT

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<tr>
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</table>

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On*
- Runway Surface — Dry
- Anti-Ice — On
- Thrust Reversers — Stowed
- Zero Wind
- Zero Runway Gradient

* For conditions other than these, apply the result from this table to the correction chart in Figure 5-77B.3.

**NOTE:** The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

---

**NOTE:** If BRAKE FAULT CAS illuminated, add 500 feet to takeoff field length.
This chart was prepared for the following conditions:

- Flaps — 20°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-Ice — On
- Thrust Reversers — Stowed

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 4,700 ft (1,433 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . 0.5% (UP)
5. Anti-Skid System Reference Line
6. Anti-Skid System . . . . . . . . . . . . . . . . ON
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . 12,000 ft
9. Corrected Takeoff Field Length . . . . . . . . 6,150 ft (1,875 m)
### Performance Data

#### Wet Runway

**Takeoff Field Length**

**Flaps — 20°**

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<th>ALT (FT)</th>
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<th>TAKEOFF FT</th>
<th>TAKEOFF FT</th>
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**Autospoilers — Armed**

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**Rudder Boost — On**

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**Runway Surface — Wet**

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**This table was prepared for the following conditions:**

- Flaps — 20°
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — Off
- Thrust Reversers — Max*
- Zero Wind*
- Zero Runway Gradient*

*For conditions other than these, apply the result from this table to the correction chart in Figure 5-59.3.

**NOTE:** If BRAKE FAULT CAS illuminated, add 600 feet to takeoff field length.

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**FAA Approved 5-19-2004**

**Figure 5-58.4**
This chart was prepared for the following conditions:
- Flaps — 20°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — Off

**EXAMPLE:**
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 4,700 ft (1,433 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 10 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . STOWED
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . 12,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . . . 5,600 ft (1,707 m)
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<th>APR On</th>
<th>Autothrottles — Armed</th>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15,000</td>
<td>6000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<tr>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20,000</td>
<td>11,000</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>21,000</td>
<td>12,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>21,500</td>
<td>13,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** The table was prepared for the following conditions:
- WING/STAB Anti-Ice or both are ON.
- For conditions other than these, apply the result from this table to the correction chart in Figure 5-59B.3.

* If BRAKE FAULT CAS illuminated, add 600 feet to takeoff field length.
This chart was prepared for the following conditions:
- Flaps — 20°
- APR — Off
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — On

**EXAMPLE:**
1. Uncorrected Takeoff Field Length
   (from table) . . . . . . . . . . . 4,700 ft (1,433 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . 10 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . STOWED
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . 12,000 ft
9. Corrected Takeoff Field Length . . . . . . . 5,600 ft (1,707 m)
### Performance Data

**Figure 5-60.4**

**FM-126 5-79.4**

5/28/04 5/28/04

---

<table>
<thead>
<tr>
<th>ALT</th>
<th>WT</th>
<th>TEMPERATURE</th>
<th>V1 — KIAS</th>
<th>V0/V — KIAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>20,000</td>
<td>15</td>
<td>103 103 103 103 103 103 103 103</td>
<td>109 110 110 110 110 110 110 110</td>
<td></td>
</tr>
<tr>
<td>15,000</td>
<td>20</td>
<td>103 103 103 103 103 103 103 103</td>
<td>109 110 110 110 110 110 110 110</td>
<td></td>
</tr>
<tr>
<td>10,000</td>
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<td></td>
</tr>
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<td>5,000</td>
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<td></td>
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<tr>
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<tr>
<td>0</td>
<td>45</td>
<td>103 103 103 103 103 103 103 103</td>
<td>109 110 110 110 110 110 110 110</td>
<td></td>
</tr>
<tr>
<td>4,000</td>
<td>50</td>
<td>103 103 103 103 103 103 103 103</td>
<td>109 110 110 110 110 110 110 110</td>
<td></td>
</tr>
</tbody>
</table>

---

**FLAPS — 20° APR — ARMED ANTI-ICE — OFF**

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-Ice — Off
- Anti-Skid — On or Off
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

---

Figures in shaded area are above engine temperature limits and are provided for interpolation only.

---

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5-79.4
### Performance Data

#### DRY RUNWAY

**TAKEOFF SPEEDS**

**FLAPS — 20°**

**APR — ARMED**

**ANTI-ICE — ON**

<table>
<thead>
<tr>
<th>EFFECTIVITY CODE</th>
</tr>
</thead>
</table>

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Runway Surface — Dry
- Anti-Ice — On
- Anti-Skid — On or Off
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

**NOTE:** The TAKEOFF SPEEDS table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.
### Table: Target Takeoff Pitch Attitude

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Altitude</th>
<th>WT</th>
</tr>
</thead>
<tbody>
<tr>
<td>40°F</td>
<td>14,000 ft</td>
<td>-40</td>
</tr>
<tr>
<td>-40°F</td>
<td>11,000 ft</td>
<td>-10</td>
</tr>
<tr>
<td>20°F</td>
<td>9,000 ft</td>
<td>-20</td>
</tr>
<tr>
<td>0°F</td>
<td>3,000 ft</td>
<td>-30</td>
</tr>
<tr>
<td>20°F</td>
<td>7,000 ft</td>
<td>10</td>
</tr>
<tr>
<td>40°F</td>
<td>1,000 ft</td>
<td>20</td>
</tr>
</tbody>
</table>

This table was prepared for the same conditions as listed on the appropriate DRY RUNWAY TAKEOFF SPEEDS table.

**NOTE:**
Before the climbout, the height of 5 feet above the runway, the climb should be to a height of 35 feet above the runway. The climb speed may be reduced to maintain V2. The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at the scheduled altitude. The climb speed may be reduced to maintain V2.

---

**Figure 5-61.4**

FM-126 5-80.4

5/28/04
<table>
<thead>
<tr>
<th>ALT (FT)</th>
<th>WT (LB)</th>
<th>APR</th>
<th>FLAPS</th>
<th>ANTI-ICE</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40</td>
<td>-20</td>
<td>0</td>
<td>20°</td>
<td>ON</td>
<td>5-19-2004</td>
</tr>
<tr>
<td>2000</td>
<td>12 12 12 12 12 12</td>
<td>12 12 12 12 12 12</td>
<td>12 12 12 12 12 12</td>
<td>12 12 12 12 12 12</td>
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<tr>
<td>3000</td>
<td>13 13 13 13 13 13</td>
<td>13 13 13 13 13 13</td>
<td>13 13 13 13 13 13</td>
<td>13 13 13 13 13 13</td>
<td>13 13 13 13 13 13</td>
</tr>
<tr>
<td>4000</td>
<td>14 14 14 14 14 14</td>
<td>14 14 14 14 14 14</td>
<td>14 14 14 14 14 14</td>
<td>14 14 14 14 14 14</td>
<td>14 14 14 14 14 14</td>
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<tr>
<td>5000</td>
<td>15 15 15 15 15 15</td>
<td>15 15 15 15 15 15</td>
<td>15 15 15 15 15 15</td>
<td>15 15 15 15 15 15</td>
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<tr>
<td>6000</td>
<td>16 16 16 16 16 16</td>
<td>16 16 16 16 16 16</td>
<td>16 16 16 16 16 16</td>
<td>16 16 16 16 16 16</td>
<td>16 16 16 16 16 16</td>
</tr>
<tr>
<td>7000</td>
<td>17 17 17 17 17 17</td>
<td>17 17 17 17 17 17</td>
<td>17 17 17 17 17 17</td>
<td>17 17 17 17 17 17</td>
<td>17 17 17 17 17 17</td>
</tr>
<tr>
<td>8000</td>
<td>18 18 18 18 18 18</td>
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<td>18 18 18 18 18 18</td>
</tr>
<tr>
<td>9000</td>
<td>19 19 19 19 19 19</td>
<td>19 19 19 19 19 19</td>
<td>19 19 19 19 19 19</td>
<td>19 19 19 19 19 19</td>
<td>19 19 19 19 19 19</td>
</tr>
<tr>
<td>10000</td>
<td>20 20 20 20 20 20</td>
<td>20 20 20 20 20 20</td>
<td>20 20 20 20 20 20</td>
<td>20 20 20 20 20 20</td>
<td>20 20 20 20 20 20</td>
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<tr>
<td>11000</td>
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<td>21 21 21 21 21 21</td>
<td>21 21 21 21 21 21</td>
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<td>21 21 21 21 21 21</td>
</tr>
<tr>
<td>12000</td>
<td>22 22 22 22 22 22</td>
<td>22 22 22 22 22 22</td>
<td>22 22 22 22 22 22</td>
<td>22 22 22 22 22 22</td>
<td>22 22 22 22 22 22</td>
</tr>
</tbody>
</table>

This table was prepared for the same conditions as listed on the appropriate DRY RUNWAY TAKEOFF SPEEDS table.

- The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled \( V_2 \) speed at a height of 35 feet above the runway, and may require manual pitch attitude changes to maintain \( V_2 \).

- The TARGET TAKEOFF PITCH ATTITUDE table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

- The \( V_2 \) speed is calculated at a height of 35 feet above the runway.
<table>
<thead>
<tr>
<th>ALT (FT)</th>
<th>WT (LB)</th>
<th>V1 — KIAS</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
<th>110</th>
<th>120</th>
<th>V2 — KIAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>1/2</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>2000</td>
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<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>3000</td>
<td>1/2</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
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<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>4000</td>
<td>1/2</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>5000</td>
<td>1/2</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>6000</td>
<td>1/2</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
</tr>
<tr>
<td>7000</td>
<td>1/2</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
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<td>1/0</td>
<td>1/0</td>
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<td>1/0</td>
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<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
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<td>1/0</td>
</tr>
<tr>
<td>9000</td>
<td>1/2</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
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<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
<td>1/0</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:
- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudders Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — Off
- Thrust Reversers — Max or Stowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

Figures in shaded area are above engine temperature limits and are provided for interpolation only.
**WET RUNWAY TAKEOFF SPEEDS**

**FLAPS — 20°**

**APR — ARMED**

**ANTI-ICE — ON**

---

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet
- Anti-Ice — On
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

**NOTE:** The TAKEOFF SPEEDS table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

---

**EFFICACY**

<table>
<thead>
<tr>
<th>EFFECTIVITY</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Figure 5-62A.4
The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

This table was prepared for the same conditions as listed on the appropriate WET RUNWAY TAKEOFF SPEEDS table.

**NOTE:**
### Target Takeoff Pitch Attitude - Degrees

<table>
<thead>
<tr>
<th>Altitude (FT)</th>
<th>0°F</th>
<th>20°F</th>
<th>40°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°F</td>
<td>15</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>20°F</td>
<td>10</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>40°F</td>
<td>10</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

This table was prepared for the same conditions as listed on the appropriate WET RUNWAY TAKEOFF SPEEDS table.

**Note:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

- The TARGET TAKEOFF PITCH ATTITUDE table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

---

**Wet Runway**

**RAPS - 20° APR - ARMED Anti-Ice - ON**

**Effectiveness Code**

- **F**
### Performance Data

**Takeoff Speeds**

**Effectiveness Code**

This table was prepared for the following conditions:

- **Flaps** — 20°
- **APR** — Off
- **Autopilots** — Armed
- **Rudder Boost** — On
- **Runway Surface** — Dry
- **Anti-Ice** — Off
- **Anti-Skid** — On or Off
- **Wind** — Between -10 and +30 knot winds
- **Runway Gradient** — Between -2.4% (downhill) and 2.4% (uphill)

---

**ULS**

**KLX**

**V1** — **KIAS**

**VS** — **KIAS**

<table>
<thead>
<tr>
<th><strong>ALT</strong> FT</th>
<th>100</th>
<th>125</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>600</th>
<th>700</th>
<th>800</th>
<th>900</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>V1</strong> KIAS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VS</strong> KIAS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

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FAA Approved 5-19-2004

5-83.4

---

*Figures in shaded area are above engine temperature limits and are provided for interpolation only.*
This table was prepared for the following conditions:

- **Flaps** — 20°
- **APR** — Off
- **Autospoilers** — Armed
- **Rudder Boost** — On
- **Runway Surface** — Dry
- **Anti-Ice** — On
- **Anti-Skid** — On or Off
- **Runway Gradient** — Between -2.4% (downhill) and +2.4% (uphill)

**NOTE:** The TAKEOFF SPEEDS table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.
The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled \( V_2 \) speed at a height of 35 feet above the runway. Small pitch attitude changes may be required to maintain \( V_2 \).
### Dry Runway Takeoff Pitch Attitude - Degrees

<table>
<thead>
<tr>
<th>Alt (FT)</th>
<th>Mach</th>
<th>Temperature °F</th>
<th>Pitch Attitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,000</td>
<td>0.8</td>
<td>-40</td>
<td>20°</td>
</tr>
<tr>
<td>12,000</td>
<td>0.85</td>
<td>-40</td>
<td>20°</td>
</tr>
<tr>
<td>13,000</td>
<td>0.9</td>
<td>-40</td>
<td>20°</td>
</tr>
<tr>
<td>14,000</td>
<td>0.95</td>
<td>-40</td>
<td>20°</td>
</tr>
<tr>
<td>15,000</td>
<td>1.0</td>
<td>-40</td>
<td>20°</td>
</tr>
<tr>
<td>16,000</td>
<td>1.05</td>
<td>-40</td>
<td>20°</td>
</tr>
<tr>
<td>17,000</td>
<td>1.1</td>
<td>-40</td>
<td>20°</td>
</tr>
<tr>
<td>18,000</td>
<td>1.15</td>
<td>-40</td>
<td>20°</td>
</tr>
<tr>
<td>19,000</td>
<td>1.2</td>
<td>-40</td>
<td>20°</td>
</tr>
<tr>
<td>20,000</td>
<td>1.25</td>
<td>-40</td>
<td>20°</td>
</tr>
<tr>
<td>21,000</td>
<td>1.3</td>
<td>-40</td>
<td>20°</td>
</tr>
<tr>
<td>22,000</td>
<td>1.35</td>
<td>-40</td>
<td>20°</td>
</tr>
</tbody>
</table>

**NOTE:**

- The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 45 feet above the runway.
- The target takeoff pitch attitude table must be used whenever anti-ice is required.

---

### Target Takeoff Pitch Attitude

- **NOTE:**
  - The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 45 feet above the runway.
  - The target takeoff pitch attitude table must be used whenever anti-ice is required.
  - The target takeoff pitch attitude table is applicable only for the stated condition.

---

**ATTITUDE table for anti-ice ON must be used whenever NAC Anti-Ice, WING/ENGINE is engaged.**

---

**Performance Data**

Figure 5.4.1A

---

**FAA Approved 5-19-2004 5/28/04**

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**LEARJET 45**

---

**RA-2854D**
This table was prepared for the following conditions:

- **Flaps** — 20°
- **APR** — Off
- **Autospoilers** — Armed
- **Rudder Boost** — On
- **Anti-Skid** — On
- **Runway Surface** — Wet
- **Anti-Ice** — Off
- **Thrust Reversers** — Max or Stowed
- **Wind** — Between -10 (tailwind) and +30 (headwind) knots
- **Runway Gradient** — Between -2.4% (downhill) and +2.4% (uphill)

This table contains performance data for the Bombardier Learjet 45. It includes takeoff speeds at various altitudes and weights, with shaded areas indicating engine temperature limits. Figures are provided for interpolation only.

Figures 5-66.4

**Performance Data**

**WET RUNWAY TAKED OFF SPEEDS**

<table>
<thead>
<tr>
<th>FLAPS — 20°</th>
<th>APR — OFF</th>
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<tbody>
<tr>
<td>ANTI-ICE — OFF</td>
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</tr>
</tbody>
</table>

**EFFECTIVITY CODE**

| 5/28/04 |

FM-126
FAA Approved 5-19-2004
This table was prepared for the following conditions:

- **Flaps** — 20°
- **APR** — Off
- **Autospoilers** — Armed
- **Rudder Boost** — On
- **Anti-Skid** — On
- **Anti-Ice** — On
- **Runway Surface** — Wet
- **Wind** — Between -10 (tailwind) and +30 (headwind) knots
- **Runway Gradient** — Between -2.4% (downhill) and +2.4% (uphill)

**NOTE:** The TAKEOFF SPEEDS table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

---

**Performance Data**

**WET RUNWAY TAKEOFF SPEEDS**

**FLAPS — 20°**

**APR — OFF**

**ANTI-ICE — ON**

**EFFECTIVITY CODE**

**Figure 5-66A.4**
Performance Data

### WET RUNWAY TAKEOFF SPEEDS

#### FLAPS — 20°

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<tr>
<th>TEMP.</th>
<th>ALT.</th>
<th>WT.</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40°F</td>
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<td>11 11 11 11 11 11 11 11 11 11 10 8 7</td>
</tr>
<tr>
<td>-20°F</td>
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<td>11 11 11 11 11 11 11 11 11 10 10 8 9</td>
</tr>
<tr>
<td>0°F</td>
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<td>11 11 11 11 11 11 11 11 11 11 11 10 10</td>
</tr>
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</table>

#### APR — OFF

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<thead>
<tr>
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<th>ALT.</th>
<th>WT.</th>
</tr>
</thead>
<tbody>
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<td>-40°F</td>
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<td>11 11 11 11 11 11 11 11 11 11 10 8 7</td>
</tr>
<tr>
<td>-20°F</td>
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#### ANTI-ICE — OFF

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<th>WT.</th>
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</thead>
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<td>0°F</td>
<td>12,000</td>
<td>11 11 11 11 11 11 11 11 11 11 11 10 10</td>
</tr>
</tbody>
</table>

This table was prepared for the same conditions as listed on the appropriate WET RUNWAY TAKEOFF SPEEDS table.

