# 737-8

# Flight Crew Operations Manual

# Volume 1

# Flair Airlines Ltd



Document Number D6-27370-MAX-FLR
Revision Number: 8
Revision Date: November 15, 2022

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# Preface — Chapter 0
## Chapter Table of Contents — Section TOC

### Volume 1

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## General

The airplanes listed in the table below are covered in this Flight Crew Operations Manual (FCOM). The numbers are used to distinguish data peculiar to one or more, but not all of the airplanes. Where data applies to all airplanes listed, no reference is made to individual airplane numbers. Configuration data reflects the airplane as delivered configuration and is updated for service bulletin incorporations in conformance with the policy stated in the introduction section of this chapter.

Registry and Tail numbers are supplied by the operator as provided by the national regulatory agency. Serial and tabulation numbers are supplied by Boeing.

Registry number(s) reflect the most current information supplied by the operator to the Boeing Company through the SR process and 60 days prior to the subject revision date. Registry numbers received after that date will be incorporated at the next scheduled revision. If a registry number is not provided the FCOM will default to serial number.

| Tail Number | Registry Number | Serial Number | Tabulation Number |
|---|---|---|---|
| 901 | C-FFEL | 64942 | 1J107 |
| 902 | C-FLEJ | 64941 | 1J104 |
| 903 | C-FLHI | 61804 | 1J103 |
| 904 | C-FFBC | 61805 | 1J105 |
| 905 | C-FLKA | 64943 | 1J106 |
| 906 | C-FLKC | 61807 | 1J111 |
| 907 | C-FLKD | 61806 | 1J110 |
| 908 | C-FLKI | 64944 | 1J108 |
| 909 | C-FLKJ | 64945 | 1J109 |
| 910 | C-FLRS | 61808 | 1J114 |
| 911 | C-FFFX | 61809 | 1J112 |
| 912 | C-FFLZ | 64946 | 1J113 |
| 913 | C-FLDX | 61803 | 1C845 |
| 914 | C-FLER | 62874 | 1L076 |
| 915 | C-FLKO | 62870 | 1L075 |

| Tail Number | Registry Number | Serial Number | Tabulation Number |
|---|---|---|---|
| 916 | C-FLKS | 62881 | 1L077 |
| 917 | C-FLKZ | 62883 | 1L078 |
| 918 | C-FLUJ | 62884 | 1K003 |
| 919 | C-FLQZ | 44307 | 1K002 |
| 920 | C-FLQO | 43565 | 1B392 |
| 921 | C-FLUT | 60134 | 1J022 |
| 922 | C-FLQF | 43300 | 1B397 |
| 923 | C-FLQG | 43619 | 1B390 |
| 924 | C-FLQP | 43566 | 1B393 |
| 925 | C-FLBG | 60135 | 1J023 |
| 926 | C-FLGD | 43564 | 1B391 |
| 927 | C-GFOF | 44302 | 1K001 |

## General

This Flight Crew Operations Manual (FCOM) has been prepared by The Boeing Commercial Airplanes, Commercial Aviation Services organization. The purpose of this manual is to:

- provide the necessary operating limitations, procedures, performance, and systems information the flight crew needs to safely and efficiently operate the 737 airplane during all anticipated airline operations
- serve as a comprehensive reference for use during transition training for the 737 airplane
- serve as a review guide for use in recurrent training and proficiency checks
- provide necessary operational data from the FAA approved airplane flight manual (AFM) to ensure that legal requirements are satisfied
- establish standardized procedures and practices to enhance Boeing operational philosophy and policy.

This manual is prepared for the owner/operator named on the title page specifically for the airplanes listed in the "Model Identification" section. It contains operational procedures and information, which apply only to these airplanes. The manual covers the Boeing delivered configuration of these airplanes. Changes to the delivered configuration are incorporated when covered by contractual revision agreements between the owner/operator and The Boeing Company

This manual is not suitable for use for any airplanes not listed in the "Model Identification" section. Further, it may not be suitable for airplanes that have been transferred to other owners/operators.

Owners/operators are solely responsible for ensuring the operational documentation they are using is complete and matches the current configuration of the listed airplanes. This includes the accuracy and validity of all information furnished by the owner/operator or any other party. Owners/operators receiving active revision service are responsible to ensure that any modifications to the listed airplanes are properly reflected in the operational procedures and information contained in this manual.

This manual is structured in a two volume format with a quick reference handbook (QRH). Volume 1 includes operational limitations, normal procedures, supplementary procedures, dispatch performance data, and inflight performance data. Volume 2 contains systems information. The QRH contains all checklists necessary for normal and non-normal procedures as well as inflight performance data.

The manual is periodically revised to incorporate pertinent procedural and systems information. Items of a more critical nature will be incorporated in operational bulletins and distributed in a timely manner. In all cases, such revisions and changes must remain compatible with the approved AFM with which the operator must comply. In the event of conflict with the AFM, the AFM shall supersede.

This manual is written under the assumption that the user has had previous multi–engine jet aircraft experience and is familiar with basic jet airplane systems and basic pilot techniques common to airplanes of this type. Therefore, the FCOM does not contain basic flight information that is considered prerequisite training.

Please send all correspondence regarding content or use of this manual, including bulletin status, to the 737 Manager, Flight Technical Data through the Services Requests (SR) application on the MyBoeingFleet home page.

## Organization

The FCOM is organized in the following manner.

Volume 1

- Preface – contains general information regarding the manual's purpose, structure, and content. It also contains lists of abbreviations, a record of revisions, bulletins, and a list of effective pages.
- Limitations and Normal Procedures chapters cover operational limitations and normal procedures. All operating procedures are based on a thorough analysis of crew activity required to operate the airplane, and reflect the latest knowledge and experience available.
- Non-Normal Procedures contain Company specific information.
- Supplementary Procedures chapter covers those procedures accomplished as required rather than routinely on each flight.
- Performance Dispatch (PD) chapter contains performance information necessary for self dispatch.
- Performance Inflight (PI) chapter contains information necessary for inflight use.

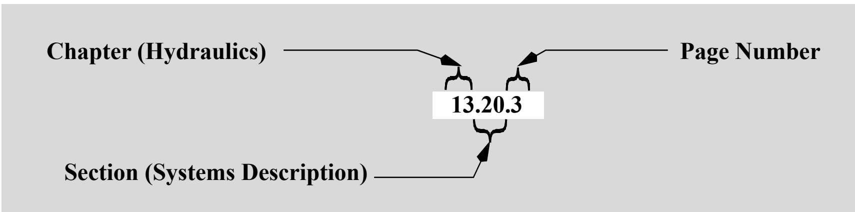
Volume 2 – Chapters 1 through 15 contain general airplane and systems information. These chapters are generally subdivided into sections covering controls and indicators and systems descriptions.

Quick Reference Handbook (QRH) – The QRH covers normal checklists, non–normal checklists, operational information, performance information necessary for inflight use (PI) on an expedited basis, and maneuvers.

## Page Numbering

The FCOM uses a decimal page numbering system. The page number is divided into three fields; chapter, section, and page. An example of a page number for the hydraulics chapter follows: chapter 13, section 20, page 3.

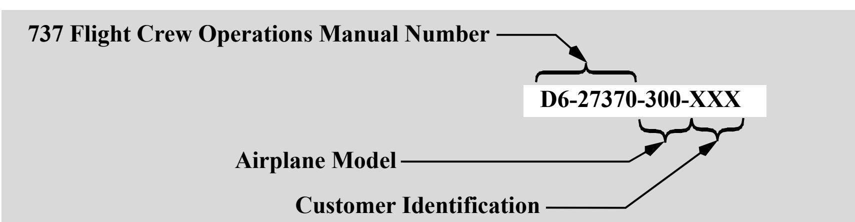
### Example Page Number




## Page Identification

Each page is identified by a customer document number and a page date. The customer document number is composed of the general 737 FCOM number, D6–27370–, and is followed by the customer identification. The page date is the date of publication of the manual or the most recent revision date.

### Example Page Identification




## Warnings, Cautions, and Notes

The following levels of written advisories are used throughout the manual.

WARNING: **An operating procedure, technique, etc., that may result in personal injury or loss of life if not carefully followed.**

CAUTION: **An operating procedure, technique, etc., that may result in damage to equipment if not carefully followed.**

**Note:** An operating procedure, technique, etc., considered essential to emphasize. Information contained in notes may also be safety related.

## Flight Crew Operations Manual Configuration

Customer airplane configuration determines the data provided in this manual. The Boeing Company keeps a list of each airplane configuration as it is built and modified through the service bulletin process. The FCOM does not reflect customer originated modifications without special contract provisions.

## Customer Configured Airplane Effectivity

Differences in airplane configuration for customer specific documents may be shown by the use of airplane effectivity throughout Volumes 1, 2 and QRH. The following rules are used to express airplane effectivity within customer documents:

- airplane effectivity can be displayed in one of four formats; by tabulation number, serial number, registry number or airplane number (customer defined). The default FCOM/QRH document effectivity display is by serial number
- airplane effectivities are listed in alpha-numeric order. A range of airplanes is defined by a dash, e.g. YZ008 - YZ014. A comma in the effectivity range indicates a break in the range, e.g. YZ008 - YZ014, YZ019, YZ021 - YZ025
- airplane effectivities apply only to the paragraph, illustration, operational note, procedural step, etc. and to subordinate items (if any) just below (except for titles) the specific effectivity range annotation;

Example (with subordinate items):

YZ008 - YZ014
Tail skid ........................................................................................Check
Verify that the tail skid is not damaged.

Horizontal stabilizer and elevator .............................................Check

In this example, the effectivity YZ008 - YZ014 applies to the first procedural step (Tail skid.....) and further indented/subordinate step (Verify....). The effectivity does not apply to the next equivalently indented step (Horizontal stabilizer.....).

Example (without subordinate items):

YZ008 - YZ014
CABIN TEMPERATURE selector ........................................... As needed
CABIN AIR CONDITIONING ................................................ As needed

In this example, the effectivity YZ008 - YZ014 applies to the first procedural step (CABIN TEMPERATURE selector.....) only. The effectivity does not apply to the next procedural step (CABIN AIR CONDITIONING.....).

When airplane effectivities are centered immediately below a checklist title, the entire checklist applies to the listed airplanes. In the following example, the PACK checklist is applicable to YZ008 - YZ014 only:

**PACK**

**YZ008 - YZ014**

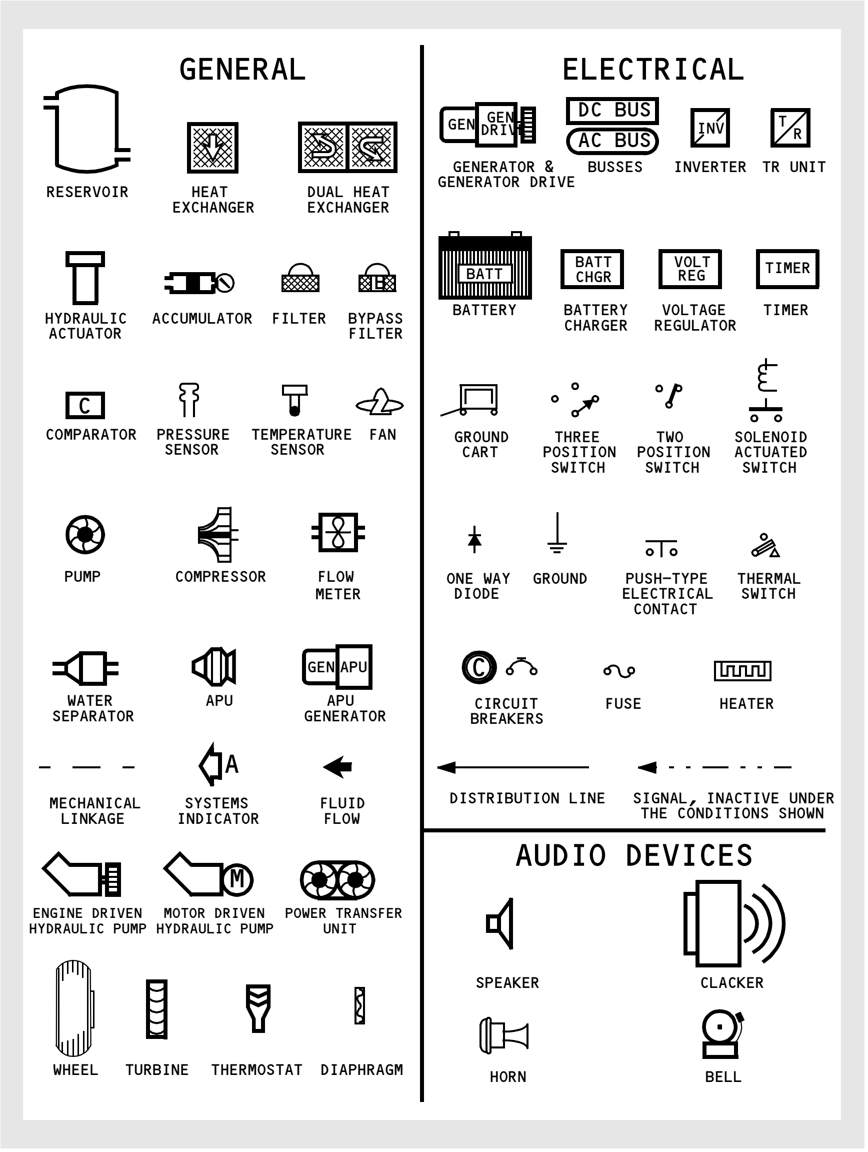
**SPECIAL NOTE:**

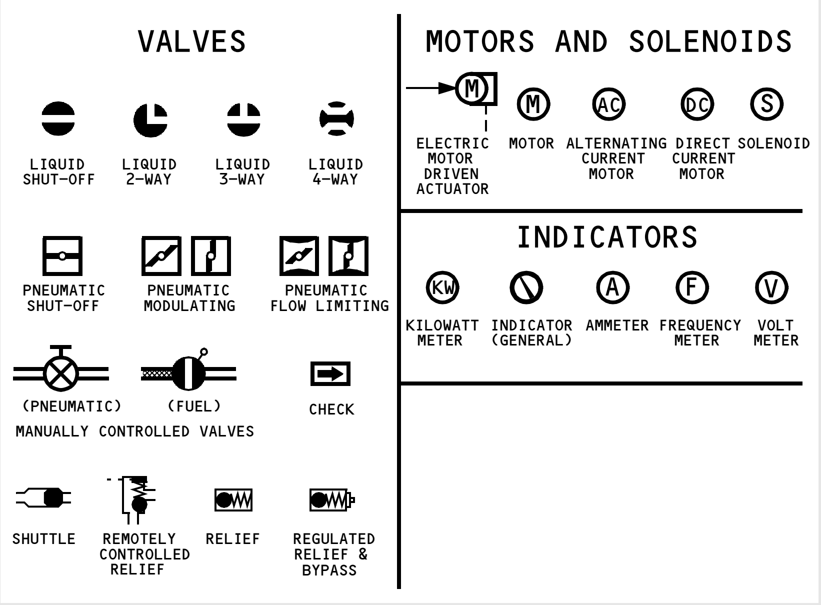
This FCOM contains information which has been included by Flair Airlines Ltd (Flair) on aircraft covered by this manual. This information may differ from Boeing recommended information. Flair has included this information in the manual, and such inclusion does not imply that The Boeing Company in any way endorses or approves such information.

The technical accuracy and validity of all information originated by Flair, and its effect, if any, on other portions of this manual, is the sole responsibility of Flair.

## Schematic Symbols

Symbols shown are those which may not be identified on schematic illustrations.




VALVES
LIQUID SHUT-OFF
LIQUID 2-WAY
LIQUID 3-WAY
LIQUID 4-WAY
PNEUMATIC SHUT-OFF
PNEUMATIC MODULATING
PNEUMATIC FLOW LIMITING
(PNEUMATIC)
(FUEL)
MANUALLY CONTROLLED VALVES
CHECK
SHUTTLE
REMOTELY CONTROLLED RELIEF
RELIEF
REGULATED RELIEF & BYPASS
MOTORS AND SOLENOIDS
M
ELECTRIC MOTOR DRIVEN ACTUATOR
M
MOTOR
AC
ALTERNATING CURRENT MOTOR
DC
DIRECT CURRENT MOTOR
S
SOLENOID
INDICATORS
KW
KILOWATT METER
INDICATOR (GENERAL)
A
AMMETER
F
FREQUENCY METER
V
VOLT METER

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## General

The following abbreviations may be found throughout the manual. Some abbreviations may also appear in lowercase letters. Abbreviations having very limited use are explained in the chapter where they are used. Some abbreviations may not apply to all or any of the aircraft covered in this manual.

| A | |
|---|---|
| A/P | Autopilot |
| A/T | Autothrottle |
| AC | Alternating Current |
| ACARS | Aircraft Communications Addressing and Reporting System |
| ACP | Audio Control Panel |
| ACT | Active |
| ADF | Automatic Direction Finder |
| ADIRU | Air Data Inertial Reference Unit |
| ADM | Air Data Module |
| AED | Automatic External Defibrillator |
| AFDS | Autopilot Flight Director System |
| AFE | Above Field Elevation |
| AFM | Airplane Flight Manual (FAA approved) |
| AGL | Above Ground Level |
| AI | Anti–Ice |
| AIL | Aileron |
| ALT | Altitude |
| ALTN | Alternate |
| AM | Amplitude Modulation |
| ANP | Actual Navigation Performance |
| ANT | Antenna |
| AOA | Angle of Attack |
| APP | Approach |
| APU | Auxiliary Power Unit |
| ARINC | Aeronautical Radio, Incorporated |
| ARPT | Airport |
| ARTE | Above Runway Threshold Elevation |
| ATA | Actual Time of Arrival |
| ATC | Air Traffic Control |
| ATT | Attitude |
| AUTO | Automatic |
| AUX | Auxiliary |
| AVAIL | Available |
| **B** | |
| B/C or BCRS | Back Course |
| BARO | Barometric |
| BAT/BATT | Battery |

| | |
|---|---|
| BRT | Bright |
| BTL DISCH | Bottle Discharge (fire extinguishers) |
| BTP | Bromotrifluropropene (fire extinguishers) |
| **C** | |
| C | Captain<br>Celsius<br>Center |
| CANC/ RCL | Cancel/Recall |
| CB | Circuit Breaker |
| CDU | Control Display Unit |
| CG | Center of Gravity |
| CHKL | Checklist |
| CLB | Climb |
| COMM | Communication |
| CON | Continuous |
| CONFIG | Configuration |
| CRZ | Cruise |
| CTL | Control |
| **D** | |
| DC | Direct Current |
| DDG | Dispatch Deviations Guide |
| DEP ARR | Departure Arrival |
| DES | Descent |
| DISC | Disconnect |
| DME | Distance Measuring Equipment |
| DPC | Display Processing Computer |
| DSPL | Display |

| | |
|---|---|
| **E** | |
| E/D | End of Descent |
| E/E | Electrical and Electronic |
| EASA | European Aviation Safety Agency |
| EBAW | Enhanced Bank Angle Warning |
| ECS | Environmental Control System |
| EEC | Electronic Engine Control |
| EFIS | Electronic Flight Instrument System |
| EGPWS | Enhanced Ground Proximity Warning System |
| EGT | Exhaust Gas Temperature |
| ELEC | Electrical |
| ELEV | Elevator |
| ENG | Engine |
| EXEC | Execute |
| EXT | Extend |
| **F** | |
| F | Fahrenheit |
| F/D or FLT DIR | Flight Director |
| F/O | First Officer |
| FAF | Final Approach Fix. May be used in place of FAP |
| FAP | Final Approach Point |
| FCTL | Flight Control |
| FCTM | Flight Crew Training Manual |

| | |
|---|---|
| FFM | Force Fight Monitor |
| FL | Flight Level |
| FMC | Flight Management Computer |
| FMS | Flight Management System |
| FPA | Flight Path Angle |
| FPV | Flight Path Vector |
| FSEU | Flap Slat Electronic Unit |
| G | |
| G/S | Glide Slope |
| GA | Go–Around |
| GBAS | Ground-Based Augmentation System |
| GEN | Generator |
| GLS | GPS Landing System or GNSS Landing System or GBAS Landing System |
| GNSS | Global Navigation Satellite System |
| GP | Glide Path |
| GPS | Global Positioning System |
| GPWS | Ground Proximity Warning System |
| H | |
| HDG | Heading |
| HDG REF | Heading Reference |
| HDG SEL | Heading Select |
| HPA | Hectopascals |
| HUD | Head-Up Display |
| HYD | Hydraulic |

| | |
|---|---|
| I | |
| IAS | Indicated Airspeed |
| IASC | Integrated Air Supply Controller |
| IDENT | Identification |
| IGS | Instrument Guidance System |
| ILS | Instrument Landing System |
| IN | Inches |
| INBD | Inboard<br>Inbound |
| IND LTS | Indicator Lights |
| INOP | Inoperative |
| INTC CRS | Intercept Course |
| ISFD | Integrated Standby Flight Display |
| ISLN | Isolation |
| K | |
| K | Knots |
| KGS | Kilograms |
| L | |
| L | Left |
| LAM | Landing Attitude Modifier |
| LAT | Latitude |
| LBS | Pounds |
| LDA | Localizer Type Directional Aid |
| LDG ALT | Landing Altitude |
| LE | Leading Edge |
| LIM | Limit |
| LNAV | Lateral Navigation |

| | |
|---|---|
| LOM | Locator Outer Marker |
| LONG | Longitude |
| LVL CHG | Level Change |
| M | |
| MAG | Magnetic |
| MAN | Manual |
| MCAS | Maneuver Characteristics Augmentation System |
| MCP | Mode Control Panel |
| MDA | Minimum Descent Altitude |
| MDS | MAX Display System |
| MEL | Minimum Equipment List |
| MFD | Multi-Function Display |
| MIN | Minimum |
| MKR | Marker |
| MLA | Maneuver Load Alleviation |
| MMO | Maximum Mach Operating Speed |
| MOD | Modify |
| MTRS | Meters |
| N | |
| N1 | Low Pressure Rotor Speed |
| N2 | High Pressure Rotor Speed |
| NAV RAD | Navigation Radio |
| ND | Navigation Display |
| NDB | Non-Directional Beacon |
| NGS | Nitrogen Generation System |
| NM | Nautical Miles |
| NORM | Normal |
| O | |
| OHU | Overhead Unit |
| OVHD | Overhead |
| OVRD | Override |
| P | |
| PASS | Passenger |
| PCU | Power Control Unit |
| PERF INIT | Performance Initialization |
| PF | Pilot Flying |
| PFC | Primary Flight Computers |
| PM | Pilot Monitoring |
| PNL | Panel |
| POS | Position |
| POS INIT | Position Initialization |
| PRI | Primary |
| PRW | Perspective Runway |
| PTU | Power Transfer Unit |
| PWS | Predictive Windshear System |
| R | |
| R | Right |
| RA | Radio Altitude Resolution Advisory |
| RAAS | Runway Awareness and Advisory System |
| RECIRC | Recirculation |
| REF | Reference |
| RET | Retract |

| | |
|---|---|
| RF | Refill |
| RH | Right Hand |
| RNP | Required Navigation Performance |
| RVSM | Reduced Vertical Separation Minimum |
| RVFP | Visual Flight Procedure |
| S | |
| S/C | Step Climb |
| SDF | Simplified Directional Facility |
| SEL | Select |
| SMYD | Stall Management Yaw Damper |
| SPD | Speed |
| SPLR | Spoiler |
| STA | Station |
| STAB | Stabilizer |
| STAT | Status |
| STD | Standard |
| STS | Speed Trim System |
| T | |
| T/D | Top of Descent |
| T or TK or TRK | Track |
| T or TRU | True |
| TA | Traffic Advisory |
| TAI | Thermal Anti-Ice |
| TAT | Total Air Temperature |

| | |
|---|---|
| TCAS | Traffic Alert and Collision Avoidance System |
| TDZE | Touch Down Zone Elevation |
| TE | Trailing Edge |
| TFC | Traffic |
| THR HLD | Throttle Hold |
| TO | Takeoff |
| TO/GA | Takeoff/Go–Around |
| U | |
| UTC | Universal Time Coordinated |
| V | |
| V/S | Vertical Speed |
| V1 | Takeoff Decision Speed |
| V2 | Takeoff Safety Speed |
| VA | Design Maneuvering Speed |
| VHF | Very High Frequency |
| VMO | Maximum Operating Speed |
| VNAV | Vertical Navigation |
| VOR | VHF Omnidirectional Range |
| VOX | Voice Operated Transmission |
| VR | Rotation Speed |
| VREF | Reference Speed |
| VSD | Vertical Situation Display |
| VTK | Vertical Track |

| W | |
|---|---|
| WPT | Waypoint |
| WXR | Weather Radar |
| X | |
| XTK | Cross Track |

## Revision Transmittal Letter

To: All holders of Flair Airlines Ltd 737 Flight Crew Operations Manual (FCOM), Boeing Document Number D6-27370-MAX-FLR.

Subject: Flight Crew Operations Manual Revision.

This revision reflects the most current information available to The Boeing Company 60 days before the subject revision date. The following revision highlights explain changes in this revision. General information below explains the use of revision bars to identify new or revised information.

## Revision Record

| No. | Revision Date | No. | Revision Date |
|---|---|---|---|
| 0 | March 21, 2021 | 1 | May 20, 2021 |
| 2 | August 1, 2021 | 3 | November 4, 2021 |
| 4 | March 15, 2022 | 5 | May 5, 2022 |
| 6 | July 15, 2022 | 7 | August 15, 2022 |
| 8 | November 15, 2022 | | |

## General

The Boeing Company issues FCOM revisions to provide new or revised procedures and information. Formal revisions also incorporate appropriate information from previously issued FCOM bulletins.

The revision date is the approximate date the manual is approved for printing. The revision is mailed a few weeks after this date. This manual is effective upon receipt and supersedes any manual (with the same document number) with a previous revision number.

Formal revisions include a Transmittal Letter, a new Revision Record, Revision Highlights, and a current List of Effective Pages. Use the information on the new Revision Record and List of Effective Pages to verify the FCOM content.

Pages containing revised technical material have revision bars associated with the changed text or illustration. Editorial revisions (for example, spelling corrections) may have revision bars with no associated highlight.

The Revision Record should be completed by the person incorporating the revision into the manual.

## Filing Instructions

Consult the List of Effective Pages (0.5). Pages identified with an asterisk (*) are either replacement pages or new (original) issue pages. Remove corresponding old pages and replace or add new pages. Remove pages that are marked DELETED; there are no replacement pages for deleted pages.

Be careful when inserting changes not to throw away pages from the manual that are not replaced. Using the List of Effective Pages (0.5) can help determine the correct content of the manual.

## Revision Highlights

This section (0.4) replaces the existing section 0.4 in your manual.

Throughout the manual, airplane effectivity may be updated to reflect coverage as listed on the Preface - Model Identification page, or to show service bulletin airplane effectivity. Highlights are not supplied.

This manual is published from a database; the text and illustrations are marked with configuration information. Occasionally, because the editors rearrange the database markers, or mark items with configuration information due to the addition of new database content, some customers may receive revision bars on content that appears to be unchanged. Pages may also be republished without revision bars due to slight changes in the flow of the document.

## Distribution List

The Flair Document Standards Coordinator is responsible for maintaining the following circulation list of this manual in order to facilitate accurate revision/recall action.

The following manual holders are responsible for the currency of manuals issued to them.

| **Digital:** **Manual holders are responsible for maintaining any and all printed copies to ensure the manual is up to date.** | |
|---|---|
| Master | Document Standards Coordinator |
| Transport Canada | Principal Operations Inspector |
| FlairConnect | Document Standards Coordinator |
| Airwatch | Document Standards Coordinator |

This manual in the most current approved version is available to all Flair employees on the FlairConnect intranet.

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## Revision 8 Highlights

| Chapter, Section | Page No. | Description of Changes |
|---|---|---|
| | | NOTE: addition of a/c 920 (1B392) due to delivery date change from 2023 to 2022. |
| Chp 0, Sec 1<br>Chp PD, Sec ModID<br>Chp PI, Sec ModID | 0.1.1, PD.ModID.10.1, PI.ModID.10.1 | ModID tables updated to same format and added the following a/c:<br>• 920 (C-FLQO / 1B392)<br>• 922 (C-FLQF / 1B397)<br>• 923 (C-FLQG / 1B390)<br>• 924 (C-FLQP / 1B393)<br>• 925 (C-FLBG / 1J023)<br>• 926 (C-FLGD / 1B391)<br>• 927 (C-GFOF / 1K001) |
| Chp L, Sec 10 | L.10.2, L.10.7, L.10.8 | Added a/c 1B392. |
| | L.10.8 | Removed a/c tail numbers from ACARS Non-AFM Operational Information per Boeing Rev7. |
| | L.10.8 | Updated a/c tail numbers for Electrical. |
| | L.10.11, L.10.12 | Updated a/c tail numbers for ORW Alerting System. |
| Chp NP, Sec 11 | NP.11.3 | Added "entering required information in Mission+ app" to PM phase of flight responsibilities |
| | NP.11.5 | Changed:<br>• "Skybook" to "Mission+";<br>• "Transmit Skybook OFP" to "Close and Export Mission+ Flight". |
| Chp NP, Sec 21 | NP.21.2 | Preliminary Preflight Procedure - Captain or First Officer - added a/c 1B392. |

| Chapter, Section | Page No. | Description of Changes |
|---|---|---|
| | NP.21.17, NP.21.18 | Preflight Procedure - First Officer - added a/c effectivity for Passenger Signs. |
| | NP.21.20 | Added "USB Power switch (as installed)...Verify on" as USB Charging outlets have been installed in the flight deck. |
| | NP.21.25 | Preflight Procedure - Captain: added "USB Power switch (as installed)...Verify on" as USB Charging outlets have been installed in the flight deck. |
| | NP.21.36 | Before Taxi Procedure:<br>• added Warning re: verifying the required takeoff flap setting against the required selection as displayed on the CDU before calling "FLAPS<br>• added a/c 1B392. |
| | NP.21.37 | Before Taxi Procedure - added a/c 1B392. |
| | NP.21.38 | Before Takeoff Procedure: added Warning that both pilots must verify the required takeoff flap setting against the required selection as displayed on the CDU when challenging and responding in the BEFORE TAKEOFF checklist. |
| | NP.21.48 | Descent Procedure - updated a/c effectivity. |
| | NP.21.64 | Landing Procedure - ILS CAT I: updated step to indicate autopilot to be disengaged in accordance with aircraft limitations. |
| | NP.21.69 | Landing Procedure - RNAV (RNP) AR - changed "as installed" to "as needed". |

| Chapter, Section | Page No. | Description of Changes |
|---|---|---|
| | NP.21.71 | Landing Procedure - RNAV (RNP) AR: updated step to indicate autopilot to be disengaged in accordance with aircraft limitations. |
| | NP.21.75 | Landing Procedure - Instrument Approach Using VNAV - per Boeing Rev7, updated instructions for when a suitable visual reference at DA(H), MDA(H) or the missed approach point is established. |
| Chp SP, Sec 2 | SP.2.4, SP.2.5 | Added or updated a/c effectivity. |
| Chp SP, Sec 6 | SP.6.1 | |
| Chp SP, Sec 7 | SP.7.3 | |
| Chp SP, Sec 11 | SP.11.1, SP.11.2 | |
| Chp SP, Sec 12 | SP.12.2 | |
| Chp SP, Sec 15 | SP.15.1, SP.15.2 | Per Boeing Rev7:<br>• removed "RAAS database version (RCD xxxxx) shows on navigation displays" per Boeing Rev7;<br>• changed "1K003" to "1K002". |
| Chp SP, Sec 16 | SP.16.1 | • Takeoff Procedure - removed PF and PM from procedures per Boeing Rev7.<br>• Editorial change. |

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| | | | |
|---|---|---|---|
| NP.11.14 | July 15, 2022 | NP.21.43 | July 15, 2022 |
| NP.11.15 | March 1, 2021 | NP.21.44 | May 5, 2022 |
| NP.11.16 | March 1, 2021 | NP.21.45 | May 5, 2022 |
| NP.11.17 | March 1, 2021 | NP.21.46 | May 5, 2022 |
| NP.11.18 | July 15, 2022 | NP.21.47 | May 5, 2022 |
| NP.21.1 | May 5, 2022 | NP.21.48 | November 15, 2022 |
| NP.21.2 | November 15, 2022 | NP.21.49 | July 15, 2022 |
| NP.21.3 | May 5, 2022 | NP.21.50 | July 15, 2022 |
| NP.21.4 | May 5, 2022 | NP.21.51 | July 15, 2022 |
| NP.21.5 | May 5, 2022 | NP.21.52 | July 15, 2022 |
| NP.21.6 | May 5, 2022 | NP.21.53 | July 15, 2022 |
| NP.21.7 | July 15, 2022 | NP.21.54 | July 15, 2022 |
| NP.21.8 | May 5, 2022 | NP.21.55 | July 15, 2022 |
| NP.21.9 | May 5, 2022 | NP.21.56 | July 15, 2022 |
| NP.21.10 | May 5, 2022 | NP.21.57 | July 15, 2022 |
| NP.21.11 | May 5, 2022 | NP.21.58 | July 15, 2022 |
| NP.21.12 | May 5, 2022 | NP.21.59 | July 15, 2022 |
| NP.21.13 | May 5, 2022 | NP.21.60 | July 15, 2022 |
| NP.21.14 | May 5, 2022 | NP.21.61 | July 15, 2022 |
| NP.21.15 | May 5, 2022 | NP.21.62 | July 15, 2022 |
| NP.21.16 | May 5, 2022 | NP.21.63 | July 15, 2022 |
| NP.21.17 | November 15, 2022 | NP.21.64 | November 15, 2022 |
| NP.21.18 | November 15, 2022 | NP.21.65 | July 15, 2022 |
| NP.21.19 | November 15, 2022 | NP.21.66 | July 15, 2022 |
| NP.21.20 | November 15, 2022 | NP.21.67 | July 15, 2022 |
| NP.21.21 | November 15, 2022 | NP.21.68 | July 15, 2022 |
| NP.21.22 | November 15, 2022 | NP.21.69 | November 15, 2022 |
| NP.21.23 | May 5, 2022 | NP.21.70 | July 15, 2022 |
| NP.21.24 | May 5, 2022 | NP.21.71 | November 15, 2022 |
| NP.21.25 | November 15, 2022 | NP.21.72 | July 15, 2022 |
| NP.21.26 | November 15, 2022 | NP.21.73 | July 15, 2022 |
| NP.21.27 | November 15, 2022 | NP.21.74 | July 15, 2022 |
| NP.21.28 | May 5, 2022 | NP.21.75 | November 15, 2022 |
| NP.21.29 | May 5, 2022 | NP.21.76 | July 15, 2022 |
| NP.21.30 | May 5, 2022 | NP.21.77 | July 15, 2022 |
| NP.21.31 | May 5, 2022 | NP.21.78 | July 15, 2022 |
| NP.21.32 | May 5, 2022 | NP.21.79 | July 15, 2022 |
| NP.21.33 | May 5, 2022 | NP.21.80 | July 15, 2022 |
| NP.21.34 | May 5, 2022 | NP.21.81 | July 15, 2022 |
| NP.21.35 | May 5, 2022 | NP.21.82 | July 15, 2022 |
| NP.21.36 | November 15, 2022 | NP.21.83 | July 15, 2022 |
| NP.21.37 | November 15, 2022 | NP.21.84 | July 15, 2022 |
| NP.21.38 | November 15, 2022 | NP.21.85 | July 15, 2022 |
| NP.21.39 | May 5, 2022 | NP.21.86 | July 15, 2022 |
| NP.21.40 | July 15, 2022 | NP.40.1 | March 1, 2021 |
| NP.21.41 | May 5, 2022 | NP.40.2 | May 5, 2022 |
| NP.21.42 | May 5, 2022 | NP.40.3 | May 5, 2022 |

## Non-Normal Procedures



## Supplementary Procedures

| | |
|---|---|
| SP.11.18 | July 15, 2022 |
| SP.11.19 | July 15, 2022 |
| SP.11.20 | July 15, 2022 |
| SP.11.21 | May 5, 2022 |
| SP.11.22 | May 5, 2022 |
| SP.12.1 | March 1, 2021 |
| SP.12.2 | November 15, 2022 |
| SP.12.3 | May 5, 2022 |
| SP.12.4 | May 5, 2022 |
| SP.15.1 | November 15, 2022 |
| SP.15.2 | November 15, 2022 |
| SP.15.3 | May 5, 2022 |
| SP.15.4 | May 5, 2022 |
| SP.16.1 | March 21, 2021 |
| SP.16.2 | March 21, 2021 |
| SP.16.3 | March 21, 2021 |
| SP.16.4 | March 21, 2021 |
| SP.16.5 | March 21, 2021 |
| SP.16.6 | November 4, 2021 |
| SP.16.7 | May 5, 2022 |
| SP.16.8 | November 4, 2021 |
| SP.16.9 | November 15, 2022 |
| SP.16.10 | March 21, 2021 |
| SP.16.11 | March 21, 2021 |
| SP.16.12 | March 21, 2021 |
| SP.16.13 | November 4, 2021 |
| SP.16.14 | March 21, 2021 |
| SP.16.15 | March 21, 2021 |
| SP.16.16 | March 21, 2021 |
| SP.16.17 | March 21, 2021 |
| SP.16.18 | March 21, 2021 |
| SP.16.19 | March 21, 2021 |
| SP.16.20 | March 21, 2021 |
| SP.16.21 | March 21, 2021 |
| SP.16.22 | March 21, 2021 |
| SP.16.23 | March 21, 2021 |
| SP.16.24 | March 21, 2021 |
| SP.16.25 | March 21, 2021 |
| SP.16.26 | March 21, 2021 |
| SP.16.27 | March 21, 2021 |
| SP.16.28 | March 21, 2021 |
| SP.16.29 | March 21, 2021 |
| SP.16.30 | March 21, 2021 |
| SP.16.31 | March 21, 2021 |
| SP.16.32 | March 21, 2021 |

**Performance Dispatch**

| | |
|---|---|
| PD.0.1 | July 15, 2022 |
| PD.0.2 | July 15, 2022 |

**737-8 LEAP-1B27 KG C M FAA CATB TO1-10% TO2-20% ALT-AB**

| | |
|---|---|
| PD.TOC.10.1 | July 15, 2022 |
| PD.TOC.10.2 | July 15, 2022 |
| PD.ModID.10.1 | November 15, 2022 |
| PD.ModID.10.2 | November 15, 2022 |
| PD.10.1 | July 15, 2022 |
| PD.10.2 | July 15, 2022 |
| PD.10.3 | July 15, 2022 |
| PD.10.4 | July 15, 2022 |
| PD.10.5 | July 15, 2022 |
| PD.10.6 | July 15, 2022 |
| PD.10.7 | July 15, 2022 |
| PD.10.8 | July 15, 2022 |
| PD.10.9 | July 15, 2022 |
| PD.10.10 | July 15, 2022 |
| PD.10.11 | July 15, 2022 |
| PD.10.12 | July 15, 2022 |
| PD.10.13 | July 15, 2022 |
| PD.10.14 | July 15, 2022 |
| PD.10.15 | July 15, 2022 |
| PD.10.16 | July 15, 2022 |
| PD.10.17 | July 15, 2022 |
| PD.10.18 | July 15, 2022 |
| PD.10.19 | July 15, 2022 |
| PD.10.20 | July 15, 2022 |
| PD.10.21 | July 15, 2022 |
| PD.10.22 | July 15, 2022 |
| PD.10.23 | July 15, 2022 |
| PD.10.24 | July 15, 2022 |
| PD.10.25 | July 15, 2022 |
| PD.10.26 | July 15, 2022 |
| PD.11.1 | July 15, 2022 |
| PD.11.2 | July 15, 2022 |
| PD.11.3 | July 15, 2022 |
| PD.11.4 | July 15, 2022 |
| PD.11.5 | July 15, 2022 |
| PD.11.6 | July 15, 2022 |
| PD.11.7 | July 15, 2022 |
| PD.11.8 | July 15, 2022 |
| PD.11.9 | July 15, 2022 |
| PD.11.10 | July 15, 2022 |

| | |
|---|---|
| PD.11.11 | July 15, 2022 |
| PD.11.12 | July 15, 2022 |
| PD.12.1 | July 15, 2022 |
| PD.12.2 | July 15, 2022 |
| PD.12.3 | July 15, 2022 |
| PD.12.4 | July 15, 2022 |
| PD.12.5 | July 15, 2022 |
| PD.12.6 | July 15, 2022 |
| PD.12.7 | July 15, 2022 |
| PD.12.8 | July 15, 2022 |
| PD.12.9 | July 15, 2022 |
| PD.12.10 | July 15, 2022 |
| PD.12.11 | July 15, 2022 |
| PD.12.12 | July 15, 2022 |
| PD.12.13 | July 15, 2022 |
| PD.12.14 | July 15, 2022 |
| PD.12.15 | July 15, 2022 |
| PD.12.16 | July 15, 2022 |
| PD.12.17 | July 15, 2022 |
| PD.12.18 | July 15, 2022 |
| PD.13.1 | July 15, 2022 |
| PD.13.2 | July 15, 2022 |
| PD.13.3 | July 15, 2022 |
| PD.13.4 | July 15, 2022 |
| PD.13.5 | July 15, 2022 |
| PD.13.6 | July 15, 2022 |
| PD.13.7 | July 15, 2022 |
| PD.13.8 | July 15, 2022 |
| PD.13.9 | July 15, 2022 |
| PD.13.10 | July 15, 2022 |
| PD.13.11 | July 15, 2022 |
| PD.13.12 | July 15, 2022 |
| PD.13.13 | July 15, 2022 |
| PD.13.14 | July 15, 2022 |
| PD.14.1 | July 15, 2022 |
| PD.14.2 | July 15, 2022 |
| PD.14.3 | July 15, 2022 |
| PD.14.4 | July 15, 2022 |
| PD.14.5 | July 15, 2022 |
| PD.14.6 | July 15, 2022 |
| PD.14.7 | July 15, 2022 |
| PD.14.8 | July 15, 2022 |

## Performance Inflight

| | |
|---|---|
| PI.TOC.1 | July 15, 2022 |
| PI.TOC.2 | July 15, 2022 |

## 737-8 LEAP-1B27 KG C M FAA CATB TO1-10% TO2-20% ALT-AB

| | |
|---|---|
| PI.TOC.10.1 | July 15, 2022 |
| PI.TOC.10.2 | July 15, 2022 |
| PI.TOC.10.3 | July 15, 2022 |
| PI.TOC.10.4 | July 15, 2022 |
| PI.TOC.10.5 | July 15, 2022 |
| PI.TOC.10.6 | July 15, 2022 |
| PI.ModID.10.1 | November 15, 2022 |
| PI.ModID.10.2 | November 15, 2022 |
| PI.10.1 | July 15, 2022 |
| PI.10.2 | July 15, 2022 |
| PI.10.3 | July 15, 2022 |
| PI.10.4 | July 15, 2022 |
| PI.10.5 | July 15, 2022 |
| PI.10.6 | July 15, 2022 |
| PI.10.7 | July 15, 2022 |
| PI.10.8 | July 15, 2022 |
| PI.10.9 | July 15, 2022 |
| PI.10.10 | July 15, 2022 |
| PI.10.11 | July 15, 2022 |
| PI.10.12 | July 15, 2022 |
| PI.10.13 | July 15, 2022 |
| PI.10.14 | July 15, 2022 |
| PI.10.15 | July 15, 2022 |
| PI.10.16 | July 15, 2022 |
| PI.10.17 | July 15, 2022 |
| PI.10.18 | July 15, 2022 |
| PI.10.19 | July 15, 2022 |
| PI.10.20 | July 15, 2022 |
| PI.10.21 | July 15, 2022 |
| PI.10.22 | July 15, 2022 |
| PI.10.23 | July 15, 2022 |
| PI.10.24 | July 15, 2022 |
| PI.10.25 | July 15, 2022 |
| PI.10.26 | July 15, 2022 |
| PI.10.27 | July 15, 2022 |
| PI.10.28 | July 15, 2022 |
| PI.10.29 | July 15, 2022 |
| PI.10.30 | July 15, 2022 |
| PI.10.31 | July 15, 2022 |
| PI.10.32 | July 15, 2022 |
| PI.10.33 | July 15, 2022 |
| PI.10.34 | July 15, 2022 |
| PI.10.35 | July 15, 2022 |
| PI.10.36 | July 15, 2022 |

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## General

The information contained in the bulletin will be incorporated into the FCOM by amendment and, upon approval by Transport Canada, the bulletin will be removed from the FCOM.

Bulletin status is defined as follows:

- In Effect (IE) – the bulletin contains pertinent information not otherwise covered in the Flight Crew Operations Manual. The bulletin remains active and should be retained in the manual
- Incorporated (INC) – information has been incorporated in the Flight Crew Operations Manual. The bulletin has been removed from the manual.
- Cancelled (CANC) – time restricted bulletin no longer in effect. The bulletin has been removed from the Flight Crew Operations Manual.

| Number | Subject | Date | Status |
|---|---|---|---|
| FCMAX22-002 | Revised Weight Limitations | July 06, 2022 | INC |

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## General

The Boeing Company issues Flight Crew Operations Manual Bulletins to provide important information to flight crews prior to the next formal revision of the Flight Crew Operations Manual. The transmitted information may be of interest to only specific Operators or may apply to all Operators of this model airplane. Each bulletin will vary.

Bulletins are dated and numbered sequentially for each operator. Each new bulletin is recorded in this record when received and filed as instructed. A bulletin may not apply to all airplane models. When appropriate, the next formal FCOM revision will include an updated bulletin record page to reflect current bulletin status.

Temporary information is normally incorporated into the manual at the next formal revision. When the condition remains temporary after a bulletin incorporation, the temporary paragraphs are identified by a heading referencing the originating bulletin. When the temporary condition no longer exists, the bulletin is cancelled and the original manual content is restored.

Bulletin status is defined as follows:

- In Effect (IE) – the bulletin contains pertinent information not otherwise covered in the Flight Crew Operations Manual. The bulletin remains active and should be retained in the manual
- Incorporated (INC) – the bulletin operating information has been incorporated into the Flight Crew Operations Manual. However, the bulletin remains active and should be retained in the manual
- Cancelled (CANC) – the bulletin is no longer active and should be removed from the Flight Crew Operations Manual. All bulletins previously cancelled are no longer listed in the Bulletin Record.

The person filing a new or revised bulletin should amend the Bulletin Record as instructed in the Administrative Information section of the bulletin. When a bulletin includes replacement pages for the Flight Crew Operations Manual or QRH, the included pages should be filed as instructed in the Flight Crew Operations Manual Information section of the bulletin.

| Number | Subject | Date | Status |
|---|---|---|---|
| FLR-1 | Cabin Pressurization Panel Blanking/Dimming Issues | March 1, 2021 | CANC |
| FLR-2 | Bleed System Oscillations | March 1, 2021 | IE |
| FLR-3 R1 | START VALVE OPEN Alert Blinking at Starter Cutout | March 1, 2021 | IE |
| FLR-4 | Elevator Jam Landing Assist Switch | March 1, 2021 | IE |
| FLR-5 | Localizer Overshoot When Using LNAV to Intercept the Localizer | May 21, 2021 | IE |
| FLR-6 | Incorrect FMC Constraint Altitude on a Standard Terminal Arrival Route (STAR) with a Common Waypoint, after Selection of another Approach | July 27, 2021 | IE |
| FLR-7 | VNAV INVALID-PERF Scratchpad Message | July 27, 2021 | IE |
| FLR-8 | Overrun Warning (ORW) System Restriction if a Landing Runway is Not Selected or Available in the FMC | July 27, 2021 | IE |
| FLR-9 | 737 MAX Integrated ADIRU(I-ADIRU) and Automatic Navigation Realign (ANR) Mode | July 27, 2021 | IE |
| FLR-10 | Lateral Path Exceedance on Approach Procedures with a Course Reversal | July 27, 2021 | IE |
| FLR-11 | 737 MAX Approach Data Block Anomaly with GLS Channel Selected | November 4, 2021 | IE |
| FLR-12 | 737-8/-9 Airplanes with Honeywell IMMR Hardware Part Number 69002600-0101. | November 4, 2021 | CANC |
| FLR-13 | Predictive Windshear System Anomaly | November 4, 2021 | IE |
| FLR-14R1 | Radio Altimeter Anomalies Due to 5G C-Band Wireless Broadband Interference in the United States | February 4, 2022 | IE |

BOEING

# Flight Crew Operations Manual Bulletin for Flair Airlines Ltd

**The Boeing Company**
**Seattle, Washington 98124-2207**

737

**Number:** FLR-2

**IssueDate:** March 1, 2021

**Subject:** Bleed System Oscillations

**Reason:** To inform the crew of bleed system oscillations with Engine Anti-Ice ON and Wing Anti-Ice OFF.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

**THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT**

## Background Information

During flight test the 737-8 has exhibited bleed system pressure oscillations. These oscillations were observed with takeoff or climb thrust set with Engine or Wing Anti-Ice ON or OFF. The oscillations have also been observed at reduced thrust settings during cruise or descent with Engine Anti-Ice ON and Wing Anti-Ice OFF. During the bleed system oscillations the L and R needles on the Bleed Air DUCT PRESSURE Indicator, located on the forward overhead panel, can fluctuate approximately plus or minus 10 psi out of phase with one another. This condition does not have any adverse effects on aircraft systems.

The oscillations are caused by unanticipated interaction of both the engine bleed air valves and the electronically controlled Flow Control Valves (eFCV). Boeing is working on the fix to these oscillations and will communicate appropriate implementation instructions as soon as possible.

737-7/8/-9 models are affected by this bulletin.

## Operating Instructions

If bleed system oscillations are observed as described above, no crew action is needed.

## Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record page to show bulletin FLR-2 "In Effect" (IE).

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status, to the 737 Manager, Flight Technical Data, through the Service Requests Application (SR App) on the MyBoeingFleet home page.

# Flight Crew Operations Manual Bulletin
# for
# Flair Airlines Ltd

**The Boeing Company**
**Seattle, Washington 98124-2207**

737

**Number:** FLR-3 R1

**IssueDate:** March 15, 2022

**Subject:** START VALVE OPEN Alert Blinking at Starter Cutout

**Reason:** This bulletin informs flight crews of nuisance blinking of the START VALVE OPEN alert after reaching starter cutout speed.

This bulletin is being revised to update the release date of MDS software Blockpoint 2.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

**THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT**

## Background Information

At starter cutout speed, momentary blinking of the START VALVE OPEN alert has occurred on 737 MAX flight tests.

The START VALVE OPEN alert and the entire crew alert block begins to blink if the start valve is still open 5 seconds after being commanded to close. In some cases, the timing of the command signal plus the time to close the start valve is slightly over the 5 second threshold, causing the alert to blink momentarily.

After starter cutout speed is reached, if the START VALVE OPEN alert blinks momentarily then extinguishes, the blinking can be considered a nuisance. Continued blinking for up to 10 seconds followed by steady illumination of the START VALVE OPEN alert is indication of a start valve malfunction.

This anomaly affects 737-7/-8/-9 airplanes with MDS software prior to Blockpoint (BP) 2. MDS software BP2, scheduled for release 4Q2022, changes the threshold of the alert from 5 seconds to 7 seconds eliminating the nuisance alerts. Boeing will communicate appropriate fix instructions as soon as they become available.

## Operating Instructions

**After starter cutout speed is reached:**

If the START VALVE OPEN alert blinks momentarily then extinguishes, no flight crew or maintenance action is needed.

If the START VALVE OPEN alert continues to blink for up to 10 seconds then illuminates steady, do the START VALVE OPEN Non-Normal Checklist.

## Administrative Information

This bulletin replaces bulletin FLR-3 , dated March 1, 2021. Revise the Flight Crew Operations Manual Bulletin Record Page to show bulletin FLR-3 as "CANCELLED" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record page to show bulletin FLR-3 R1 "In Effect" (IE).

This bulletin will be cancelled after Boeing is notified that all affected airplanes in your fleet have been modified with MDS software BP 2.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status, to the 737 Manager, Flight Technical Data, through the Service Requests Application (SR App) on the MyBoeingFleet home page.

# Flight Crew Operations Manual Bulletin
# for
# Flair Airlines Ltd

**The Boeing Company**
**Seattle, Washington 98124-2207**

737

**Number:** FLR-4

**IssueDate:** March 1, 2021

**Airplane Effectivity: 737-7 / -8 / -9**

**Subject:** Elevator Jam Landing Assist Switch

**Reason:** To inform flight crews of the possibility that the Elevator Jam Landing Assist switch installed on some airplanes is a 3 position switch instead of the correct 2 position switch.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

**THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT**

## Background Information

The Elevator Jam Landing Assist switch on the 737 MAX is supposed to be a guarded 2 position switch. The 2 positions are ON and OFF with the switch guard closed to the OFF position. During production testing on a 737-8 airplane, it was discovered that the Elevator Jam Landing Assist switch installed on some airplanes has a 3 position switch, an ON position, an OFF position and a middle position. The middle position is not wired and is therefore equivalent to the OFF position. Regardless of whether the correct 2 position switch or incorrect 3 position switch is installed, the panel is only labeled for a 2 position switch and labeled with ON and OFF. When the guard is closed, the switch can only be in the middle or OFF positions.

Boeing has worked with the switch manufacturer, Honeywell, to identify the issue. Service Letter 737-27-275 has been released to provide a switch replacement process.

Boeing has determined that airplanes from line number 7065 to line number 7278 might have the incorrect 3 position switch installed. However, airplanes outside of this line number range might also be affected since spare switches may have been sent directly from Honeywell to operators.

## Operating Instructions

### Normal Procedures

During the Preliminary Preflight Procedure – Captain or First Officer, ensure the guard is closed.

### Non-Normal Procedures

In the event a non-normal checklist (NNC) directs the crew to use the Elevator Jam Landing Assist switch, ensure complete movement of the switch to either the ON or OFF position as directed by the NNC. The following NNCs have steps for the Elevator Jam Landing Assist switch:

- ASSIST ON
- Jammed or Restricted Flight Controls

## Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record page to show bulletin FLR-4 "In Effect" (IE).

This Bulletin will be canceled after Boeing is notified that:

- all airplanes in your fleet have been confirmed to have the correct 2 position Elevator Jam Landing Assist switch, and
- any spare switches in your inventory have been confirmed to be the correct 2 position Elevator Jam Landing Assist switch.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status, to the 737 Manager, Flight Technical Data, through the Service Requests Application (SR App) on the MyBoeingFleet home page.

# Flight Crew Operations Manual Bulletin
# for
# Flair Airlines Ltd

**The Boeing Company**
**Seattle, Washington 98124-2207**

737

**Number:** FLR-5

**IssueDate:** May 21, 2021

**Airplane Effectivity: All 737-7/-8/-8200/-9 with Rockwell Collins FCC P12.1.2 or Newer**

**Subject:** Localizer Overshoot When Using LNAV to Intercept the Localizer

**Reason:** This bulletin informs flight crews of affected 737-7/-8/-8200/-9 airplanes with Rockwell Collins FCC 12.1.2 or newer of the potential for localizer overshoot by the Autopilot Flight Director System (AFDS) when using LNAV to intercept the localizer.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

**THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT**

## Background Information

Boeing has received reports from operators of the affected 737-7/-8/-8200/-9 airplanes with Rockwell Collins FCC 12.1.2 or newer that the AFDS did not provide proper guidance when capturing a localizer from certain transitions flown in the LNAV roll mode. These incidents have occurred on transitions with large intercept angles (60 degrees or more) and have resulted in flight through the localizer path (overshoot) during capture.

Flight data have confirmed that during these overshoot events, the AFDS initially banks up to 30 degrees but then reduces bank angle during localizer capture and continues through the final approach course, even when VOR/LOC is the engaged roll mode as shown by the Flight Mode Annunciation (FMA). AFDS correction back to the localizer course may not occur within the distance available to establish a stabilized final approach.

Most overshoot events have been reported on ILS approaches with transition segments which intercept the localizer at 90-degree angles. However, some overshoots have also occurred with intercept angles less than 90 degrees. In these events, LNAV is the engaged roll mode prior to engagement of VOR/LOC during localizer capture.

In all reported overshoot events, deviation from the localizer was accurately shown by the localizer pointer and scale on the primary flight display (PFD) and the navigation display (ND), and by the airplane symbol on the ND.

Boeing has been able to reproduce the overshoot behavior in an engineering simulator and has determined the root cause. Boeing plans to correct the undesired localizer capture behavior in future Rockwell Collins FCC Operational Program Software (OPS).

## Operating Instructions

When conducting an approach using LNAV to intercept a localizer-based final approach course, monitor localizer raw data and call out deviations. If an overshoot occurs that exceeds or is likely to exceed stabilized approach criteria, go-around.

## Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record page to show bulletin FLR-5 "In Effect" (IE).

This undesired localizer capture behavior will be corrected with a future Rockwell Collins FCC OPS.

This FCOM Bulletin will be canceled after Boeing is notified that all of the affected airplanes in your fleet have been retrofitted with the appropriate Rockwell Collins FCC OPS when available.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status, to the 737 Manager, Flight Technical Data, through the Service Requests Application (SR App) on the MyBoeingFleet home page.

# Flight Crew Operations Manual Bulletin
# for
# Flair Airlines Ltd

**The Boeing Company**
**Seattle, Washington 98124-2207**

737

**Number:** FLR-6

**IssueDate:** July 27, 2021

**Airplane Effectivity: 737-8/-9 Airplanes with FMC U13**

**Subject:** Incorrect FMC Constraint Altitude on a Standard Terminal Arrival Route (STAR) with a Common Waypoint, after Selection of another Approach

**Reason:** To inform crews about the incorrect FMC Constraint Altitude, when selecting another approach that has a common waypoint with the original STAR in the active flight plan.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

**THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT**

## Background Information

For airplanes with FMC U13, when a selected approach is changed to another approach that has a common waypoint with the original STAR, the FMC will use the higher constraint altitude for the common waypoint.

## Operating Instructions

When a selected approach is changed for another approach that has a common waypoint with the original STAR, verify the waypoint constraint altitude after changing the selected approach.

This anomaly will be corrected in FMC software update U14.

## Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record page to show bulletin FLR-6 "In Effect" (IE).

This anomaly will be corrected in FMC software update U14.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status, to the 737 Manager, Flight Technical Data, through the Service Requests Application (SR App) on the MyBoeingFleet home page.

# Flight Crew Operations Manual Bulletin
# for
# Flair Airlines Ltd

**The Boeing Company**
**Seattle, Washington 98124-2207**

737

**Number:** FLR-7

**IssueDate:** July 27, 2021

**Airplane Effectivity: B737-7/8/9 Airplanes with FMC Software U13**

**Subject:** VNAV INVALID-PERF Scratchpad Message

**Reason:** To inform the Flight Crews of an anomaly in which the VNAV INVALID-PERF scratchpad message cannot be cleared unless an approach is selected in the active flight plan.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

**THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT**

## Background Information

During a Boeing flight test the following software exception error was discovered. When certain forecast wind data is entered into the DES FORECAST page and no approach is selected in the active flight plan, FMC predictions stop, VNAV disengages, the VNAV INVALID-PERF scratchpad message shows and the FMC Alert Lights illuminate. This software exception causes the Cost Index (CI) to be replaced with box prompts on the PERF INIT page. The corrective action for VNAV INVALID-PERF scratchpad message is reentering the CI using either the previous or a new value on the PERF INIT page. Following the CI reentry, activating the data modification by pushing the execute (EXEC) key will restart FMC predictions and allow the crew to reengage VNAV.

However, it was discovered that with certain winds entered on the DES FORECAST page, it may not be possible to reenter a CI value on the PERF INIT page until an approach is selected into the active flight plan.

**Note:** The exact wind data entries that will trigger this anomaly are not known at this time.

## Operating Instructions

When wind data is entered into the DES FORECAST page with no approach selected in the active flight plan, and the VNAV INVALID-PERF scratchpad message is shown in flight, an approach should be entered into the active flight plan. This should be followed by reentering the original CI or a new CI on the PERF INIT page. Afterwards, activating the data modification by pushing the execute (EXEC) key will restart FMC predictions and allow the crew to reengage VNAV.

The inability to reenter a CI if the VNAV INVALID-PERF scratchpad message is shown, can be avoided if an approach is selected in the active flight plan prior to the FMC-calculated Top of Descent (TOD), or if winds are not entered on the DES FORECAST page.

## Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record page to show bulletin FLR-7 "In Effect" (IE).

This anomaly will be corrected in FMC Software Update U14, scheduled to be released in the second quarter of 2019. This FCOM Bulletin will be revised to include Service Bulletin information when available.

This Bulletin will be cancelled after Boeing is notified that all affected airplanes in your fleet have been retrofitted with FMC Software U14.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status, to the 737 Manager, Flight Technical Data, through the Service Requests Application (SR App) on the MyBoeingFleet home page.

# Flight Crew Operations Manual Bulletin
# for
# Flair Airlines Ltd

**The Boeing Company**
**Seattle, Washington 98124-2207**

737

**Number:** FLR-8

**IssueDate:** July 27, 2021

**Airplane Effectivity: B737-7/-8/-9 with Overrun Warning (ORW) system installed**

**Subject:** Overrun Warning (ORW) System Restriction if a Landing Runway is Not Selected or Available in the FMC

**Reason:** To inform flight crews to inhibit the ORW system if a landing runway is not selected in the FMC and the runway condition is less than dry.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

**THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT**

## Background Information

Testing of the ORW system revealed that if a landing runway is not selected in the FMC ARRIVALS page, the ORW system will only use a DRY runway condition in the system's calculation of landing distance. Thus, if the pilot selects a runway condition that is less than DRY on APPROACH REF Page 2/2 without also selecting a landing runway, the ORW system calculation will not compute properly for the degraded runway condition.

## Operating Instructions

Select a landing runway in the FMC. If a landing runway is not available in the FMC and the runway condition is less than DRY, disable the ORW system in accordance with the Overrun Warning (ORW) System Inhibit Operation supplementary procedure.

## Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record page to show bulletin FLR-8 "In Effect" (IE).

This anomaly will be corrected in FMC Software Update U14, scheduled to be released in the second quarter of 2019. This FCOM Bulletin will be revised to include Service Bulletin information when available.

This FCOM Bulletin will be cancelled after Boeing is notified that all affected airplanes in your fleet have been retrofitted with FMC Software U14.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status, to the 737 Manager, Flight Technical Data, through the Service Requests Application (SR App) on the MyBoeingFleet home page.

Flight Crew Operations Manual Bulletin
for
Flair Airlines Ltd

# Flight Crew Operations Manual Bulletin for Flair Airlines Ltd

**The Boeing Company**
**Seattle, Washington 98124-2207**

**Number:** FLR-9

**IssueDate:** July 27, 2021

**Subject:** 737 MAX Integrated ADIRU (I-ADIRU) and Automatic Navigation Realign (ANR) Mode

**Reason:** To provide information to the flight crew of the flight deck effects of the ANR mode.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

**THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT**

## Background Information

The 737 MAX is equipped with I-ADIRU part number HG2050BC04 and it was revealed during flight test that after landing when the I-ADIRU enters the post-flight Auto Navigation Realign (ANR) mode it can cause some unexpected flight deck effects.

The purpose of the ANR mode is to automatically perform an IRS realignment when the airplane is motionless to remove drift errors associated with position and ground speed.

The ANR mode is active when the following conditions are met:

- The airplane is on ground
- The IRS Mode Selectors are in NAV mode
- The airplane remains motionless for 7.5 to 15 minutes depending on the airplane latitude

737 MAX airplanes with I-ADIRU part number HG2050BC04 that have been connected to the Multi-Mode Receiver (MMR) are capable of automatically accepting GPS position for IRS initializations (i.e. full alignment, Fast Realignment, and post-flight ANR mode).

**Note:** Position entered by the flight crew has priority over automatically accepted GPS position data. Once initialized, whether automatically by GPS or manually by the flight crew, GPS position is no longer automatically accepted by the I-ADIRU until after a flight is completed.

The FMC receives latitude, longitude and ground speed inputs from the I-ADIRU and uses this data to calculate its own FMC ground speed, track and position which are then displayed on the Navigation and Primary Flight Displays (ND and PFD).

The I-ADIRU position can drift over time during flight. In order to remove drift errors, the post-flight ANR mode is automatically activated after completion of a flight when the conditions described above are met. During post-flight ANR mode, the I-ADIRU accepts present GPS position from the MMR to automatically update IRS position and remove drift errors accumulated during flight.

When the I-ADIRU drift errors accumulated during flight are removed by the post-flight ANR mode, the FMC calculation of ground speed, track, and position can be adversely affected. One or more of the following flight deck effects can be observed on the ND and PFD:

- Slew of the compass rose on the ND for the “Track Up” display option (Figure 1)
- Slew of the track line on the ND for the “Heading Up” display option (Figure 2)
- Slew of the track line on the PFD compass rose (Figure 3)
- Change in the current track (Figure 4)
- Change in FMC position resulting in a map shift (Figure 5)
    - There is a perceived change in GPS position due to the map shift (Figure 6)
- Change in the FMC ANP and ground speed (Figure 7)

- Change in ADIRU position (Figure 8)
- SPEEDBRAKE Warning (aural and visual) can alert, if this option is installed (figure 9)

**Note:** These flight deck effects happen post-flight only and are not always present. It depends on how much IRS drift error has occurred during flight (i.e. the difference between IRS position and GPS position) and whether the airplane remains motionless long enough for post-flight ANR mode to complete before IRS mode selectors are set to OFF or a full alignment or Fast Realignment is done. If the difference is small (approximately 1 nm), the FMC position, track, and ground speed transient errors may not be noticeable.

The flight deck effects described above will last approximately 10 - 120 seconds, depending on the IRS position update magnitude, after which the ND and PFD will return to normal and the visual SPEEDBRAKE Warning (if installed) will extinguish. Heading on the PFD and ND is not affected.

It is important to note that the flight deck effects described in the above are only possible when the post-flight ANR mode is active after completion of a flight and valid GPS position is received, i.e., cannot occur during taxi out even if the airplane remains stationary for approximately 7.5 to 15 minutes. Also, if the airplane is moved (motion detected) prior to the ANR mode completing the realignment, the ANR mode is stopped, I-ADIRU position drift errors remain and none of the flight deck effects described above are presented to the flight crew. The ANR mode timer is restarted from the beginning when the airplane again remains stationary (motionless).

The following is more specific information on 737 MAX models affected by this bulletin:

- 737-7 – All
- 737-8
  - Line number 6854 and earlier if Service Bulletin 737-34-3141 is incorporated
  - All from line number 6855 and on
- 737-9 – All

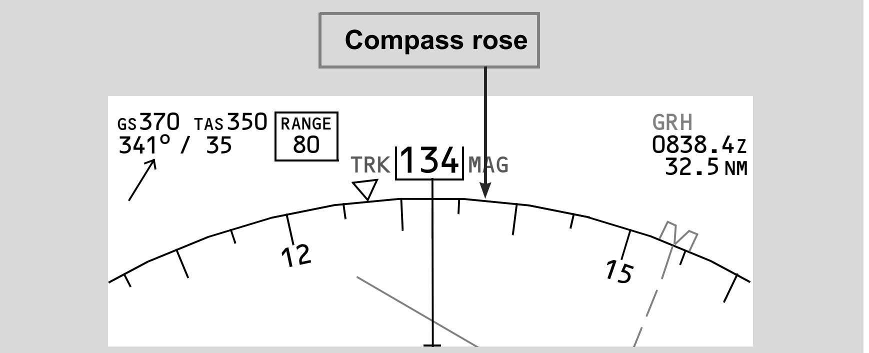


Figure 1

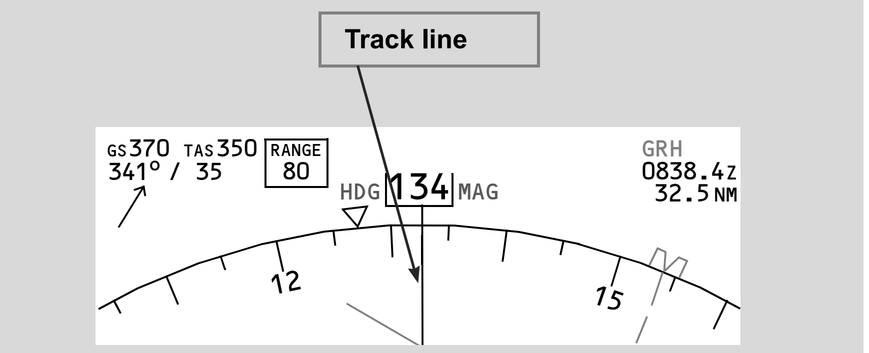


Figure 2

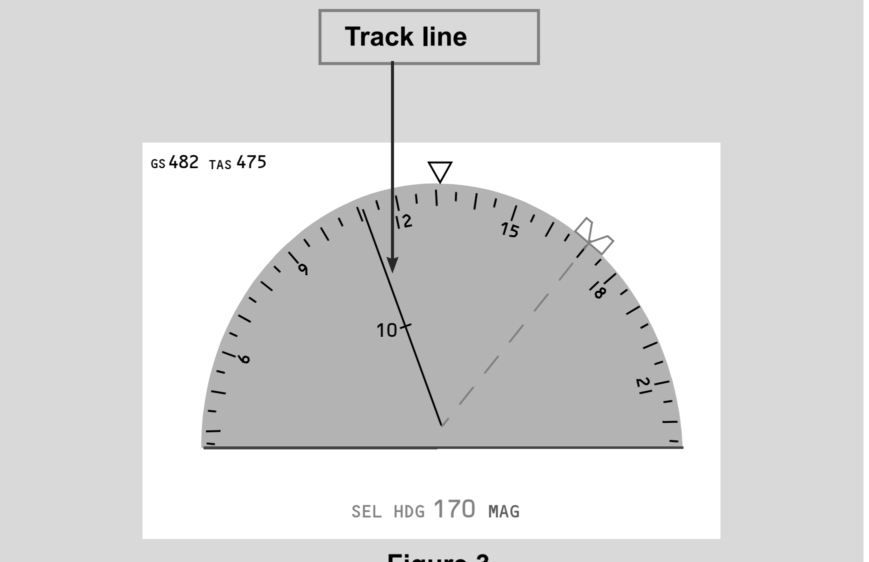


Figure 3

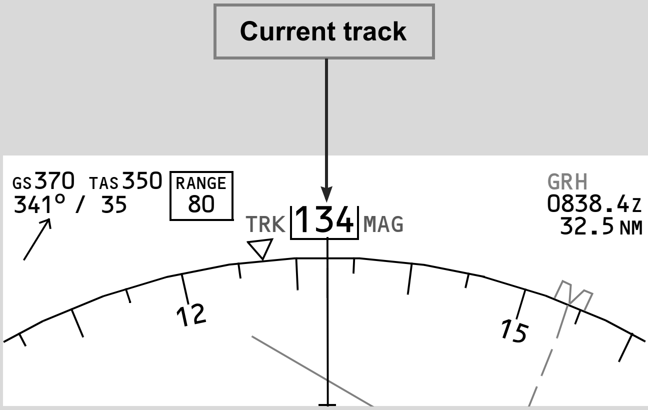


Figure 4

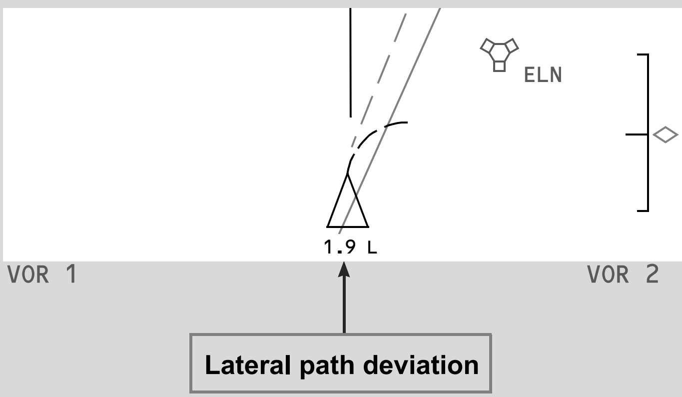


Figure 5

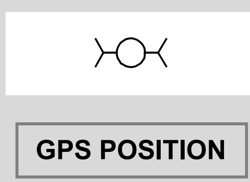


Figure 6

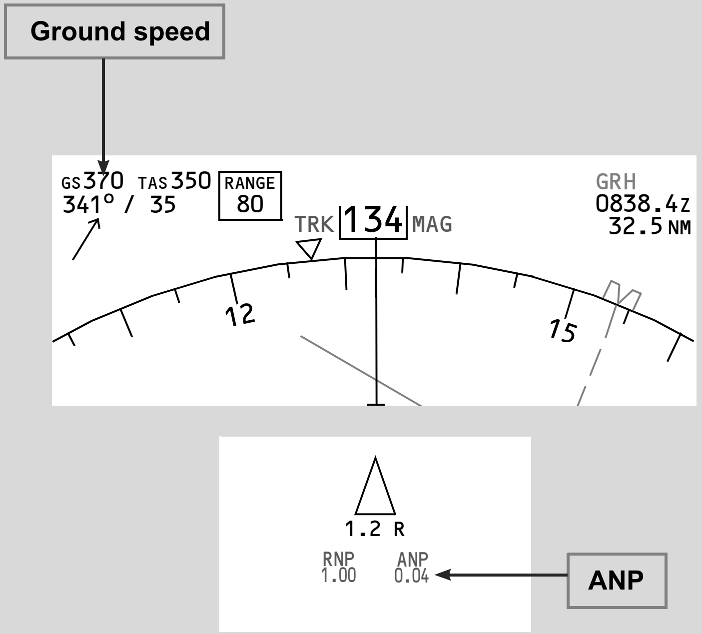


Figure 7

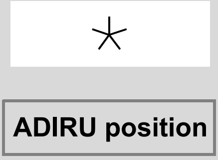


Figure 8

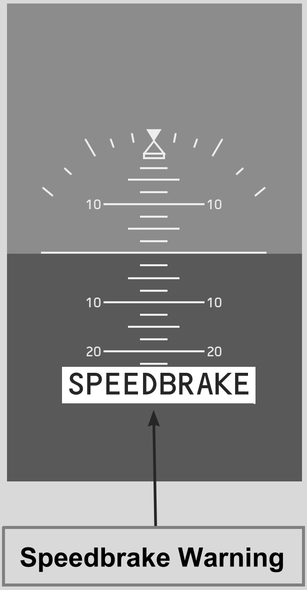


Figure 9

## Operating Instructions

Before each flight complete a full IRS alignment and enter the most accurate latitude and longitude to initiate the alignment. If time does not allow a full alignment, do the Fast Realignment Supplementary Procedure.

If after completion of a flight the airplane remains stationary for approximately 7.5 - 15 minutes, the flight crew may observe one or more of the flight deck effects described in the background information. As the IRSs are operating per design no flight crew or maintenance action is needed.

## Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record page to show bulletin FLR-9 "In Effect" (IE).

This anomaly will be corrected in FMC Software Update U14, scheduled to be released in the second quarter of 2019. This FCOM Bulletin will be revised to include Service Bulletin information when available.

This bulletin will be canceled after Boeing is notified that all affected airplanes in your fleet have been retrofitted with FMC Software U14.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status, to the 737 Manager, Flight Technical Data, through the Service Requests Application (SR App) on the MyBoeingFleet home page.

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# Flight Crew Operations Manual Bulletin
# for
# Flair Airlines Ltd

**The Boeing Company**
**Seattle, Washington 98124-2207**

737

**Number:** FLR-10

**IssueDate:** July 27, 2021

**Airplane Effectivity: 737 MAX Airplanes with FMC Software U13**

**Subject:** Lateral Path Exceedance on Approach Procedures with a Course Reversal

**Reason:** This bulletin informs flight crews of an FMC software U13 anomaly which generates an LNAV lateral path exceedance when flying an approach with a course reversal to the inbound leg.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

**THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT**

## Background Information

Boeing and GE have received reports from operators of FMC generated LNAV lateral path exceedances when flying an approach with a course reversal to the inbound leg. Some of these approach procedures commence the course reversal at a specified DME and have a lateral limitation not to exceed XX.X DME. In certain instances, the FMC created path may result in exceeding the DME restriction.

This is an original anomaly in FMC U13 for the 737 MAX. This anomaly was introduced when a design change was made to prevent bypasses or discontinuities, based on procedure design of large track changes that are not flyable with high terminal ground speeds.

## Operating Instructions

When executing approaches containing distance constrained course reversals on airplanes with FMC Software U13, crews should be aware of this anomaly and pay particular attention that the lateral path on the Navigation Display (ND) does not exceed the limits indicated on the approach procedure. This can be done by reviewing the procedure as displayed on the ND.

To mitigate this issue, it may be necessary to complete the course reversal using Heading Select (HDG SEL) to avoid a lateral path exceedance.

## Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record page to show bulletin FLR-10 "In Effect" (IE).

This anomaly will be corrected in FMC software update U14.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status, to the 737 Manager, Flight Technical Data, through the Service Requests Application (SR App) on the MyBoeingFleet home page.

# Flight Crew Operations Manual Bulletin
# for
# Flair Airlines Ltd

**The Boeing Company**
**Seattle, Washington 98124-2207**

737

**Number:** FLR-11

**IssueDate:** November 4, 2021

**Subject:** 737 MAX Approach Data Block Anomaly with GLS Channel Selected

**Reason:** To inform the crew of the potential for missing approach data block information when a GLS channel is selected, and prior to the IMMR receiving ground station data.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

**THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT**

## Background Information

Certification flight tests of the Honeywell Integrated Multi-Mode Receiver (IMMR) revealed an anomaly with the presentation of the GLS channel number on the approach data block on the PFD. The GLS channel number can be temporarily shown but subsequently removed.

This anomaly occurs when both of the following conditions are met:

- A GLS channel is tuned and the Ground Based Augmentation System (GBAS) VHF signals are received by the IMMR.
- A new GLS channel corresponding to a different GBAS is tuned and the VHF signals are not yet received by the IMMR.

In addition to the channel number being removed, GLS deviation scales as well as all of the other information on the approach data block can also be removed, including:

- Selected GLS identifier / Selected course
- Runway ID and distance to threshold
- Navigation source reference

Proper GLS approach data block information and GLS deviation scales are restored when the IMMR receives VHF signals from the tuned GBAS.

Honeywell is currently working on a software fix. Once the software fix has been determined, Boeing will communicate appropriate fix instructions.

This anomaly affects 737 MAX airplanes equipped with:

- Honeywell IMMR Part Number 69002600-0101 and
- Honeywell software 34 MMR OPS P/N HNR55-2601-0501 or
- Honeywell software 34 MMR OPS P/N HNR56-2601-0601.

## Operating Instructions

Do not select a GLS channel until completing the Descent Procedure. If after selecting a GLS channel the approach reference and deviation scales are removed, these indications are restored automatically when the airplane is within range of the newly tuned ground station.

## Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record page to show bulletin FLR-11 "In Effect" (IE).

The approach data block anomaly is temporary until a fix is implemented. This OMB will be canceled when an operator reports the fix has been installed on all affected airplanes in their fleet.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status, to the 737 Manager, Flight Technical Data, through the Service Requests Application (SR App) on the MyBoeingFleet home page.

# Flight Crew Operations Manual Bulletin
# for
# Flair Airlines Ltd

**The Boeing Company**
**Seattle, Washington 98124-2207**

737

**Number:** FLR-13

**IssueDate:** November 4, 2021

**Subject:** Predictive Windshear System Anomaly

**Reason:** This bulletin informs flight crews of the susceptibility of certain airports to false Predictive Windshear System (PWS) alerts.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

**THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT**

## Background Information

Airlines have reported a false Predictive Windshear System (PWS) alert at the Rio de Janeiro airport (SBRJ). The anomaly is only applicable to PWS alerts; all reactive windshear alerts which occur are valid. These false alerts are limited to airplanes equipped with the Honeywell weather radar RDR-4000 with the following PWS weather radar processor part numbers:

- 930-1000-001
- 930-1000-002
- 930-1000-003

Honeywell has reviewed data provided by the affected airlines and has attempted to determine if particular airports and runways may be susceptible to “false alerts”. In addition, data have been analyzed to determine if the alerts are more likely during takeoff or on approach.

Honeywell has accumulated sufficient data to suggest that the following runway is susceptible to false PWS alerts:

- SBRJ (Rio de Janeiro), Runway 20L, Approach

Although this particular airport appears to be more susceptible to false alerts, the data indicates the majority of operations at this airport do not experience false PWS alerts.

Flight crews should use the following criteria to help determine if windshear exists:

- reports of windshear from other aircraft
- visual indications
- tower windshear alerts
- differences between computed winds in the airplane and reported winds from the tower.

As Honeywell continues to develop a software solution and to process data, operators are encouraged to continue reporting incidents to Honeywell and Boeing in order to provide the most effective solution possible to this anomaly.

## Operating Instructions

If windshear is encountered, perform the Windshear Escape Maneuver.

It is recommended operators establish policies for flight crews operating into the reported runway in the event a PWS alert occurs. The following windshear criteria may be beneficial in establishing policies:

- reports of windshear from other aircraft
- visual indications
- tower windshear alerts
- differences between computed winds in the airplane and reported winds from the tower.

## Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record page to show bulletin FLR-13 "In Effect" (IE).

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status, to the 737 Manager, Flight Technical Data, through the Service Requests Application (SR App) on the MyBoeingFleet home page.

# Flight Crew Operations Manual Bulletin
# for
# Flair Airlines Ltd

**The Boeing Company**
**Seattle, Washington 98124-2207**

737

**Number:** FLR-14 R1

**IssueDate:** February 4, 2022

**Airplane Effectivity: 737-8 /-8200 /-9**

**Subject:** Radio Altimeter Anomalies Due to 5G C-Band Wireless Broadband Interference in the United States

**Reason:** Radio altimeters can be unreliable due to interference from 5G C-Band wireless broadband.

This bulletin is being revised to update the background information and to provide guidance when operating at an airport/runway with an AMOC.

Information in this bulletin is recommended by The Boeing Company, but may not be FAA approved at the time of writing. In the event of conflict with the FAA approved Airplane Flight Manual (AFM), the AFM shall supersede. The Boeing Company regards the information or procedures described herein as having a direct or indirect bearing on the safe operation of this model airplane.

**THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT**

## Background Information

Frequency spectrum, power levels, tower location, and antenna direction used by new 5G C-Band wireless broadband technology in the United States can interfere with radio altimeters, especially at lower altitudes. Radio altimeters can fail or present erroneous information, which affects systems using radio altimeter data.

In response to this, the FAA has issued Airworthiness Directives that prohibit certain operations requiring radio altimeter (RA) data when in the presence of 5G C-Band interference.

Airports and approaches that can be affected by 5G C-Band interference are identified via Notice to Air Missions (NOTAMs) for airports with published instrument approaches.

## Background Information (continued)

The FAA is approving Alternative Method of Compliance (AMOCs) specific to airplane model, radio altimeter manufacturer, radio altimeter part number, airport and runway. These have been evaluated for susceptibility to 5G interference at runways where 5G NOTAMs have been issued. The AMOCs provide relief to some or all of the limitations outlined in ADs pertaining to 5G interference. The AMOC may not cover all runways at a given airport. The AMOCs will be updated as the 5G system is deployed, so it is important to reference the most recent revision.

The FAA AD identifies several types of operations that are prohibited when identified by a NOTAM:

- Instrument Landing System (ILS) Instrument Approach Procedures (IAP) SA CAT I, SA CAT II, CAT II, and CAT III
- Required Navigation Performance (RNP) Procedures with Authorization Required (AR), RNP AR IAP
- Automatic Landing Operations
- Manual Flight Control Guidance System operations to landing/head-up display (HUD) to touchdown operation
- Use of Enhanced Flight Vision System (EFVS) to touchdown under 14 CFR Part 91.176(a).

The reference to the Manual Flight Control Guidance System in the 4th bullet above, refers to a HUD mode that provides guidance to touchdown.

## 5G Interference and Potential Effects on Radio Altimeter Indications

When a radio altimeter is subjected to 5G interference, there are three different possible effects for each radio altimeter:

- Fail Warning: Failure of the radio altimeter results in failure alerts of radio altimeter including flags and other system alerts
- No Computed Data (NCD): No data is generated by the radio altimeter. The data shown on the Primary Flight Display (PFD) and HUD (as installed) will be removed from view, however this condition does not generate an alert since it is a normal condition of the radio altimeter
- Erroneous: Interference causes erroneous data to be sent to airplane systems. The erroneous radio altimeter data in this case will be shown on the PFD and HUD (as installed), however, it can be erroneously high or low.

## 5G Interference and Potential Effects on Airplane Systems

Flight deck effects may be variable on the 737 and multiple systems can be impacted regardless of the approach type or weather. They include, but are not limited to the following:

## 5G Interference and Potential Effects on Airplane Systems (continued)

### Autopilot Flight Director System

- NO AUTOLAND autopilot status annunciation may be shown on the PFD and the HUD (as installed - fail operational autopilot and HUD)
- NO AUTOLAND advisory message may be shown on the engine display (as installed - fail operational autopilot)
- Autopilot disengagement may occur during ILS/GLS approaches (as installed - GLS approach capability)
- Autopilot may not engage
- Flare mode and runway alignment may not be available or may activate earlier or later than expected (as installed - fail operational autopilot)
- Flight director on the PFD and HUD may retract from view during ILS/GLS approach (as installed - HUD and GLS approach capability)
- Flight director guidance on the PFD and HUD may be erroneous (as installed - HUD)
- LNAV and VNAV may not engage or engage at an erroneous altitude after departure.
- Takeoff or Go-Around (TO/GA) mode may not be available.

### Autothrottle System

- Autothrottle (A/T) may not be available
- A/T may remain in MCP SPD mode and may advance to maintain speed during flare instead of reducing the thrust to RETARD at 27 feet RA, or may reduce thrust to RETARD prematurely.

### Engines

- Thrust reversers may not deploy during a rejected takeoff or the landing roll
- Engines may be at a higher idle during a rejected takeoff or remain at approach idle after touchdown.

### Flight Controls

- Automatic speedbrake deployment may not occur after touchdown
- SPEEDBRAKES EXTENDED amber light may not illuminate or may illuminate erroneously
- SPEEDBRAKE time critical visual and aural warnings may not be available (as installed)
- Spoilers may be limited to their maximum in-flight position during manual deployment during a rejected takeoff or after touchdown
- Landing Attitude Modifier (LAM) may be erroneous.

## 5G Interference and Potential Effects on Airplane Systems (continued)

### Flight Instruments

- The RA indication on the PFD and HUD may not show or may be erroneous (as installed - HUD)
- The RADIO minimums indications (flashing or turning amber) may not be available or may be erroneous on the PFD and HUD (as installed - HUD)
- Rising runway symbol may not show on the PFD (as installed)
- The localizer/FAC deviation alert (amber scale on the PFD and flashing pointer on the PFD and HUD) may not show (the deviation indications are still available) (as installed - HUD and IAN)
- The glideslope/glidepath deviation alert (amber scale on the PFD and flashing pointer on the PFD and HUD) may not show (the deviation indications are still available) (as installed - HUD and IAN).

### Traffic Alert and Collision Avoidance System (TCAS)

- TCAS alerts may not be available (TCAS alerts that do occur will be valid)
- TCAS inhibits for resolution advisories may be erroneous.

### Ground Proximity Warning System (GPWS)

- GPWS alerts may not be available or may be erroneous. Look-Ahead Terrain Alerting remains available
- In-Air Overrun, On-Ground Overrun and SPEEDBRAKE warnings may not be available or may be erroneous (as installed)
- Radio altitude-based altitude and minimums aural callouts during approach may not be available or erroneous
- Windshear detection systems (predictive and reactive) may be inoperative.

### Configuration Warnings

- Erroneous illumination of the red landing gear indicator lights may occur
- Erroneous steady landing gear warning horn may occur
- Radio Altitude Based Alerts may not be available or may be erroneous.

### Warning Systems

- Stall warning test may not be available.

### Dispatch To and From Airport/Runway With a 5G C-Band NOTAM With an AMOC

Dispatch using normal procedures.

### Dispatch To and From Airport/Runway With a 5G C-Band NOTAM Without an AMOC

In the event of 5G interference, takeoff and landing performance can be impacted. Comply with these performance calculations when operating at an airport identified via NOTAM that restricts operations where 5G interference is possible.

#### Departure Airport - Takeoff Performance

Stopping distance during a rejected takeoff (RTO) can be significantly increased due to the following potential effects on airplane systems:

- Limited spoiler extension
- Higher engine idle
- Thrust reversers may not deploy.

In order to account for the increased stopping distance during an RTO, refer to the guidance in the Operating Instructions section below.

#### Destination or Alternate Airport - Landing Performance

Boeing has determined two methods to calculate the landing performance at the destination or alternate airport in the event of 5G interference during the landing. Either method can be used to approximate the landing distance expected in the event of 5G interference. Either method provides an acceptable margin of safety.

- <u>Method A using normal landing performance and increasing by a predetermined percentage</u>
  - To use method A, refer to how to “Calculate the Required Landing Distance” in the Operating Instructions section below.
- <u>Method B using the Non-Normal Configuration Landing Distance table for SPOILERS</u>.
  - To use method B, refer to the “Dispatch Guidance” section below.

#### MEL Considerations for Dispatch

Since it is possible that the brakes may provide the only means to slow the airplane, it is not advisable to dispatch to an impacted airport with the following brake system Minimum Equipment List (MELs). This list is not all inclusive and other MELs may want to be considered.

- 32-42-01 - Antiskid System
- 32-42-02 - Alternate Antiskid Valves
- 32-42-03 - Automatic Brake System
- 32-44-01 - Parking Brake Valve.

## Dispatch To and From Airport/Runway With a 5G C-Band NOTAM Without an AMOC (continued)

### Dispatch Guidance

The following table from the Advisory Information section of the Performance Inflight chapter of the QRH, defines runway condition codes. The runway condition codes are used to calculate takeoff and landing performance based on runway surface conditions or reported braking action.

### Runway Surface Condition Correlation Table

| RUNWAY CONDITION CODE | RUNWAY SURFACE CONDITION DESCRIPTION | REPORTED BRAKING ACTION |
|---|---|---|
| 6 | Dry | --- |
| 5 | Wet (Smooth, Grooved or PFC) or Frost<br>3 mm (0.12 inches) or less of: Water, Slush, Dry Snow or Wet Snow | Good |
| 4 | Compacted Snow at or below -15°C OAT | Good to Medium |
| 3 | Wet (Slippery), Dry Snow or Wet Snow (any depth) over Compacted Snow<br>Greater than 3 mm (0.12 inches) of: Dry Snow or Wet Snow<br>Compacted Snow at OAT warmer than -15°C | Medium |
| 2 | Greater than 3 mm (0.12 inches) of: Water or Slush | Medium to Poor |
| 1 | Ice | Poor |
| 0 | Wet Ice, Water on top of Compacted Snow, Dry Snow or Wet Snow over Ice | Nil |

## Dispatch To and From Airport/Runway With a 5G C-Band NOTAM Without an AMOC (continued)

**Calculate the Required Landing Distance** (Select Method A or Method B)

- Method A using normal landing performance and increasing by a predetermined percentage
  - To use method A, refer to how to "Calculate the Required Landing Distance" in the Operating Instructions section below.
- Method B using the Non-Normal Configuration Landing Distance table for SPOILERS.
  - Normal dispatch procedures can be used for runway condition codes 6 and 5.

    **Note:** A time of arrival landing distance assessment for runway condition codes 6 and 5 may be greater than the normal dispatch assessment.
  - Use the SPOILERS Non-Normal Configuration Landing Distance table in the Performance Inflight-QRH chapter, or other approved source, for flaps 30 or flaps 40, as needed.
    - Use the distance for MAX MANUAL braking configuration with the appropriate runway condition at estimated time of arrival
    - Apply all of the appropriate distance adjustments including the reverse thrust adjustment for no reverse (NO REV).
  - For runway condition codes 6 and 5, Boeing recommends obtaining the required landing distance by using the higher of:
    - The resulting unfactored distance increased by 15%, vs
    - The normal dispatch calculations.
  - For runway condition codes 4 and 3, increase the resulting unfactored distance by 15% to obtain the required landing distance
  - For runway condition code 2, increase the resulting unfactored distance by 30% to obtain the required landing distance
  - Verify the landing runway meets this required landing distance.

    **Note:** Dispatch to airports with a runway condition code 1 or lower should not be attempted.

End of Method B

The instrument approach and autoland prohibitions of 5G interference ADs may impact the destination and alternate weather requirements.

## Operating Instructions

### Airport/Runway With a 5G C-Band NOTAM With an AMOC

Crews operating 737 airplanes with radio altimeters with an AMOC do not have dispatch or operations restrictions when operating to and from runways specified in the AMOC. Plan a normal dispatch, approach, and landing.

During approach and landing, monitor for potential system effects that have been described above. Flight crews encountering potential 5G interference effects should consider discontinuing the approach and:

- changing to another airport/runway with an AMOC, or
- returning to the same runway using the operating instructions in the following section.

### Airport/Runway With a 5G C-Band NOTAM Without an AMOC

When operations are planned at a US airport where the FAA has issued a NOTAM for 5G interference, the flight crew will need to be alert for system anomalies that have been described above.

The flight crew should verify with Company Dispatch that the Dispatch Requirements above have been accounted for in flight planning.

Monitoring and cross checking of barometric and radio altitude indications can provide early indications of 5G interference. If the autopilot or autothrottle is not performing as expected, pilots should disconnect both the autopilot and autothrottle and apply manual inputs to ensure proper control of path and performance.

Radio altimeter anomalies may not be evident until very low altitudes. After touchdown, the flight crew should be aware of the thrust reverser and speedbrake deployment. Landing distances can be longer than normal due to the effect of 5G interference on thrust reverser deployment, automatic speedbrake deployment, and increased idle thrust. Landing on runways with a runway condition code of 4 through 2 can result in a significant increase in landing distance.

## Operating Instructions (continued)

**Departure Airport - Takeoff Performance** (Select Method 1 or Method 2)

In the event of 5G interference during a rejected takeoff (RTO), stopping distance can be significantly increased. Boeing has determined two methods to approximate the accelerate/stop distance required. Both provide an acceptable margin of safety.

Method 1 adjusts the accelerate stop distance available (ASDA) by a predetermined value.

- Adjust the accelerate stop distance available (ASDA) by the following adjustment:

| Runway Condition Code | **Runway Surface Condition** | **Subtract from ASDA** |
|---|---|---|
| 6 | Dry | 950 feet |
| 5 | Wet Skid Resistant* | 2,600 feet |
| 5, 4 and 3 | Wet / Dry Snow / Wet Snow / Compact Snow / Slippery | 3,700 feet |
| 2 | Slush or Standing Water | 4,900 feet |

- Use the adjusted ASDA and complete the takeoff performance calculations using:
  - Actual departure runway conditions
  - Actual departure environmental conditions
  - Do not take credit for use of reverse thrust when calculating takeoff performance
  - Verify the departure runway meets this required distance.

**Note:** Do not use FCOM Volume 1 Performance Dispatch Chapter as it does not provide a method to adjust the ASDA. Use another approved source.

**Note:** * Provided the operator has received approval to use Wet Skid Resistant data from the appropriate regulatory authority in accordance with the Airplane Flight Manual (AFM).

**Note:** Takeoffs from runways with a runway condition code 1 or lower should not be attempted.

End of Method 1

## Operating Instructions (continued)

### Departure Airport - Takeoff Performance (continued)

Method 2 adjusts the accelerate stop distance available (ASDA) by a predetermined factor.

- Multiply the accelerate stop distance available (ASDA) by the following factor:

| Runway Condition Code | **Runway Surface Condition** | **ASDA Factor** |
|---|---|---|
| 6 | Dry | 0.86 |
| 5 | Wet Skid Resistant* | 0.76 |
| 5, 4 and 3 | Wet / Dry Snow / Wet Snow / Compact Snow / Slippery | 0.71 |
| 2 | Slush or Standing Water | 0.65 |

- Use the adjusted ASDA and complete the takeoff performance calculations using:
  - Actual departure runway conditions
  - Actual departure environmental conditions
  - Do not take credit for use of reverse thrust when calculating takeoff performance
  - Verify the departure runway meets this required distance.

**Note:** Do not use FCOM Volume 1 Performance Dispatch Chapter as it does not provide a method to adjust the ASDA. Use another approved source.

**Note:** * Provided the operator has received approval to use Wet Skid Resistant data from the appropriate regulatory authority in accordance with the Airplane Flight Manual (AFM).

**Note:** Takeoffs from runways with a runway condition code 1 or lower should not be attempted.

End of Method 2

## Operating Instructions (continued)

### Prior to Takeoff

- Verify normal radio altimeter indications.

### Climb Out

- TO/GA mode may not be available
- Monitor pitch mode engagement
- Monitor roll mode engagement
- Autopilot may not engage.

### Prior to Descent

Plan on doing a time of arrival (en route) landing distance assessment using one of the two methods described below. Reference the Performance Inflight-QRH chapter or other approved source for runway condition codes 6 to 2.

**Note:** Landings on runways with a runway condition code 1 or lower should not be attempted.

## Operating Instructions (continued)

**Calculate the Required Landing Distance** (Select Method A or Method B)

Method A using normal landing performance and increasing by a predetermined percentage.

- Select the Normal Configuration Landing Distance table, or other approved source, for flaps 30 or flaps 40, as needed

  **Note:** The distances and adjustments shown in the Normal Configuration Landing Distance table are factored and have been increased by 15%. Use of other approved sources must also account for the 15% increase.

- Select the appropriate runway condition
- Select the distance for MAX MANUAL braking configuration
- Apply all of the appropriate distance adjustments

  **Note:** Do not apply adjustments for reverse thrust.

- To obtain the required landing distance, increase the resulting factored distance by the percentage below based on the runway condition code or runway braking action.

  **Note:** If other approved source already accounts for this percentage increase, there is no need to apply it again.

| Runway Condition Code | Braking Action | Percentage |
|---|---|---|
| 6 | Dry | 23% |
| 5 | Good | 53% |
| 4 | Good to Medium | 56% |
| 3 | Medium | 65% |
| 2 | Medium to Poor | 113% |

- Verify the landing runway meets this required landing distance.

**Note:** Landings on runways with a runway condition code 1 or lower should not be attempted.

- Refer to “Determine Autobrake Setting” section below.

End of Method A

## Operating Instructions (continued)

Method B using the Non-Normal Configuration Landing Distance table for SPOILERS

- Select the Non-Normal Configuration Landing Distance table for flaps 30 or flaps 40, as needed.
- Select the appropriate runway condition
- Select the distance for MAX MANUAL braking configuration
- Apply all of the appropriate distance adjustments including the reverse thrust adjustment for no reverse (NO REV)
- For runway condition codes 6 to 3, increase the resulting unfactored distance by 15% to obtain the required landing distance
- For runway condition code 2, increase the resulting unfactored distance by 30% to obtain the required landing distance
- Verify the landing runway meets this required landing distance.

**Note:** Landings on runways with a runway condition code 1 or lower should not be attempted.

- Refer to "Determine Autobrake Setting" section below.

End of Method B

## Operating Instructions (continued)

### Determine Autobrake Setting

- Use Normal Configuration Landing Distance table in the Performance Inflight-QRH chapter or other approved source to determine the desired autobrake setting.

**Note:** Normal manual or normal autobrakes can be used. The use of maximum brakes is not needed except as stated in the “During Landing” section below.

### During Approach

- Monitor radio altimeters for anomalies
- Monitor performance of autopilot and autothrottle. If the autopilot or autothrottle is not performing as expected, disconnect both the autopilot and autothrottle and apply manual inputs to ensure proper control of path and performance.

At DA(H), MDA(H), or the missed approach point:

- If suitable visual reference is established, disengage the autopilot and autothrottle and continue for a normal manual landing
- If a go-around is needed, do the go-around and the missed approach procedure either in manual or automatic flight.

### During Landing

- Radio altitude-based altitude aural callouts during approach may not be available or erroneous
- Manual deployment of the speedbrakes may be needed
- If the thrust reversers do not deploy, immediately ensure the speedbrakes are extended, apply manual braking and modulate as needed for the existing runway conditions.

**Note:** In some conditions, maximum manual braking may be needed throughout the entire landing roll.

### During Go-Around and Missed Approach

- TO/GA mode may not be available
- Monitor thrust and verify that thrust increases
- Monitor pitch mode engagement
- Monitor roll mode engagement
- Autopilot may not engage.

### Operating Instructions (continued)

#### If Radio Altimeter Anomalies are Experienced

Operators and pilots who experience radio altimeter anomalies should notify air traffic control, as soon as practical. Post flight, follow established procedures or policies to document the radio altimeter anomaly so that the radio altimeters can be checked for proper operation. Pilots are encouraged to submit detailed reports of radio altimeter disruptions or interference events, as soon as practical, using the *Radio Altimeter Anomaly Reporting Form* available on the FAA website at https://www.faa.gov/air_traffic/nas/RADALT_reports/.

#### Additional References

FAA Safety Alert for Operators SAFO 21007

FAA Special Airworthiness Information Bulletin SAIB AIR-21-18R1

## Administrative Information

This bulletin replaces bulletin FLR-14 , dated January 17, 2022. Revise the Flight Crew Operations Manual (FCOM) Bulletin Record Page to show bulletin FLR-14 as “CANCELLED” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record page to show bulletin FLR-14 R1 "In Effect" (IE).

This Bulletin will be revised when more information becomes available.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status, to the Flight Technical Data, through the Service Requests Application (SR App) on the MyBoeingFleet home page.

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## Limitations and Operational Information

# Limitations — Chapter L

## Limitations and Operational Information — Section 10

### General

This chapter contains:

- Airplane Flight Manual (AFM) limitations
- Non-AFM operational information.

Limitations and operational information are included if they are:

- operationally significant
- required by FAA Airworthiness Directive
- required by another regulatory requirement.

Limitations and operational information are not included if they are:

- incorporated into FCOM normal, supplementary, or non-normal procedures, with a few exceptions
- shown on a placard, display, or other marking.

Limitations and operational information listed in this chapter that must be memorized (memory items) are marked with a (#) symbol. Memory items must meet the following criterion – flight crew access by reference cannot assure timely compliance; e.g., Maximum Takeoff and Landing Tailwind Component. Memory items need only be memorized to the extent that compliance is assured. Knowing the exact wording of the limitation is not required.

Assuming that the remaining items are available to the flight crew by reference, they do not need to be memorized.

# Airplane General

## AFM Limitations

| | |
|---|---|
| Runway slope | ±2% |
| # Maximum Takeoff and Landing Tailwind Component | 15 knots |
| Maximum Speeds | Observe gear and flap placards |
| Maximum Operating Altitude | 41,000 feet pressure altitude |
| Maximum Takeoff and Landing Altitude | **1C845 - 1K003**<br>8,400 feet pressure altitude<br>**1B392, 1L075 - 1L078**<br>10,000 feet pressure altitude |

Maximum flight operating latitude is dependent on the configuration of the Magnetic Variation tables in the ADIRU as follows: 82° North and 82° South, except for the region between 80° West and 170 ° West longitude, the maximum flight operating latitude is 73° North, and the region between 120° East and 160° East longitude, the maximum flight operating latitude is 60° South.

Installation of handle covers on the overwing exits must be verified prior to departure whenever passengers are carried.

Verify that an operational check of the flight deck door access system has been accomplished according to approved procedures once each flight day.

### Ground Wind Operating Envelope

- For crosswinds greater than 43 knots, limit thrust to a setting normally used for taxi.
- Except when setting takeoff thrust on the runway, limit engine thrust to idle for winds greater than 58 knots.

### Narrow Runway Operation

Narrow Runway Operations applies to runways with widths less than 148 ft (45 m) and not less than 98 ft (30 m).

The maximum crosswind component at 10 meter (32.8 feet) height for takeoff and landing is as shown in the Takeoff and Landing Crosswind Limitations section.

Runway centerline shall be clearly visible in the prevailing conditions.

The dispatch from / to runways less than 148 ft (45 m) wide is not allowed in case of nose gear steering inoperative or one thrust reverser inoperative. If an alternate airport is available with a runway at least 148 ft (45 m) wide, diversion to that alternate shall be performed in case of jammed or restricted flight controls, trailing edge flap asymmetry, leading edge flap/slat asymmetry, or loss of system A or B hydraulics.

**Note:** Adjustment to V1(MCG) based on a 20-foot deviation from runway centerline is automatically applied within the OPT computation for takeoff from a narrow runway. An adjustment to Maximum Takeoff Weight and Takeoff Speeds may also be required.

**Note:** Use of an engine thrust derate when allowed will help reduce airplane lateral deviation in the unlikely event of an engine failure below V1 on takeoff.

## AFM Operational Information

# Severe Turbulent Air Penetration speed is 280 KIAS / .76M, whichever is lower. Applicable to Climb and Descent only. During Cruise, refer to SP.16, Severe Turbulence Supplementary Procedure.

# Non-AFM Operational Information

## Takeoff and Landing Crosswind Limitations

| Runway Condition | TAKEOFF** | |
|---|---|---|
| | Crosswind Components (knots)* Applies to runways 148 ft (45m) or greater in width | Crosswind Components (knots)* Applies to runways with widths less than 148 ft (45m) and not less than 98 ft (30m) |
| Dry | 34 | 34 |
| Wet | 25 | 25 |
| Standing Water | 15 | 15 |
| Slush | 15 | 15 |
| Compact Snow | 20 | 20 |
| Dry Snow | 20 | 20 |
| Wet Snow | 20 | 20 |
| Good | 25 | 25 |
| Good to Medium | 22 | 22 |
| Medium | 20 | 20 |
| Medium to Poor | 15 | 15 |
| Poor | 13 | 13 |

* These crosswind guidelines are based on steady wind (no gust) conditions and include all engines operating and engine inoperative. Gust effects increase pilot workload without significantly affecting the provided guidelines.

** Takeoff or Landing on untreated ice or snow should only be attempted when no melting is present.

| Braking Action (Runway Condition Code) | LANDING** | |
|---|---|---|
| | Crosswind Components (knots)* Applies to runways 148 ft (45m) or greater in width | Crosswind Components (knots)* Applies to runways with widths less than 148 ft (45m) and not less than 98 ft (30m) |
| Dry (6) | 37 | 32 |
| Good (5) | 37 | 32 |
| Good to Medium (4) | 35 | 32 |
| Medium (3) | 25 | 25 |
| Medium to Poor (2) | 17 | 17 |
| Poor (1) | 15 | 15 |
| Nil (0)*** | 0 | 0 |

* These crosswind guidelines are based on steady wind (no gust) conditions and include all engines operating and engine inoperative. Gust effects increase pilot workload without significantly affecting the provided guidelines.

** Sideslip only (zero crab) landings are not recommended with crosswind components in excess of 15 kts at flaps 15, 18 kts at flaps 30, or 21 kts at flaps 40. This recommendation ensures adequate ground clearance and is based on maintaining adequate control margin.

*** Landings are prohibited when braking action is Nil (CRFI <.25).

## Runway Contamination Limitations

Maximum allowable precipitation depth for takeoff:

- Dry Snow - 102mm (4")
- Standing water, wet snow, or slush - 13mm (1/2")

Minimum CRFI: .25 (Braking Action better than Nil).

On revenue flights, the escape slide retention bar (girt bar) must be installed during taxi, takeoff and landing.

# Do not operate HF radios during refueling operations.

### Altitude Display Limits For RVSM Operations

Standby altimeters do not meet altimeter accuracy requirements of RVSM airspace.

The maximum allowable in-flight difference between Captain and First Officer altitude displays for RVSM operations is 200 feet.

The maximum allowable on-the-ground altitude display differences for RVSM operations are:

| Field Elevation | Max Difference Between Captain & F/O | Max Difference Between Captain or F/O & Field Elevation |
|---|---|---|
| Sea Level to 5,000 feet | 50 feet | 75 feet |
| 5,001 to 10,000 feet | 60 feet | 75 feet |

### Hydraulic Oil

Minimum 76% and Maximum 100%. If the Hydraulic Oil level exceeds 100%, contact Maintenance.

**Note:** Operations with overfilled hydraulic fluid can lead to contamination of the packs.

# Weight Limitations

## AFM Limitations

**Note:** The maximum weight limitations can be further limited as referenced in the WEIGHT LIMITATIONS section of the CERTIFICATE LIMITATIONS chapter of the AFM.

**Note:** Possible conflicts between the AFM and the FCOM may occur due to separate publication release dates. In the event of a conflict between the FCOM and the AFM, the AFM shall govern.

| |
|---|
| **Maximum Taxi Weight** |
| 82,871 Kilograms |
| **Maximum Takeoff Weight** |
| 82,644 Kilograms |
| **Maximum Landing Weight** |
| 69,308 Kilograms |
| **Maximum Zero Fuel Weight** |
| 65,952 Kilograms |

## Alternate Maximum Weight Limitations

**1C845, 1J103 - 1J114**

**Note:** Alternate weights are applicable only when operating under Alternate Weights appendices specified in the AFM. Alternate weight limitations are associated with Service Bulletins and are placarded on the flight deck.

**Note:** Possible conflicts between the AFM and the FCOM may occur due to separate publication release dates. In the event of a conflict between the FCOM and the AFM, the AFM shall govern.

## AFM Limitations

| |
|---|
| **Maximum Alternate Taxi Weight** |
| 75,069 Kilograms |
| **Maximum Alternate Takeoff Weight** |
| 74,842 Kilograms |

# Air Systems

## AFM Limitations

### Pressurization

The maximum cabin differential pressure (relief valves) is 9.1 psi.

## Non-AFM Operational Information

With either one or both engine bleed air switches ON, do not operate the air conditioning packs in HIGH for takeoff, approach or landing.

**Note:** The fire protection Non-Normal procedures take precedence over the statement regarding no air conditioning pack in HIGH during takeoff, approach, or landing. The CARGO FIRE and SMOKE/ FUMES REMOVAL checklists require the operating PACK switch(es) HIGH. Switch(es) need to be placed in HIGH in order to increase ventilation for smoke removal.

# Autopilot / Flight Director System

## AFM Limitations

# Use of aileron trim with the autopilot engaged is prohibited.

# Do not engage the autopilot for takeoff below 400 feet AGL.

# For single channel operation during approach, the autopilot shall not remain engaged below 50 feet AGL.

**1B392, 1L075 - 1L078**

# Do not use the autopilot below 100 feet radio altitude at airport pressure altitudes above 8,400 feet.

# Maximum allowable wind speeds when landing weather minima are predicated on autoland operations:

- Headwind 25 knots
- Crosswind 20 knots
- Tailwind 15 knots.

# Maximum and minimum glideslope angles for autoland are 3.25 degrees and 2.5 degrees, respectively.

# Autoland capability may only be used with Flaps 30 or 40 and both engines operative.

**1B392, 1L075 - 1L078**

# Autoland capability may only be used to runways at or below 8,400 feet pressure altitude.

# Use of autoland system on runways with a width less than 148 ft (45 m) is not approved.

## Non-AFM Operational Information

# Do not use LVL CHG on final approach below 1000 feet AFE.

# Communications

## AFM Limitations

**1K002, 1K003**

Flights predicated on the use of the following HF frequencies are prohibited: 29.489 and 29.490 (MHz).

## Non-AFM Operational Information

Use the VHF radio connected to the top of fuselage antenna for primary ATC communications on the ground.

**Aircraft Communications Addressing and Reporting System (ACARS)**

The ACARS is limited to the transmission and receipt of messages that will not create an unsafe condition if the message is improperly received, such as the following:

- the message or parts of the message are delayed or not received;
- the message is delivered to the wrong recipient; or
- the message content may be frequently corrupted.

However, Pre-Departure Clearance, Digital Automatic Terminal Information Service, Oceanic Clearances, Weight and Balance, and Takeoff Data messages can be transmitted and received over ACARS if they are verified per approved operational procedures.

# Electrical

**1B392 - 1J203, 1K001 - 1L078**

## AFM Limitations

The use of Flight Deck Auxiliary Power outlets in the flight deck requires operational regulatory approval.

# Engines and APU

## AFM Limitations

### Engine Limit Display Markings

Maximum and minimum limits are red.

Caution limits are amber.

### Engine Ignition

Engine ignition must be on for:

- takeoff
- landing
- operation in heavy rain
- anti-ice operation.

### Thrust

Derated takeoff thrust: Use of derated takeoff thrust is not allowed for alternate EEC mode operation.

Reduced takeoff thrust: Operation at reduced takeoff thrust based on an assumed temperature is referenced to the takeoff thrust, which in turn can be either full rated takeoff thrust or derated takeoff thrust. Reduced thrust based on an assumed temperature is allowed on a wet runway if suitable performance accountability is made for the increased stopping distance on the wet surface. Use of assumed temperature reduced thrust procedures is not allowed when the runway is contaminated with standing water, ice, slush, or snow. Assumed temperature reduced thrust is not allowed for alternate EEC mode operation. Assumed temperature reduced takeoff thrust is not permitted with anti-skid inoperative.

### Engines - Reverse Thrust

Use for ground operation only.

# Intentional selection of reverse thrust in flight is prohibited.

Backing the airplane with the reverse thrust is prohibited.

Do not attempt go-around after thrust reverser deployment on landing.

### APU

# Inflight - APU bleed + electrical load: Maximum altitude 10,000 feet.

# Ground only - APU bleed + electrical load: Maximum altitude 15,000 feet.

# APU bleed: Maximum altitude 17,000 feet.

# APU electrical load: Maximum altitude 41,000 feet.

## Non-AFM Operational Information

APU bleed valve must be closed when:

- ground air connected and isolation valve is open
- engine no. 1 bleed valve is open
- isolation and engine no. 2 bleed valves open.

APU bleed valve may be open during engine start, but avoid engine power above idle.

After three consecutive aborted start attempts, a 15-minute cooling period is required.

Run the APU for two full minutes before using it as a bleed air source.

### Engine Oil

Minimum dispatch quantity (engine not in operation): 69% (14.5 litres).

**Note:** 62% is the minimum acceptable as per the Aircraft Maintenance Manual (AMM). 69% provides an acceptable margin to account for consumption during flight.

# Flight Controls

## AFM Limitations

# The maximum altitude with flaps extended is 20,000 feet.

# Holding in icing conditions with flaps extended is prohibited.

# In flight, do not extend the speed brake lever beyond the FLIGHT detent.

# In flight, do not extend the speedbrake lever beyond the ARMED detent with flaps 40 selected.

# Avoid rapid and large alternating control inputs, especially in combination with large changes in pitch, roll, or yaw (e.g., large side slip angles) as they may result in structural failure at any speed, including below VA.

## Non-AFM Operational Information

# Do not deploy the speedbrakes in flight at radio altitudes less than 1,000 feet.

Alternate flap duty cycle:

- When extending or retracting flaps with the ALTERNATE FLAPS position switch, allow 15 seconds after releasing the ALTERNATE FLAPS position switch before moving the switch again to avoid damage to the alternate flap motor clutch
- After a complete extend/retract cycle, i.e., 0 to 15 and back to 0, allow 5 minutes cooling before attempting another extension.

# Flight Management, Navigation

## FMS Barometric Altitude Temperature Compensation

# Instrument approach operations are prohibited unless altitude corrections are applied to all published procedure altitudes when the temperature at the landing elevation is 0 degrees Celsius or colder.

Vertical Situational Display (VSD) must be selected for display for all approach operations where temperature corrected altitudes are manually entered.

**WARNING: Use of published procedures without consideration of cold temperature effects on barometric altitudes does not assure obstacle clearance. The Flight Management System does not provide an automatic approach barometric altitude temperature compensation function.**

## AFM Limitations

### Air Data Inertial Reference Unit (ADIRU)

ADIRU alignment must not be attempted at latitudes greater than 78 degrees 15 minutes.

All flight operations based on magnetic heading or magnetic track angle are prohibited in geographic areas where the installed IRS MagVar table errors are greater than 5 degrees.

Refer to Operating Data/Inertial Reference System (IRS) section of AFM for procedures to determine the geographic areas and magnitude of MagVar errors for the specific MagVar table installed in the IRS and if any of these limitations apply.

### Look-Ahead Terrain Alerting (GPWS)

Do not use the terrain display for navigation.

Do not use the look-ahead terrain alerting and terrain display functions:

- within 15 nm of takeoff, approach or landing at an airport or runway not contained in the GPWS terrain database.

**Note:** Refer to Honeywell Document 060-4267-000 for airports and runways contained in the installed GPWS terrain database.

### Overrun Warning (ORW) Alerting System

#### 1B392 - 1J114, 1K003 - 1L078

The ORW alerting system does not replace the requirement to conduct an en route landing distance performance assessment prior to landing. The lack of an overrun alert does not guarantee the airplane can stop prior to reaching the runway end.

If the In-Air Overrun Warning (“OVERRUN, GO-AROUND”) occurs during approach, execute an immediate go-around.

Inhibit the overrun alert when:

**1B392, 1L075 - 1L078**

- Landing altitude is above 10,000 feet pressure altitude; or
- Landing OAT on the ground is below –40°C or greater than 50°C; or
- Gross Weight is greater than Maximum Landing Weight.

## Non-AFM Operational Information

# Avoid weather radar operation in a hangar.

Avoid weather radar operation when personnel are within the area normally enclosed by the aircraft nose radome.

**Note:** The hangar recommendation does not apply to the weather radar test mode.

### Runway Awareness and Advisory System (RAAS)

Do not use RAAS callouts or alerts for navigation.

Do not use RAAS callouts or alerts as a substitute for NOTAM or ATIS information.

# Fuel System

## AFM Limitations

Maximum tank fuel temperature is 49°C.

Minimum tank fuel temperature prior to takeoff and inflight is –43°C, or 3°C above the fuel freezing point temperature, whichever is higher.

**Note:** The use of Fuel System Icing Inhibitor additives does not change the minimum fuel tank temperature limit.

Intentional dry running of a center tank fuel pump (low pressure light illuminated) is prohibited.

### Fuel Balance

The lateral fuel imbalance between main wing tanks must be scheduled to be zero. Fuel imbalance between main wing tanks for taxi, takeoff, flight or landing must not exceed 453 kilograms.

### Fuel Loading

Main tanks 1 and 2 must be full if center tank contains more than 453 kilograms.

# Landing Gear

## Non-AFM Operational Information

Do not apply brakes until after touchdown.

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# Normal Procedures — Chapter NP

## Table of Contents — Section TOC

### Introduction



### Amplified Procedures

## General

This chapter gives:

- an introduction to the normal procedures philosophy and assumptions
- step by step normal procedures.

## Normal Procedures Philosophy and Assumptions

Normal procedures verify for each phase of flight that:

- the airplane condition is satisfactory
- the flight deck configuration is correct.

Normal procedures are done on each flight. Refer to the Supplementary Procedures (SP) chapter for procedures that are done as needed, for example the adverse weather procedures.

Normal procedures are written for a trained flight crew and assume:

- all systems operate normally
- the full use of all automated features (LNAV, VNAV, autoland, autopilot, and autothrottle). This does not preclude the possibility of manual flight for pilot proficiency where allowed

Normal procedures also assume coordination with the ground crew before:

- hydraulic system pressurization, or
- flight control surface movement, or
- airplane movement.

Normal procedures do not include steps for flight deck lighting and crew comfort items.

Normal procedures are done by memory and scan flow. The panel illustration in this section shows the scan flow. The scan flow sequence may be changed as needed.

## Configuration Check

It is the crew member’s responsibility to verify correct system response. Before engine start, use system lights to verify each system's condition or configuration. After engine start, the master caution system alerts the crew to warnings or cautions away from the normal field of view.

If there is an incorrect configuration or response:

- verify that the system controls are set correctly
- check the respective circuit breaker as needed. Maintenance must first determine that it is safe to reset a tripped circuit breaker on the ground
- test the respective system light as needed

Before engine start, use individual system lights to verify the system status. If an individual system light indicates an improper condition:

- check the Dispatch Deviations Guide (DDG) or the operator equivalent to decide if the condition has a dispatch effect
- decide if maintenance is needed

If, during or after engine start, a red warning or amber caution light illuminates:

- do the respective non-normal checklist (NNC)
- on the ground, check the DDG or the operator equivalent

If, during recall, an amber caution illuminates and then extinguishes after a master caution reset:

- check the DDG or the operator equivalent
- the respective non-normal checklist is not needed

## Crew Duties

Preflight and postflight crew duties are divided between the captain and first officer. Phase of flight duties are divided between the Pilot Flying (PF) and the Pilot Monitoring (PM.)

Each crewmember is responsible for moving the controls and switches in their area of responsibility:

- the phase of flight areas of responsibility for both normal and non-normal procedures are shown in the Area of Responsibility illustrations in this section. Typical panel locations are shown
- the preflight and postflight areas of responsibility are defined by the “Preflight Procedure - Captain” and “Preflight Procedure - First Officer.”

The captain may direct actions outside of the crewmember’s area of responsibility.

The general PF phase of flight responsibilities are:

- taxiing
- flight path and airspeed control
- airplane configuration
- navigation.

The general PM phase of flight responsibilities are:

- checklist reading
- communications

- entering required information in Mission+ app
- tasks asked for by the PF
- monitoring taxiing, flight path, airspeed, airplane configuration and navigation.

PF and PM duties may change during a flight. For example, the captain could be the PF during taxi but be the PM during takeoff through landing.

Normal procedures show who does a step by crew position (C, F/O, PF, or PM):

- in the procedure title, or
- in the far right column, or
- in the column heading of a table

The mode control panel is the PF's responsibility. When flying manually, the PF directs the PM to make the changes on the mode control panel.

The procedures described in this manual assume that the A/P and A/T are engaged and that the PF is making the applicable changes on the mode control panel. When flying manually, the PF directs the PM to make the changes on the mode control panel by first stating "SET" followed by the applicable direction. (e.g. "SET SPEED 230", "SET ALTITUDE 5000" or "SET LNAV").

The PF must guard the flight controls and the thrust levers anytime the aircraft is below 5000 ft AGL in order to be prepared to take immediate control in the event of a malfunction with the autoflight system.

The captain is the final authority for all tasks directed and done.

# Crew Duties Reference Chart

| Crew Duties | CAPT | F/O | PF | PM |
|---|---|---|---|---|
| **REPORT** | | | | |
| Report and check-in with Dispatch, as applicable. All crew members present. | ● | | | |
| **FLIGHT PLANNING** | | | | |
| Review Flight Plan, Weather, Route Information, NOTAMs | ● | ● | | |
| Review RNP Availability Predictions when RNP AR Approach procedures are planned/required. | ● | ● | | |
| Joint crew briefing | ● | ● | | |
| **COCKPIT PREPARATION** | | | | |
| Exterior Inspection | | | (●) | ● |
| Check A/C Documents | ● | ● | | |
| Cockpit preparation / Interior Inspection | ● | ● | | |
| Check Aircraft Journey Log | ● | ● | | |
| Set up FMS equipment | | | ● | (●) |
| Verify FMS equipment | | | (●) | ● |
| Initialize ACARS | | | ● | (●) |
| Check final documents (Load Summary, Gen Dec, NOTOC, etc.) on board | ● | ● | | |
| ATC Clearance | ● | ● | | |
| Takeoff / Taxi briefing | ● | ● | | |
| **TAXI AND BEFORE TAKEOFF** | | | | |
| Taxi Clearance | | ● | | |
| Takeoff briefing if changed | | | ● | |
| Ensure required fuel for takeoff | ● | ● | | |
| **CLIMB AND CRUISE** | | | | |
| FMS changes and updates | | | ● | ● |
| MCP changes and updates<br>Autopilot engaged | | | ● | |
| MCP changes and updates<br>Autopilot not engaged | | | | ● |
| PA Announcements | | | ● | ● |
| Update Weather | | | | ● |

| Crew Duties | CAPT | F/O | PF | PM |
|---|---|---|---|---|
| **WAYPOINT PASSAGE** | | | | |
| Confirm name of next waypoint, desired track, distance and time to next waypoint | | | | ● |
| Record data on Operational Flight Plan in Mission+ | | | | ● |
| **BEFORE DESCENT** | | | | |
| Arrival ATIS | | | | ● |
| Calculate Landing Performance | | | ● | |
| FMS set up for approach | | | ● | ● |
| Approach Briefing | | | ● | |
| **DESCENT, APPROACH AND LANDING** | | | | |
| MCP changes and updates<br>Autopilot engaged | | | ● | |
| MCP changes and updates<br>Autopilot not engaged | | | | ● |
| After Landing Checks and Ground Communications | | ● | | |
| **POSTFLIGHT** | | | | |
| Shutdown checks | ● | ● | | |
| Aircraft Journey Log Book entries | ● | (●) | | |
| Report to Dispatch, as applicable | ● | | | |
| Close and Export Mission+ Flight | | | | ● |
| Responsible for shutdown and overnight aircraft security | ● | | | |

Duties as indicated by (●) denote that either pilot may complete the procedure. The Captain may direct actions outside of the crew member's area of responsibility.

Whenever control of the aircraft is relinquished by the PF to the PM, they will state "YOU HAVE CONTROL." The pilot taking control will respond: "I HAVE CONTROL."

When engaging the autopilot, the PF will state "COMMAND A" or "COMMAND B", as applicable. Auto throttle engagement will be announced by: "AUTO THROTTLE ENGAGED."

When disconnecting the autopilot and/or the auto throttle, the PF will state: "AUTOPILOT DISENGAGED" and/or "AUTO THROTTLE DISENGAGED."

Cross Checks:

- Initiation: Calls should be responded to with "CHECK". If the designated pilot fails to initiate a call, the other pilot should then make the call and receive acknowledgment with "CHECK".
- Acknowledgment: It is essential that the recipient acknowledge any calls made. If the call is in reference to speed, pitch or bank the PF must respond with "CORRECTING", and the PM must ensure that the corrections are adequate.

Headsets will normally be worn and used as follows:

- From Start/Taxi to Top of Climb and from Top of Descent to Landing and Taxi-In.
- Worn in a way that will allow normal communications between Flight Crew members.
- It is recommended that headsets be used when in high traffic areas, at times of high workload during cruise, and at any time more than one frequency is being used by the crew members.
- If above 10000 ft and the crew elects to operate without headsets, the speaker volume should be at a level that allows verbal interaction between the crew and also at a level that ATC communications will not be missed.

Flight crews should be diligent and professional, and use proper radio procedures at all times, as follows:

- It is important that crew members respond with the aircraft call sign when making initial calls, responding to an instruction or clearance, and when leaving a frequency.
- VHF 2 must be on 121.5 and monitored at all times while airborne, when not being used for another communication.
- If the PF or PM leave the active frequency, it is important to advise the other crew member and have them confirm: "OFF FREQUENCY"; when returning to the frequency in use, respond: "BACK ON FREQUENCY".

Anytime a crew member leaves the Flight Deck for physiological needs, transfer of control must be properly established. The remaining crew member will wear their headset and monitor ATS. Additionally, they must brief the returning crew member on current and any changes in status.

### Pilot Incapacitation and the Two-Challenge Rule

Crew members should be attentive to peculiar actions or behaviour, inaction, lack of attentiveness or awareness, or any other abnormal conduct displayed by any crew member.

In the event of an incorrect, or no response to a normal call or challenge, the initial call shall be repeated. If a correct response is not received, incapacitation must be suspected and the appropriate action taken (i.e., assume control of the aircraft).

## Control Display Unit (CDU) Procedures

Before taxi, the captain or first officer may make CDU entries. The other pilot must verify the entries.

Make CDU entries before taxi or when stopped, when possible. If CDU entries must be made during taxi, the PM makes the entries. The PF must verify the entries before they are executed.

In flight, the PM usually makes the CDU entries. The PF may also make simple, CDU entries when the workload allows. The pilot making the entries executes the change only after the other pilot verifies the entries.

During high workload times, for example departure or arrival, try to reduce the need for CDU entries. Do this by using the MCP heading, altitude, and speed control modes. The MCP can be easier to use than entering complex route modifications into the CDU.

Below 10000 ft, in flight, the PM usually makes the CDU modifications as directed by PF. The PM calls: "CONFIRM". The PF calls: "CONFIRMED" after verifying the change is correct and the PF calls: "EXECUTE". The PM executes the change only after the PF verifies the entry.

## Sterile Cockpit

There will be no engagement in any non-essential communications or tasks unrelated to operational requirements BELOW 10000 ft AAE.

This includes:

- administrative duties;
- PA announcements;
- communication between flight deck and cabin;
- entry or exit from the flight deck;
- interaction with flight deck observers (briefed as per Flair COM).

## Performance Data CDU Entry and Crosscheck

The entry of correct performance data into the FMS is critical to the safety of the flight. Flair uses the Onboard Performance Tool (OPT) application for the calculation of weight & balance and takeoff performance. Cross checking the calculated data as well as the entry of that data is fundamental to safe operation. This section describes the procedure that both pilots will use to determine weight and balance and takeoff performance.

1. At the appropriate time in the sequence of events during the pre-flight phase, both pilots will independently complete the WGT & Balance tab utilizing the Preliminary Load Report, if available. If the Final Load Report is available at this stage of the pre-flight, then it must be used in lieu of the Preliminary Load Report.

   **Note:** An ARPT must be selected on the TKO Dispatch tab prior to completing the WGT & Balance tab in order for the Takeoff Weight and CG(%) fields to auto populate.

   a. Setup tab: Verify the aircraft, Flight Deck and FAs field are correct.
   b. FUEL tab: Enter the applicable fuel value in the Total Load, Planned Trip Fuel (exact DEST fuel from the OFP) and Taxi- out Fuel (exact TAXI fuel from the OFP).

      **Note:** Total Load is displayed on the fuel indicators rounded to the nearest 100 kg.

   c. FIXED tab: Select any fixed items as applicable (e.g. MLG Wheel).
   d. CARGO tab: Enter the baggage and/or cargo weight in the applicable pit as indicated on the Load Report.

      **Note:** Baggage weight is determined by multiplying the number of bags in the associated pit by 17 kg/bag.

   e. PAX tab: Select PAX WINTER or PAX SUMMER, as applicable, and enter the passenger distribution by zone as indicated on the Load Report.
   f. Verify that the CG (%MAC) values are all within the CG envelope and that structural weight limits have not been exceeded.

2. When the Weight & Balance inputs are completed on both EFBs, the Captain will select "Compare Calculation" on their EFB. The F/O will then accept the Compare Calculation notification on their iPad.

   **Note:** Both EFBs must be selected to the WGT & Balance tab and have Wi-Fi selected on. If the Wi-Fi connection or the "Compare Calculation" is not functioning, the F/O must verbally read out to the Captain all entries from the WGT & Balance tab for a cross check.

   The Compare Calculation function will alert the pilots to any discrepancies by highlighting the affected entry in amber. Any discrepancies must be rectified, and another check done until a "No mismatches found" message is received.

   The Captain will then enter the calculated ZFW in the CDU PERF INIT page. Both pilots will verify that the calculated GW on the CDU agrees with that calculated in the OPT.

   - The Captain will read aloud the ZFW, FUEL and GW from the CDU and call: "CONFIRM?"
   - The F/O will verify the ZFW & GW against the OPT weight and balance, and the Fuel against the Fuel Indicators.
   - F/O will call: "CONFIRMED, EXECUTE".
   - The Captain will Execute the changes.
3. With reference to the OFP the Captain will then verify:
   a. that the FUEL on the CDU, Flight Plan and fuel quantity indicators all agree; and
   b. that the planned ZFW and GW on the CDU agree with the planned weights on the OFP.
4. With reference to the ATIS, or other method, both pilots will independently complete the TKO Dispatch tab on the OPT.

   Both pilots will select "Calculate". When the calculation is complete on both EFBs, the Captain will select "Compare Calculation" on their EFB. The F/O will then accept the Compare Calculation notification on their iPad.

   **WARNING: Ensure that any applicable NOTAMs and/or MEL/CDL items are entered and accounted for before selecting Calculate.**

   **Note:** Both EFBs must be selected to the TKO Dispatch tab and have Wi-Fi selected on. If the Wi-Fi connection or the "Compare Calculation" is not functioning, the F/O must verbally read out to the Captain their OPT output for D-TO, SEL TEMP, FLAP, TRIM, and V speeds.

The Compare Calculation function will alert the pilots to any discrepancies by highlighting the affected output in amber. Any discrepancies must be rectified, and another check done until a "No mismatches found" message is received.

5. Performance data will then be entered directly in the CDU by the Captain as follows:

N1 LIMIT page:

Enter assumed temperature (SEL TEMP) / OAT.

**Note:** At any time after the temperature values are entered, should the OAT DISAGREE-DELETED and TAKEOFF SPEED DELETED alerting messages be displayed on the FMC CDU, re-enter the OAT and performance data after both engines have been started.

Select a fixed derate takeoff, as needed.

**Note:** The Optimum thrust derate and assumed temperature as calculated by the OPT should normally be used.

Verify or select a full or derated climb thrust as needed.

**Note:** The default FMC climb thrust should normally be used.

TAKEOFF REF page:

Make data entries on page 2/2, as applicable, before page 1/2.

Verify or enter an ACCEL HT.

Verify or enter an EO ACCEL HT, as calculated on the OPT.

Verify or enter a THR REDUCTION height.

Enter CG.

Using the OPT data, enter the required flap setting and associated takeoff V Speeds.

Verify that a trim value is shown and set trim for takeoff.

CLB page:

When planning a standard NADP2 departure profile, set or verify a climb speed of Vref 40+80 kts to 3000 ft AAE in the FMC CLIMB page, with a transition speed of 250 kts above that.

The Captain will read aloud the N1 Thrust Target, Flap Setting and Vspeeds from the TAKEOFF REF page on the CDU then call "CONFIRM?". The F/O verifies these values on their OPT and that the stab trim is set and then, if all is correct, calls "CONFIRMED".

**Note:** FMC calculated N1 should be within 1% of the OPT calculated N1.

Example:

Captain: "N1 88.1, Flaps 1, V1 140, VR 145, V2 150, CONFIRM?"

F/O: "CONFIRMED".

6. If the Preliminary Load Report has been used to obtain the performance data to this point, then the flight crew must await receipt of the Final Load Report before moving on to the next steps.

   **Note:** Departure is not authorized based on the Preliminary Load Report. A Final Load Report form must be provided by the airport gate staff.

7. Upon receipt of the Final Load Report, the F/O will update the OPT WGT&Balance data and provide the Captain with the final TOW %MAC. The Captain will enter the final CofG in the FMC and set the corresponding trim for takeoff. The F/O will be required to select the TKO Dispatch tab and Calculate in order to activate the Send Output function.

   **Note:** Performance recalculation by the Captain and FMC update, other than CofG, is not required for a final ZFW that is less than the preliminary ZFW by no more than 500 kg. If the final ZFW is greater than the preliminary or it is more than 500 kg less, then the performance must be recalculated and the performance data CDU entry and crosscheck procedure must be completed again beginning at Step 1 above.

8. The F/O will then ensure that the EFB is connected to a network (cellular or Wi-Fi), select Send Output, Send via Email and Send Load Sheet via Email function, complete the CREW SIGNATURE pop-up and select "Done". The OPT will generate an email to be sent to SOCC. The F/O will then Send the (Combined) email.

   **Note:** It is imperative that the sending pilot (normally the FO) ensures that the email has been sent by verifying that it is in their email Sent folder before setting the EFB iPad to Airplane Mode.

9. Both pilots will set their EFBs to airplane mode and continue with the normal Before Start Procedure.

## Checklists

Normal Checklists are organized by phase of flight with the Captain/PF calling for each checklist as the flight phase dictates.

Normal checklists are used after the flight crew has accomplished all the procedural items using flow and scan in the pilot's area of responsibility.

Checklist use is challenge and response.

If the response is different than the checklist response, the checklist must be discontinued until the item discrepancy is resolved.

It is important that the crew not be interrupted during the checklist procedures, however, if interrupted, when the checks are resumed, the last item called for before the interruption should be repeated.

After completion of each checklist, the pilot reading the checklist calls "______ CHECKLIST COMPLETE".

## Autopilot Flight Director System (AFDS) Procedures

The crew must always monitor:

- airplane course
- vertical path
- speed

When selecting a value on the MCP, verify that the respective value changes on the flight instruments, as applicable.

The crew must verify manually selected or automatic AFDS changes. Use the FMA to verify mode changes for the:

- autopilot
- flight director
- autothrottle

During LNAV and VNAV operations, verify all changes to the airplane’s:

- course
- vertical path
- thrust
- speed

Announcing changes on the FMA and thrust mode display when they occur is a good CRM practice.

FMA changes should be called out by PF and verified by PM, unless PF is unable or misses the call-out. Other FMA recommendations include:

- When operating roll mode is not LNAV, PM should call "LNAV AVAILABLE" when FMC lateral track is available for LNAV engagement as per ATC instructions.
- "COMMAND A" or "COMMAND B" (as applicable) is an FMA change and should be called out when changing from manual to autoflight.

Normally, A/P "A" is used when Captain is PF, and A/P "B" is used when F/O is PF.

## Taxi and Takeoff Briefing / Emergency Procedures Review

The taxi briefing is given to ensure both crew members understand the expected taxi route to include Low Vis Coded Taxi routes and Hot Spots. The takeoff briefing is a description of the departure flight path with emphasis on anticipated track and altitude restrictions. It assumes normal operating procedures are used.

Therefore, it is not necessary to brief normal or standard takeoff procedures. Additional briefing items may be required when any elements of the takeoff and/or departure are different from those routinely used. These may include:

- adverse weather;
- adverse runway conditions;
- unique noise abatement requirements;
- dispatch using the MEL;
- special engine out departure procedures;
- any other situation where it is necessary to review or define crew responsibilities.

The Captain will determine who the PF for the leg is and the PF will brief as follows:

Taxi route and hot spots.

| | | |
|---|---|---|
| **Depart Rwy (____)** | **____(SID)** | **(NADP)** |
| runway | departure procedure | |
| **Special Procedures** | **Adverse Conditions** | |
| if applicable | if applicable | |

***Crew's first flight of the day, brief the following:***

**Captain:**

In case of a malfunction below 80 knots, Standard Reject: Above 80, we will reject for Fire, Engine Failure, Loss of Control and/or Windshear.

The crew member noticing the abnormality will clearly state the problem.

I will call: "REJECT" or "CONTINUE".