**NOTE:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

Figures in shaded area are above engine temperature limits and are provided for interpolation only.

---

Figure 5-67.4
### Performance Data

#### WET RUNWAY

**TARGET TAKEOFF PITCH ATTITUDE**

<table>
<thead>
<tr>
<th>ALTITUDE FL</th>
<th>WT</th>
<th>FLAPS</th>
<th>APR</th>
<th>ANTI-ICE</th>
<th>EFFECTIVITY CODE</th>
</tr>
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<td>ON</td>
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<td>ON</td>
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**TARGET TAKEOFF PITCH ATTITUDE (TEMMPERATURE)**

<table>
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<th>ANTI-ICE</th>
<th>EFFECTIVITY CODE</th>
</tr>
</thead>
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<td>ON</td>
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<td>4</td>
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</table>

NOTE: - The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

- The TARGET TAKEOFF PITCH ATTITUDE table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

This table was prepared for the same conditions as listed on the appropriate WET RUNWAY TAKEOFF SPEEDS table.

**Figure 5-74A.4**

FM-126
FAA Approved 5-19-2004
### Uncorrected First Segment Net Climb Gradient — %

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#### Conditions:
- Single Engine
- Thrust: Takeoff
- Gear: Down
- Flaps: 20°
- Speed: VLOF

**Example:**
1. Uncorrected Net Climb Gradient (from table) = 8.5%
2. Headwind = 10 kt
3. APR System = Armed
4. Corrected Net Climb Gradient = 8.8%

** performance Data**

---

Figures in shaded area are above engine temperature limits and are provided for interpolation only.

FM-126
FAA Approved 5-19-2004

5-87.4
### Uncorrected First Segment Climb Gradient — %

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</table>

**Example:**
1. Uncorrected Net Climb Gradient (from table) 8.5%
2. Headwind 10 kt
3. APR System ARMED
4. Corrected Net Climb Gradient 8.8%

**Note:** The FIRST SEGMENT CLIMB GRADIENT table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

**Conditions:**
- Single Engine
- Thrust Takeoff
- Gear DOWN
- Flaps 20°
- Speed VLOF
**Performance Data**

**Second Segment Climb Gradient**

- **FLAPS — 20°**
- **ANTI-ICE — OFF**

**Reference Line**

- **Effectivity Code**

**Conditions:**
- Single Engine
- Thrust: Takeoff
- Cbear: Up
- Flaps: 20°
- Speed: V2

**Baseline Engine Temperature Limits:**

<table>
<thead>
<tr>
<th>Altitude (ft)</th>
<th>Temp (°F)</th>
<th>Effectivity</th>
<th>Code</th>
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</tr>
</tbody>
</table>

**Headwind:** 10 kt

**APR System Reference Line**

**Corrected Net Climb Gradient:**

- **8.8%**

**Takeoff Thrust:**

- **5.0 5.0 4.9 4.9 4.8 4.8 4.8 4.8 4.8 4.8 4.7 4.6 4.3 4.1**

**Accuracy Limits:**

- **3.0 2.9 2.8 2.8 2.8 2.7 2.7 2.7 2.6 2.6 2.5 2.1 1.7 1.1**

**References:**

- FM-126 5-88.4
- FAA Approved 5-19-2004

Figure 5-69.4
Performance Data

**FM-126 5-88.5**

FAA Approved 5-19-2004

5/28/04

---

SECOND SEGMENT CLIMB GRADIENT

**FLAPS — 20°**

**ANTI-ICE — ON**

**EFFECTIVITY CODE**

**F**

---

UNCORRECTED SECOND SEGMENT NET CLIMB GRADIENT — %

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</tr>
<tr>
<td>30000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

EXAMPLE:

1. Uncorrected Net Climb Gradient (from table). . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 8.5%
2. Headwind . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .10 kt
3. APR System Reference Line
4. APR System . . . . . . . . . . . . . . . . . . . . . . . . . . ARMED
5. Corrected Net Climb Gradient . . . . . . . . . . . . . . 8.8%

**NOTE:** The SECOND SEGMENT CLIMB GRADIENT table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

Conditions:

- Single Engine
- Thrust . . . . . . . . . . . . . . . . . . . . . . . . Takeoff
- Gear . . . . . . . . . . . . . . . . . . . . . . . . UP
- Flaps . . . . . . . . . . . . . . . . . . . . . . . . 20°
- Speed . . . . . . . . . . . . . . . . . . . . . . . . . V1

---

**Figure 5-69A.4**
This table presents the maximum horizontal distance from Reference Zero allowable for Second Segment Climb when determining obstacle clearance from Figure 5-72. If the actual obstacle distance from Reference Zero exceeds this maximum, obstacle clearance may still be assured by using this maximum distance as the horizontal distance from Reference Zero in Figure 5-72. Observing this limit will ensure the completion of Second Segment Climb prior to the five minute limitation for takeoff/APR power.

### Maximum Distance for Second Segment Climb - NM

<table>
<thead>
<tr>
<th>Departure Altitude - Feet</th>
<th>Departure Temperature - °C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-40</td>
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<tr>
<td>2000</td>
<td>7.1</td>
</tr>
<tr>
<td>4000</td>
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<tr>
<td>12000</td>
<td>8.6</td>
</tr>
<tr>
<td>14000</td>
<td>8.9</td>
</tr>
</tbody>
</table>

This table is for **Maximum Distance for Second Segment Climb and Altitude Loss During A Steady 15° Bank Angle Turn in Takeoff Flight Path**.
Prior to using this chart, verify that obstacle height has been increased to account for any turns in the takeoff flight path. This information is presented in Figure 5-70.

**EXAMPLE:**

1. Obstacle Distance (horizontal from reference zero) . . . . . . . 6,850 ft (2,088 m)
2. Obstacle Height (above runway) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 450 ft
3. Required Net Climb Gradient . . . . . . . . . 7.1%
4. Gross Level-Off Height (above runway) . . . . . . . . . . . . . . . . . . . . . . 500 ft

Note: - To determine the indicated altitude when obstacle clearance has been achieved under below standard temperature conditions, consult the GEOMETRIC HEIGHT CORRECTION FOR BELOW STANDARD TEMPERATURE chart and the appropriate altitude position correction chart.
- To maintain 35-foot obstacle clearance, assume obstacle height is Height Above Reference Zero.
Prior to using this chart, verify:
- Obstacle height has been increased to account for any turns in the takeoff flight path (refer to Figure 5-70).
- Obstacle distance from reference zero does not exceed the maximum distance allowable for second segment climb (refer to Figure 5-70). If obstacle distance exceeds the maximum, obstacle clearance may still be assured by reducing the assumed obstacle distance to the maximum allowable from Figure 5-70.

**EXAMPLE:**
1. Obstacle Distance (horizontal from reference zero) . . . . . . 6.1 nm (11.29 km)
2. Obstacle Height (above runway) . . . . . . . . . . . . . . . . . . . 2,500 ft
3. Required Net Climb Gradient . . . . . . . . . 7.0%
4. Gross Level-Off Height (above runway) . . . . . . . . . . . 2,800 ft

**Note:** To determine the indicated altitude when obstacle clearance has been achieved under below standard temperature conditions, consult the GEOMETRIC HEIGHT CORRECTION FOR BELOW STANDARD TEMPERATURE chart and the appropriate altitude position correction chart.
- To maintain 35-foot obstacle clearance, assume obstacle height is Height Above Reference Zero.

Figure 5-72
## Performance Data

**FM-126 5-92.4**

**FAA Approved 5-19-2004**

### Transition Segment

**Distance to Accelerate from V<sub>2</sub> to 200 KIAS**

**Effectivity Code**

**Example:**

A. Corrected Second Segment
   Net Climb Gradient ................. 4.5%

B. Gross Level-off Height .......... 2500 ft

C. Acceleration Index ............... 3.1

D. Flaps .......................... 8°

E. Weight .......................... 18,500 lb

F. Distance to Accelerate from V<sub>2</sub> to 200 KIAS ................. 8.0 nm

### Flaps — 8°, Gear — Up

- Initial Speed ......................... V<sub>2</sub>
- Initial Flaps ......................... 8°
- Transition Speed ..................... V<sub>2</sub> + 25 KIAS
- Final Flaps ......................... 0°
- Final Speed ......................... 200 KIAS (En Route Climb Speed)

### Flaps — 20°, Gear — Up

- Initial Speed ......................... V<sub>2</sub>
- Initial Flaps ......................... 20°
- Transition Speed ..................... V<sub>2</sub> + 25 KIAS
- Final Flaps ......................... 0°
- Final Speed ......................... 200 KIAS (En Route Climb Speed)

### Acceleration Index

<table>
<thead>
<tr>
<th>GROSS LEVEL-OFF HEIGHT - FEET</th>
<th>CORRECTED SECOND SEGMENT NET CLIMB GRADIENT - %</th>
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<tr>
<td>1500 or less</td>
<td>0.8 1.2 2.2 3.2 4.2 5.2 6.2 7.2 8.2 9.2 10.2 11.2 12.2</td>
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</tr>
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</tr>
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<td>4000</td>
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</tr>
<tr>
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### Flaps — 8° Distance to Accelerate from V<sub>2</sub> to 200 KIAS — NM

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<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
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### Flaps — 20° Distance to Accelerate from V<sub>2</sub> to 200 KIAS — NM

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<tr>
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</tr>
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</tr>
<tr>
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<td></td>
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<td></td>
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</tr>
</tbody>
</table>

*Figure 5.73.4*
### Performance Data

#### EN ROUTE CLIMB GRADIENT

**Single Engine**

**Anti-Ice — Off**

### Conditions:
- Single Engine
- Anti-Ice: Off
- Thrust: Max Continuous
- Gear: UP
- Flaps: UP
- Speed: (See En Route Climb Speed Schedule)

### EN ROUTE CLIMB SPEED SCHEDULE:

- **Sea Level to 21,000 ft**: 200 KIAS
- **21,000 ft to 29,000 ft**: 0.45 Mi
- **29,000 ft to 49,000 ft**: 170 KIAS

**NOTE:** This speed schedule approximates best rate-of-climb speeds or, above the single-engine ceiling, the minimum sink-rate speed.

---

**Figures in shaded area are beyond engine temperature limits and are provided for interpolation only.**

---

**Figure 5-74.4**
<table>
<thead>
<tr>
<th>Conditions:</th>
</tr>
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<tbody>
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<td>• Single Engine</td>
</tr>
<tr>
<td>• Anti-Ice . . . . . . . . . . . . . . . . . . . . . . . . . . . . . On</td>
</tr>
<tr>
<td>• Thrust . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Max Continuous</td>
</tr>
<tr>
<td>• Gear . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Up</td>
</tr>
<tr>
<td>• Flaps . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . Up</td>
</tr>
<tr>
<td>• Speed . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . (See En Route Climb Speed Schedule)</td>
</tr>
</tbody>
</table>

NOTE: The EN ROUTE CLIMB GRADIENT table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

EN ROUTE CLIMB GRADIENT SPEED SCHEDULE:
Sea Level to 21,000 ft . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 200 KIAS
21,000 ft to 29,000 ft . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 0.45 Mach
29,000 ft to 49,000 ft . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 170 KIAS
49,000 ft to 51,000 ft . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 0.70 Mach

NOTE: This speed schedule approximates best rate-of-climb speeds or, above the single-engine ceiling, the minimum sink-rate speed.

---

Figure 5-74A.4
APPROACH AND LANDING CHARTS

The charts on the following pages present approach and landing climb gradients, maximum landing weights as limited by approach and landing climb performance, and landing weights as limited by maximum brake energy.

MAXIMUM LANDING WEIGHT

Landings must be made within the limitations of the maximum landing weight as governed by the LANDING WEIGHT LIMIT charts and by the performance determined from the ACTUAL LANDING DISTANCE and FACTORED LANDING DISTANCE (if applicable) charts. The heaviest weight at which the aircraft can land is the lowest of the following weights:

1. The maximum landing weight (design structural limit for landing) is 19,200 pounds (8,709 kg).
2. The landing weight limit for airport altitude and reported surface temperature as determined from the LANDING WEIGHT LIMIT charts.
3. The maximum landing weight for the runway and ambient conditions as determined from the ACTUAL LANDING DISTANCE and FACTORED LANDING DISTANCE (if applicable) charts.

If the aircraft weight over the destination is greater than the lowest of the above weights, fuel must be burned off until the proper weight is achieved.

LANDING DISTANCE CHARTS

The ACTUAL LANDING DISTANCE chart shows the demonstrated landing distance in terms of altitude, outside air temperature and weight. The ACTUAL LANDING DISTANCE CORRECTION CHART shows the effects of wind, runway gradient, and anti-skid on or off. The FACTORED LANDING DISTANCE chart shows the operational landing field length when a factored landing distance is required by applicable regulations. These charts may be used to determine either of the following:

1. The landing field length required given the airplane weight, runway gradient, pressure altitude, reported surface temperature, and wind.
2. The maximum landing weight corresponding to a specific runway length, runway gradient, pressure altitude, reported surface temperature, and wind. Landing weight for runway length available may be determined by working through the chart in the opposite manner as finding landing distance. Landing weight determined in this manner may not be the limiting landing weight, refer to MAXIMUM LANDING WEIGHT.

3. Landing performance information above the maximum landing weight has been provided for abnormal conditions requiring an overweight landing. Refer to Abnormal and Overweight Landings procedure, in Section IV.

LANDING ON WET RUNWAY

Refer to the CONTAMINATED RUNWAY DATA pertaining to landings on a wet runway.
LANDING ON CONTAMINATED RUNWAY

Refer to the CONTAMINATED RUNWAY DATA pertaining to landings on a contaminated runway.

LANDING PROCEDURE

The landing distances on the ACTUAL LANDING DISTANCE chart can be realized when following the landing procedure in the INTRODUCTION TO PERFORMANCE DATA at the beginning of this section.

APPROACH CLimb AND LANDING Climb GRADIENT CHARTS

The APPROACH CLIMB GRADIENT and LANDING CLIMB GRADIENT Charts are read at the airport temperature and pressure altitude. The gradients will be achieved using the speeds shown in the APPROACH SPEEDS Chart.
### Approach Speeds — Normal Landings

Approach Climb Speed — $V_{APP}$, Flaps 8° — Gear Up

Landing Approach Speed — $V_{REF}$, Flaps 40° — Gear down

#### EFFECTIVITY CODE

- E
- F

#### V$_{APP}$ and V$_{REF}$ — KIAS

<table>
<thead>
<tr>
<th>ALT FEET</th>
<th>WEIGHT LB</th>
<th>V$_{APP}$</th>
<th>V$_{REF}$</th>
<th>ALT FEET</th>
<th>WEIGHT LB</th>
<th>V$_{APP}$</th>
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Figures in shaded area are above maximum certified landing weight.
### Approach Speeds — Abnormal Landings

**Gear Down**

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#### Approach Speeds — KIAS

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*Figures in shaded area are above the maximum certified landing weight.*
Performance Data

**Approach Climb Gradient**

**Anti-Ice — Off**

**Effectivity Code**

**Example:**
1. Uncorrected Approach Climb Gradient (from table) .................. 7.0%
2. Headwind .................................................. -20 kt
3. Corrected Approach Climb Gradient .................. 7.5%

**Conditions:**
- Single Engine
- Anti-Ice ............................... Off
- Gear .................................... UP
- Flaps ................................. .8°
- Speed ................................. VAPP

**Note:** When using RMU for primary engine indication, subtract 3% from Climb Gradient.

---

**Figure 5-77-4**

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**Table:**

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**Figure 5-77-4**

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**Diagrams:**

- Approach Climb Gradient
- Anti-Ice — Off

---

**Notes:**
- Figures in shaded area are above engine temperature limits and are provided for interpolation only.
- FAA Approved 5-19-2004
**APPRAOCH CLIMB GRADIENT ANTI-ICE — ON**

**EFFECTIVITY CODE**

**EXAMPLE:**
1. Uncorrected Approach Climb Gradient (from table) . . . . . . . . . . . . . . . . . . . . . . . . . . . 7.0%
2. Headwind . . . . . . . . . . . . . . . . . . . . . . . . . . . . .20 kt
3. Corrected Approach Climb Gradient . . . . . . . 7.5%

**Conditions:**
- Single Engine
- Anti-Ice . . . . . . . . . . . . . . . . . . . . On
- Thrust . . . . . . . . . . . . . . . . . . . . Takeoff
- Gear . . . . . . . . . . . . . . . . . . . . UP
- Flaps . . . . . . . . . . . . . . . . . . . . 8°
- Speed . . . . . . . . . . . . . . . . . . . . VAPP

**NOTE:** The APPRAOCH CLIMB GRADIENT table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.
- When using RMU for primary engine indication, subtract 5% from Climb Gradient.
### UNCORRECTED LANDING GROSS CLIMB GRADIENT — %

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#### CONDITIONS:
- Two Engines
- Anti-Ice Off
- Thrust Takeoff
- Gear DOWN
- Speed VREF

**NOTE:** When using RMU for primary engine indication, subtract 6% from Climb Gradient.
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<th>Temperature (°F)</th>
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Note:
- The UNCORRECTED LANDING CLIMB GRADIENT table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.
- When using RMU for primary engine indication, subtract 8% from Climb Gradient.
This chart was prepared for the following conditions:

- Automatic Spoilers - Armed
- Anti-Ice - Off

**EXAMPLE:**

1. Temperature: 20°C (68°F)  
2. Altitude: 12,000 ft  
3. Climb Weight Limit: 22,353 lb (10,139 kg)

Correction for +2.2% Runway Gradient: 400 lb (-181.4 kg)

Climb Weight Limit (corrected for runway gradient): 21,953 lb (9,958 kg)

4. Wind Reference Line  
5. Headwind: 8 kt  
6. Runway Gradient Reference Line  
7. Runway Gradient: +2.2% (Up)  
8. Brake Energy Weight Limit: 18,255 lb (8,280 kg)

The most limiting condition is Brake Energy Weight Limit.