If the decision is to REJECT, I will:

- close thrust levers / disengage auto throttle
- observe or apply maximum braking
- raise speedbrakes
- apply maximum amount of reverse thrust consistent with conditions
- bring aircraft to a complete stop on the runway, stow the speedbrake, and set the parking brake

- advise the cabin: "THIS IS THE CAPTAIN SPEAKING. REMAIN SEATED, REMAIN SEATED"
- perform any necessary memory items or checklists as appropriate
- if an evacuation is required, initiate Evacuation Checklist

**First Officer:**

I will:

- Note the reject speed
- Verify thrust levers closed, autothrottle disengaged and maximum brakes applied
- Call "SPEEDBRAKES UP"
- Call "REVERSERS NORMAL"
- Call out any omitted action items
- Call out “60 KNOTS” and advise ATC
- When stopped, select the Flap lever to 40 and standby for instructions

**Pilot Flying:**

In the event of an engine failure after V1, we will:

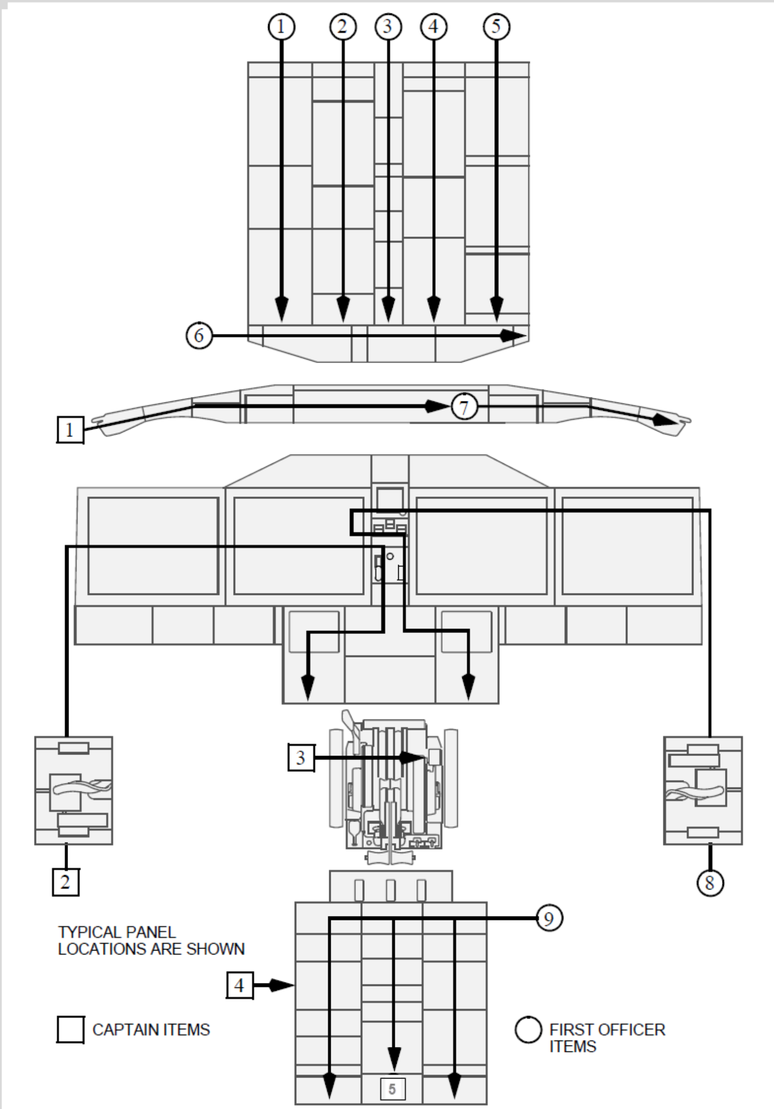
- continue the takeoff
- rotate at Vr
- positive rate, gear up
- cancel Master Caution
- There will be no other calls below 400 ft
- At 400 ft, call for a roll mode, then
- call: "WHAT'S THE PROBLEM?"
- If required, perform any necessary memory items
- climb at V2 to V2+20 to 1000 ft AFL or TOCA, whichever is higher
- Retract flaps on schedule.
- When flaps have been retracted and at or above Flaps Up manoeuvre speed - call for Level Change if VNAV is not engaged.
- Set max continuous thrust, and
- call for the appropriate emergency checklist.

## Scan Flow and Areas of Responsibility

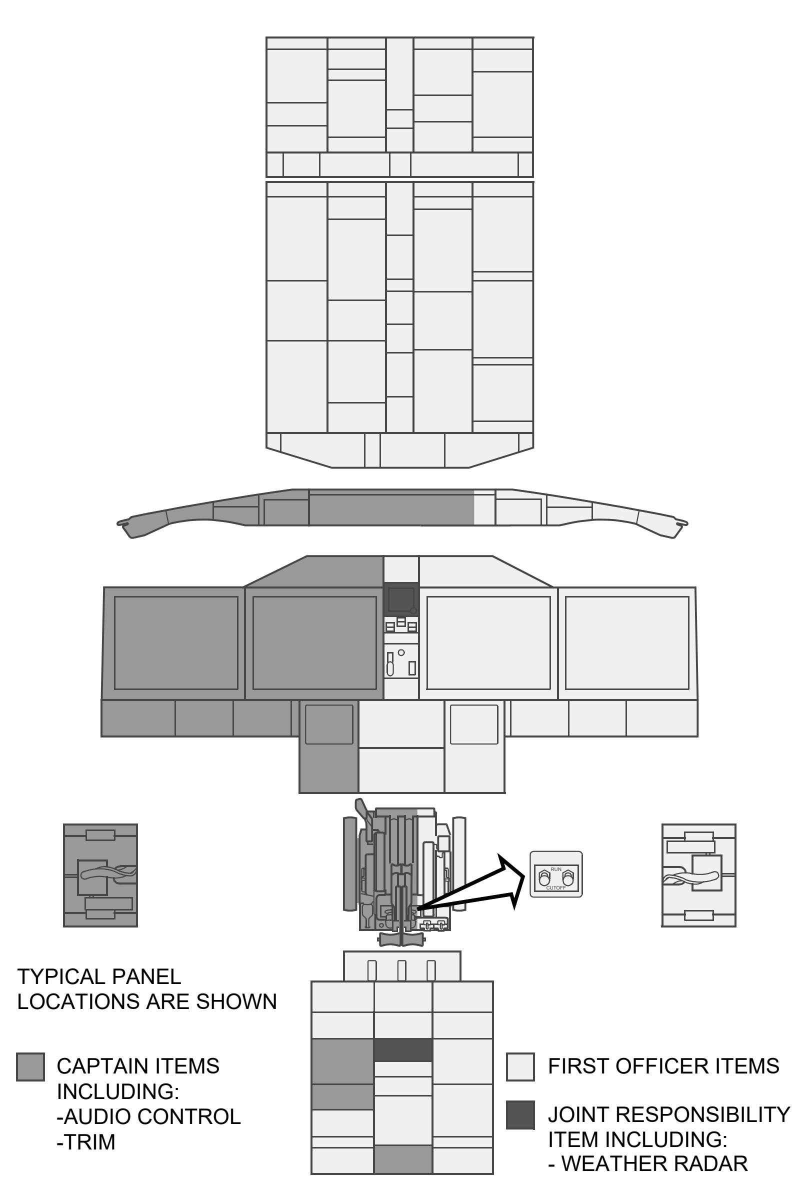
The scan flow and areas of responsibility diagrams shown below are representative and may not match the configuration(s) of your airplanes.

The scan flow diagram provides general guidance on the order each flight crew member should follow when doing the preflight and postflight procedures. Specific guidance on the items to be checked are detailed in the amplified Normal Procedures. For example, preflight procedure details are in the Preflight Procedure - Captain and Preflight Procedure - First Officer.

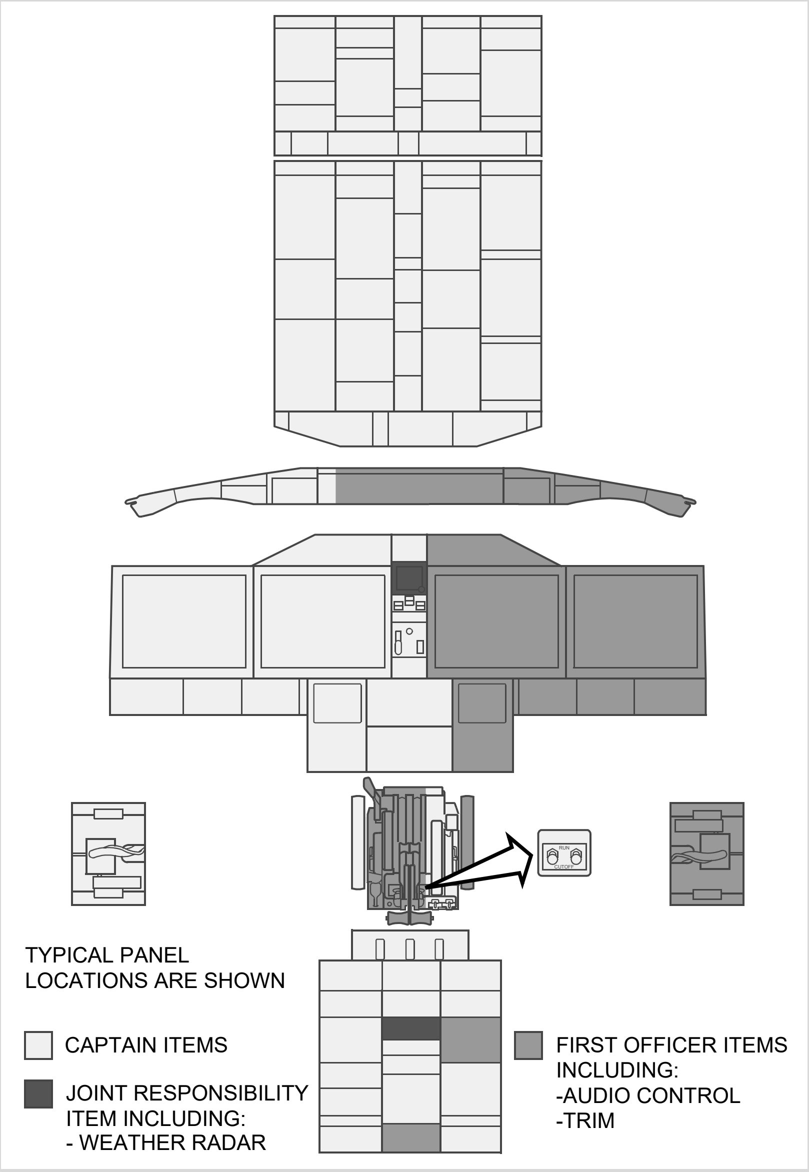
## Preflight and Postflight Scan Flow



# Areas of Responsibility - Captain as Pilot Flying or Taxiing



# Areas of Responsibility - First Officer as Pilot Flying or Taxiing



## Sequence of Events During Pre-Flight

The Captain and F/O pre-flight activities will be performed in the following sequence:

- Preliminary Preflight Procedure (PF)
- Exterior Inspection (PM)
- Initial FMC/CDU Setup (PF)
- Initialize ACARS (PF)
- Preflight Flow* (PF)
- Preflight Flow* (PM) (after returning from exterior inspection)
- Checks FMC Entries (PM) (crew compares FMC with Flight Plan)
- Set up EFB/charts, Headsets, Seat and Pedals.
- Call for and complete the Preflight Checklist.
- Obtain ATC Clearance, Captain sets MCP Altitude and Transponder Code.
- (CA) Enter appropriate SID and Departure Routing per clearance and confirm.
- Conduct Taxi and Takeoff Briefing / Emergency Procedures Review.
- Utilizing the Preliminary Load Report, if available, complete the Performance Data CDU Entry and Crosscheck Procedure.
- Arm A/T, Set V2 Speed, Arm LNAV/VNAV (as applicable) on MCP.
- Utilizing the Final Load Report, F/O updates the OPT WGT & Balance data, if applicable, and then provides the Captain with the final TOW %MAC. The Captain will enter the final CofG in the FMC.

  **Note:** Performance recalculation and FMC update, other than CofG, is not required for a final ZFW that is less than the preliminary ZFW by no more than 500 kg.
- When ready, and in consultation with the IFD and Ground Crew, close the doors and call for the Before Start Checklist.

* As per the Preflight and Postflight Scan Flow diagram.

## Preliminary Preflight Procedure - Captain or First Officer

The PF normally completes the Preliminary Preflight Procedure. The Preliminary Preflight Procedure assumes that the Electrical Power Up supplementary procedure is complete.

Upon entering the flight deck, the First Officer must confirm that the QRH, log books and any other required documents are on board.

The PF will begin the interior setup with the Preliminary Preflight checks while the PM is completing the exterior inspection. If the PF is doing the walk around, this item would then fall to the PM.

A full IRS alignment is recommended before each flight. If time does not allow a full alignment, do the Fast Realignment supplementary procedure.

IRS mode selectors ............................................ OFF, then NAV

Verify that the ON DC lights illuminate then extinguish.

Verify that the ALIGN lights are illuminated.

The UNABLE REQD NAV PERF-RNP message may show until IRS alignment is complete.

VOICE RECORDER switch .................................................As needed

Verify that the following are sufficient for flight:

- oxygen pressure
- hydraulic quantity
- engine oil quantity

Maintenance documents ............................................................ Check

Do the remaining actions after a crew change or maintenance action.

**Note:** The following oxygen pressure drop test only needs to be performed at one crewmember or observer station.

**1C845, 1J103 - 1J114, 1K002, 1K003**
Oxygen pressure drop. ..........................................................Test

Note the crew oxygen pressure.

Oxygen mask – Stowed and doors closed

RESET/TEST switch – Push and hold

Verify that the yellow cross shows momentarily in the flow indicator.

EMERGENCY/Test selector – Push and hold

Continue to hold the RESET/TEST switch down and push the EMERGENCY/Test selector for 5 seconds. Verify that the yellow cross shows continuously in the flow indicator.

Verify that the crew oxygen pressure does not decrease more than 100 psig.

If the oxygen cylinder valve is not in the full open position, pressure can:

- decrease rapidly, or
- decrease more than 100 psig, or
- increase slowly back to normal.

Release the RESET/TEST switch and the EMERGENCY/Test selector. Verify that the yellow cross does not show in the flow indicator.

Normal/100% switch – 100%

Crew oxygen pressure - Check.

Verify that the pressure is sufficient for dispatch.

**1B392, 1J022, 1J023, 1L075 - 1L078**

Oxygen pressure drop ............................................................ Test

Note the crew oxygen pressure.

Oxygen mask – Stowed and doors closed

TEST/RESET switch – Push and hold

Verify that the yellow cross shows momentarily in the flow indicator.

Regulator selector – Rotate to EMER

Continue to hold the TEST/RESET switch down with the regulator selector in the EMER position for 5 seconds. Verify that the yellow cross shows continuously in the flow indicator.

Verify that the crew oxygen pressure does not decrease more than 100 psig.

If the oxygen cylinder valve is not in the full open position, pressure can:

- decrease rapidly, or

- decrease more than 100 psig, or
- increase slowly back to normal.

Release the TEST/RESET switch and rotate the regulator selector to 100%. Verify that the yellow cross does not show in the flow indicator.

Crew oxygen pressure - Check.

Verify that the pressure is sufficient for dispatch.

FLIGHT DECK DOOR ACCESS SYSTEM TEST (first flight of the day)

Flight deck access system switch ............................ Guard closed

Flight deck door .................................................................Open

Flight deck door lock selector ........................................... AUTO

Emergency access code .......................................................Enter

ENT key ..........................................................................Push

Verify alert sounds.

Verify AUTO UNLK light illuminates.

Flight deck door lock selector ........................................... DENY

Verify AUTO UNLK light extinguishes.

Flight deck door lock selector ........................................ UNLKD

Flight deck access system switch .......................................... OFF

Emergency equipment ...................................................... Check

Fire extinguisher – Checked and stowed

Crash axe – Stowed

Escape ropes – Stowed

Other needed equipment – Checked and stowed

ELT switch .......................................................... Guard closed

Verify that the ELT light is extinguished.

ELEVATOR JAM LANDING ASSIST switch ........ Guard closed

Verify that the ASSIST ON light is extinguished.

MAINT light................................................ Verify extinguished

GPS light ..................................................... Verify extinguished

ILS light ........................................................ Verify extinguished

GLS light........................................................ Verify extinguished

SERVICE INTERPHONE switch..........................................OFF

ENGINE panel ....................................................................Set

Verify that the REVERSER COMMAND light is extinguished.

Verify that the REVERSER AIR/GRD light is extinguished.

Verify that the REVERSER LIMITED lights are extinguished.

Verify that the ENGINE CONTROL lights are extinguished.

EEC switches – ON

Oxygen panel .......................................................................Set

**Note:** PASSENGER OXYGEN switch activation causes deployment of the passenger oxygen masks.

PASSENGER OXYGEN switch - Guard closed

Verify that the PASS OXY ON light is extinguished.

Landing gear indicator lights ............................Verify illuminated

FLIGHT RECORDER switch..................................Guard closed

Verify that the OFF light is illuminated.

MACH AIRSPEED WARNING
TEST switches ................................................. Push, one at a time

Verify that the clacker sounds.

STALL WARNING TEST switches... Push and hold, one at a time

Verify that each control column vibrates when the respective switch is pushed.

**Note:** The stall warning test requires that AC transfer busses are powered for up to 4 minutes.

**Note:** With hydraulic power off, the leading edge flaps can droop enough to cause an asymmetry signal, resulting in a failure of the stall warning system test. Should this occur, obtain a clearance to pressurize the hydraulic system, place the “B” system electric pump ON and retract the flaps. When flaps are retracted repeat the test.

Circuit breakers (P6 panel) .................................................. Check

Manual gear extension access door .................................... Closed

**CAUTION: Do not open the door. Verify that it is securely closed. If the door is not securely closed the landing gear may not retract after takeoff.**

Circuit breakers (P18 panel) ................................................ Check

Parking brake ..............................................................As needed

Set the parking brake if the brake wear indicators are to be checked during the exterior inspection.

Tune and adjust radios as required, record the ATIS.

## Crew Briefing

Prior to the completion of the preflight checks (first flight of the day) the Captain will ensure the Crew Member Preflight Briefing has been completed as per COM 3.22.

## CDU Preflight Procedure - Captain and First Officer

The PF normally completes the Initial Data and Navigation Data steps in the CDU Preflight Procedure.

Start the CDU Preflight Procedure anytime after the Preliminary Preflight Procedure. The Initial Data and Navigation Data entries must be complete before the flight instrument check during the Preflight Procedure. The Performance Data entries must be complete before the Before Start Checklist.

The captain or first officer may make CDU entries. The other pilot must verify the entries.

Enter data in all the boxed items on the following CDU pages.

Enter data in the dashed items or modify small font items that are listed in this procedure. Enter or modify other items at pilot's discretion.

Failure to enter enroute winds can result in flight plan time and fuel burn errors.

Initial Data ........................................ Set

IDENT page:

Verify that the MODEL is correct.

Verify that the ENG RATING is correct.

Verify that the navigation data base ACTIVE date range is current.

POS INIT page:

Verify that the time is correct.

Enter the present position on the SET IRS POS line. Use the most accurate latitude and longitude.

Navigation Data ........................................ Set

ROUTE page:

Enter the ORIGIN.

Enter the route.

Enter the FLIGHT NUMBER.

Activate and execute the route.

DEPARTURES page (after ATC clearance received):

Select the runway and departure routing.

Execute the runway and departure routing.

LEGS page:

Verify the correct RNP for the departure, as needed.

Verify that the route is correct on the RTE pages. Check the LEGS pages as needed to ensure compliance with the flight plan.

Verify that the distance shown on PROG PAGE 1 is within 20 NM of the OFP total distance (G/C). If not within 20 NM, investigate discrepancy.

Performance Data ........................................................................Set

PERF INIT page:

Enter:

Cost Index

Reserves (from OFP)

CRZ ALT (initial planned altitude)

CRZ wind

Confirm transition altitude.

**Note:** The Performance Data ZFW entry will be completed after the Load Report form is received, the Weight and Balance is completed and the performance data is verified correct.

**CAUTION: Do not enter the ZFW into the GW boxes. The FMC will calculate performance data with significant errors.**

Complete the remainder of the CDU weight and performance entries after the Load Report form is available, and as described in the Performance Data CDU Entry and Crosscheck section.

Verify that the preflight is complete.

ACARS Initialization / Pre-flight page:

Enter or verify the flight number, departure airport, arrival airport, scheduled, or delayed estimated time of departure, flight time (EET), date and fuel uplift.

## Exterior Inspection

Before each flight the captain, first officer, or maintenance crew must verify that the airplane is satisfactory for flight.

The PM normally completes the exterior inspection.

Items at each location may be checked in any sequence.

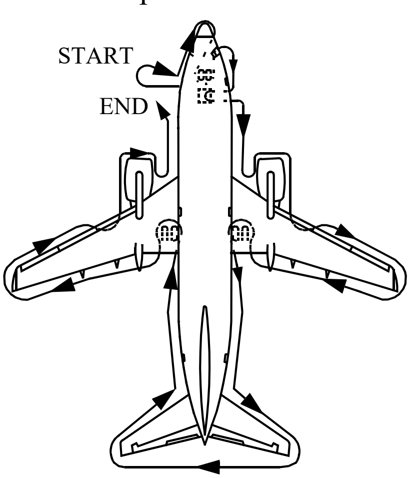
Use the detailed inspection route below to check that:

- the surfaces and structures are clear, not damaged, not missing parts and there are no fluid leaks *
- the tires are not too worn, not damaged, and there is no tread separation
- the gear struts are not fully compressed
- the engine inlets and tailpipes are clear, the access panels are secured, the fan cowls are latched, the exterior, including the bottom of the nacelles, is not damaged, and the reversers are stowed
- the doors and access panels that are not in use are latched
- look in each hold and take note of what, if any cargo or equipment is on board; the necessary adjustments to the W&B can then be made, if required
- the probes, vents, and static ports are clear and not damaged
- the skin area adjacent to the pitot probes and static ports is not wrinkled
- the antennas are not damaged
- the light lenses are clean and not damaged

For cold weather operations see the Supplementary Procedures.

**Note:** * Fluid leaks from the engine drains are allowed provided the leaks are less than a continuous stream. Refer to the Engine Start Procedure for additional guidance.

Inspection Route



## Left Forward Fuselage

Probes, sensors, ports, vents, and drains (as applicable) ............... Check

Doors and access panels (not in use) ..........................................Latched

## Nose

Radome ................................................................................. Check
Conductor straps - Secure

Forward E and E door ..................................................................Secure

## Nose Wheel Well

Tires and wheels ......................................................................... Check

Gear strut and doors ..................................................................... Check

Nose wheel steering assembly ...................................................... Check

Nose gear steering lockout pin ................................................As needed

Gear pin ......................................................................................As needed

Nose wheel spin brake (snubbers) ...............................................In place

## Right Forward Fuselage

Probes, sensors, ports, vents, and drains (as applicable) ............... Check

Oxygen pressure relief green disc ...............................................In place

Doors and access panels (not in use) ..........................................Latched

## Right Wing Root, Pack, and Lower Fuselage

Ram air deflector door ..............................................................Extended

Pack and pneumatic access doors ..................................................Secure

Probes, sensors, ports, vents, and drains (as applicable) ............... Check

Exterior lights ............................................................................... Check

Leading edge flaps ....................................................................... Check

## Number 2 Engine

Exterior surfaces
(including the bottom of the nacelles) ........................ Check for damage

Access panels and fan cowl latches ........................................ Latched

Probes, sensors, ports, vents, and drains (as applicable) ............... Check

Fan blades, probes, and spinner .................................................. Check

Thrust reverser ........................................................................ Stowed

Exhaust area and tailcone .......................................................... Check

## Right Wing and Leading Edge

Access panels ........................................................................... Latched

Leading edge flaps and slats ....................................................... Check

Fuel measuring sticks ................................................ Flush and secure

Wing Surfaces ........................................................................... Check

Fuel tank vent ........................................................................... Check

## Right Wing Tip and Trailing Edge

Position, winglet aft marker, and strobe lights .............................. Check

Static discharge wicks ................................................................ Check

Aileron and trailing edge flaps .................................................... Check

## Right Main Gear

Tires, brakes and wheels ............................................................ Check

Verify that the wheel chocks are in place as needed.

If the parking brake is set, the brake wear indicator pins must extend out of the guides.

Gear strut, actuators, and doors ................................................... Check

Hydraulic lines ........................................................................... Secure

Gear pin ............................................................................... As needed

## Right Main Wheel Well

APU FIRE CONTROL handle ........................................ Up

NGS operability indicator light ........................................ Check

Verify that the light is green.

Wheel well ........................................ Check

## Right Aft Fuselage

Doors and access panels (not in use) ........................................ Latched

Negative pressure relief door ........................................ Closed

Outflow valve ........................................ Check

Probes, sensors, ports, vents, and drains (as applicable) ........................................ Check

APU air inlet ........................................ Check

## Tail

Vertical stabilizer and rudder ........................................ Check

Elevator feel probes ........................................ Check

Tail skid ........................................ Check

Verify that the tail skid is not damaged.

Horizontal stabilizer and elevator ........................................ Check

Static discharge wicks ........................................ Check

Position and strobe lights ........................................ Check

APU exhaust outlet ........................................ Check

## Left Aft Fuselage

Doors and access panels (not in use) ........................................ Latched

Probes, sensors, ports, vents, and drains (as applicable) ........................................ Check

## Left Main Gear

Tires, brakes and wheels ........................................ Check

Verify that the wheel chocks are in place as needed.

If the parking brake is set, the brake wear indicator pins must extend out of the guides.

Gear strut, actuators, and doors .................... Check

Hydraulic lines .................... Secure

Gear pin .................... As needed

## Left Main Wheel Well

Wheel well .................... Check

Engine fire bottle pressure .................... Check

## Left Wing Tip and Trailing Edge

Aileron and trailing edge flaps .................... Check

Static discharge wicks .................... Check

Position, winglet aft marker, and strobe lights .................... Check

## Left Wing and Leading Edge

Fuel tank vent .................... Check

Wing Surfaces .................... Check

Fuel measuring sticks .................... Flush and secure

Leading edge flaps and slats .................... Check

Access panels .................... Latched

## Number 1 Engine

Exhaust area and tailcone .................... Check

Thrust reverser .................... Stowed

Fan blades, probes, and spinner .................... Check

Probes, sensors, ports, vents, and drains (as applicable) .................... Check

Access panels and fan cowl latches .................... Latched

Exterior surfaces
(including the bottom of the nacelles) .................... Check for damage

## Left Wing Root, Pack, and Lower Fuselage

Leading edge flaps .................................................................. Check

Probes, sensors, ports, vents, and drains (as applicable) ............... Check

Exterior lights ........................................................................ Check

Pack and pneumatic access doors ..................................................Secure

Ram air deflector door ..............................................................Extended

## Preflight Procedure - First Officer

The first officer normally does this procedure. The captain may do this procedure as needed.

Flight control panel .................................................................. Check

FLIGHT CONTROL switches – Guards closed

Verify that the flight control LOW PRESSURE lights are illuminated.

**Note:** If the B ELECTRIC HYDRAULIC PUMP switch is ON, the B System flight control LOW PRESSURE light will be extinguished.

Flight SPOILER switches – Guards closed

YAW DAMPER switch – ON

Verify that the YAW DAMPER light is extinguished.

Verify that the standby hydraulic LOW QUANTITY light is extinguished.

Verify that the standby hydraulic LOW PRESSURE light is extinguished.

Verify that the STBY RUD ON light is extinguished.

ALTERNATE FLAPS master switch – Guard closed

ALTERNATE FLAPS position switch – OFF

Verify that the FEEL DIFF PRESS light is extinguished.

**Note:** If the B ELECTRIC HYDRAULIC PUMP switch is ON the FEEL DIFF PRESS light will be illuminated.

Verify that the SPEED TRIM FAIL light is extinguished.

Verify that the MACH TRIM FAIL light is extinguished.

Verify that the AUTO SLAT FAIL light is extinguished.

Verify that the SPOILERS light is extinguished.

NAVIGATION panel ........................................................................ Set

VHF NAV transfer switch – NORMAL

IRS transfer switch – NORMAL

FMC source select switch – NORMAL

DISPLAYS panel ........................................................................... Set

SOURCE selector – AUTO

CONTROL PANEL select switch – NORMAL

Fuel panel ..................................................................................... Set

Verify that the ENG VALVE CLOSED lights are illuminated dim.

Verify that the SPAR VALVE CLOSED lights are illuminated dim.

Verify that the FILTER BYPASS lights are extinguished.

CROSSFEED selector – Closed

Verify that the VALVE OPEN light is extinguished.

FUEL PUMP switches – OFF

Verify that the center tank fuel pump LOW PRESSURE lights are extinguished.

Verify that the main tank fuel pump LOW PRESSURE lights are illuminated.

Electrical panel ............................................................................. Set

BATTERY switch – Guard closed

CAB/UTIL power switch – ON

IFE/PASS SEAT power switch – ON

STANDBY POWER switch – Guard closed

Verify that the STANDBY PWR OFF light is extinguished.

Verify that the BAT DISCHARGE light is extinguished.

Verify that the TR UNIT light is extinguished.

Verify that the ELEC light is extinguished.

Generator drive DISCONNECT switches – Guards closed

Verify that the DRIVE lights are illuminated.

BUS TRANSFER switch – Guard closed

Verify that the TRANSFER BUS OFF lights are extinguished.

Verify that the SOURCE OFF lights are extinguished.

Verify that the GEN OFF BUS lights are illuminated.

Overheat and fire protection panel ................................................ Check

Do this check if the flight crew did not do the Electrical Power Up supplementary procedure. This check is needed once per flight day.

Verify that the engine No. 1, APU, and engine No. 2 fire switches are in.

Alert ground personnel before the following test is accomplished:

OVERHEAT DETECTOR switches – NORMAL

TEST switch – Hold to FAULT/INOP

Verify that the MASTER CAUTION lights are illuminated.

Verify that the OVHT/DET annunciator is illuminated.

Verify that the FAULT light is illuminated.

If the FAULT light fails to illuminate, the fault monitoring system is inoperative.

Verify that the APU DET INOP light is illuminated.

Do not run the APU if the APU DET INOP light does not illuminate.

**Note:** The fire warning light flashes and the horn sounds on the APU ground control panel when this test is done with the APU running. This can be mistaken by the ground crew as an APU fire.

TEST switch – Hold to OVHT/FIRE

Verify that the fire warning bell sounds.

Verify that the master FIRE WARN lights are illuminated.

Verify that the MASTER CAUTION lights are illuminated.

Verify that the OVHT/DET annunciator is illuminated.

Master FIRE WARN light – Push

Verify that the master FIRE WARN lights are extinguished.

Verify that the fire warning bell cancels.

Verify that the engine No. 1, APU and engine No. 2 fire switches stay illuminated.

Verify that the engine No. 1 and engine No. 2 engine start levers stay illuminated.

Verify that the ENG 1 OVERHEAT and ENG 2 OVERHEAT lights stay illuminated.

Verify that the WHEEL WELL fire warning light stays illuminated.

EXTINGUISHER TEST switch – Check

TEST switch – Position to 1 and hold.

Verify that the three green extinguisher test lights are illuminated.

TEST switch – Release

Verify that the three green extinguisher test lights are extinguished.

Repeat for test position 2.

APU switch (as needed) ............................................................ START

**Note:** If extended APU operation is needed on the ground and the airplane busses are powered by AC electrical power, position an AC powered fuel pump ON. This extends the service life of the APU fuel control unit.

**Note:** If fuel is loaded in the center tank, position the left center tank fuel pump switch ON to prevent a fuel imbalance before takeoff.

**CAUTION: Position the center tank fuel pump switches ON only if the fuel quantity in the center tank exceeds 453 kgs.**

**CAUTION: Do not operate the center tank fuel pumps with the flight deck unattended.**

When the APU GEN OFF BUS light is illuminated:

APU GENERATOR bus switches – ON

Verify that the SOURCE OFF lights are extinguished.

Verify that the TRANSFER BUS OFF lights are extinguished.

**Note:** Run the APU for two full minutes before using it as a bleed air source.

Verify that the APU DOOR light is extinguished.

Verify that the APU LOW OIL PRESSURE light is extinguished.

Verify that the APU FAULT light is extinguished.

Verify that the APU OVERSPEED light is extinguished.

EQUIPMENT COOLING switches ............................................NORM

Verify that the OFF lights are extinguished.

EQUIP SMOKE light .............................................. Verify extinguished

EMERGENCY EXIT LIGHTS switch ................................Guard closed

Verify that the NOT ARMED light is extinguished.

Passenger signs ..........................................................................Set

**1B392 - 1J114, 1L075 - 1L078**
NO SMOKING switch – ON

FASTEN BELTS switch – ON (when fueling is complete)

Windshield WIPER selectors......................................................... PARK

Verify that the windshield wipers are stowed.

WINDOW HEAT switches ..............................................................ON

Position switches ON at least 10 minutes before takeoff.

Verify that the OVERHEAT lights are extinguished.

Verify that the ON lights are illuminated (except at high ambient temperatures.)

PROBE HEAT switches ..............................................................AUTO

Verify that all lights are illuminated.

WING ANTI–ICE switch ............................................................. OFF

Verify that the L VALVE and R VALVE lights are extinguished.

ENGINE ANTI–ICE switches ........................................................ OFF

Verify that the ENG ANTI–ICE lights are extinguished.

Verify that the COWL ANTI–ICE lights are extinguished.

Verify that the COWL VALVE lights are extinguished.

Hydraulic panel............................................................................Set

ENGINE HYDRAULIC PUMPS switches – ON

Verify that the LOW PRESSURE lights are illuminated.

ELECTRIC HYDRAULIC PUMPS switches – OFF

Verify that the OVERHEAT lights are extinguished.

Verify that the LOW PRESSURE lights are illuminated.

**CAUTION: Before selecting any hydraulic pump switch to on, ALERT ground personnel to remain clear of powered controls such as the leading edge flaps or slats.**

B ELECTRIC HYDRAULIC PUMP switch ............................ ON

Verify that the LOW PRESSURE and OVERHEAT lights are extinguished.

**1B392, 1L075 - 1L078**

High altitude landing switch.................................................. As needed

The switch is normally off (ON not visible). Verify that the INOP light is extinguished

Air conditioning panel ........................................................................ Set

AIR TEMPERATURE source selector – As needed

TRIM AIR switch – ON

Verify that the ZONE TEMP lights are extinguished.

Temperature selectors – As needed

RECIRC FAN switches – AUTO

Air conditioning PACK switches – AUTO or HIGH

ISOLATION VALVE switch – OPEN

Engine BLEED air switches – ON

APU BLEED air switch – ON

Verify that the DUAL BLEED light is illuminated.

Verify that the PACK lights are extinguished.

Verify that the WING–BODY OVERHEAT lights are extinguished.

Verify that the BLEED lights are extinguished.

Cabin pressurization panel .................................................................. Set

Verify that the AUTO FAIL light is extinguished.

Verify that the OFF SCHED DESCENT light is extinguished.

FLIGHT ALTITUDE indicator – Set final (highest) planned flight plan cruise altitude.

LANDING ALTITUDE indicator – Destination field elevation

Pressurization mode selector – AUTO

Verify that the ALTN light is extinguished.

Verify that the MANUAL light is extinguished.

Lighting panel .......................................................................... Set

LANDING light switches – OFF

RUNWAY TURNOFF light switches – OFF

TAXI light switch – OFF

Ignition select switch ........................................................ IGN L or R

Alternate the ignition select switch position on subsequent starts.

ENGINE START switches ............................................................ OFF

Lighting panel .......................................................................... Set

LOGO light switch – As needed

POSITION light switch – As needed (normally STEADY)

ANTI–COLLISION light switch – OFF

WING illumination switch – As needed

WHEEL WELL light switch – As needed

Mode control panel .................................................................... Set

COURSE(S) – Set

FLIGHT DIRECTOR switch – ON

Move the switch for the pilot flying to ON first.

EFIS control panel ...................................................................... Set

MINIMUMS reference selector – RADIO or BARO

FLIGHT PATH VECTOR switch – As needed

VSD switch – As needed

METERS switch – As needed

BAROMETRIC reference selector – IN or HPA

BAROMETRIC selector – Set local altimeter setting

VOR/ADF switches – As needed

Mode selector – MAP

CENTER switch – As needed

Range selector – As needed

TRAFFIC switch – As needed

WEATHER RADAR – Off

Verify that the weather radar indications are not shown on the MAP.

Map switches – As needed

USB Power switch (as installed) .............................................. Verify on

**Note:** The oxygen test and set is not needed if the oxygen pressure drop test was done at this crewmember station during the Preliminary Preflight Procedure - Captain or First Officer.

Oxygen ........................................................................... Test and set

Oxygen mask – Stowed and doors closed

RESET/TEST switch – Push and hold

Verify that the yellow cross shows momentarily in the flow indicator.

RESET/TEST switch – Release

**1C845, 1J103 - 1J114, 1K002, 1K003**
Normal/100% switch – 100%

EMERGENCY/TEST selector – Normal (non-emergency)

TAKEOFF CONFIG light ........................................Verify extinguished

CABIN ALTITUDE light ..........................................Verify extinguished

Disengage light TEST switch .................................................. Hold to 1

Verify that the A/P light is illuminated steady amber.

Verify that the A/T light is illuminated steady amber.

Verify that the FMC light is illuminated steady amber.

Disengage light TEST switch .................................................. Hold to 2

Verify that the A/P light is illuminated steady red.

Verify that the A/T light is illuminated steady red.

Verify that the FMC light is illuminated steady amber.

Do the Initial Data and Navigation Data steps from the CDU Preflight Procedure and verify that the IRS alignment is complete before checking the flight instruments.

Flight instruments .......................................................................... Check

**CAUTION: At no time are pilots to touch the display screens.**

Verify that the flight instrument indications are correct.

Verify that only these flags are shown:

- TCAS OFF
- NO VSPD until V–speeds are selected

Verify that the flight mode annunciations are correct:

- autothrottle mode is blank
- roll mode is blank
- pitch mode is blank
- AFDS status is FD.

Select the map mode.

PFD/MFD selector..........................................................................NORM

GROUND PROXIMITY panel ..................................................... Check

FLAP INHIBIT switch – Guard closed

GEAR INHIBIT switch – Guard closed

TERRAIN INHIBIT switch – Guard closed

RUNWAY INHIBIT switch – Guard closed

**Note:** Before departure, if one or more of the following exist:

- the airport or runway is not in the GPWS database;
- a NOTAM applies to the intended runway; or
- airline policy prohibits the use of RAAS for an airport or runway;

complete the Overrun Warning (ORW) System and Runway Awareness and Advisory System (RAAS) Inhibit Operation Supplementary Procedure.

Verify that the GROUND PROXIMITY INOP light is extinguished.

Verify that the RUNWAY INOP light is extinguished

The RUNWAY INOP light can be illuminated until the GPS accuracy is adequate for the Runway Awareness and Advisory System requirements.

Landing gear panel ........................................ Set

LANDING GEAR lever – DN

Verify that the green landing gear indicator lights are illuminated.

Verify that the red landing gear indicator lights are extinguished.

NOSE WHEEL STEER switch ........................................ Guard closed

Engine instruments ........................................ Check

**CAUTION: At no time are pilots to touch the display screens.**

Verify that the primary and secondary engine indications show existing conditions.

Verify that no exceedance is shown.

Verify or select the engine indications to the Captain's inboard display unit.

AUTO BRAKE select switch ........................................ RTO

Verify that the AUTO BRAKE DISARM light is extinguished

ANTISKID INOP light ........................................ Verify extinguished

**1K002, 1K003**
TIRE PRESSURE light ........................................ Verify extinguished

SELECTOR switch ........................................ C

CARGO FIRE panel ........................................ Check

This check is needed once per flight day.

DETECTOR SELECT switches – NORM

TEST switch – Push

Verify that the fire warning bell sounds.

Verify that the master FIRE WARN lights are illuminated.

Master FIRE WARN light – Push

Verify that the master FIRE WARN lights are extinguished.

Verify that the fire warning bell cancels.

Verify that the green EXTINGUISHER test lights stay illuminated.

Verify that the FWD and AFT cargo fire warning lights stay illuminated.

Verify that the DETECTOR FAULT light stays extinguished.

Verify that the DISCH light stays illuminated.

Radio tuning panel ........................................ Set

**WARNING: Do not key the HF radio while the airplane is being fueled. Injury to personnel or fire can occur.**

Verify that the OFF light is extinguished.

VHF communications radios ........................................ Set

VHF #1 – ATC
VHF #2 – ATIS or 121.5
VHF #3 – ACARS - ensure "DATA" is selected/displayed

VHF NAVIGATION radios ........................................ Set for departure

Audio control panel ........................................ Set

ADF radios ........................................ Set

WEATHER RADAR control panel ........................................ Set

Transponder panel ........................................ Set

**Note:** For FD "A", set the XPNDR and the ALT source selectors to 1. For FD "B", set the XPNDR and the ALT source selectors to 2.

STABILIZER TRIM override switch ........................................ Guard closed

**WARNING: Do not put objects between the seat and the aisle stand. Injury can occur when the seat is adjusted.**

Seat ........................................ Adjust

Use the handhold above the forward window for assistance when pulling the seat forward. Do not use the glareshield as damage can occur.

Adjust the seat for optimum eye reference.

Whenever the seat is adjusted, verify a positive horizontal (fore and aft) seat lock by pushing against the seat.

Rudder pedals ........................................ Adjust

Adjust the rudder pedals to allow full rudder pedal and brake pedal movement.

**CAUTION: Turn the rudder pedal adjust crank no faster than approximately one turn per second to avoid damage. Do not apply force to the pedals during adjustment.**

Seat belt and shoulder harness .................................................... Adjust

Do the PREFLIGHT checklist on the captain’s command.

## Preflight Procedure - Captain

The captain normally does this procedure. The first officer may do this procedure if needed.

Lights ........................................................................................Test

Master LIGHTS TEST and DIM switch – TEST

The fire warning lights are not checked during this test. Use individual test switches or push to test features to check lights which do not illuminate during the light test. Use scan flow to verify that all other lights are flashing or illuminated. Verify that all system annunciator panel lights are illuminated.

Master LIGHTS TEST and DIM switch – As needed

EFIS control panel ........................................................................Set

MINIMUMS reference selector – RADIO or BARO

FLIGHT PATH VECTOR switch – As needed

VSD switch – As needed

METERS switch – As needed

BAROMETRIC reference selector – IN or HPA

BAROMETRIC selector – Set local altimeter setting

VOR/ADF switches – As needed

Mode selector – MAP

CENTER switch – As needed

Range selector – As needed

TRAFFIC switch – As needed

WEATHER RADAR – Off

Verify that the weather radar indications are not shown on the MAP.

Map switches – As needed

Mode control panel ........................................................................Set

COURSE(S) – Set

FLIGHT DIRECTOR switch – ON

Move the switch for the pilot flying to ON first.

Bank angle selector – As needed

Autopilot DISENGAGE bar – UP

USB Power switch (as installed) ............................................... Verify on

**Note:** The oxygen test and set is not needed if the oxygen pressure drop test was done at this crewmember station during the Preliminary Preflight Procedure - Captain or First Officer.

Oxygen ........................................................................... Test and set

Oxygen mask – Stowed and doors closed

RESET/TEST switch – Push and hold

Verify that the yellow cross shows momentarily in the flow indicator.

RESET/TEST switch – Release

**1C845, 1J103 - 1J114, 1K002, 1K003**
Normal/100% switch – 100%

EMERGENCY/TEST selector – Normal (non-emergency)

TAKEOFF CONFIG light ....................................... Verify extinguished

CABIN ALTITUDE light ........................................ Verify extinguished

Disengage light TEST switch .................................................. Hold to 1

Verify that the A/P light is illuminated steady amber.

Verify that the A/T light is illuminated steady amber.

Verify that the FMC light is illuminated steady amber.

Disengage light TEST switch .................................................. Hold to 2

Verify that the A/P light is illuminated steady red.

Verify that the A/T light is illuminated steady red.

Verify that the FMC light is illuminated steady amber.

STAB OUT OF TRIM light ..................................... Verify extinguished

Do the Initial Data and Navigation Data steps from the CDU Preflight Procedure and verify that the IRS alignment is complete before checking the flight instruments.

Flight instruments .................................................................... Check

**CAUTION: At no time are pilots to touch the display screens.**

Verify that the flight instrument indications are correct.

Verify that only these flags are shown:

- TCAS OFF
- NO VSPD until V–speeds are selected

Verify that the flight mode annunciations are correct:

- autothrottle mode is blank
- roll mode is blank
- pitch mode is blank
- AFDS status is FD

Select the map mode.

PFD/MFD selector .................................................................... NORM

Integrated standby flight display ............................................................ Set

Verify that the approach mode display is blank.

Set the altimeter.

Verify that the flight instrument indications are correct.

Verify that no flags or messages are shown.

FUEL FLOW switch – RATE

Move switch to RESET, then RATE.

SELECTOR switch .................................................................... C

SPEED BRAKE lever .................................................... DOWN detent

Verify that the SPEED BRAKE DO NOT ARM light is extinguished.

Verify that the SPEED BRAKE ARMED light is extinguished.

Verify that the SPEEDBRAKES EXTENDED light is extinguished.

Reverse thrust levers .................................................................... Down

Forward thrust levers.................................................................... Closed

FLAP lever .................................................................................... Set

Set the flap lever to agree with the flap position.

Parking brake ........................................................................................Set

Verify that the parking brake warning light is illuminated

**Note:** Do not assume that the parking brake can prevent airplane movement. Accumulator pressure can be insufficient.

Engine start levers .................................................................. CUTOFF

STABILIZER TRIM cutout switches .................................... NORMAL

Radio tuning panel.........................................................................Set

**WARNING: Do not key the HF radio while the airplane is being fueled. Injury to personnel or fire can occur.**

Verify that the OFF light is extinguished.

VHF communications radios ...............................................................Set

VHF #1 – ATC
VHF #2 – ATIS or 121.5
VHF #3 – ACARS - ensure "DATA" is selected/displayed

VHF NAVIGATION radios ..........................................Set for departure

Audio control panel .........................................................................Set

ADF radios ........................................................................................Set

Trim .....................................................................................................Set

**Note:** The B ELECTRIC HYDRAULIC PUMP switch must be selected ON prior to completing the trim check.

Check each trim for freedom of movement. This check is required for the first flight of the day.

**WARNING: Do not put objects between the seat and the aisle stand. Injury can occur when the seat is adjusted.**

Seat ..............................................................................................Adjust

Use the handhold above the forward window for assistance when pulling the seat forward. Do not use the glareshield as damage can occur.

Adjust the seat for optimum eye reference.

Whenever the seat is adjusted, verify a positive horizontal (fore and aft) seat lock by pushing against the seat.

Rudder pedals ........................................................................ Adjust

Adjust the rudder pedals to allow full rudder pedal and brake pedal movement.

**CAUTION: Turn the rudder pedal adjust crank no faster than approximately one turn per second to avoid damage. Do not apply force to the pedals during adjustment.**

Seat belt and shoulder harness ..................................................... Adjust

Call “PREFLIGHT CHECKLIST.”

## Before Start Procedure

Start the Before Start Procedure after the Load Report is on board.

EFB ............................................................Airplane Mode C, F/O

Papers and Log Books ........................................... On board C, F/O

Flight deck door.......................................Closed and locked F/O

Verify that the LOCK FAIL light is extinguished.

Passenger Signs ................................................................ On F/O

Do the CDU Preflight Procedure – Performance Data steps before completing this procedure.

CDU display ...................................................................... Set C, F/O

Normally the PF selects the TAKEOFF REF page.

Normally the PM selects the LEGS page.

N1 bugs ..........................................................................Check C, F/O

Verify that the N1 reference bugs are correct.

IAS bugs .......................................................................... Set C, F/O

MCP ................................................................................. Set C

AUTOTHROTTLE ARM switch – ARM

IAS/MACH selector – Set V2

Arm LNAV as needed

**Note:** Do not arm LNAV if engine out procedure deviates from SID below 400 ft.

**Note:** For LNAV to be armed on the ground, the departure runway must be selected and the course to the first waypoint must be within 5 degrees of the runway heading.

Arm VNAV

**Note:** For VNAV to be armed on the ground, verify that ACCEL HT, EO ACCEL HT and THR REDUCTION for CLB thrust is set as applicable for the departure profile. When planning a standard NADP 2 departure profile, set or verify a climb speed of Vref 40+80 kts to 3000 ft AAE in the FMC CLIMB page, with a transition speed of 250 kts above that.

Initial heading – Set

Initial altitude – Set

Taxi and Takeoff briefings ....................................Complete C, F/O

The pilot who will do the takeoff does the taxi and takeoff briefings.

As part of the Takeoff Briefing for the first flight of the day, and following a change of either flight crew member, cabin altitude warning indications and memory item procedures must be briefed on aircraft in which the CABIN ALTITUDE and TAKEOFF CONFIG lights are not installed, or are installed but not activated. The briefing must contain the following information:

Whenever the intermittent warning horn sounds in flight at an aircraft flight altitude above 10000 feet MSL:

1. Immediately don oxygen masks and set regulators to 100%.
2. Establish crew communications.
3. Do the CABIN ALTITUDE WARNING or Rapid Depressurization non-normal checklist.

Both pilots must verify on the overhead Cabin Altitude Panel that the cabin altitude is stabilized at or below 10,000 feet before removing oxygen masks.

Exterior doors ................................................ Verify closed F/O

Flight deck windows ...............................Closed and locked C, F/O

Start clearance ..........................................................Obtain C, F/O

Establish communications with ground personnel through headset or visual signals.

Confirm: brakes set; chocks removed; doors closed; boarding/loading equipment removed; aircraft clear for start.

Obtain a clearance to pressurize the hydraulic systems.

**Note:** If a pushback is required, the F/O should commence the Before Start Procedure as soon as the ground crew verifies that the tow bar is connected and the nose gear steering lockout pin is installed.

Obtain a clearance to start the engines.

Fuel panel ........................................................................ Set F/O

If the center tank fuel quantity exceeds 453 kilograms:

LEFT and RIGHT CENTER FUEL PUMPS switches – ON

Verify that the LOW PRESSURE lights illuminate momentarily and then extinguish.

If the LOW PRESSURE light stays illuminated turn off the CENTER FUEL PUMPS switch.

**CAUTION: Centre tank fuel pump switches should be positioned ON only if the fuel quantity in the center tank exceeds 453 kg.**

AFT and FORWARD FUEL PUMPS switches – ON

Verify that the LOW PRESSURE lights are extinguished.

Hydraulic panel................................................................ Set F/O

If pushback is needed and the nose gear steering lockout pin is not installed:

**WARNING: Do not pressurize hydraulic system A. Unwanted tow bar movement can occur.**

System A HYDRAULIC PUMP switches – OFF

Verify that the system A pump LOW PRESSURE lights are illuminated.

System B electric HYDRAULIC PUMP switch – ON

Verify that the system B electric pump LOW PRESSURE light is extinguished.

Verify that the brake pressure is 2,800 psi minimum.

Verify that the system B pressure is 2,800 psi minimum.

If pushback is not needed, or if pushback is needed and the nose gear steering lockout pin is installed:

Electric HYDRAULIC PUMP switches – ON

Verify that the electric pump LOW PRESSURE lights are extinguished.

Verify that the brake pressure is 2,800 psi minimum.

Verify that the system A and B pressures are 2,800 psi minimum.

ANTI-COLLISION light switch ....................................ON F/O

Trim ........................................................................ Set C

Stabilizer trim – ___ UNITS

Set the trim for takeoff.

Verify that the trim is in the green band.

Aileron trim – 0 units

Rudder trim – 0 units

Call “BEFORE START CHECKLIST.” C

Do the BEFORE START checklist. F/O

Where it is necessary to start an engine or de-ice at the gate prior to taxi, the ACARS OUT time must be manually triggered after all exterior doors are closed and ground crew are confirmed clear of the nose gear area.

**Note:** If pushback after engine start or de-icing is required, ensure that the towbar is connected and the bypass pin is installed.

Release the parking brake and hold the brakes to prevent aircraft movement. Wait approximately 30 seconds or until the OUT time populates on the ACARS OOOI or FLT LOG page, as applicable, and then re-set the parking brake. Continue with normal engine start or de-ice procedures.

## Pushback or Towing Procedure

The Engine Start procedure may be done during pushback or towing.

Establish communications with ground handling personnel. C

**CAUTION: Do not hold or turn the nose wheel steering wheel during pushback or towing. This can damage the nose gear or the tow bar.**

**CAUTION: Do not use airplane brakes to stop the airplane during pushback or towing. This can damage the nose gear or the tow bar.**

Transponder ........................................................ As needed F/O

**Note:** At airports where ground tracking is not available, select STBY on the Mode Selector. At airports equipped to track aircraft on the ground, select XPNDR on the Mode Selector.

Set or release the parking brake as directed by ground handling personnel. C or F/O

When pushback or towing is complete:

Verify that the tow bar is disconnected C

Verify that the nose gear steering lockout pin is removed C

System A HYDRAULIC PUMPS switches – ON F/O

Verify that the system A pump LOW PRESSURE lights are extinguished

Verify that the system A pressure is 2800 psi minimum.

## Engine Start Procedure

Normal starter duty cycle:

- Multiple consecutive start attempts are permitted. Each start attempt is limited to 3 minutes of starter usage.
- A minimum of 10 seconds is needed between start attempts.

Extended engine motorings:

- Starter usage is limited to 5 minutes for all extended engine motorings. A minimum of 5 minutes is needed between the first two extended engine motorings.
- For the third and subsequent extended engine motorings, a minimum of 10 minutes is needed between each engine motoring.

Normal engine start considerations:

- Captain will monitor start timing and FO will monitor ignition timing
- do not move an engine start lever to IDLE detent early or a hot start can occur
- keep a hand on the engine start lever while monitoring RPM, EGT and fuel flow until stable
- if fuel is shutoff accidentally (by closing the engine start lever) do not reopen the engine start lever in an attempt to restart the engine
- failure of the ENGINE START switch to stay in GRD until the starter cutout RPM can cause a hot start. Do not re–engage the ENGINE START switch until engine RPM is below 20% N2.
- If a fluid leak (other than a continuous stream) from any of the engine drains is discovered during the Exterior Inspection, the engine can be started. If during engine start, the ground crew reports a fluid leak from an engine drain, the engine start may be continued.
- If the fluid leak continues after the engine is stable at idle, do one of the following:
  - shut down the engine for maintenance action, or
  - run the engine at idle thrust for up to 5 minutes. If the fluid leak stops during this time, no maintenance action is needed, or
  - shut down and restart the engine. Run the engine at idle thrust for up to 5 minutes. If the fluid leak stops during this time, no maintenance action is needed.
- For the first flight of the day, at airport elevations at or above 2,000 feet MSL, if the temperature is below 5°C/41°F, consider placing the Ignition select switch to BOTH before starting the engines. This may increase the likelihood of a successful engine start on the first attempt.

Do the ABORTED ENGINE START checklist for one or more of the following abort start conditions:

- the N1 or N2 does not increase or increases very slowly after the EGT increases
- there is no oil pressure indication by the time that the engine is stable at idle
- the EGT does not increase by 15 seconds after the engine start lever is moved to IDLE detent
- the EGT quickly nears or exceeds the start limit

| | |
|---|---|
| Select the secondary engine indications. | F/O |
| Air conditioning PACK switches .................................. OFF | F/O |

| | | |
|---|---|---|
| Start sequence ....................................................Announce | | C |
| Call “START #___ ENGINE” | | C |
| ENGINE START switch .............................................GRD | | F/O |
| Verify that the N2 RPM increases. | | C, F/O |

After MOTORING indication blanks, N1 rotation is seen, and N2 is at 25%, or (if 25% N2 is not possible), at maximum motoring and a minimum of 20% N2:

**Note:** Maximum motoring occurs when N2 acceleration is less than 1% in approximately 5 seconds.

**CAUTION: Do not apply rotational force when moving the engine start lever.**

| | |
|---|---|
| Engine start lever ............................................ IDLE detent | C |

**Note:** During the TCMA/EOS test, fuel flow indication will be zero and the ENG VALVE CLOSED light will illuminate bright blue until the test is complete.

| | |
|---|---|
| Monitor fuel flow and EGT indications. | C, F/O |
| At 63% N2, verify that the ENGINE START switch moves to OFF. If not, move the ENGINE START switch to OFF. | F/O |
| Verify that the START VALVE OPEN alert extinguishes when the ENGINE START switch moves to OFF. | F/O |
| Call “STARTER CUTOUT.” | F/O |
| Monitor N1, N2, EGT, fuel flow and oil pressure for normal indications while the engine accelerates to a stable idle. | C, F/O |

After the engine is stable at idle, start the other engine.

**Note:** The engine is stable at idle when the EGT start limit redline is no longer shown.

| | |
|---|---|
| Call "STABLE ENGINES" | C |

## Before Taxi Procedure

Start the Before Taxi Procedure after the engines are stable at idle.

**Note:** The F/O completes the Before Taxi Procedure as soon as the engines are stable at idle. When getting to the point for selecting flaps, they will rest their hand on the flap lever until the Captain calls "FLAPS ____" as needed for takeoff.

| | | |
|---|---|---|
| GENERATOR 1 and 2 switches .................................... ON | | F/O |
| APU switch ................................................................. OFF | | F/O |
| PROBE HEAT switches ..................................................ON | | F/O |
| WING ANTI–ICE switch.....................................As needed | | F/O |
| ENGINE ANTI–ICE switches .............................As needed | | F/O |
| HYDRAULIC SYSTEM switches ..................................ON | | F/O |
| PACK switches........................................................ AUTO | | F/O |
| ISOLATION VALVE switch ..................................... AUTO | | F/O |
| APU BLEED air switch .............................................. OFF | | F/O |
| ENGINE START switches .........................................CONT | | F/O |
| Engine start levers ..........................................IDLE detent | | C |
| Call “FLAPS ___” as needed for takeoff. | | C |

**WARNING: Verify the required takeoff flap setting against the required selection as displayed on the CDU before calling "FLAPS ___".**

Flap lever.................................................. Set takeoff flaps — F/O

Verify requested takeoff flap setting against the CDU setting and call "FLAPS ___CONFIRMED".

Verify that the LE FLAPS EXT green light is illuminated.

Flight controls ......................................................... Check — C

**WARNING: Verify that the ground equipment is clear and the ground handling person is disconnected.**

**1B392, 1J022, 1J023, 1L075 - 1L078**
Push the MFD SYS switch to display the flight control surface position indications on the selected inboard display unit.

Make slow and deliberate inputs, one direction at a time.

Move the control wheel and the control column to full travel in both directions and verify:

- freedom of movement
- that the controls return to center

**1B392, 1J022, 1J023, 1L075 - 1L078**

- correct flight control movements are displayed on the selected inboard display unit.

Hold the nose wheel steering wheel during the rudder check to prevent nose wheel movement.

Move the rudder pedals to full travel in both directions and verify:

- freedom of movement
- that the rudder pedals return to center

**1B392, 1J022, 1J023, 1L075 - 1L078**

- correct flight control movements are displayed on the selected inboard display unit.

Select the primary engine indications to the Captain's Inboard Display Unit. F/O

Transponder ........................................................ As needed F/O

**Note:** At airports where ground tracking is not available, select STBY on the Mode Selector. At airports equipped to track aircraft on the ground, select XPNDR on the Mode Selector.

Recall ..................................................................... Check C, F/O

Verify that all system annunciator panel lights illuminate and then extinguish.

Update changes to the taxi briefing, as needed. C or PF

Call “BEFORE TAXI CHECKLIST.” C

Do the BEFORE TAXI checklist. F/O

With the pushback and BEFORE TAXI checklist complete, the Captain will call for the F/O to call ground and request taxi clearance.

Copy taxi instructions, read back and clarify any misunderstanding of the route, hold points and direction.

During the taxi, **DO NOT** engage in administrative duties or actions that distract from situational awareness.

Normal taxi speed is approximately 20 knots, adjusted for conditions. On long straight taxi routes, speeds up to 30 knots are acceptable, however, at speeds greater than 20 knots use caution when using the nose wheel steering wheel to avoid over-controlling the nose wheels. When approaching a turn, speed should be slowed to an appropriate speed for conditions. On a dry surface, for turn angles greater than those typically required for high speed runway turnoffs, use approximately 10 knots.

## Before Takeoff Procedure

Engine warm up requirement:

- Before setting the takeoff thrust, verify that the engine oil temperature is at or above 31°C. Running the engines for approximately 3 minutes with an OAT 0°C or greater allows the engine oil temperature to rise to 31°C or above.

Engine warm up recommendations:

- run the engines for at least 3 minutes
- use a thrust setting normally used for taxi operations.

| CAPTAIN | FIRST OFFICER |
|---|---|
| | IFD will call the flight deck via interphone and say: "CABIN SECURE". |
| The pilot who will do the takeoff updates changes to the takeoff briefing as needed. | |
| Set the weather radar display as needed.<br>Set the terrain display as needed. | |
| Call “BEFORE TAKEOFF CHECKLIST.” | Do the BEFORE TAKEOFF checklist. |
| **WARNING: Both pilots must verify the required takeoff flap setting against the required selection as displayed on the CDU when challenging and responding in the BEFORE TAKEOFF checklist.** | |

## Takeoff Procedure

<table>
<tr><th>CAPTAIN</th><th>FIRST OFFICER</th></tr>
<tr><td></td><td>When cleared to position for takeoff on the departure runway make PA from the flight deck: "FLIGHT ATTENDANTS BE SEATED FOR TAKEOFF."</td></tr>
<tr><td colspan="2">Before entering the departure runway, verify that the runway and runway entry point are correct.</td></tr>
<tr><td>Verify weather radar/TERRAIN set as required.<br>It is recommended that one pilot display TERRAIN.</td><td>When entering the departure runway, set the transponder to TA/RA and the STROBE light switch to ON.<br>Verify weather radar/TERRAIN set as required.<br>It is recommended that one pilot display TERRAIN.</td></tr>
<tr><td>Verify that the brakes are released.<br>Align the aircraft with the runway.</td><td></td></tr>
<tr><td colspan="2">Verify that the aircraft heading agrees with the assigned runway heading.</td></tr>
<tr><td>When cleared for takeoff, set all LANDING light switches to ON and TAXI light switch to OFF.</td><td></td></tr>
<tr><td colspan="2">Note: For F/O takeoffs - the F/O becomes the PF after the aircraft is aligned on the runway, LANDING light switches are ON, the aircraft is cleared for takeoff and the controls are transferred.</td></tr>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Immediately prior to advancing the thrust levers call:<br>"TAKEOFF".</td><td>Call: "RUNWAY XXX VERIFIED".<br>Note: Verification requires:<br>1. Runway number on the ND and runway matches runway cleared for takeoff.<br>2. Aircraft heading on the runway reconciles with runway number cleared for takeoff (e.g. aircraft heading 332 and cleared for takeoff on Rwy 33L).</td></tr>
</table>

| | |
|---|---|
| Advance the thrust levers to approximately 40% N1.<br>Allow the engines to stabilize. | |
| Push the TO/GA switch.<br>Call "N1/TOGA".<br>**Note:** Call roll mode if annunciated. | |
| Verify the correct takeoff thrust is set. | |
| | Monitor the engine instruments during the takeoff. Call out any abnormal indications.<br>Adjust takeoff thrust before 60 knots as needed.<br>During strong headwinds, if the thrust levers do not advance to the planned takeoff thrust by 60 knots, manually advance the thrust levers.<br>Call "THRUST SET." |
| After takeoff thrust is set, the Captain's hand must be on the thrust levers until V1. | |
| Monitor airspeed and runway centerline.<br>Maintain light forward pressure on the control column. | Monitor airspeed and call out any abnormal indications. |
| Verify 80 knots and call: "CHECK". | Call "80 KNOTS."<br>**CAUTION:** If call is made after 80 KIAS, call out actual IAS. |
| | Verify required takeoff thrust is set and that THR HLD is annunciated. |
| Verify V1 speed. | Verify the automatic V1 callout or call "V1". |

| | |
|---|---|
| At VR, rotate toward 15° pitch attitude.<br>After liftoff, follow F/D commands. | At VR, call: "ROTATE".<br>Monitor airspeed and vertical speed. |
| Establish a positive rate of climb. | |
| | Verify a positive rate of climb on the altimeter and call: "POSITIVE RATE". |
| Verify a positive rate of climb on the altimeter and call: "GEAR UP". | Set the landing gear lever to UP. |
| Above 400 ft radio altitude, call for a roll mode, as needed. | Select or verify the roll mode.<br>Verify VNAV is engaged. |
| Select autopilot as desired.<br>Call:<br>"COMMAND A" or "COMMAND B" as applicable. | |

NADP 1 Profile:

Takeoff power, Takeoff flap and climb at V2+10 - 20kts to 1500 feet AAE (Above Airport Elevation).

At 1500 feet AAE, reduce to climb thrust and maintain V2+10 - 20kts to 3000 feet AAE.

At 3000 feet AAE, accelerate to en route climb speed with flap retraction on schedule.

**Note:** To assist in planning departure spacing at Canadian airports, pilots are to notify ATC Clearance Delivery or Ground Control when intending to use NADP 1.

NADP 2 Profile:

Takeoff power, Takeoff flap and climb at V2+10 - 20kts to 1000 feet AAE.

At 1000 feet AAE (or MFRA if higher), reduce to climb thrust and accelerate to minimum maneuvering speed (Vzf), retracting flaps on schedule.

From 1000 feet AAE to 3000 feet AAE, continue to climb at not greater than Vzf+10 - 20 kts (Vzf is the equivalent of Vref40 + 70 kts).

At 3000 feet AAE transition to en route climb speed.

At thrust reduction height, verify that climb thrust is set.

| | |
|---|---|
| At acceleration height (minimum 1000 feet AAE), verify acceleration.<br>Call: "FLAP ____" according to the flap retraction schedule. | |
| | Verify the speed and set the FLAP lever as directed. Monitor flaps and slats retraction.<br>When flaps are indicating the selected position, call "FLAP____". |
| | When flaps and slats have fully retracted, call: "FLAPS UP, NO LIGHTS". |
| | After flap retraction is complete:<br>• set or verify engine bleeds and air conditioning packs are operating;<br>• set the engine start switches a as needed;<br>• set the AUTO BRAKE select switch to OFF; |
| After flap retraction and above 3000 ft AAE, call "AFTER TAKEOFF CHECKLIST." | Verify or select engine indications to the desired inboard display. |
| | Do the AFTER TAKEOFF checklist. |

Once above 3000 ft AAE, engage VNAV if it is not already the active mode.

## Takeoff Flap Retraction Speed Schedule

| Takeoff Flaps | At Speed (display) | Select Flaps |
|---|---|---|
| 25 | V2 + 15<br>“15”<br>“5”<br>“1” | 15<br>5<br>1<br>UP |
| 15 or 10 | V2 + 15<br>“5”<br>“1” | 5<br>1<br>UP |
| 5 | V2 + 15<br>“1” | 1<br>UP |
| 1 | “1” | UP |
| Limit bank angle to 15° until reaching V2 + 15 | | |

Before calling for flap settings, the PF will note and consider the speeds above.

The PM will note and confirm speed in range and set the requested Flap position. If speed is out of limits for flap retraction, PM will call: "SPEED".

## MCP Altitude Setting Techniques Using VNAV - Published Departures

**Note:** Flight crews must be vigilant and aware of FMA annunciation and pitch mode selection. If a pitch mode other than VNAV PTH or VNAV SPD is engaged, there is a risk of violating procedure altitude constraints and the MCP must be set to each successive altitude constraint until VNAV is selected/annunciated.

During climb in VNAV, set the clearance altitude in the MCP. VNAV will ensure that intermediate altitude constraints are satisfied. The FMC alerts the crew with an "UNABLE NEXT ALTITUDE" CDU scratch pad message if an altitude constraint will not be satisfied.

For example, when departing KLAX on the DARRK RNAV SID with VNAV engaged, set the MCP to FL230, or ATC assigned altitude as applicable. If the pitch mode is not VNAV, then the intermediate altitudes for the applicable SID waypoints must be set in the MCP until VNAV is engaged.

## Climb and Cruise Procedure

Complete the After Takeoff Checklist before starting the Climb and Cruise Procedure.