**NOTE:** The value obtained from this chart may not be the limiting weight. Landing weight is also limited by the maximum certified landing weight and the landing weight for the runway length available.

Figure 5-79.4
This chart was prepared for the following conditions:

- Autospoilers — Armed
- Anti-Ice — On

**EXAMPLE:**
1. Temperature . . . . . . . . . 5 °C (41 °F)
2. Altitude . . . . . . . . . . . . . . . . 10,000 ft
3. Climb Weight Limit . . . . . . . 18,846 lb (8,549 kg)

Correction for +0.8% Runway Gradient . . . . . . . . . . . . . . None
4. Wind Reference Line
5. Tailwind . . . . . . . . . . . . . . . . . . . . 4 kt
6. Runway Gradient Reference Line
7. Runway Gradient . . . . . . +0.8° (UP)
8. Brake Energy Weight Lmt . . . . . . 17,460 lb (7,920 kg)

The most limiting condition is Brake Energy Weight Limit
- Landing Weight Limit . . . . . 17,460 lb (7,920 kg)

**NOTE:** The value obtained from this chart may not be the limiting weight. Landing weight is also limited by the maximum certified landing weight and the landing weight for the runway length available.

The LANDING WEIGHT LIMIT chart for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.
### UNCORRECTED TAKEOFF FIELD LENGTH — FT

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### EFFECTIVITY CODE

- **E**: This table was prepared for the following conditions:
  - Flaps — Down
  - Autospoilers — Deployed
  - Anti-Skid — On*
  - Runway Surface — Dry
  - Thrust Reversers — Slowed
  - Zero Wind*
  - Zero Runway Gradient*

*For conditions other than these, apply the result from this table to the correction chart in Figure 5-82.2.

**NOTE:** If BRAKE FAULT CAS illuminated, add 500 feet to actual landing distance.

---

Figure 5-81.3

---

FM-126
FAA Approved 5-19-2004

5-103.3
This table was prepared for the following conditions:

Flaps — Down
Autospoilers — Deployed
Runway Surface — Dry
Thrust Reversers — Stowed

EXAMPLE:
1. Uncorrected Landing Distance (from table) . . . 3,750 ft (1,143 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . 10 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . -1.0% (DN)
5. Anti-Skid Reference Line
6. Anti-Skid . . . . . . . . . . . . . . . . . . . . . ON
7. Corrected Landing Distance . . . . 3,640 ft (1,109 m)

NOTE: Whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON, add 100 feet (31 meters) to final corrected landing distance.
EXAMPLE:

1. Dry Runway Actual Landing Distance . . . . . . 5,000 Ft (1,524 M)
2. Factored Landing Field Length (Dry) . . . . . . 8,333 Ft (2,540 M)
3. Factored Landing Field Length (Wet) . . . . . . 9,583 Ft (2,921 M)

NOTE:
The Factored Dry Runway Landing Field Length determined from this chart is equal to the Dry Runway Actual Landing Distance divided by 0.60.

The Factored Wet Runway Landing Field Length determined from this chart is equal to the Dry Runway Actual Landing Distance multiplied by 1.92 (factored dry distance x 1.15).
# SECTION VI — WEIGHT AND BALANCE DATA

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INTRODUCTION

This section contains data and procedures enabling the aircraft operator to maintain weight and balance of the aircraft within the prescribed envelope. It is the responsibility of the operator to ensure that the aircraft is loaded properly. A separate data package, which is specific to a particular aircraft serial number, is provided by the manufacturer at time of initial aircraft delivery. This package includes the aircraft equipment list, the aircraft weighing record, and a payload moments chart. It is the responsibility of the aircraft owner and operator to update this data package when required by aircraft changes.

WEIGHT AND CENTER-OF-GRAVITY LIMITS

NOTE

The Normal Empty Weight Center of Gravity may be aft of the Flight Limit.

The center-of-gravity of the airplane for all flight and ground conditions must be maintained within the applicable figure entitled CENTER-OF-GRAVITY ENVELOPE, this section.
Weight and Balance Data

CENTER-OF-GRAVITY ENVELOPE

EFFECTIVITY

Aircraft 45-002 & Subsequent
modified by SB 45-11-4

![Graph showing Center-of-Gravity Envelope](image-url)

- Max Ramp Weight: 21,750 lb (9865 kg)
- Max Takeoff Weight: 21,500 lb (9752 kg)
- Max Landing Weight: 19,200 lb (8709 kg)
- Max Zero Fuel Weight: 16,000 lb (7258 kg)
- Min Flight Weight: 14,000 lb (6350 kg)
- Max Takeoff Weight: 21,500 lb (9752 kg)
- Max Landing Weight: 19,200 lb (8709 kg)
- Max Zero Fuel Weight: 16,000 lb (7258 kg)
- Min Flight Weight: 14,000 lb (6350 kg)

**Figure 6-1.3**
# Weight and Balance Data

## Dimensional Data

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Figure 6-2
Weight and Balance Data

LINEAR CONVERSIONS

- To convert from centimeters to inches, find, in the bold face columns, the number of centimeters to be converted. The equivalent number of inches is read in the adjacent column headed INCHES.
- To convert from inches to centimeters, find, in the bold face columns, the number of inches to be converted. The equivalent number of centimeters is read in the adjacent column headed CENTIMETERS.

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VOLUME CONVERSIONS

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- To convert from gallons to liters, find, in the bold face columns, the number of gallons to be converted. The equivalent number of liters is read in the adjacent column headed LITERS.

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Figure 6-4

FM-126
FAA Approved 5-19-2004
**WEIGHT CONVERSIONS**

- To convert from kilograms to pounds, find, in the bold face columns, the number of kilograms to be converted. The equivalent number of pounds is read in the adjacent column headed POUNDS.
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Figure 6-5
LOADING INSTRUCTIONS

It is the responsibility of the pilot to see that this aircraft is loaded within the weight and C.G. limits. The loading form (figure 6-6) may be used.

1. Enter the aircraft’s BASIC EMPTY WEIGHT and MOMENT from the current weighing record.
2. Enter the payload weights and moments (crew, passengers, provisions, baggage, etc.) using the Payload Moments Charts provided in the aircraft’s weight and balance data package.
3. Compute the ZERO FUEL WEIGHT and MOMENT (OPERATING WEIGHT values plus Passenger and Baggage values).
4. Enter the fuel weights and moments using the Fuel Moments Charts, figure 6-9.
5. Compute RAMP WEIGHT and MOMENT (ZERO FUEL WEIGHT values plus fuel values).
6. Compute TAKEOFF WEIGHT and MOMENT (RAMP WEIGHT values minus Taxi Burnoff out of wings).
7. Compare TAKEOFF WEIGHT and MOMENT with weight and C.G. limits from Weight-Moment-C.G. Envelope, figure 6-7, or Center-of-Gravity Table, figure 6-8. If not within limits, reduce weight or rearrange load as required to obtain weight and C.G. within limits.
8. LANDING WEIGHT and MOMENT may be calculated by adding the fuel weight and moment remaining at the destination to the ZERO FUEL WEIGHT.
9. The formula to calculate the C.G. in % MAC is:

\[
C.G. \text{ in } \% \text{ MAC} = \frac{\text{Fuselage Station} - 413.77 \text{ in}}{87.22 \text{ in}} \times 100
\]

or

\[
C.G. \text{ in } \% \text{ MAC} = \frac{\text{Fuselage Station} - 10,510 \text{ mm}}{2215 \text{ mm}} \times 100
\]
**AIRCRAFT LOADING FORM**

Interior Configuration ________________________________

Missing or Additional Equipment ________________________________

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| Baggage — Cabin            |        |      |          |       |
| Baggage — Tailcone         |        |      |          |       |
| Passenger 1                |        |      |          |       |
| Passenger 2                |        |      |          |       |
| Passenger 3                |        |      |          |       |
| Passenger 4                |        |      |          |       |
| Passenger 5                |        |      |          |       |
| Passenger 6                |        |      |          |       |
| Passenger 7                |        |      |          |       |
| Passenger 8                |        |      |          |       |
| Passenger 9                |        |      |          |       |

| ZERO FUEL WEIGHT           |        |      |          |       |
| Fuel — Fuselage & Wing Tanks|        |      |          |       |

| RAMP WEIGHT                |        |      |          |       |
| Taxi Burnoff*              |        |      |          |       |

| TAKEOFF GROSS WEIGHT       |        |      |          |       |

| ZERO FUEL WEIGHT           |        |      |          |       |
| Fuel — Fuselage & Wing Tanks|        |      |          |       |

| LANDING WEIGHT             |        |      |          |       |

* Fuel burnoff is approximately 3.3 pounds per engine per minute.

Figure 6-6
NOTE
The landing gear retraction moment is (minus) 979 inch-pounds.

EFFECTIVITY
Aircraft 45-002 & Subsequent modified by SB 45-11-4

Figure 6-7.3
### Weight and Balance Data

**NOTE**

EFFECTIVITY

Aircraft 45-002 & Subsequent

reflects the ground handling envelope only.

---

#### Weight Limits

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**NOTE**

EFFECTIVITY

Aircraft 45-002 & Subsequent

reflects the ground handling envelope only.

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Figure 6-8.3

Data for weights above 21,500 pounds reflects the ground handling envelope only.
### Usable Fuel Moments

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<th>Moment/1000 In-Pounds</th>
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Figure 6-9
WEIGHING INSTRUCTIONS
Occasional weighing may be required to keep the Basic Empty Weight current. All changes to the aircraft affecting weight and balance are the responsibility of the aircraft operator. For additional detail information relating to weighing and leveling procedures, refer to Maintenance Manual, Chapter 8.

1. The Basic Empty Weight C.G. is established with the wheels down.
2. Fuel should be drained through the drain valves prior to weighing and with the aircraft in level or static position. If unable to drain fuel, refer to the Unusable Fuel Table to determine weight and balance. Unusable and trapped fluids, (Figure 6-10), are included in the basic empty weight.
3. The engine oil must be at full level in each oil tank. Total engine oil is 45 pounds (20.4 kilograms) at Fuselage Station 519.0 in. (13,183 mm).
4. Hydraulic reservoir, accumulators, oxygen bottles and gear shock struts must be filled to normal operating capacities.
5. Determine aircraft configuration at time of weighing. Missing items or items in aircraft (but not part of Basic Empty Weight) should be noted and the final Basic Empty Weight shall be corrected for these items. All items should be in their normal place during weighing.
6. The aircraft must be in a level attitude at the time of weighing.
7. Weighing should always be made in an enclosed area free of drafts. The scales used should be properly certified and calibrated.
8. Weighing the aircraft on jacks.
   a. Three jackpoints are provided for weighing: Two on the wing at Fuselage Station 468.00 in. (11,887 mm) and one on the forward fuselage at Fuselage Station 158.95 in. (4037 mm).
   b. Leveling is accomplished by adjusting the jacks.
9. Weighing the aircraft on wheels.
   a. Inflate the tires to the proper pressure.
   b. Deflate the shock struts. This is to establish the fuselage station of the centerline of the nose wheel axle. The fuselage station for the nose wheel axle in this condition is 142.15 in. (3611 mm).
   c. Leveling is accomplished by inflating the main gear struts.
d. Measure the perpendicular distance between the nose and main gear axle center lines. Add this measurement to the nose gear axle position (Fuselage Station 142.15 in. [6311 mm]) to obtain the main gear fuselage station.

e. Substitute the nose and main gear stations for the jackpot stations on the Aircraft Weighing Record and proceed as in jackpot weighing.
UNUSABLE AND TRAPPED FLUIDS

The basic empty weight includes full oil, trapped, sump, and unusable fuel. If the aircraft is weighed after draining the fuel and oil, the sump and unusable fuel and drainable oil must be added to the “as weighed” condition to obtain the basic empty weight.

When the aircraft is weighed with completely dry fuel and drained oil systems, the trapped, sump, and unusable fuel and drainable oil weight and moment must be added to the “as weighed” condition to obtain the basic empty weight of the aircraft. This dry fuel condition would occur only if the fuel system were purged.

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<th>Arm</th>
<th>Moment</th>
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### TABLE I

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* Jackpoint stations for electronic scales weighing.

Figure 6-11

FM-126
FAA Approved 5-19-2004
Log of Supplements

**LOG OF SUPPLEMENTS**

Assigned to Aircraft Serial Number ____________

This list is intended to assist the flight crew in determining the applicable AFM supplements for the assigned aircraft. Only those supplements which apply to the assigned aircraft need be listed here. It is the responsibility of the aircraft owner and operator to maintain this list. Insert this list behind the AFM SUPPLEMENTS & APPENDICES divider tab.

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*Continued*
Contaminated Runway Data

45-002 thru 45-2000 when modified by SB 45-72-1 (TFE731-20BR-1B Engine Upgrade)

U.S. Units

Reissue 5-19-2004
CONTAMINATED RUNWAY DATA

The performance information in this addendum is not FAA approved. These data represent the best available information for planning and use during operations on contaminated runway surfaces. Data were derived by calculation methods which are recognized as aviation industry standards. The use of this information will enhance the safety of operations on contaminated runways.

The effectivity codes used in this addendum are identical to the effectivity codes used in the basic airplane flight manual. For an explanation of the effectivity codes, refer to FLIGHT MANUAL PERFORMANCE DATA in the AFM introduction.

Refer to Section V, PERFORMANCE DATA, in the AFM for data not covered in this section.

Other Learjet publications and documents referenced in this addendum are as follows:

SB 45-11-4  Increase Maximum Takeoff Weight to 21,500 Pounds.
SB 45-22-4  Honeywell Phase III Software Upgrade.
SB 45-72-1  TFE731-20BR-1B Engine Upgrade.
SB 45-76-2  Thrust Reverser Max Thrust Credit.

CUSTOMIZING THE ADDENDUM FOR U.S. OR METRIC UNITS

This addendum may be customized so that data is presented in terms of U.S. units or metric units. This addendum is supplied with both sets of pages (U.S. and metric).

Usually if the airplane fuel quantity indicating system is configured to display pounds, this addendum would be customized to retain the U.S. units presentation while discarding the metric units. If the airplane fuel quantity indicating system is configured to display kilograms, this addendum would be customized to retain the metric units presentation while discarding the U.S. units.
### LIST OF EFFECTIVE PAGES

Use this page to determine the current status of this document. Pages affected by the current change are indicated by an asterisk (*) immediately preceding the page number.

Dates of issue for original and changed pages are:
- **Original** .......................... O ........................ 1 May 1998
- **Reissued** .......................... 14 May 2001
- **Reissued** .......................... 19 May 2004

This list shows the aircraft applicability of the pages in this addendum. Only the pages applicable to the aircraft assigned to this addendum must be retained. Pages not applicable to the aircraft may be removed.

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LOEP-6

S-19-2004
Contaminated Runway Data

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## Contaminated Runway Takeoff Data, Flaps — 20°

### Moderate Contaminant Depth (Flaps — 20°)

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Contaminated Runway Performance Data

GENERAL

The following information and procedures have been prepared by Learjet for use when operating on runway surfaces contaminated by standing water, slush, loose snow, compacted snow or ice.

- The data have been prepared using industry accepted calculations to determine the effects of contaminated runway surfaces on the accelerating ground roll and braking ground roll. The effects of actual conditions may differ from those used to establish this data.
- The level of safety is decreased when operating on contaminated runways, therefore, every effort should be made to ensure that the runway surface is cleared adequately of any significant precipitation.
- Contaminated runway performance data were calculated assuming that the runway is completely contaminated, with the contaminant (standing water, slush, or snow) to be of uniform depth and density.
- When operating on contaminated runways, ground handling characteristics will not be as good as can be achieved on dry runways. The variability of surface conditions, particularly crosswinds, should be taken into consideration. If directional control reduces while in reverse thrust, reduce reverse thrust to reverse idle or stow the reversers to improve directional control. Reverse thrust may be reapplied after directional control is reestablished.
DEFINITION OF RUNWAY CONDITIONS

STANDING WATER, SLUSH OR LOOSE SNOW

A runway is considered to be contaminated when more than 25% of the runway surface (whether in isolated areas or not), within the required length and width being used, is covered by more than 1/8 inch (3 mm) of standing water or by slush or loose snow, equivalent to more than 1/8 inch (3 mm) of water.

COMPACTED SNOW

A runway is considered to be contaminated by compacted snow when covered by snow which has been compacted into a solid mass which resists further compression and will hold together or break into lumps if picked up.

WET ICE

A runway is considered to be contaminated when braking action is expected to be very low, due to the presence of wet ice.

TAKEOFF FROM CONTAMINATED RUNWAYS

Distances for runways contaminated with standing water, slush, loose snow, compacted snow or wet ice have been calculated assuming that the runway is completely contaminated. However, selection of the type and amount of contaminant should be based on the runway conditions where the high speed portion of the takeoff will occur and, in the case of an ice covered runway, where braking would be used during a rejected takeoff.

STANDARD PERFORMANCE CONDITIONS

All contaminated runway takeoff performance is based on the following performance conditions:

- Rudder Boost - ON
- Anti-Skid System - ON
- APR/Autospoilers - ARMED
- Thrust Reversers:
  - Aircraft not modified by SB 45-76-2 or SB 45-22-4 — Idle deploy or stowed.
  - Aircraft modified by SB 45-76-2 or SB 45-22-4 — Maximum or stowed.

NOTE

To account for reduced braking coefficients during initial takeoff power setting, release brakes and rapidly move thrust levers into the takeoff detent.
Contaminated Runway Data

Bombardier Learjet 45

Contaminated runway charts are provided for four different runway conditions:

- Moderate contaminant depths of standing water, slush and loose snow.
- Heavy contaminant depths of standing water, slush and loose snow.
- Compacted snow.
- Wet ice.

**Takeoff Contaminant Depths**

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The CONTAMINATED RUNWAY TAKEOFF FIELD LENGTH, CONTAMINATED RUNWAY TAKEOFF SPEED and CONTAMINATED RUNWAY TARGET TAKEOFF PITCH ATTITUDE charts are presented for 8° and 20° flap settings (rudder boost ON, anti-skid ON, and APR/autospoilers ARMED). The takeoff distances, speeds and target pitch attitudes are shown in terms of altitude, temperature, and weight.
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<td>40</td>
<td>18,000</td>
</tr>
</tbody>
</table>

#### Contaminant Depths

- **Contaminant Moderated:**
  - Standing Water
  - Slush
  - Loose Snow (Wet)

- **Contaminant Moderate:**
  - Snow (Dry)

This table was prepared for the following conditions:

- Flaps — 8°
- Anti-Ice — Off
- Runway Surface — Contaminated
- Moderate Depth

For conditions other than these, apply the result from this table to the correction chart in Figure 2.3

---

Figure 1.4

5-19-2004
This chart was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated
  Moderate Depth
- Anti-Ice — Off

**EXAMPLE:**

1. Uncorrected Takeoff Field Length
   (from table) . . . . . . . . . . . 6,600 ft (2,012 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . STOWED
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . 1,500 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . 7,920 ft (2,414 m)

**Figure 2.3**
### Uncorrected Takeoff Field Length

<table>
<thead>
<tr>
<th>WT C</th>
<th>WT</th>
<th>WT</th>
<th>WT</th>
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<th>WT</th>
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</thead>
<tbody>
<tr>
<td>4830</td>
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<td>5290</td>
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</tr>
<tr>
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<td>18,000</td>
<td>18,000</td>
</tr>
<tr>
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<td>19,000</td>
<td>19,000</td>
<td>19,000</td>
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<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
<td>20,000</td>
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### Contaminant Depths

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<td>7620</td>
<td>7920</td>
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<td>7790</td>
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<td>8450</td>
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<td>8540</td>
<td>8880</td>
<td>11460</td>
</tr>
<tr>
<td>7650</td>
<td>7980</td>
<td>8320</td>
<td>8650</td>
<td>9080</td>
<td>11110</td>
</tr>
<tr>
<td>7680</td>
<td>7990</td>
<td>8320</td>
<td>8650</td>
<td>9080</td>
<td>11110</td>
</tr>
</tbody>
</table>

### Effectivity Level

<table>
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<tr>
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<th>APR</th>
<th>APR</th>
<th>APR</th>
<th>APR</th>
</tr>
</thead>
<tbody>
<tr>
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<td>6580</td>
<td>6830</td>
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<td>6870</td>
<td>7140</td>
<td>7410</td>
<td>7700</td>
<td>8040</td>
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### Rudder Boost

<table>
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<th>APR</th>
<th>APR</th>
<th>APR</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-19-2004</td>
<td>6A.4</td>
<td>6A.4</td>
<td>6A.4</td>
<td>6A.4</td>
<td>6A.4</td>
</tr>
</tbody>
</table>

### Anti-Skid

<table>
<thead>
<tr>
<th>APR</th>
<th>APR</th>
<th>APR</th>
<th>APR</th>
<th>APR</th>
<th>APR</th>
</tr>
</thead>
<tbody>
<tr>
<td>12,000</td>
<td>14,000</td>
<td>18,000</td>
<td>14,000</td>
<td>18,000</td>
<td>20,000</td>
</tr>
<tr>
<td>8830</td>
<td>9200</td>
<td>9610</td>
<td>10190</td>
<td>11200</td>
<td>12840</td>
</tr>
<tr>
<td>9400</td>
<td>9820</td>
<td>10280</td>
<td>10970</td>
<td>12270</td>
<td>14,000</td>
</tr>
</tbody>
</table>

### Anti-Ice

<table>
<thead>
<tr>
<th>APR</th>
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<th>APR</th>
<th>APR</th>
<th>APR</th>
<th>APR</th>
</tr>
</thead>
<tbody>
<tr>
<td>14,000</td>
<td>18,000</td>
<td>18,000</td>
<td>18,000</td>
<td>18,000</td>
<td>18,000</td>
</tr>
<tr>
<td>8640</td>
<td>9020</td>
<td>9410</td>
<td>10190</td>
<td>11200</td>
<td>12840</td>
</tr>
<tr>
<td>8830</td>
<td>9200</td>
<td>9610</td>
<td>10190</td>
<td>11200</td>
<td>12840</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- Flap = 8
- Anti-spoilers = Armed
- Ruiler Boost = On
- Rudder Boost = Max
- Anti-snow = Contaminated

#### NOTE:

- The VASOS-EF length table for "Contaminated, Normal Depth" was used for this table.
- For conditions other than these, apply the results from the table to the correct chart in Figure 28.3.
This chart was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated Moderate Depth
- Anti-Ice — On

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . . . . . . .6,600 ft (2,012 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . . . . . . STOWED
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . 1,500 ft
9. Corrected Takeoff Field Length . . . . . . .7,920 ft (2,414 m)
Contaminated Runway Data

**Contaminated Runway Takeoff Speeds**

**Moderate Contaminant Depth**

FLAPS — 8°

ANTI-ICE — OFF

<table>
<thead>
<tr>
<th>EFFECTIVITY CODE</th>
<th>P</th>
</tr>
</thead>
</table>

**Contaminant Depths**

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing Water</td>
<td>0.125 in (3 mm)</td>
</tr>
<tr>
<td>Slush</td>
<td>0.15 in (3.8 mm)</td>
</tr>
<tr>
<td>Loose Snow (Wet)</td>
<td>0.25 in (6.4 mm)</td>
</tr>
<tr>
<td>Loose Snow (Dry)</td>
<td>0.95 in (24.1 mm)</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Automatic Brakes — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated Moderate Depth
- Anti-Ice — Off
- Thrust Reversers — Max or Stowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots

The following correction must be applied for runway gradient:

- Runway Gradient V1 Correction
- ATF Correction

**Figure 3.4**
### Contaminated Runway Data

#### Takeoff Speeds

<table>
<thead>
<tr>
<th>Contaminant Depth</th>
<th>Flaps — 8°</th>
<th>APR — Armed</th>
<th>Autospoilers — Armed</th>
<th>Rudder Boost — On</th>
<th>Anti-Skid — On</th>
<th>Runway Surface — Contaminated</th>
<th>Moderate Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Contaminant Depths

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>MODERATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDING WATER</td>
<td>0.125 in (3 mm)</td>
</tr>
<tr>
<td>LOOSE SNOW (WET)</td>
<td>0.25 in (6.4 mm)</td>
</tr>
<tr>
<td>LOOSE SNOW (DRY)</td>
<td>0.95 in (24.1 mm)</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated
- Moderate Depth
- Anti-Ice — On
- Thrust Reversers — Max or Stowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots

The following correction must be applied for runway gradient:

<table>
<thead>
<tr>
<th>Runway Gradient</th>
<th>Anti-Ice Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>+0.5% (uphill)</td>
<td>+0.5% (uphill)</td>
</tr>
<tr>
<td>-0.5% (downhill)</td>
<td>-0.5% (downhill)</td>
</tr>
</tbody>
</table>

**NOTE:** The TAKEOFF SPEEDS table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.
### Contaminated Runway Data

#### Contaminated Runway Target Takeoff Pitch Attitude — Degrees

<table>
<thead>
<tr>
<th>ALT (FT)</th>
<th>-40</th>
<th>-20</th>
<th>0</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000</td>
<td>16</td>
<td>16</td>
<td>15</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>1,500</td>
<td>15</td>
<td>15</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
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<td>2,000</td>
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<td>14</td>
</tr>
<tr>
<td>2,500</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
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<td>12</td>
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<td>12</td>
</tr>
<tr>
<td>4,000</td>
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<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>4,500</td>
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<td>9</td>
<td>9</td>
<td>9</td>
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</tr>
<tr>
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<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>6,500</td>
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<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

#### Contaminant Depths

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing Water</td>
<td>0.125 in (3 mm)</td>
</tr>
<tr>
<td>Slush</td>
<td>0.15 in (3.8 mm)</td>
</tr>
<tr>
<td>Loose Snow (Wet)</td>
<td>0.25 in (6.4 mm)</td>
</tr>
<tr>
<td>Loose Snow (Dry)</td>
<td>0.95 in (24.1 mm)</td>
</tr>
</tbody>
</table>

**Note:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

---

**Figure 4.4**

Contaminated Runway Target Takeoff Pitch Attitudes — Degrees

**Contaminated Runway Takeoff Speeds**

**Effectiveness Code**

This table was prepared for the same conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table.

**STANDING WATER**

**SLUSH**

**LOOSE SNOW (WET)**

**LOOSE SNOW (DRY)**

This table was prepared for the same conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table.

**Note:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

---

**Figure 4.4**

8.4
### Contaminated Runway Data

Contaminated Runway Target Takeoff Pitch Attitude

<table>
<thead>
<tr>
<th>Contaminant Depth</th>
<th>Pitch Attitude</th>
</tr>
</thead>
<tbody>
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<td>Standing Water</td>
<td>10°</td>
</tr>
<tr>
<td>Slush</td>
<td>10°</td>
</tr>
<tr>
<td>Loose Snow (Wet)</td>
<td>10°</td>
</tr>
<tr>
<td>Loose Snow (Dry)</td>
<td>10°</td>
</tr>
<tr>
<td>Standing Water</td>
<td>10°</td>
</tr>
<tr>
<td>Slush</td>
<td>10°</td>
</tr>
<tr>
<td>Loose Snow (Wet)</td>
<td>10°</td>
</tr>
<tr>
<td>Loose Snow (Dry)</td>
<td>10°</td>
</tr>
</tbody>
</table>

### Notes:
- The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.
- The TARGET TAKEOFF PITCH ATTITUDE table for anti-ice ON must be used whenever NAC Anti-Ice, Wing/STAB Anti-Ice or both are ON.

---

Figure 4A.4

5-19-2004

8A.4
### Contaminated Runway Data

**UNCORRECTED TAKEOFF FIELD LENGTH — FT**

<table>
<thead>
<tr>
<th>ALT (FT)</th>
<th>WT (LB)</th>
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<th>TEMPERATURE</th>
</tr>
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<td></td>
<td></td>
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</tr>
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<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

**CONTAIMGN DEPTHS**

<table>
<thead>
<tr>
<th>CONTAMINANT</th>
<th>DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing Water</td>
<td>0.25 in (6 mm)</td>
</tr>
<tr>
<td>Slush</td>
<td>0.30 in (7.6 mm)</td>
</tr>
<tr>
<td>Loose Snow</td>
<td>0.50 in (12.7 mm)</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- **Flaps** — 8°
- **APR** — Armed
- **Autospoilers** — Armed
- **Rudder Boost** — On
- **Anti-Skid** — On
- **Runway Surface** — Contaminated
- **Anti-Ice** — Off
- **Thrust Reversers** — Max*
- **Zero Wind**
- **Zero Runway Gradient** *

* For conditions other than these, apply the result from this table to the correction chart in Figure 6.3

---

Figures in shaded area are above engine temperature limits and are provided for interpolation only.

---

**Figure 5.4**
This chart was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated
- Heavy Depth
- Anti-Ice — Off

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 6,700 ft (2,045 m)
2. Tailwind . . . . . . . . . . . . . . . . . . . . . . . . . 5 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . . . . . MAX
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . 6,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . 8,020 ft (2,445 m)
Contaminated Runway Data

<table>
<thead>
<tr>
<th>CONTAMINATED RUNWAY</th>
<th>TAKEOFF FIELD LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Contaminant Depth</td>
<td>Flaps — 8°</td>
</tr>
<tr>
<td></td>
<td>Anti-Ice — On</td>
</tr>
</tbody>
</table>

### EFFECTIVITY CODE

- **Armed**
- **Max**
- **Zero**

**CONTAMINANT DEPTHS**

- **STANDING WATER**: 0.25 in (6 mm)
- **SLUSH**: 0.30 in (7.6 mm)
- **LOOSE SNOW (WET)**: 0.50 in (12.7 mm)
- **LOOSE SNOW (DRY)**: 1.90 in (48.3 mm)

This table was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated
- Heavy Depth
- Anti-Ice — On
- Thrust Reversers — Max*
- Zero Wind* 
- Zero Runway Gradient *

* For conditions other than these, apply the result from this table to the correction chart in Figure 6B.3

**NOTE:** The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-ice, WING/STAB Anti-ice or both are on.

---

Contaminated Runway Data (Table)

### UNCORRECTED TAKEOFF FIELD LENGTH — FT

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Ft</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>40°F</td>
<td>14,000</td>
<td>678</td>
<td>6584</td>
<td>6305</td>
<td>6475</td>
<td>7070</td>
<td>7150</td>
<td>7300</td>
<td>7450</td>
<td>7600</td>
</tr>
<tr>
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<td>14,000</td>
<td>678</td>
<td>6584</td>
<td>6305</td>
<td>6475</td>
<td>7070</td>
<td>7150</td>
<td>7300</td>
<td>7450</td>
<td>7600</td>
</tr>
<tr>
<td>136°F</td>
<td>14,000</td>
<td>678</td>
<td>6584</td>
<td>6305</td>
<td>6475</td>
<td>7070</td>
<td>7150</td>
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<td>169°F</td>
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<td>7450</td>
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<td>6584</td>
<td>6305</td>
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<td>7450</td>
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<td>268°F</td>
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<td>7150</td>
<td>7300</td>
<td>7450</td>
<td>7600</td>
</tr>
</tbody>
</table>

**NOTE:** The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-ice, WING/STAB Anti-ice or both are on.
This chart was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated Heavy Depth
- Anti-Ice — On

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) . . . . 6,700 ft (2,045 m)
2. Tailwind . . . . . . . . . . . . . . . . . . 5 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . MAX
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . 6,000 ft
9. Corrected Takeoff Field Length . . . . . 8,020 ft (2,445 m)
<table>
<thead>
<tr>
<th>Conditions</th>
<th>V1 Correction</th>
<th>Knots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Runway</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following corrections must be applied for the following conditions:

- Flutter, Cross-Wind, Adequate, Runway Surface - Contaminated
- Engine Temperature
- Engine Oil Temperature
- Engine Oil Temperature
- Engine Oil Temperature
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- Engine Oil Temperature
- Engine Oil Temperature
- Engine Oil Temperature
- Engine Oil Temperature
- Engine Oil Temperature
- Engine Oil Time
### Contaminated Runway Data

#### Contaminated Runway Takeoff Speeds

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Heavy Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing Water</td>
<td>0.25 in (6 mm)</td>
</tr>
<tr>
<td>Loose Snow (Wet)</td>
<td>0.50 in (12.7 mm)</td>
</tr>
<tr>
<td>Loose Snow (Dry)</td>
<td>1.90 in (48.3 mm)</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:
- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated
- Anti-ice — On
- Thrust Reversers — Max or Stowed

The following corrections must be applied for wind and runway gradient:

<table>
<thead>
<tr>
<th>Wind — Ktas</th>
<th>VI Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headwind/Vtail</td>
<td>5</td>
</tr>
<tr>
<td>5-19-2004 12A.4</td>
<td></td>
</tr>
<tr>
<td>10°</td>
<td>Add 6 knots</td>
</tr>
<tr>
<td>20°</td>
<td>Add 11 knots</td>
</tr>
<tr>
<td>30°</td>
<td>Add 17 knots</td>
</tr>
<tr>
<td>40°</td>
<td>Add 23 knots</td>
</tr>
<tr>
<td>50°</td>
<td>Add 29 knots</td>
</tr>
<tr>
<td>60°</td>
<td>Add 35 knots</td>
</tr>
</tbody>
</table>

**NOTE:** The TAKEOFF SPEEDS table for anti-ice ON must be used whenever NAC Anti-ice, WING/STAB Anti-ice or both are ON.