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td></td><td>During climb and cruise, verify the RNP as needed.</td></tr>
<tr><td>At or above 10000 ft MSL, Captain selects all LANDING light switches to OFF.<br><br>If VNAV was engaged prior to takeoff, set or verify that ECON climb is selected in the FMC Climb page.</td><td>F/O selects Logo light switch OFF, if applicable.<br><br>Check pressurization normal.<br><br>Set the passenger signs as needed.<br><br>Select the center tank fuel pump switches ON, as applicable.</td></tr>
<tr><td>Climbing or Descending:<br><br>Call passing through: "10,000", "20,000" and "30,000".<br><br>e.g. "10000 CLIMBING FL330".</td><td></td></tr>
<tr><td>Climbing or Descending:<br><br>Call 1000 ft prior to cleared altitude.<br><br>e.g. "FL270 CLIMBING FL280".</td><td></td></tr>
<tr><td colspan="2">At transition level, set and cross check the altimeters to standard.<br><br>PF calls: "TRANSITION, SET STANDARD"; PM calls: "STANDARD SET AND CROSS CHECKED".<br><br>The Captain sets the ISFD to standard.<br><br>CAUTION: With a combination of low QNH, high rate of climb and low TA, consider setting STD earlier than fixed TA to preclude a possible ATC altitude violation.</td></tr>
</table>

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td></td><td>During climb, set the affected center tank fuel pump switch to OFF when a center tank fuel pump LOW PRESSURE light illuminates.<br><br>Set both center tank fuel pump switches to OFF when a center tank fuel pump LOW PRESSURE light illuminates if the center tank is empty.</td></tr>
<tr><td></td><td>When established in a level flight attitude, if the center tank contains usable fuel and a center tank fuel pump switch(es) is OFF, set the center tank fuel pump switch(es) to ON again.<br><br>Set the affected center tank fuel pump switch to OFF when a center tank fuel pump LOW PRESSURE light illuminates.<br><br>Set both center tank fuel pump switches to OFF when a center tank fuel pump LOW PRESSURE light illuminates if the center tank is empty.</td></tr>
<tr><td colspan="2">At top of climb, complete panel scan in area of responsibility, including a RECALL check.<br><br>Ensure altimeters are within RVSM limits.<br><br>Setup VHF as follows:<br><br>1) VHF #1 - ATC<br><br>2) VHF #2 - 121.5<br><br>3) VHF #3 - ACARS - leave "DATA" active</td></tr>
<tr><td colspan="2">CAUTION: Do not allow the shoulder harness straps to retract quickly. Buckles can pull or damage circuit breakers.</td></tr>
<tr><td>Ensure the aircraft is in trim.<br><br>CAUTION: Do not fly above Maximum Altitude in the FMC. Fly at or below Optimum Altitude as much as possible.</td><td></td></tr>
</table>

| Pilot Flying | Pilot Monitoring |
|---|---|
| | Cross check actual time and fuel remaining with OFP requirements at least once per hour for any flight over 1 hour in duration. |
| In flight, the PM usually makes the CDU modifications as directed by PF. The PM calls: "CONFIRM". The PF calls "CONFIRMED" after verifying the change is correct and then PF calls: "EXECUTE". The PM executes the change only after the PF verifies the entries. | |

## Descent Procedure

Normally, the Descent Procedure is commenced sufficiently in advance of the Top of Descent point so as to have the Approach Briefing completed prior to descending from the cruise altitude for arrival at the destination.

In any case, the Descent Procedure should be completed by 10000 feet MSL.

| Pilot Flying | Pilot Monitoring |
|---|---|
| | During the descent, verify the RNP as needed. |
| | Set the affected center tank fuel pump switch to OFF when a center tank fuel pump LOW PRESSURE light illuminates.<br>Set both center tank fuel pump switches to OFF when a center tank fuel pump LOW PRESSURE light illuminates if the center tank is empty.<br>If established in a level flight attitude, for an extended period of time with usable fuel in the center tank and a center tank fuel pump switch(es) is OFF, set the center tank fuel pump switch(es) to ON again.<br>Set the affected center tank fuel pump switch to OFF when a center tank fuel pump LOW PRESSURE light illuminates.<br>Set both center tank fuel pump switches to OFF when a center tank fuel pump LOW PRESSURE light illuminates if the center tank is empty. |
| | Obtain arrival ATIS.<br>Prepare their EFB with the appropriate arrival/approach/taxi charts. |
| Transfer control to the PM.<br>Program the FMC with the applicable STAR and Approach anticipated for arrival. | |

| Pilot Flying | Pilot Monitoring |
|---|---|
| When planning an RNAV (RNP) AR approach, the approach must be selected from the navigation database. The ACT RTE X LEGS page must match the charted approach and the waypoint sequence, track and distance must be verified.<br><br>If there is an "at or above" altitude restriction before the FAF, it may be changed to an "at" altitude restriction using the same altitude. Speed modifications are permissible provided the maximum published speed is not exceeded. | |
| | Verify that pressurization is set to landing altitude. |
| Calculate the landing performance.*<br><br>Set the AUTO BRAKE select switch to the needed brake setting. | |
| **1K002**<br>Set the applicable VREF on the APPROACH REF page.<br><br>**1B392 - 1J114, 1K003 - 1L078**<br>Set the applicable VREF on the APPROACH REF page 1/2 and select or verify the appropriate runway condition on page 2/2. | Verify VREF on the APPROACH REF page 1 and appropriate runway condition on page 2, if available. |
| Set or verify the navigation radios and course for the approach. | |

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td colspan="2">Set the RADIO/BARO minimums and final approach course as needed for the approach.<br>If planning an RNAV or RNP AR approach set the vertical RNP to 125 ft on FMS page RNP PROGRESS 4/5.<br>If planning an RNAV approach set the lateral RNP value to 0.3.<br>If planning an RNP AR approach, set the lateral RNP value according to the required DH suitable for the weather (normally 0.3, but may be lower).<br>On the NAV OPTIONS page:<br>• Select VOR UPDATE OFF;<br>• Verify or select DME UPDATE OFF;<br>• Verify of select GPS UPDATE ON.</td></tr>
<tr><td>Do the approach briefing with reference to the charted information and the CAT II or RNP AR OPERATIONS Briefing Card, as applicable.</td><td>Verify that the information in the FMC correlates to the information being briefed from the charted information during the approach briefing.</td></tr>
<tr><td>Assume control from PF.</td><td>Transfer control to PM.</td></tr>
<tr><td>Recall and review the system annunciator lights.</td><td>Recall and review the system annunciator lights.</td></tr>
<tr><td>Call: "DESCENT CHECKLIST"</td><td>Do the DESCENT checklist.</td></tr>
</table>

## * Landing Performance Calculation

Landing Performance must be calculated, using the OPT or the appropriate QRH Performance Inflight landing distance table prior to every landing.

Pilots should select an appropriate autobrake setting that will enable them to exit the runway at an appropriate planned taxiway intersection.

**Note:** The applicable braking action must be selected on APPROACH REF page 2 anytime that the runway condition is not DRY.

## MCP Altitude Setting Technique Using VNAV - Published Arrivals and Approaches / Transitions

**Note:** Flight crews must be vigilant and aware of FMA annunciation and pitch mode selection. If a pitch mode other than VNAV PTH or VNAV SPD is engaged, there is a risk of violating procedure altitude constraints and the MCP must be set to each successive altitude constraint until VNAV is selected/annunciated.

During descent in VNAV, set the clearance altitude in the MCP. VNAV will ensure that intermediate altitude constraints are satisfied. The FMC alerts the crew with an "UNABLE NEXT ALTITUDE" CDU scratch pad message if an altitude constraint will not be satisfied.

For example, when the airplane has been cleared from cruise level to 7000 ft, on the CYXX HOPE arrival to cross KEKPO at 9000 ft, set the MCP to 7000 ft.

When cleared for an approach using VNAV, set the MCP to the lowest of the published altitude constraints or the FAP/FAF altitude, whichever is higher.

For example, when the airplane has been cleared for the RNAV (RNP) X Rwy 16 approach, VIVEK transition in CYLW, set the MCP initially to 9500 ft. When the altitude crossing restriction at VIVEK is assured, set 3400 ft (FAP crossing altitude).

**Note:** The FMC generated path should be checked against each altitude constraint to ensure that the path complies with all constraints.

Approximately 2 NM before the final approach fix and after VNAV PTH, VNAV ALT or ALT HOLD is annunciated:

- set DA(H) on the MCP;
- select or verify VNAV;
- select or verify speed intervention (as installed).

**Note:** For approach procedures where the vertical angle ("GP" angle shown on the LEGS page) begins earlier in the approach (prior to the FAP/FAF), the MCP may be set to the DA(H) once established on the vertical angle.

Altitude intervention is appropriate during approaches only if the AFDS enters VNAV ALT mode above the approach path and descent must be continued. Entering VNAV ALT mode can occur if passing a waypoint on the descent/approach and the crew has neglected resetting the MCP altitude to a lower altitude. If this occurs, set the MCP altitude to the next lower altitude constraint or the TDZE, as appropriate, and select altitude intervention. When VNAV altitude intervention is selected, VNAV path deviation indications on the map display disappear momentarily while the path is recalculated but should reappear.

When on-approach logic is active and the airplane is below the VNAV path when altitude intervention is selected, level flight is commanded until reaching the VNAV path, then the airplane captures the VNAV path.

## Approach Briefing

The approach briefing will be given by the PF prior to descent after obtaining the arrival ATIS or advisory.

Both pilots will review the approach procedure. The briefing will include the following:

- STAR
- Type of approach - State page number and effective date. If applicable, check that the approach plate is current.
- Navigational frequency to be used.
- Final Approach Course.
- Verify that the applicable RNP value has been set for the applicable RNAV (GNSS) or RNAV (RNP) approach procedure.
- Glideslope / FAF minimum altitude crossing fix.
- DA(H) / MDA
- Minimum safe altitude sectors.
- Transition altitude.
- Vertical profile including all minimum altitudes, crossing altitudes, speed restrictions and approach minimums.
- Engine failure and Unable Required RNP procedures.
- Flap setting / Autobrake / Vref / Command speed.
- Weather considerations - crosswind/tailwind, visibility, cloud cover, rain, ice and snow effect on braking, windshear, thunderstorms, etc.
- Missed Approach Point and Missed Approach Procedure.
- Management of the AFDS. Set up of NAV SOURCES.
- Operations, monitoring and standard calls.
- Reminder that if the In-Air Overrun Warning (“OVERRUN, GO-AROUND”) occurs during approach, an immediate go-around is required.
- Questions and confirmation of minimum altitudes by PM.

**Note:** Inhibit the overrun alert when:

- Landing OAT is below -40C or greater than 50C; or
- Gross weight is greater than Maximum Landing Weight.

For CAT II operations, review and verify all CAT II requirements have been met as per pages NP.21.53 - NP.21.54.

Brief the CAT II approach using briefing guide on page NP.21.53 plus any additional considerations listed above.

For RNAV (RNP) AR operations, review and verify all requirements have been met as per page NP.21.55.

## CAT II Operations

### CAT II Approach Briefing

ILS CAT II APPROACH RUNWAY ____, (Airport), (page#), Effective Date ____.

LOCALIZER FREQ ____, APPROACH COURSE ____, CROSS FIX ____ @ (altitude).

FLAPS ____ AUTOBRAKE ____

DECISION HEIGHT IS ____ FEET, SET ON THE RADIO ALTIMETER.

AFTER APPROACH IS ARMED, I WILL ENGAGE THE 2nd AUTOPILOT.

ON THE GLIDESLOPE AND PRIOR TO THE FAF, WE WILL BE FULLY CONFIGURED FOR LANDING.

WE WILL BOTH MONITOR THE INSTRUMENTS WHILE ON APPROACH. YOU WILL REMAIN HEADS DOWN THROUGHOUT THE APPROACH, LANDING, ROLL OUT AND/OR GO-AROUND.

AT THE 1000 FOOT CALL, YOU WILL CALL "STABLE" OR "GO-AROUND".

AT THE 500 FOOT CALL, YOU WILL CALL: "FLARE ARMED".

I WILL GO HEADS UP AND SCAN FOR VISUAL CUES.

AT MINIMUMS, I WILL CALL EITHER: "CONTINUE" OR "GO-AROUND".

IN THE EVENT OF A GO-AROUND: [BRIEF MISSED APPROACH PROCEDURE].

CALL ANY DEVIATIONS FROM FLIGHT PATH, AFDS ANNUNCIATORS OR AN UNSTABILIZED CONDITION.

ANY QUESTIONS?

**Note:** Prior to conducting a CAT II Approach: Review the CAT II Limitations and Approach Ban Criteria as displayed on the reverse side of the glareshield NORMAL CHECKLIST.

### CAT II Limitations

| Wind Direction | Autoland Wind Limits |
|---|---|
| Headwind | 25 knots |
| Tailwind | 15 knots |
| Crosswind | 20 knots (15 knots USA) |

- No CAT II landings are authorized at airfields above 8400 ft pressure altitude.
- Automatic landings can be made using Flap 30 or Flap 40, however, Flap 40 should be used for CAT II operations to improve cockpit visibility.
- Maximum glideslope angle is 3.25°.
- Minimum glideslope angle is 2.5°.

**Note:** Autoland should not be attempted unless the final approach course path is aligned with the runway centerline. If the localizer beam is offset from the centerline, the AFDS may cause the aircraft to depart the runway.

- The Captain's and First Officer's instruments (Display Source, VHF NAV and IRS) must not be on the same source.
- All required equipment must be serviceable. Refer to Approach Procedures Equipment Requirements Chart in the QRH, Ops Info section.
- FAL's policy is to operate all CAT II Approaches with 2 autopilots engaged and landing with Autoland.
- Autobrake must be used when serviceable.

## RNAV (RNP) AR Operations

**Note:** For RNAV (GPS) and RNAV (GNSS) procedures use the Landing Procedure - Instrument Approach using VNAV in Normal Procedures.

**Note:** This procedure is not authorized using QFE.

**Note:** Approach Procedures with RF Legs are authorized.

The procedure below supplements Normal Preflight, Cruise, Descent and Approach Procedures and replaces the Landing Procedure.

All required equipment must be serviceable. Refer to Approach Procedures Equipment Requirements Chart in the QRH, Ops Info section.

**Note:** Do the Go-Around and Missed Approach Procedure if the UNABLE REQD NAV PERF-RNP, FMC DISAGREE, or any VERIFY POSITION alerting message is shown unless suitable visual reference is established and maintained.

**WARNING: If an UNABLE REQD NAV PERF-RNP is shown during the approach, whether the lateral or vertical RNP are exceeded or not, do the Go-Around and Missed Approach Procedure unless suitable visual reference is established and maintained.**

Do the following before starting the approach:

- verify that the UNABLE REQD NAV PERF-RNP alert is not displayed;
- verify that the approach RNP is equal to or greater than:
  - with NPS, 0.10 (A/P or F/D)
  - without NPS, 0.11 (A/P)
  - without NPS, 0.15 (F/D)
- set current local altimeter (remote altimeter settings not allowed);
- verify that the wind is within limits published for the approach (if applicable);
- verify that the reported airport temperature is within published limits for the approach;
- review the maximum IAS for each segment of the approach as determined by aircraft category and applicable regulatory airspeed requirements.

# RNAV Visual Flight Procedures

Flair is authorized to conduct RNAV Visual Flight Procedure (RVFP) operations at select airports in the USA as shown in the following table:

| Airport | Procedures |
|---|---|
| KBUR | RNAV VISUAL Rwy 15<br>RNAV VISUAL Rwy 33 |
| KIWA | RNAV VISUAL Rwy 30L |
| KLAS | RNAV VISUAL Rwy 08R<br>RNAV VISUAL Rwy 19L<br>RNAV VISUAL Rwy 19R |
| KPSP | RNAV VISUAL Rwy 13R<br>RNAV VISUAL Rwy 31L |

The ceiling and visibility requirements published for these procedures will allow the crew to navigate in VMC flight conditions from the minimum radar vectoring altitude for the remainder of the procedure.

When planning on conducting an RVFP procedure, initial contact with Arrival must include "REQUEST RNAV VISUAL APPROACH RWY XX". ATC will clear the aircraft to a point on the procedure and provide descent clearance to the Minimum Radar Vectoring Altitude.

An approach clearance will not be given until the flight reports the airport, or preceding traffic, in sight. Any delay in providing this notification may result in the aircraft being in an undesired energy state (i.e., too high).

The flight must advise ATC if unable to accept the clearance due to IMC or lack of sufficient visual reference by stating "UNABLE THE RNAV VISUAL".

Once established on the procedure the flight is expected to follow the published track until landing. In the event of a missed approach the flight is expected to join a visual traffic pattern or comply with alternate ATC instructions.

The following procedures are required:

1. The procedure must be selected from the FMC database and the waypoints must not be modified.

2. Fly the published RVFP route and, unless cleared otherwise by ATC, comply with the charted mandatory altitudes and airspeeds.
3. Report the airport or preceding traffic in sight as soon as possible in order to receive the approach clearance.
4. Notify ATC "UNABLE THE RNAV VISUAL" if unable to accept the clearance and maintain VMC to the landing.

**Note:** By accepting clearance for an RVFP procedure the flight acknowledges that terrain, traffic and weather avoidance is the responsibility of the flight crew.

## Approach Procedure

The Approach Procedure is normally started at transition level.

Complete the Approach Procedure before:

- the initial approach fix, or
- the start of radar vectors to the final approach course, or
- the start of a visual approach

For RNAV (RNP) AR approaches:

1. When receiving radar vectors from ATC, intercept course modifications may be used to join the LNAV path at any point on the initial, intermediate or missed approach segments;
2. Direct To modifications are not permitted when:
   - the fix is the beginning of an RF leg; or
   - the fix is the Final Approach Fix (FAF) for the procedure.
3. Approaches must be flown with one autopilot engaged while operating in IMC conditions and until suitable visual reference is established; and
4. Confirm FMC approach track is within 3°, distance between waypoints is within 0.1 NM and vertical GP is within -.01° to +0.1° of charted values.

Select the G/S prompt OFF if flying an ILS approach where the G/S transmitter is inoperative or when the G/S data is unreliable. Do not manually build the approach to add waypoints to the selected FMC procedure.

For an ILS, LOC, BCRS, SDF or LDA approach, select the appropriate localizer frequency.

For a BCRS approach, enter the front course in the Mode Control Panel COURSE window. Do not select VOR/LOC.

For all other approaches, select VOR frequency 108.00 in both VHF control panels.

Before approach, if one or more of the following exist or are planned:

- the airport is not in the GPWS database;
- a NOTAM applies to the intended runway;
- airline policy prohibits the use of ORW for an airport or runway;
- conducting Land and Hold Short Operations (LAHSO);
- conducting Touch and Go landings;
- landing altitude is above 10,000 feet pressure altitude;
- Landing OAT on the ground is below -40°C or greater than +50°C; or
- gross weight is greater than maximum landing weight;

complete the Overrun Warning (ORW) System and Runway Awareness and Advisory System (RAAS) Inhibit Operation Supplementary Procedure.

### Stabilized Approach

At 1000 ft AAE, if the Stabilized Approach Criteria are not met then a go-around must be initiated, unless:

- the aircraft speed does not meet the criterion but can reasonably be expected to be achieved by 500 ft AAE and the thrust setting is appropriate to achieve this; or
- the aircraft is in the planned landing configuration and all landing actions have been completed but the Landing Checklist has not yet been completed. In this case the approach may be continued to not less than 500 ft AAE while the Landing Checklist is completed. At 500 ft AAE, if any other of the criteria are not met, the PM will call “GO-AROUND” and the PF will initiate an immediate go-around.

If a stable approach destabilizes below 500 ft AAE, the PM will call “GO-AROUND” and the PF will initiate an immediate go-around.

Any significant deviation from planned flight path, airspeed or descent rate must be announced. The decision to execute a go-around is no indication of poor performance.

All approaches must be stabilized by 1000 ft AAE in instrument meteorological conditions (IMC) and in visual meteorological conditions (VMC).

An approach is considered stabilized when all of the following criteria are met:

- The aircraft is on the correct flight path.
- Only small changes in heading / pitch are required to maintain the correct flight path.
- The aircraft is at approach speed. Deviations of +10 kts to -5 kts are acceptable if the airspeed is trending toward approach speed.
- The aircraft is in the correct landing configuration.
- Sink rate is no greater than 1,000 fpm; if an approach requires a sink rate greater than 1,000 fpm, a special briefing should be conducted.
- Thrust setting is appropriate for the aircraft configuration.
- All briefings and checklists have been conducted.
- ILS final approach flown within half dot of the glideslope and localizer within the expanded localizer scale.
- During a circling approach, wings must be level on final when the aircraft reaches 300 ft AAE.

Unique approach procedures or abnormal conditions requiring a deviation from the above elements of a stabilized approach require a special briefing.

**Note:** An approach that becomes unstabilized below 1000 ft AAE in IMC and in VMC requires an immediate go-around. Either pilot can call for the go-around, with the expectation that the PF will immediately respond by executing the missed approach procedure. Do not attempt to land from an unstable approach.

These conditions must be maintained throughout the rest of the approach for it to be considered a stabilized approach. If the above criteria cannot be established and maintained until approaching the flare, initiate a go-around.

At 300 ft HAT for all visual approaches, the aircraft must be positioned so the flight deck is within, and tracking to remain within, the lateral confines of the runway edges extended.

As the aircraft crosses the runway threshold it must be:

- Stabilized on approach airspeed to within +10 knots until arresting descent rate at flare.
- On a stabilized flight path using normal maneuvering.
- Positioned to make a normal landing in the touchdown zone (the first 3000 ft or the first third of the runway, whichever is less).

Initiate a go-around if the above criteria cannot be maintained.

**Note:** An approach in gusty conditions may be continued where airspeed and descent rate fluctuations exceed the stabilized approach criteria if the excursions are brief in duration and in the judgment of the Captain is safe to continue.

**Note:** Some visual approaches require turning final at less than 1000 ft AFE (e.g. LAS.) All other stabilized approach criteria apply at 1000 ft AFE except that the aircraft is not on the final approach track. This exception to the stabilized approach criteria must be briefed.

| Pilot Flying | Pilot Monitoring |
|---|---|
| When descending below transition level, set and cross check the altimeters. Verify that the 2 primary altimeters are indicating within 100 ft of each other.<br>The Captain sets the ISFD to destination QNH.<br>PF calls: "TRANSITION, SET _____ INCHES" (or mb, as the case may be).<br>PM calls: "_____ INCHES SET AND CROSS CHECKED". | |
| In descent at 10000 feet MSL, Captain sets the Landing light switches to ON, First Officer sets LOGO light switch to ON (during night operations). | During arrival and approach, verify the RNP for the approach on the FMS page RNP PROGRESS 4/5. |
| | At 10000 ft MSL (adjust if required for high airport elevation) or 10 minutes prior to landing, select the SEAT BELTS sign ON.<br>Call: "FLIGHT ATTENDANTS PREPARE FOR ARRIVAL".<br>If seat belt sign is already ON: select OFF, then ON again. |
| Update the arrival and approach, as needed. | |
| Update the approach briefing as needed. | |
| Call "APPROACH CHECKLIST" | Do the APPROACH checklist. |
| **Note:** The Approach Checklist is normally completed at 10000 ft MSL. Delay the Approach checklist until after transition if Transition Level is lower than FL100. | |

## Flap Extension Schedule

| Current Flap Position | At Speedtape “Display” | Select Flaps | Command Speed for Selected Flaps |
|---|---|---|---|
| UP | “UP” | 1 | “1” |
| 1 | “1” | 5 | “5” |
| 5 | “5” | 15 | “15” |
| 15 | “15” | 30 or 40 | (VREF30 or VREF40) + wind additives |

Before calling for flap settings, the PF will note and consider the speeds above.

The PM will note and confirm speed in range before selecting requested flap setting.

The PF will confirm the flap selection and movement of the flaps before calling for or selecting a lower speed on the MCP.

If speeds are increased due to wind gust corrections, consider using a lower flap setting for approach and landing.

| Pilot Flying | Pilot Monitoring |
|---|---|
| "FLAP 1, SPEED 190" (as applicable) | Set the flap lever as directed. Monitor flaps and slats extension. When flaps indicate the selected position,<br>Call "FLAP 1" |

# Landing Procedure - ILS CAT I

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Initially:<br>If on radar vectors<br>• HDG SEL<br>• Pitch mode (as needed)<br>If en route to a fix<br>• LNAV or other roll mode<br>• VNAV or other pitch mode</td><td></td></tr>
<tr><td>Call "FLAP ____, (SPEED)" according to the flap extension schedule. After flap selection, Set MCP speed.</td><td></td></tr>
<tr><td></td><td>Set the flap lever as directed. Monitor flaps and slats extension. When flaps indicate the selected position,<br>Call "FLAP ____"</td></tr>
<tr><td colspan="2">When on localizer intercept heading:<br>• Verify that the ILS is tuned and identified.<br>• Verify that LOC and G/S pointers are shown.</td></tr>
<tr><td>Arm the APP mode.<br>If a dual channel approach is desired, engage the second autopilot.</td><td></td></tr>
<tr><td>"LOCALIZER AND GLIDESLOPE ARMED"</td><td></td></tr>
<tr><td colspan="2">Note: When using LNAV to intercept the final approach course, LNAV might parallel the localizer without capturing it.<br><br>LNAV should not be selected until the aircraft is established on the intercept heading.</td></tr>
<tr><td>Use LNAV or HDG SEL to intercept the final approach course as needed.</td><td>Call "LOCALIZER ALIVE"</td></tr>
<tr><td colspan="2">Verify that the localizer is captured.<br>Verify the final approach course heading.</td></tr>
<tr><td>Call "LOCALIZER CAPTURED"</td><td></td></tr>
</table>

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td></td><td>Call "GLIDESLOPE ALIVE"</td></tr>
<tr><td>At glideslope alive, call:<br>"GEAR DOWN"<br>"FLAP 15"<br>"SPEED ____"<br>• Captain sets the speedbrake lever to ARM, verifies that the SPEEDBRAKE ARMED light is illuminated and calls:<br>"SPEEDBRAKE ARMED"</td><td>Set the landing gear lever to DOWN.<br>Verify that the green landing gear indicator lights are illuminated.<br>Check speed and set the flap lever as directed. When flaps indicate the selected position,<br>Call "FLAP 15"<br>Set the engine start switches to CONT.</td></tr>
<tr><td>At glideslope capture:<br>"GLIDESLOPE CAPTURED"<br>"FLAP _____, SPEED ____" as needed for landing.<br>Set the missed approach altitude on the MCP.</td><td>Check speed and set the flap lever as directed. Monitor flap and slat extension.</td></tr>
<tr><td>Call "LANDING CHECKLIST"</td><td>Do the LANDING checklist.</td></tr>
<tr><td></td><td>At OM / FAF:<br>"(FIX NAME) ____" (published altitude)</td></tr>
<tr><td>Respond "CONTINUE" or "GO-AROUND"</td><td>At 1000 ft AAE, verify MA altitude set on MCP, AFDS status and aircraft in stabilized approach.<br>Auto callout "ONE THOUSAND"<br>Call "STABLE" or "GO-AROUND"</td></tr>
<tr><td>"CHECK"</td><td>Auto callout "FIVE HUNDRED"</td></tr>
<tr><td colspan="2">On approaches other than CAT II and prior to 100 ft above DH, the PM will advise the PF of runway environment in sight by stating the following:<br>"APPROACH LIGHTS IN SIGHT"<br>"RUNWAY IN SIGHT"</td></tr>
</table>

| Pilot Flying | Pilot Monitoring |
|---|---|
| "CHECK" | Auto callout "APPROACHING MINIMUMS" |
| If a normal approach and visual reference can be maintained, call "CONTINUE".<br>If the requirements above are not met, or at any time thereafter, immediately execute a missed approach and call:<br>"GO-AROUND, GO-AROUND THRUST" | Auto callout "MINIMUMS" |
| If suitable visual reference is established at DA(H), MDA(H) or the missed approach point, disengage the autopilot in accordance with aircraft limitations and disengage the autothrottle at the same time.<br>Maintain the glidepath to landing. | |
| For a single channel approach, disengage the autopilot and auto throttle no later than the minimum use height for single autopilot operation.<br>For a dual channel approach, disengage the autopilot after touchdown. | |

## Landing Procedure - ILS CAT II

| Pilot Flying | Pilot Monitoring |
|---|---|
| Initially:<br>If on radar vectors<br>• HDG SEL<br>• Pitch mode (as needed)<br>If en route to a fix<br>• LNAV or other roll mode<br>• VNAV or other pitch mode | |
| Call "FLAP ____, SPEED ____" according to the flap extension schedule. After flap selection, Set MCP speed. | |
| | Set the flap lever as directed. Monitor flaps and slats extension. When flaps indicate the selected position,<br>Call "FLAP ____" |
| When on localizer intercept heading:<br>• Verify that the ILS is tuned and identified.<br>• Verify that LOC and G/S pointers are shown. | |
| Arm the APP mode.<br>"LOCALIZER & GLIDESLOPE ARMED"<br>Engage the second autopilot.<br>Call "SECOND AUTOPILOT ENGAGED" | "CHECK" |
| Use LNAV or HDG SEL to intercept the final approach course as needed. | Call "LOCALIZER ALIVE" |
| Verify that the localizer is captured.<br>Verify the final approach course heading. | |
| Call "LOCALIZER CAPTURED" | |

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td></td><td>"GLIDESLOPE ALIVE"</td></tr>
<tr><td>At glideslope alive, call:<br>"GEAR DOWN"<br>"FLAP 15"<br>"SPEED ____"<br>• Captain sets the speedbrake lever to ARM, verifies that the SPEEDBRAKE ARMED light is illuminated and calls:<br>"SPEEDBRAKE ARMED"</td><td>Set the landing gear lever to DOWN.<br>Verify that the green landing gear indicator lights are illuminated.<br>Check speed and set the flap lever as directed. When flaps indicate the selected position,<br>Call "FLAP 15"<br>Set the engine start switches to CONT.</td></tr>
<tr><td>At glideslope capture:<br>"GLIDESLOPE CAPTURED"<br>"FLAP _____, SPEED ____" as needed for landing.<br>Set the missed approach altitude on the MCP.</td><td>Check speed, set the flap lever as directed. Monitor flap and slat extension.</td></tr>
<tr><td>Call "LANDING CHECKLIST"</td><td>Do the LANDING checklist.</td></tr>
<tr><td></td><td>At OM / FAF:<br>"(FIX NAME) ____" (published altitude)</td></tr>
<tr><td>Respond "CONTINUE" or "GO-AROUND"</td><td>At 1000 ft AAE, verify MA altitude set on MCP, AFDS status and aircraft in stabilized approach.<br>Auto callout "ONE THOUSAND"<br>Call "STABLE" or "GO-AROUND"</td></tr>
<tr><td colspan="2">Monitor the approach.<br>At 500 feet AGL verify the AFDS status.</td></tr>
<tr><td></td><td>Auto callout "FIVE HUNDRED"<br>"FLARE ARMED"</td></tr>
<tr><td>Scan for visual cues.<br>"CHECK"</td><td>Auto callout "APPROACHING MINIMUMS"</td></tr>
</table>

| Pilot Flying | Pilot Monitoring |
|---|---|
| If visual reference (approach lights, runway environment) can be established and maintained, call<br>"CONTINUE"<br>If the requirements above are not met, or at any time thereafter, immediately execute a missed approach and call:<br>"GO-AROUND, GO-AROUND THRUST" | Auto callout "MINIMUMS" |
| During AUTOLAND, keep hands on controls and closely monitor aircraft.<br>If "NO FLARE" is called, immediately press TO/GA button and GO-AROUND. | Keep heads down and closely monitor.<br>At 50 ft radar altitude, annunciated FLARE, will replace G/S.<br>If not, call "NO FLARE". |
| Upon disengaging AP during landing roll; "AUTOPILOT DISENGAGED". | |

## Landing Procedure - RNAV (RNP) AR

**Note:** For airplanes with NPS, verify that the vertical RNP is 125 feet. While there are no vertical RNP values published on the approach chart, the use of 125 feet will cause the NPS amber deviation exceedance alert to occur at 75 feet or slightly less deviation, since vertical ANP will be at least 50 feet at all times.

| Pilot Flying | Pilot Monitoring |
|---|---|
| Initially<br>• If on radar vectors<br>  • HDG SEL<br>  • Pitch mode (as needed)<br>• If en route to a fix<br>  • LNAV or other roll mode<br>  • VNAV or other pitch mode | |
| Select TERR on map.<br>Select CDU: ACT RTE X LEGS page. | Select TERR or WX radar on map.<br>Select CDU: For aircraft without NPS, RNP PROGRESS 4/5. |
| One pilot must have the map display in 10 NM range or less to monitor path tracking during the final approach segment. | |
| Use LNAV and VNAV or other pitch mode for initial descent. VNAV is required from the FAF inbound.<br>Some approach procedures can require use of VNAV from the IAF inbound.<br>On intercept heading, select or verify LNAV.<br>**Note:** LNAV should not be selected until the aircraft is established on the intercept heading. | |
| Call "FLAP ___, SPEED ____" according to the flap extension schedule or approach speed constraint. | Set the flap lever as directed. Monitor flaps and slats extension. When flaps indicate the selected position,<br>Call "FLAP ___" |
| **Note:** For approach procedures where the vertical angle ("GP" angle shown on the LEGS page) begins earlier in the approach (prior to the FAF), the MCP may be set to the DA(H) once established on the vertical angle. | |

| Pilot Flying | Pilot Monitoring |
|---|---|
| Approximately 2 NM before the final approach fix and after ALT HOLD or VNAV PTH or VNAV ALT (as installed) is annunciated:<br>• set DA(H) on the MCP<br>• select or verify VNAV<br>• select or verify speed intervention (as needed) | |
| | Maximum Lateral Deviation (XTK ERROR): 1 x RNP<br>Maximum Vertical Deviation - FAF to DA: 75 feet.<br>Monitor RNP PROGRESS page. For aircraft without NPS, select RNP PROGRESS Page 4/5. |
| Approaching glide path, call:<br>"GEAR DOWN"<br>• "FLAP 15"<br>• "SPEED ____" (if speed intervention engaged)<br>• Captain sets the speedbrake lever to ARM, verifies SPEEDBRAKE ARMED light is illuminated and calls:<br>"SPEEDBRAKE ARMED" | Set the landing gear lever to DN.<br>Verify that the green landing gear indicator lights are illuminated.<br>Check speed and set the flap lever as directed. Monitor flaps and slats extension. When flaps indicate the selected position,<br>Call "FLAP 15"<br>Set the engine start switches to CONT. |
| Beginning the final approach descent, call "FLAP ___, SPEED ___" as needed for landing. | Check speed and set the flap lever as directed. Monitor flaps and slats extension. |
| Call "LANDING CHECKLIST" | Do the LANDING checklist. |
| At the final approach fix:<br>• verify the crossing altitude;<br>• cross check altimeters within 100 feet between primary altimeters. | |
| | At FAF:<br>"(FIX NAME) ___" (published altitude). |

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>When past the FAF and at least 300 ft below the missed approach altitude, set the missed approach altitude on the MCP.</td><td></td></tr>
<tr><td>Respond "CONTINUE" or "GO-AROUND"</td><td>At 1000 ft AAE, verify MA altitude set on MCP, AFDS status and aircraft in stabilized approach.<br><br>Auto callout "ONE THOUSAND"<br><br>Call "STABLE" or "GO-AROUND"</td></tr>
<tr><td>“CHECK”</td><td>Auto callout “FIVE HUNDRED”</td></tr>
<tr><td colspan="2">On approaches other than CAT II and prior to 100 ft above DA(H) or MDA(H), the PM will advise the PF of runway environment in sight by stating the following:<br><br>“APPROACH LIGHTS IN SIGHT”<br><br>“RUNWAY IN SIGHT”</td></tr>
<tr><td colspan="2">Monitor the approach. Verify the AFDS status at 500 ft radio altitude.<br><br>Note: Do the Go-Around and Missed Approach Procedure if the UNABLE REQD NAV PERF-RNP, FMC DISAGREE, or any VERIFY POSITION alerting message is shown unless suitable visual reference is established and maintained.</td></tr>
<tr><td>“CHECK”</td><td>Auto callout "APPROACHING MINIMUMS"</td></tr>
<tr><td>If a normal approach and visual reference can be maintained, call "CONTINUE”.<br><br>If the requirements above are not met, or at any time thereafter, immediately execute a missed approach and call:<br><br>“GO-AROUND, GO-AROUND THRUST”</td><td>Auto callout "MINIMUMS"</td></tr>
</table>

| Pilot Flying | Pilot Monitoring |
|---|---|
| If suitable visual reference is established at DA(H), disengage the autopilot in accordance with aircraft limitations and disengage the autothrottle at the same time.<br>Maintain the glide path to landing. | |

## Landing Procedure - Instrument Approach Using VNAV

Non-ILS approaches are normally flown using VNAV or V/S pitch modes. Recommended roll modes are provided in the FCOM procedure.

When conducting non-ILS approaches, the barometric minimums selector is to be set to MDA(H)+50 ft, to ensure that if a missed approach is initiated, descent below the MDA(H) does not occur during the missed approach.

The published DA(H) may be set in the barometric minimums selector if the approach is flown using VNAV for vertical guidance and the approach procedure has a published LNAV/VNAV DA(H).

A manual FMC entry of 0.3 RNP is required for approaches not using ground based Nav Aids such as a LOC or VOR.

VNAV should be used only for approaches that have one of the following features:

- a published GP angle on the LEGS page for the final approach segment
- an RWxx waypoint at the approach end of the runway
- a missed approach waypoint before the approach end of the runway, (for example, MXxx).

Use of the autopilot during the approach minimizes crew workload and provides:

- autopilot alerts and mode fail indications;
- more accurate course and glide path tracking; and
- lower RNP limits.

Enter the appropriate wind additive on the Approach Reference page or use speed intervention, if available.

This procedure is not authorized using QFE.

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Initially:<br><br>If on radar vectors<br>• HDG SEL<br>• Pitch mode (as needed)<br>If en route to a fix<br>• LNAV or other roll mode<br>• VNAV or other pitch mode</td><td></td></tr>
<tr><td colspan="2">The recommended roll modes for the final approach are:<br>• for a RNAV or RNAV (GNSS) approach, use LNAV;<br>• for a LOC-BC or NDB approach, use LNAV;<br>• for a LOC, VOR, SDF or LDA approach, use VOR/LOC or LNAV.</td></tr>
<tr><td colspan="2">When on the final approach course intercept heading for LOC, LOC-BC, SDF or LDA approaches:<br>• verify that the localizer is tuned and identified;<br>• verify that the anticipation cue or LOC pointer is shown.</td></tr>
<tr><td>Call "FLAP ____, SPEED ____" according to the flap extension schedule. After flap selection, if speed intervention is available and selected, set speed.</td><td></td></tr>
<tr><td></td><td>Set the flap lever as directed. Monitor flaps and slats extension. When flaps indicate the selected position,<br><br>Call "FLAP ____"</td></tr>
<tr><td>Upon ATC clearance for the approach, select LNAV or arm the VOR/LOC mode.</td><td></td></tr>
<tr><td>"LOCALIZER ARMED" or<br><br>"LNAV SELECTED"</td><td></td></tr>
<tr><td colspan="2">WARNING: When using LNAV to intercept the localizer, LNAV might parallel the localizer without capturing it. The aircraft can then descend on the VNAV PATH with the localizer not captured.<br><br>Note: LNAV should not be selected until the aircraft is established on the intercept heading.</td></tr>
</table>

| Pilot Flying | Pilot Monitoring |
|---|---|
| Use HDG SEL or LNAV to intercept the final approach course as needed. | For a LOC approach call: "LOCALIZER ALIVE"<br>or, if intercepting final approach in HDG SEL call:<br>"INBOUND TRACK" |
| "LOCALIZER CAPTURED" or<br>"LNAV." | |
| **Note:** For approach procedures where the vertical angle ("GP" angle shown on the LEGS page) begins earlier in the approach (prior to the FAF), the MCP may be set to the DA(H) or MDA(H) once established on the vertical angle. | |
| Approximately 2 NM before the final approach fix and after ALT HOLD or VNAV PTH or VNAV ALT is annunciated:<br>• set DA(H) or MDA(H) on the MCP<br>• select or verify VNAV<br>• select or verify speed intervention, as needed (and as installed). | |
| Call:<br>• "GEAR DOWN"<br>• "FLAP 15"<br>• "SPEED ____" (if speed intervention engaged).<br>• Captain sets the speedbrake lever to ARM, verifies that the SPEEDBRAKE ARMED light is illuminated and calls:<br>"SPEEDBRAKE ARMED" | Set the landing gear lever to DN.<br>Verify that the green landing gear indicator lights are illuminated.<br>Check speed and set the flap lever as directed. Monitor flaps and slats extension. When flaps indicate the selected position,<br>Call "FLAP 15"<br>Set the engine start switches to CONT. |
| Beginning the final approach descent, call "FLAP ____, SPEED ____" (as needed for landing). | Check speed and set the flap lever as directed. Monitor flaps and slats extension. |

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Call "LANDING CHECKLIST"</td><td>Do the LANDING checklist.</td></tr>
<tr><td colspan="2">At the final approach fix:<br>• verify the crossing altitude;<br>• cross check the altimeters. Verify they agree within 100 feet.</td></tr>
<tr><td></td><td>At OM / FAF:<br>"(FIX NAME) ____" (published altitude).</td></tr>
<tr><td>When past the FAF and at least 300 ft below the missed approach altitude, set the missed approach altitude on the MCP.</td><td></td></tr>
<tr><td>Respond "CONTINUE" or "GO-AROUND"</td><td>At 1000 ft AAE, verify MA altitude set on MCP, AFDS status and aircraft in stabilized approach.<br>Auto callout "ONE THOUSAND"<br>Call "STABLE" or "GO-AROUND"</td></tr>
<tr><td>"CHECK"</td><td>Auto callout "FIVE HUNDRED"</td></tr>
<tr><td colspan="2">On approaches other than CAT II and prior to 100 ft above DA(H) or MDA(H), the PM will advise the PF of runway environment in sight by stating the following:<br>"APPROACH LIGHTS IN SIGHT"<br>"RUNWAY IN SIGHT"</td></tr>
<tr><td colspan="2">Monitor the approach. Verify the AFDS status at 500 ft radio altitude.</td></tr>
<tr><td>"CHECK"</td><td>Auto callout "APPROACHING MINIMUMS"</td></tr>
</table>

| Pilot Flying | Pilot Monitoring |
|---|---|
| If a normal approach and visual reference can be maintained, call "CONTINUE".<br>If the requirements above are not met, or at any time thereafter, immediately execute a missed approach and call:<br>"GO-AROUND, GO-AROUND THRUST" | Auto callout "MINIMUMS" |
| If suitable visual reference is established at DA(H), MDA(H) or the missed approach point, disengage the autopilot in accordance with aircraft limitations and disengage autothrottle at the same time.<br>Maintain the glide path to landing. | |

## Go-Around and Missed Approach Procedure

On all instrument approaches, execute an immediate missed approach when:

- a suitable visual reference has not been established by minimums and maintained to landing;
- a navigation radio or flight instrument failure occurs which affects the ability to safely complete the approach;
- the navigation instruments show significant disagreement;
- on ILS final approach and either the localizer or the glideslope indicator shows full deflection;
- on a radar approach and radio communication is lost;
- not stabilized by 1000 ft AAE or becomes unstabilized below 1000 ft AAE in IMC or VMC conditions.

| Pilot Flying | Pilot Monitoring |
|---|---|
| Call "GO-AROUND, GO-AROUND THRUST" and at the same time:<br>• push the TO/GA switch | |
| Verify that the thrust increases. | |
| Call "FLAP 15" or "FLAP ___" as needed. | Set the flap lever as directed and monitor flap retraction. |
| Verify the rotation to go-around attitude. | |
| | Verify that the thrust is sufficient for the go-around or adjust as needed. |
| Verify a positive rate of climb on the altimeter and call “GEAR UP.” | Verify a positive rate of climb on the altimeter and call “POSITIVE RATE.”<br>Set the landing gear lever to UP. |
| | Verify that the missed approach altitude is set on the MCP. |
| If the airspeed is within the amber band, limit bank angle to 15°. | |

| Pilot Flying | Pilot Monitoring |
|---|---|
| Above 400 feet radio altitude, verify LNAV or select HDG SEL as appropriate. | Observe mode annunciation. |
| Verify that the missed approach route is tracked. | |
| At acceleration height (minimum 1000 feet AAE), call “FLAPS ___” according to the flap retraction schedule. | Verify the speed and set the flap lever as directed. Monitor flaps and slats retraction.<br>When flaps are indicating the selected position, call "FLAPS___". |
| After flaps are set to the planned flap setting and at or above the flap maneuvering speed, select LVL CHG or VNAV. | |
| Verify that climb thrust is set. | |
| Verify that the missed approach altitude is captured. | |
| | Set the engine start switches as needed. |
| Call “AFTER TAKEOFF CHECKLIST.” | Do the AFTER TAKEOFF checklist. |

**Note:** With all engines operating, ensure sufficient thrust for a nominal climb rate of approximately 2000 fpm (equivalent to one press of the TO/GA switch), or if required for performance reasons ensure maximum go-around thrust is set. With all engines operating at typical landing weights, it is not normally necessary to select maximum go-around thrust.

The autopilot may be engaged when climbing above 400 ft AGL provided the aircraft is in trim, the flight director commands are satisfied, the flight path is under control and the missed approach altitude is set. Engage the autothrottle, or verify that the autothrottle is engaged at the same time as autopilot engagement.

**Note:** With pitch mode in TO/GA, autopilot engagement automatically engages LVL CHG pitch mode and autothrottle will command climb thrust.

Standard all engine minimum flap retraction height (acceleration height) is 1000 ft AFE unless an alternative all engine minimum flap retraction height or speed restriction is stipulated as part of the missed approach procedure/airport brief.

## Landing Roll Procedure

| Pilot Flying | Pilot Monitoring |
|---|---|
| If an autoland was accomplished, disengage the autopilot. Control the airplane manually. | |
| Verify that the thrust levers are closed.<br>Verify that the SPEED BRAKE lever is UP.<br>Without delay, fly the nose wheel smoothly onto the runway. | Verify that the SPEED BRAKE lever is UP.<br>Call “SPEED BRAKES UP.”<br>If the SPEED BRAKE lever is not UP, call “SPEED BRAKES NOT UP.” |
| Monitor the rollout progress. | |
| Verify correct autobrake operation. | |
| **WARNING: After the reverse thrust levers are moved, only a full stop landing can be made. If an engine stays in reverse, safe flight is not possible.** | |
| Without delay, move the reverse thrust levers to the interlocks and hold light pressure until the interlocks release.<br>Apply reverse thrust as needed. | Verify that the forward thrust levers are closed.<br>When both REV indications are green, call "REVERSERS NORMAL".<br>If there is no REV indication(s) or the indication(s) stays amber, call "NO REVERSER ENGINE NUMBER 1", or "NO REVERSER ENGINE NUMBER 2", or "NO REVERSERS". |
| By 60 knots, start movement of the reverse thrust levers to be at the reverse idle detent before taxi speed. | Call “60 KNOTS.” |

| Pilot Flying | Pilot Monitoring |
|---|---|
| After the engines are at reverse idle, move the reverse thrust levers full down. | |
| Before taxi speed, disarm the autobrake and advise "MANUAL BRAKING".<br>Use manual braking as needed. | Call "AUTOBRAKES DISARMED" when advisory light illuminates. |

**WARNING: During landing rollout, immediately apply maximum manual braking and maximum reverse thrust consistent with conditions any time that an On-Ground Warning alert activates. The alert consists of a MAX REVERSE visual alert shown on the PFD, and a "MAX BRAKES, MAX BRAKES" aural alert.**

**In circumstances where the On-Ground Warning system is inhibited or inoperative, the PM must call:**

1. **"3000 FEET REMAINING" at 3000 ft remaining markerboard or equivalent (daytime) or at alternating red and white centreline lights or equivalent (night), and**
2. **"1000 FEET REMAINING" at 1000 ft remaining markerboard or equivalent (daytime) or at all red centreline lights or equivalent (night).**

## After Landing Procedure

Start the After Landing Procedure when clear of the active runway and the SPEEDBRAKE lever is stowed. The Captain will stow the SPEEDBRAKE lever, which is the cue for the First Officer to begin the After Landing Flow. The flow should only be completed when clear of the active runway and after taxi instructions have been received.

Engine cooldown recommendations:

- run the engines for at least 3 minutes
- use a thrust setting normally used for taxi operations
- routine cooldown times less than 3 minutes are not recommended.

| Pilot Flying | Pilot Monitoring |
|---|---|
| The Captain moves or verifies that the SPEEDBRAKE lever is DOWN. | |
| | Set the transponder as needed.<br>At airports where ground tracking is not available, select STBY.<br>At airports equipped to track aircraft on the ground, select XPNDR. |
| Set the WEATHER RADAR to OFF. | |
| | Set the FLAP LEVER to UP. |
| | Set the STAB TRIM to 5 units. |
| | Set the AUTO BRAKE select switch to OFF. |
| LANDING LIGHTS, Runway Turnoff Lights and Taxi Light, as needed. | Set the exterior lights as needed. |
| | Set the ENGINE START and ENGINE ANTI ICE switches to OFF (or as required). |
| | Set the PROBE HEAT switches to AUTO. |
| | Start the APU as required. (Start APU as close to gate as possible.) |
| | When available, select the APU GEN bus switches to ON and call: "APU ON BUSSES". |
| **Note:** If the landing was made in slush, the flaps should remain extended until an assessment of the contaminant on the aircraft can be determined and the contaminant removed. | |

## Engine Out Taxi In Procedure

The After Landing Procedure must be completed prior to shutting an engine down (stabilizer trim reset and flaps UP).

**Note:** Operate the engine at or near idle thrust for a minimum of 3 minutes before shutdown. Taxi thrust can be considered idle thrust for this purpose. If idle reverse thrust or no reverse thrust was used during the landing rollout, the 3 minute period can begin when thrust was reduced to idle for landing.

The crew should consider the current atmospheric conditions such as wind, visibility, and temperature. During icing conditions, or when taxiways and aprons are slippery or contaminated, taxi with all engines operating.

Engine Out Taxi In is authorized with or without the APU operating:

Verify that the APU BLEED air switch is OFF. ................. F/O

APU switch. ...................................................(as required). F/O

If APU is running:

APU GEN switches ............................................ON F/O

ISOLATION VALVE switch ....................................AUTO F/O

**Note:** Both pack switches and engine bleed air switches must be ON and the isolation valve switch in AUTO prior to shutting down an engine or the remaining engine may also shut down. Both packs cannot be operated from a single engine bleed source on the ground.

Engine start lever (affected engine) .......................CUTOFF C

The following Caution lights will be illuminated:

- (APU not operating) SOURCE OFF (affected side)
- DRIVE (affected side)
- LOW OIL PRESSURE – Engine (affected side)
- LOW PRESSURE – Engine Hydraulic Pump (affected side)

## Shutdown Procedure

Start the Shutdown Procedure after taxi is complete.

Parking brake ............................................................... Set C

Verify that the parking brake warning light is illuminated.

Electrical power ............................................................ Set F/O

If APU power is needed:

Verify that the APU GENERATOR OFF BUS light is illuminated.

APU GENERATOR bus switches – ON

Verify that the SOURCE OFF lights are extinguished.

If external power is needed:

Verify that the GRD POWER AVAILABLE light is illuminated.

GRD POWER switch – ON

Verify that the SOURCE OFF lights are extinguished.

**CAUTION: Do not apply rotational force when moving the engine start lever.**

Engine start levers ............................................ CUTOFF C

Operate the engines at or near idle thrust for a minimum of three minutes before shutdown to thermally stabilize the engines and reduce undercowl soak-back temperatures. Taxi thrust can be considered idle thrust for this purpose.

If idle reverse thrust or no reverse thrust is used during the landing rollout, the three minute period can begin when thrust is reduced to idle for landing.

Routine cooldown times of less than three minutes before engine shutdown can cause engine degradation.

If towing is needed:

Establish communications with ground handling personnel C

**WARNING: If the nose gear steering lockout pin is not installed and hydraulic system A is pressurized, any change to electrical or hydraulic power with the tow bar connected can cause unwanted tow bar movement.**

Verify that the nose gear steering lockout pin is installed, or, if the nose gear steering lockout pin is not used — C

System A HYDRAULIC PUMP switches – OFF

Verify that the system A pump LOW PRESSURE lights are illuminated.

**CAUTION: Do not hold or turn the nose wheel steering wheel during pushback or towing. This can damage the nose gear or the tow bar.**

**CAUTION: Do not use airplane brakes to stop the airplane during pushback or towing. This can damage the nose gear or the tow bar.**

Set or release the parking brake as directed by ground handling personnel. — C or F/O

| | | |
|---|---|---|
| FASTEN BELTS switch | OFF | F/O |
| ANTI-COLLISION light switch | OFF | F/O |
| FUEL PUMP switches | OFF (as required) | F/O |
| WING ANTI–ICE switch | OFF | F/O |
| ENGINE ANTI–ICE switches | OFF | F/O |
| Hydraulic panel | Set | F/O |

ENGINE HYDRAULIC PUMPS switches - ON

ELECTRIC HYDRAULIC PUMPS switches (normally ELEC 2 OFF and ELEC 1 ON for through flights and both OFF for terminating flights)

| | | |
|---|---|---|
| ENGINE START switches | OFF | F/O |
| Air conditioning PACK switches | AUTO | F/O |
| ISOLATION VALVE switch | OPEN | F/O |
| Engine BLEED air switches | ON | F/O |
| APU BLEED air switch | ON | F/O |

**Note:** Run the APU for two full minutes before using it as a bleed air source.

| | | |
|---|---|---|
| Exterior lights switches | As needed | F/O |

FLIGHT DIRECTOR
switches / MCP Panel:.............. OFF / ALT 9900 / SPD 100 C, F/O

Transponder mode selector .............................. STBY / 1000 F/O

After the wheel chocks are in place:

Parking brake – Release C

APU switch ..........................................................As needed F/O

**Note:** If extended APU operation is needed on the ground and the airplane busses are powered by AC electrical power, position an AC powered fuel pump ON. This extends the service life of the APU fuel control unit.

**Note:** If fuel is loaded in the center tank, position the left center tank fuel pump switch ON to prevent a fuel imbalance before takeoff.

**CAUTION: Position the center tank fuel pump switches ON only if the fuel quantity in the center tank exceeds 453 kgs.**

**CAUTION: Do not operate the center tank fuel pumps with the flight deck unattended.**

Flight deck door (when FWD ENTRY open) ...........Unlock C, F/O

Call “SHUTDOWN CHECKLIST.” C

Do the SHUTDOWN checklist. F/O

## Secure Procedure

Complete this procedure when the aircraft will be left unattended by the flight crew and/or maintenance.

| | | |
|---|---|---|
| IRS mode selectors | OFF | F/O |
| EMERGENCY EXIT LIGHTS switch | OFF | F/O |
| WINDOW HEAT switches | OFF | F/O |
| Air conditioning PACK switches | OFF | F/O |
| Call "SECURE CHECKLIST." | | C |
| Do the SECURE checklist. | | F/O |

To facilitate crew changes and turn arounds where Customs procedures are required, pilots may leave the aircraft unattended with the APU in operation under the following conditions:

- the operating pilots will be returning to the aircraft after clearing Customs/Security, or at least one operating pilot from the outbound crew has arrived at the gate for a crew change;
- center tank fuel pumps are selected OFF;
- fuel on board is greater than 1800 kg;
- there are no passengers on board; and
- the L1 door remains open.

In all other cases when Maintenance personnel are not present, complete the Electrical Power Down Supplementary Procedure before leaving the aircraft unattended.

Intentionally
Blank

## General

Both crew members should be aware of altitude, aircraft position and situation. Avoid casual and non-essential conversation during critical phases of flight, particularly during taxi, takeoff, approach and landing. Sterile cockpit rules apply below 10000 ft.

While in terminal airspace and, in particular, between 10000 ft and 20000 ft, non-essential duties such as paperwork and communication (i.e., with flight attendants, ACARS, etc.) should be avoided.

The pilot monitoring should accomplish callouts based on instrument indications or observations for the appropriate condition. The pilot flying should verify the condition/location from their instruments and acknowledge. FMA/MCP and Autopilot Status Annunciation changes should be called out by the PF, and verified and acknowledged ("CHECK") by the PM. Any other calls made by the PF or PM for awareness or as per Standard Calls should be verified and acknowledged with "CHECK". If the pilot flying does not make the required callout, the pilot monitoring should make it.

One of the basic fundamentals of the "Crew Coordination Concept" is that each crew member must be able to supplement or act as a backup for the other crew member. Proper adherence to standard callouts is an essential element of a well-managed cockpit. These callouts provide both crew members required information about aircraft systems and about the participation of the other crew member. The absence of a standard callout at the appropriate time may indicate a malfunction of an aircraft system or indication, or indicate the possibility of incapacitation of the other crew member.

When GPWS height callouts occur during approach (above 500 ft AFE), the pilot flying should acknowledge the electronic callout. If the normally expected electronic voice callout is not heard by the flight crew, the pilot monitoring should make the callout.

The procedures described in this manual assume that the A/P and A/T are engaged, and that the PF is making the applicable changes on the mode control panel. When flying manually, the PF directs the PM to make the changes on the mode control panel by first stating "SET" followed by the applicable direction. (e.g. "SET SPEED 230", "SET ALTITUDE 5000" or "SET LNAV").

## Standard Callouts

| Phase of Flight | PF Call | PM Call |
|---|---|---|
| Passenger Boarding complete and IFD confirms the passenger count | "CLEAR FOR THE DOOR" (Captain) | |
| Engine Start | "START #___ ENGINE" (Captain) | |
| | | "STARTER CUTOUT or "NO STARTER CUTOUT" (First Officer) |
| | "STABLE ENGINES" (Captain) | |
| Engaging an autopilot | "COMMAND A" or "COMMAND B", as applicable | "CHECK" |
| At 400 feet RA following takeoff or go-around | "LNAV" or "HEADING SELECT", as applicable | |
| Climbing or Descending:<br>Call passing through "10000", "20000" and "30000"<br>E.G. "10000 CLIMBING FL330" | "10000 CLIMBING FL330" | |
| | | "CHECK" |
| Transition in climb | "TRANSITION, SET STANDARD" | |

| Phase of Flight | PF Call | PM Call |
|---|---|---|
| | | "STANDARD SET AND CROSS CHECKED" |
| 1000 feet below | "8000 CLIMBING 9000" (as applicable) | |
| | | "CHECK" |
| Level Off | "ALTITUDE ACQUIRE / HOLD / VNAV PATH" (FMA change) | |
| | | "CHECK" |
| New Cleared Altitude/FL (A/P ON) | "EIGHT THOUSAND SET" (call out what the PF sees on PFD) | |
| | | "CHECK" |
| Transition in Descent (Crosscheck is to verify that correct altimeter setting is set and that the 2 primary altimeters are indicating within 100 ft of each other) | "TRANSITION, SET ____ INCHES" | "____ INCHES SET AND CROSS CHECKED" |
| Descent through 10000 ft or FL100 (adjust if required for high altitude airport elevations) | "10000 DESCENDING ____" | "FLIGHT ATTENDANTS PREPARE FOR ARRIVAL" |
| | "APPROACH CHECKLIST" | |
| 1000 ft above | "9000 DESCENDING 8000" | |
| | | "CHECK" |
| Transfer of control | "YOU HAVE CONTROL" | |
| | | "I HAVE CONTROL" |
| When disengaging autopilot | "AUTOPILOT DISENGAGED" | |

| Phase of Flight | PF Call | PM Call |
|---|---|---|
| When disengaging autothrottle | "AUTOTHROTTLE DISENGAGED" | |
| After a navigation change has been EXECUTED in the FMS and if not in LNAV | | "LNAV AVAILABLE" |
| During Rejected Takeoff or during landing rollout | | "SPEEDBRAKES UP" or "SPEEDBRAKES NOT UP" (as appropriate)<br>"REVERSERS NORMAL" or "NO REVERSER ENGINE NUMBER 1 (or 2)" or "NO REVERSERS". |
| Windshear Encounter | "WINDSHEAR TOGA" | |
| TCAS RA | "TCAS, I HAVE CONTROL" | |

## Standard Callouts - Approach

| Condition / Location | Pilot Flying | Pilot Monitoring |
|---|---|---|
| After selecting Approach mode | "LOCALIZER AND GLIDESLOPE ARMED" | |
| When selecting second autopilot for a dual autopilot approach | "SECOND AUTOPILOT ENGAGED" | |
| Localizer alive | | "LOCALIZER ALIVE" |
| Localizer capture | "LOCALIZER CAPTURED" | |

| Condition / Location | Pilot Flying | Pilot Monitoring |
|---|---|---|
| Glideslope alive | | "GLIDESLOPE ALIVE" |
| | "GEAR DOWN"<br>"FLAP 15"<br>"SPEED___ "<br>"SPEEDBRAKE ARMED" (Captain) | "FLAP 15" |
| Glideslope capture | "GLIDESLOPE CAPTURED" | |
| | "FLAP ___,<br>SPEED ___," (as needed for landing)<br>"LANDING CHECKLIST" | |
| FAF | | "___ (FIX NAME)" (published altitude) |
| | "CHECK" (check against G/S check altitude) | |
| "ONE THOUSAND" auto callout | Reply, as applicable:<br>"CONTINUE" or "GO-AROUND" | "STABLE" or "GO-AROUND" (if Stabilized Approach criteria is not met or maintained) |
| “FIVE HUNDRED” auto callout | "CHECK" (CAT I and non-precision approaches) | "FLARE ARMED" (CAT II approach) |
| 100 feet above DA Auto callout<br>"APPROACHING MINIMUMS" | "CHECK" | "100 ABOVE" (if no auto callout) |
| At DA Auto callout "MINIMUMS" | "CONTINUE" or "GO-AROUND" | |
| AUTOLAND: | | |

| Condition / Location | Pilot Flying | Pilot Monitoring |
|---|---|---|
| Approx 50 feet RA | | "NO FLARE" if FLARE does not annunciate |
| Approx 27 feet RA | | "NO RETARD" if RETARD does not annunciate |

**Note:** The PF may call "VISUAL" prior to the "APPROACHING MINIMUMS" call when the runway environment is in sight (and will remain so throughout the remainder of the approach). After the "VISUAL" call, the PF can maneuver from the instrument approach track if required to line up with the runway (e.g. offset final approach track.)

**Note:** The following calls are dependent on whether the autopilot is engaged or disengaged:

a) "FLAP ___, SET SPEED ___" (if autopilot is disengaged)

b) "FLAP ___, SPEED ___" (if autopilot is engaged)

## Standard Callouts - Go-Around / Missed Approach

| Phase of Flight | PF Call | PM Call |
|---|---|---|
| Decision to Go-Around made | "GO-AROUND, GO-AROUND THRUST"<br>"FLAP ___" as appropriate. | |
| | | "POSITIVE RATE" |
| | "GEAR UP" | |
| Acceleration Height | "FLAP ___" according to retraction schedule. | |

# Non-Normal Procedures — Chapter NNP
## Table of Contents — Section TOC

### Introduction and Procedures

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# Non-Normal Procedures — Chapter NNP
## Introduction and Procedures — Section 22

## Introduction

Non-Normal Procedures are to be carried out in accordance with the QRH.

For checklists with memory items, the pilot monitoring first verifies that each memory item has been done. The checklist is normally read aloud during this verification. The pilot flying does not need to respond except for items that are not in agreement with the checklist.

## Non-Normal Checklists

Non-Normal checklist are used by the flight crew to properly configure the aircraft for safe flight and to ensure a high level of safety while coping with non-normal situations. All actions must be coordinated and accomplished in a deliberate, systematic manner.

Do not reset any tripped fuel pump or fuel control circuit breaker. Any other circuit breaker that has opened should be reset only in accordance with the procedures in the QRH or Airplane Flight Manual. For more information, refer to the Company Operations Manual.

The word "Confirm" is added to checklist items when both crew members must verbally agree before action is taken. During an in-flight non-normal situation, verbal confirmation is required for:

- an engine thrust lever;
- an engine, APU or cargo fire switch;
- a generator drive disconnect switch;
- an IRS mode selector when only one IRS is failed; and
- a flight control switch.

When the Loss of Thrust on Both Engines checklist is required, or when the aircraft is on the ground, confirmation is not required before action is taken regarding the items listed above. It is recommended that, if an Engine Fire occurs while on the ground, the Captain brings the aircraft to a stop, sets the Parking Brake and completes the Engine Fire on the Ground non-normal checklist.

There are some situations where the crew must always land at the nearest suitable airport. These situations include, but are not limited to, conditions where:

- the non-normal checklist has the words "Plan to land at the nearest suitable airport";
- fire or smoke continues;
- only one AC power source remains (engine or APU generator);

- only one hydraulic system remains (the standby system is considered a hydraulic system);
- any other situation determined by the crew to have a significant adverse effect on safety if the flight is continued.

All Non-Normal Checklists, and the guidance information for the use of the checklists, can be found in the Quick Reference Handbook (QRH).

## Flight Crew Notification of an Emergency

Refer to COM Section 5.

## Ground Emergency Coordination Procedures

While on the ground with the aircraft on the stand, cabin crew should inform of any irregularity observed. During taxiing, takeoff roll, initial climb and final approach, cabin crew must inform the Captain of any anomalous situation or incident that might endanger passengers' lives, and which requires an immediate evacuation.

This information will be reported over the interphone, after having notified with the emergency chime signal (3 chimes).

## Rejected Takeoff

### Briefing

The Flair Standard Takeoff Briefing will include information on the events that will result in a rejected takeoff and the actions to be taken.

The reasons for rejecting a takeoff between 80 knots and V1 are:

- fire or fire warning;
- engine failure;
- predictive windshear warning; or
- if the aircraft is unsafe or unable to fly.

Should one of those critical failures occur, the pilot first noticing the problem shall call the problem, and the Captain will call "REJECT", and the reason for reject will be discussed once the aircraft has been brought to a stop.

### Execution

Once the decision to reject the takeoff is made, the Captain becomes PF.

It is strongly advised that the Autobrake be set to "RTO" for takeoff, and that the PM monitors the system. Autobrake is not available if the takeoff is rejected below 90 kts. A rejected takeoff below 80 kts will require that the autothrottle (A/T) be disengaged

Consideration needs to be given to placing any fire downwind of the aircraft. If this is not practical, initially turn the aircraft into the wind. Generally, the aircraft should be stopped on the runway as this allows better access for emergency vehicles and more space for evacuation.

The Captain will bring the aircraft to a complete stop and make a PA: "THIS IS THE CAPTAIN SPEAKING. REMAIN SEATED, REMAIN SEATED".

After analyzing the situation, the Captain will either initiate the Evacuation Non-Normal Checklist or, should an evacuation prove not to be required and normal operations can be resumed, make a PA: "THIS IS THE CAPTAIN SPEAKING. FLIGHT ATTENDANTS, RETURN TO NORMAL OPERATIONS".

## Evacuation Procedure

The Evacuation Non-Normal Checklist shall be performed as a read and do procedure.

Once the Evacuation Checklist has been completed, the pilots will help cabin crew members to evacuate the passengers.

### Flight Deck Crew Responsibilities

After completing the procedures, and when circumstances permit, the F/O will leave the aircraft by the R1 door as soon as possible. They will take control of the evacuation from outside the aircraft until they are relieved by the Captain.

The Captain, if circumstances permit, will inspect the inside of the aircraft to make sure no one is left on board and then they will leave the aircraft using door L1, taking control of the evacuation. If conditions are unfavorable, flight crew members will leave the aircraft by the nearest available exit (e.g. the Flight Deck side windows).

## Rapid Deplanement

Rapid deplanement is the quick and orderly disembarking of passengers through the main cabin door. The command from the Flight Deck to deplane the passengers shall be: "THIS IS THE CAPTAIN SPEAKING. DEPLANE QUICKLY" over the PA.

## Engine Malfunction After V1

In the event of any engine failure or fire after V1, the takeoff is to be continued.

The PM is to call: "ENGINE FAILURE" or "ENGINE FIRE" but is not to identify the engine. This removes the possibility of the wrong engine being called. Only after passing 400 ft is the problem to be confirmed and the faulty engine identified.

| Pilot Flying | Pilot Monitoring |
|---|---|
| Maintain directional control by smoothly applying rudder proportionate with thrust decay to maintain runway centerline. | If engine failure or fire occurs after V1, call: "ENGINE FAILURE" or "ENGINE FIRE". |
| At Vr, rotate towards the target pitch attitude (12° - 13°).<br>Do not rotate early or rapidly. Adjust pitch attitude to maintain desired airspeed of V2 to V2+20 knots. | At Vr, call: "ROTATE". |
| Limit the bank angle to 15° until V2+15 knots to maintain an adequate maneuvering margin. The bank angle limit increases to 30° at V2+15 knots with takeoff flaps. | |
| | "POSITIVE RATE" |
| "GEAR UP" | |
| At 400 ft AGL, call for Roll Mode. | Select HDG or LNAV, as requested. |
| As soon as possible after 400 ft:<br>Call "WHAT'S THE PROBLEM?" | PM will state the emergency, carefully identifying the correct engine<br>(e.g. "ENGINE FIRE #1"). |
| In case of an engine failure, there are no memory items. The non-normal checklist for an engine failure is normally accomplished after the flaps have been retracted and if conditions permit.<br>In case of engine fire, severe damage or separation, memory items must be accomplished as soon as possible after 400 ft AGL. | |
| When an engine failure and/or fire after takeoff necessitates the actioning of Memory Items, the PF is to deselect the A/T and close their own thrust lever after receiving confirmation of the correct selection from the PM. Subsequently, all selections are to be made by the PM after confirmation from the PF. | |
| "ENGINE FIRE MEMORY ITEMS" | |
| "AUTOTHROTTLE DISENGAGE" | |

| Pilot Flying | Pilot Monitoring |
|---|---|
| "# ____ THRUST LEVER, CONFIRM?"<br><br>"CLOSE" | "# ____, CONFIRMED" |
| "# ____ CONFIRMED" | "# ____ ENGINE START LEVER, CONFIRM?"<br><br>"CUTOFF" |
| "# ____ CONFIRMED" | "# ____ ENGINE FIRE SWITCH, CONFIRM?"<br><br>"PULL" |
| If the Engine Fire Switch or Engine Overheat light stays illuminated:<br>Engine Fire Switch - Rotate to the stop and hold for 1 second. | |
| | Call "BOTTLE DISCHARGED" |
| | "ENGINE FIRE MEMORY ITEMS COMPLETE" |

At engine out acceleration altitude, 1000 feet AGL or as shown in the Special Procedures, accelerate for flap retraction.

After flaps have been retracted:

- verify or set Flap Up speed;
- confirm CON thrust has been selected and set;
- accomplish the reference non-normal checklist items;
- accomplish AFTER TAKEOFF checklist;
- select ENGINE OUT on FMS.

## Engine Failure On Final Approach

If an engine failure should occur on final approach with the aircraft in the landing configuration, the decision to continue the approach or execute a go-around should be made immediately. If the approach is continued and sufficient thrust is available, continue the approach with landing flaps. If the approach is continued and sufficient thrust is not available for landing flaps, retract the flaps to 15 and adjust thrust on the operating engine. Speed should be increased to 20 knots over the previously set Flap 30 or 40 Vref. This is equal to at least Vref for Flap 15.

## Windshear

Whenever windshear warnings occur, the procedures specified in the FCTM, FCOM (Volume 1, SP) and QRH Non-Normal Maneuvers will be used.

Windshear is defined as any change of wind speed and/or direction over a relatively short distance on the flight path. Severe windshear produces changes in speed greater than 15 kts or changes in the Vertical Speed Indicator readings of over 500 ft per minute.

The presence of windshear may be indicated by:

- Stormy conditions
- Virga (rain which evaporates before reaching the ground)
- PIREPs
- Low Level Windshear Alerting System (LLWAS)

If there is a chance windshear will be encountered, the following preventive actions are recommended:

**On takeoff**

- Use the maximum power available.
- Use the longest runway available.
- Use Flaps between 5 and 15.
- Pay attention to oscillations in airspeed during takeoff and initial climb.
- If windshear close to V1 is encountered, speed may quickly diminish without there being enough runway left for the aircraft to stop, so that a normal rotation should be initiated at least 2000 ft before the end of the runway even if speed is low. A rotation superior to normal may be necessary to achieve takeoff on the remaining length of the runway.
- Once in the air, the Windshear Escape Maneuvre will be executed as indicated in QRH Chapter Maneuvers, Non Normal Maneuvers section.

**Note:** If windshear is reported or suspected, consider delaying the takeoff.

**Approach and Landing**

- Use Flaps 30º.
- If there is a possibility of windshear or it has been reported, the approach must be stabilized before 1000 AGL, to improve the capacity of reaction and recognition.
- Add Vref corrections without exceeding 15 kts.
- Avoid great changes in power and compensation as IAS increases, since IAS is likely to decrease rapidly immediately afterwards.
- Maintain constant coordination between pilots.
- Pay careful attention to the altimeter, vertical speed indicator and ILS glide path.
- The PM will advise of any deviation.
- Using the A/P and the A/T will allow a better instrument cross check to be made.
- Use the longest runway available.
- Use all available aids, PAPI, VASI etc.

Recognition of a Recovery From Windshear

See Windshear Escape Maneuver stated in QRH Chapter Maneuvers.

## TCAS Warning

Refer to COM Section 3.45 Traffic Alert and Collision Avoidance System and QRH Chapter: Maneuvers, Traffic Avoidance.

Whenever a TCAS RA occurs, the PF will call "TCAS, I HAVE CONTROL" and comply with the RA. ATC must be informed of all TCAS maneuvers and the phraseology is: Callsign + TCAS RA (an example would be "FLAIR 123 TCAS RA").

## Emergency Descent

Whenever QRH Non-Normal memory items require the donning of oxygen masks and the initiation of an Emergency Descent, the following procedure will be used:

- Both pilots don oxygen masks simultaneously.
- Captain takes over as PF.
- Captain performs the descent in accordance with the Memory Items.
- First Officer alerts ATC and obtains an altimeter setting.

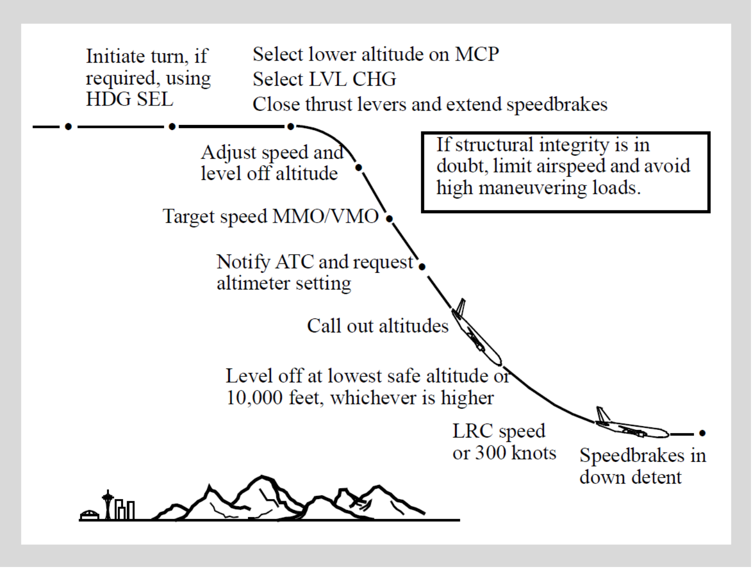
This maneuver is designed to bring the aircraft down smoothly to a safe altitude, in the minimum time, with the least possible passenger discomfort. It is intended as a specialized case in the event of an uncontrollable loss of cabin pressurization.

**Note:** Use of the A/P is recommended.

In the event of a cabin altitude exceedance or the intermittent cabin altitude/configuration warning horn sounds, complete the QRH CABIN ALTITUDE WARNING or Rapid Depressurization checklist.

If the cabin altitude is uncontrollable, go to the Emergency Descent checklist.

**Captain takes over as PF.**




Perform the maneuver deliberately and methodically. Do not be distracted from flying the aircraft. If icing conditions are entered, use anti-ice and thrust as required.

**Note:** Rapid descents are normally made with the landing gear up.

The PM checks the lowest safest altitude, notifies ATC and obtains an area altimeter setting (QNH). Both pilots should verify that all memory items have been accomplished and call out any items not completed. The PM calls out 2000 ft and 1000 ft above the level off altitude.

Level off at the lowest safe altitude or 10000 ft, whichever is higher. Lowest safe altitude is the Minimum Enroute Altitude (MEA), Minimum Off Route Altitude (MORA) or any other altitude based on terrain clearance, navigational aid reception or other appropriate criteria.

If severe turbulent air is encountered or expected, reduce to the turbulent air penetration speed.

Refer to COM Section 5.14 for additional reference.

# CABIN ALTITUDE WARNING or Rapid Depressurization

| Pilot Flying | Pilot Monitoring |
|---|---|
| OXYGEN MASK . . . . . .ON/100%<br>Crew communications establish.<br>"CAPTAIN ON OXYGEN" | OXYGEN MASK . . . . . ON/100%<br>Crew communications establish.<br>"FIRST OFFICER ON OXYGEN" |
| "CAN YOU CONTROL THE CABIN?"<br>Seat Belt/No Smoking - ON<br>Engine Start Switches - CONT<br>All Landing and Runway Turnoff Lights - ON | Ensure Packs and Bleeds - ON<br>Press Mode Selector - MAN<br>Outflow Valve Sw - Hold in CLOSE until Outflow Valve indicates fully closed.<br>"CONTROLLABLE"<br>"UNABLE TO CONTROL" |
| If cabin is uncontrollable<br>"EMERGENCY DESCENT"<br>Set 10000 ft or Min Safe Altitude<br>LVL CHG<br>Set Speed Mmo / Vmo<br>Heading, Turn if required<br>Thrust levers - Idle<br>Speedbrake - Flight detent | If Cabin Altitude uncontrollable:<br>Passenger Oxygen Switch - ON<br>Advise ATC. Request area altimeter setting and lower safe altitude.<br>Confirm MEA.<br>Squawk 7700 if required. |
| When stabilized in descent, PA<br>"THIS IS THE CAPTAIN SPEAKING. EMERGENCY DESCENT, EMERGENCY DESCENT" | |
| "EMERGENCY DESCENT CHECKLIST" | Accomplish Emergency Descent Checklist. |
| "TRANSITION, SET ____ INCHES" | |
| | "____ INCHES SET AND CROSS CHECKED" (or mb as applicable) |
| When pitch mode changes to ALT on the FMA, adjust speed then retract speedbrakes to down detent.<br>Level off at lowest safe altitude or 10000 ft, whichever is higher.<br>Set LRC or 300 kts IAS. | Call: "2000 to LEVEL"<br>Call: "1000 to LEVEL" |

| Pilot Flying | Pilot Monitoring |
|---|---|
| Once aircraft has descended to safe altitude, PA:<br>"THIS IS THE CAPTAIN SPEAKING. FLIGHT ATTENDANTS COMMENCE POST - DEPRESSURIZATION DUTIES" | |
| When appropriate below 13000 ft, PA:<br>"THIS IS THE CAPTAIN SPEAKING. YOU MAY NOW REMOVE YOUR OXYGEN MASKS" | |
| Crew Oxygen Regulators - NORMAL<br>Flight crew must use oxygen when cabin altitude is above 10000 ft.<br>To conserve oxygen, move the regulator to Normal. | |
| | Engine Start Switches - As Needed |
| When the cabin altitude is at or below 10000 ft,<br>oxygen masks may be removed. | |

## Approach to Stall Recovery

All recoveries from approach to stall should be done as if an actual stall has occurred.

Immediately do the following at the first indication of stall (buffet or stick shaker).

**Note:** Do not use flight director commands during the recovery.

| Pilot Flying | Pilot Monitoring |
|---|---|
| Initiate the recovery:<br>• Hold the control column firmly.<br>• Disconnect A/P and A/T.<br>• Smoothly apply nose down elevator to reduce the angle of attack until buffet or stick shaker stops. Nose down stabilizer trim may be needed.* | • Monitor altitude and airspeed.<br>• Verify all required actions have been done and call out any omissions.<br>• Call out any trend toward terrain contact. |
| Continue the recovery:<br>• Roll in the shortest direction to wings level if needed.**<br>• Advance thrust levers as needed.<br>• Retract the speedbrakes.<br>• Do not change gear or flap configuration, except<br>• During liftoff, if flaps are up, call for Flap 1. | • Monitor altitude and airspeed.<br>• Verify all required actions have been done and call out any omissions.<br>• Call out any trend toward terrain contact.<br>• Set the FLAP lever as directed. |
| Complete the recovery:<br>• Check airspeed and adjust thrust as needed.<br>• Establish pitch attitude.<br>• Return to the desired flight path.<br>• Re-engage the A/P and A/T, if desired. | • Monitor altitude and airspeed.<br>• Verify all required actions have been done and call out any omissions.<br>• Call out any trend toward terrain contact. |

**WARNING: * If the control column does not provide the needed response, stabilizer trim may be necessary.**

**WARNING: ** Excessive use of pitch trim or rudder may aggravate the condition, or may result in loss of control or in high structural loads.**

# Bomb Threat and Hijacking

## Unlawful Interference

All information contained in this section is "privileged need to know" and must be treated as such for security reasons.

## Action of Pilot in Command

All decisions as to the conduct of the flight when an unlawful interference is underway must be made by the pilot-in-command (PIC) according to his/her judgment and assessment of the situation. Under no circumstances will the PIC allow the hijacker access to the Flight Deck. The PIC will establish and maintain contact with ATC and the Company, and will divert the aircraft to the nearest suitable airport to land as soon as possible.

Should the hijacker gain access to the Flight Deck, the PIC should:

- comply with the demands of the hijacker within the range of operational feasibility;
- ensure that nothing is done to endanger the safety of the crew, passengers or aircraft;
- attempt to communicate with the ground station, indicating intentions, if possible;
- advise the hijacker that in order to meet their demands, the following factors must be considered to permit a change in destination:
    - fuel capability;
    - clearance through ATC;
    - filing of revised flight plan to ensure safety of operation;
    - weather conditions; and
- runway length.

Communications Signals During Hijack

When possible, the pilot of a hijacked aircraft should transmit their predicament to ATC in the clear. However, should the hijacker gain access to the flight deck, they may forcibly prevent such transmissions which will necessitate use of covert signaling. The use of the specific word identified during crew training will convey a message to ATC that communication in the clear is impossible due to hijack activity. ATC will confirm receipt of the signal and message by using the covert word with the flight number in response.

The standard signal for unlawful interference is the hijack transponder code. The spoken code numbers impart the same message as if the respective transponder codes were received on radar.

ATC shall acknowledge receipt of the transponder code by transmitting: "FLAIR 999, CENTER….. YOU ARE SQUAWKING _ _ _ _. IS THIS INTENTIONAL?". An affirmative reply will initiate ATC response to hijacking and notification of the Company and appropriate authorities.

When a clear radio transmission of a hijacking is received, controllers shall assign the hijack code to the aircraft.

Where an emergency occurs in addition to the unlawful interference, the PIC shall change from the hijack code to code 7700, allowing a period of at least 3 minutes on the hijack code or until a confirmation is received from the controller, whichever is sooner, before changing to code 7700. Controllers shall acknowledge receipt of 7700 by transmitting: "FLAIR 999, CENTER NOW READING YOU ON TRANSPONDER SEVEN SEVEN ZERO ZERO."

Aircraft squawking code 7700 and not in radio contact with the ground will be considered by ATC to have an emergency in addition to hijacking and the appropriate emergency procedures will be implemented. In these cases, notification to the Company and concerned authorities shall include information that the aircraft displayed the hijack code as well as the emergency code.

## Inadvertent Encounter With Moderate to Severe In-Flight Icing

*Moderate Icing:* The rate of accumulation is such that even short encounters become potentially hazardous, and use of de-icing or anti-icing equipment or diversion is necessary.

*Severe Icing:* The rate of accumulation is such that de-icing or anti-icing equipment fails to reduce or control the hazard. Immediate diversion is necessary.

The B737 is certified for in-flight icing conditions, however, if moderate to severe in-flight icing conditions are inadvertently encountered, flight crew should consider the following actions:

- turn on all available de-ice/anti-ice equipment, as appropriate;
- request an expedited clearance from ATC to exit the area of icing conditions.

Any non-standard procedures shall be briefed between the flight crew members.

For more information, refer to COM Section 3.38 - Flight Operations in Icing Conditions.

## Pilot Incapacitation

Refer to COM Section 5.18 - Incapacitated Pilot and Section 5.19 - Incapacitated Flight Attendant.

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# Supplementary Procedures — Chapter SP
## Table of Contents — Section TOC

## Anti–Ice, Rain



## Automatic Flight



## Communications



## Electrical

## Adverse Weather

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## General

This section contains procedures (adverse weather operation, engine crossbleed start, and so on) that are accomplished as required rather than routinely performed on each flight.

Supplementary procedures may be required because of adverse weather, unscheduled maintenance or as a result of a procedure referenced in a Non–Normal Checklist. Additionally, some may be performed if the flight crew must accomplish preflight actions normally performed by maintenance personnel.

At the discretion of the Captain, procedures may be performed by memory, by reviewing the procedure prior to accomplishment, or by reference to the procedure during its accomplishment.

Supplementary procedures are provided by section. Section titles correspond to the respective chapter title for the system being addressed except for the adverse weather section.

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## Interior Inspection

Emergency exit lights .................................................................. Check

Passenger signs ........................................................................ Check

Service and entry doors ............................................................... Check

Escape slides .............................................................. Check pressure

Emergency exits ........................................................................ Check

Wing upper surfaces ................................................................... Check

Lavatory fire extinguishers .......................................................... Check

Emergency equipment ................................................................. Check

Check availability and condition of emergency equipment, as required.

## Flight Deck Door Access System Test

Flight Deck Access System switch .............................................. NORM

Flight deck door ......................................................................... Open

Flight deck door lock selector ...................................................... AUTO

Emergency access code .............................................................. Enter

ENT key ..................................................................................... Push

Verify alert sounds.

Verify AUTO UNLK light illuminates.

Flight deck door lock selector ...................................................... DENY

Verify AUTO UNLK light extinguishes.

Flight deck door lock selector .................................................... UNLKD

Flight deck access system switch ................................................... OFF

Verify LOCK FAIL light illuminates.

Flight deck access system switch ........................................... NORM

Guard - Down

Verify LOCK FAIL light extinguishes.

## Water System Draining

Lavatory water supply selector valves ......................... SUPPLY/DRAIN

Galley water supply shutoff valves ................................... SUPPLY ON

The shutoff valve is found adjacent to each wet galley sink.

Drain line ........................................................ Connect to drain ports

There are two drain port locations:

- below the main passenger entry door
- aft of the water service panel

Water service panel ........................................................................ Open

Tank drain valve handle ................................................................ OPEN

Drains potable water tank and water system aft of the wings.

Forward lavatory drain valve ......................................................... OPEN

Drain valve is found below the sink in the forward lavatory only.

Drain valves for coffee maker and
water boiler (if installed) .............................................................. OPEN

All galley and lavatory water faucets ............................................. Open

Close faucets when water flow stops.

Accomplish the following items after verifying the potable water system is empty:

Drain valves for coffee maker and
water boiler (if installed) ............................................... CLOSED

Forward lavatory drain valve ........................................ CLOSED

Tank drain valve handle ................................................ CLOSED

Water service panel ............................................................ Close

Drain line ........................................ Disconnect from drain ports

If the potable water tank will not be refilled immediately after the system is emptied, open the following circuit breakers and attach DO–NOT–CLOSE tags:

P18–3 circuit breaker panel

- LAVATORY WATER HEATER A
- LAVATORY WATER HEATER D
- LAVATORY WATER HEATER E

Power distribution panel number 1

- POT WATER COMPRESSOR
- WATER QTY IND

## Air Turn Back - Flaps 15 Landing

When needed to meet Return-to-Land dispatch requirements, do the following:

Plan a flaps 15 landing and a flaps 1 go-around.

Use a Normal Descent Procedure except:

Set VREF 15 or VREF ICE.

**Note:** If any of the following conditions apply, set VREF ICE= VREF 15 + 10 knots:

- Engine anti-ice will be used during landing
- Wing anti-ice has been used any time during the flight
- Icing conditions were encountered during the flight and the landing temperature is below 10°C.

**Note:** When VREF ICE is needed, the wind additive should not exceed 5 knots.

Use Normal Approach Procedure except:

GROUND PROXIMITY
FLAP INHIBIT switch ........................................ FLAP INHIBIT

Use Normal Landing Procedure.

Use the normal Go-Around and Missed Approach Procedure except:

Use flaps 1 for the go-around.

Limit bank angle to 15° when airspeed is less than VREF 15 + 15 knots or the minimum maneuver speed, whichever is lower.

# ETOPS

Operators conducting ETOPS are required to comply with appropriate regulations. An operator must have an ETOPS configured and approved airplane, and approved flight operations and maintenance programs in place to support ETOPS.

## APU Operation

Unless otherwise authorized, start the APU before the ETOPS segment. The APU must be on for the entire ETOPS segment.

## Fuel Crossfeed Valve Check

Unless accomplished by maintenance personnel prior to the ETOPS flight, do the following steps on the ground prior to engine start:

Crossfeed selector .................................................................. Open

Verify that the VALVE OPEN light illuminates bright, then dim.

Crossfeed selector .................................................................. Close

Verify that the VALVE OPEN light illuminates bright, then extinguishes.

## Wing–Body Overheat Test

Wing–body OVHT TEST switch .................................................. Push

Hold for a minimum of 5 seconds.

Both WING–BODY OVERHEAT lights – illuminated

MASTER CAUTION – illuminated

AIR COND system annunciator – illuminated

Wing–body OVHT TEST switch .............................................. Release

Both WING–BODY OVERHEAT lights – extinguished

MASTER CAUTION lights – extinguished

AIR COND system annunciator – extinguished

## External Air Cart Use

**CAUTION: The BAT switch should always be on when using the airplane air conditioning system since the protective circuits are DC. This ensures protection in the event of loss of AC power.**

**Note:** For engine start with a ground air source, see section SP.7.

APU BLEED air switch ................................................................ OFF

ISOLATION VALVE switch ....................................................... OPEN

RECIRC FAN switches ............................................................. AUTO

Trim Air Switch ............................................................................. ON

PACK switches ............................................................ AUTO or HIGH

Cabin temperature selectors ....................................................... AUTO

Set for desired temperature.

Duct pressure ........................................................... 20 psi minimum

If external air cannot hold 20 psi minimum and the APU is operating:

ISOLATION VALVE switch ........................................... AUTO

APU BLEED air switch .......................................................... ON

APU supplies left pack and external air source supplies right pack.

## Ground Conditioned Air Use

Before connecting ground conditioned air:

PACK switches ..................................................................OFF

Packs can be damaged if they are operated while ground conditioned air is connected.

After disconnecting ground conditioned air:

PACK switches ........................................................ As needed

## Isolated Pack Operation during Engine Start

To improve cabin air quality between starting the first and second engine:

**CAUTION: Moving engine BLEED air switches while a starter is engaged can damage the starter.**

Engine No. 2 .........................................................................Start

After engine No. 2 stabilized:

ISOLATION VALVE switch........................................... CLOSE

Right PACK switch ..........................................................AUTO

Duct pressure ............................................................Stabilized

Engine No. 1 .........................................................................Start

After engine No. 1 stabilized:

ISOLATION VALVE switch..............................................AUTO

## Pressurization System Manual Mode Test

PACK switches...........................................................................OFF

Pressurization mode selector ..........................................................MAN

AUTO FAIL and ALTN lights – extinguished.

MANUAL light – illuminated.

Outflow valve switch ........................................................ CLOSE

Verify outflow valve position indicator moves toward CLOSE.

Outflow valve switch ........................................................ OPEN

Verify outflow valve position indicator moves toward OPEN.

Pressurization mode selector ............................................. AUTO

Verify outflow valve position indicator moves toward OPEN.

MANUAL light – extinguished.

## Manual Mode Operation

**CAUTION: Switch actuation to the manual mode causes an immediate response by the outflow valve. Full range of motion of the outflow valve can take up to 20 seconds.**

Pressurization mode selector ............................................. MAN

MANUAL light – illuminated

CABIN/FLIGHT ALTITUDE placard ................................ Check

Determine the desired cabin altitude.

If a higher cabin altitude is desired:

Outflow valve switch (momentarily) ............................ OPEN

Verify the outflow valve position indicator moves right, cabin altitude climbs at the desired rate, and differential pressure decreases. Repeat as necessary.

If a lower cabin altitude is desired:

Outflow valve switch (momentarily) ............................ CLOSE

Verify the outflow valve position indicator moves left, cabin altitude descends at the desired rate, and differential pressure increases. Repeat as necessary.

During Descent

Thrust lever changes should be made as slowly as possible to prevent excessive pressure bumps.

Outflow valve switch (momentarily) ................................ CLOSE

During descent, intermittently position the outflow valve switch toward CLOSE, observing cabin altitude decrease as the airplane descends.

Before entering the landing pattern, slowly position the outflow valve to full open to depressurize the airplane. Verify differential pressure is zero.

## Pressurization Control Operation – Landing at Alternate Airport

At top of descent:

LAND ALT Indicator ............................................................ Reset

Reset to new destination field elevation.

## Automatic Pressurization Control – Departure Airport Elevation Above 8400 Feet

**1B392, 1L075 - 1L078**

If departure airport elevation is above 10,000 feet:

Oxygen masks and regulators .................................... ON, Normal

Supplemental oxygen must be used from departure until the cabin altitude is below 10,000 feet.

After electrical power is applied to the airplane:

HIGH ALT LDG switch ........................................................... Off

Monitor CABIN ALT and CABIN rate of CLIMB indicators during climbout to ensure cabin altitude is descending below 8500 feet, at which time the cabin altitude warning system is reset to 10,000 feet.

**Note:** If departure airport elevation is above 9000 feet, the high altitude landing mode may be active and the warning system set at the High Altitude setpoint. When the cabin altitude descends below 8500 feet, the cabin altitude warning system is reset to 10,000 feet.

If landing altitude is at or below 6000 feet:

LAND ALT indicator .......................... Destination field elevation

If landing altitude is above 6000 feet:

Do the Automatic Pressurization Control - Landing Airport Elevation Above 6000 Feet supplementary procedure.

## Return to Departure Airport is Needed

HIGH ALT LDG switch ........................................................................ ON

If landing elevation is above 10,000 feet:

Oxygen masks and regulators .................................... ON, Normal

Supplemental oxygen must be used anytime the cabin altitude is above 10,000 feet.

## Automatic Pressurization Control – Landing Airport Elevation Above 6000 Feet but 8400 Feet and Below

Do the normal Preflight Procedure - First Officer except as modified below.

Prior to takeoff:

LAND ALT indicator ..............................................6000 feet

At initial descent:

LAND ALT indicator .................. Destination field elevation

## Automatic Pressurization Control – Landing Airport Elevation Above 8400 Feet

**1B392, 1L075 - 1L078**

Do the normal Preflight Procedure - First Officer except as modified below.

Prior to takeoff:

LAND ALT indicator ..............................................6000 feet

At initial descent or approximately 20 minutes prior to landing:

If landing elevation is above 8400 feet:

HIGH ALT LDG switch .......................................... ON

If landing elevation is above 10,000 feet:

Oxygen masks and regulators.....................ON, Normal

Supplemental oxygen must be used anytime the cabin altitude is above 10,000 feet.

LAND ALT indicator ...................Destination field elevation

## Unpressurized Takeoff and Landing

When making a no engine bleed takeoff or landing with the APU inoperative, or operative but not providing bleed air:

### Takeoff

PACK switches ........................................................................ AUTO

ISOLATION VALVE switch ....................................................... CLOSE

Engine BLEED air switches ............................................................OFF

APU BLEED air switch ..................................................................OFF

### After Takeoff

**Note:** If engine failure occurs, do not position engine BLEED air switches ON until reaching 1500 feet or until obstacle clearance height has been attained.

At not less than 400 feet, and prior to 2000 feet above field elevation:

Engine No. 2 BLEED air switch ............................................ ON

When CABIN rate of CLIMB indicator stabilizes:

Engine No. 1 BLEED air switch ............................................ ON

ISOLATION VALVE switch.............................................AUTO

### Landing

When below 10,000 feet and starting the turn to final approach:

Engine BLEED air switches ..................................................OFF

Avoid high rates of descent for passenger comfort.

## No Engine Bleed Takeoff and Landing

When making a no engine bleed takeoff or landing with the APU operating.

### Takeoff

**Note:** If anti–ice is required for taxi, configure for a “No Engine Bleed Takeoff” just prior to takeoff.

**Note:** If anti–ice is not required for taxi, configure for a “No Engine Bleed Takeoff” just after engine start.

Right PACK switch....................AUTO

ISOLATION VALVE switch....................CLOSE

Left PACK switch....................AUTO

Engine No. 1 BLEED air switch....................OFF

APU BLEED air switch....................ON

Engine No. 2 BLEED air switch....................OFF

Trim Air Switch....................ON

WING ANTI-ICE switch....................OFF

The WING ANTI-ICE switch must remain OFF until the engine BLEED air switches are repositioned to ON and the ISOLATION VALVE switch is repositioned to AUTO.

### After Takeoff

**Note:** If engine failure occurs, do not position engine BLEED air switches ON until reaching 1500 feet or until obstacle clearance height has been attained.

Engine No. 2 BLEED air switch....................ON

APU BLEED air switch....................OFF

When CABIN rate of CLIMB indicator stabilizes:

Engine No. 1 BLEED air switch....................ON

ISOLATION VALVE switch....................AUTO

## Landing

If additional go–around thrust is desired, configure for a "No Engine Bleed Landing."

When below 10,000 feet:

WING ANTI-ICE switch ........................................................OFF

Right PACK switch ............................................................AUTO

ISOLATION VALVE switch ............................................. CLOSE

Left PACK switch ..............................................................AUTO

Engine No. 1 BLEED air switch .............................................OFF

APU BLEED air switch ........................................................... ON

Engine No. 2 BLEED air switch .............................................OFF

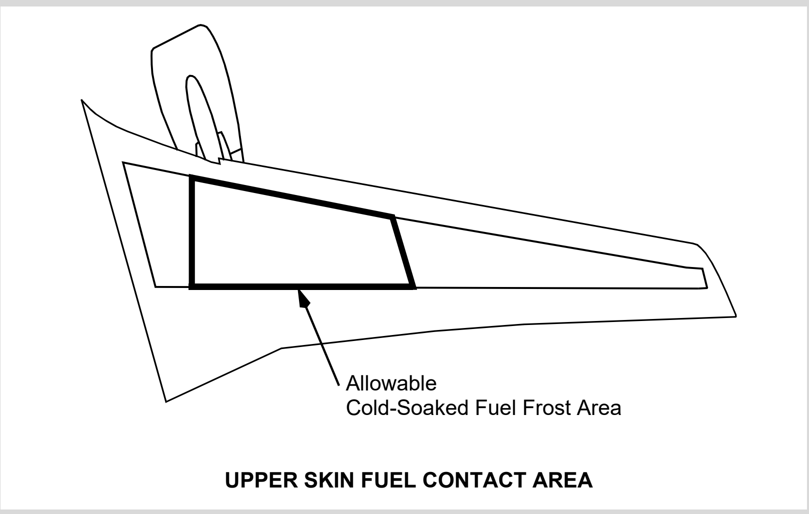
## Anti–Ice Operation

Requirements for use of anti–ice and operational procedures for engine and wing anti–ice are contained in Supplementary Procedures, Adverse Weather Section SP.16.

## Cold-Soaked Fuel Frost (CSFF)

Frost may form on the lower and upper wing surfaces due to cold-soaked fuel touching the wing surface after long flights with large fuel loads.

### Exterior Safety Inspection - Airplanes with Defined Cold-Soaked Fuel Frost Area




Surfaces ........................................................................................ Check

Visually inspect the lower and upper wing surfaces.

If there is frost or ice on the lower surface outboard of measuring stick 4, there may also be frost or ice on the upper surface. The distance that the frost extends outboard of measuring stick 4 can be used as an indication of the extent of the frost on the upper surface.

Takeoff with CSFF on lower wing surfaces is allowable provided all of the following conditions are met:

- Ambient air temperature is at or above +4°C, +39°F.
- There is no precipitation or visible moisture (rain, snow, drizzle or fog with less than 1 mile visibility).
- Tank fuel temperature is at or above -16°C, +3°F.
- All leading edge devices, all control surfaces, tab surfaces, winglet surfaces, and control surface balance panel cavities must be free of snow, ice and frost.

If all of the above conditions are not met, takeoff with light coatings of frost, up to 1/8 inch (3 mm) in thickness, on lower wing surfaces due to cold fuel is allowable; however, all leading edge devices, all control surfaces, tab surfaces, winglet surfaces and control surface balance panel cavities must be free of snow, ice and frost. If the frost on the lower surface is greater than 1/8 inch (3 mm) in thickness, all snow, ice and frost on the wings must be removed using appropriate deicing/anti-icing procedures.

Takeoff with CSFF on upper wing surfaces is allowable provided all of the following conditions are met:

- The CSFF on the wing tank upper surfaces is only within the lines defining the permissible CSFF area with no snow, ice or frost on the leading edges or control surfaces.
- Ambient air temperature is at or above +4°C, +39°F.
- There is no precipitation or visible moisture (rain, snow, drizzle, or fog with less than 1 mile visibility).
- Tank fuel temperature is at or above -16°C, +3°F.

If all of the above conditions are not met, all snow, ice and frost on the upper wing surfaces must be removed using appropriate deicing/anti-icing procedures.

## Exterior Safety Inspection - Airplanes without Defined Cold-Soaked Fuel Frost Area

Surfaces ........................................................................................ Check

Visually inspect the lower and upper wing surfaces.

If there is frost or ice on the lower surface outboard of measuring stick 4, there may also be frost or ice on the upper surface. The distance that the frost extends outboard of measuring stick 4 can be used as an indication of the extent of the frost on the upper surface.

Takeoff with CSFF on lower wing surfaces is allowable provided all of the following conditions are met:

- Ambient air temperature is at or above +4°C, +39°F.
- There is no precipitation or visible moisture (rain, snow, drizzle, or fog with less than 1 mile visibility).
- Tank fuel temperature is at or above -16°C, +3°F.
- All leading edge devices, all control surfaces, tab surfaces, winglet surfaces, and control surface balance panel cavities must be free of snow, ice and frost.

If all of the above conditions are not met, takeoff with light coatings of frost, up to 1/8 inch (3 mm) in thickness, on lower wing surfaces due to cold fuel is allowable; however, all leading edge devices, all control surfaces, tab surfaces, winglet surfaces and control surface balance panel cavities must be free of snow, ice and frost. If the frost on the lower surface is greater than 1/8 inch (3 mm) in thickness, all snow, ice and frost on the wings must be removed using appropriate deicing/anti-icing procedures.

Takeoff with frost on upper wing surfaces due to cold fuel (CSFF) is not allowable. If any frost is present on the upper wing surface, all snow, ice and frost on the wings must be removed using appropriate deicing/anti-icing procedures.

## Window Heat System Tests

### Overheat Test

The overheat test simulates an overheat condition to check the overheat warning function of the window heat system.

WINDOW HEAT switches ............................................................... ON

WINDOW HEAT TEST switch .................................................... OVHT

OVERHEAT lights – On

ON lights – Extinguish

Lights extinguish after approximately 1 minute.

MASTER CAUTION – On

ANTI–ICE system annunciator – On

WINDOW HEAT switches ........................................................... Reset

Position the WINDOW HEAT switches OFF, then ON.

## Power Test

The power test verifies operation of the window heat system. The test may be accomplished when any of the window heat ON lights are extinguished and the associated WINDOW HEAT switch is ON.

WINDOW HEAT switches ............................................................... ON

**Note:** Do not perform the power test when all ON lights are illuminated

WINDOW HEAT TEST switch ................................................... PWR

The controller is forced to full power, bypassing normal temperature control. Overheat protection is still available.

WINDOW HEAT ON lights ...............................................Illuminated

If any ON light remains extinguished, the window heat system is inoperative. Observe the maximum airspeed limit of 250 kts below 10,000 feet.

## Level Change Climb/Descent

ALTITUDE selector ................................................ Set desired altitude

**Note:** If a new MCP altitude is selected while in ALT ACQ, the AFDS engages in V/S and the existing vertical speed is maintained.

LVL CHG switch ........................................................................ Push

Verify FMA display:

Thrust mode (climb) – N1

Thrust mode (descent) – RETARD then ARM

Pitch mode – MCP SPD

IAS/MACH Selector .................................................. Set desired speed

## Vertical Speed (V/S) Climb/Descent

ALTITUDE selector ................................................ Set desired altitude

**Note:** If a new MCP altitude is selected while in ALT ACQ, the AFDS engages in V/S and the existing vertical speed is maintained.

V/S thumbwheel ............................................ Set desired vertical speed

Verify FMA display:

Thrust mode (climb or descent) – MCP SPD

Pitch mode – V/S

IAS/MACH Selector .................................................. Set desired speed

To transition to the vertical speed mode from another engaged climb or descent mode:

V/S mode switch ................................................................ Push

V/S climb mode engages at existing V/S.

V/S thumbwheel .................................. Set desired vertical speed

Verify FMA display:

Thrust mode (climb or descent) – MCP SPD

Pitch mode – V/S

IAS/MACH Selector .......................................... Set desired speed

## Intervention of FMC Altitude Constraints during VNAV Climb

MCP altitude selector ..................................................... Set new altitude

New altitude must be higher than the FMC altitude constraint(s) to be deleted.

ALT INTV switch .......................................................................... Push

Each push of the ALT INTV switch will delete an FMC altitude constraint.

## Intervention of FMC Altitude Constraints during VNAV Descent

MCP altitude selector ..................................................... Set new altitude

New altitude must be lower than the FMC altitude constraint (s) to be deleted.

ALT INTV switch .......................................................................... Push

Each push of the ALT INTV switch will delete an FMC altitude constraint.

If all FMC altitude constraints are deleted, the descent mode will revert to a VNAV speed descent.

## Intervention of FMC Cruise Altitude during VNAV Cruise

MCP altitude selector ......................................................................... Set

ALT INTV switch ........................................................................Push

If a higher altitude is selected, a CRZ climb will be started.

If the airplane is more than 50 nm from T/D, if a lower altitude is selected, a CRZ descent will be started if the selected altitude is at or above any FMC altitude constraint.

If the airplane is more than 50 nm from T/D, if a lower altitude is selected, an early descent will be started if the selected altitude is below any FMC altitude constraint.

If the airplane is 50 nm or less from T/D, if a lower altitude is selected, an early descent will be started.

## Intervention of FMC Airspeed Constraints during VNAV

SPD INTV switch ........................................................................Push

MCP IAS/MACH display shows current FMC target speed.

IAS/MACH Selector ..................................................Set desired speed

VNAV remains engaged.

To resume former FMC speed:

SPD INTV switch ................................................................Push

MCP IAS/MACH display blanks and FMC commanded VNAV speed is active.

## Altitude Hold

Altitude HOLD switch ...................................................................Push

Verify FMA display:

Pitch mode – ALT HOLD

## Heading Select

Heading selector ..................................................... Set desired heading

Heading select switch ...................................................................Push

Verify FMA display:

Roll mode – HDG SEL

## VOR Navigation

VHF NAV radio(s) ........................................ Tune and Identify

COURSE selector ........................................ Set desired course

When on an intercept heading to the VOR course:

VOR LOC mode switch ........................................ Push

Verify VOR LOC armed mode annunciates.

A/P automatically captures the VOR course.

Verify VOR LOC engaged mode annunciates upon course capture.

**Note:** If change to a localizer frequency is desired when captured in the VOR mode, disengage VOR LOC mode prior to selection of the localizer. VOR LOC mode can then be reengaged.

## Instrument Approach using Vertical Speed (V/S)

| Pilot Flying | Pilot Monitoring |
|---|---|
| Initially<br>• If on radar vectors<br>  • HDG SEL<br>  • Pitch mode (as needed)<br>• If enroute to a fix<br>  • LNAV or other roll mode<br>  • VNAV or other pitch mode | |
| Call “FLAPS ___” according to the flap extension schedule. | Set the flap lever as directed. Monitor flaps and slats extension. |

**Note:** If required to remain at or above MDA(H) during the missed approach, the missed approach must be initiated at least 50 feet above MDA(H).

Recommended roll modes:

- RNAV, GPS, TACAN, LOC-BC, VOR or NDB approach: LNAV or HDG SEL.
- LOC, SDF or LDA approach: VOR/LOC or LNAV.

**Note:** When using LNAV to intercept a localizer, LNAV might parallel the localizer without capturing it. Use HDG SEL to intercept the final approach course, if needed.

Ensure appropriate navaids (VOR, LOC or NDB) are tuned and identified before commencing the approach.

| Pilot Flying | Pilot Monitoring |
|---|---|
| Use LNAV or other roll mode to intercept the final approach course as needed. | |
| Approximately 2 NM before the final approach fix, set the first intermediate altitude constraint or MDA(H).<br>Set the MCP altitude to the nearest 100 foot increment at or above each intermediate altitude constraint or MDA(H).<br>When the current constraint is assured, set the next constraint before ALT HOLD is engaged to achieve a continuous descent path. | Approximately 2 NM before the final approach fix, call “APPROACHING GLIDE PATH.” |
| Call:<br>• “GEAR DOWN”<br>• “FLAPS 15.” | Set the landing gear lever to DN.<br>Verify that the green landing gear indicator lights are illuminated.<br>Set the flap lever to 15.<br>Set the engine start switches to CONT. |
| Set the speed brake lever to ARM.<br>Verify that the SPEED BRAKE ARMED light is illuminated. | |

Before descent to MDA(H):

| Pilot Flying | Pilot Monitoring |
|---|---|
| Call "FLAPS ___" as needed for landing. | Set the flap lever as directed. |

At descent point:

Desired V/S .......................................................................... Set

Set desired V/S to descend to MDA(H). Use a V/S that results in no level flight segment at MDA(H).

Verify V/S mode annunciates.

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Call "LANDING CHECKLIST."</td><td>Do the LANDING checklist.</td></tr>
<tr><td colspan="2">At the final approach fix, crosscheck the altimeters. Verify they agree within 100 feet.</td></tr>
</table>

Approximately 300 feet above MDA(H):

MCP altitude .................................. Set missed approach altitude

At MDA(H)/missed approach point:

If suitable visual reference is not established, execute missed approach.

After suitable visual reference is established:

A/P disengage switch .................................................... Push

Disengage the autopilot in accordance with regulatory requirements.

A/T disengage switch .................................................. Push

Disengage the autothrottle when disengaging the autopilot.

## Circling Approach

If a missed approach is needed at any time while circling, make an initial climbing turn toward the landing runway and intercept the missed approach course.

Configuration at MDA(H):

- Gear down
- Flaps 15 (landing flaps optional)
- Speedbrake armed

MCP altitude selector ....................................................................... Set

Set the MCP altitude to the nearest 100 foot increment at or above the MDA(H).

Accomplish an instrument approach, establish suitable visual reference and level off at MCP altitude.

Verify ALT HLD or VNAV ALT mode annunciates.

ALT HLD mode ............................................................... Verify/select

Verify ALT HLD mode annunciates.

MCP altitude selector ................................ Set missed approach altitude

HDG SEL switch .......................................................................... Push

Verify HDG SEL mode annunciates.

Before starting the turn to base:

- Landing flaps (if not previously selected)
- Do the LANDING checklist.

Intercepting the landing profile:

Autopilot disengage switch .................................................... Push

Autothrottle disengage switch ................................................ Push

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## Cockpit Voice Recorder Test

**Note:** The Cockpit VOICE RECORDER switch must be in the ON position or at least one engine must be operating to perform this test.

Test switch ........................................................................................Push

Hold switch for 1 second then release. Observe that the STATUS light illuminates once within 6 seconds. A tone may be heard through a headset plugged into the headset jack.

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## Electrical Power Up

The following procedure is accomplished to permit safe application of electrical power.

BATTERY switch .......................................................... Guard closed

**Note:** Do not move the airplane until Integrated Standby Flight Display (ISFD) alignment is complete.

**Note:** If external power is not used for APU start, wait at least 30 seconds between closing the BATTERY switch guard and starting the APU. This allows for completion of DPC self-test.

**1B392 - 1J022, 1K002 - 1L078**

**Note:** Devices plugged into the flight deck auxiliary power outlets during Electrical Power Up will not be powered until the plugs are removed and reinserted.

STANDBY POWER switch ............................................ Guard closed

ALTERNATE FLAPS master switch ................................ Guard closed

Windshield WIPER selectors ........................................................ PARK

ELECTRIC HYDRAULIC PUMPS switches .................................. OFF

LANDING GEAR lever ..................................................................DN

Verify that the green landing gear indicator lights are illuminated.

Verify that the red landing gear indicator lights are extinguished.

If external power is needed:

Verify that the GRD POWER AVAILABLE light is illuminated.

GRD POWER switch – ON

Verify that the SOURCE OFF lights are extinguished.

Verify that the TRANSFER BUS OFF lights are extinguished.

Verify that the STANDBY PWR OFF light is extinguished.

If APU power is needed:

Verify that the engine No. 1, APU and the engine No. 2 fire switches are in.

Alert ground personnel before the following test is accomplished.

OVERHEAT DETECTOR switches – NORMAL

TEST switch – Hold to FAULT/INOP

Verify that the MASTER CAUTION lights are illuminated.

Verify that the OVHT/DET annunciator is illuminated.

Verify that the FAULT light is illuminated.

If the FAULT light fails to illuminate, the fault monitoring system is inoperative.

Verify that the APU DET INOP light is illuminated.

Do not operate the APU if the APU DET INOP light fails to illuminate.

TEST switch – Hold to OVHT/FIRE

Verify that the fire warning bell sounds.

Verify that the master FIRE WARN lights are illuminated.

Verify that the MASTER CAUTION lights are illuminated.

Verify that the OVHT/DET annunciator is illuminated.

Master FIRE WARN light – Push

Verify that the master FIRE WARN lights are extinguished.

Verify that the fire warning bell cancels.

Verify that the engine No. 1, APU and the engine No. 2 fire switches stay illuminated.

Verify that the engine No. 1 and engine No. 2 start lever lights stay illuminated.

Verify that the ENG 1 OVERHEAT and ENG 2 OVERHEAT lights stay illuminated.

**Note:** The WHEEL WELL fire warning light on the overheat and fire protection panel may or may not illuminate when testing on DC electrical power only. For accurate testing, do the wheel well fire detection system test after AC electrical power is established.

EXTINGUISHER TEST switch – Check

TEST Switch - Position to 1 and hold

Verify that the three green extinguisher test lights are illuminated.

TEST Switch - Release

Verify that the three green extinguisher test lights are extinguished.

Repeat for test position 2.

APU - Start

**Note:** If extended APU operation is needed on the ground and the airplane busses are powered by AC electrical power, position an AC powered fuel pump ON. This will extend the service life of the APU fuel control unit.

**Note:** If fuel is loaded in the center tank, position the left center tank fuel pump switch ON to prevent a fuel imbalance before takeoff.

**CAUTION: Center tank fuel pump switches should be positioned ON only if the fuel quantity in the center tank exceeds 453 kgs.**

**CAUTION: Do not operate the center tank fuel pumps with the flight deck unattended.**

When the APU GEN OFF BUS light is illuminated:

APU GENERATOR bus switches - ON

Verify that the SOURCE OFF lights are extinguished.

Verify that the TRANSFER BUS OFF lights are extinguished.

Verify that the STANDBY PWR OFF light is extinguished.

Verify that the APU DOOR light is extinguished.

Verify that the APU LOW OIL PRESSURE light is extinguished.

Verify that the APU FAULT light is extinguished.

Verify that the APU OVERSPEED light is extinguished.

Wheel well fire detection system ............................................ Test

Test switch – Hold to OVHT/FIRE

Verify fire warning bell sounds, master FIRE WARN lights, MASTER CAUTION lights and OVHT/DET annunciator illuminate.

Fire warning BELL CUTOUT switch – Push

Verify that the master FIRE WARN lights extinguish.

Verify that the fire warning bell cancels.

Verify that the WHEEL WELL fire warning light is illuminated.

## Electrical Power Down

This procedure assumes the Secure procedure is complete.

APU switch and/or GRD POWER switch ........................................OFF

If APU was operating:

Delay approximately 5 minutes after the APU GEN OFF BUS light extinguishes before placing the BATTERY switch OFF.

BATTERY switch ..................................................................OFF

## Standby Power Test

Battery switch ........................................................................ ON

AC and DC meter selectors ................................................ STBY PWR

If APU generator is on–line:

APU GEN No. 1 switch ..........................................................OFF

APU GEN No. 2 switch ..........................................................OFF

If ground power is on–line:

GRD PWR switch ...................................................................OFF

STANDBY POWER switch .......................................................OFF

Check STANDBY PWR OFF light illuminated.

AC and DC voltmeters ...........................................................Zero

STANDBY POWER switch .......................................................BAT

Check STANDBY PWR OFF Light extinguished.

AC and DC voltmeters .................................................................. Check

AC voltmeter 115 +/-5 volts

DC voltmeter 24 +/-4 volts

Frequency meter ......................................................................... Check

Check frequency meter for normal indication: 400 +/- 5 CPS.

DC meter selector ........................................................................... BAT

Check DC voltmeter for normal indication: 24 +/- 4 volts.

Check DC ammeter for discharge indication: a negative value.

DC meter selector ................................................................. AUX BAT

Check DC voltmeter for normal indication: 24 +/- 4 volts.

Check DC ammeter for discharge indication: a negative value.

STANDBY POWER switch ........................................................AUTO

GRD PWR switch or APU GEN No. 1 and No. 2 switches ...............ON

**Note:** It can take up to 3 minutes for MDS displays to recover when power is interrupted for more than 2 seconds on the ground.

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## Starting with Ground Air Source (AC electrical power available)

Engine No. 1 must be started first.

When cleared to start:

APU BLEED air switch .......................................................... OFF

Engine No. 1 start ...................................................... Accomplish

Use normal start procedures.

**WARNING: To minimize the hazard to ground personnel, the external air should be disconnected, and engine No. 2 started using the Engine Crossbleed Start procedure.**

## Engine Crossbleed Start

Do not accomplish a crossbleed start during pushback.

Before using this procedure, ensure that the area to the rear is clear.

Engine BLEED air switches ................................................................ON

APU BLEED air switch ................................................................ OFF

PACK switches ........................................................................... OFF

ISOLATION VALVE switch ........................................................AUTO

Ensures bleed air supply for engine start.

Engine thrust lever
(operating engine) ..................................................................... Idle

**Note:** If needed, advance thrust lever until bleed duct pressure indicates 30 PSI.

Non–operating engine ............................................................... Start

Use normal start procedures with crossbleed air.

After starter cutout, adjust thrust on both engines, as required.

## Setting N1 Bugs with No Operative FMC (Manual N1 Bug Setting)

Reference the Performance – Inflight section to determine N1 setting for desired phase of flight.

**Note:** SELECTOR refers to either the CAPT or FO SELECTOR knob.

SELECTOR outer knob ............................................................Select C

MFD INFO switch ........................................................................ Push

N1/SPD REF SET display is shown.

SELECTOR inner knob ................................................Rotate to BOTH and push

The last FMC computed value is shown by reference N1 bugs and readouts. If the FMC has not calculated an input since power up, a default value of 104% is shown.

SELECTOR inner knob ................................................Rotate to the N1 data field and push

SELECTOR inner knob ................................................ Rotate to set N1 and push

**Note:** If the N1 SET selection is returned to the AUTO, the bugs and readouts will revert to the last FMC computed value or 104% if the FMC has not calculated an input since power up.

SELECTOR inner knob ................................................. Rotate to SET and push

Verify that the Thrust Mode Display Annunciation is MAN.

**When** manual N1 bug setting is no longer needed:

MFD INFO switch ................................................................ Push

N1/SPD REF SET display is shown.

SELECTOR inner knob ......................................Rotate to AUTO and push

Verify that the Thrust Mode Display Annunciation is appropriate for the phase of flight.

## High Altitude Airport Engine Start (Above 8400 Feet)

**1B392, 1L075 - 1L078**

Engine start ........................................................................ Accomplish

An indication of N1 rotation plus maximum motoring and a minimum of 20% N2 are required prior to introducing fuel to the engine.

**Note:** Maximum motoring occurs when N2 acceleration is less than 1% in approximately 5 seconds.

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## Fire and Overheat System Test with an Inoperative Loop

To determine the specific inoperative loop:

OVHT DET switches ................................................................ A

Test switch ............................................................... OVHT/FIRE

If the FAULT light remains extinguished and both ENG OVERHEAT lights, engine start levers, and engine fire switches illuminate, loop A is good.

If the FAULT light illuminates and one of the ENG OVERHEAT lights and corresponding engine start lever and engine fire switch remain extinguished, there is a fault in loop A of the detection system of that engine.

OVHT DET switches ................................................................B

Test switch ............................................................... OVHT/FIRE

If the FAULT light remains extinguished and both ENG OVERHEAT lights, engine start levers, and engine fire switches illuminate, loop B is good.

If the FAULT light illuminates and one of the ENG OVERHEAT lights and corresponding engine start lever and engine fire switch remain extinguished, there is a fault in loop B of the detection system of that engine.

OVHT DET switches .................................................As required

Select the good loop for each engine (NORMAL if both loops tested good).

Test switch ............................................................... OVHT/FIRE

If the test is successful leave the fire panel in this configuration for flight.

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## Altimeter Difference

**Note:** If flight in RVSM airspace is planned use the RVSM table in the limitations section.

This procedure is accomplished when there is a noticeable difference between the altimeters. Accomplish this procedure in stabilized level flight or on the ground.

Altimeter barometric settings .................................................... Check

Check all altimeters set to proper barometric setting for phase of flight.

Standby altimeter baro set control ................................. Rotate and reset

Rotate to a different setting, then reset proper barometric setting.

Altimeters ........................................................................ Crosscheck

Maximum differences between the altimeter readings:

| Altitude | MDS/MDS | MDS/Standby |
|---|---|---|
| Sea Level | 50 feet | 60 feet |
| 5,000 feet | 50 feet | 80 feet |
| 10,000 feet | 60 feet | 120 feet |
| 15,000 feet | 70 feet | (see note) |
| 20,000 feet | 80 feet | (see note) |
| 25,000 feet | 100 feet | (see note) |
| 30,000 feet | 120 feet | (see note) |
| 35,000 feet | 140 feet | (see note) |
| 40,000 feet | 160 feet | (see note) |
| 41,000 feet | 170 feet | (see note) |

**Note:** Above 10,000 feet and 0.4 Mach, position error causes the tolerance to diverge rapidly and direct crosscheck becomes inconclusive. Between 10,000 feet and 29,000 feet, differences greater than 400 feet should be suspect and verified by ground maintenance checks. Between 29,000 feet and the maximum operating altitude, differences greater than 500 feet should be suspect and verified by ground maintenance checks.

If it is not possible to identify which altimeter is indicating the correct altitude:

ATC .......................................................................... Notify

## Setting Airspeed Bugs with No Operative FMC (Manual Airspeed Bug Setting)

### To set reference airspeed bugs for takeoff:

**Note:** SELECTOR refers to either the CAPT or FO SELECTOR knob.

SELECTOR outer knob .................................................... Select C

MFD INFO switch .................................................... Push

N1/SPD REF SET display is shown.

SELECTOR inner knob .................................................... Rotate to V1 and push

Default speed of 80 knots is shown.

SELECTOR inner knob .................................................... Rotate to the V1 data field and push

SELECTOR inner knob .................................................... Rotate to set V1 speed and push

V1 bug is shown when a speed greater than 80 knots is set.

SELECTOR inner knob .................................................... Rotate to VR and push

Default speed of 80 knots is shown.

SELECTOR inner knob .................................................... Rotate to the VR data field and push

SELECTOR inner knob .................................................... Rotate to set VR speed and push

VR bug is shown and the NO VSPD flag is removed when a speed greater than 80 knots is set.

MCP speed selector .................................................... Set V2

Airspeed bug and V2+15 bug move to the correct speeds.

SELECTOR inner knob .................................................... Rotate to WT KGS and push

Default weight of 32,000 kgs is shown.

SELECTOR inner knob ........................................Rotate to the WT KGS data field and push

SELECTOR inner knob ........................................Rotate to set takeoff gross weight and push

Flaps up maneuver speed bug is shown.

SELECTOR inner knob ........................................ Rotate to SET and push

Digital readout is removed from PFD and MAN SPD is shown.

To set the spare bug, if desired:

SELECTOR inner knob ........................................Rotate to spare bug and push

Default speed of 60 knots is shown.

SELECTOR inner knob ........................................Rotate to the spare bug data field and push

SELECTOR inner knob ........................................ Rotate to set spare bug speed and push

SELECTOR inner knob ........................................ Rotate to SET and push

Digital readout is removed from PFD and MAN SPD is shown.

**Note:** When the flap lever is set to any takeoff flap setting above flaps 1, a bug comes into view for the next smaller flap maneuvering speed, between takeoff flaps and flaps up. For example, if the flap lever is set to 15 for takeoff, a bug for flaps 5 maneuvering speed will appear. For a flaps 1 takeoff, the flaps 1 maneuvering speed is shown.

**When** manual airspeed bug setting is no longer needed:

MFD INFO switch ........................................ Push

N1/SPD REF SET display is shown.

SELECTOR inner knob ........................................Rotate to AUTO and push

Verify that the MAN SPD airspeed indication is removed from PFD.

## To set reference airspeed bugs for approach:

**Note:** SELECTOR refers to either the CAPT or FO SELECTOR knob.

SELECTOR outer knob ............................................................ Select C

MFD INFO switch ......................................................................Push

N1/SPD REF SET display is shown.

SELECTOR inner knob ........................................... Rotate to WT KGS and push

Default weight of 32,000 kgs is shown.

SELECTOR inner knob ...................................... Rotate to the WT KGS data field and push

SELECTOR inner knob .......................................... Rotate to set current gross weight and push

Flaps up maneuver speed bug is shown.

SELECTOR inner knob .................................................Rotate to VREF and push

Default speed of 80 knots is shown.

SELECTOR inner knob ............................................ Rotate to the VREF data field and push

SELECTOR inner knob ............................................Rotate to set VREF speed and push

The green VREF bug and white VREF +20 bug are shown when a speed greater than 80 knots is set.

SELECTOR inner knob .................................................... Rotate to SET and push

Digital readout is removed from PFD and MAN SPD is shown.

To set the spare bug, if desired:

SELECTOR inner knob.................................. Rotate to spare bug and push

Default speed of 60 knots is shown.

SELECTOR inner knob...................................Rotate to the spare bug data field and push

SELECTOR inner knob .................................... Rotate to set spare bug speed and push

SELECTOR inner knob .......................................... Rotate to SET and push

Digital readout is removed from PFD and MAN SPD is shown.

# Tests

## Transponder Test

This procedure requires the IRSs to be aligned and in NAV mode.

Transponder ........................................ TEST

Check FAIL light illuminates.

Check all code segments illuminate. Verify no error codes exist.

Verify aural indicates TCAS system test passed.

**Note:** TCAS TEST is displayed on the navigation display during the test followed by TCAS TEST PASSED or TCAS TEST FAILED. This test remains in view for 8 seconds then blanks. An aural annunciation sounds at the completion of the test.

**1B392 - 1J022, 1L075 - 1L078**

| AURAL ALERTS | DEFINITION |
|---|---|
| "TCAS TEST" "TCAS TEST FAIL" | Test failed. Maintenance required. |
| "TCAS TEST" "TCAS TEST OK" | Test complete. System operable. |

**1J103 - 1K003**

| AURAL ALERTS | DEFINITION |
|---|---|
| "TCAS SYSTEM TEST FAIL" | Test failed. Maintenance required. |
| "TCAS SYSTEM TEST OK" | Test complete. System operable. |

## Weather Radar Test

EFIS mode selector .............. MAP, MAP CTR, VOR, or APP

Weather Radar Mode ........................................ TEST

WXR (EFIS control panel) ........................................ ON

Verify test pattern consisting of the following colors appears:

- Green
- Amber
- Red
- Magenta.

If testing of the PWS system is desired:

Weather Radar Mode ............................................Deselect TEST

WXR (EFIS control panel) .................................................... ON

Weather Radar Mode ............................................................ TEST

Verify the amber WINDSHEAR caution, red WINDSHEAR warning and PWS FAIL annunciations display momentarily and then extinguish.

**1B392 - 1J022, 1L075 - 1L078**

After test is complete, check for any weather related fault messages on the navigation display. Test is complete when either of the following occurs:

- TEST COMPLETE message is shown on the navigation displays;
- 50 seconds have elapsed since test was initiated.

**Note:** It can take up to 20 seconds after test is complete for any weather related fault messages to show.

**Note:** In the short time the weather radar is on and not in the TEST position, it will radiate.

## IRS

### Align Light(s) Flashing

Do not move IRS Mode selector to OFF except where called for in procedure.

POS INIT page ......................................................................... Select

Set IRS position .................................................Enter present position

Enter present position using the most accurate latitude and longitude available. If the present position is being entered via the CDU and a position is already displayed on the SET IRS POS line, enter new position over displayed position.

If ALIGN light continues to flash:

Set IRS position .........................................Enter present position

Re-enter same present position.

If ALIGN light continues to flash after re-entry:

IRS ........................................................................................ OFF

Rotate IRS Mode Selector to OFF and verify ALIGN light extinguished.

**Note:** Light must be extinguished before continuing with procedure (approximately 30 seconds.)

IRS ........................................................................................ NAV

Rotate IRS Mode Selector to NAV and verify ALIGN light illuminated.

Set IRS position ........................................ Enter present position

Enter present position. If ALIGN light flashes, re-enter same present position over displayed position.

**Note:** Approximately five to seventeen minutes are required for alignment.

If ALIGN light continues to flash, maintenance action is required.

## Fast Realignment

Prior to commencing procedure the airplane must be parked and not moved until procedure is complete and ALIGN lights extinguish.

IRS mode selectors ................................................................. ALIGN

Observe ALIGN lights illuminate steadily.

CDU ..........................................................................................Set

Enter present position on SET IRS POS line of the POS INIT page.

IRS mode selector.........................................................................NAV

Observe ALIGN light extinguished within 30 seconds.

**Note:** If time permits it is preferable to perform a full alignment of the IRS. A more precise alignment will result.

**Note:** If the mode selector is accidentally switched to OFF or ATT, position mode selector to OFF, wait for ALIGN light(s) to extinguish, then perform full alignment procedure.

## Inadvertent Selection of Attitude Mode (while on the ground)

Inadvertent selection of the attitude mode may be due to physically overpowering the switch during turn–on or may be the result of a faulty switch which prevents the flight crew from accurately determining which mode is selected.

If ATT position is selected inadvertently when switching to NAV

IRS mode selectors ............................................................OFF

Observe ALIGN lights extinguish.

After ALIGN lights extinguish, initiate a full alignment.

## IRS Entries

### Present Position Entry

IRS mode selector ............................................................NAV

ALIGN lights must be illuminated (steady or flashing).

IRS display selector ............................................................PPOS

Latitude ............................................................Enter

Key–in latitude in the data display, beginning with N or S, then press the ENT Key (the Cue Lights extinguish).

Longitude ............................................................Enter

Key–in longitude in the data display, beginning with E or W, then press the ENT key (the cue lights extinguish). Observe that proper latitude and longitude are displayed and that the ALIGN light is not flashing.

### Heading – Enter through CDU

FMC/CDU POS INIT page ............................................................ Select

Enter the correct heading into the CDU scratch pad then press line select key 5R. Verify entered heading appears on line 5R. Select HDG on the IRS display selector and verify that the entered heading is displayed on the navigation displays.

### Heading – Enter through ISDU

IRS display selector .................................................................. HDG

Press the H key to initiate a heading entry.

Key–in present magnetic heading. Press the ENT key (the cue lights extinguish). Observe proper heading displayed on the navigation displays.

## Lateral Navigation (LNAV)

### Proceeding Direct to a Waypoint (overwrite)

RTE LEGS page .................................................................. Select

On page 1/XX, line 1L, enter desired waypoint over the presently active waypoint.

Correct any ROUTE DISCONTINUITY if entered waypoint was not in original flight plan.

### Intercepting a Leg (Course) to a Waypoint

RTE LEGS page .................................................................. Select

On page 1/XX, line 1L, enter desired waypoint over presently active waypoint.

Observe INTC CRS prompt displayed in line 6R.

Enter the desired intercept course in the INTC CRS line. Observe the desired course is displayed on line 6R. The displayed course on line 1L may vary by several degrees due to magnetic variation.

Correct any ROUTE DISCONTINUITY if the entered waypoint was not in original flight plan.

EXEC key .................................................................. Push

Observe MOD RTE LEGS page changes to ACT.

LNAV may disengage after execution of an intercept leg to a waypoint. If LNAV disengages, turn to a heading to satisfy LNAV capture criteria, as described in Chapter 11, and then engage LNAV.

### Active Route Modification

ACT RTE x LEGS or ACT RTE x page .......................................... Select

Line select existing waypoints in the desired sequence.

Key–in any new waypoints in the scratch pad and line select into the flight plan. Correct any ROUTE DISCONTINUITY.

EXEC key .......................................................................... Push

Observe MOD RTE x LEGS or MOD RTE x page changes to ACT.

## Inactive Route Modification

RTE x LEGS or RTE x page .......................................................... Select

Line select existing waypoints in the desired sequence.

Key–in any new waypoints in the scratch pad and line select into the flight plan. Correct any ROUTE DISCONTINUITY.

**Note:** The flight number should not be changed in the inactive route as it will change the flight number in the active route.

## Route Copy

ACT RTE x LEGS or ACT RTE x page ......................................... Select

RTE COPY line select key ............................................................ Push

## Inactive Route Activation

RTE x LEGS or RTE x page .......................................................... Select

ACTIVATE line select key ............................................................ Push

Correct any ROUTE DISCONTINUITY.

EXEC key .......................................................................... Push

## Route Removal

ACT RTE xpage ......................................................................... Select

ORIGIN ...............................................................................Enter

If EXEC key illuminates

EXEC key ..................................................................... Push

## Linking a Route Discontinuity

Correct the ROUTE DISCONTINUITY by entering or deleting waypoints in a sequence that provides a continuous flight–plan path.

EXEC key .......................................................................... Push

Observe MOD RTE or MOD RTE LEGS page changes to ACT.

## Determining ETA and Distance to Cross Radial (Bearing) or Distance from a Fix

FIX INFO page ........................................................................ Select

Enter the identifier of the reference waypoint (normally an off–route waypoint) onto the FIX line. Enter the desired radial or distance from the FIX on a RAD/DIS line, or line select the ABM prompt if the desired radial from the FIX is perpendicular to the present route/course.

Time and distance to go ............................................................ Check

Check ETA and DTG, as desired.

**Note:** If ETA and DTG are not displayed, the fix radial and/or distance do not intersect the route.

## Changing Destination

RTE page .................................................................................. Select

Enter the new destination over the original DEST. Enter desired routing to the new destination using the RTE, RTE LEGS, and ARRIVALS pages, as appropriate. Correct any ROUTE DISCONTINUITY.

EXEC key ................................................................................... Push

Observe the MOD RTE or MOD RTE LEGS page changes to ACT.

**Note:** If destination is changed during climb, performance predictions may be blanked if the new flight plan is incompatible with the entered cruise altitude. Correct by entering a lower CRZ ALT on the CLB page.

## Entering Holding Fix Into Route

HOLD key ................................................................................... Push

(If RTE HOLD page is displayed, observe NEXT HOLD prompt. Line select 6L until (RTE LEGS) HOLD AT page is displayed.)

Observe HOLD AT box prompts and PPOS prompt (if in flight) are displayed. Enter the holding fix in line 6L, or line select PPOS.

If the holding fix is a waypoint in the active route, or PPOS was selected, observe MOD RTE HOLD page displayed. If the holding fix is a waypoint not in the active route, observe message HOLD AT XXXXX displayed in the scratch pad. Enter the holding fix into the route by line selecting in the desired waypoint sequence. Observe the MOD RTE HOLD page displayed. If displayed holding details are incorrect or inadequate, enter correct information on appropriate line(s).

EXEC key ........................................................................ Push

Observe MOD RTE HOLD page changes to RTE HOLD (ACT RTE HOLD if holding at PPOS).

## Exiting Holding Pattern

HOLD key ........................................................................ Push

Observe EXIT HOLD prompt displayed.

EXIT HOLD line select key ........................................................ Push

Observe EXIT HOLD prompt changes to EXIT ARMED.

EXEC key ........................................................................ Push

Observe EXIT ARMED is highlighted in reverse video and LNAV flight returns to the holding fix and resumes the active route.

**Note:** The holding pattern may be exited by performing a DIRECT TO modification if desired. In this case, the flight path may not return to the holding fix before proceeding to the selected waypoint.

**Note:** A late sequencing of the hold exit waypoint may occur if multiple route modifications are performed just prior to exiting the hold. LNAV guidance may be temporarily interrupted while sequencing the hold exit waypoint.

## Along Track Displacement

RTE LEGS page .................................................................. Select

Line select the reference waypoint to the scratch pad. Add a "/" and the + or – distance desired. (EX: SEA/15 for a point 15 miles downtrack from SEA)

Line select the reference waypoint. (The FMC will automatically position the created waypoint to appropriate position.)

EXEC key ............................................................................ Push

Observe the MOD RTE LEGS page change to ACT.

## Entering Created Waypoints on the Route or Route Legs Pages

**Note:** Created waypoints are stored in the temporary navigation data base for one flight only.

RTE or RTE LEGS page ............................................................ Select

Using any of the following methods, key into the scratch pad the parameters which define the new created waypoint (place identifiers must already be stored in one of the FMC data bases):

- Place bearing/distance (for example, SEA250/40);
- Place bearing/place bearing (for example, SEA180/ELN270);
- Along–track displacement (for example, SEA/-10);
- Latitude and longitude (for example, N4731.8W12218.3).

Enter into the route by line selecting to the appropriate waypoint sequence.

Repeat the above steps to define additional created waypoints as desired. Correct any ROUTE DISCONTINUITY.

EXEC key ............................................................................ Push

Observe the MOD RTE or MOD RTE LEGS page changes to ACT (for an inactive route, activate and execute on the RTE or RTE LEGS page).

## Entering Created Waypoints on the Nav Data Pages

**Note:** Created waypoints entered on the SUPP NAV DATA pages (permitted on the ground only) are stored in the supplemental navigation data base for an indefinite time period; those entered on REF NAV DATA pages are stored in the temporary navigation data base for one flight only.

INIT/REF key ........................................................................ Push

Observe INDEX prompt displayed.

INIT/REF INDEX page ............................................................ Select

Observe the NAV DATA prompt displayed. To access the SUPP NAV DATA page, enter SUPP into the scratch pad.

NAV DATA page .................................................................. Select

(If the SUPP NAV DATA page is selected, observe the EFF FRM date line displayed. If an effective date had not been previously entered, box prompts are displayed. The effective date must be entered before proceeding. If required, enter the current or appropriate date on EFF FRM line and execute.)