---

### Figure 8A.4
### Target Takeoff Pitch Attitude — Degrees

#### Table of Target Takeoff Pitch Attitude

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Target Takeoff Pitch Attitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>-80°F to -10°F</td>
<td>13°</td>
</tr>
<tr>
<td>-10°F to -12°F</td>
<td>14°</td>
</tr>
<tr>
<td>-12°F to -14°F</td>
<td>15°</td>
</tr>
<tr>
<td>-14°F to -16°F</td>
<td>16°</td>
</tr>
<tr>
<td>-16°F to -18°F</td>
<td>17°</td>
</tr>
<tr>
<td>-18°F to -20°F</td>
<td>18°</td>
</tr>
<tr>
<td>-20°F to -22°F</td>
<td>19°</td>
</tr>
<tr>
<td>-22°F to -24°F</td>
<td>20°</td>
</tr>
<tr>
<td>-24°F to -26°F</td>
<td>21°</td>
</tr>
<tr>
<td>-26°F to -28°F</td>
<td>22°</td>
</tr>
<tr>
<td>-28°F to -30°F</td>
<td>23°</td>
</tr>
<tr>
<td>-30°F to -32°F</td>
<td>24°</td>
</tr>
<tr>
<td>-32°F to -34°F</td>
<td>25°</td>
</tr>
<tr>
<td>-34°F to -36°F</td>
<td>26°</td>
</tr>
<tr>
<td>-36°F to -38°F</td>
<td>27°</td>
</tr>
<tr>
<td>-38°F to -40°F</td>
<td>28°</td>
</tr>
<tr>
<td>-40°F to -42°F</td>
<td>29°</td>
</tr>
<tr>
<td>-42°F to -44°F</td>
<td>30°</td>
</tr>
<tr>
<td>-44°F to -46°F</td>
<td>31°</td>
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<tr>
<td>-46°F to -48°F</td>
<td>32°</td>
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<td>-48°F to -50°F</td>
<td>33°</td>
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<td>34°</td>
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<td>-52°F to -54°F</td>
<td>35°</td>
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<td>-54°F to -56°F</td>
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<td>37°</td>
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<td>-58°F to -60°F</td>
<td>38°</td>
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<td>-60°F to -62°F</td>
<td>39°</td>
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<td>-62°F to -64°F</td>
<td>40°</td>
</tr>
<tr>
<td>-64°F to -66°F</td>
<td>41°</td>
</tr>
<tr>
<td>-66°F to -68°F</td>
<td>42°</td>
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<td>-68°F to -70°F</td>
<td>43°</td>
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<td>-70°F to -72°F</td>
<td>44°</td>
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<tr>
<td>-72°F to -74°F</td>
<td>45°</td>
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<tr>
<td>-74°F to -76°F</td>
<td>46°</td>
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<td>-76°F to -78°F</td>
<td>47°</td>
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<tr>
<td>-78°F to -80°F</td>
<td>48°</td>
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<td>-80°F to -82°F</td>
<td>49°</td>
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<td>-82°F to -84°F</td>
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<td>51°</td>
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<td>-86°F to -88°F</td>
<td>52°</td>
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<td>-88°F to -90°F</td>
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<tr>
<td>-90°F to -92°F</td>
<td>54°</td>
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<tr>
<td>-92°F to -94°F</td>
<td>55°</td>
</tr>
<tr>
<td>-94°F to -96°F</td>
<td>56°</td>
</tr>
<tr>
<td>-96°F to -98°F</td>
<td>57°</td>
</tr>
<tr>
<td>-98°F to -100°F</td>
<td>58°</td>
</tr>
</tbody>
</table>

#### Contaminated Runway Data

### Contaminant Depths

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Heavy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing Water</td>
<td>0.25 in (6 mm)</td>
</tr>
<tr>
<td>Slush</td>
<td>0.25 in (6 mm)</td>
</tr>
<tr>
<td>Loose Snow (Wet)</td>
<td>0.50 in (12.7 mm)</td>
</tr>
<tr>
<td>Loose Snow (Dry)</td>
<td>1.90 in (48.3 mm)</td>
</tr>
</tbody>
</table>

This table was prepared for the same conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table.

**Note:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

---

Figures in shaded areas are engine temperature limits and are provided for interpolation only.

---

Contaminated Runway Data

#### Figure 9.4
Contaminated Runway Data

### Contaminated Runway

**Target Takeoff Pitch Attitude — Degrees**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Altitude (FT)</th>
<th>Weight (LB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1000</td>
<td>1200</td>
</tr>
<tr>
<td>0°F</td>
<td>10°F</td>
<td>-20°F</td>
</tr>
</tbody>
</table>

#### Heavy Contaminant Depth

<table>
<thead>
<tr>
<th>Altitude (FT)</th>
<th>Standing Water (in)</th>
<th>Loose Snow (Wet) (in)</th>
<th>Loose Snow (Dry) (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>0.25</td>
<td>0.50</td>
<td>1.90</td>
</tr>
<tr>
<td>15,000</td>
<td>0.25</td>
<td>0.50</td>
<td>1.90</td>
</tr>
<tr>
<td>20,000</td>
<td>0.25</td>
<td>0.50</td>
<td>1.90</td>
</tr>
</tbody>
</table>

This table was prepared for the same conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table.

**NOTE:**
- The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled $V_2$ speed at a height of 35 feet above the runway. Maintain $V_2$ once achieved. Small pitch attitude changes may be required to maintain $V_2$.
- The **TARGET TAKEOFF PITCH ATTITUDE** table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

Figure 9A.4
<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Takeoff Field Length (FT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40</td>
<td>14,000</td>
</tr>
<tr>
<td>-30</td>
<td>15,000</td>
</tr>
<tr>
<td>-20</td>
<td>15,000</td>
</tr>
<tr>
<td>-10</td>
<td>15,000</td>
</tr>
<tr>
<td>0</td>
<td>15,000</td>
</tr>
<tr>
<td>10</td>
<td>15,000</td>
</tr>
<tr>
<td>20</td>
<td>15,000</td>
</tr>
<tr>
<td>30</td>
<td>17,000</td>
</tr>
<tr>
<td>40</td>
<td>17,000</td>
</tr>
<tr>
<td>50</td>
<td>17,000</td>
</tr>
<tr>
<td>60</td>
<td>17,000</td>
</tr>
<tr>
<td>70</td>
<td>17,000</td>
</tr>
<tr>
<td>80</td>
<td>17,000</td>
</tr>
<tr>
<td>90</td>
<td>17,000</td>
</tr>
<tr>
<td>100</td>
<td>17,000</td>
</tr>
<tr>
<td>110</td>
<td>17,000</td>
</tr>
<tr>
<td>120</td>
<td>17,000</td>
</tr>
<tr>
<td>130</td>
<td>17,000</td>
</tr>
<tr>
<td>140</td>
<td>17,000</td>
</tr>
<tr>
<td>150</td>
<td>17,000</td>
</tr>
<tr>
<td>160</td>
<td>17,000</td>
</tr>
<tr>
<td>170</td>
<td>17,000</td>
</tr>
<tr>
<td>180</td>
<td>17,000</td>
</tr>
<tr>
<td>190</td>
<td>17,000</td>
</tr>
<tr>
<td>200</td>
<td>17,000</td>
</tr>
</tbody>
</table>

**Notes:**
- Rudder Boost - On
- Anti-Skid - On
- Zero Runway Gradient
- TAF - Armed
- Autopilots - Armed
- Runway Surface - Compacted Snow

**Conditions:**
- ARMED suites apply the result from this table to the correction chart in Figure 11.3
This chart was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Compacted Snow
- Anti-Ice — Off

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 7,400 ft (2,256 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . . 6 kt
3. Runway Gradient . . . . . . . . . . . . . . . . . +1.0% (UP)
4. Thrust Reverser Reference Line . . . . . . . . . . . STOWED
5. Altitude Reference Line . . . . . . . . . . . . . . . . . . . . . . . 1,500 ft
6. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . . . 9,680 ft (2,950 m)
Contaminated Runway Data

### Contaminated Runway Takeoff Field Length

**Compacted Snow**

<table>
<thead>
<tr>
<th>FLAPS — 8°</th>
<th>ANTI-ICE — ON</th>
</tr>
</thead>
</table>

**EFFECTIVITY CODE**

*For conditions other than these, apply the result from this table to the correction chart in Figure 11B.3*

**NOTE:** The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

---

**This table was prepared for the following conditions:**

- **Flaps — 8°**
- **APR — Armed**
- **Autospoilers — Armed**
- **Rudder Boost — On**
- **Runway Surface — Compact Snow**
- **Anti-Ice — On**
- **Thrust Reversers — Max**
- **Zero Wind**
- **Zero Runway Gradient**

---

**Figure 11A.4**

---

**Contaminated Runway Data**

---

**Figure 11A.4**
This chart was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Compacted Snow
- Anti-Ice — On

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) ........... 7,400 ft (2,256 m)
2. Headwind ........................................ 6 kt
3. Runway Gradient Reference Line
4. Runway Gradient .................................. +1.0% (UP)
5. Thrust Reverser Reference Line
6. Thrust Reverser ................................. STOWED
7. Altitude Reference Line
8. Altitude ............................................ 1,500 ft
9. Corrected Takeoff Field Length ................. 9,680 ft (2,950 m)
### Contaminated Runway Data

<table>
<thead>
<tr>
<th>ALT (FT)</th>
<th>WT (LB)</th>
<th>Temperature (°F)</th>
<th>Takeoff Speeds (KIAS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>14,000</td>
<td>100</td>
<td>105 105 105 105</td>
<td>190 105 105 105</td>
</tr>
<tr>
<td>15,000</td>
<td>100</td>
<td>105 105 105 105</td>
<td>190 105 105 105</td>
</tr>
<tr>
<td>16,000</td>
<td>100</td>
<td>105 105 105 105</td>
<td>190 105 105 105</td>
</tr>
<tr>
<td>17,000</td>
<td>100</td>
<td>105 105 105 105</td>
<td>190 105 105 105</td>
</tr>
</tbody>
</table>

### Effectivity Code

- **P**

This table was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Compacted Snow
- Anti-Ice — Off
- Thrust Reversers — Max or Stowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

Figure 12.4
Contaminated Runway Data

This table was prepared for the following conditions:

- Flaps — 8°
- Autospoilers — Armed
- Anti-Skid — On
- Rudder Boost — On
- Anti-Ice — On
- Thrust Reversers — Max or Stowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -2.4% (downhill) and +2.4% (uphill)

NOTE: The TAKEOFF SPEEDS table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

![Figure 12A.4](image-url)
### Contaminated Runway Data

#### Compacted Snow

**TARGET TAKEOFF PITCH ATTITUDE — DEGREES**

<table>
<thead>
<tr>
<th>ALT FT</th>
<th>WT LB</th>
<th>1000</th>
<th>2000</th>
<th>3000</th>
<th>4000</th>
<th>5000</th>
<th>6000</th>
<th>7000</th>
<th>8000</th>
<th>9000</th>
<th>10000</th>
<th>11000</th>
<th>12000</th>
<th>13000</th>
<th>14000</th>
<th>15000</th>
<th>16000</th>
<th>17000</th>
<th>18000</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,000</td>
<td>15</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
</tr>
<tr>
<td>12,000</td>
<td>16</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
</tr>
<tr>
<td>13,000</td>
<td>17</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
</tr>
<tr>
<td>14,000</td>
<td>18</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
</tr>
<tr>
<td>15,000</td>
<td>19</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
<td>-20</td>
</tr>
</tbody>
</table>

This table was prepared for the same conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table.

**NOTE:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

---

**Figure 13.4**

5-19-2004  17.4
Contaminated Runway Data

Contaminated Runway Target Takeoff Pitch Attitude - Degrees

This table was prepared for the same conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table.

NOTE: The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

- The TARGET TAKEOFF PITCH ATTITUDE table for anti-ice ON must be used whenever NAC Anti-ice, WING/STAB Anti-Ice or both are ON.

Figure 13A.4
## Contaminated Runway Data

### Wet Ice

#### Takeoff Field Length

<table>
<thead>
<tr>
<th>ALT FT</th>
<th>WT</th>
<th>40</th>
<th>20</th>
<th>10</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>14,000</td>
<td>7</td>
<td>740</td>
<td>730</td>
<td>720</td>
<td>710</td>
<td>700</td>
<td>690</td>
<td>680</td>
<td>670</td>
</tr>
<tr>
<td>15,000</td>
<td>7</td>
<td>800</td>
<td>790</td>
<td>780</td>
<td>770</td>
<td>760</td>
<td>750</td>
<td>740</td>
<td>730</td>
</tr>
<tr>
<td>16,000</td>
<td>7</td>
<td>860</td>
<td>840</td>
<td>830</td>
<td>820</td>
<td>810</td>
<td>800</td>
<td>790</td>
<td>780</td>
</tr>
<tr>
<td>17,000</td>
<td>7</td>
<td>920</td>
<td>900</td>
<td>890</td>
<td>880</td>
<td>870</td>
<td>860</td>
<td>850</td>
<td>840</td>
</tr>
<tr>
<td>18,000</td>
<td>7</td>
<td>980</td>
<td>960</td>
<td>950</td>
<td>940</td>
<td>930</td>
<td>920</td>
<td>910</td>
<td>900</td>
</tr>
<tr>
<td>19,000</td>
<td>7</td>
<td>1040</td>
<td>1020</td>
<td>1010</td>
<td>1000</td>
<td>990</td>
<td>980</td>
<td>970</td>
<td>960</td>
</tr>
<tr>
<td>20,000</td>
<td>7</td>
<td>1100</td>
<td>1080</td>
<td>1070</td>
<td>1060</td>
<td>1050</td>
<td>1040</td>
<td>1030</td>
<td>1020</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet Ice
- Anti-Ice — Off
- Thrust Reversers — Max*
- Zero Wind*

* For conditions other than these, apply the result from this table to the correction chart in Figure 15.3

### Effectivity Code

![Effectivity Code](image)

Figure 14.4

---

5-19-2004  18.4
CONTAMINATED RUNWAY
TAKEOFF FIELD LENGTH CORRECTION CHART
Wet Ice
FLAPS — 8°
ANTI-ICE — OFF

This chart was prepared for the following conditions:
Flaps — 8°
APR — Armed
Autospoilers — Armed
Rudder Boost — On
Anti-Skid — On
Runway Surface — Wet Ice
Anti-Ice — Off

EXAMPLE:
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . 10,400 ft (3,170 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . 1.0% (UP)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . MAX
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . . 300 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . 8,660 ft (2,640 m)

Figure 15.3
Contaminated Runway Data

This table was prepared for the following conditions:

Flaps — 8°
Autospoilers — Armed
Rudder Boost — On
Anti-Skid — On
Runway Surface — Wet Ice
Anti-Ice — On
Thrust Reversers — Max*
Zero Wind*
Zero Runway Gradient *

* For conditions other than these, apply the result from this table to the correction chart in Figure 13B.3

NOTE: The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

Figure 15A.4
This chart was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet Ice
- Anti-Ice — On

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . 10,400 ft (3,170 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . . . . . . . 1.0% (UP)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . . . . . MAX
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . . . 300 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . 8,660 ft (2,640 m)

Figure 15B.3
Contaminated Runway Data

### Contaminated Runway Takeoff Speeds

<table>
<thead>
<tr>
<th>Wet Ice</th>
<th>Flaps — 8°</th>
<th>APR — Armed</th>
<th>AutoSpoilers — Armed</th>
<th>Rudder Boost — On</th>
<th>Anti-Skid — On</th>
<th>Runway Surface — Wet Ice</th>
<th>Anti-Ice — Off</th>
<th>Thrust Reversers — Max or Stowed</th>
<th>Wind — Between -10 (tailwind) and +30 (headwind) knots</th>
<th>Runway Gradient — Between -1.0% (downhill) and +2.4% (uphill)</th>
</tr>
</thead>
</table>

This table was prepared for the following conditions:

- Flaps — 8°
- APR — Armed
- AutoSpoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet Ice
- Anti-Ice — Off
- Thrust Reversers — Max or Stowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -1.0% (downhill) and +2.4% (uphill)

Figure 16.4
### Wet Ice

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>0</th>
<th>-10</th>
<th>-20</th>
<th>-30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift Off Weight (LB)</td>
<td>18,000</td>
<td>17,000</td>
<td>16,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Takeoff Speeds (KIAS)</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Max Thrust Reversers</td>
<td>Max or Stowed</td>
<td>Max or Stowed</td>
<td>Max or Stowed</td>
<td>Max or Stowed</td>
</tr>
<tr>
<td>Anti-Skid</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Rudder Boost</td>
<td>Armed</td>
<td>Armed</td>
<td>Armed</td>
<td>Armed</td>
</tr>
<tr>
<td>Flaps</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

### Sea Level

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>0</th>
<th>-10</th>
<th>-20</th>
<th>-30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift Off Weight (LB)</td>
<td>18,000</td>
<td>17,000</td>
<td>16,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Takeoff Speeds (KIAS)</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Max Thrust Reversers</td>
<td>Max or Stowed</td>
<td>Max or Stowed</td>
<td>Max or Stowed</td>
<td>Max or Stowed</td>
</tr>
<tr>
<td>Anti-Skid</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Rudder Boost</td>
<td>Armed</td>
<td>Armed</td>
<td>Armed</td>
<td>Armed</td>
</tr>
<tr>
<td>Flaps</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

### Pressure Altitude

<table>
<thead>
<tr>
<th>Pressure Altitude (FT)</th>
<th>14,000</th>
<th>15,000</th>
<th>16,000</th>
<th>17,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift Off Weight (LB)</td>
<td>18,000</td>
<td>17,000</td>
<td>16,000</td>
<td>15,000</td>
</tr>
<tr>
<td>Takeoff Speeds (KIAS)</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Max Thrust Reversers</td>
<td>Max or Stowed</td>
<td>Max or Stowed</td>
<td>Max or Stowed</td>
<td>Max or Stowed</td>
</tr>
<tr>
<td>Anti-Skid</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Rudder Boost</td>
<td>Armed</td>
<td>Armed</td>
<td>Armed</td>
<td>Armed</td>
</tr>
<tr>
<td>Flaps</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

**Note:** The TAKEOFF SPEEDS table for anti-ice ON must be used whenever anti-ice ON.
### Contaminated Runway Data

#### TARGET TAKEOFF PITCH ATTITUDE — DEGREES

<table>
<thead>
<tr>
<th>ALT FT</th>
<th>WT LB</th>
<th>ALT FT</th>
<th>WT LB</th>
</tr>
</thead>
<tbody>
<tr>
<td>14,000</td>
<td>10</td>
<td>15,000</td>
<td>15</td>
</tr>
<tr>
<td>14,000</td>
<td>12</td>
<td>15,000</td>
<td>15</td>
</tr>
<tr>
<td>14,000</td>
<td>14</td>
<td>15,000</td>
<td>15</td>
</tr>
<tr>
<td>14,000</td>
<td>16</td>
<td>15,000</td>
<td>15</td>
</tr>
<tr>
<td>14,000</td>
<td>18</td>
<td>15,000</td>
<td>15</td>
</tr>
<tr>
<td>14,000</td>
<td>20</td>
<td>15,000</td>
<td>15</td>
</tr>
</tbody>
</table>

This table was prepared for the same conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table.

**NOTE:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V\(_2\) speed at a height of 35 feet above the runway. Maintain V\(_2\) once achieved. Small pitch attitude changes may be required to maintain V\(_2\).

---

**CONTAMINATED RUNWAY**

**TARGET TAKEOFF PITCH ATTITUDE**

- Wet Ice
- RAPS — 8°
- ANTI-ICE — OFF

**EFFECTIVITY CODE**

### Figure 17.4
### Contaminated Runway Data

**Target Takeoff Pitch Attitude**

<table>
<thead>
<tr>
<th>ALT (FT)</th>
<th>WT (LB)</th>
<th>FLAPS</th>
<th>Temp (°F)</th>
<th>Target Pitch Attitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>14,000</td>
<td>14,14,14</td>
<td>8°</td>
<td>-40</td>
<td>-20</td>
</tr>
<tr>
<td>15,000</td>
<td>15,15,15</td>
<td>8°</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16,000</td>
<td>16,16,16</td>
<td>8°</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>17,000</td>
<td>17,17,17</td>
<td>8°</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

**Effectivity**

<table>
<thead>
<tr>
<th>SEA LEVEL (FT)</th>
<th>WT (LB)</th>
<th>FLAPS</th>
<th>Temp (°F)</th>
<th>Target Pitch Attitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,000</td>
<td>7,7,7</td>
<td>8°</td>
<td>-40</td>
<td>-20</td>
</tr>
<tr>
<td>12,000</td>
<td>12,12,12</td>
<td>8°</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18,000</td>
<td>18,18,18</td>
<td>8°</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>20,000</td>
<td>20,20,20</td>
<td>8°</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

**Note:**
- The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.
- The target takeoff pitch attitude table for anti-ice on must be used whenever NAC anti-ice, wing/stab anti-ice or both are on.
## Contaminated Runway Data

### Moderate Contaminant Depth

#### Flaps — 20°

<table>
<thead>
<tr>
<th>CONTAMINANT DEPTH</th>
<th>CONTAMINANT MODERATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDING WATER</td>
<td>0.125 in (3 mm)</td>
</tr>
<tr>
<td>SLUSH</td>
<td>0.15 in (3.8 mm)</td>
</tr>
<tr>
<td>LOOSE SNOW (WET)</td>
<td>0.25 in (6.4 mm)</td>
</tr>
<tr>
<td>LOOSE SNOW (DRY)</td>
<td>0.95 in (24.1 mm)</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Arm
- Autospoilers — Arm
- Rudders Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated

**NOTE:** All icing and contamination conditions are moderate. References are in the comments section.

**Shifts:**

- Engine temperature
- Takeoff field length
- Takeoff distance
- Landing field length
- Landing distance
- Pitching attitude

**Ratio:**

- 1.00 = No Correction
- 0.88 = 10°F Correction
- 0.76 = 20°F Correction
- 0.64 = 30°F Correction
- 0.52 = 40°F Correction

**Factors:**

- 1.00 = No Correction
- 0.88 = 10°F Correction
- 0.76 = 20°F Correction
- 0.64 = 30°F Correction
- 0.52 = 40°F Correction

### Figures in Shaded Area

- Figures in shaded area are above engine temperature limits and are provided for interpolation only.

### Figure 18.4

- 5-19-2004 22.4
CONTAMINATED RUNWAY TAKEOFF FIELD LENGTH CORRECTION CHART

Moderate Contaminant Depth
FLAPS — 20°
ANTI-ICE — OFF

This chart was prepared for the following conditions:
- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated
- Moderate Depth
- Anti-Ice — Off

EXAMPLE:
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 6,600 ft (2,012 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . STOWED
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . 1,500 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . . . . . 7,920 ft (2,414 m)

Figure 19.3
## Contaminated Runway Data

<table>
<thead>
<tr>
<th>Contaminant Depth</th>
<th>Moderate Contaminant Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flaps — 20°</td>
</tr>
<tr>
<td></td>
<td>APR — Armed</td>
</tr>
<tr>
<td></td>
<td>Autospoilers — Armed</td>
</tr>
<tr>
<td></td>
<td>Rudder Boost — On</td>
</tr>
<tr>
<td></td>
<td>Anti-Skid — On</td>
</tr>
<tr>
<td></td>
<td>Runway Surface — Contaminated</td>
</tr>
<tr>
<td></td>
<td>Anti-Ice — On</td>
</tr>
<tr>
<td></td>
<td>Thrust Reversers — Max*</td>
</tr>
<tr>
<td></td>
<td>Zero Wind*</td>
</tr>
<tr>
<td></td>
<td>Zero Runway Gradient *</td>
</tr>
</tbody>
</table>

### Temperature

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Uncorrected Takeoff Field Length in °F</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40</td>
<td>6950 7190 7430 7670 7910 8150</td>
</tr>
<tr>
<td>-20</td>
<td>7050 7290 7530 7770 8010 8250</td>
</tr>
<tr>
<td>0</td>
<td>7150 7390 7630 7870 8110 8350</td>
</tr>
<tr>
<td>20</td>
<td>7250 7490 7730 7970 8210 8450</td>
</tr>
<tr>
<td>40</td>
<td>7350 7590 7830 8070 8310 8550</td>
</tr>
</tbody>
</table>

### Effectivity Code

<table>
<thead>
<tr>
<th>Contaminant Depth</th>
<th>Contaminant</th>
<th>Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing Water</td>
<td>0.125 in (3 mm)</td>
<td></td>
</tr>
<tr>
<td>Slush</td>
<td>0.15 in (3.8 mm)</td>
<td></td>
</tr>
<tr>
<td>Loose Snow (Wet)</td>
<td>0.25 in (6.4 mm)</td>
<td></td>
</tr>
<tr>
<td>Loose Snow (Dry)</td>
<td>0.95 in (24.1 mm)</td>
<td></td>
</tr>
</tbody>
</table>

### Note

- For conditions other than these, apply the result from this table to the correction chart in Figure 19B.3
- The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

---

**Figure 19A.4**

5-19-2004
This chart was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated Moderate Depth
- Anti-Ice — On

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . 6,600 ft (2,012 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . .15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . .STOWED
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . 1,500 ft
9. Corrected Takeoff Field Length . . . . . . . . . . 7,920 ft (2,414 m)

Figure 19B.3
### Contaminated Runway Data

#### Contaminated Runway Takeoff Speeds

**Moderate Contaminant Depth**

**FLAPS — 20°**

**ANTI-ICE — OFF**

#### Effectiveness Code

- **CONTMNANT DEPTHS**
  - **CONTAMINANT**
    - **STANDING WATER**
      - **MODERATE**
        - **Depth**
          - **Surface**
            - **Engine Temperature Limits and are provided for interpolation only.**

#### Conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated
- Moderate Depth
- Anti-Ice — Off
- Throst Reversers — Max or Stowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots

The following correction must be applied for runway gradient: **2.5%**

#### Figures in shaded area are above engine temperature limits and are provided for interpolation only.

---

**Figure 20.4**

---

**5-19-2004 24.4**
### Contaminated Runway Data

#### Contaminated Runway Takeoff Speeds

**Takeoff Speeds**

<table>
<thead>
<tr>
<th>Contaminant Depth</th>
<th>Takeoff Speeds</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FLAPS — 20°</strong></td>
<td>106 106 106 105 105 105 108 116</td>
</tr>
<tr>
<td><strong>APR</strong></td>
<td>105 105 105 105 105 105 109 116</td>
</tr>
<tr>
<td><strong>Autospoilers</strong></td>
<td>106 105 105 105 105 105 110 116</td>
</tr>
<tr>
<td><strong>Anti-Skid</strong></td>
<td>106 105 105 105 105 105 110 116</td>
</tr>
<tr>
<td><strong>Thrust Reversers</strong></td>
<td><strong>Max or Stowed</strong></td>
</tr>
</tbody>
</table>

#### Contaminant Depths

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Moderate Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing Water</td>
<td>0.125 in (3 mm)</td>
</tr>
<tr>
<td>Slush</td>
<td>0.15 in (3.8 mm)</td>
</tr>
<tr>
<td>Loose Snow (Wet)</td>
<td>0.25 in (6.4 mm)</td>
</tr>
<tr>
<td>Loose Snow (Dry)</td>
<td>0.95 in (24.1 mm)</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Anti-Skid — On
- Runway Surface — Contaminated
- Moderate Depth
- Anti-Ice — On
- Thrust Reversers — Max or Stowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots

The following correction must be applied for runway gradient:

- Runway Gradient V1 Correction

- **NOTE:** The TAKEOFF SPEEDS table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.
## Contaminated Runway Data

### Target Takeoff Pitch Attitude — Degrees

<table>
<thead>
<tr>
<th>ALT FT</th>
<th>TEMP</th>
<th>10°F</th>
<th>20°F</th>
<th>30°F</th>
<th>40°F</th>
<th>50°F</th>
<th>60°F</th>
<th>70°F</th>
<th>80°F</th>
<th>90°F</th>
<th>100°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>-20</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>3000</td>
<td>0</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>5000</td>
<td>20°F</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>70°F</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>90°F</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

### Effects of Temperature and Altitude

**-40°F**

- 11° (10°F)
- 11° (20°F)
- 11° (30°F)
- 11° (40°F)
- 11° (50°F)
- 11° (60°F)
- 11° (70°F)
- 11° (80°F)
- 11° (90°F)
- 11° (100°F)

**20°F**

- 10° (10°F)
- 11° (20°F)
- 11° (30°F)
- 11° (40°F)
- 11° (50°F)
- 11° (60°F)
- 11° (70°F)
- 11° (80°F)
- 11° (90°F)
- 11° (100°F)

**30°F**

- 10° (10°F)
- 10° (20°F)
- 10° (30°F)
- 10° (40°F)
- 9° (50°F)
- 9° (60°F)
- 9° (70°F)
- 9° (80°F)
- 9° (90°F)
- 9° (100°F)

**50°F**

- 9° (10°F)
- 9° (20°F)
- 9° (30°F)
- 9° (40°F)
- 9° (50°F)
- 9° (60°F)
- 9° (70°F)
- 9° (80°F)
- 9° (90°F)
- 9° (100°F)

**70°F**

- 9° (10°F)
- 9° (20°F)
- 9° (30°F)
- 9° (40°F)
- 9° (50°F)
- 9° (60°F)
- 9° (70°F)
- 9° (80°F)
- 9° (90°F)
- 9° (100°F)

**90°F**

- 8° (10°F)
- 8° (20°F)
- 8° (30°F)
- 8° (40°F)
- 8° (50°F)
- 8° (60°F)
- 8° (70°F)
- 8° (80°F)
- 8° (90°F)
- 8° (100°F)

**100°F**

- 8° (10°F)
- 8° (20°F)
- 8° (30°F)
- 8° (40°F)
- 8° (50°F)
- 8° (60°F)
- 8° (70°F)
- 8° (80°F)
- 8° (90°F)
- 8° (100°F)

### Notes

- Figures in shaded area are above engine temperature limits and are provided for interpolation only.
- This table was prepared for the same conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table.

---

**Contaminated Runway Takeoff Speeds**

- RAPS — 20°
- Anti-Ice — Off

**Effectiveness Code**

**CONTAMINANT DEPTHS**

- STANDING WATER: 0.126 in (3 mm)
- SLUSH: 0.15 in (3.8 mm)
- LOOSE SNOW (WET): 0.25 in (6.4 mm)
- LOOSE SNOW (DRY): 0.95 in (24.1 mm)

**NOTE:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.
### Contaminated Runway Data

**TARGET TAKEOFF PITCH ATTITUDE DEGREES**

<table>
<thead>
<tr>
<th>FLAPS — 20°</th>
<th>-40</th>
<th>-20</th>
<th>0</th>
<th>20</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT FT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WT LB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLAPS — 20°</td>
<td>-40</td>
<td>-30</td>
<td>-20</td>
<td>-10</td>
<td>0</td>
</tr>
<tr>
<td>ALT FT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WT LB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLAPS — 20°</td>
<td>-40</td>
<td>-30</td>
<td>-20</td>
<td>-10</td>
<td>0</td>
</tr>
<tr>
<td>ALT FT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WT LB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLAPS — 20°</td>
<td>-40</td>
<td>-30</td>
<td>-20</td>
<td>-10</td>
<td>0</td>
</tr>
<tr>
<td>ALT FT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WT LB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TARGET TAKEOFF PITCH ATTITUDE**

The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled \( V_2 \) speed at a height of 35 feet above the runway. Maintain \( V_2 \) once achieved. Small pitch attitude changes may be required to maintain \( V_2 \).