Data ......................................................................................Enter

Enter a crew-assigned identifier on either the WPT IDENT, NAVAID IDENT, or AIRPORT IDENT line, as appropriate. Use the navaid category only for stations with DME.

For a WPT IDENT entry, define the waypoint with entries for either latitude and longitude, or with entries for REF IDENT and RADIAL/DIST (REF IDENT identifier must already be stored in one of the FMC data bases).

For a NAVAID IDENT or AIRPORT IDENT entry, enter appropriate data.

EXEC key illuminates when data has been entered into all box prompts.

EXEC key ............................................................................ Push

Repeat above steps to define additional created waypoints as desired. To enter a new identifier in the same category, simply overwrite the previous identifier.

**Note:** To enter a created waypoint into the flight plan, key the identifier into the scratch pad and follow the route modification procedure.

## Deleting Created Waypoints on the Nav Data Pages

INIT/REF key ........................................................................ Push

Observe the INDEX prompt displayed.

INIT/REF INDEX page ......................................................... Select

Observe the NAV DATA prompt displayed. To access the SUPP NAV DATA page, key SUPP into the scratch pad.

NAV DATA page .................................................................. Select

Enter the identifier on either the WPT IDENT, NAVAID IDENT, or AIRPORT IDENT line, as appropriate.

Data .......................................................................................... Delete

Push the DEL key and then line select the identifier. Observe the EXEC key illuminates.

EXEC key ...................................................................................... Push

Data previously entered is deleted. Observe NAV DATA page displayed with prompts.

## Entering a Crossing Radial (Bearing) or Distance from a Fix as a Route Waypoint

FIX INFO page ............................................................................ Select

Enter identifier of the reference waypoint (normally an off–route waypoint) onto the FIX line. Enter the desired radial or distance from the FIX on a RAD/DIS line, or line select the ABM prompt if the desired radial or distance from the FIX is perpendicular to the present route/course.

Line select the desired intersection (lines 2L–5L) into the scratch pad and observe the new created waypoint displayed as FIX/Radial/Distance.

RTE LEGS page ............................................................................ Select

Line select the new created waypoint, displayed in the scratch pad, to the desired waypoint sequence.

Repeat the above steps to define additional created waypoints as desired. Correct any ROUTE DISCONTINUITY.

EXEC key ...................................................................................... Push

Observe the MOD RTE LEGS page changes to ACT.

**Note:** These created waypoints are stored in the temporary navigation data base for one flight only.

## Entering a Lateral Offset

RTE page ...................................................................................... Select

Observe the OFFSET prompt displayed.

LATERAL OFFSET page ................................................................ Select

Observe dash prompts for OFFSET DIST.

OFFSET DIST ....................................................................Enter

Enter desired offset distance using format Lxx or Rxx for left or right offset up to 99 nm. Observe dash prompts for START WAYPOINT and END WAYPOINT.

START/END WAYPOINT ...............................................Enter

If no start/end waypoint is entered, offset will begin/end at first/last valid offset leg.

## Change SID or Runway

This entire procedure must be accomplished when a SID is used and the runway or SID is changed. This will prevent the possibility of incorrect routing or inadequate obstacle clearance.

DEPARTURES page ..................................................... Select

RUNWAY ..........................................................................Reselect

SID ..................................................................................Reselect

TRANSITION (if required) .........................................Reselect

RTE LEGS page ............................................................. Select

WAYPOINT SEQUENCE and ALTITUDES ....................Check

Modify as necessary to agree with clearance.

EXEC key ........................................................................ Push

## Change STAR, PROF DES, or APP

The associated airport must be entered as route origin or destination.

ARRIVAL page ............................................................... Select

STAR or PROFILE DESCENT (if required). .................... Select

TRANSITION (if required). ........................................... Select

APPROACH. ................................................................... Select

APPROACH TRANSITION (if required). ....................... Select

RTE LEGS page. ........................................................... Select

WAYPOINT SEQUENCE. .............................................CHECK

Modify as necessary to agree with clearance.

EXEC key ........................................................................ Push

## Delete Procedure Turn

DEP/ARR page .......................................................................... Select

Approach .............................................................................. Select

Reselecting same approach or selecting a new approach will remove procedure turn and select a straight in approach on the LEGS page.

EXEC key ................................................................................ Push

or

RTE LEGS page ................................................................ Select

Select last waypoint of procedure turn to scratchpad and overwrite PROC TURN line. Check waypoint sequencing to comply with clearance.

EXEC key ................................................................................ Push

## Other Operations

### FMC Navigation Check

Do the following as needed to ensure navigation accuracy if any alerting message listed below is shown in the scratch pad or course deviation is suspected:

- GPS-L INVALID and GPS-R INVALID (both)
- IRS-L DRIFT
- IRS-R DRIFT
- UNABLE REQD NAV PERF - RNP
- VERIFY POS: FMC-FMC
- VERIFY POS: FMC-GPS
- VERIFY POS: FMC-RADIO
- VERIFY POS: IRS-FMC
- VERIFY POS: IRS-IRS
- VERIFY POS: IRS-RADIO

Actual position .................... Determine and compare with FMC position

Determine actual airplane position using raw data from VHF navigation or ADF radios.

If radio navaids are unavailable:

FMC position ............................... Compare with the IRS position

Use the POS SHIFT page of the FMC CDU. If the two IRS positions are in agreement and the FMC position is significantly different, the FMC position is probably unreliable. The POS SHIFT page may be used to shift FMC position to one of the IRS positions. This is accomplished by line selecting the IRS or radio position and then pressing the EXEC Key.

Actual position ....... Confirm with ATC radar or visual reference points.

Navigate using most accurate information available (continue to monitor FMC position using VOR/ADF raw data displays on non–flying pilot's navigation display).

**CAUTION: Navigating in LNAV mode with an unreliable FMC position may result in significant navigation errors.**

Navigate by conventional VOR/ADF procedures, radar vectors from ATC, dead reckoning from last known position, and/or use of visual references.

## Inhibiting VOR/DME Use for Position Updating

**Note:** This procedure inhibits the use of VOR/DME information for FMC position updating. Use DEL key to remove a VOR/DME from inhibit status.

PROG page ........................................................................... Select

Observe NAV STATUS prompt displayed.

NAV STATUS page ................................................................... Select

NAV OPTIONS page .................................. Select (NEXT/PREV page)

Observe dash prompts for VOR/DME INHIBIT. Enter desired VOR/DME identifier (a previous entry may be overwritten but will no longer be inhibited).

## Inhibiting GPS Updating

**Note:** Inhibit GPS updates for approach operations that are not based on WGS-84, unless other appropriate procedures are used.

PROG page ........................................................................... Select

Observe NAV STATUS prompt displayed.

NAV STATUS page ........................................................................ Select

NAV OPTIONS page .................................. Select (NEXT/PREV page)

GPS UPDATE ............................................................................ OFF

# Vertical Navigation (VNAV)

## Temporary Level Off during Climb or Descent (Not at FMC Cruise Altitude)

MCP altitude selector ............................................. Set desired altitude

Verify VNAV ALT is annunciated on the flight mode annunciator when leveling at the selected MCP altitude.

MCP N1 light extinguishes if leveling from a climb.

N1 limit changes to CRZ if leveling from a climb.

To continue climb or descent:

MCP altitude selector .................................... Set desired altitude

ALT INTV switch .................................................................. Push

Climb or descent is initiated. Mode annunciations appear as initial climb or descent.

## Intervention of FMC Altitude Constraints during VNAV Climb

MCP altitude selector ................................................. Set new altitude

New altitude must be higher than the FMC altitude constraint(s) to be deleted.

ALT INTV switch ........................................................................ Push

Each push of the ALT INTV switch will delete an FMC altitude constraint.

## Intervention of FMC Cruise Altitude during VNAV Cruise

MCP altitude selector ..................................................................... Set

ALT INTV switch ........................................................................ Push

If a higher altitude is selected, a CRZ climb will be initiated.

If the airplane is more than 50 nm from T/D, if a lower altitude is selected, a CRZ descent will be started if the selected altitude is at or above any FMC altitude constraint.

If the airplane is more than 50 nm from T/D, if a lower altitude is selected, an early descent will be started if the selected altitude is below any FMC altitude constraint.

If the airplane is 50 nm or less from T/D, if a lower altitude is selected, an early descent will be started.

## Intervention of FMC Altitude Constraints during VNAV Descent

MCP altitude selector .................................................... Set new altitude

New altitude must be lower than the FMC altitude constant (s) to be deleted.

ALT INTV switch ........................................................................ Push

Each push of the ALT INTV switch will delete an FMC altitude constraint.

If all FMC altitude constraints are deleted, the descent mode will revert to a VNAV speed descent.

## Intervention of FMC Airspeed Constraints during VNAV

SPD INTV switch ........................................................................ Push

MCP IAS/MACH display shows current FMC target speed.

MCP speed selector .................................................... Set desired speed

VNAV remains engaged.

To resume former FMC speed:

SPD INTV switch ................................................................. Push

MCP IAS/MACH display blanks and FMC commanded VNAV speed is active.

## Entering Waypoint Speed and Altitude Restriction (On Climb or Descent Legs Only)

RTE LEGS page ......................................................................... Select

Key–in desired speed and altitude, or speed only (followed by /), or altitude only, into scratch pad.

An altitude followed by A or B signifies a requirement to be “at or above” or “at or below” that altitude at the waypoint (for example, key–in 220A or 240B).

Line select to desired waypoint line.

EXEC key ........................................................................................ Push

Observe MOD RTE LEGS page changes to ACT.

**Note:** This changes any prior speed and altitude restriction at this waypoint.

## Deleting Waypoint Speed and Altitude Restriction

RTE LEGS page ........................................................................... Select

Push DEL key to enter DELETE in scratch pad. Line select to appropriate waypoint line.

EXEC key ........................................................................................ Push

Observe MOD RTE LEGS page changes to ACT and restriction is deleted and replaced with an FMC predicted value (small size characters).

## Changing Speed and/or Altitude Restriction during Climb or Descent

CLB/DES page ............................................................................. Select

Push DEL key to enter DELETE in the scratch pad, or key–in the desired speed and altitude in the scratch pad. Line select to the SPD REST line.

EXEC key ........................................................................................ Push

Observe the MOD CLB or the MOD DES page changes to ACT and the restriction is changed or deleted.

## Changing Climb/Cruise/Descent Speed Schedule

CLB/CRZ/DES page ..................................................................... Select

Select the prompt for the desired climb/cruise/descent schedule, or key–in the desired speed in the scratch pad and line select to the TGT SPD line.

EXEC key ........................................................................... Push

Observe the MOD CLB, MOD CRZ, or MOD DES page changes to ACT and new speed schedule is specified.

## Early Descent

MCP altitude selector ........................................................................ Set

Set next level–off altitude.

DES page ........................................................................... Select

Line select DES NOW prompt.

EXEC key ........................................................................... Push

Observe MOD DES page changes to ACT. Observe descent is initiated (if VNAV engaged).

**Note:** For a PATH DES, this will result in a 1000 FPM rate of descent until the planned path is intercepted. For a SPD DES, this will result in an idle thrust normal rate of descent.

## Step Climb or Descent from Cruise

MCP altitude selector ........................................................................ Set

Set new level–off altitude.

FLT ALT indicator ........................................................................ Set

Set new level–off altitude.

CRZ page ........................................................................... Select

Enter new altitude on the CRZ ALT line. The display changes to MOD CRZ CLB or MOD CRZ DES.

If the desired climb/descent speed is different from the displayed cruise speed, manually enter the desired TGT SPD, or use access prompts to select desired CLB/DES page.

EXEC key ........................................................................... Push

Observe the MOD CRZ CLB/MOD CRZ DES page (or other selected MOD CLB/MOD DES page) changes to ACT. Observe climb/descent is initiated at the TGT SPD (if VNAV engaged).

## Performance and Progress Functions

## Determining ETA and Fuel Remaining for New Destination

RTE page ........................................................................................ Select

Enter the new destination over the original DEST. Enter correct routing to the new destination using RTE, RTE LEGS, and ARRIVALS pages, as appropriate. Correct any ROUTE DISCONTINUITY.

PROGRESS page ......................................................................... Select

Observe new destination with a MOD title. Check ETA and FUEL remaining.

RTE page ........................................................................................ Select

EXEC or ERASE the new destination/routing, as desired. Observe MOD RTE page changes to ACT.

## Estimated Wind Entries for Cruise Waypoints

RTE LEGS page ........................................................................... Select

Observe the DATA prompt displayed.

RTE DATA page ........................................................................... Select

Enter the estimated true wind direction/speed on the appropriate line(s).

## Step Climb Evaluation

CRZ page ....................................................................................... Select

Enter the desired step climb altitude on the STEP line. If known, enter the estimated average true wind direction/speed for the desired step climb altitude on the ACTUAL WIND line.

Step climb savings ................................................................ Determine

Observe the fuel SAVINGS/PENALTY and FUEL AT ______ (destination) lines to determine if a higher cruise altitude is advantageous.

If step climb fuel savings are significant, use the appropriate climb procedure to initiate climb to the higher altitude when NOW is displayed on STEP POINT line.

**Note:** Step climb evaluations do not consider buffet margin limits. If the altitude entered for the step climb evaluation is higher than the maximum altitude for flight with an adequate buffet margin, the message “MAX ALT FLXXX” will be displayed in the scratch pad. Ensure the new cruise altitude entered for the climb is at or below the MAX ALT displayed in the message in order to maintain a safe buffet margin.

## Entering Descent Forecasts

DES page ........................................................................................ Select

Observe FORECAST prompt displayed.

DES FORECASTS page ................................................................ Select

Verify the TRANS LVL and revise if required. Enter average ISA DEV forecast for descent and destination QNH. Enter forecast descent WINDs (for up to three different altitudes).

EXEC key ........................................................................................ Push

Observe MOD DES FORECASTS page changes to ACT.

## Engine Out

Engine out climb and cruise pages provide advisory information for engine out operation. Refer to section 11.41 and 11.42 for a complete description of ENG OUT CLB and ENG OUT CRZ pages.

# Required Time of Arrival (RTA)

**Note:** An active FMC flight plan complete with all performance data must exist before the required time of arrival (RTA) mode can be used.

## Entering an RTA Waypoint and Time

RTA PROGRESS page .................................................................. Select

On PROGRESS page 2, line 1L, enter the flight plan waypoint where required time of arrival is applicable. Observe the MOD RTA PROGRESS page displayed with the computed ETA, for the entered waypoint, displayed in line 1R.

RTA .................................................................................................. Enter

Enter required time of arrival into line 1R. Time should be entered in hours, minutes, and seconds (Examples: 174530, 1745, 1745.5). Observe MOD RTA PROGRESS page displayed with pertinent data for complying with entered RTA. Observe EXEC key illuminated.

EXEC key ......................................................................................... Push

Observe ACT RTA PROGRESS page displayed.

## Entering Speed Restrictions for RTA Navigation

PERF LIMITS page ........................................................................ Select

Enter minimum or maximum speed restriction for RTA navigation in lines 2, 3, or 4 depending on phase of flight. Observe RTA parameters change to reflect new limits (RTA PROGRESS page) and EXEC key illuminated.

EXEC key ......................................................................................... Push

Observe MOD PERF LIMITS page change to ACT PERF LIMITS page.

**Note:** Entered restrictions on line 2, 3, and 4 also restrict other navigation modes such as ECON.

## Entering New Time Error Tolerances for RTA Navigation

PERF LIMITS page ........................................................... Select

Enter desired time error tolerance (5 to 30 seconds) for the RTA waypoint on line 1L (Example: 25). Observe MOD PERF LIMITS page displayed and EXEC key illuminated.

EXEC key ........................................................................ Push

Observe ACT PERF LIMITS page displayed.

## Additional CDU Functions

## Navigation Display Plan Mode (Center Step Operation)

EFIS Control Panel Mode Selector ...............................................PLAN

RTE LEGS page ............................................................... Select

EFIS Control Panel Range Selector ..................................... As required

MAP CTR STEP key ........................................................... Push

Each push moves the CTR label to the next geographically fixed waypoint in the route. Selecting PREV PAGE or NEXT PAGE moves the CTR label to the first geographically fixed waypoint on the new page.

EFIS Control Panel Mode Selector ...................................... As required

## Enter Position Shift on Runway

**1K002, 1K003**

TAKEOFF REF page ........................................................... Select

RWY REMAIN distance ......................................................Enter

Enter runway remaining distance. When TO/GA is pushed, FMC will update to the runway remaining distance.

If position shift must be removed

RTE page............................................................................ Select

RWY ................................................................................ Enter

Reenter runway on RTE page. Check and reenter other performance data as required.

## Fuel Balancing

If an engine fuel leak is suspected:

Accomplish the Fuel Leak Engine checklist.

If the fuel IMBAL alert shows:

Accomplish the IMBAL checklist.

Maintain main tank No. 1 and No. 2 fuel balance within limitations.

**Note:** Fuel pump pressure should be supplied to the engines at all times. At high altitude, without fuel pump pressure, thrust deterioration or engine flameout may occur.

**If** the center tank contains fuel:

Center tank fuel pump switches .......................................... OFF

[Fuel CONFIG indication may be displayed with fuel in the center tank.]

Crossfeed selector .................................................................Open

Fuel pump switches (low tank) ........................................... OFF

When quantities are balanced:

Fuel pump switches (main tank) ....................................ON

Center tank fuel pump switches .....................................ON

Crossfeed selector .......................................................Close

**If** the center tank contains no fuel:

Crossfeed selector .................................................................Open

Fuel pump switches (low tank) ........................................... OFF

When quantities are balanced:

Fuel pump switches ........................................................ON

Crossfeed selector .......................................................Close

# Refueling

## Fuel Load Distribution

Main tanks No. 1 and No. 2 should normally be serviced equally until full. Additional fuel is loaded into the center tank until the desired fuel load is reached.

**Note:** Main tanks No. 1 and No. 2 must be scheduled to be full if the center tank contains more than 453 kgs of fuel. With less than 453 kgs of center tank fuel, partial main tank fuel may be loaded provided the effects of balance have been considered.

## Fuel Pressure

Apply from a truck or fuel pit. A nozzle pressure of 50 psi provides approximately 1136 liters per minute.

## Normal Refueling

**1B392, 1J022, 1J023, 1L075 - 1L078**

When a full fuel load is required, the fuel shutoff system closes the fueling valves automatically when the tanks are full. When a partial fuel load is required, the fuel shutoff system closes the fueling valves automatically when the quantity preselected on the fuel quantity selector (located on the test gauges and fueling panel) is reached.

**1C845, 1J103 - 1K002**

When a full fuel load is required, the fuel shutoff system closes the fueling valves automatically when the tanks are full. When a partial fuel load is required, the fuel quantity indicators are monitored and the fueling valves are closed by manually positioning the fueling valve switches to CLOSED when the desired fuel quantity is aboard the airplane.

## Refueling with Battery Only

When the APU is inoperative and external power is not available, refueling can be accomplished as follows:

Battery switch ........................................................................ ON

**Note:** The refueling system will operate normally. Operation is limited only by battery life.

## Refueling with No AC or DC Power Source Available

When it becomes necessary to refuel with the APU inoperative, the aircraft battery depleted, and no external power source available, refueling can still be accomplished:

Fueling hose nozzle .............. Attached to the refueling receptacle

Fueling valves ............................Open for the tanks to be refueled

**Note:** Main tanks No. 1 and No. 2, and the center tank refueling valves each have a red override button that must be pressed and held while fuel is being pumped into the tank. Releasing the override button allows the spring in the valve to close the valve.

Caution must be observed not to overfill a tank, since there is no automatic fuel shutoff during manual operation. When the desired amount of fuel has been pumped into the tanks, the refueling valves for the respective tanks can be released.

## Ground Transfer of Fuel

Fuel can be transferred from one tank to another tank using the fuel pumps, fueling valve, defueling valve, and crossfeed valve. AC power must be available.

**Note:** Before transferring fuel, ensure that the associated FUEL PUMP LOW PRESSURE lights are operating.

**CAUTION: Transferring fuel with passengers onboard is prohibited, unless the fuel quantity in the tank from which fuel is being taken is maintained at or above 2000 pounds/900 kilograms.**

To transfer fuel from the main tanks to the center tank:

Main tank fuel pump switches ..................................................ON

Crossfeed selector ..................................................................Open

Manual defueling valve ...........................................................Open

Center tank fueling valve switch ..........................................OPEN

Fuel transfer ........................................................................Monitor

The center tank fuel quantity indicator shows an increase in fuel. The main tank indicators show a decrease in fuel.

When a FUEL PUMP LOW PRESSURE light illuminates, turn OFF the associated fuel pump.

When the required amount of fuel has been transferred:

Center tank fueling valve switch .................................. CLOSED

Manual defueling valve ..................................................................Close

Crossfeed selector ..........................................................................Close

Main tank fuel pump switches ..........................................................OFF

Main Tanks ......................................................................................Refill

Refueling panel and defuel panel access doors ...............................Close

## Fuel Crossfeed Valve Check

Crossfeed selector ..........................................................................Open

Verify crossfeed VALVE OPEN light illuminates bright and then dim.

Crossfeed selector ..........................................................................Close

Verify crossfeed VALVE OPEN light illuminates bright and then extinguishes.

## Ground Proximity Warning System (GPWS) and Runway Awareness and Advisory System (RAAS) Test

### 1K002

Verify IRS alignment is complete.

Verify that the guards are closed for all GROUND PROXIMITY INHIBIT switches.

Ground proximity SYS TEST switch .......................... Push momentarily

Verify the following:

- BELOW G/S and GPWS INOP lights illuminate
- TERR FAIL and TERR TEST annunciations show on navigation displays
- PULL UP and WINDSHEAR alerts illuminate
- “GLIDESLOPE”, “PULL UP” and “WINDSHEAR" aurals sound
- “TERRAIN TERRAIN PULLUP" aural sounds
- terrain display test pattern shows on navigation displays
- TERRAIN caution message shows on navigation displays
- "OBSTACLE OBSTACLE PULLUP" aural sounds

During the test the RUNWAY INOP light illuminates and one of the following aurals will announce the status of the RAAS system:

- RUNWAY AWARENESS OK - FEET
- RUNWAY AWARENESS NOT AVAILABLE
- RUNWAY AWARENESS INOP
- "AIRSPEED LOW" aural sounds

**Note:** If the test switch is held until the aurals begin, additional GPWS aural warnings are tested.

## Ground Proximity Warning System (GPWS), Overrun Warning (ORW) System, and Runway Awareness and Advisory System (RAAS) Test

Verify IRS alignment is complete.

Verify that the guards are closed for all GROUND PROXIMITY INHIBIT switches.

Ground proximity SYS TEST switch .......................... Push momentarily

Verify the following:
- BELOW G/S and GPWS INOP lights illuminate
- TERR FAIL and TERR TEST annunciations show on navigation displays
- PULL UP and WINDSHEAR alerts illuminate
- "GLIDESLOPE", "PULL UP" and "WINDSHEAR" aurals sound
- "TERRAIN TERRAIN PULLUP" aural sounds
- terrain display test pattern shows on navigation displays
- TERRAIN caution message shows on navigation displays
- "OBSTACLE OBSTACLE PULLUP" aural sounds

During the test the RUNWAY INOP light illuminates and one of the following aurals will announce the status of the ORW and RAAS system:
- RUNWAY AWARENESS OK - FEET
- RUNWAY AWARENESS NOT AVAILABLE
- RUNWAY AWARENESS INOP
- "AIRSPEED LOW" aural sounds

**Note:** If the test switch is held until the aurals begin, additional GPWS aural warnings are tested.

## Runway Awareness and Advisory System (RAAS) Inhibit Operation

### 1K002

If one or more of the following exist:
- The airport or runway is not in the GPWS database
- A NOTAM applies to the intended runway
- Airline policy prohibits the use of RAAS for an airport or runway.

RUNWAY INHIBIT switch ........................................... INHIBIT

**Note:** If the RUNWAY INHIBIT switch is in the INHIBIT position, and the airspeed is 250 knots or greater for 60 seconds or more, the RUNWAY INOP light illuminates. The RUNWAY INOP light extinguishes when airspeed is below 250 knots.

After takeoff, if RAAS use is allowed at the destination:

RUNWAY INHIBIT switch ............................................... NORM

## Overrun Warning (ORW) System and Runway Awareness and Advisory System (RAAS) Inhibit Operation

Before departure if one or more of the following exist:

- The airport or runway is not in the GPWS database
- A NOTAM applies to the intended runway
- Airline policy prohibits the use of RAAS for an airport or runway.

RUNWAY INHIBIT switch ............................................INHIBIT

**Note:** If the RUNWAY INHIBIT switch is in the INHIBIT position, and the airspeed is 250 knots or greater for 60 seconds or more, the RUNWAY INOP light illuminates. The RUNWAY INOP light extinguishes when airspeed is below 250 knots.

After takeoff:

RUNWAY INHIBIT switch .............................................. NORM

Before approach if one or more of the following exist or are planned:

- The airport is not in the GPWS database
- A NOTAM applies to the intended runway
- Airline policy prohibits the use of ORW for an airport or runway.
- Conducting Land and Hold Short Operations (LAHSO).
- Conducting Touch and Go landings
- Landing altitude is above 10,000 feet pressure altitude
- Landing OAT on the ground is below -40°C or greater than +50°C
- Gross weight is greater than maximum landing weight.

RUNWAY INHIBIT switch ............................................INHIBIT

**Note:** If the RUNWAY INHIBIT switch is in the INHIBIT position, and the airspeed is 250 knots or greater for 60 seconds or more, the RUNWAY INOP light illuminates. The RUNWAY INOP light extinguishes when airspeed is below 250 knots.

Intentionally
Blank

## Introduction

Airplane operation in adverse weather conditions may require additional considerations due to the effects of extreme temperatures, precipitation, turbulence and windshear. Procedures in this section supplement normal procedures and should be observed when applicable.

## Takeoff - Wet or Contaminated Runway Conditions

The following information applies to takeoffs on wet or contaminated runways:

- For wet runways, reduced thrust (fixed derate, assumed temperature method, or both) is allowed provided suitable takeoff performance accountability is made for the increased stopping distance on a wet surface
- For runways contaminated by slush, snow, standing water, or ice, reduced thrust (fixed derate) is allowed provided takeoff performance accounts for the runway surface condition. Reduced thrust using assumed temperature method, whether alone or in combination with a fixed derate, is not allowed
- V1 may be reduced to minimum V1 to provide increased stopping margin provided the field length required for a continued takeoff from the minimum V1 and obstacle clearance meet the regulatory requirements. The determination of such minimum V1 may require a real-time performance calculation tool or other performance information supplied by dispatch
- Takeoffs are not recommended when slush, wet snow, or standing water depth is more than 1/2 inch (13 mm) or dry snow depth is more than 4 inches (102 mm).

## Cold Weather Operations

Considerations associated with cold weather operation are primarily concerned with low temperatures and with ice, snow, slush and standing water on the airplane, ramps, taxiways, and runways.

Icing conditions exist when OAT (on the ground) or TAT (in flight) is 10°C or below and any of the following exist:

- visible moisture (clouds, fog with visibility of one statute mile (1600m) or less, rain, snow, sleet, ice crystals, and so on) is present, or
- ice, snow, slush or standing water is present on the ramps, taxiways, or runways.

**CAUTION: Do not use engine or wing anti–ice when OAT (on the ground) or TAT (in flight) is above 10°C.**

## Exterior Inspection

Although removal of surface snow, ice and frost is normally a maintenance function, during preflight procedures, the captain or first officer should carefully inspect areas where surface snow, ice or frost could change or affect normal system operations.

Do the normal Exterior Inspection with the following additional steps:

Surfaces ........................................ Check

Takeoff with light coatings of frost, up to 1/8 inch (3 mm) in thickness, on lower wing surfaces due to cold fuel is allowable; however, all leading edge devices, all control surfaces, tab surfaces, upper wing surfaces, winglet surfaces and control surface balance panel cavities must be free of snow, ice and frost.

Thin hoarfrost is acceptable on the upper surface of the fuselage provided all vents and ports are clear. Thin hoarfrost is a uniform white deposit of fine crystalline texture, which usually occurs on exposed surfaces on a cold and cloudless night, and which is thin enough to distinguish surface features underneath, such as paint lines, markings or lettering.

Control surface balance panel cavities ........................................ Check

Check drainage after snow removal. Puddled water may freeze in flight.

Pitot probes and static ports ........................................ Check

Verify that all pitot probes and static ports free of snow and ice. Water rundown after snow removal may freeze immediately forward of static ports and cause an ice buildup which disturbs airflow over the static ports resulting in erroneous static readings even when static ports are clear.

Air conditioning inlets and exits .................................................. Check

Verify that the air inlets and exits, including the outflow valve, are free of snow and ice.

If the APU is operating, verify that the outflow valve is fully open.

Engine inlets .......................................................................... Check

Verify that the inlet cowling is free of snow and ice.

Verify that the fan is free to rotate.

Snow or ice that accumulates on the fan spinner or fan blades during extended shutdown periods must be removed by maintenance or other means before engine start.

Snow or ice that accumulates on the fan spinner or fan blades as a result of operation in icing conditions, such as during approach or taxi in, is allowed if the fan is free to rotate and the snow or ice is removed using the ice shedding procedure during taxi out and before setting takeoff thrust.

Fuel tank vents ....................................................................... Check

Verify all traces of ice and frost are removed.

Landing gear doors ................................................................. Check

Landing gear doors should be free of snow and ice.

APU air inlets ........................................................................ Check

The APU inlet door and cooling air inlet must be free of snow and ice before APU start.

## Preflight Procedure - First Officer

Do the following step after completing the normal Preflight Procedure - First Officer:

PROBE HEAT switches ..........................................................ON

Verify that all probe heat lights are extinguished.

## Engine Start Procedure

Do the normal Engine Start Procedure with the following modifications:

- If the engine has been cold soaked for one or more hours at ambient temperatures below -40°C, do not start or motor the engine. Maintenance personnel should do appropriate procedures for adverse weather heating of the Hydro-Mechanical Unit.
- If the engine has been cold soaked for three or more hours at ambient temperatures below -40°C, do not start or motor the engine. Maintenance personnel should do appropriate procedures for adverse weather starter servicing.
- Several minutes may be needed for oil pressure to reach the normal operating pressure. During this period, oil pressure may go above the normal range and the OIL FILTER BYPASS light may illuminate. Operate the engine at idle thrust until oil pressure returns to the normal range.
- If the oil pressure remains above the normal range after the oil temperature has stabilized within limits, shut down the engine.
- Display units may require additional warm-up time before displayed engine indications accurately show changing values. Display units may appear less bright than normal.

## Engine Anti-ice Operation - On the Ground

Engine anti-ice must be selected ON immediately after both engines are started and remain on during all ground operations when icing conditions exist or are anticipated.

**WARNING: Do not rely on airframe visual icing cues before activating engine anti-ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.**

**CAUTION: Do not use engine anti-ice when OAT is above 10°C.**

When engine anti-ice is needed:

ENGINE START switches .............................. CONT F/O

ENGINE ANTI-ICE switches .............................. ON F/O

Verify that the COWL ANTI-ICE lights are extinguished.

**Note:** If the COWL VALVE lights remain illuminated amber with engines at IDLE, do the following:

- verify APU BLEED air switch is in the OFF position,
- verify ISOLATION VALVE switch is in the AUTO position,
- check that the area around the airplane is clear, and
- increase thrust slightly (up to a maximum of 30% N1).

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE switches ............................ OFF F/O

## Wing Anti-ice Operation - On the Ground

Use wing anti-ice during all ground operations between engine start and takeoff when icing conditions exist or are anticipated, unless the airplane is, or will be protected by the application of Type II or Type IV fluid in compliance with an approved ground de-icing program.

**WARNING: Do not use wing anti-ice as an alternative for ground de-icing/anti-icing. Close inspection is still needed to ensure that no frost, snow or ice is adhering to the wing, leading edge devices, stabilizer, control surfaces or other critical airplane components at takeoff.**

**CAUTION: Do not use wing anti–ice when OAT is above 10°C.**

When wing anti-ice is needed:

WING ANTI-ICE switch ..................................... ON F/O

When wing anti-ice is no longer needed:

WING ANTI-ICE switch ................................... OFF F/O

## Before Taxi Procedure

Do the normal Before Taxi Procedure with the following modifications:

GENERATOR 1 and 2 switches ..................................... ON F/O

Normally the IDG’s stabilize within one minute, although due to cold oil, up to five minutes can be needed to produce steady power.

If there is snow or ice accumulation on the wing, consider delaying the flight control check until after de-icing/anti-icing is accomplished.

Flight controls .......................................................... Check C

An increase in control forces can be expected at low temperatures.

**CAUTION: The flap position indicator and the leading edge devices annunciator panel should be closely observed for positive movement. If the flaps should stop, the flap lever should be placed immediately in the same position as indicated.**

If taxi route is through ice, snow, slush or standing water in low temperatures or if precipitation is falling with temperatures below freezing, taxi out with the flaps up. Taxiing with the flaps extended subjects the flaps and flap drives to contamination. Leading edge devices are also susceptible to slush accumulations.

Call “FLAPS ___” as needed. C

Flap lever............................................... Set flaps, as needed F/O

## Taxi–Out

**CAUTION: Taxi at a reduced speed. Use smaller nose wheel steering wheel and rudder inputs and apply minimum thrust smoothly. Differential thrust may be used to help maintain airplane momentum during turns. At all other times, apply thrust evenly. Taxiing on slippery taxiways or runways at excessive speed or with high crosswinds may start a skid.**

**CAUTION: When operating the engines over significant amounts of standing de-icing or anti-icing fluid, limit thrust to the minimum required. Excessive ingestion of de-icing or anti-icing fluid can cause the fluid to build up on the engine compressor blades resulting in compressor stalls and engine surges.**

When engine anti-ice is required and the OAT is 3°C or below, or if increased fan vibration due to fan ice accumulation is present, do an engine run up to minimize ice build-up. Use the following procedure:

Check that the area behind the airplane is clear. C

Increase thrust to a minimum of 50% N1 then decrease thrust to idle. Repeat as necessary or at intervals no greater than 60 minutes. C

**Note:** Fan blade ice build-up is cumulative. If the fan spinner and fan blades were not deiced prior to taxi out, the time the engines were operating during the taxi in should be included in the 60 minute interval.

**Note:** Engine vibration may indicate above the normal operating range up to the maximum display value during ice shedding, however, this will have no adverse effect on the engine.

Within 5 minutes of or in conjunction with the takeoff

Check that the area behind the airplane is clear. PF

Run-up to a minimum of 50% N1 for a minimum of 5 seconds. PF

Confirm stable engine operation prior to setting takeoff thrust. PF, PM

**Note:** Engine vibration may indicate above the normal operating range up to the maximum display value during ice shedding, however, this will have no adverse effect on the engine.

## De-icing/Anti-icing

Testing of undiluted de-icing/anti-icing fluids has shown that some of the fluid remains on the wing during takeoff rotation and initial climb. The residual fluid causes a temporary decrease in lift and increase in drag, however, the effects are temporary. Use the normal takeoff rotation rate.

**CAUTION: Operate the APU during de-icing only if necessary. If the APU is running, ingestion of de-icing fluid causes objectionable fumes and odors to enter the airplane. Ingestion of snow, slush, ice, or de-icing/anti-icing fluid can also cause damage to the APU.**

If de-icing/anti-icing is needed:

APU ........................................................ As needed F/O

The APU should be shut down unless APU operation is necessary.

Call “FLAPS UP”. C

Flaps ................................................................ UP F/O

Prevents ice and slush from accumulating in flap cavities during de-icing.

Thrust levers ........................................................ Idle C

Reduces the possibility of injury to personnel at inlet or exhaust areas.

**WARNING: Ensure that the stabilizer trim wheel handles are stowed before using electric trim to avoid personal injury.**

Stabilizer trim ........................................ ___ UNITS C

Set the trim for takeoff.

Verify that the trim is in the green band.

Engine BLEED air switches ................................ OFF F/O

Reduces the possibility of fumes entering the air conditioning system.

APU BLEED air switch ...................................... OFF F/O

Reduces the possibility of fumes entering the air conditioning system.

After de-icing/anti-icing is completed:

APU ........................................................ As needed F/O

**CAUTION: After de-icing, the use of APU bleed air during takeoff can cause smoke in the airplane.**

APU BLEED air switch ............................ As needed F/O

Wait approximately one minute after de-icing is completed to turn engine BLEED air switches on to ensure all de-icing fluid has been cleared from the engines:

Engine BLEED air switches .......................... ON F/O

Flight controls ................................ Check, as needed C

An increase in control forces can be expected at low temperatures.

## Before Takeoff Procedure

Do the normal Before Takeoff Procedure with the following modifications:

Call “FLAPS ___” as needed for takeoff. PF

Flap lever ................................. Set takeoff flaps, as needed PM

Extend the flaps to the takeoff setting at this time if they have been held because of slush, or standing water, or icing conditions, or because of exterior de-icing/anti-icing.

Verify that the LE FLAPS EXT green light is illuminated.

Before setting takeoff thrust, verify that the engine oil temperature is at or above 31°C. The table below provides the approximate time needed for a cold soaked engine to reach an oil temperature of 31°C with engines operating at idle thrust.

| Ambient Temperature | Approximate Idle Time |
|---|---|
| 0°C | 3 minutes |
| -7°C | 4 minutes |
| -18°C | 6 minutes |
| -32°C | 8 minutes |
| -40°C | 9 minutes |
| -54°C | 10 minutes |

## Takeoff Procedure

Do the normal Takeoff Procedure with the following modification when engine anti-ice is needed and the OAT is 3°C or below:

Within 5 minutes of or in conjunction with the takeoff:

Check that the area behind the airplane is clear.

Run-up to a minimum of 50% N1 for a minimum of 5 seconds.

Confirm stable engine operation prior to the final advance to takeoff thrust.

**Note:** Engine vibration may indicate above the normal operating range up to the maximum display value during ice shedding, however, this will have no adverse effect on the engine.

## Engine Anti-Ice Operation - In Flight

Engine anti–ice must be ON during all flight operations when icing conditions exist or are anticipated, except during climb and cruise when the temperature is below -40°C SAT. Engine anti–ice must be ON before, and during descent in all icing conditions, including temperatures below -40°C SAT.

When operating in areas of possible icing, activate engine anti–ice before entering icing conditions.

**WARNING: Do not rely on airframe visual icing cues before activating engine anti–ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.**

**CAUTION: Do not use engine anti-ice when TAT is above 10°C**

When engine anti-ice is needed:

ENGINE START switches .............................. CONT PM

ENGINE ANTI-ICE switches .............................. ON PM

Verify that the COWL ANTI-ICE lights are extinguished.

**Note:** If the COWL VALVE lights remain illuminated amber with engines at IDLE, do the following:

- verify APU BLEED air switch is in the OFF position,
- verify ISOLATION VALVE switch is in the AUTO position, and
- increase thrust slightly (up to a minimum of 30% N1).

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE switches ..............................OFF PM

ENGINE START switches ..................................OFF PM

## Fan Ice Removal

**CAUTION: Avoid prolonged operation in moderate to severe icing conditions.**

Prolonged operation in moderate to severe icing conditions can lead to fan blade/spinner icing and engine vibration. Severe icing can usually be avoided by a change in altitude and/or airspeed. If flight in moderate to severe icing conditions cannot be avoided, do the following on both engines, one engine at a time:

**Note:** Engine vibration can reduce to a low level before 80% N1 is reached, however, thrust increase must continue to a minimum of 80% N1 to remove ice from the fan blades.

**Note:** Engine vibration can indicate full scale before shedding ice, however, this has no adverse effect on the engine.

ENGINE START switches (both) .......................FLT PM

Autothrottle (if engaged) ...........................Disengage PF

Thrust ......................................................... Increase PF

Increase thrust to a minimum of 80% N1 for approximately 1 second to ensure the fan blades and spinner are clear of ice.

Thrust ...........Reduce as needed for flight conditions PF

Wait 15 seconds. This allows engine vibration level to stabilize.

If engine vibration is less than 4.0 units after thrust is reduced, repeat the above steps at approximately 15 minute intervals or sooner as needed.

Autothrottle (if needed) .................................Engage PF

If engine vibration is 4.0 units or greater after thrust is reduced, do the Engine High Vibration non-normal checklist.

## Wing Anti-ice Operation - In Flight

Ice accumulation on the flight deck window frames, windshield center post, or on the windshield wiper arm may be used as an indication of structural icing conditions and the need to turn on wing anti-ice.

In flight, the wing anti-ice system may be used as a de-icer or as an anti-icer. The primary method is to use it as a de-icer by allowing ice to accumulate before turning wing anti-ice on. This procedure provides the cleanest airfoil surface, the least possible runback ice formation, and the least thrust and fuel penalty. Normally it is not necessary to shed ice periodically unless extended flight through icing conditions is necessary (holding).

The secondary method is to use wing anti-ice before ice accumulation. Operate the wing anti-ice system as an anti-icer only during extended operations in moderate or severe icing conditions, such as holding.

**CAUTION: Do not use wing anti-ice when TAT is above 10°C.**

**CAUTION: Use of wing anti-ice above approximately FL350 may cause bleed trip off and possible loss of cabin pressure.**

**Note:** Prolonged operation in icing conditions with the leading edge and trailing edge flaps extended is not recommended. Holding in icing conditions with flaps extended is prohibited.

When wing anti-ice is needed:

WING ANTI-ICE switch ..................................... ON PM

When wing anti-ice is no longer needed:

WING ANTI-ICE switch ....................................OFF PM

## Cold Temperature Altitude Corrections

Extremely low temperatures create significant altimeter errors and greater potential for reduced terrain clearance. When the temperature is colder than ISA, true altitude will be lower than indicated altitude. Altimeter errors become significantly larger when the surface temperature approaches -30°C or colder, and also become larger with increasing height above the altimeter reference source.

Apply the altitude correction table when needed:

- apply corrections to all published minimum departure, en route and approach altitudes, including missed approach altitudes, according to the table below. Advise ATC of the corrections.
- MDA/DA settings should be set at the corrected minimum altitudes for the approach.
- corrections apply to QNH and QFE operations.

To determine the correction from the Altitude Correction Table:

- subtract the elevation of the altimeter barometric reference setting source (normally the departure or destination airport elevation) from the published minimum altitude to be flown to determine “height above altimeter reference source”
- enter the table with Airport Temperature and with “height above altimeter reference source”. Read the correction where these two entries intersect. Add the correction to the published minimum altitude to be flown to determine the corrected indicated altitude to be flown. To correct an altitude above the altitude in the last column, use linear extrapolation (e.g., to correct 6000 feet or 1800 meters, use twice the correction for 3000 feet or 900 meters, respectively.) The corrected altitude must always be greater than the published minimum altitude
- if the corrected indicated altitude to be flown is between 100 foot increments, set the MCP altitude to the closest 100 foot increment above the corrected indicated altitude to be flown
- do not correct altimeter barometric reference settings

An altitude correction due to cold temperature is not needed for the following conditions:

- while under ATC radar vectors
- when maintaining an ATC assigned flight level (FL)
- when the reported airport temperature is above 0°C.

## Altitude Correction Table (Heights and Altitudes in Feet)

| Airport Temp °C | Height Above Altimeter Reference Source | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 200 feet | 300 feet | 400 feet | 500 feet | 600 feet | 700 feet | 800 feet | 900 feet | 1000 feet | 1500 feet | 2000 feet | 3000 feet |
| 0° | 20 | 20 | 30 | 30 | 40 | 40 | 50 | 50 | 60 | 90 | 120 | 170 |
| -10° | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 150 | 200 | 290 |
| -20° | 30 | 50 | 60 | 70 | 90 | 100 | 120 | 130 | 140 | 210 | 280 | 420 |
| -30° | 40 | 60 | 80 | 100 | 120 | 140 | 150 | 170 | 190 | 280 | 380 | 570 |
| -40° | 50 | 80 | 100 | 120 | 150 | 170 | 190 | 220 | 240 | 360 | 480 | 720 |
| -50° | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 450 | 590 | 890 |

## Altitude Correction Table (Heights and Altitudes in Meters)

| Airport Temp °C | Height Above Altimeter Reference Source | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 60 m | 90 m | 120 m | 150 m | 180 m | 210 m | 240 m | 270 m | 300 m | 450 m | 600 m | 900 m |
| 0° | 5 | 5 | 10 | 10 | 10 | 15 | 15 | 15 | 20 | 25 | 35 | 50 |
| -10° | 10 | 10 | 15 | 15 | 20 | 20 | 25 | 30 | 30 | 45 | 60 | 90 |
| -20° | 10 | 15 | 20 | 25 | 25 | 30 | 35 | 40 | 45 | 65 | 85 | 130 |
| -30° | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 55 | 60 | 85 | 115 | 170 |
| -40° | 15 | 25 | 30 | 40 | 45 | 50 | 60 | 65 | 75 | 110 | 145 | 220 |
| -50° | 20 | 30 | 40 | 45 | 55 | 65 | 75 | 80 | 90 | 135 | 180 | 270 |

## Approach and Landing

Use normal procedures and reference speeds.

## After Landing Procedure

**CAUTION: Taxi at a reduced speed. Use smaller nose wheel steering wheel and rudder inputs and apply minimum thrust smoothly. Differential thrust may be used to help maintain airplane momentum during turns. At all other times, apply thrust evenly. Taxiing on slippery taxiways or runways at excessive speed or with high crosswinds may start a skid.**

**CAUTION: When operating the engines over significant amounts of standing de-icing or anti-icing fluid, limit thrust to the minimum required. Excessive ingestion of de-icing or anti-icing fluid can cause the fluid to build up on the engine compressor blades resulting in compressor stalls and engine surges.**

Do the normal After Landing Procedure with the following modifications:

After prolonged operation in icing conditions with the flaps extended, or when an accumulation of airframe ice is observed, or when operating on a runway or taxiway contaminated with ice, snow, slush or standing water:

Do not retract the flaps to less than flaps 15 until the flap areas have been checked to be free of contaminants.

Engine anti-ice must be selected ON and remain on during all ground operations when icing conditions exist or are anticipated.

**WARNING: Do not rely on airframe visual icing cues before activating engine anti-ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.**

**CAUTION: Do not use engine anti-ice when OAT is above 10°C.**

When engine anti-ice is needed:

ENGINE START switches ..............................CONT F/O

ENGINE ANTI-ICE switches ..............................ON F/O

Verify that the COWL ANTI-ICE lights are extinguished.

**Note:** If the COWL VALVE lights remain illuminated amber with engines at IDLE, do the following:

- verify APU BLEED air switch is in the OFF position,
- verify ISOLATION VALVE switch is in the AUTO position, and
- increase thrust slightly (up to a maximum of 30% N1).

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE switches ............................ OFF F/O

ENGINE START switches ................................ OFF F/O

When engine anti-ice is required and the OAT is 3°C or below, or if increased fan vibration due to fan ice accumulation is present, do an engine run up to minimize ice build-up. Use the following procedure:

Check that the area behind the airplane is clear. C

Increase thrust to a minimum of 50% N1 then decrease thrust to idle. Repeat as necessary or at intervals no greater than 60 minutes. C

**Note:** Engine vibration may indicate above the normal operating range up to the maximum display value during ice shedding, however, this will have no adverse effect on the engine.

## Shutdown Procedure

Do the following step before starting the normal Shutdown Procedure:

After landing in icing conditions:

**WARNING: Ensure that the stabilizer trim wheel handles are stowed before using electric trim to avoid personal injury.**

Stabilizer trim .......................................... Set 5 units C

Prevents melting snow and ice from running into the tailcone. Excessive water in the tailcone can freeze and lock controls.

## Secure Procedure

Do the normal Secure Procedure with the following modifications:

If the airplane will be attended and warm air circulation throughout the cargo E/E compartments is desired:

**CAUTION: Do not leave the interior unattended with a pack operating and all doors closed. With the airplane in this configuration, accidental closure of the main outflow valve can cause unscheduled pressurization of the airplane.**

APU ..................................................................Start F/O

APU GENERATOR bus switches ....................... ON F/O

PACK switches ............................................. AUTO F/O

ISOLATION VALVE switch............................OPEN F/O

Pressurization mode selector ............................MAN F/O

Outflow valve switch .......................................OPEN F/O

Prevents aircraft pressurization.

**Note:** The airplane must be parked into the wind when the outflow valve is full open.

APU BLEED air switch ...................................... ON F/O

If the airplane will not be attended, or if staying overnight at off-line stations or at airports where normal support is not available, the flight crew must arrange for or verify that the following steps are done:

| | | |
|---|---|---|
| Pressurization mode selector | MAN | F/O |
| Outflow valve | CLOSE | F/O |

Position the outflow valve fully closed to inhibit the intake of snow or ice.

| | | |
|---|---|---|
| Wheel chocks | Verify in place | C or F/O |
| Parking brake | Released | C |

Reduces the possibility of frozen brakes.

Cold weather maintenance procedures for securing the airplane may be required. These procedures are normally done by maintenance personnel, and include, but are not limited to:

- protective covers and plugs installed
- water storage containers drained
- toilets drained
- doors and sliding windows closed
- batteries removed. If the batteries will be exposed to temperatures below -18°C, the batteries should be removed and stored in an area warmer than -18°C, but below 40°C. Subsequent installation of the warm batteries ensures the starting capability of the APU.

## Hot Weather Operation

During ground operation the following considerations will help keep the airplane as cool as possible:

- While the airplane is electrically powered, packs should be run or cooling air supplied to the airplane when the OAT exceeds 40° C (103° F) to protect the reliability of electrical and electronic equipment in the airplane.
- If cooling air is available from an outside source, the supply should be plugged in immediately after engine shutdown and should not be removed until just prior to engine start.
- Keep all doors and windows, including cargo doors, closed as much as possible.
- Electronic components which contribute to a high temperature level in the flight deck should be turned off while not needed.
- Open all passenger cabin gasper outlets and close all window shades on the sun–exposed side of the passenger cabin.

If these actions do not reduce cabin temperatures sufficiently:

PASSENGER CABIN temperature selector .................................................. AUTO COOL

Use of APU bleed air instead of engine bleed air to supply the packs while on the ground can significantly increase cabin cooling. If additional cooling is needed during extended ground operations:

Engine BLEED 1 air switch .................................................. OFF

Engine BLEED 2 air switch .................................................. OFF

ISOLATION VALVE switch .................................................. OPEN

APU BLEED air switch .................................................. ON

PACK switches .................................................. HIGH

Temperature selectors .................................................. AUTO COOL

Prior to takeoff:

PACK switches .................................................. AUTO

Engine BLEED 2 air switch .................................................. ON

APU BLEED air switch .................................................. OFF

Engine BLEED 1 air switch .................................................. ON

ISOLATION VALVE switch .................................................. AUTO

Temperature selectors .................................................. As needed

Brake temperature levels may be reached which can cause the wheel fuse plugs to melt and deflate the tires. Consider the following actions:

- Be aware of brake temperature buildup when operating a series of short flight sectors. The energy absorbed by the brakes from each landing is accumulative
- Extending the landing gear early during the approach provides additional cooling for tires and brakes.
- In–flight cooling time can be determined from the “Brake Cooling Schedule” in the Performance–Inflight section of the QRH.

During flight planning consider the following:

- High temperatures inflict performance penalties which must be taken into account on the ground before takeoff
- Alternate takeoff procedures (No Engine Bleed Takeoff, Improved Climb Performance, etc.)

## Moderate to Heavy Rain, Hail or Sleet

Flights should be conducted to avoid thunderstorm or hail activity. If visible moisture is present at high altitude, avoid flight over the storm cell. (Storm cells that do not produce visible moisture at high altitude can be overflown safely.) To the maximum extent possible, moderate to heavy rain, hail or sleet should also be avoided.

If moderate to heavy rain, hail or sleet is encountered or anticipated:

ENGINE START switches ................................................CONT

Autothrottle ..................................................................Disengage

Thrust Levers......................................................... Adjust Slowly

If thrust changes are necessary, move the thrust levers slowly. Avoid changing thrust lever direction until engines have stabilized at a selected setting. Maintain an increased minimum thrust setting.

IAS/MACH ..................................................Use a slower speed

Using a slower speed improves engine tolerance to heavy precipitation intake.

Consider starting the APU (if available).

## Operation in a Sandy or Dusty Environment

The main hazards of a sandy or dusty environment are erosion (especially of engine fan blades), accumulation of sand or dust on critical surfaces and blockage. The effects of sand ingestion occur predominantly during takeoff, landing and taxi operations. The adverse effects, however, can occur if the airplane's flight path was through a cloud of visible sand or dust or the airplane was parked during a sand or dust storm. Premature engine deterioration can result from sand or dust ingestion, causing increased fuel burn and reduced EGT margins.

**CAUTION: After a sandstorm, if all taxiways and runways are not carefully inspected and swept for debris before flight ops are conducted, the risk of engine damage and wear is increased.**

## Exterior Inspection

Although removal of sand and dust contaminants is primarily a maintenance function, during the exterior inspection the captain or first officer should carefully inspect areas where accumulation of sand or dust could change or affect normal system operations.

Do the normal Exterior Inspection with the following additional steps:

Windshield .................................................................................. Check

Verify that the windshield has been cleaned.

**Note:** Do not use windshield wipers for sand or dust removal. Wash deposits off with water and wipe residue off with a soft cloth.

Surfaces ....................................................................................... Check

Verify that the upper surfaces of the wings and other control surfaces are free of sand.

**CAUTION: Particular care should be taken to ensure that the fuselage and all surfaces are clean after a sand storm that occurs with a rain storm.**

Probes, sensors, ports, ram turbine doors,
vents, and drains (as applicable) .................................................. Check

Verify that the left and right ram air inlets are free of sand and dust. Verify that the cabin pressure outflow valve and both positive pressure relief valves are free of sand and dust.

Leading edge flaps ........................................................................ Check

Verify that all leading edges are undamaged.

Engine inlets .................................................................................. Check

Verify that the inlet cowling is free of sand and dust.

Verify that the fan is free to rotate and fan blades are undamaged.

Fuel tank vents .............................................................................. Check

Verify that all vents are free of sand and dust.

Landing gear .................................................................................. Check

Verify that gear struts and doors are free of sand and dust build-up.

Vertical and horizontal stabilizers .................................................. Check

Verify that all leading edges are undamaged.

APU air inlets ........................................................................ Check

Ensure that the APU inlet door and cooling air inlet are free of sand and dust before APU start.

## Preflight Procedure - First Officer

Do the normal Preflight Procedure - First Officer with the following modifications:

**Note:** Minimize the use of air conditioning, other than from a ground air conditioner, as much as possible. If the APU must be used for air conditioning, maintain a temperature as high as possible while still providing a tolerable flight deck and cabin environment.

APU BLEED air switch ................................................OFF F/O

If APU bleed air will be used and the APU is not operating:

APU switch ..................................................START F/O

**Note:** Run the APU for two full minutes before using it as a bleed air source.

Engine BLEED air switches ............................... OFF F/O

APU BLEED air switch ......................................ON F/O

## Engine Start Procedure

Do the normal Engine Start Procedure with the following modifications:

**Note:** Use a filtered ground cart for pneumatic air for engine start, if available.

ENGINE START switch .............................................GRD F/O

Verify that the N2 RPM increases. C, F/O

Motor the engine for 2 minutes to help remove contaminants.

**CAUTION: Do not apply rotational force when moving the engine start lever.**

Engine start lever ............................................ IDLE detent C

## Before Taxi Procedure

Do the normal Before Taxi Procedure with special emphasis on the following steps:

If bleed air is needed to maintain tolerable flight deck and cabin temperatures, use APU bleed air rather than engine bleed air during the taxi out. Limit APU bleed air use as much as possible to reduce sand and dust ingestion.

If APU bleed air will be used and the APU is not operating:

APU switch .................................................. START F/O

**Note:** Run the APU for two full minutes before using it as a bleed air source.

Engine BLEED air switches ............................... OFF F/O

APU BLEED air switch ..................................... ON F/O

Flight controls ........................................................... Check C

Verify that there is no increase in control forces due to sand or dust contaminants.

## Taxi–Out

Do the following, conditions permitting, to minimize sand and dust ingestion by the engines and to improve visibility during taxi:

- Use all engines during taxi and taxi at low speed. Limit ground speed to 10 knots and maintain thrust below 40% N1 whenever possible to avoid creating engine vortices during ground operations.
- Maintain a greater than normal separation from other aircraft while taxiing and avoid the ingestion of another engine's wake.
- Avoid engine overhang of unprepared surfaces.
- In the event of a crosswind during 180° turns, turn away from the wind if possible to minimize sand and dust ingestion.
- Whenever possible, avoid situations that would require the airplane to be brought to a complete stop.
- Avoid excessive braking. The presence of sand or dust will increase brake wear.

## Takeoff

Do the following to minimize sand and dust ingestion by the engines during takeoff:

- Use the maximum fixed derate and/or assumed temperature thrust reduction that meets performance requirements.
- Make an No Engine Bleed Takeoff if operations permit. If cabin and flight deck temperatures can be maintained at a tolerable temperature, consider an Unpressurized Takeoff.
- Prior to takeoff, allow sand and dust to settle.
- Do not take off into a sand or dust cloud.
- Use a rolling takeoff. Whenever possible, avoid setting high thrust at low speed.
- When visible sand and dust exist, consider delaying flap retraction until above the dust cloud, if operations permit.

## Approach

Do the following, conditions permitting, to minimize sand and dust ingestion:

- Make an No Engine Bleed Landing if operations permit. If cabin and flight deck temperatures can be maintained at a tolerable temperature, consider an Unpressurized Landing.

## Landing

Do the following to minimize sand and dust ingestion by the engines during landing:

- Use autobrakes on landing to help minimize the need for reverse thrust.
- Performance permitting, minimize the use of reverse thrust to prevent ingestion of dust and sand and to prevent reduction of visibility. Reverse thrust is most effective at high speed.

## After Landing Procedure

Do the normal After Landing Procedure with the following modifications:

If bleed air is needed to maintain tolerable flight deck and cabin temperatures, use APU bleed air rather than engine bleed air during the taxi in. Limit APU bleed air use as much as possible to reduce sand and dust ingestion.

If APU bleed air will be used and the APU is not operating:

APU switch ....................................................START PM

**Note:** Run the APU for two full minutes before using it as a bleed air source.

| | | |
|---|---|---|
| Engine BLEED air switches | OFF | PM |
| APU BLEED air switch | ON | PM |

## Taxi-In

Do the following, conditions permitting, to minimize sand and dust ingestion by the engines and to improve visibility during the taxi-in:

- Use all engines and taxi at low speed. Limit ground speed to 10 knots and maintain thrust below 40% N1 whenever possible.
- Maintain a greater than normal separation from other aircraft while taxiing and avoid the ingestion of another engine's wake.
- Avoid engine overhang of unprepared surfaces.
- In the event of a crosswind during 180° turns, turn away from the wind if possible to minimize sand and dust ingestion.
- Whenever possible, avoid situations that would require the airplane to be brought to a complete stop.
- Avoid excessive braking. The presence of sand or dust will increase brake wear.

## Secure Procedure

Do the normal Secure Procedure with the following modifications:

**CAUTION: Do not leave the interior unattended with a pack operating and all doors closed. With the main outflow valve closed, an unscheduled pressurization of the airplane may occur.**

| | | |
|---|---|---|
| PACK switches | Verify OFF | F/O |
| Pressurization mode selector | MAN | F/O |
| Outflow VALVE switch | CLOSE | F/O |

Position the outflow valve fully closed to inhibit the intake of sand or dust.

Additional procedures for securing the airplane during sandy or dusty conditions may be needed. These procedures are normally done by maintenance personnel, and include, but are not limited to:

- engine covers installed, if applicable.
- protective covers and plugs installed (streamers should be used to remind personnel to remove before flight).

- doors and sliding windows closed.
- all compartments closed.

## Turbulence

During flight in light to moderate turbulence, the autopilot and/or autothrottle may remain engaged unless performance is objectionable. Increased thrust lever activity can be expected when encountering wind, temperature changes and large pressure changes. Short–time airspeed excursions of 10 to 15 knots can be expected.

Passenger signs ........................................................................ ON

Advise passengers to fasten seat belts prior to entering areas of reported or anticipated turbulence. Instruct flight attendants to check that all passengers' seat belts are fastened.

## Severe Turbulence

Yaw Damper ........................................................................ ON

Autothrottle ........................................................................ Disengage

AUTOPILOT ........................................................................ CWS

A/P status annunciators display CWS for pitch and roll.

**Note:** If sustained trimming occurs, disengage the autopilot.

ENGINE START switches ........................................................ FLT

Thrust ........................................................................ Set

Set thrust as needed for the phase of flight. Change thrust setting only if needed to modify an unacceptable speed trend.

| PHASE OF FLIGHT | AIRSPEED |
|---|---|
| CLIMB | 280 knots or .76 Mach, whichever is lower. |

| PHASE OF FLIGHT | AIRSPEED |
|---|---|
| CRUISE | Use FMC recommended thrust settings. If the FMC is inoperative, refer to the Unreliable Airspeed page in the Performance–Inflight section of the QRH for approximate N1 settings that maintain near optimum penetration airspeed. |
| DESCENT | .76 Mach/280/250 knots, whichever is lower. If severe turbulence is encountered at altitudes below 15,000 feet and the airplane gross weight is less than the maximum landing weight, the airplane may be slowed to 250 knots in the clean configuration. |

**Note:** If an approach must be made into an area of severe turbulence, delay flap extension as long as possible. The airplane can withstand higher gust loads in the clean configuration.

## Windshear

Windshear is a change of wind speed and/or direction over a short distance along the flight path. Indications of windshear are listed in the Windshear non-normal maneuver in this manual.

### Avoidance

The flight crew should search for any clues to the presence of windshear along the intended flight path. Presence of windshear may be indicated by:
- Thunderstorm activity
- Virga (rain that evaporates before reaching the ground)
- Pilot reports
- Low level windshear alerting system (LLWAS) warnings.

Stay clear of thunderstorm cells and heavy precipitation and areas of known windshear. If the presence of windshear is confirmed, delay takeoff or do not continue an approach.

### Precautions

If windshear is suspected, be especially alert to any of the danger signals and be prepared for the possibility of an inadvertent encounter. The following precautionary actions are recommended if windshear is suspected:

#### Takeoff

- Takeoff with full rated takeoff thrust is recommended, unless the use of a fixed derate is required to meet a dispatch performance requirement
- For optimum takeoff performance, use flaps 5, 10 or 15 unless limited by obstacle clearance and/or climb gradient
- Use the longest suitable runway provided it is clear of areas of known windshear
- Consider increasing Vr speed to the performance limited gross weight rotation speed, not to exceed actual gross weight Vr + 20 knots. Set V speeds for the actual gross weight. Rotate at the adjusted (higher) rotation speed. This increased rotation speed results in an increased stall margin and meets takeoff performance requirements. If windshear is encountered at or beyond the actual gross weight Vr, do not attempt to accelerate to the increased Vr but rotate without hesitation
- Be alert for any airspeed fluctuations during takeoff and initial climb. Such fluctuations may be the first indication of windshear

- Know the all–engine initial climb pitch attitude. Rotate at the normal rate to this attitude for all non–engine failure takeoffs. Minimize reductions from the initial climb pitch attitude until terrain and obstruction clearance is assured, unless stick shaker activates
- Crew coordination and awareness are very important. Develop an awareness of normal values of airspeed, attitude, vertical speed, and airspeed buildup. Closely monitor vertical flight path instruments such as vertical speed and altimeters. The pilot monitoring should be especially aware of vertical flight path instruments and call out any deviations from normal
- Should airspeed fall below the trim airspeed, unusual control column forces may be required to maintain the desired pitch attitude. If stick shaker is encountered, reduce pitch attitude. Do not exceed the Pitch Limit Indication.

## Approach and Landing

- Use flaps 30 for landing
- Establish a stabilized approach no lower than 1000 feet above the airport to improve windshear recognition capability
- Use the most suitable runway that avoids the areas of suspected windshear and is compatible with crosswind or tailwind limitations. Use electronic or visual glidepath indications to detect flight path deviations and help with timely detection of windshear
- If the autothrottle is disengaged, or is planned to be disengaged prior to landing, add an appropriate airspeed correction (correction applied in the same manner as gust), up to a maximum of 15 knots
- Avoid large thrust reductions or trim changes in response to sudden airspeed increases as these may be followed by airspeed decreases
- Crosscheck flight director commands using vertical flight path instruments
- Crew coordination and awareness are very important, particularly at night or in marginal weather conditions. Closely monitor the vertical flight path instruments such as vertical speed, altimeters, and glideslope displacement. The pilot monitoring should call out any deviations from normal. Use of the autopilot and autothrottle for the approach may provide more monitoring and recognition time.

## Recovery

Accomplish the Windshear Escape Maneuver found in the Non–Normal Maneuvers section of the QRH.

## Ice Crystal Icing (ICI)

At temperatures below freezing near convective weather, the airplane can encounter visible moisture made up of high concentrations of small ice crystals. Ice crystals can accumulate aft of the engine fan in the engine core. Ice shedding can cause engine vibration, engine power loss and engine damage.

Ice crystals can also accumulate in the fan hub. This can cause vibration indications above 4 units. Fan ice removal procedures have no effect on fan hub icing. When clear of clouds, fan hub ice sublimates and engine vibration decreases over time. Fan hub ice can remain into descent.

Ice crystal icing is difficult to detect because ice crystals do not cause significant weather radar returns. They are often found in high concentrations above and near regions of heavy precipitation. Ice crystals do not stick to cold airplane surfaces.

Avoid ICI conditions. Flight in clouds containing high concentrations of ice crystals has been associated with engine vibration, engine power loss and engine damage.

Because these conditions can be difficult to recognize, careful preflight planning is a key component of in-flight situational awareness. When ICI is encountered or suspected, do the QRH Ice Crystal Icing NNC to mitigate the effect on the flight.

### Recognizing Ice Crystal Icing

Ice crystals are most frequently found in areas of visible moisture and above altitudes normally associated with icing conditions. Their presence can be indicated by one or more of the following:

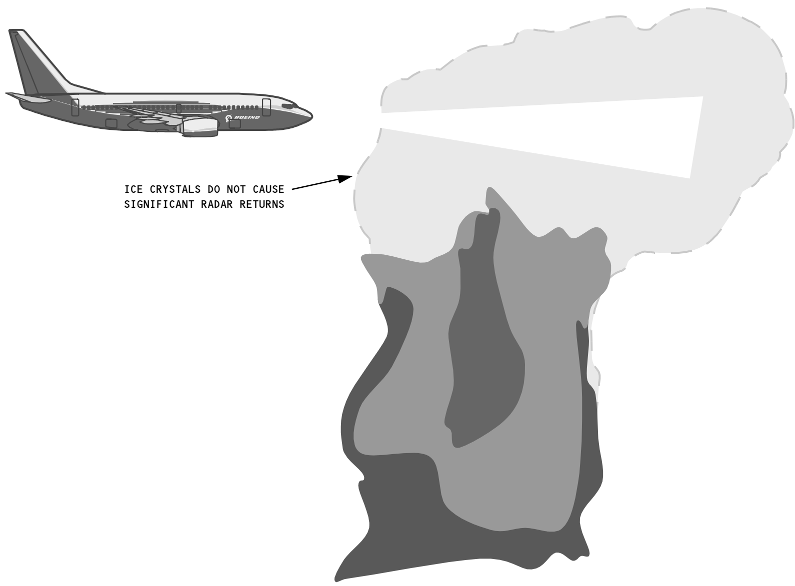
- appearance of rain on the windshield at temperatures too cold for liquid water to exist. This is due to ice crystals melting on the heated windows (sounds different than rain)
- areas of light to moderate turbulence.
- in IMC with:
  - no significant airframe icing and
  - no significant radar returns at airplane altitude and
  - heavy precipitation below the airplane, identified by amber and red radar returns on the weather radar.
- cloud tops above typical cruise levels (above the tropopause)
- smell of ozone or sulfur

- humidity increase
- static discharge around the windshield (St. Elmo’s fire).

## Avoiding Ice Crystal Icing

During flight in IMC, avoid flying directly over significant amber or red radar returns, even if there are no returns at airplane altitude.

Use the weather radar controls to assess weather radar reflectivity below the airplane flight path. Refer to weather radar operating instructions for additional information.




ICE CRYSTAL ICING WEATHER

Areas with a higher risk of High Ice Water Content (HIWC) are identified by some aviation weather vendors. In these areas, ICI should be suspected while operating in IMC. Use of this type of HIWC information is recommended for strategic preflight planning and in-flight adjustments in order to avoid potential ICI conditions.

## Ice Crystal Icing Suspected

If conditions allow, exit the ice crystal icing conditions laterally. Climbing or descending to exit ice crystal icing conditions is not recommended. Request a route change to minimize the time above red and amber radar returns.

Do the Ice Crystal Icing non-normal checklist.

## 737-8 LEAP-1B27 KG C M FAA CATB TO1-10% TO2-20% ALT-AB

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# Performance Dispatch — Chapter PD
## Table of Contents — Section 10

### 737-8 LEAP-1B27 KG C M FAA CATB TO1-10% TO2-20% ALT-AB

### Pkg Model Identification

### Takeoff



### Enroute



### Landing

## Gear Down



## Text

## General

The table below shows the airplanes that have been identified with the following performance package. Note, some airplanes may be identified with more than one performance package. This configuration table information reflects the Boeing delivered configuration updated for service bulletin incorporations in conformance with the policy stated in the introduction section of the FCOM. The performance data is prepared for the owner/operator named on the title page. The intent of this information is to assist flight crews and airlines in knowing which performance package is applicable to a given airplane. The performance package model identification information is based on Boeing's knowledge of the airline's fleet at a point in time approximately three months prior to the page date. Notice of Change (NOC) will not be provided to airlines to identify airplanes that are moved between performance packages within this manual or airplanes added to the airline's fleet whose performance packages are already represented in this manual. These types of changes will be updated in the next block revision. Owners/operators are responsible for ensuring the operational documentation they are using is complete and matches the current configuration of their airplanes, and the accuracy and validity of all information furnished by the owner/operator or any other party. Owners/operators receiving active revision service are responsible to ensure that any modifications to the listed airplanes are properly reflected in this manual.

Serial and tabulation number are supplied by Boeing.

| Tail Number | Registry Number | Serial Number | Tabulation Number |
|---|---|---|---|
| 901 | C-FFEL | 64942 | 1J107 |
| 902 | C-FLEJ | 64941 | 1J104 |
| 903 | C-FLHI | 61804 | 1J103 |
| 904 | C-FFBC | 61805 | 1J105 |
| 905 | C-FLKA | 64943 | 1J106 |
| 906 | C-FLKC | 61807 | 1J111 |
| 907 | C-FLKD | 61806 | 1J110 |
| 908 | C-FLKI | 64944 | 1J108 |
| 909 | C-FLKJ | 64945 | 1J109 |
| 910 | C-FLRS | 61808 | 1J114 |

| Tail Number | Registry Number | Serial Number | Tabulation Number |
|---|---|---|---|
| 911 | C-FFFX | 61809 | 1J112 |
| 912 | C-FFLZ | 64946 | 1J113 |
| 913 | C-FLDX | 61803 | 1C845 |
| 914 | C-FLER | 62874 | 1L076 |
| 915 | C-FLKO | 62870 | 1L075 |
| 916 | C-FLKS | 62881 | 1L077 |
| 917 | C-FLKZ | 62883 | 1L078 |
| 918 | C-FLUJ | 62884 | 1K003 |
| 919 | C-FLQZ | 44307 | 1K002 |
| 920 | C-FLQO | 43565 | 1B392 |
| 921 | C-FLUT | 60134 | 1J022 |
| 922 | C-FLQF | 43300 | 1B397 |
| 923 | C-FLQG | 43619 | 1B390 |
| 924 | C-FLQP | 43566 | 1B393 |
| 925 | C-FLBG | 60135 | 1J023 |
| 926 | C-FLGD | 43564 | 1B391 |
| 927 | C-GFOF | 44302 | 1K001 |

### Takeoff Field Corrections - Dry Runway
### Table 1 of 3: Slope Correction

| FIELD LENGTH AVAILABLE (FT) | SLOPE CORRECTED FIELD LENGTH (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | RUNWAY SLOPE (%) | | | | | | | | |
| | -2.0 | -1.5 | -1.0 | -0.5 | 0.0 | 0.5 | 1.0 | 1.5 | 2.0 |
| 4200 | 4230 | 4220 | 4210 | 4210 | 4200 | 4080 | 3960 | 3850 | 3730 |
| 4600 | 4680 | 4660 | 4640 | 4620 | 4600 | 4460 | 4320 | 4180 | 4040 |
| 5000 | 5130 | 5100 | 5060 | 5030 | 5000 | 4840 | 4680 | 4520 | 4360 |
| 5400 | 5580 | 5540 | 5490 | 5450 | 5400 | 5220 | 5040 | 4850 | 4670 |
| 5800 | 6030 | 5970 | 5920 | 5860 | 5800 | 5600 | 5390 | 5190 | 4990 |
| 6200 | 6480 | 6410 | 6340 | 6270 | 6200 | 5980 | 5750 | 5530 | 5300 |
| 6600 | 6930 | 6850 | 6770 | 6680 | 6600 | 6350 | 6110 | 5860 | 5610 |
| 7000 | 7390 | 7290 | 7190 | 7100 | 7000 | 6730 | 6460 | 6200 | 5930 |
| 7400 | 7840 | 7730 | 7620 | 7510 | 7400 | 7110 | 6820 | 6530 | 6240 |
| 7800 | 8290 | 8170 | 8040 | 7920 | 7800 | 7490 | 7180 | 6870 | 6560 |
| 8200 | 8740 | 8610 | 8470 | 8340 | 8200 | 7870 | 7540 | 7200 | 6870 |
| 8600 | 9190 | 9040 | 8900 | 8750 | 8600 | 8250 | 7890 | 7540 | 7190 |
| 9000 | 9640 | 9480 | 9320 | 9160 | 9000 | 8630 | 8250 | 7880 | 7500 |
| 9400 | 10090 | 9920 | 9750 | 9570 | 9400 | 9000 | 8610 | 8210 | 7810 |
| 9800 | 10550 | 10360 | 10170 | 9990 | 9800 | 9380 | 8960 | 8550 | 8130 |
| 10200 | 11000 | 10800 | 10600 | 10400 | 10200 | 9760 | 9320 | 8880 | 8440 |
| 10600 | 11450 | 11240 | 11020 | 10810 | 10600 | 10140 | 9680 | 9220 | 8760 |
| 11000 | 11900 | 11680 | 11450 | 11230 | 11000 | 10520 | 10040 | 9550 | 9070 |
| 11400 | 12350 | 12110 | 11880 | 11640 | 11400 | 10900 | 10390 | 9890 | 9390 |
| 11800 | 12800 | 12550 | 12300 | 12050 | 11800 | 11280 | 10750 | 10230 | 9700 |
| 12200 | 13250 | 12990 | 12730 | 12460 | 12200 | 11650 | 11110 | 10560 | 10010 |
| 12600 | 13710 | 13430 | 13150 | 12880 | 12600 | 12030 | 11460 | 10900 | 10330 |
| 13000 | 14160 | 13870 | 13580 | 13290 | 13000 | 12410 | 11820 | 11230 | 10640 |
| 13400 | 14610 | 14310 | 14000 | 13700 | 13400 | 12790 | 12180 | 11570 | 10960 |
| 13800 | 15060 | 14750 | 14430 | 14120 | 13800 | 13170 | 12540 | 11900 | 11270 |
| 14200 | 15510 | 15180 | 14860 | 14530 | 14200 | 13550 | 12890 | 12240 | 11590 |
| 14600 | 15960 | 15620 | 15280 | 14940 | 14600 | 13930 | 13250 | 12580 | 11900 |
| 15000 | 16410 | 16060 | 15710 | 15350 | 15000 | 14300 | 13610 | 12910 | 12210 |
| 15400 | 16870 | 16500 | 16130 | 15770 | 15400 | 14680 | 13960 | 13250 | 12530 |
| 15800 | 17320 | 16940 | 16560 | 16180 | 15800 | 15060 | 14320 | 13580 | 12840 |

## Takeoff Field Corrections - Dry Runway
## Table 2 of 3: Wind Correction

| SLOPE CORR'D FIELD LENGTH (FT) | SLOPE AND WIND CORRECTED FIELD LENGTH (FT) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | WIND COMPONENT (KTS) | | | | | | | |
| | -15 | -10 | -5 | 0 | 10 | 20 | 30 | 40 |
| 4200 | 2970 | 3380 | 3790 | 4200 | 4310 | 4500 | 4760 | 5110 |
| 4600 | 3320 | 3740 | 4170 | 4600 | 4720 | 4920 | 5190 | 5540 |
| 5000 | 3660 | 4110 | 4550 | 5000 | 5130 | 5330 | 5610 | 5970 |
| 5400 | 4000 | 4470 | 4930 | 5400 | 5540 | 5750 | 6040 | 6390 |
| 5800 | 4350 | 4830 | 5320 | 5800 | 5950 | 6170 | 6460 | 6820 |
| 6200 | 4690 | 5190 | 5700 | 6200 | 6360 | 6590 | 6880 | 7250 |
| 6600 | 5030 | 5550 | 6080 | 6600 | 6770 | 7000 | 7310 | 7680 |
| 7000 | 5380 | 5920 | 6460 | 7000 | 7180 | 7420 | 7730 | 8110 |
| 7400 | 5720 | 6280 | 6840 | 7400 | 7590 | 7840 | 8160 | 8540 |
| 7800 | 6060 | 6640 | 7220 | 7800 | 8000 | 8260 | 8580 | 8970 |
| 8200 | 6410 | 7000 | 7600 | 8200 | 8410 | 8680 | 9010 | 9400 |
| 8600 | 6750 | 7370 | 7980 | 8600 | 8820 | 9090 | 9430 | 9820 |
| 9000 | 7090 | 7730 | 8360 | 9000 | 9230 | 9510 | 9850 | 10250 |
| 9400 | 7440 | 8090 | 8750 | 9400 | 9640 | 9930 | 10280 | 10680 |
| 9800 | 7780 | 8450 | 9130 | 9800 | 10050 | 10350 | 10700 | 11110 |
| 10200 | 8120 | 8810 | 9510 | 10200 | 10460 | 10760 | 11130 | 11540 |
| 10600 | 8470 | 9180 | 9890 | 10600 | 10870 | 11180 | 11550 | 11970 |
| 11000 | 8810 | 9540 | 10270 | 11000 | 11280 | 11600 | 11970 | 12400 |
| 11400 | 9150 | 9900 | 10650 | 11400 | 11690 | 12020 | 12400 | 12830 |
| 11800 | 9500 | 10260 | 11030 | 11800 | 12090 | 12440 | 12820 | 13250 |
| 12200 | 9840 | 10630 | 11410 | 12200 | 12500 | 12850 | 13250 | 13680 |
| 12600 | 10180 | 10990 | 11790 | 12600 | 12910 | 13270 | 13670 | 14110 |
| 13000 | 10530 | 11350 | 12180 | 13000 | 13320 | 13690 | 14090 | 14540 |
| 13400 | 10870 | 11710 | 12560 | 13400 | 13730 | 14110 | 14520 | 14970 |
| 13800 | 11210 | 12070 | 12940 | 13800 | 14140 | 14520 | 14940 | 15400 |
| 14200 | 11560 | 12440 | 13320 | 14200 | 14550 | 14940 | 15370 | 15830 |
| 14600 | 11900 | 12800 | 13700 | 14600 | 14960 | 15360 | 15790 | 16260 |
| 15000 | 12240 | 13160 | 14080 | 15000 | 15370 | 15780 | 16210 | 16680 |
| 15400 | 12590 | 13520 | 14460 | 15400 | 15780 | 16200 | 16640 | 17110 |
| 15800 | 12930 | 13890 | 14840 | 15800 | 16190 | 16610 | 17060 | 17540 |

## Takeoff Field & Climb Limit Weights - Dry Runway

### Flaps 5

### Based on engine bleed for packs on and anti-ice off

### Table 3(a) of 3: Sea Level Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4000 | 60.1 | 56.6 | 56.2 | 55.9 | 55.6 | 55.3 | 55.0 | 54.7 | 54.4 | 50.9 | 47.4 |
| 4200 | 61.8 | 58.2 | 57.8 | 57.5 | 57.2 | 56.9 | 56.5 | 56.2 | 55.9 | 52.4 | 48.7 |
| 4600 | 65.2 | 61.4 | 61.0 | 60.7 | 60.3 | 60.0 | 59.7 | 59.3 | 59.0 | 55.3 | 51.5 |
| 5000 | 68.4 | 64.4 | 64.1 | 63.7 | 63.4 | 63.0 | 62.7 | 62.3 | 62.0 | 58.0 | 54.1 |
| 5400 | 71.5 | 67.3 | 67.0 | 66.6 | 66.2 | 65.8 | 65.5 | 65.1 | 64.8 | 60.7 | 56.5 |
| 5800 | 74.5 | 70.1 | 69.7 | 69.3 | 68.9 | 68.5 | 68.2 | 67.8 | 67.4 | 63.1 | 58.8 |
| 6200 | 77.3 | 72.7 | 72.3 | 71.9 | 71.5 | 71.1 | 70.7 | 70.3 | 69.9 | 65.5 | 61.0 |
| 6600 | 79.9 | 75.2 | 74.8 | 74.4 | 73.9 | 73.5 | 73.1 | 72.7 | 72.3 | 67.7 | 63.1 |
| 7000 | 82.5 | 77.6 | 77.2 | 76.7 | 76.3 | 75.9 | 75.4 | 75.0 | 74.6 | 69.8 | 65.0 |
| 7400 | 84.9 | 79.8 | 79.4 | 78.9 | 78.5 | 78.0 | 77.6 | 77.2 | 76.7 | 71.8 | 66.9 |
| 7800 | 87.2 | 82.0 | 81.5 | 81.1 | 80.6 | 80.2 | 79.7 | 79.3 | 78.8 | 73.8 | 68.7 |
| 8200 | 89.6 | 84.2 | 83.8 | 83.3 | 82.8 | 82.3 | 81.9 | 81.4 | 81.0 | 75.8 | 70.5 |
| 8600 | 90.7 | 86.4 | 85.9 | 85.4 | 84.9 | 84.4 | 84.0 | 83.5 | 83.0 | 77.7 | 72.3 |
| 9000 | 90.7 | 88.3 | 87.8 | 87.3 | 86.8 | 86.3 | 85.8 | 85.4 | 84.9 | 79.5 | 74.0 |
| 9400 | 90.7 | 89.9 | 89.4 | 88.8 | 88.3 | 87.8 | 87.3 | 86.9 | 86.4 | 80.8 | 75.2 |
| 9800 | 90.7 | 90.7 | 90.7 | 90.4 | 89.9 | 89.4 | 88.9 | 88.4 | 87.9 | 82.2 | 76.5 |
| 10200 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.5 | 90.0 | 89.5 | 83.7 | 77.9 |
| 10600 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 85.2 | 79.2 |
| 11000 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 86.6 | 80.6 |
| 11400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 88.0 | 81.9 |
| 11800 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 89.4 | 83.1 |
| 12200 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 84.4 |
| 12600 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 85.5 |
| 13000 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 86.7 |
| 13400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 87.9 |
| 13800 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 89.1 |
| 14200 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.2 |
| 14600 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 |
| 15000 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 |
| 15400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 |
| CLIMB LIMIT WT (1000 KG) | 86.3 | 86.2 | 86.2 | 86.2 | 86.2 | 86.1 | 86.1 | 86.1 | 86.1 | 78.5 | 71.4 |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -900 |
| ENGINE AND WING ON | -150 | -900 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -1000 |
| ENGINE AND WING ON | -150 | -1000 |

# Takeoff Field & Climb Limit Weights - Dry Runway

**Flaps 5**

**Based on engine bleed for packs on and anti-ice off**

## Table 3(b) of 3: 2000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4000 | 56.9 | 53.3 | 53.0 | 52.5 | 52.2 | 51.9 | 51.6 | 51.3 | 50.4 | 47.1 | 43.4 |
| 4200 | 58.5 | 54.8 | 54.5 | 54.0 | 53.7 | 53.4 | 53.1 | 52.8 | 51.9 | 48.5 | 44.7 |
| 4600 | 61.8 | 57.9 | 57.5 | 57.0 | 56.7 | 56.3 | 56.1 | 55.8 | 54.8 | 51.2 | 47.2 |
| 5000 | 64.8 | 60.8 | 60.4 | 59.9 | 59.5 | 59.2 | 58.9 | 58.6 | 57.5 | 53.8 | 49.6 |
| 5400 | 67.8 | 63.5 | 63.1 | 62.6 | 62.2 | 61.8 | 61.5 | 61.2 | 60.1 | 56.2 | 51.8 |
| 5800 | 70.5 | 66.1 | 65.7 | 65.1 | 64.7 | 64.4 | 64.0 | 63.7 | 62.6 | 58.5 | 53.9 |
| 6200 | 73.2 | 68.6 | 68.2 | 67.6 | 67.1 | 66.8 | 66.4 | 66.1 | 64.9 | 60.7 | 55.9 |
| 6600 | 75.7 | 70.9 | 70.5 | 69.9 | 69.4 | 69.0 | 68.7 | 68.3 | 67.1 | 62.7 | 57.8 |
| 7000 | 78.1 | 73.1 | 72.7 | 72.1 | 71.6 | 71.2 | 70.8 | 70.5 | 69.2 | 64.7 | 59.6 |
| 7400 | 80.3 | 75.2 | 74.8 | 74.1 | 73.6 | 73.2 | 72.8 | 72.5 | 71.2 | 66.5 | 61.2 |
| 7800 | 82.5 | 77.3 | 76.8 | 76.1 | 75.6 | 75.2 | 74.8 | 74.4 | 73.1 | 68.3 | 62.9 |
| 8200 | 84.8 | 79.4 | 78.9 | 78.2 | 77.7 | 77.3 | 76.9 | 76.4 | 75.1 | 70.2 | 64.6 |
| 8600 | 86.9 | 81.3 | 80.8 | 80.2 | 79.7 | 79.2 | 78.8 | 78.4 | 77.0 | 72.0 | 66.2 |
| 9000 | 88.9 | 83.2 | 82.7 | 82.0 | 81.5 | 81.0 | 80.6 | 80.2 | 78.7 | 73.6 | 67.7 |
| 9400 | 90.4 | 84.7 | 84.2 | 83.4 | 82.9 | 82.4 | 82.0 | 81.6 | 80.1 | 74.9 | 68.9 |
| 9800 | 90.7 | 86.2 | 85.6 | 84.9 | 84.3 | 83.8 | 83.4 | 83.0 | 81.5 | 76.1 | 70.1 |
| 10200 | 90.7 | 87.7 | 87.2 | 86.4 | 85.8 | 85.3 | 84.9 | 84.4 | 82.9 | 77.5 | 71.3 |
| 10600 | 90.7 | 89.3 | 88.7 | 87.9 | 87.3 | 86.9 | 86.4 | 85.9 | 84.4 | 78.8 | 72.5 |
| 11000 | 90.7 | 90.7 | 90.1 | 89.4 | 88.8 | 88.3 | 87.9 | 87.4 | 85.8 | 80.2 | 73.7 |
| 11400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.3 | 89.8 | 89.3 | 88.8 | 87.2 | 81.4 | 74.9 |
| 11800 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.2 | 88.6 | 82.7 | 76.0 |
| 12200 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 89.9 | 83.9 | 77.1 |
| 12600 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 85.1 | 78.2 |
| 13000 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 86.3 | 79.3 |
| 13400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 87.4 | 80.4 |
| 13800 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 88.6 | 81.5 |
| 14200 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 89.8 | 82.5 |
| 14600 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 83.6 |
| 15000 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 84.6 |
| 15400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 85.7 |
| CLIMB LIMIT WT (1000 KG) | 81.6 | 81.3 | 81.3 | 81.2 | 81.2 | 81.2 | 81.3 | 81.4 | 79.5 | 72.4 | 65.0 |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -900 |
| ENGINE AND WING ON | -150 | -900 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -1000 |
| ENGINE AND WING ON | -150 | -1000 |

# Takeoff Field & Climb Limit Weights - Dry Runway

**Flaps 5**

**Based on engine bleed for packs on and anti-ice off**

## Table 3(c) of 3: 4000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4000 | 53.4 | 49.9 | 49.6 | 49.3 | 49.0 | 48.7 | 48.5 | 47.8 | 46.8 | 42.9 | |
| 4200 | 54.9 | 51.3 | 51.0 | 50.7 | 50.4 | 50.2 | 49.9 | 49.2 | 48.1 | 44.2 | |
| 4600 | 57.9 | 54.2 | 53.9 | 53.6 | 53.3 | 53.0 | 52.7 | 52.0 | 50.9 | 46.7 | 43.2 |
| 5000 | 60.8 | 56.9 | 56.6 | 56.3 | 55.9 | 55.6 | 55.3 | 54.6 | 53.4 | 49.1 | 45.4 |
| 5400 | 63.6 | 59.5 | 59.1 | 58.8 | 58.5 | 58.1 | 57.8 | 57.1 | 55.8 | 51.2 | 47.4 |
| 5800 | 66.2 | 61.9 | 61.5 | 61.2 | 60.8 | 60.5 | 60.2 | 59.4 | 58.1 | 53.3 | 49.3 |
| 6200 | 68.7 | 64.2 | 63.8 | 63.5 | 63.1 | 62.8 | 62.4 | 61.6 | 60.2 | 55.3 | 51.1 |
| 6600 | 71.0 | 66.4 | 66.0 | 65.6 | 65.2 | 64.9 | 64.5 | 63.7 | 62.3 | 57.1 | 52.8 |
| 7000 | 73.2 | 68.5 | 68.1 | 67.7 | 67.3 | 66.9 | 66.6 | 65.7 | 64.2 | 58.9 | 54.5 |
| 7400 | 75.3 | 70.4 | 70.0 | 69.6 | 69.2 | 68.8 | 68.4 | 67.5 | 66.0 | 60.6 | 56.0 |
| 7800 | 77.4 | 72.3 | 71.9 | 71.5 | 71.1 | 70.7 | 70.3 | 69.4 | 67.8 | 62.2 | 57.5 |
| 8200 | 79.5 | 74.3 | 73.8 | 73.4 | 73.0 | 72.6 | 72.2 | 71.3 | 69.7 | 63.9 | 59.0 |
| 8600 | 81.3 | 76.2 | 75.7 | 75.3 | 74.9 | 74.4 | 74.0 | 73.0 | 71.4 | 65.5 | 60.5 |
| 9000 | 83.3 | 77.9 | 77.4 | 77.0 | 76.5 | 76.1 | 75.7 | 74.7 | 73.0 | 67.0 | 61.9 |
| 9400 | 84.8 | 79.2 | 78.8 | 78.3 | 77.9 | 77.4 | 77.0 | 76.0 | 74.3 | 68.1 | 63.0 |
| 9800 | 86.3 | 80.6 | 80.1 | 79.7 | 79.2 | 78.8 | 78.3 | 77.3 | 75.6 | 69.3 | 64.0 |
| 10200 | 87.8 | 82.0 | 81.5 | 81.1 | 80.6 | 80.2 | 79.7 | 78.7 | 76.9 | 70.5 | 65.1 |
| 10600 | 89.4 | 83.5 | 83.0 | 82.5 | 82.0 | 81.6 | 81.1 | 80.1 | 78.2 | 71.7 | 66.2 |
| 11000 | 90.7 | 84.9 | 84.4 | 83.9 | 83.4 | 82.9 | 82.5 | 81.4 | 79.6 | 72.9 | 67.3 |
| 11400 | 90.7 | 86.3 | 85.8 | 85.2 | 84.8 | 84.3 | 83.8 | 82.7 | 80.8 | 74.0 | 68.3 |
| 11800 | 90.7 | 87.6 | 87.1 | 86.6 | 86.1 | 85.6 | 85.1 | 84.0 | 82.1 | 75.2 | 69.4 |
| 12200 | 90.7 | 88.9 | 88.4 | 87.8 | 87.3 | 86.9 | 86.4 | 85.2 | 83.3 | 76.3 | 70.4 |
| 12600 | 90.7 | 90.1 | 89.6 | 89.1 | 88.6 | 88.1 | 87.6 | 86.4 | 84.5 | 77.4 | 71.4 |
| 13000 | 90.7 | 90.7 | 90.7 | 90.3 | 89.8 | 89.3 | 88.8 | 87.6 | 85.6 | 78.4 | 72.4 |
| 13400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.5 | 90.0 | 88.8 | 86.8 | 79.5 | 73.4 |
| 13800 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.0 | 88.0 | 80.6 | 74.4 |
| 14200 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 89.1 | 81.6 | 75.3 |
| 14600 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.3 | 82.6 | 76.3 |
| 15000 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 83.7 | 77.2 |
| 15400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 84.7 | 78.1 |
| CLIMB LIMIT WT (1000 KG) | 76.9 | 76.7 | 76.6 | 76.6 | 76.6 | 76.6 | 76.6 | 75.6 | 73.5 | 65.4 | 59.0 |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -900 |
| ENGINE AND WING ON | -150 | -900 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -1000 |
| ENGINE AND WING ON | -150 | -1000 |

# Takeoff Field & Climb Limit Weights - Dry Runway

### Flaps 5

### Based on engine bleed for packs on and anti-ice off

## Table 3(d) of 3: 6000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4000 | 49.8 | 46.7 | 46.4 | 46.2 | 45.9 | 45.6 | 45.1 | 44.3 | 43.2 | | |
| 4200 | 51.3 | 48.1 | 47.8 | 47.5 | 47.2 | 46.9 | 46.5 | 45.6 | 44.5 | | |
| 4600 | 54.1 | 50.8 | 50.5 | 50.2 | 49.9 | 49.6 | 49.1 | 48.2 | 47.0 | | |
| 5000 | 56.8 | 53.3 | 53.0 | 52.7 | 52.4 | 52.1 | 51.6 | 50.7 | 49.4 | 44.6 | |
| 5400 | 59.4 | 55.7 | 55.4 | 55.1 | 54.8 | 54.4 | 53.9 | 52.9 | 51.6 | 46.6 | 43.5 |
| 5800 | 61.8 | 58.0 | 57.7 | 57.3 | 57.0 | 56.7 | 56.1 | 55.1 | 53.7 | 48.5 | 45.2 |
| 6200 | 64.1 | 60.2 | 59.8 | 59.5 | 59.1 | 58.7 | 58.2 | 57.1 | 55.7 | 50.2 | 46.8 |
| 6600 | 66.3 | 62.2 | 61.8 | 61.5 | 61.1 | 60.7 | 60.1 | 59.0 | 57.6 | 51.9 | 48.4 |
| 7000 | 68.4 | 64.1 | 63.8 | 63.4 | 63.0 | 62.6 | 62.0 | 60.9 | 59.3 | 53.5 | 49.9 |
| 7400 | 70.3 | 65.9 | 65.6 | 65.2 | 64.8 | 64.4 | 63.7 | 62.6 | 61.0 | 54.9 | 51.2 |
| 7800 | 72.2 | 67.7 | 67.3 | 66.9 | 66.5 | 66.1 | 65.5 | 64.2 | 62.6 | 56.4 | 52.6 |
| 8200 | 74.2 | 69.5 | 69.2 | 68.7 | 68.3 | 67.9 | 67.2 | 66.0 | 64.3 | 57.9 | 54.0 |
| 8600 | 76.1 | 71.3 | 70.9 | 70.5 | 70.0 | 69.6 | 68.9 | 67.6 | 66.0 | 59.4 | 55.4 |
| 9000 | 77.8 | 72.9 | 72.5 | 72.1 | 71.6 | 71.2 | 70.5 | 69.2 | 67.5 | 60.8 | 56.6 |
| 9400 | 79.1 | 74.2 | 73.8 | 73.3 | 72.9 | 72.4 | 71.7 | 70.4 | 68.6 | 61.8 | 57.6 |
| 9800 | 80.5 | 75.5 | 75.0 | 74.6 | 74.1 | 73.7 | 73.0 | 71.6 | 69.8 | 62.8 | 58.6 |
| 10200 | 81.9 | 76.8 | 76.3 | 75.9 | 75.4 | 75.0 | 74.2 | 72.8 | 71.0 | 63.9 | 59.5 |
| 10600 | 83.4 | 78.1 | 77.7 | 77.2 | 76.7 | 76.3 | 75.5 | 74.1 | 72.2 | 65.0 | 60.5 |
| 11000 | 84.8 | 79.4 | 79.0 | 78.5 | 78.0 | 77.5 | 76.8 | 75.3 | 73.4 | 66.0 | 61.5 |
| 11400 | 86.1 | 80.7 | 80.2 | 79.8 | 79.3 | 78.8 | 78.0 | 76.5 | 74.6 | 67.1 | 62.4 |
| 11800 | 87.5 | 82.0 | 81.5 | 81.0 | 80.5 | 80.0 | 79.2 | 77.7 | 75.7 | 68.1 | 63.4 |
| 12200 | 88.8 | 83.2 | 82.7 | 82.2 | 81.7 | 81.2 | 80.4 | 78.8 | 76.9 | 69.1 | 64.3 |
| 12600 | 90.0 | 84.3 | 83.8 | 83.3 | 82.8 | 82.3 | 81.5 | 80.0 | 77.9 | 70.1 | 65.3 |
| 13000 | 90.7 | 85.5 | 85.0 | 84.5 | 84.0 | 83.5 | 82.6 | 81.1 | 79.0 | 71.1 | 66.2 |
| 13400 | 90.7 | 86.7 | 86.2 | 85.6 | 85.1 | 84.6 | 83.8 | 82.2 | 80.1 | 72.0 | 67.1 |
| 13800 | 90.7 | 87.8 | 87.3 | 86.8 | 86.3 | 85.7 | 84.9 | 83.3 | 81.2 | 73.0 | 68.0 |
| 14200 | 90.7 | 89.0 | 88.5 | 87.9 | 87.4 | 86.8 | 86.0 | 84.3 | 82.2 | 73.9 | 68.8 |
| 14600 | 90.7 | 90.1 | 89.6 | 89.1 | 88.5 | 88.0 | 87.1 | 85.4 | 83.3 | 74.8 | 69.7 |
| 15000 | 90.7 | 90.7 | 90.7 | 90.2 | 89.6 | 89.1 | 88.2 | 86.5 | 84.3 | 75.7 | 70.5 |
| 15400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.2 | 89.3 | 87.6 | 85.3 | 76.6 | 71.3 |
| CLIMB LIMIT WT (1000 KG) | 72.5 | 72.2 | 72.2 | 72.2 | 72.2 | 72.1 | 71.7 | 70.1 | 67.8 | 58.7 | 53.5 |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -900 |
| ENGINE AND WING ON | -150 | -900 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -1000 |
| ENGINE AND WING ON | -150 | -1000 |

# Takeoff Field & Climb Limit Weights - Dry Runway

## Flaps 5

## Based on engine bleed for packs on and anti-ice off

## Table 3(e) of 3: 8000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4000 | 46.7 | 43.7 | 43.4 | 43.2 | 42.9 | | | | | | |
| 4200 | 48.0 | 45.0 | 44.7 | 44.5 | 44.2 | 43.0 | | | | | |
| 4600 | 50.7 | 47.6 | 47.3 | 47.0 | 46.7 | 45.4 | 44.2 | 42.9 | | | |
| 5000 | 53.3 | 50.0 | 49.7 | 49.4 | 49.1 | 47.8 | 46.4 | 45.1 | 43.8 | | |
| 5400 | 55.7 | 52.2 | 51.9 | 51.6 | 51.3 | 49.9 | 48.5 | 47.1 | 45.8 | | |
| 5800 | 58.0 | 54.3 | 54.0 | 53.7 | 53.4 | 51.9 | 50.5 | 49.0 | 47.6 | 44.3 | |
| 6200 | 60.1 | 56.3 | 56.0 | 55.7 | 55.3 | 53.8 | 52.3 | 50.8 | 49.3 | 45.9 | 42.8 |
| 6600 | 62.1 | 58.2 | 57.9 | 57.5 | 57.2 | 55.6 | 54.0 | 52.5 | 51.0 | 47.4 | 44.2 |
| 7000 | 64.1 | 60.0 | 59.7 | 59.3 | 59.0 | 57.3 | 55.7 | 54.1 | 52.5 | 48.9 | 45.6 |
| 7400 | 65.9 | 61.7 | 61.3 | 61.0 | 60.6 | 58.9 | 57.3 | 55.6 | 54.0 | 50.2 | 46.8 |
| 7800 | 67.7 | 63.4 | 63.0 | 62.6 | 62.2 | 60.5 | 58.8 | 57.1 | 55.4 | 51.5 | 48.0 |
| 8200 | 69.5 | 65.1 | 64.7 | 64.3 | 63.9 | 62.1 | 60.4 | 58.6 | 56.9 | 52.9 | 49.3 |
| 8600 | 71.3 | 66.8 | 66.3 | 65.9 | 65.5 | 63.7 | 61.9 | 60.1 | 58.4 | 54.3 | 50.6 |
| 9000 | 72.9 | 68.3 | 67.8 | 67.4 | 67.0 | 65.2 | 63.3 | 61.5 | 59.7 | 55.5 | 51.7 |
| 9400 | 74.1 | 69.4 | 69.0 | 68.6 | 68.2 | 66.3 | 64.4 | 62.5 | 60.7 | 56.4 | 52.6 |
| 9800 | 75.4 | 70.6 | 70.2 | 69.7 | 69.3 | 67.4 | 65.5 | 63.6 | 61.7 | 57.4 | 53.5 |
| 10200 | 76.7 | 71.8 | 71.4 | 70.9 | 70.5 | 68.6 | 66.6 | 64.7 | 62.8 | 58.3 | 54.3 |
| 10600 | 78.1 | 73.1 | 72.6 | 72.2 | 71.7 | 69.7 | 67.7 | 65.7 | 63.8 | 59.3 | 55.2 |
| 11000 | 79.4 | 74.3 | 73.8 | 73.4 | 72.9 | 70.9 | 68.8 | 66.8 | 64.8 | 60.2 | 56.1 |
| 11400 | 80.7 | 75.5 | 75.0 | 74.5 | 74.1 | 72.0 | 69.9 | 67.9 | 65.8 | 61.2 | 56.9 |
| 11800 | 81.9 | 76.6 | 76.2 | 75.7 | 75.2 | 73.1 | 71.0 | 68.9 | 66.9 | 62.1 | 57.8 |
| 12200 | 83.1 | 77.8 | 77.3 | 76.8 | 76.3 | 74.2 | 72.1 | 69.9 | 67.8 | 63.0 | 58.6 |
| 12600 | 84.3 | 78.9 | 78.4 | 77.9 | 77.4 | 75.3 | 73.1 | 70.9 | 68.8 | 63.9 | 59.5 |
| 13000 | 85.4 | 80.0 | 79.5 | 79.0 | 78.5 | 76.3 | 74.1 | 71.9 | 69.8 | 64.8 | 60.4 |
| 13400 | 86.6 | 81.1 | 80.5 | 80.0 | 79.6 | 77.3 | 75.1 | 72.9 | 70.7 | 65.7 | 61.2 |
| 13800 | 87.8 | 82.1 | 81.6 | 81.1 | 80.6 | 78.4 | 76.1 | 73.9 | 71.7 | 66.6 | 62.0 |
| 14200 | 88.9 | 83.2 | 82.7 | 82.2 | 81.7 | 79.4 | 77.1 | 74.8 | 72.6 | 67.4 | 62.7 |
| 14600 | 90.1 | 84.3 | 83.7 | 83.2 | 82.7 | 80.4 | 78.0 | 75.7 | 73.5 | 68.2 | 63.5 |
| 15000 | 90.7 | 85.3 | 84.8 | 84.2 | 83.7 | 81.4 | 79.0 | 76.7 | 74.4 | 69.0 | 64.2 |
| 15400 | 90.7 | 86.4 | 85.8 | 85.3 | 84.7 | 82.3 | 79.9 | 77.6 | 75.2 | 69.8 | 64.9 |
| CLIMB LIMIT WT (1000 KG) | 68.5 | 68.1 | 68.1 | 68.1 | 68.1 | 65.6 | 63.2 | 60.8 | 58.5 | 53.2 | 48.5 |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -900 |
| ENGINE AND WING ON | -150 | -900 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -1000 |
| ENGINE AND WING ON | -150 | -1000 |

# Takeoff Field & Climb Limit Weights - Dry Runway

## Flaps 5

### Based on engine bleed for packs on and anti-ice off

## Table 3(f) of 3: 10000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4000 | 43.7 | | | | | | | | | | |
| 4200 | 45.0 | | | | | | | | | | |
| 4600 | 47.6 | 44.6 | 44.3 | 44.1 | 42.9 | | | | | | |
| 5000 | 50.0 | 46.9 | 46.6 | 46.3 | 45.0 | 43.7 | | | | | |
| 5400 | 52.2 | 49.0 | 48.7 | 48.4 | 47.1 | 45.7 | 44.4 | 43.1 | | | |
| 5800 | 54.4 | 51.0 | 50.6 | 50.3 | 49.0 | 47.5 | 46.1 | 44.8 | 43.5 | | |
| 6200 | 56.4 | 52.8 | 52.5 | 52.2 | 50.7 | 49.2 | 47.8 | 46.4 | 45.0 | | |
| 6600 | 58.2 | 54.6 | 54.2 | 53.9 | 52.4 | 50.9 | 49.4 | 47.9 | 46.5 | 43.3 | |
| 7000 | 60.1 | 56.3 | 55.9 | 55.6 | 54.0 | 52.4 | 50.9 | 49.4 | 47.9 | 44.6 | |
| 7400 | 61.7 | 57.8 | 57.5 | 57.1 | 55.5 | 53.9 | 52.3 | 50.7 | 49.2 | 45.8 | |
| 7800 | 63.4 | 59.4 | 59.0 | 58.6 | 57.0 | 55.3 | 53.7 | 52.1 | 50.5 | 47.0 | 43.8 |
| 8200 | 65.1 | 61.0 | 60.6 | 60.2 | 58.6 | 56.8 | 55.1 | 53.5 | 51.9 | 48.2 | 44.9 |
| 8600 | 66.8 | 62.6 | 62.2 | 61.8 | 60.1 | 58.3 | 56.6 | 54.9 | 53.2 | 49.5 | 46.1 |
| 9000 | 68.3 | 63.9 | 63.5 | 63.1 | 61.4 | 59.6 | 57.8 | 56.1 | 54.4 | 50.6 | 47.1 |
| 9400 | 69.5 | 65.0 | 64.6 | 64.2 | 62.5 | 60.6 | 58.8 | 57.0 | 55.3 | 51.4 | 47.9 |
| 9800 | 70.6 | 66.2 | 65.7 | 65.3 | 63.5 | 61.6 | 59.8 | 58.0 | 56.3 | 52.3 | 48.7 |
| 10200 | 71.9 | 67.3 | 66.8 | 66.4 | 64.6 | 62.6 | 60.8 | 59.0 | 57.2 | 53.1 | 49.5 |
| 10600 | 73.1 | 68.4 | 68.0 | 67.6 | 65.7 | 63.7 | 61.8 | 59.9 | 58.1 | 54.0 | 50.2 |
| 11000 | 74.3 | 69.5 | 69.1 | 68.7 | 66.7 | 64.7 | 62.8 | 60.9 | 59.0 | 54.8 | 51.0 |
| 11400 | 75.5 | 70.6 | 70.2 | 69.7 | 67.8 | 65.7 | 63.8 | 61.8 | 60.0 | 55.7 | 51.8 |
| 11800 | 76.7 | 71.7 | 71.3 | 70.8 | 68.8 | 66.7 | 64.7 | 62.8 | 60.9 | 56.5 | 52.5 |
| 12200 | 77.8 | 72.8 | 72.3 | 71.9 | 69.8 | 67.7 | 65.7 | 63.7 | 61.8 | 57.3 | 53.3 |
| 12600 | 78.9 | 73.8 | 73.4 | 72.9 | 70.9 | 68.7 | 66.7 | 64.6 | 62.7 | 58.2 | 54.1 |
| 13000 | 80.0 | 74.9 | 74.4 | 73.9 | 71.9 | 69.7 | 67.6 | 65.6 | 63.6 | 59.0 | 54.9 |
| 13400 | 81.1 | 75.9 | 75.4 | 74.9 | 72.8 | 70.6 | 68.5 | 66.4 | 64.4 | 59.8 | 55.7 |
| 13800 | 82.2 | 76.9 | 76.4 | 75.9 | 73.8 | 71.6 | 69.4 | 67.3 | 65.3 | 60.6 | 56.4 |
| 14200 | 83.2 | 77.9 | 77.4 | 76.9 | 74.7 | 72.5 | 70.3 | 68.2 | 66.1 | 61.4 | 57.1 |
| 14600 | 84.3 | 78.8 | 78.3 | 77.8 | 75.7 | 73.4 | 71.1 | 69.0 | 66.9 | 62.1 | 57.7 |
| 15000 | 85.3 | 79.8 | 79.3 | 78.8 | 76.6 | 74.2 | 72.0 | 69.8 | 67.7 | 62.8 | 58.3 |
| 15400 | 86.4 | 80.8 | 80.2 | 79.7 | 77.5 | 75.1 | 72.8 | 70.6 | 68.4 | 63.4 | 58.9 |
| CLIMB LIMIT WT (1000 KG) | 64.9 | 64.5 | 64.4 | 64.4 | 61.9 | 59.5 | 57.2 | 55.0 | 52.8 | 48.0 | 43.7 |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1450 | -1450 |
| ENGINE AND WING ON | -1450 | -1450 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1350 | -1400 |
| ENGINE AND WING ON | -1350 | -1400 |

# Takeoff Field & Climb Limit Weights - Dry Runway

**Flaps 5**

**Based on engine bleed for packs on and anti-ice off**

## Table 3(g) of 3: 12000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4600 | 44.1 | | | | | | | | | | |
| 5000 | 46.3 | 43.5 | 43.2 | | | | | | | | |
| 5400 | 48.4 | 45.4 | 45.1 | 43.8 | | | | | | | |
| 5800 | 50.3 | 47.2 | 46.9 | 45.5 | 44.1 | 42.8 | | | | | |
| 6200 | 52.2 | 49.0 | 48.6 | 47.2 | 45.7 | 44.4 | 43.0 | | | | |
| 6600 | 53.9 | 50.6 | 50.2 | 48.8 | 47.2 | 45.8 | 44.4 | 43.1 | | P | |
| 7000 | 55.6 | 52.1 | 51.8 | 50.2 | 48.7 | 47.2 | 45.8 | 44.4 | 43.0 | E | |
| 7400 | 57.1 | 53.6 | 53.2 | 51.6 | 50.0 | 48.5 | 47.0 | 45.5 | 44.2 | R | |
| 7800 | 58.6 | 55.0 | 54.6 | 53.0 | 51.3 | 49.8 | 48.2 | 46.7 | 45.3 | F | |
| 8200 | 60.2 | 56.5 | 56.1 | 54.4 | 52.7 | 51.1 | 49.5 | 48.0 | 46.5 | O | |
| 8600 | 61.8 | 57.9 | 57.5 | 55.8 | 54.0 | 52.4 | 50.8 | 49.2 | 47.8 | R | |
| 9000 | 63.2 | 59.2 | 58.8 | 57.1 | 55.3 | 53.6 | 51.9 | 50.3 | 48.8 | M | |
| 9400 | 64.3 | 60.2 | 59.8 | 58.0 | 56.2 | 54.5 | 52.8 | 51.2 | 49.6 | A | |
| 9800 | 65.3 | 61.3 | 60.8 | 59.0 | 57.1 | 55.4 | 53.7 | 52.0 | 50.4 | N | |
| 10200 | 66.5 | 62.3 | 61.8 | 60.0 | 58.1 | 56.3 | 54.6 | 52.9 | 51.3 | C | |
| 10600 | 67.6 | 63.3 | 62.9 | 61.0 | 59.0 | 57.2 | 55.4 | 53.7 | 52.1 | E | |
| 11000 | 68.7 | 64.3 | 63.9 | 61.9 | 60.0 | 58.1 | 56.3 | 54.5 | 52.9 | | |
| 11400 | 69.8 | 65.3 | 64.9 | 62.9 | 60.9 | 59.0 | 57.2 | 55.4 | 53.7 | L | |
| 11800 | 70.8 | 66.3 | 65.9 | 63.9 | 61.8 | 59.9 | 58.0 | 56.2 | 54.5 | I | |
| 12200 | 71.9 | 67.3 | 66.9 | 64.8 | 62.7 | 60.8 | 58.9 | 57.0 | 55.3 | M | |
| 12600 | 72.9 | 68.3 | 67.8 | 65.8 | 63.7 | 61.7 | 59.8 | 57.9 | 56.1 | I | |
| 13000 | 73.9 | 69.3 | 68.8 | 66.7 | 64.6 | 62.6 | 60.6 | 58.7 | 56.9 | T | |
| 13400 | 74.9 | 70.2 | 69.7 | 67.6 | 65.4 | 63.4 | 61.5 | 59.5 | 57.7 | E | |
| 13800 | 75.9 | 71.1 | 70.6 | 68.5 | 66.3 | 64.3 | 62.3 | 60.3 | 58.4 | D | |
| 14200 | 76.9 | 72.0 | 71.5 | 69.4 | 67.1 | 65.1 | 63.0 | 61.0 | 59.2 | | |
| 14600 | 77.9 | 72.9 | 72.4 | 70.2 | 67.9 | 65.8 | 63.8 | 61.8 | 59.8 | | |
| 15000 | 78.8 | 73.8 | 73.3 | 71.0 | 68.7 | 66.6 | 64.5 | 62.4 | 60.5 | | |
| 15400 | 79.7 | 74.6 | 74.1 | 71.8 | 69.5 | 67.3 | 65.2 | 63.1 | 61.1 | | |
| CLIMB LIMIT WT (1000 KG) | 60.2 | 59.7 | 59.6 | 57.2 | 54.8 | 52.7 | 50.6 | 48.5 | 46.6 | | |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1450 | -1450 |
| ENGINE AND WING ON | -1450 | -1450 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1350 | -1400 |
| ENGINE AND WING ON | -1350 | -1400 |

# Takeoff Field & Climb Limit Weights - Dry Runway

### Flaps 5

### Based on engine bleed for packs on and anti-ice off

## Table 3(h) of 3: 14000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 5000 | 42.9 | | | | | | | | | | |
| 5400 | 44.8 | | | | | | | | | | |
| 5800 | 46.6 | 43.7 | | | | | | | | | |
| 6200 | 48.3 | 45.3 | 44.0 | | | | | | | | |
| 6600 | 49.9 | 46.8 | 45.4 | 44.0 | | | | | | | |
| 7000 | 51.5 | 48.2 | 46.8 | 45.3 | 43.8 | | | P | | | |
| 7400 | 52.9 | 49.5 | 48.1 | 46.5 | 45.0 | 43.5 | | E | | | |
| 7800 | 54.3 | 50.9 | 49.3 | 47.7 | 46.1 | 44.7 | 43.2 | R | | | |
| 8200 | 55.7 | 52.2 | 50.7 | 49.0 | 47.4 | 45.9 | 44.4 | F | | | |
| 8600 | 57.2 | 53.6 | 52.0 | 50.3 | 48.6 | 47.1 | 45.5 | O | | | |
| 9000 | 58.4 | 54.8 | 53.2 | 51.4 | 49.7 | 48.1 | 46.5 | R | | | |
| 9400 | 59.4 | 55.7 | 54.1 | 52.3 | 50.5 | 48.9 | 47.3 | M | | | |
| 9800 | 60.4 | 56.6 | 55.0 | 53.1 | 51.4 | 49.7 | 48.1 | A | | | |
| 10200 | 61.5 | 57.6 | 55.9 | 54.0 | 52.2 | 50.5 | 48.8 | N | | | |
| 10600 | 62.5 | 58.5 | 56.7 | 54.8 | 53.0 | 51.3 | 49.6 | C | | | |
| 11000 | 63.5 | 59.4 | 57.6 | 55.7 | 53.8 | 52.1 | 50.4 | E | | | |
| 11400 | 64.5 | 60.3 | 58.5 | 56.6 | 54.7 | 52.9 | 51.1 | | | | |
| 11800 | 65.5 | 61.3 | 59.4 | 57.4 | 55.5 | 53.6 | 51.9 | L | | | |
| 12200 | 66.4 | 62.2 | 60.3 | 58.3 | 56.3 | 54.5 | 52.7 | I | | | |
| 12600 | 67.4 | 63.1 | 61.2 | 59.1 | 57.2 | 55.3 | 53.5 | M | | | |
| 13000 | 68.3 | 64.0 | 62.1 | 60.0 | 58.0 | 56.1 | 54.2 | I | | | |
| 13400 | 69.3 | 64.9 | 62.9 | 60.8 | 58.8 | 56.8 | 55.0 | T | | | |
| 13800 | 70.2 | 65.7 | 63.7 | 61.6 | 59.5 | 57.6 | 55.7 | E | | | |
| 14200 | 71.1 | 66.5 | 64.5 | 62.3 | 60.3 | 58.3 | 56.4 | D | | | |
| 14600 | 71.9 | 67.3 | 65.3 | 63.1 | 61.0 | 58.9 | 57.0 | | | | |
| 15000 | 72.8 | 68.1 | 66.0 | 63.8 | 61.6 | 59.6 | 57.6 | | | | |
| 15400 | 73.6 | 68.9 | 66.8 | 64.5 | 62.3 | 60.2 | 58.2 | | | | |
| CLIMB LIMIT WT (1000 KG) | 55.7 | 55.3 | 53.1 | 50.8 | 48.6 | 46.5 | 44.5 | | | | |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1450 | -1450 |
| ENGINE AND WING ON | -1450 | -1450 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1350 | -1400 |
| ENGINE AND WING ON | -1350 | -1400 |

# Takeoff Field & Climb Limit Weights - Dry Runway

**Flaps 5**

**Based on engine bleed for packs on and anti-ice off**

## Table 3(i) of 3: 14500 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 5400 | 44.0 | | | | | | | | | | |
| 5800 | 45.7 | | | | | | | | | | |
| 6200 | 47.4 | 44.3 | 42.9 | | | | | | | | |
| 6600 | 49.0 | 45.7 | 44.3 | 42.8 | | | | | | | |
| 7000 | 50.5 | 47.1 | 45.6 | 44.1 | | | | | | | |
| 7400 | 51.8 | 48.4 | 46.8 | 45.3 | 43.8 | | | P | | | |
| 7800 | 53.2 | 49.6 | 48.1 | 46.5 | 44.9 | 43.4 | | E | | | |
| 8200 | 54.7 | 51.0 | 49.4 | 47.7 | 46.1 | 44.6 | 43.2 | R | | | |
| 8600 | 56.1 | 52.3 | 50.7 | 49.0 | 47.3 | 45.8 | 44.3 | F | | | |
| 9000 | 57.3 | 53.5 | 51.8 | 50.0 | 48.4 | 46.8 | 45.3 | O | | | |
| 9400 | 58.3 | 54.4 | 52.7 | 50.9 | 49.2 | 47.6 | 46.0 | R | | | |
| 9800 | 59.3 | 55.3 | 53.5 | 51.7 | 50.0 | 48.3 | 46.8 | M | | | |
| 10200 | 60.3 | 56.2 | 54.4 | 52.6 | 50.8 | 49.1 | 47.5 | A | | | |
| 10600 | 61.3 | 57.1 | 55.3 | 53.4 | 51.6 | 49.9 | 48.2 | N | | | |
| 11000 | 62.2 | 58.0 | 56.1 | 54.2 | 52.4 | 50.6 | 49.0 | C | | | |
| 11400 | 63.2 | 58.9 | 57.0 | 55.0 | 53.2 | 51.4 | 49.7 | E | | | |
| 11800 | 64.2 | 59.8 | 57.8 | 55.9 | 54.0 | 52.1 | 50.4 | | | | |
| 12200 | 65.1 | 60.7 | 58.7 | 56.7 | 54.8 | 52.9 | 51.2 | L | | | |
| 12600 | 66.1 | 61.6 | 59.6 | 57.6 | 55.6 | 53.8 | 52.0 | I | | | |
| 13000 | 67.0 | 62.4 | 60.4 | 58.4 | 56.4 | 54.5 | 52.7 | M | | | |
| 13400 | 67.9 | 63.3 | 61.3 | 59.2 | 57.2 | 55.3 | 53.5 | I | | | |
| 13800 | 68.8 | 64.1 | 62.1 | 59.9 | 57.9 | 56.0 | 54.1 | T | | | |
| 14200 | 69.7 | 64.9 | 62.8 | 60.7 | 58.6 | 56.7 | 54.8 | E | | | |
| 14600 | 70.5 | 65.7 | 63.6 | 61.4 | 59.3 | 57.3 | 55.4 | D | | | |
| 15000 | 71.3 | 66.4 | 64.3 | 62.1 | 59.9 | 57.9 | 56.0 | | | | |
| 15400 | 72.2 | 67.2 | 65.0 | 62.7 | 60.6 | 58.5 | 56.5 | | | | |
| CLIMB LIMIT WT (1000 KG) | 54.7 | 53.8 | 51.5 | 49.3 | 47.1 | 45.1 | 43.2 | | | | |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1450 | -1450 |
| ENGINE AND WING ON | -1450 | -1450 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1350 | -1400 |
| ENGINE AND WING ON | -1350 | -1400 |

# Takeoff Field Corrections - Wet Runway

## Table 1 of 3: Slope Correction

| FIELD LENGTH AVAILABLE (FT) | SLOPE CORRECTED FIELD LENGTH (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | RUNWAY SLOPE (%) | | | | | | | | |
| | -2.0 | -1.5 | -1.0 | -0.5 | 0.0 | 0.5 | 1.0 | 1.5 | 2.0 |
| 4200 | 4230 | 4220 | 4210 | 4210 | 4200 | 4100 | 4010 | 3910 | 3820 |
| 4600 | 4680 | 4660 | 4640 | 4620 | 4600 | 4490 | 4380 | 4270 | 4150 |
| 5000 | 5130 | 5100 | 5070 | 5030 | 5000 | 4870 | 4750 | 4620 | 4490 |
| 5400 | 5580 | 5540 | 5490 | 5450 | 5400 | 5260 | 5120 | 4970 | 4830 |
| 5800 | 6040 | 5980 | 5920 | 5860 | 5800 | 5640 | 5480 | 5330 | 5170 |
| 6200 | 6490 | 6420 | 6340 | 6270 | 6200 | 6030 | 5850 | 5680 | 5510 |
| 6600 | 6940 | 6860 | 6770 | 6690 | 6600 | 6410 | 6220 | 6030 | 5850 |
| 7000 | 7390 | 7300 | 7200 | 7100 | 7000 | 6800 | 6590 | 6390 | 6180 |
| 7400 | 7850 | 7730 | 7620 | 7510 | 7400 | 7180 | 6960 | 6740 | 6520 |
| 7800 | 8300 | 8170 | 8050 | 7920 | 7800 | 7570 | 7330 | 7100 | 6860 |
| 8200 | 8750 | 8610 | 8480 | 8340 | 8200 | 7950 | 7700 | 7450 | 7200 |
| 8600 | 9200 | 9050 | 8900 | 8750 | 8600 | 8330 | 8070 | 7800 | 7540 |
| 9000 | 9660 | 9490 | 9330 | 9160 | 9000 | 8720 | 8440 | 8160 | 7880 |
| 9400 | 10110 | 9930 | 9750 | 9580 | 9400 | 9100 | 8810 | 8510 | 8220 |
| 9800 | 10560 | 10370 | 10180 | 9990 | 9800 | 9490 | 9180 | 8870 | 8550 |
| 10200 | 11010 | 10810 | 10610 | 10400 | 10200 | 9870 | 9550 | 9220 | 8890 |
| 10600 | 11470 | 11250 | 11030 | 10820 | 10600 | 10260 | 9920 | 9570 | 9230 |
| 11000 | 11920 | 11690 | 11460 | 11230 | 11000 | 10640 | 10280 | 9930 | 9570 |
| 11400 | 12370 | 12130 | 11890 | 11640 | 11400 | 11030 | 10650 | 10280 | 9910 |
| 11800 | 12820 | 12570 | 12310 | 12060 | 11800 | 11410 | 11020 | 10630 | 10250 |
| 12200 | 13280 | 13010 | 12740 | 12470 | 12200 | 11800 | 11390 | 10990 | 10580 |
| 12600 | 13730 | 13450 | 13160 | 12880 | 12600 | 12180 | 11760 | 11340 | 10920 |
| 13000 | 14180 | 13890 | 13590 | 13300 | 13000 | 12570 | 12130 | 11700 | 11260 |
| 13400 | 14630 | 14330 | 14020 | 13710 | 13400 | 12950 | 12500 | 12050 | 11600 |
| 13800 | 15090 | 14760 | 14440 | 14120 | 13800 | 13330 | 12870 | 12400 | 11940 |
| 14200 | 15540 | 15200 | 14870 | 14530 | 14200 | 13720 | 13240 | 12760 | 12280 |
| 14600 | 15990 | 15640 | 15300 | 14950 | 14600 | 14100 | 13610 | 13110 | 12620 |
| 15000 | 16440 | 16080 | 15720 | 15360 | 15000 | 14490 | 13980 | 13470 | 12950 |
| 15400 | 16900 | 16520 | 16150 | 15770 | 15400 | 14870 | 14350 | 13820 | 13290 |
| 15800 | 17350 | 16960 | 16570 | 16190 | 15800 | 15260 | 14720 | 14170 | 13630 |

# Takeoff Field Corrections - Wet Runway

## Table 2 of 3: Wind Correction

| SLOPE CORR'D FIELD LENGTH (FT) | SLOPE AND WIND CORRECTED FIELD LENGTH (FT) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | WIND COMPONENT (KTS) | | | | | | | |
| | -15 | -10 | -5 | 0 | 10 | 20 | 30 | 40 |
| 4200 | 2860 | 3300 | 3750 | 4200 | 4360 | 4560 | 4800 | 5070 |
| 4600 | 3190 | 3660 | 4130 | 4600 | 4770 | 4980 | 5230 | 5520 |
| 5000 | 3530 | 4020 | 4510 | 5000 | 5180 | 5400 | 5660 | 5960 |
| 5400 | 3870 | 4380 | 4890 | 5400 | 5590 | 5830 | 6100 | 6410 |
| 5800 | 4200 | 4740 | 5270 | 5800 | 6000 | 6250 | 6530 | 6850 |
| 6200 | 4540 | 5090 | 5650 | 6200 | 6410 | 6670 | 6960 | 7300 |
| 6600 | 4880 | 5450 | 6030 | 6600 | 6830 | 7090 | 7400 | 7740 |
| 7000 | 5220 | 5810 | 6410 | 7000 | 7240 | 7510 | 7830 | 8190 |
| 7400 | 5550 | 6170 | 6780 | 7400 | 7650 | 7930 | 8260 | 8630 |
| 7800 | 5890 | 6530 | 7160 | 7800 | 8060 | 8360 | 8700 | 9080 |
| 8200 | 6230 | 6890 | 7540 | 8200 | 8470 | 8780 | 9130 | 9520 |
| 8600 | 6570 | 7240 | 7920 | 8600 | 8880 | 9200 | 9560 | 9970 |
| 9000 | 6900 | 7600 | 8300 | 9000 | 9290 | 9620 | 10000 | 10410 |
| 9400 | 7240 | 7960 | 8680 | 9400 | 9700 | 10040 | 10430 | 10860 |
| 9800 | 7580 | 8320 | 9060 | 9800 | 10110 | 10460 | 10860 | 11300 |
| 10200 | 7920 | 8680 | 9440 | 10200 | 10520 | 10890 | 11290 | 11750 |
| 10600 | 8250 | 9040 | 9820 | 10600 | 10930 | 11310 | 11730 | 12190 |
| 11000 | 8590 | 9390 | 10200 | 11000 | 11340 | 11730 | 12160 | 12640 |
| 11400 | 8930 | 9750 | 10580 | 11400 | 11750 | 12150 | 12590 | 13080 |
| 11800 | 9260 | 10110 | 10950 | 11800 | 12160 | 12570 | 13030 | 13530 |
| 12200 | 9600 | 10470 | 11330 | 12200 | 12570 | 12990 | 13460 | 13970 |
| 12600 | 9940 | 10830 | 11710 | 12600 | 12980 | 13420 | 13890 | 14420 |
| 13000 | 10280 | 11180 | 12090 | 13000 | 13400 | 13840 | 14330 | 14860 |
| 13400 | 10610 | 11540 | 12470 | 13400 | 13810 | 14260 | 14760 | 15310 |
| 13800 | 10950 | 11900 | 12850 | 13800 | 14220 | 14680 | 15190 | 15750 |
| 14200 | 11290 | 12260 | 13230 | 14200 | 14630 | 15100 | 15630 | 16200 |
| 14600 | 11630 | 12620 | 13610 | 14600 | 15040 | 15520 | 16060 | 16640 |
| 15000 | 11960 | 12980 | 13990 | 15000 | 15450 | 15950 | 16490 | 17090 |
| 15400 | 12300 | 13330 | 14370 | 15400 | 15860 | 16370 | 16930 | 17530 |
| 15800 | 12640 | 13690 | 14750 | 15800 | 16270 | 16790 | 17360 | 17980 |

# Takeoff Field & Climb Limit Weights - Wet Runway

## Flaps 5

### Based on engine bleed for packs on and anti-ice off

### Table 3(a) of 3: Sea Level Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4100 | 61.2 | 57.2 | 56.8 | 56.5 | 56.2 | 55.8 | 55.5 | 55.1 | 54.8 | 51.2 | 47.9 |
| 4200 | 62.1 | 58.0 | 57.6 | 57.3 | 56.9 | 56.6 | 56.2 | 55.9 | 55.5 | 51.9 | 48.5 |
| 4600 | 65.3 | 61.0 | 60.7 | 60.3 | 59.9 | 59.6 | 59.2 | 58.8 | 58.5 | 54.6 | 51.1 |
| 5000 | 68.5 | 64.0 | 63.6 | 63.2 | 62.8 | 62.4 | 62.1 | 61.7 | 61.3 | 57.3 | 53.6 |
| 5400 | 71.6 | 66.8 | 66.4 | 66.0 | 65.6 | 65.2 | 64.8 | 64.4 | 64.0 | 59.7 | 55.9 |
| 5800 | 74.5 | 69.5 | 69.1 | 68.6 | 68.2 | 67.8 | 67.4 | 67.0 | 66.6 | 62.1 | 58.0 |
| 6200 | 77.3 | 72.1 | 71.6 | 71.2 | 70.7 | 70.3 | 69.9 | 69.4 | 69.0 | 64.4 | 60.1 |
| 6600 | 79.9 | 74.5 | 74.0 | 73.6 | 73.1 | 72.7 | 72.2 | 71.8 | 71.3 | 66.5 | 62.1 |
| 7000 | 82.4 | 76.8 | 76.3 | 75.8 | 75.4 | 74.9 | 74.4 | 74.0 | 73.5 | 68.5 | 64.0 |
| 7400 | 84.5 | 78.8 | 78.3 | 77.8 | 77.3 | 76.8 | 76.4 | 75.9 | 75.4 | 70.3 | 65.6 |
| 7800 | 86.7 | 80.8 | 80.3 | 79.8 | 79.3 | 78.8 | 78.3 | 77.8 | 77.4 | 72.1 | 67.3 |
| 8200 | 89.1 | 83.1 | 82.6 | 82.0 | 81.5 | 81.0 | 80.5 | 80.0 | 79.5 | 74.1 | 69.1 |
| 8600 | 90.7 | 85.3 | 84.8 | 84.2 | 83.7 | 83.2 | 82.6 | 82.0 | 81.4 | 76.0 | 70.9 |
| 9000 | 90.7 | 87.3 | 86.7 | 86.2 | 85.6 | 85.1 | 84.5 | 84.0 | 83.5 | 77.8 | 72.6 |
| 9400 | 90.7 | 88.8 | 88.2 | 87.7 | 87.1 | 86.6 | 86.0 | 85.5 | 84.9 | 79.1 | 73.8 |
| 9800 | 90.7 | 90.3 | 89.8 | 89.2 | 88.6 | 88.1 | 87.5 | 87.0 | 86.4 | 80.5 | 75.1 |
| 10200 | 90.7 | 90.7 | 90.7 | 90.7 | 90.3 | 89.7 | 89.1 | 88.6 | 88.0 | 82.0 | 76.5 |
| 10600 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.3 | 89.7 | 83.5 | 77.9 |
| 11000 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 85.0 | 79.3 |
| 11400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 86.5 | 80.6 |
| 11800 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 88.0 | 82.0 |
| 12200 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 89.3 | 83.3 |
| 12600 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 84.5 |
| 13000 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 85.7 |
| 13400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 86.9 |
| 13800 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 88.1 |
| 14200 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 89.3 |
| 14600 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.5 |
| 15000 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 |
| 15400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 |
| CLIMB LIMIT WT (1000 KG) | 86.3 | 86.2 | 86.2 | 86.2 | 86.2 | 86.1 | 86.1 | 86.1 | 86.1 | 78.5 | 71.4 |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -100 | -550 |
| ENGINE AND WING ON | -100 | -550 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -1000 |
| ENGINE AND WING ON | -150 | -1000 |

# Takeoff Field & Climb Limit Weights - Wet Runway

## Flaps 5

### Based on engine bleed for packs on and anti-ice off

### Table 3(b) of 3: 2000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4100 | 57.7 | 53.5 | 53.1 | 52.8 | 52.5 | 52.1 | 51.8 | 51.6 | 50.6 | 47.4 | 44.0 |
| 4200 | 58.5 | 54.2 | 53.9 | 53.5 | 53.2 | 52.9 | 52.5 | 52.3 | 51.3 | 48.1 | 44.6 |
| 4600 | 61.6 | 57.1 | 56.7 | 56.4 | 56.0 | 55.7 | 55.3 | 55.0 | 54.0 | 50.6 | 47.0 |
| 5000 | 64.6 | 59.9 | 59.5 | 59.1 | 58.7 | 58.3 | 58.0 | 57.7 | 56.6 | 53.0 | 49.3 |
| 5400 | 67.4 | 62.5 | 62.1 | 61.6 | 61.3 | 60.9 | 60.5 | 60.2 | 59.1 | 55.3 | 51.3 |
| 5800 | 70.2 | 65.0 | 64.5 | 64.1 | 63.7 | 63.3 | 62.9 | 62.6 | 61.4 | 57.5 | 53.3 |
| 6200 | 72.8 | 67.4 | 66.9 | 66.4 | 66.0 | 65.6 | 65.2 | 64.8 | 63.6 | 59.6 | 55.2 |
| 6600 | 75.2 | 69.6 | 69.1 | 68.7 | 68.2 | 67.8 | 67.4 | 67.0 | 65.7 | 61.5 | 57.0 |
| 7000 | 77.5 | 71.7 | 71.2 | 70.8 | 70.3 | 69.9 | 69.4 | 69.0 | 67.7 | 63.3 | 58.7 |
| 7400 | 79.6 | 73.6 | 73.1 | 72.6 | 72.1 | 71.7 | 71.2 | 70.8 | 69.5 | 65.0 | 60.2 |
| 7800 | 81.6 | 75.5 | 75.0 | 74.5 | 74.0 | 73.5 | 73.1 | 72.6 | 71.2 | 66.6 | 61.7 |
| 8200 | 83.9 | 77.6 | 77.0 | 76.5 | 76.0 | 75.5 | 75.1 | 74.6 | 73.2 | 68.4 | 63.4 |
| 8600 | 86.1 | 79.6 | 79.1 | 78.5 | 78.0 | 77.5 | 77.1 | 76.6 | 75.1 | 70.3 | 65.0 |
| 9000 | 88.1 | 81.5 | 80.9 | 80.3 | 79.8 | 79.3 | 78.8 | 78.4 | 76.9 | 71.9 | 66.5 |
| 9400 | 89.6 | 82.9 | 82.3 | 81.7 | 81.2 | 80.7 | 80.2 | 79.7 | 78.2 | 73.1 | 67.7 |
| 9800 | 90.7 | 84.3 | 83.7 | 83.2 | 82.6 | 82.1 | 81.6 | 81.1 | 79.6 | 74.4 | 68.9 |
| 10200 | 90.7 | 85.9 | 85.3 | 84.7 | 84.1 | 83.6 | 83.1 | 82.6 | 81.0 | 75.7 | 70.1 |
| 10600 | 90.7 | 87.5 | 86.9 | 86.3 | 85.7 | 85.2 | 84.7 | 84.2 | 82.5 | 77.1 | 71.4 |
| 11000 | 90.7 | 89.1 | 88.5 | 87.9 | 87.3 | 86.7 | 86.2 | 85.7 | 84.0 | 78.5 | 72.6 |
| 11400 | 90.7 | 90.7 | 90.0 | 89.4 | 88.8 | 88.2 | 87.7 | 87.2 | 85.5 | 79.9 | 73.9 |
| 11800 | 90.7 | 90.7 | 90.7 | 90.7 | 90.3 | 89.7 | 89.2 | 88.6 | 86.9 | 81.2 | 75.0 |
| 12200 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.6 | 90.0 | 88.3 | 82.4 | 76.2 |
| 12600 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 89.6 | 83.7 | 77.3 |
| 13000 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 84.9 | 78.5 |
| 13400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 86.1 | 79.6 |
| 13800 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 87.3 | 80.6 |
| 14200 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 88.4 | 81.7 |
| 14600 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 89.6 | 82.7 |
| 15000 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 83.8 |
| 15400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 84.8 |
| CLIMB LIMIT WT (1000 KG) | 81.6 | 81.3 | 81.3 | 81.2 | 81.2 | 81.2 | 81.3 | 81.4 | 79.5 | 72.4 | 65.0 |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -100 | -550 |
| ENGINE AND WING ON | -100 | -550 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -1000 |
| ENGINE AND WING ON | -150 | -1000 |