**NOTE**

The TARGET TAKEOFF PITCH ATTITUDE table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice, or both are ON.

**CONTAMINANT DEPTHS**

<table>
<thead>
<tr>
<th>STANDING WATER</th>
<th>0.125 in (3 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOOSE SNOW (WET)</td>
<td>0.25 in (6.4 mm)</td>
</tr>
<tr>
<td>LOOSE SNOW (DRY)</td>
<td>0.95 in (24.1 mm)</td>
</tr>
</tbody>
</table>

**TARGET TAKEOFF SPEEDS**

This table was prepared for the conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table. STOL Analysis Note: WIG.
**Contaminated Runway Data**

### Uncorrected Takeoff Field Length — ft

<table>
<thead>
<tr>
<th>Altitude</th>
<th>0</th>
<th>1000</th>
<th>2000</th>
<th>3000</th>
<th>4000</th>
<th>5000</th>
<th>6000</th>
<th>7000</th>
<th>8000</th>
<th>9000</th>
<th>10000</th>
<th>11000</th>
<th>12000</th>
<th>13000</th>
<th>14000</th>
<th>15000</th>
<th>16000</th>
<th>17000</th>
<th>18000</th>
<th>19000</th>
<th>20000</th>
<th>21000</th>
<th>22000</th>
</tr>
</thead>
<tbody>
<tr>
<td>15°F</td>
<td>1000</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
<td>3000</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
<td>5000</td>
<td>5500</td>
<td>6000</td>
<td>6500</td>
<td>7000</td>
<td>7500</td>
<td>8000</td>
<td>8500</td>
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<td>9500</td>
<td>10000</td>
<td>10500</td>
<td>11000</td>
<td>11500</td>
<td></td>
</tr>
<tr>
<td>20°F</td>
<td>1200</td>
<td>1700</td>
<td>2200</td>
<td>2700</td>
<td>3200</td>
<td>3700</td>
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<td>4700</td>
<td>5200</td>
<td>5700</td>
<td>6200</td>
<td>6700</td>
<td>7200</td>
<td>7700</td>
<td>8200</td>
<td>8700</td>
<td>9200</td>
<td>9700</td>
<td>10200</td>
<td>10700</td>
<td>11200</td>
<td>11700</td>
<td></td>
</tr>
<tr>
<td>25°F</td>
<td>1400</td>
<td>1900</td>
<td>2400</td>
<td>2900</td>
<td>3400</td>
<td>3900</td>
<td>4400</td>
<td>4900</td>
<td>5400</td>
<td>5900</td>
<td>6400</td>
<td>6900</td>
<td>7400</td>
<td>7900</td>
<td>8400</td>
<td>8900</td>
<td>9400</td>
<td>9900</td>
<td>10400</td>
<td>10900</td>
<td>11400</td>
<td>11900</td>
<td></td>
</tr>
<tr>
<td>30°F</td>
<td>1600</td>
<td>2100</td>
<td>2600</td>
<td>3100</td>
<td>3600</td>
<td>4100</td>
<td>4600</td>
<td>5100</td>
<td>5600</td>
<td>6100</td>
<td>6600</td>
<td>7100</td>
<td>7600</td>
<td>8100</td>
<td>8600</td>
<td>9100</td>
<td>9600</td>
<td>10100</td>
<td>10600</td>
<td>11100</td>
<td>11600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35°F</td>
<td>1800</td>
<td>2300</td>
<td>2800</td>
<td>3300</td>
<td>3800</td>
<td>4300</td>
<td>4800</td>
<td>5300</td>
<td>5800</td>
<td>6300</td>
<td>6800</td>
<td>7300</td>
<td>7800</td>
<td>8300</td>
<td>8800</td>
<td>9300</td>
<td>9800</td>
<td>10300</td>
<td>10800</td>
<td>11300</td>
<td>11800</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Contaminant Depths

<table>
<thead>
<tr>
<th>Contaminant Depth</th>
<th>Heavy Contaminant Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standing Water</td>
<td>0.25 m (0.98 ft)</td>
</tr>
<tr>
<td>Loose Snow (Wet)</td>
<td>0.50 m (1.64 ft)</td>
</tr>
<tr>
<td>Loose Snow (Dry)</td>
<td>1.00 m (3.28 ft)</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated
- Heavy Depth
- Anti-Ice — Off
- Thrust Reversers — Max
- Zero Wind
- Zero Runway Gradient

*Figures in shaded area are above engine temperature limits and are provided for interpolation only.*
This chart was prepared for the following conditions:
Flaps — 20°
APR — Armed
Autospoilers — Armed
Rudder Boost — On
Anti-Skid — On
Runway Surface — Contaminated
Anti-Ice — Off
Heavy Depth

EXAMPLE:
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . .6,700 ft (2,045 m)
2. Tailwind . . . . . . . . . . . . . . . . . . . . . . . . . 5 kt
3. Runway Gradient Reference Line
4. Runway Gradient  . . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser  . . . . . . . . . . . . . . . . . MAX
7. Altitude Reference Line
8. Altitude  . . . . . . . . . . . . . . . . . . . . . 6,000 ft
9. Corrected Takeoff Field Length . . . . . . .8,020 ft (2,445 m)

Figure 23.3
### Contaminated Runway Data

**UNCORRECTED TAKEOFF FIELD LENGTH — FT**

<table>
<thead>
<tr>
<th>WT (LBS)</th>
<th>ALT (FT)</th>
<th>30°F</th>
<th>40°F</th>
<th>50°F</th>
<th>60°F</th>
<th>70°F</th>
<th>80°F</th>
<th>90°F</th>
<th>100°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>4300</td>
<td>4000</td>
<td>3700</td>
<td>3400</td>
<td>3100</td>
<td>2800</td>
<td>2500</td>
<td>2200</td>
<td>1900</td>
</tr>
<tr>
<td>15,000</td>
<td>4500</td>
<td>4200</td>
<td>3900</td>
<td>3600</td>
<td>3300</td>
<td>3000</td>
<td>2700</td>
<td>2400</td>
<td>2100</td>
</tr>
<tr>
<td>20,000</td>
<td>4700</td>
<td>4400</td>
<td>4100</td>
<td>3800</td>
<td>3500</td>
<td>3200</td>
<td>2900</td>
<td>2600</td>
<td>2300</td>
</tr>
<tr>
<td>25,000</td>
<td>4900</td>
<td>4600</td>
<td>4300</td>
<td>4000</td>
<td>3700</td>
<td>3400</td>
<td>3100</td>
<td>2800</td>
<td>2500</td>
</tr>
<tr>
<td>30,000</td>
<td>5200</td>
<td>4900</td>
<td>4600</td>
<td>4300</td>
<td>4000</td>
<td>3700</td>
<td>3400</td>
<td>3100</td>
<td>2800</td>
</tr>
</tbody>
</table>

**TEMPERATURE**

<table>
<thead>
<tr>
<th>WT (LBS)</th>
<th>ALT (FT)</th>
<th>30°F</th>
<th>40°F</th>
<th>50°F</th>
<th>60°F</th>
<th>70°F</th>
<th>80°F</th>
<th>90°F</th>
<th>100°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>4300</td>
<td>4000</td>
<td>3700</td>
<td>3400</td>
<td>3100</td>
<td>2800</td>
<td>2500</td>
<td>2200</td>
<td>1900</td>
</tr>
<tr>
<td>15,000</td>
<td>4500</td>
<td>4200</td>
<td>3900</td>
<td>3600</td>
<td>3300</td>
<td>3000</td>
<td>2700</td>
<td>2400</td>
<td>2100</td>
</tr>
<tr>
<td>20,000</td>
<td>4700</td>
<td>4400</td>
<td>4100</td>
<td>3800</td>
<td>3500</td>
<td>3200</td>
<td>2900</td>
<td>2600</td>
<td>2300</td>
</tr>
<tr>
<td>25,000</td>
<td>4900</td>
<td>4600</td>
<td>4300</td>
<td>4000</td>
<td>3700</td>
<td>3400</td>
<td>3100</td>
<td>2800</td>
<td>2500</td>
</tr>
<tr>
<td>30,000</td>
<td>5200</td>
<td>4900</td>
<td>4600</td>
<td>4300</td>
<td>4000</td>
<td>3700</td>
<td>3400</td>
<td>3100</td>
<td>2800</td>
</tr>
</tbody>
</table>

**CONTAMINANT DEPTHS**

<table>
<thead>
<tr>
<th>WT (LBS)</th>
<th>ALT (FT)</th>
<th>30°F</th>
<th>40°F</th>
<th>50°F</th>
<th>60°F</th>
<th>70°F</th>
<th>80°F</th>
<th>90°F</th>
<th>100°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000</td>
<td>4300</td>
<td>4000</td>
<td>3700</td>
<td>3400</td>
<td>3100</td>
<td>2800</td>
<td>2500</td>
<td>2200</td>
<td>1900</td>
</tr>
<tr>
<td>15,000</td>
<td>4500</td>
<td>4200</td>
<td>3900</td>
<td>3600</td>
<td>3300</td>
<td>3000</td>
<td>2700</td>
<td>2400</td>
<td>2100</td>
</tr>
<tr>
<td>20,000</td>
<td>4700</td>
<td>4400</td>
<td>4100</td>
<td>3800</td>
<td>3500</td>
<td>3200</td>
<td>2900</td>
<td>2600</td>
<td>2300</td>
</tr>
<tr>
<td>25,000</td>
<td>4900</td>
<td>4600</td>
<td>4300</td>
<td>4000</td>
<td>3700</td>
<td>3400</td>
<td>3100</td>
<td>2800</td>
<td>2500</td>
</tr>
<tr>
<td>30,000</td>
<td>5200</td>
<td>4900</td>
<td>4600</td>
<td>4300</td>
<td>4000</td>
<td>3700</td>
<td>3400</td>
<td>3100</td>
<td>2800</td>
</tr>
</tbody>
</table>

*This table was prepared for the following conditions:*

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated
- Heavy Depth
- Anti-Ice — On
- Thrust Reversers — Max*
- Zero Wind*
- Zero Runway Gradient *

*For conditions other than these, apply the result from this table to the correction chart in Figure 23B.3

**NOTE:** The TAKEOFF FIELD LENGTH table for anti-ice ON must be used whenever NAC Anti-ice, WING/STAB Anti-ice or both are on.

**Figure 23A.4**
This chart was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated
- Anti-Ice — On

**Heavy Depth**

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . 6,700 ft (2,045 m)
2. Tailwind . . . . . . . . . . . . . . . . . . . . 5 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . . . . . . . . . . . -1.0% (DN)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . . . . . . . . . . . . MAX
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . . . . 6,000 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . 8,020 ft (2,445 m)
### Contaminated Runway Data

#### Contaminant Depths

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Heavy</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDING WATER</td>
<td>0.25 in (6 mm)</td>
</tr>
<tr>
<td>SLUSH</td>
<td>0.30 in (7.6 mm)</td>
</tr>
<tr>
<td>LOOSE SNOW (WET)</td>
<td>0.50 in (12.7 mm)</td>
</tr>
<tr>
<td>LOOSE SNOW (DRY)</td>
<td>1.90 in (48.3 mm)</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated Heavy Depth
- Anti-Ice — Off
- Thrust Reversers — Max or Stowed

The following corrections must be applied for wind and runway gradient:

<table>
<thead>
<tr>
<th>Wind — Knots</th>
<th>V₁ Correction*</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-20</td>
<td>A61/4 knots</td>
</tr>
<tr>
<td>Above 20</td>
<td>A61/2 knots</td>
</tr>
</tbody>
</table>

*V₁ shall not exceed 1.5 the corrected V₁ if the corrected V₁ is greater than 1.9 knots.

#### V₁ — KIAS

| ALT (FT) | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 |
|----------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| TEMP | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 | 230 | 240 |
| V₁ | 105 | 110 | 115 | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 |

#### V₁ — KIAS

| ALT (FT) | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 |
|----------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| TEMP | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 | 210 | 220 | 230 | 240 |
| V₁ | 105 | 110 | 115 | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 |

**Note:** Figures in shaded area are above engine temperature limits and are provided for interpolation only.

Figure 244
### Contaminated Runway Data

#### Contaminated Runway Takeoff Speeds

**Heavy Contaminant Depth**

<table>
<thead>
<tr>
<th>Flaps</th>
<th>APR</th>
<th>AutoSpoilers</th>
<th>Rudder Boost</th>
<th>Anti-Ice</th>
<th>Thrust Reversers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armed</td>
<td>Armed</td>
<td>Armed</td>
<td>On</td>
<td>On</td>
<td>Max or Stowed</td>
</tr>
</tbody>
</table>

*V₁ must not exceed Vₚ.* If the corrected V₁ is greater than Vₚ, reduce V₁ to Vₚ.

**NOTE:** The TAKEOFF SPEEDS table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

### Contaminant Depths

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Heavy</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDING WATER</td>
<td>0.25 in (6 mm)</td>
</tr>
<tr>
<td>SLUSH</td>
<td>0.30 in (7.6 mm)</td>
</tr>
<tr>
<td>LOOSE SNOW (WET)</td>
<td>0.50 in (12.7 mm)</td>
</tr>
<tr>
<td>LOOSE SNOW (DRY)</td>
<td>1.90 in (48.3 mm)</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- AutoSpoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Contaminated
- Heavy Depth

The following corrections must be applied for wind and runway gradient:

<table>
<thead>
<tr>
<th>Wind/Gradient</th>
<th>V₁ Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 20°</td>
<td>No Correction</td>
</tr>
<tr>
<td>&gt; 20° to 40°</td>
<td>Add 4 knots</td>
</tr>
<tr>
<td>&gt; 40° to 60°</td>
<td>Add 8 knots</td>
</tr>
<tr>
<td>&gt; 60° to 80°</td>
<td>Add 12 knots</td>
</tr>
</tbody>
</table>

For wind or gradient > 80°, use the next higher correction. The maximum V₁ correction is 30 knots.

**Figure 25A.4**
### Contaminated Runway Data

**Target Pitch Attitude**

- **Temperature**: 
  - 40°F, 20°F, 0°F, 20°F, 40°F
  - 40°C, 20°C, 0°C, 20°C, 40°C

- **Altitude**: 
  - 1000 ft, 2000 ft, 3000 ft, 4000 ft, 5000 ft
  - 1000 ft, 2000 ft, 3000 ft, 4000 ft, 5000 ft

- **Wt**: 
  - 11,000 lb, 12,000 lb, 13,000 lb, 14,000 lb, 15,000 lb
  - 11,000 lb, 12,000 lb, 13,000 lb, 14,000 lb, 15,000 lb

- **FLAPS**: 
  - 20°, 30°, 40°, 50°, 60°
  - 20°, 30°, 40°, 50°, 60°

- **Anti-Ice**: 
  - Off, On, On, On, On
  - Off, On, On, On, On

- **Sea Level**: 
  - 1000 ft, 2000 ft, 3000 ft, 4000 ft, 5000 ft
  - 1000 ft, 2000 ft, 3000 ft, 4000 ft, 5000 ft

**CONTAMINANT DEPTHS**

- SLUSH 0.30 in (7.6 mm)
- LOOSE SNOW (WET) 0.50 in (12.7 mm)
- LOOSE SNOW (DRY) 1.90 in (48.3 mm)

**NOTE**: The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

Figure 26.4
Contaminated Runway Data

**TARGET TAKEOFF PITCH ATTITUDE — DEGREES**

<table>
<thead>
<tr>
<th>CONTAMINANT DEPTHS</th>
<th>CONTAMINANT</th>
<th>HEAVY</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDING WATER</td>
<td>0.25 in (6 mm)</td>
<td></td>
</tr>
<tr>
<td>SLUSH</td>
<td>0.30 in (7.6 mm)</td>
<td></td>
</tr>
<tr>
<td>LOOSE SNOW (WET)</td>
<td>0.60 in (12.7 mm)</td>
<td></td>
</tr>
<tr>
<td>LOOSE SNOW (DRY)</td>
<td>1.80 in (48.3 mm)</td>
<td></td>
</tr>
</tbody>
</table>

This table was prepared for the same conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table.

**NOTE:**
- The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway.
- Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.
- The TARGET TAKEOFF PITCH ATTITUDE table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

Figure 26A.4
## Contaminated Runway Data

### Contaminated Runway Takeoff Field Length

#### Compacted Snow

**FLAPS — 20°**

**ANTI-ICE — OFF**

**EFFECTIVITY CODE**

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Compacted Snow
- Anti-Ice — Off
- Thrust Reversers — Max
- Zero Wind
- Zero Runway Gradient

* For conditions other than these, apply the result from this table to the correction chart in Figure 28.3

---

<table>
<thead>
<tr>
<th>TEMP</th>
<th>TEMP</th>
<th>TEMP</th>
<th>TEMP</th>
<th>TEMP</th>
<th>TEMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1400</td>
<td>1600</td>
<td>1800</td>
<td>2000</td>
<td>2200</td>
<td>2400</td>
</tr>
<tr>
<td>1400</td>
<td>1600</td>
<td>1800</td>
<td>2000</td>
<td>2200</td>
<td>2400</td>
</tr>
<tr>
<td>1400</td>
<td>1600</td>
<td>1800</td>
<td>2000</td>
<td>2200</td>
<td>2400</td>
</tr>
<tr>
<td>1400</td>
<td>1600</td>
<td>1800</td>
<td>2000</td>
<td>2200</td>
<td>2400</td>
</tr>
<tr>
<td>1400</td>
<td>1600</td>
<td>1800</td>
<td>2000</td>
<td>2200</td>
<td>2400</td>
</tr>
<tr>
<td>1400</td>
<td>1600</td>
<td>1800</td>
<td>2000</td>
<td>2200</td>
<td>2400</td>
</tr>
</tbody>
</table>

---

**Figure 27.4**

5-19-2004  31.4
This chart was prepared for the following conditions:
- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Compacted Snow
- Anti-Ice — Off

**EXAMPLE:**
1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . 7,400 ft (2,256 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . .  6 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . . +1.0% (UP)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . STOWED
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . 1,500 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . 9,680 ft (2,950 m)

Figure 28.3
### Contaminated Runway Data

**Temperature**

<table>
<thead>
<tr>
<th>Takeoff Field Length (FT)</th>
<th>-40</th>
<th>-20</th>
<th>0</th>
<th>20</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Effectivity**

<table>
<thead>
<tr>
<th>Takeoff Field Length (FT)</th>
<th>-40</th>
<th>-20</th>
<th>0</th>
<th>20</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Compacted Snow**

<table>
<thead>
<tr>
<th>Takeoff Field Length (FT)</th>
<th>-40</th>
<th>-20</th>
<th>0</th>
<th>20</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flaps — 20°</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Anti-Ice — On**

<table>
<thead>
<tr>
<th>Takeoff Field Length (FT)</th>
<th>-40</th>
<th>-20</th>
<th>0</th>
<th>20</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Anti-Ice — Off**

<table>
<thead>
<tr>
<th>Takeoff Field Length (FT)</th>
<th>-40</th>
<th>-20</th>
<th>0</th>
<th>20</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Conditions

This table was prepared for the following conditions:

- Zero runway gradient
- Armed
- Autospoilers — On
- Anti-ice ON
- Crosswind
- Turbulence — Weak
- Max headwind — On
- Max tailwind — On
- Crossheadwind — On
- Frigid air — On
- Air slush — On
- Andertons — On
- Airflow suppressors — On
- Airflow suppressors — Off
- Anticlimb — Off
- Aft — Off
- Flaps — 20°

### Note

For conditions other than these, apply the result from this table to the correction chart in Figure 28B.3.
Contaminated Runway Data

**CONMITTED RUNWAY TAKEOFF FIELD LENGTH CORRECTION CHART**

**Compacted Snow**

**FLAPS — 20°**

**ANTI-ICE — ON**

This chart was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Compacted Snow
- Anti-Ice — On

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) . . . . . . . . . . . 7,400 ft (2,256 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 6 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . +1.0% (UP)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . . . . STOWED
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . 1,500 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . . . . . . . . . . . . 9,680 ft (2,950 m)

Figure 28B.3
### Contaminated Runway Takeoff Speeds

<table>
<thead>
<tr>
<th>Temperature °F</th>
<th>Flaps — 20°</th>
<th>APR Armed</th>
<th>Anti-Ice — Off</th>
<th>Throttle Reversers</th>
</tr>
</thead>
<tbody>
<tr>
<td>9000 — 3000</td>
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<td>105</td>
<td>105</td>
</tr>
<tr>
<td>10,000 — 4000</td>
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<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>11,000 — 5000</td>
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<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>12,000 — 6000</td>
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<td>105</td>
<td>105</td>
<td>105</td>
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<td>13,000 — 7000</td>
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<td>105</td>
<td>105</td>
<td>105</td>
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<td>14,000 — 8000</td>
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<td>105</td>
<td>105</td>
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<tr>
<td>15,000 — 9000</td>
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<td>105</td>
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</tr>
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<tr>
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<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>18,000 — 12,000</td>
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<td>105</td>
<td>105</td>
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<tr>
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<td>105</td>
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<tr>
<td>21,500 — 15,500</td>
<td>107</td>
<td>107</td>
<td>107</td>
<td>107</td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- Flaps — 20°
- Anti-Ice — Off
- Runway Surface — Compact Snow
- Autothrottle — On

Between -2.4% and 2.4% Takeoff Thrust

**Figure 29.4**

---

**Takeoff Thrust**

**EFFECTIVITY**

**CONTAMINATED RUNWAY**

**TAKEOFFS**

**FLAPS — 20°**

**APR ARMED**

**ANTI-ICE — OFF**

**THROTTLE REVERSERS**

**CID DATA**

---

**Figure 29.4**
This table was prepared for the following conditions:

- Anti-Ice ON
- Wing/STAB Anti-Ice or NAC Anti-Ice

The table indicates various runway conditions and corresponding takeoff speeds. The data includes FLAPS, TEMPERATURE, FLAPS, and other pertinent information for takeoff operations.
Contaminated Runway Data

### Contaminated Runway Target Takeoff Pitch Attitude

#### Compacted Snow

- **FLAPS** — 20°
- **ANTI-ICE** — OFF

**Effectivity Code**

This table was prepared for the same conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table.

**NOTE:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled \( V_2 \) speed at a height of 35 feet above the runway. Maintain \( V_2 \) once achieved. Small pitch attitude changes may be required to maintain \( V_2 \).

---

**Figure 30.4**

---

**Table:**

<table>
<thead>
<tr>
<th>ALT (FT)</th>
<th>WT (LB)</th>
<th>0°</th>
<th>10°</th>
<th>20°</th>
<th>30°</th>
<th>40°</th>
</tr>
</thead>
<tbody>
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<td>11</td>
<td>11</td>
<td>11</td>
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<tr>
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**TEMPERATURE**

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<th>20°F</th>
<th>30°F</th>
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<td>-20</td>
<td>-10</td>
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<td>-20</td>
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<td>0</td>
</tr>
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<td>-20</td>
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<td>0</td>
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<td>-40</td>
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<td>-20</td>
<td>-10</td>
<td>0</td>
</tr>
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<td>-20</td>
<td>-10</td>
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</table>

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**Table continued...**
<table>
<thead>
<tr>
<th>Altitude (FT)</th>
<th>WT (LB)</th>
<th>Temps (°F)</th>
<th>Flaps Angle (°)</th>
<th>Pitch Attitude (°)</th>
</tr>
</thead>
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<tr>
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<td></td>
<td></td>
<td></td>
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<tr>
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<tr>
<td>17 00 00 00 00 00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a Mach 0.8. Small pitch attitude changes may be required to maintain V2. Small pitch attitude changes may be required to maintain V2.
### Contaminated Runway Data

**UNCORRECTED TAKEOFF FIELD LENGTH (FT)**

<table>
<thead>
<tr>
<th>Condition</th>
<th>FLAPS — 20°</th>
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</thead>
<tbody>
<tr>
<td>14,000</td>
<td></td>
</tr>
<tr>
<td>16,000</td>
<td></td>
</tr>
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<td></td>
</tr>
<tr>
<td>20,000</td>
<td></td>
</tr>
</tbody>
</table>

This table was prepared for the following conditions:

- Flaps — 20°
- Anti-Skid — On
- Runway Surface — Wet
- Zero Wind

*For conditions other than these, apply the correction chart in Figure 32.3.*
Contaminated Runway Data

Figure 32.3

This chart was prepared for the following conditions:
- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet Ice
- Anti-Ice — Off

**EXAMPLE:**
1. Uncorrected Takeoff Field Length (from table) . . . . . . . 10,400 ft (3,170 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . . .1.0% (UP)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . . . . . . . . MAX
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . . 300 ft
9. Corrected Takeoff Field Length . . . . . . . . . . . . . . . . . . . . 8,660 ft (2,640 m)
### Contaminated Runway Data

#### Temperature and Takeoff Field Length

<table>
<thead>
<tr>
<th>Temperature °C</th>
<th>Takeoff Field Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40</td>
<td>-20</td>
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<tr>
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<td>10</td>
<td>30</td>
</tr>
<tr>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

#### Anti-Ice Conditions

- **Anti-Ice ON**: Apply the conditions for anti-ice ON conditions.
- **Anti-Ice OFF**: Apply the conditions for anti-ice OFF conditions.

#### Figure 32A.4

- **Flaps**: 0°
- **Airspeed**: Normal
- **Approach**: Standard
- **Rudder Boost**: Off
- **Thrust Reverse**: Max
- **Zero Wind**: Max

**Note**: For conditions other than these, apply the correction chart in Figure 32B.4.

**Effective Code**

This table was prepared for the following conditions:

- **Takeoff Field Length Table for 5-19-2004 36A.4**
- **NOTE**: The Table 32A.4 data is subject to revision based on new data available.
This chart was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet Ice
- Anti-Ice — On

**EXAMPLE:**

1. Uncorrected Takeoff Field Length (from table) . . . . . 10,400 ft (3,170 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 15 kt
3. Runway Gradient Reference Line
4. Runway Gradient . . . . . . . . . . 1.0% (UP)
5. Thrust Reverser Reference Line
6. Thrust Reverser . . . . . . . . . . . . . . . . . MAX
7. Altitude Reference Line
8. Altitude . . . . . . . . . . . . . . . . . . . . . . . . 300 ft
9. Corrected Takeoff Field Length . . . . . . 8,660 ft (2,640 m)
Contaminated Runway Data

**Temporature**

<table>
<thead>
<tr>
<th>°C</th>
<th>-40</th>
<th>-20</th>
<th>0</th>
<th>20</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
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<td></td>
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<tr>
<td>V2</td>
<td></td>
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</tbody>
</table>

**Takeoff Speeds**

<table>
<thead>
<tr>
<th>Alt</th>
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<th>15,000</th>
<th>16,000</th>
<th>17,000</th>
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<tbody>
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<td>105</td>
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<td>116</td>
<td>116</td>
<td>116</td>
</tr>
</tbody>
</table>

**Effectivity Code**

- **F**

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet Ice
- Anti-Ice — Off
- Thrust Reversers — Max or Stowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -1.0% (downhill) and +2.4% (uphill)

Figure 33.4
**Contaminated Runway Data**

This table was prepared for the following conditions:

- Flaps — 20°
- APR — Armed
- Autospoilers — Armed
- Rudder Boost — On
- Anti-Skid — On
- Runway Surface — Wet Ice
- Anti-Ice — On
- Thrust Reversers — Max or Slowed
- Wind — Between -10 (tailwind) and +30 (headwind) knots
- Runway Gradient — Between -1.0% (downhill) and +2.4% (uphill)

---

**Figure 33A.4**
Contaminated Runway Data

<table>
<thead>
<tr>
<th>ALT FT</th>
<th>WT LB</th>
<th>10°F</th>
<th>20°F</th>
<th>30°F</th>
<th>40°F</th>
<th>50°F</th>
<th>60°F</th>
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<td>13,000</td>
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<td>15</td>
<td>15</td>
<td>15</td>
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<td>15</td>
</tr>
</tbody>
</table>

**NOTE:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V₂ speed at a height of 35 feet above the runway. Maintain V₂ once achieved. Small pitch attitude changes may be required to maintain V₂.
### Contaminated Runway Data

This table was prepared for the same conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table.

**NOTE:** The target takeoff pitch attitude is the approximate pitch attitude required to achieve the scheduled V2 speed at a height of 35 feet above the runway. Maintain V2 once achieved. Small pitch attitude changes may be required to maintain V2.

The TARGET TAKEOFF PITCH ATTITUDE table for anti-ice ON must be used whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON.

---

**Contaminated Runway Takeoff Pitch Attitude**

<table>
<thead>
<tr>
<th>ALT</th>
<th>WT</th>
<th>FLAPS</th>
<th>20°</th>
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<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

*This table was prepared for the same conditions as listed on the appropriate CONTAMINATED RUNWAY TAKEOFF SPEEDS table.*

**EFFECTIVITY CODE**
A runway is considered to be wet when it has a shiny appearance due to a thin layer of water on it, but without significant areas of standing water. A runway with greater than 0.125 inch (3 mm) of standing water would be a contaminated runway.

When operating on wet runways, ground handling characteristics will not be as good as can be achieved on dry runways. The variability of surface conditions and crosswinds should be taken into consideration. If directional control reduces while in reverse thrust, reduce reverse thrust to reverse idle or stow the reversers to improve directional control. Reverse thrust may be reapplied if directional control can be maintained.

**STANDARD PERFORMANCE CONDITIONS**

All wet runway landing performance is based on the following performance conditions:

- Flaps — 40°
- Autospoilers — Deployed

*NOTE*

Aircraft 45-002 thru 45-169 not modified by SB 45-76-2 or SB 45-22-4, the WET RUNWAY ACTUAL LANDING DISTANCE table is presented for 40° flap setting (anti-skid ON and autospoilers deployed on landing.)

The WET RUNWAY ACTUAL LANDING DISTANCE CORRECTION CHART includes corrections for winds, runway gradient and anti-skid OFF.

Aircraft 45-170 & subsequent and prior aircraft modified by SB 45-76-2 or SB 45-22-4, the WET RUNWAY ACTUAL LANDING DISTANCE table is presented for 40° flap setting (anti-skid ON, autospoilers deployed on landing and use of maximum reverse thrust.) The WET RUNWAY ACTUAL LANDING DISTANCE CORRECTION CHART includes corrections for winds, runway gradient, thrust reversers stowed and anti-skid OFF.
This table was prepared for the following conditions:

- Flaps — Down
- Autospoilers — Deployed
- Anti-Skid — On*
- Runway Surface — Wet
- Thrust Reversers — Max*
- Zero Wind*
- Zero Runway Gradient*

* For conditions other than these, apply the result from this table to the correction chart in Figure 35.3

NOTE: If brake fault CAS illuminated, add 600 feet to actual landing distance.

Figure 35.3
Contaminated Runway Data

This chart was prepared for the following conditions:
- Flaps — Down
- Autospoilers — Deployed
- Runway Surface — Wet

Example:
1. Uncorrected landing distance (from table) . . . . . . . . . . . 6,300 ft (1,921 m)
2. Headwind . . . . . . . . . . . . . . . . . . . . . . 10 kt
3. Runway Gradient — . . . . . . . . . . . 1.0% (UP)
4. Thrust Reverser Reference Line
5. Thrust Reverser . . . . . . . . . . . . . . . . . MAX
6. Anti-Skid Reference Line
7. Anti-Skid . . . . . . . . . . . . . . . . . . . . . . . . . On
8. Corrected Landing Distance . . . . . . . . . . . 5,820 ft (1,774 m)

Note: Whenever NAC Anti-Ice, WING/STAB Anti-Ice or both are ON, add 350 feet to final corrected landing distance.

Figure 36.3
LANDING ON CONTAMINATED RUNWAYS

STANDARD PERFORMANCE CONDITIONS

All contaminated runway landing performance is based on the following performance conditions:
- No tailwind component
- Runway Gradient — Between -1% and +2.4%
- Flaps — 40°
- Anti-Skid System — ON
- Autospoilers — Deployed on landing

Contaminated runway landing distance factors are provided for the following contaminants:

<table>
<thead>
<tr>
<th>CONTAMINANT</th>
<th>(Depths up to)</th>
<th>T/R Slow</th>
<th>T/R Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDING WATER</td>
<td>0.75 in (19.1 mm)</td>
<td>2.5</td>
<td>1.9</td>
</tr>
<tr>
<td>SLUSH</td>
<td>0.88 in (22.4 mm)</td>
<td>2.5</td>
<td>1.9</td>
</tr>
<tr>
<td>LOOSE SNOW</td>
<td>1.50 in (38.1 mm)</td>
<td>2.5</td>
<td>1.9</td>
</tr>
<tr>
<td>COMPACTED SNOW</td>
<td></td>
<td>1.7</td>
<td>1.4</td>
</tr>
<tr>
<td>WET ICE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- S.L. to 4000 ft</td>
<td></td>
<td>5.6</td>
<td>3.5</td>
</tr>
<tr>
<td>- 4001 to 8000 ft</td>
<td></td>
<td>5.6</td>
<td>4.4</td>
</tr>
<tr>
<td>- 8001 to 14000 ft</td>
<td></td>
<td>5.6</td>
<td>5.6</td>
</tr>
</tbody>
</table>

The contaminated runway landing distance is calculated by multiplying the corrected landing distance determined from the DRY RUNWAY LANDING DISTANCE CORRECTION CHART (Refer to Section V, PERFORMANCE DATA) by the contaminated runway landing factor.

Contaminated Landing Distance = Corrected Landing Distance (Dry) x Landing Factor