# Takeoff Field & Climb Limit Weights - Wet Runway

## Flaps 5

## Based on engine bleed for packs on and anti-ice off

## Table 3(c) of 3: 4000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4100 | 54.1 | 50.1 | 49.8 | 49.5 | 49.1 | 48.8 | 48.6 | 47.9 | 46.9 | 43.4 | |
| 4200 | 54.8 | 50.8 | 50.5 | 50.1 | 49.8 | 49.5 | 49.2 | 48.6 | 47.5 | 44.0 | |
| 4600 | 57.8 | 53.5 | 53.1 | 52.8 | 52.5 | 52.1 | 51.8 | 51.1 | 50.1 | 46.3 | 43.3 |
| 5000 | 60.5 | 56.1 | 55.7 | 55.3 | 55.0 | 54.6 | 54.3 | 53.6 | 52.5 | 48.5 | 45.3 |
| 5400 | 63.2 | 58.5 | 58.1 | 57.7 | 57.4 | 57.0 | 56.7 | 55.9 | 54.7 | 50.6 | 47.2 |
| 5800 | 65.7 | 60.8 | 60.4 | 60.0 | 59.6 | 59.2 | 58.9 | 58.1 | 56.8 | 52.5 | 49.0 |
| 6200 | 68.1 | 63.0 | 62.6 | 62.2 | 61.8 | 61.4 | 61.0 | 60.2 | 58.9 | 54.4 | 50.7 |
| 6600 | 70.4 | 65.1 | 64.7 | 64.2 | 63.8 | 63.4 | 63.0 | 62.2 | 60.8 | 56.1 | 52.3 |
| 7000 | 72.6 | 67.1 | 66.6 | 66.2 | 65.7 | 65.3 | 64.9 | 64.0 | 62.6 | 57.8 | 53.8 |
| 7400 | 74.4 | 68.8 | 68.3 | 67.9 | 67.4 | 67.0 | 66.6 | 65.7 | 64.2 | 59.3 | 55.2 |
| 7800 | 76.4 | 70.6 | 70.1 | 69.6 | 69.1 | 68.7 | 68.3 | 67.3 | 65.9 | 60.8 | 56.6 |
| 8200 | 78.5 | 72.5 | 72.0 | 71.5 | 71.0 | 70.6 | 70.1 | 69.2 | 67.7 | 62.4 | 58.1 |
| 8600 | 80.4 | 74.4 | 73.9 | 73.4 | 72.9 | 72.4 | 72.0 | 71.0 | 69.4 | 64.1 | 59.6 |
| 9000 | 82.4 | 76.1 | 75.6 | 75.1 | 74.6 | 74.1 | 73.6 | 72.6 | 71.0 | 65.5 | 61.0 |
| 9400 | 83.8 | 77.4 | 76.9 | 76.4 | 75.9 | 75.4 | 74.9 | 73.9 | 72.3 | 66.7 | 62.0 |
| 9800 | 85.3 | 78.8 | 78.2 | 77.7 | 77.2 | 76.7 | 76.2 | 75.2 | 73.5 | 67.8 | 63.1 |
| 10200 | 86.9 | 80.2 | 79.7 | 79.1 | 78.6 | 78.1 | 77.6 | 76.6 | 74.9 | 69.0 | 64.2 |
| 10600 | 88.5 | 81.7 | 81.2 | 80.6 | 80.1 | 79.6 | 79.1 | 78.0 | 76.2 | 70.3 | 65.4 |
| 11000 | 90.1 | 83.2 | 82.6 | 82.1 | 81.5 | 81.0 | 80.5 | 79.4 | 77.6 | 71.5 | 66.5 |
| 11400 | 90.7 | 84.6 | 84.0 | 83.5 | 82.9 | 82.4 | 81.9 | 80.7 | 78.9 | 72.7 | 67.6 |
| 11800 | 90.7 | 86.0 | 85.4 | 84.8 | 84.3 | 83.7 | 83.2 | 82.0 | 80.2 | 73.9 | 68.7 |
| 12200 | 90.7 | 87.4 | 86.8 | 86.2 | 85.6 | 85.0 | 84.5 | 83.3 | 81.5 | 75.0 | 69.7 |
| 12600 | 90.7 | 88.7 | 88.1 | 87.5 | 86.9 | 86.3 | 85.8 | 84.6 | 82.7 | 76.1 | 70.7 |
| 13000 | 90.7 | 90.0 | 89.4 | 88.7 | 88.1 | 87.6 | 87.0 | 85.8 | 83.9 | 77.2 | 71.8 |
| 13400 | 90.7 | 90.7 | 90.6 | 90.0 | 89.4 | 88.8 | 88.3 | 87.0 | 85.1 | 78.3 | 72.7 |
| 13800 | 90.7 | 90.7 | 90.7 | 90.7 | 90.6 | 90.0 | 89.5 | 88.2 | 86.2 | 79.4 | 73.7 |
| 14200 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 89.4 | 87.4 | 80.4 | 74.7 |
| 14600 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.6 | 88.5 | 81.4 | 75.6 |
| 15000 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 89.6 | 82.5 | 76.5 |
| 15400 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 90.7 | 83.4 | 77.4 |
| CLIMB LIMIT WT (1000 KG) | 76.9 | 76.7 | 76.6 | 76.6 | 76.6 | 76.6 | 76.6 | 75.6 | 73.5 | 65.4 | 59.0 |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -100 | -550 |
| ENGINE AND WING ON | -100 | -550 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -1000 |
| ENGINE AND WING ON | -150 | -1000 |

# Takeoff Field & Climb Limit Weights - Wet Runway

## Flaps 5

### Based on engine bleed for packs on and anti-ice off

### Table 3(d) of 3: 6000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4100 | 50.5 | 46.9 | 46.6 | 46.3 | 46.0 | 45.7 | 45.3 | 44.5 | 43.4 | | |
| 4200 | 51.2 | 47.5 | 47.2 | 46.9 | 46.6 | 46.3 | 45.9 | 45.1 | 44.0 | | |
| 4600 | 54.0 | 50.1 | 49.7 | 49.4 | 49.1 | 48.8 | 48.3 | 47.5 | 46.3 | | |
| 5000 | 56.5 | 52.5 | 52.1 | 51.8 | 51.5 | 51.1 | 50.6 | 49.7 | 48.6 | 44.4 | |
| 5400 | 59.0 | 54.7 | 54.4 | 54.0 | 53.7 | 53.3 | 52.8 | 51.8 | 50.6 | 46.2 | 43.4 |
| 5800 | 61.3 | 56.9 | 56.5 | 56.1 | 55.7 | 55.4 | 54.8 | 53.8 | 52.6 | 48.0 | 45.0 |
| 6200 | 63.6 | 58.9 | 58.5 | 58.1 | 57.7 | 57.4 | 56.8 | 55.7 | 54.4 | 49.6 | 46.5 |
| 6600 | 65.7 | 60.8 | 60.4 | 60.0 | 59.6 | 59.2 | 58.6 | 57.6 | 56.2 | 51.2 | 48.0 |
| 7000 | 67.6 | 62.6 | 62.2 | 61.8 | 61.4 | 61.0 | 60.4 | 59.3 | 57.8 | 52.7 | 49.4 |
| 7400 | 69.4 | 64.2 | 63.8 | 63.4 | 63.0 | 62.5 | 61.9 | 60.8 | 59.3 | 54.0 | 50.6 |
| 7800 | 71.2 | 65.9 | 65.4 | 65.0 | 64.6 | 64.1 | 63.5 | 62.3 | 60.8 | 55.3 | 51.9 |
| 8200 | 73.1 | 67.7 | 67.2 | 66.8 | 66.3 | 65.9 | 65.2 | 64.0 | 62.4 | 56.8 | 53.2 |
| 8600 | 75.1 | 69.5 | 69.0 | 68.5 | 68.1 | 67.6 | 66.9 | 65.7 | 64.1 | 58.3 | 54.6 |
| 9000 | 76.8 | 71.0 | 70.6 | 70.1 | 69.6 | 69.2 | 68.5 | 67.2 | 65.5 | 59.6 | 55.9 |
| 9400 | 78.1 | 72.3 | 71.8 | 71.3 | 70.8 | 70.4 | 69.7 | 68.3 | 66.7 | 60.7 | 56.8 |
| 9800 | 79.5 | 73.5 | 73.0 | 72.5 | 72.1 | 71.6 | 70.9 | 69.5 | 67.8 | 61.7 | 57.8 |
| 10200 | 80.9 | 74.9 | 74.4 | 73.9 | 73.4 | 72.9 | 72.1 | 70.8 | 69.1 | 62.8 | 58.8 |
| 10600 | 82.5 | 76.3 | 75.7 | 75.2 | 74.7 | 74.2 | 73.5 | 72.1 | 70.3 | 63.9 | 59.9 |
| 11000 | 83.9 | 77.6 | 77.1 | 76.6 | 76.0 | 75.5 | 74.8 | 73.3 | 71.5 | 65.0 | 60.9 |
| 11400 | 85.4 | 78.9 | 78.4 | 77.9 | 77.3 | 76.8 | 76.0 | 74.6 | 72.7 | 66.1 | 61.8 |
| 11800 | 86.8 | 80.2 | 79.7 | 79.1 | 78.6 | 78.1 | 77.3 | 75.8 | 73.9 | 67.2 | 62.8 |
| 12200 | 88.2 | 81.5 | 80.9 | 80.4 | 79.8 | 79.3 | 78.5 | 77.0 | 75.1 | 68.2 | 63.8 |
| 12600 | 89.5 | 82.7 | 82.1 | 81.6 | 81.0 | 80.5 | 79.6 | 78.1 | 76.2 | 69.2 | 64.7 |
| 13000 | 90.7 | 83.9 | 83.3 | 82.7 | 82.2 | 81.6 | 80.8 | 79.2 | 77.3 | 70.2 | 65.6 |
| 13400 | 90.7 | 85.1 | 84.5 | 83.9 | 83.3 | 82.8 | 81.9 | 80.4 | 78.3 | 71.1 | 66.5 |
| 13800 | 90.7 | 86.2 | 85.6 | 85.1 | 84.5 | 83.9 | 83.0 | 81.4 | 79.4 | 72.1 | 67.4 |
| 14200 | 90.7 | 87.4 | 86.8 | 86.2 | 85.6 | 85.0 | 84.1 | 82.5 | 80.5 | 73.0 | 68.3 |
| 14600 | 90.7 | 88.5 | 87.9 | 87.3 | 86.7 | 86.1 | 85.2 | 83.6 | 81.5 | 73.9 | 69.1 |
| 15000 | 90.7 | 89.6 | 89.0 | 88.4 | 87.8 | 87.2 | 86.3 | 84.6 | 82.5 | 74.8 | 69.9 |
| 15400 | 90.7 | 90.7 | 90.1 | 89.5 | 88.9 | 88.3 | 87.3 | 85.6 | 83.5 | 75.7 | 70.7 |
| CLIMB LIMIT WT (1000 KG) | 72.5 | 72.2 | 72.2 | 72.2 | 72.2 | 72.1 | 71.7 | 70.1 | 67.8 | 58.7 | 53.5 |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -100 | -550 |
| ENGINE AND WING ON | -100 | -550 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -1000 |
| ENGINE AND WING ON | -150 | -1000 |

# Takeoff Field & Climb Limit Weights - Wet Runway

## Flaps 5

## Based on engine bleed for packs on and anti-ice off

## Table 3(e) of 3: 8000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4100 | 47.4 | 43.9 | 43.6 | 43.4 | 43.1 | | | | | | |
| 4200 | 48.0 | 44.5 | 44.2 | 43.9 | 43.7 | | | | | | |
| 4600 | 50.6 | 46.9 | 46.6 | 46.3 | 46.0 | 44.9 | 43.7 | | | | |
| 5000 | 53.0 | 49.1 | 48.8 | 48.5 | 48.2 | 47.0 | 45.8 | 44.6 | 43.5 | | |
| 5400 | 55.3 | 51.2 | 50.9 | 50.5 | 50.2 | 49.0 | 47.7 | 46.5 | 45.3 | | |
| 5800 | 57.5 | 53.2 | 52.8 | 52.5 | 52.2 | 50.8 | 49.5 | 48.2 | 47.0 | 44.0 | |
| 6200 | 59.5 | 55.1 | 54.7 | 54.3 | 54.0 | 52.6 | 51.2 | 49.9 | 48.6 | 45.5 | |
| 6600 | 61.5 | 56.9 | 56.5 | 56.1 | 55.7 | 54.3 | 52.9 | 51.5 | 50.1 | 46.9 | 44.0 |
| 7000 | 63.3 | 58.5 | 58.1 | 57.7 | 57.4 | 55.9 | 54.4 | 53.0 | 51.6 | 48.2 | 45.2 |
| 7400 | 64.9 | 60.0 | 59.6 | 59.2 | 58.8 | 57.3 | 55.8 | 54.3 | 52.9 | 49.4 | 46.3 |
| 7800 | 66.6 | 61.5 | 61.1 | 60.7 | 60.3 | 58.7 | 57.2 | 55.7 | 54.2 | 50.7 | 47.5 |
| 8200 | 68.4 | 63.2 | 62.8 | 62.3 | 61.9 | 60.3 | 58.7 | 57.2 | 55.6 | 52.0 | 48.7 |
| 8600 | 70.2 | 64.9 | 64.4 | 64.0 | 63.6 | 61.9 | 60.3 | 58.7 | 57.1 | 53.4 | 50.0 |
| 9000 | 71.8 | 66.4 | 65.9 | 65.4 | 65.0 | 63.3 | 61.6 | 60.0 | 58.4 | 54.6 | 51.1 |
| 9400 | 73.1 | 67.5 | 67.0 | 66.6 | 66.1 | 64.4 | 62.7 | 61.1 | 59.4 | 55.5 | 52.0 |
| 9800 | 74.3 | 68.7 | 68.2 | 67.7 | 67.3 | 65.5 | 63.8 | 62.1 | 60.4 | 56.5 | 52.9 |
| 10200 | 75.7 | 69.9 | 69.4 | 68.9 | 68.5 | 66.7 | 64.9 | 63.2 | 61.5 | 57.5 | 53.8 |
| 10600 | 77.1 | 71.2 | 70.7 | 70.2 | 69.7 | 67.9 | 66.1 | 64.3 | 62.6 | 58.5 | 54.7 |
| 11000 | 78.5 | 72.4 | 71.9 | 71.4 | 71.0 | 69.1 | 67.2 | 65.4 | 63.6 | 59.4 | 55.6 |
| 11400 | 79.8 | 73.7 | 73.1 | 72.6 | 72.1 | 70.2 | 68.4 | 66.5 | 64.7 | 60.4 | 56.5 |
| 11800 | 81.1 | 74.9 | 74.3 | 73.8 | 73.3 | 71.4 | 69.4 | 67.6 | 65.7 | 61.3 | 57.4 |
| 12200 | 82.4 | 76.0 | 75.5 | 74.9 | 74.4 | 72.5 | 70.5 | 68.6 | 66.7 | 62.3 | 58.2 |
| 12600 | 83.6 | 77.1 | 76.6 | 76.0 | 75.5 | 73.5 | 71.6 | 69.6 | 67.7 | 63.2 | 59.1 |
| 13000 | 84.8 | 78.3 | 77.7 | 77.1 | 76.6 | 74.6 | 72.6 | 70.6 | 68.7 | 64.1 | 59.9 |
| 13400 | 86.0 | 79.3 | 78.8 | 78.2 | 77.7 | 75.6 | 73.6 | 71.6 | 69.6 | 65.0 | 60.7 |
| 13800 | 87.2 | 80.4 | 79.8 | 79.3 | 78.8 | 76.7 | 74.6 | 72.5 | 70.5 | 65.8 | 61.5 |
| 14200 | 88.4 | 81.5 | 80.9 | 80.3 | 79.8 | 77.7 | 75.5 | 73.5 | 71.4 | 66.6 | 62.3 |
| 14600 | 89.5 | 82.5 | 81.9 | 81.3 | 80.8 | 78.6 | 76.5 | 74.4 | 72.3 | 67.5 | 63.0 |
| 15000 | 90.6 | 83.6 | 82.9 | 82.4 | 81.8 | 79.6 | 77.4 | 75.3 | 73.2 | 68.3 | 63.8 |
| 15400 | 90.7 | 84.6 | 83.9 | 83.3 | 82.8 | 80.6 | 78.3 | 76.2 | 74.1 | 69.0 | 64.5 |
| CLIMB LIMIT WT (1000 KG) | 68.5 | 68.1 | 68.1 | 68.1 | 68.1 | 65.6 | 63.2 | 60.8 | 58.5 | 53.2 | 48.5 |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -100 | -550 |
| ENGINE AND WING ON | -100 | -550 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -150 | -1000 |
| ENGINE AND WING ON | -150 | -1000 |

# Takeoff Field & Climb Limit Weights - Wet Runway

## Flaps 5

### Based on engine bleed for packs on and anti-ice off

### Table 3(f) of 3: 10000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4100 | 44.4 | | | | | | | | | | |
| 4200 | 45.0 | | | | | | | | | | |
| 4600 | 47.4 | 44.0 | 43.7 | 43.5 | | | | | | | |
| 5000 | 49.7 | 46.1 | 45.8 | 45.5 | 44.4 | 43.2 | | | | | |
| 5400 | 51.8 | 48.1 | 47.7 | 47.4 | 46.2 | 45.0 | 43.8 | | | | |
| 5800 | 53.8 | 49.9 | 49.6 | 49.2 | 47.9 | 46.7 | 45.4 | 44.2 | 43.1 | | |
| 6200 | 55.7 | 51.6 | 51.3 | 50.9 | 49.6 | 48.3 | 47.0 | 45.7 | 44.5 | | |
| 6600 | 57.5 | 53.3 | 52.9 | 52.6 | 51.2 | 49.8 | 48.5 | 47.2 | 45.9 | 42.9 | |
| 7000 | 59.2 | 54.8 | 54.5 | 54.1 | 52.6 | 51.2 | 49.8 | 48.5 | 47.2 | 44.1 | |
| 7400 | 60.7 | 56.2 | 55.8 | 55.5 | 54.0 | 52.5 | 51.1 | 49.7 | 48.3 | 45.2 | |
| 7800 | 62.3 | 57.6 | 57.2 | 56.9 | 55.3 | 53.8 | 52.4 | 50.9 | 49.5 | 46.3 | 43.4 |
| 8200 | 64.0 | 59.2 | 58.8 | 58.4 | 56.8 | 55.3 | 53.8 | 52.3 | 50.9 | 47.5 | 44.5 |
| 8600 | 65.6 | 60.7 | 60.3 | 59.9 | 58.3 | 56.7 | 55.2 | 53.7 | 52.2 | 48.8 | 45.6 |
| 9000 | 67.1 | 62.1 | 61.7 | 61.3 | 59.6 | 58.0 | 56.4 | 54.9 | 53.3 | 49.8 | 46.7 |
| 9400 | 68.3 | 63.2 | 62.8 | 62.3 | 60.7 | 59.0 | 57.4 | 55.8 | 54.3 | 50.7 | 47.5 |
| 9800 | 69.5 | 64.3 | 63.8 | 63.4 | 61.7 | 60.0 | 58.4 | 56.8 | 55.2 | 51.6 | 48.3 |
| 10200 | 70.7 | 65.4 | 65.0 | 64.6 | 62.8 | 61.1 | 59.4 | 57.8 | 56.2 | 52.5 | 49.1 |
| 10600 | 72.0 | 66.6 | 66.1 | 65.7 | 63.9 | 62.1 | 60.4 | 58.8 | 57.1 | 53.4 | 49.9 |
| 11000 | 73.3 | 67.8 | 67.3 | 66.8 | 65.0 | 63.2 | 61.5 | 59.8 | 58.1 | 54.2 | 50.7 |
| 11400 | 74.5 | 68.9 | 68.4 | 67.9 | 66.1 | 64.2 | 62.5 | 60.7 | 59.0 | 55.1 | 51.5 |
| 11800 | 75.7 | 70.0 | 69.5 | 69.0 | 67.1 | 65.2 | 63.4 | 61.7 | 59.9 | 55.9 | 52.3 |
| 12200 | 76.9 | 71.1 | 70.6 | 70.1 | 68.2 | 66.2 | 64.4 | 62.6 | 60.8 | 56.8 | 53.1 |
| 12600 | 78.1 | 72.1 | 71.6 | 71.1 | 69.2 | 67.2 | 65.4 | 63.5 | 61.7 | 57.6 | 53.8 |
| 13000 | 79.2 | 73.1 | 72.6 | 72.1 | 70.1 | 68.2 | 66.3 | 64.4 | 62.6 | 58.4 | 54.6 |
| 13400 | 80.3 | 74.2 | 73.6 | 73.1 | 71.1 | 69.1 | 67.2 | 65.3 | 63.5 | 59.2 | 55.3 |
| 13800 | 81.4 | 75.2 | 74.6 | 74.1 | 72.1 | 70.0 | 68.1 | 66.2 | 64.3 | 59.9 | 56.0 |
| 14200 | 82.5 | 76.1 | 75.6 | 75.1 | 73.0 | 70.9 | 69.0 | 67.0 | 65.1 | 60.7 | 56.7 |
| 14600 | 83.5 | 77.1 | 76.6 | 76.0 | 73.9 | 71.8 | 69.8 | 67.8 | 65.9 | 61.4 | 57.3 |
| 15000 | 84.6 | 78.0 | 77.5 | 77.0 | 74.8 | 72.7 | 70.6 | 68.6 | 66.7 | 62.1 | 58.0 |
| 15400 | 85.6 | 79.0 | 78.4 | 77.9 | 75.7 | 73.5 | 71.4 | 69.4 | 67.4 | 62.8 | 58.6 |
| CLIMB LIMIT WT (1000 KG) | 64.9 | 64.5 | 64.4 | 64.4 | 61.9 | 59.5 | 57.2 | 55.0 | 52.8 | 48.0 | 43.7 |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1250 | -1000 |
| ENGINE AND WING ON | -1250 | -1000 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1350 | -1400 |
| ENGINE AND WING ON | -1350 | -1400 |

# Takeoff Field & Climb Limit Weights - Wet Runway

## Flaps 5

## Based on engine bleed for packs on and anti-ice off

## Table 3(g) of 3: 12000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 4600 | 44.0 | | | | | | | | | | |
| 5000 | 46.1 | 42.8 | | | | | | | | | |
| 5400 | 48.1 | 44.6 | 44.3 | 43.1 | | | | | | | |
| 5800 | 49.9 | 46.3 | 45.9 | 44.7 | 43.5 | | | | | | |
| 6200 | 51.6 | 47.9 | 47.5 | 46.2 | 44.9 | 43.7 | | | | P | |
| 6600 | 53.3 | 49.4 | 49.0 | 47.7 | 46.3 | 45.0 | 43.8 | | | E | |
| 7000 | 54.8 | 50.8 | 50.4 | 49.0 | 47.6 | 46.3 | 45.0 | 43.7 | | R | |
| 7400 | 56.2 | 52.0 | 51.7 | 50.2 | 48.8 | 47.5 | 46.1 | 44.8 | 43.6 | F | |
| 7800 | 57.6 | 53.3 | 53.0 | 51.5 | 50.0 | 48.6 | 47.3 | 45.9 | 44.6 | O | |
| 8200 | 59.2 | 54.8 | 54.4 | 52.9 | 51.3 | 49.9 | 48.5 | 47.1 | 45.8 | R | |
| 8600 | 60.7 | 56.2 | 55.8 | 54.2 | 52.7 | 51.2 | 49.8 | 48.3 | 47.0 | M | |
| 9000 | 62.1 | 57.5 | 57.0 | 55.5 | 53.9 | 52.4 | 50.9 | 49.4 | 48.0 | A | |
| 9400 | 63.2 | 58.5 | 58.0 | 56.4 | 54.8 | 53.3 | 51.8 | 50.3 | 48.9 | N | |
| 9800 | 64.3 | 59.5 | 59.0 | 57.4 | 55.7 | 54.2 | 52.7 | 51.1 | 49.7 | C | |
| 10200 | 65.4 | 60.5 | 60.1 | 58.4 | 56.7 | 55.1 | 53.6 | 52.0 | 50.6 | E | |
| 10600 | 66.6 | 61.6 | 61.1 | 59.4 | 57.7 | 56.1 | 54.5 | 52.9 | 51.4 | | |
| 11000 | 67.8 | 62.6 | 62.2 | 60.4 | 58.7 | 57.0 | 55.4 | 53.7 | 52.2 | L | |
| 11400 | 68.9 | 63.7 | 63.2 | 61.4 | 59.6 | 57.9 | 56.2 | 54.6 | 53.0 | I | |
| 11800 | 70.0 | 64.7 | 64.2 | 62.4 | 60.5 | 58.8 | 57.1 | 55.4 | 53.8 | M | |
| 12200 | 71.1 | 65.7 | 65.2 | 63.3 | 61.4 | 59.7 | 58.0 | 56.3 | 54.6 | I | |
| 12600 | 72.1 | 66.6 | 66.1 | 64.2 | 62.3 | 60.6 | 58.8 | 57.1 | 55.4 | T | |
| 13000 | 73.2 | 67.6 | 67.1 | 65.1 | 63.2 | 61.4 | 59.6 | 57.9 | 56.2 | E | |
| 13400 | 74.2 | 68.5 | 68.0 | 66.0 | 64.1 | 62.3 | 60.4 | 58.7 | 57.0 | D | |
| 13800 | 75.2 | 69.4 | 68.9 | 66.9 | 64.9 | 63.1 | 61.2 | 59.4 | 57.7 | | |
| 14200 | 76.1 | 70.3 | 69.8 | 67.8 | 65.7 | 63.9 | 62.0 | 60.1 | 58.4 | | |
| 14600 | 77.1 | 71.2 | 70.6 | 68.6 | 66.5 | 64.6 | 62.7 | 60.9 | 59.1 | | |
| 15000 | 78.0 | 72.0 | 71.5 | 69.4 | 67.3 | 65.4 | 63.4 | 61.6 | 59.8 | | |
| 15400 | 79.0 | 72.8 | 72.3 | 70.2 | 68.1 | 66.1 | 64.1 | 62.2 | 60.4 | | |
| CLIMB LIMIT WT (1000 KG) | 60.2 | 59.7 | 59.6 | 57.2 | 54.8 | 52.7 | 50.6 | 48.5 | 46.6 | | |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1250 | -1000 |
| ENGINE AND WING ON | -1250 | -1000 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1350 | -1400 |
| ENGINE AND WING ON | -1350 | -1400 |

## Takeoff Field & Climb Limit Weights - Wet Runway

### Flaps 5

### Based on engine bleed for packs on and anti-ice off

### Table 3(h) of 3: 14000 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT (°C) | | | | | | | | | | |
| | -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
| 5000 | 42.8 | | | | | | | | | | |
| 5400 | 44.6 | | | | | | | | | | |
| 5800 | 46.3 | 42.8 | | | | | | | | | |
| 6200 | 47.8 | 44.3 | 43.2 | | | | | P | | | |
| 6600 | 49.3 | 45.7 | 44.5 | 43.2 | | | | E | | | |
| 7000 | 50.8 | 47.0 | 45.7 | 44.4 | 43.1 | | | R | | | |
| 7400 | 52.0 | 48.2 | 46.9 | 45.5 | 44.1 | 42.8 | | F | | | |
| 7800 | 53.3 | 49.3 | 48.0 | 46.6 | 45.2 | 43.8 | | O | | | |
| 8200 | 54.8 | 50.7 | 49.3 | 47.8 | 46.4 | 45.0 | 43.7 | R | | | |
| 8600 | 56.2 | 52.0 | 50.6 | 49.0 | 47.6 | 46.1 | 44.8 | M | | | |
| 9000 | 57.5 | 53.1 | 51.7 | 50.1 | 48.6 | 47.2 | 45.8 | A | | | |
| 9400 | 58.5 | 54.1 | 52.6 | 51.0 | 49.5 | 48.0 | 46.6 | N | | | |
| 9800 | 59.5 | 55.0 | 53.5 | 51.9 | 50.3 | 48.8 | 47.4 | C | | | |
| 10200 | 60.5 | 56.0 | 54.4 | 52.8 | 51.2 | 49.7 | 48.2 | E | | | |
| 10600 | 61.6 | 56.9 | 55.4 | 53.7 | 52.0 | 50.5 | 48.9 | | | | |
| 11000 | 62.6 | 57.9 | 56.3 | 54.6 | 52.9 | 51.3 | 49.7 | L | | | |
| 11400 | 63.7 | 58.8 | 57.2 | 55.4 | 53.7 | 52.1 | 50.5 | I | | | |
| 11800 | 64.7 | 59.7 | 58.1 | 56.3 | 54.5 | 52.9 | 51.2 | M | | | |
| 12200 | 65.6 | 60.6 | 58.9 | 57.1 | 55.3 | 53.6 | 52.0 | I | | | |
| 12600 | 66.6 | 61.5 | 59.8 | 57.9 | 56.2 | 54.4 | 52.7 | T | | | |
| 13000 | 67.6 | 62.4 | 60.6 | 58.8 | 56.9 | 55.2 | 53.5 | E | | | |
| 13400 | 68.5 | 63.2 | 61.4 | 59.5 | 57.7 | 55.9 | 54.2 | D | | | |
| 13800 | 69.4 | 64.0 | 62.2 | 60.3 | 58.4 | 56.6 | 54.9 | | | | |
| 14200 | 70.3 | 64.8 | 63.0 | 61.1 | 59.2 | 57.3 | 55.5 | | | | |
| 14600 | 71.2 | 65.6 | 63.8 | 61.8 | 59.9 | 58.0 | 56.2 | | | | |
| 15000 | 72.0 | 66.4 | 64.5 | 62.5 | 60.5 | 58.6 | 56.8 | | | | |
| 15400 | 72.8 | 67.1 | 65.2 | 63.2 | 61.2 | 59.3 | 57.4 | | | | |
| CLIMB LIMIT WT (1000 KG) | 55.7 | 55.3 | 53.1 | 50.8 | 48.6 | 46.5 | 44.5 | | | | |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

### Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1250 | -1000 |
| ENGINE AND WING ON | -1250 | -1000 |

### Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1350 | -1400 |
| ENGINE AND WING ON | -1350 | -1400 |

# Takeoff Field & Climb Limit Weights - Wet Runway

## Flaps 5

## Based on engine bleed for packs on and anti-ice off

## Table 3(i) of 3: 14500 FT Pressure Altitude

| CORR'D FIELD LENGTH (FT) | FIELD LIMIT WEIGHT (1000 KG) OAT (°C) -40 | 2 | 6 | 10 | 14 | 18 | 22 | 26 | 30 | 40 | 50 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5400 | 43.8 | | | | | | | | | | |
| 5800 | 45.4 | | | | | | | | | | |
| 6200 | 46.9 | 43.3 | | | | | | P | | | |
| 6600 | 48.4 | 44.6 | 43.4 | | | | | E | | | |
| 7000 | 49.8 | 45.9 | 44.6 | 43.3 | | | | R | | | |
| 7400 | 51.0 | 47.0 | 45.7 | 44.3 | 43.0 | | | F | | | |
| 7800 | 52.3 | 48.2 | 46.8 | 45.4 | 44.0 | | | O | | | |
| 8200 | 53.7 | 49.5 | 48.1 | 46.6 | 45.2 | 43.8 | | R | | | |
| 8600 | 55.1 | 50.8 | 49.3 | 47.8 | 46.3 | 44.9 | 43.6 | M | | | |
| 9000 | 56.3 | 51.9 | 50.4 | 48.9 | 47.4 | 45.9 | 44.6 | A | | | |
| 9400 | 57.3 | 52.8 | 51.3 | 49.7 | 48.2 | 46.7 | 45.3 | N | | | |
| 9800 | 58.3 | 53.7 | 52.2 | 50.6 | 49.0 | 47.5 | 46.1 | C | | | |
| 10200 | 59.3 | 54.6 | 53.1 | 51.5 | 49.9 | 48.3 | 46.9 | E | | | |
| 10600 | 60.4 | 55.6 | 54.0 | 52.3 | 50.7 | 49.1 | 47.7 | | | | |
| 11000 | 61.4 | 56.5 | 54.9 | 53.2 | 51.5 | 49.9 | 48.4 | L | | | |
| 11400 | 62.4 | 57.4 | 55.7 | 54.0 | 52.3 | 50.7 | 49.1 | I | | | |
| 11800 | 63.4 | 58.3 | 56.6 | 54.8 | 53.1 | 51.4 | 49.9 | M | | | |
| 12200 | 64.3 | 59.2 | 57.4 | 55.6 | 53.9 | 52.2 | 50.6 | I | | | |
| 12600 | 65.3 | 60.0 | 58.3 | 56.4 | 54.7 | 53.0 | 51.3 | T | | | |
| 13000 | 66.2 | 60.9 | 59.1 | 57.2 | 55.4 | 53.7 | 52.0 | E | | | |
| 13400 | 67.1 | 61.7 | 59.9 | 58.0 | 56.2 | 54.4 | 52.7 | D | | | |
| 13800 | 68.0 | 62.5 | 60.6 | 58.7 | 56.9 | 55.1 | 53.4 | | | | |
| 14200 | 68.9 | 63.3 | 61.4 | 59.5 | 57.6 | 55.8 | 54.0 | | | | |
| 14600 | 69.7 | 64.0 | 62.1 | 60.2 | 58.3 | 56.4 | 54.7 | | | | |
| 15000 | 70.6 | 64.8 | 62.9 | 60.9 | 58.9 | 57.0 | 55.3 | | | | |
| 15400 | 71.4 | 65.5 | 63.5 | 61.5 | 59.5 | 57.6 | 55.8 | | | | |
| CLIMB LIMIT WT (1000 KG) | 54.7 | 53.8 | 51.5 | 49.3 | 47.1 | 45.1 | 43.2 | | | | |

**With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1150 kg.**

## Field Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | FIELD LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1250 | -1000 |
| ENGINE AND WING ON | -1250 | -1000 |

## Climb Limit Weight Anti-Ice Adjustments

| ANTI-ICE CONFIGURATION | CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1350 | -1400 |
| ENGINE AND WING ON | -1350 | -1400 |

# Takeoff Obstacle Limit Weight

## Flaps 5

### Based on engine bleed for packs on and anti-ice off

### Table 1 of 4: Sea Level, 30°C and Below, Zero Wind

| OBSTACLE HEIGHT (FT) | REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DISTANCE FROM BRAKE RELEASE (1000 FT) | | | | | | | | | | | |
| | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
| 10 | 77.0 | 85.0 | 90.2 | | | | | | | | | |
| 50 | 71.8 | 79.2 | 84.6 | 88.1 | 90.5 | | | | | | | |
| 100 | 67.2 | 74.2 | 79.4 | 83.5 | 86.3 | 88.3 | 89.8 | | | | | |
| 150 | 63.5 | 70.3 | 75.5 | 79.5 | 82.7 | 84.9 | 86.9 | 88.3 | 89.5 | 90.5 | | |
| 200 | 60.5 | 67.1 | 72.3 | 76.3 | 79.5 | 82.1 | 84.2 | 85.7 | 87.2 | 88.3 | 89.2 | 90.1 |
| 250 | 57.9 | 64.3 | 69.5 | 73.6 | 76.9 | 79.5 | 81.7 | 83.6 | 85.0 | 86.3 | 87.4 | 88.3 |
| 300 | 55.6 | 61.9 | 67.0 | 71.2 | 74.5 | 77.2 | 79.5 | 81.4 | 83.1 | 84.4 | 85.5 | 86.6 |
| 350 | 53.5 | 59.8 | 64.8 | 69.0 | 72.4 | 75.1 | 77.5 | 79.5 | 81.2 | 82.7 | 83.9 | 84.9 |
| 400 | 51.7 | 57.8 | 62.8 | 67.0 | 70.4 | 73.2 | 75.6 | 77.7 | 79.4 | 81.0 | 82.3 | 83.5 |
| 450 | 50.0 | 56.0 | 61.0 | 65.1 | 68.6 | 71.5 | 73.9 | 76.0 | 77.8 | 79.4 | 80.8 | 82.0 |
| 500 | 48.3 | 54.4 | 59.3 | 63.4 | 66.9 | 69.8 | 72.3 | 74.5 | 76.3 | 77.9 | 79.4 | 80.6 |
| 550 | 46.8 | 52.9 | 57.7 | 61.8 | 65.3 | 68.3 | 70.8 | 73.0 | 74.9 | 76.5 | 78.0 | 79.3 |
| 600 | 45.3 | 51.4 | 56.3 | 60.4 | 63.8 | 66.8 | 69.4 | 71.6 | 73.5 | 75.2 | 76.7 | 78.1 |
| 650 | 43.9 | 50.1 | 54.9 | 59.0 | 62.4 | 65.4 | 68.0 | 70.2 | 72.2 | 74.0 | 75.5 | 76.9 |
| 700 | 42.8 | 48.8 | 53.6 | 57.6 | 61.1 | 64.1 | 66.7 | 69.0 | 71.0 | 72.7 | 74.3 | 75.7 |
| 750 | | 47.6 | 52.4 | 56.4 | 59.9 | 62.8 | 65.5 | 67.8 | 69.8 | 71.6 | 73.2 | 74.6 |
| 800 | | 46.4 | 51.2 | 55.2 | 58.7 | 61.7 | 64.3 | 66.6 | 68.7 | 70.5 | 72.1 | 73.6 |
| 850 | | 45.3 | 50.1 | 54.1 | 57.5 | 60.5 | 63.2 | 65.5 | 67.6 | 69.4 | 71.1 | 72.5 |
| 900 | | 44.2 | 49.0 | 53.0 | 56.5 | 59.5 | 62.1 | 64.4 | 66.5 | 68.4 | 70.0 | 71.5 |
| 950 | | 43.2 | 48.0 | 52.0 | 55.4 | 58.4 | 61.1 | 63.4 | 65.5 | 67.4 | 69.1 | 70.6 |
| 1000 | | 42.8 | 47.0 | 51.0 | 54.4 | 57.4 | 60.1 | 62.4 | 64.5 | 66.4 | 68.1 | 69.7 |

**Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.**
**For FAA operators adhering to EASA standards, when using line-up allowances, the obstacle distance from brake release must be reduced by the ASDA adjustment.**

### Table 2 of 4: OAT Adjustment

| OAT (°C) | OBSTACLE LIMIT WEIGHT ADJUSTMENT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
| | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 |
| 30 & BELOW | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 32 | -0.6 | -0.7 | -0.8 | -0.9 | -1.0 | -1.1 | -1.2 | -1.3 | -1.4 | -1.4 | -1.5 |
| 34 | -1.2 | -1.4 | -1.6 | -1.8 | -2.0 | -2.1 | -2.3 | -2.5 | -2.7 | -2.9 | -3.1 |
| 36 | -1.8 | -2.1 | -2.4 | -2.7 | -2.9 | -3.2 | -3.5 | -3.8 | -4.1 | -4.3 | -4.6 |
| 38 | -2.4 | -2.8 | -3.2 | -3.5 | -3.9 | -4.3 | -4.7 | -5.0 | -5.4 | -5.8 | -6.1 |
| 40 | -3.0 | -3.5 | -4.0 | -4.4 | -4.9 | -5.4 | -5.8 | -6.3 | -6.8 | -7.2 | -7.7 |
| 42 | -3.7 | -4.2 | -4.8 | -5.3 | -5.9 | -6.4 | -7.0 | -7.5 | -8.1 | -8.6 | -9.2 |
| 44 | -4.3 | -5.0 | -5.6 | -6.2 | -6.8 | -7.5 | -8.1 | -8.7 | -9.4 | -10.0 | -10.6 |
| 46 | -5.0 | -5.7 | -6.4 | -7.1 | -7.8 | -8.5 | -9.3 | -10.0 | -10.7 | -11.4 | -12.1 |
| 48 | -5.6 | -6.4 | -7.2 | -8.0 | -8.8 | -9.6 | -10.4 | -11.2 | -12.0 | -12.8 | -13.6 |
| 50 | -6.3 | -7.1 | -8.0 | -8.9 | -9.8 | -10.7 | -11.5 | -12.4 | -13.3 | -14.2 | -15.1 |

# Takeoff Obstacle Limit Weight
## Flaps 5
### Based on engine bleed for packs on and anti-ice off
### Table 3 of 4: Pressure Altitude Adjustment

| PRESS ALT (FT) | OBSTACLE LIMIT WEIGHT ADJUSTMENT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
| | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 |
| S.L. & BELOW | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1000 | -1.6 | -1.8 | -1.9 | -2.1 | -2.3 | -2.5 | -2.7 | -2.9 | -3.1 | -3.3 | -3.5 |
| 2000 | -3.1 | -3.5 | -3.9 | -4.3 | -4.7 | -5.1 | -5.5 | -5.9 | -6.3 | -6.7 | -7.1 |
| 3000 | -4.6 | -5.1 | -5.7 | -6.3 | -6.8 | -7.4 | -8.0 | -8.6 | -9.1 | -9.7 | -10.3 |
| 4000 | -6.0 | -6.7 | -7.5 | -8.2 | -9.0 | -9.7 | -10.5 | -11.2 | -12.0 | -12.7 | -13.5 |
| 5000 | -7.6 | -8.6 | -9.5 | -10.4 | -11.4 | -12.3 | -13.3 | -14.2 | -15.1 | -16.1 | -17.0 |
| 6000 | -9.3 | -10.4 | -11.5 | -12.6 | -13.8 | -14.9 | -16.0 | -17.1 | -18.3 | -19.4 | -20.5 |
| 7000 | -10.7 | -12.1 | -13.5 | -14.9 | -16.3 | -17.7 | -19.1 | -20.5 | -21.9 | -23.3 | -24.6 |
| 8000 | -12.2 | -13.8 | -15.5 | -17.1 | -18.8 | -20.5 | -22.1 | -23.8 | -25.5 | -27.1 | -28.8 |
| 9000 | -13.6 | -15.4 | -17.2 | -19.1 | -20.9 | -22.7 | -24.6 | -26.4 | -28.2 | -30.1 | -31.9 |
| 10000 | -15.0 | -17.0 | -19.0 | -21.0 | -23.0 | -25.0 | -27.0 | -29.0 | -31.0 | -33.0 | -35.0 |
| 11000 | -16.2 | -18.5 | -20.7 | -22.9 | -25.1 | -27.2 | -29.5 | -31.6 | -33.9 | -36.0 | -38.2 |
| 12000 | -17.5 | -19.9 | -22.3 | -24.7 | -27.1 | -29.5 | -31.9 | -34.3 | -36.7 | -39.1 | -41.5 |

### Table 4 of 4: Wind Adjustment

| WIND (KTS) | OBSTACLE LIMIT WEIGHT ADJUSTMENT (1000 KG) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OAT AND ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG) | | | | | | | | | | |
| | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 |
| 15 TW | -9.8 | -9.7 | -9.5 | -9.3 | -9.2 | -9.0 | -8.8 | -8.7 | -8.5 | -8.3 | -8.2 |
| 10 TW | -6.6 | -6.4 | -6.3 | -6.2 | -6.1 | -6.0 | -5.9 | -5.8 | -5.7 | -5.6 | -5.4 |
| 5 TW | -3.3 | -3.2 | -3.2 | -3.1 | -3.1 | -3.0 | -2.9 | -2.9 | -2.8 | -2.8 | -2.7 |
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 HW | 0.8 | 0.7 | 0.6 | 0.6 | 0.5 | 0.5 | 0.4 | 0.4 | 0.3 | 0.3 | 0.2 |
| 20 HW | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 1.0 | 0.9 | 0.8 | 0.7 | 0.6 | 0.5 |
| 30 HW | 2.2 | 2.1 | 1.9 | 1.8 | 1.6 | 1.5 | 1.3 | 1.2 | 1.0 | 0.9 | 0.8 |
| 40 HW | 3.0 | 2.8 | 2.6 | 2.4 | 2.2 | 2.0 | 1.8 | 1.6 | 1.4 | 1.2 | 1.0 |

**With engine bleed for packs off, increase weight by 600 kg.**

### Anti-Ice Adjustments
### Pressure Altitude ≤ 8000 FT

| ANTI-ICE CONFIGURATION | OBSTACLE LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -250 | -1200 |
| ENGINE AND WING ON | -250 | -1200 |

### Pressure Altitude > 8000 FT

| ANTI-ICE CONFIGURATION | OBSTACLE LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1500 | -1500 |
| ENGINE AND WING ON | -1500 | -1500 |

# Brake Energy Limits VMBE

## Flaps 5

## Maximum Brake Energy Speed

| OAT (°C) | REFERENCE VMBE (KIAS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PRESSURE ALTITUDE (FT) | | | | | | | | |
| | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14000 | 14500 |
| 54 | 178 | 171 | 165 | 159 | 153 | | | | |
| 50 | 179 | 172 | 166 | 160 | 154 | | | | |
| 46 | 179 | 173 | 167 | 161 | 155 | | | | |
| 42 | 180 | 174 | 168 | 162 | 156 | 150 | | | |
| 38 | 181 | 175 | 169 | 163 | 157 | 151 | | | |
| 34 | 182 | 176 | 169 | 163 | 158 | 152 | | | |
| 30 | 183 | 177 | 170 | 164 | 159 | 153 | | | |
| 26 | 184 | 178 | 171 | 165 | 159 | 154 | 148 | | |
| 22 | 186 | 179 | 172 | 166 | 160 | 154 | 149 | | |
| 18 | 187 | 180 | 174 | 167 | 161 | 155 | 150 | | |
| 14 | 189 | 182 | 175 | 169 | 162 | 156 | 151 | | |
| 10 | 190 | 183 | 177 | 170 | 163 | 157 | 151 | 146 | |
| 6 | 192 | 185 | 178 | 171 | 165 | 158 | 152 | 147 | 145 |
| 2 | 194 | 186 | 179 | 173 | 166 | 159 | 153 | 147 | 146 |
| 0 | 195 | 187 | 180 | 173 | 167 | 160 | 154 | 148 | 147 |
| -10 | 199 | 191 | 184 | 177 | 170 | 164 | 157 | 151 | 150 |
| -20 | 204 | 196 | 188 | 181 | 174 | 167 | 161 | 155 | 153 |
| -30 | 209 | 201 | 193 | 186 | 178 | 171 | 165 | 158 | 157 |
| -40 | 210 | 206 | 198 | 190 | 183 | 176 | 169 | 162 | 160 |

## Weight Adjusted VMBE

| WEIGHT (1000 KG) | REFERENCE VMBE (KIAS) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 |
| 45 | 181 | 188 | 195 | 201 | 208 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 |
| 50 | 170 | 176 | 182 | 189 | 195 | 201 | 207 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 |
| 55 | 159 | 165 | 171 | 177 | 183 | 189 | 195 | 201 | 207 | 210 | 210 | 210 | 210 | 210 | 210 |
| 60 | 152 | 158 | 163 | 169 | 174 | 180 | 185 | 191 | 196 | 202 | 207 | 210 | 210 | 210 | 210 |
| 65 | 144 | 149 | 155 | 160 | 165 | 171 | 176 | 181 | 187 | 192 | 197 | 203 | 208 | 210 | 210 |
| 70 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 |
| 75 | 134 | 139 | 144 | 148 | 153 | 158 | 163 | 167 | 172 | 177 | 182 | 186 | 191 | 196 | 200 |
| 80 | 129 | 134 | 138 | 143 | 147 | 152 | 157 | 161 | 166 | 170 | 175 | 179 | 184 | 188 | 192 |
| 85 | 125 | 129 | 134 | 138 | 143 | 147 | 152 | 156 | 160 | 165 | 169 | 174 | 178 | 182 | 186 |
| 90 | 120 | 124 | 129 | 133 | 137 | 142 | 146 | 150 | 155 | 159 | 163 | 168 | 172 | 176 | 180 |

**Increase VMBE by 2 knots per 1% uphill runway slope. Decrease VMBE by 3 knots per 1% downhill runway slope.**
**Increase VMBE by 3 knots per 10 knots headwind. Decrease VMBE by 18 knots per 10 knots tailwind.**
**Decrease brake release weight by 650 kg for each knot V1 exceeds VMBE.**
**Determine normal V1, VR, V2 speeds for lower brake release weight.**

# Fuel Jettison Limit Weight
## Valid for approach with flaps 15 and landing with flaps 40
## Based on engine bleed for packs on and anti-ice off

| AIRPORT OAT (°C) | FUEL JETTISON LIMIT WEIGHT (1000 KG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | AIRPORT PRESSURE ALTITUDE (FT) | | | | | | | | |
| | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14000 | 14500 |
| 54 | 66.7 | | | | | | | | |
| 52 | 68.3 | | | | | | | | |
| 50 | 70.1 | 63.7 | | | | | | | |
| 48 | 71.3 | 64.8 | | | | | | | |
| 46 | 72.6 | 65.9 | 60.1 | | | | | | |
| 44 | 73.9 | 67.6 | 61.1 | | | | | | |
| 42 | 75.4 | 69.4 | 62.2 | 56.6 | | | | | |
| 40 | 76.9 | 71.1 | 64.1 | 57.6 | | | | | |
| 38 | 78.3 | 72.5 | 66.1 | 58.7 | 53.2 | | | | |
| 36 | 79.7 | 73.9 | 67.9 | 60.8 | 54.2 | | | | |
| 34 | 81.1 | 75.3 | 69.4 | 63.0 | 55.2 | 50.0 | | | |
| 32 | 82.5 | 76.6 | 70.8 | 64.9 | 56.2 | 50.9 | 45.0 | | |
| 30 | 83.8 | 77.8 | 72.0 | 66.3 | 57.3 | 51.9 | 45.9 | | |
| 28 | 83.9 | 78.6 | 73.2 | 67.6 | 58.4 | 52.9 | 46.8 | | |
| 26 | 83.9 | 79.5 | 74.1 | 68.5 | 59.5 | 53.9 | 47.7 | | |
| 24 | 83.9 | 79.5 | 74.6 | 69.6 | 60.7 | 55.0 | 48.7 | | |
| 22 | 83.9 | 79.4 | 75.1 | 70.2 | 61.8 | 56.1 | 49.7 | 43.8 | |
| 20 | 83.9 | 79.4 | 75.0 | 70.5 | 62.9 | 57.2 | 50.7 | 44.8 | 43.4 |
| 18 | 83.9 | 79.4 | 75.0 | 70.7 | 64.1 | 58.2 | 51.7 | 45.7 | 44.3 |
| 16 | 83.9 | 79.4 | 75.0 | 70.7 | 65.4 | 59.3 | 52.7 | 46.7 | 45.3 |
| 14 | 83.9 | 79.4 | 75.0 | 70.7 | 66.5 | 60.5 | 53.7 | 47.7 | 46.3 |
| 12 | 83.9 | 79.4 | 75.0 | 70.7 | 66.5 | 61.8 | 54.8 | 48.7 | 47.3 |
| 10 | 84.0 | 79.4 | 75.0 | 70.7 | 66.5 | 62.9 | 56.0 | 49.8 | 48.3 |
| 0 | 84.0 | 79.5 | 75.1 | 70.7 | 66.5 | 63.0 | 58.4 | 54.1 | 53.0 |
| -10 | 84.0 | 79.6 | 75.1 | 70.8 | 66.6 | 63.1 | 58.6 | 54.2 | 53.1 |
| -20 | 84.1 | 79.6 | 75.1 | 70.9 | 66.7 | 63.2 | 58.7 | 54.3 | 53.3 |
| -30 | 84.1 | 79.7 | 75.2 | 71.0 | 66.9 | 63.3 | 58.8 | 54.4 | 53.4 |
| -40 | 84.1 | 79.7 | 75.3 | 71.0 | 66.9 | 63.4 | 58.8 | 54.5 | 53.5 |

**Table valid for Zero Fuel Weight up to 72500 kg.**
**With engine bleed for packs off, increase weight by 1250 kg.**

## Icing Adjustments

| FUEL JETTISON LIMIT WEIGHT ADJUSTMENT (KG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AIRPORT PRESSURE ALTITUDE (FT) | | | | | | | | |
| 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14000 | 14500 |
| -5800 | -5650 | -5650 | -5600 | -4950 | -4650 | -4350 | -4050 | -3950 |

**When operating in icing conditions during any part of the flight with forecast landing temperature at or below 10°C, decrease weight by the Fuel Jettison Limit Weight Icing Adjustment shown above.**

## Anti-Ice Adjustments
## Pressure Altitude ≤ 8000 FT

| ANTI-ICE CONFIGURATION | FUEL JETTISON LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -100 | -1000 |
| ENGINE AND WING ON | -250 | -2050 |

## Pressure Altitude > 8000 FT

| ANTI-ICE CONFIGURATION | FUEL JETTISON LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1300 | -1300 |
| ENGINE AND WING ON | -3600 | -3850 |

# Performance Dispatch — Chapter PD
## Enroute — Section 11

### Long Range Cruise Maximum Operating Altitude
### Max Cruise Thrust
### ISA + 10°C and Below

| WEIGHT (1000 KG) | OPTIMUM ALT (FT) | TAT (°C) | MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1.20 (33°) | 1.25 (36°) | 1.30 (39°) | 1.40 (44°) | 1.50 (48°) |
| 85 | 33500 | -12 | 35000* | 35000* | 35000* | 34200 | 32600 |
| 80 | 34800 | -15 | 36200* | 36200* | 36200* | 35500 | 33900 |
| 75 | 36200 | -18 | 37400* | 37400* | 37400* | 36800 | 35200 |
| 70 | 37600 | -18 | 38700* | 38700* | 38700* | 38200 | 36700 |
| 65 | 39100 | -18 | 40000* | 40000* | 40000* | 39800 | 38200 |
| 60 | 40800 | -18 | 41000 | 41000 | 41000 | 41000 | 39900 |
| 55 | 41000 | -18 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 50 | 41000 | -18 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 45 | 41000 | -18 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 40 | 41000 | -18 | 41000 | 41000 | 41000 | 41000 | 41000 |

### ISA + 15°C

| WEIGHT (1000 KG) | OPTIMUM ALT (FT) | TAT (°C) | MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1.20 (33°) | 1.25 (36°) | 1.30 (39°) | 1.40 (44°) | 1.50 (48°) |
| 85 | 33500 | -6 | 34000* | 34000* | 34000* | 34000* | 32600 |
| 80 | 34800 | -9 | 35500* | 35500* | 35500* | 35500 | 33900 |
| 75 | 36200 | -12 | 36700* | 36700* | 36700* | 36700* | 35200 |
| 70 | 37600 | -12 | 37900* | 37900* | 37900* | 37900* | 36700 |
| 65 | 39100 | -12 | 39200* | 39200* | 39200* | 39200* | 38200 |
| 60 | 40800 | -12 | 40400* | 40400* | 40400* | 40400* | 39900 |
| 55 | 41000 | -12 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 50 | 41000 | -12 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 45 | 41000 | -12 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 40 | 41000 | -12 | 41000 | 41000 | 41000 | 41000 | 41000 |

### ISA + 20°C

| WEIGHT (1000 KG) | OPTIMUM ALT (FT) | TAT (°C) | MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1.20 (33°) | 1.25 (36°) | 1.30 (39°) | 1.40 (44°) | 1.50 (48°) |
| 85 | 33500 | -1 | 32400* | 32400* | 32400* | 32400* | 32400* |
| 80 | 34800 | -4 | 34300* | 34300* | 34300* | 34300* | 33900 |
| 75 | 36200 | -7 | 35800* | 35800* | 35800* | 35800* | 35200 |
| 70 | 37600 | -7 | 37000* | 37000* | 37000* | 37000* | 36700 |
| 65 | 39100 | -7 | 38200* | 38200* | 38200* | 38200* | 38200 |
| 60 | 40800 | -7 | 39500* | 39500* | 39500* | 39500* | 39500* |
| 55 | 41000 | -7 | 40900* | 40900* | 40900* | 40900* | 40900* |
| 50 | 41000 | -7 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 45 | 41000 | -7 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 40 | 41000 | -7 | 41000 | 41000 | 41000 | 41000 | 41000 |

***Denotes altitude thrust limited in level flight, 100 fpm residual rate of climb.**

# Long Range Cruise Trip Fuel and Time

## Table 1 of 3: Ground to Air Miles Conversion

| AIR DISTANCE (NM) | | | | | GROUND DISTANCE (NM) | AIR DISTANCE (NM) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| HEADWIND COMPONENT (KTS) | | | | | | TAILWIND COMPONENT (KTS) | | | | |
| 100 | 80 | 60 | 40 | 20 | | 20 | 40 | 60 | 80 | 100 |
| 276 | 257 | 240 | 225 | 212 | 200 | 190 | 181 | 173 | 166 | 159 |
| 548 | 511 | 477 | 448 | 423 | 400 | 381 | 364 | 348 | 334 | 321 |
| 820 | 765 | 715 | 672 | 634 | 600 | 573 | 547 | 524 | 503 | 484 |
| 1091 | 1018 | 953 | 896 | 846 | 800 | 764 | 730 | 700 | 672 | 646 |
| 1361 | 1271 | 1190 | 1120 | 1057 | 1000 | 955 | 914 | 875 | 840 | 809 |
| 1630 | 1523 | 1427 | 1342 | 1268 | 1200 | 1147 | 1097 | 1051 | 1010 | 972 |
| 1899 | 1775 | 1663 | 1565 | 1479 | 1400 | 1338 | 1280 | 1227 | 1179 | 1135 |
| 2167 | 2026 | 1899 | 1788 | 1689 | 1600 | 1529 | 1464 | 1403 | 1348 | 1298 |
| 2435 | 2277 | 2135 | 2010 | 1900 | 1800 | 1721 | 1647 | 1579 | 1517 | 1461 |
| 2702 | 2528 | 2370 | 2233 | 2111 | 2000 | 1912 | 1830 | 1755 | 1686 | 1624 |
| 2968 | 2778 | 2606 | 2455 | 2322 | 2200 | 2104 | 2014 | 1932 | 1856 | 1787 |
| 3233 | 3027 | 2841 | 2677 | 2532 | 2400 | 2295 | 2198 | 2108 | 2026 | 1951 |
| 3499 | 3276 | 3075 | 2899 | 2743 | 2600 | 2487 | 2382 | 2285 | 2196 | 2115 |
| 3763 | 3525 | 3310 | 3121 | 2953 | 2800 | 2679 | 2566 | 2462 | 2366 | 2279 |
| 4027 | 3773 | 3544 | 3342 | 3163 | 3000 | 2870 | 2750 | 2638 | 2536 | 2443 |
| 4290 | 4021 | 3778 | 3564 | 3374 | 3200 | 3062 | 2933 | 2815 | 2706 | 2607 |
| 4553 | 4269 | 4011 | 3785 | 3584 | 3400 | 3253 | 3117 | 2991 | 2876 | 2771 |
| 4815 | 4516 | 4245 | 4006 | 3794 | 3600 | 3445 | 3301 | 3168 | 3046 | 2935 |
| 5077 | 4763 | 4478 | 4227 | 4004 | 3800 | 3637 | 3485 | 3345 | 3216 | 3099 |
| 5339 | 5009 | 4711 | 4448 | 4214 | 4000 | 3829 | 3669 | 3522 | 3386 | 3263 |
| 5600 | 5256 | 4943 | 4669 | 4424 | 4200 | 4020 | 3853 | 3698 | 3556 | 3427 |
| 5860 | 5501 | 5176 | 4890 | 4634 | 4400 | 4212 | 4036 | 3875 | 3726 | 3591 |
| 6120 | 5747 | 5408 | 5110 | 4843 | 4600 | 4403 | 4220 | 4051 | 3896 | 3755 |
| 6380 | 5992 | 5641 | 5331 | 5053 | 4800 | 4595 | 4404 | 4228 | 4066 | 3919 |
| 6639 | 6237 | 5873 | 5551 | 5263 | 5000 | 4787 | 4589 | 4405 | 4237 | 4083 |

# Long Range Cruise Trip Fuel and Time

## Table 2 of 3: Reference Fuel and Time Required

| AIR DIST (NM) | PRESSURE ALTITUDE (1000 FT) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 29 | | 31 | | 33 | | 35 | | 37 | |
| | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) |
| 200 | 1.2 | 0:38 | 1.2 | 0:37 | 1.2 | 0:37 | 1.3 | 0:37 | 1.3 | 0:36 |
| 400 | 2.1 | 1:10 | 2.1 | 1:08 | 2.0 | 1:07 | 2.0 | 1:06 | 2.0 | 1:04 |
| 600 | 3.0 | 1:41 | 2.9 | 1:39 | 2.9 | 1:36 | 2.8 | 1:34 | 2.8 | 1:32 |
| 800 | 3.8 | 2:13 | 3.8 | 2:09 | 3.7 | 2:06 | 3.6 | 2:03 | 3.6 | 2:00 |
| 1000 | 4.7 | 2:44 | 4.6 | 2:40 | 4.5 | 2:35 | 4.4 | 2:32 | 4.3 | 2:28 |
| 1200 | 5.6 | 3:15 | 5.5 | 3:09 | 5.3 | 3:04 | 5.2 | 3:00 | 5.1 | 2:55 |
| 1400 | 6.5 | 3:46 | 6.3 | 3:39 | 6.2 | 3:33 | 6.1 | 3:28 | 5.9 | 3:23 |
| 1600 | 7.4 | 4:16 | 7.2 | 4:09 | 7.0 | 4:02 | 6.9 | 3:56 | 6.7 | 3:50 |
| 1800 | 8.3 | 4:46 | 8.1 | 4:38 | 7.9 | 4:31 | 7.7 | 4:24 | 7.5 | 4:17 |
| 2000 | 9.2 | 5:17 | 9.0 | 5:08 | 8.7 | 4:59 | 8.5 | 4:52 | 8.3 | 4:44 |
| 2200 | 10.1 | 5:46 | 9.8 | 5:37 | 9.6 | 5:27 | 9.4 | 5:19 | 9.2 | 5:10 |
| 2400 | 11.1 | 6:16 | 10.7 | 6:05 | 10.4 | 5:56 | 10.2 | 5:47 | 10.0 | 5:37 |
| 2600 | 12.0 | 6:46 | 11.7 | 6:34 | 11.3 | 6:23 | 11.1 | 6:14 | 10.8 | 6:04 |
| 2800 | 12.9 | 7:15 | 12.6 | 7:03 | 12.2 | 6:51 | 11.9 | 6:41 | 11.7 | 6:30 |
| 3000 | 13.9 | 7:44 | 13.5 | 7:31 | 13.1 | 7:19 | 12.8 | 7:08 | 12.5 | 6:57 |
| 3200 | 14.9 | 8:13 | 14.4 | 7:59 | 14.0 | 7:46 | 13.7 | 7:35 | 13.4 | 7:23 |
| 3400 | 15.8 | 8:42 | 15.3 | 8:27 | 14.9 | 8:14 | 14.5 | 8:02 | 14.2 | 7:50 |
| 3600 | 16.8 | 9:10 | 16.3 | 8:55 | 15.8 | 8:41 | 15.4 | 8:28 | 15.1 | 8:16 |
| 3800 | 17.8 | 9:39 | 17.2 | 9:23 | 16.7 | 9:08 | 16.3 | 8:55 | 16.0 | 8:42 |
| 4000 | 18.8 | 10:07 | 18.2 | 9:51 | 17.6 | 9:35 | 17.2 | 9:21 | 16.8 | 9:09 |
| 4200 | 19.8 | 10:35 | 19.2 | 10:18 | 18.6 | 10:02 | 18.1 | 9:48 | 17.8 | 9:35 |
| 4400 | 20.8 | 11:03 | 20.1 | 10:45 | 19.5 | 10:29 | 19.1 | 10:14 | 18.7 | 10:01 |
| 4600 | 21.8 | 11:31 | 21.1 | 11:12 | 20.5 | 10:55 | 20.0 | 10:40 | 19.6 | 10:28 |
| 4800 | 22.8 | 11:58 | 22.1 | 11:39 | 21.4 | 11:22 | 20.9 | 11:07 | 20.5 | 10:54 |
| 5000 | 23.9 | 12:26 | 23.1 | 12:06 | 22.4 | 11:48 | 21.9 | 11:33 | 21.5 | 11:20 |

## Table 3 of 3: Fuel Required Adjustment (1000 KG)

| REFERENCE FUEL REQUIRED (1000 KG) | LANDING WEIGHT (1000 KG) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 40 | 45 | 50 | 55 | 60 | 65 | 70 |
| 2 | -0.2 | -0.1 | 0.0 | 0.1 | 0.2 | 0.3 | 0.5 |
| 4 | -0.3 | -0.2 | 0.0 | 0.2 | 0.4 | 0.7 | 1.0 |
| 6 | -0.5 | -0.3 | 0.0 | 0.3 | 0.7 | 1.1 | 1.5 |
| 8 | -0.7 | -0.4 | 0.0 | 0.4 | 0.9 | 1.5 | 2.2 |
| 10 | -0.9 | -0.5 | 0.0 | 0.5 | 1.2 | 2.0 | 2.9 |
| 12 | -1.1 | -0.6 | 0.0 | 0.7 | 1.5 | 2.4 | 3.6 |
| 14 | -1.3 | -0.7 | 0.0 | 0.8 | 1.8 | 3.0 | 4.4 |
| 16 | -1.4 | -0.8 | 0.0 | 1.0 | 2.1 | 3.5 | 5.2 |
| 18 | -1.6 | -0.9 | 0.0 | 1.1 | 2.5 | 4.1 | 6.1 |
| 20 | -1.8 | -1.0 | 0.0 | 1.3 | 2.9 | 4.7 | 7.1 |
| 22 | -2.0 | -1.1 | 0.0 | 1.5 | 3.2 | 5.4 | 8.1 |
| 24 | -2.2 | -1.2 | 0.0 | 1.7 | 3.7 | 6.0 | 9.1 |

**Based on 280/.78 climb, Long Range Cruise speed and .78/280/250 descent.**

# Long Range Cruise Step Climb

## Table 1 of 2: Ground to Air Miles Conversion

| AIR DISTANCE (NM) HEAD WIND COMPONENT (KTS) 100 | 80 | 60 | 40 | 20 | GROUND DISTANCE (NM) | AIR DISTANCE (NM) TAIL WIND COMPONENT (KTS) 20 | 40 | 60 | 80 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1316 | 1237 | 1168 | 1106 | 1050 | 1000 | 954 | 912 | 874 | 839 | 807 |
| 1829 | 1723 | 1629 | 1545 | 1469 | 1400 | 1337 | 1280 | 1227 | 1179 | 1134 |
| 2342 | 2209 | 2090 | 1984 | 1887 | 1800 | 1720 | 1648 | 1581 | 1519 | 1462 |
| 2854 | 2694 | 2551 | 2422 | 2306 | 2200 | 2104 | 2015 | 1934 | 1859 | 1790 |
| 3367 | 3179 | 3011 | 2861 | 2724 | 2600 | 2487 | 2383 | 2287 | 2199 | 2118 |
| 3879 | 3664 | 3472 | 3299 | 3142 | 3000 | 2870 | 2751 | 2641 | 2540 | 2446 |
| 4391 | 4149 | 3932 | 3737 | 3561 | 3400 | 3253 | 3119 | 2995 | 2880 | 2774 |
| 4903 | 4634 | 4393 | 4176 | 3979 | 3800 | 3636 | 3486 | 3348 | 3221 | 3102 |
| 5414 | 5118 | 4853 | 4614 | 4397 | 4200 | 4020 | 3854 | 3702 | 3561 | 3431 |
| 5926 | 5603 | 5313 | 5052 | 4815 | 4600 | 4403 | 4222 | 4056 | 3902 | 3759 |
| 6437 | 6087 | 5773 | 5490 | 5234 | 5000 | 4786 | 4590 | 4409 | 4242 | 4088 |

## Table 2 of 2: Trip Fuel and Time Required

| AIR DIST (NM) | TRIP FUEL (1000 KG) LANDING WEIGHT (1000 KG) 40 | 45 | 50 | 55 | 60 | 65 | 70 | TIME (HR:MIN) |
|---|---|---|---|---|---|---|---|---|
| 1000 | 3.8 | 4.0 | 4.2 | 4.5 | 4.8 | 5.1 | 5.4 | 2:24 |
| 1400 | 5.2 | 5.4 | 5.7 | 6.2 | 6.6 | 7.0 | 7.4 | 3:17 |
| 1800 | 6.5 | 6.9 | 7.3 | 7.8 | 8.4 | 8.9 | 9.5 | 4:10 |
| 2200 | 7.9 | 8.3 | 8.9 | 9.6 | 10.2 | 10.9 | 11.6 | 5:03 |
| 2600 | 9.3 | 9.8 | 10.5 | 11.3 | 12.1 | 12.9 | 13.8 | 5:55 |
| 3000 | 10.8 | 11.4 | 12.2 | 13.1 | 14.1 | 15.0 | 16.0 | 6:48 |
| 3400 | 12.2 | 12.9 | 13.9 | 15.0 | 16.1 | 17.1 | 18.2 | 7:40 |
| 3800 | 13.7 | 14.5 | 15.6 | 16.8 | 18.1 | 19.3 | 20.5 | 8:33 |
| 4200 | 15.2 | 16.2 | 17.4 | 18.8 | 20.2 | 21.5 | 22.9 | 9:25 |
| 4600 | 16.7 | 17.9 | 19.2 | 20.8 | 22.3 | 23.8 | 25.3 | 10:17 |
| 5000 | 18.3 | 19.6 | 21.1 | 22.8 | 24.5 | 26.1 | 27.8 | 11:10 |

**Based on 280/.78 climb, Long Range Cruise speed and .78/280/250 descent.**
**Valid for all pressure altitudes with 4000 ft step climb to 2000 ft above optimum altitude.**

## Short Trip Fuel and Time

### Table 1 of 2: Ground to Air Miles Conversion

| AIR DISTANCE (NM) | | | | | GROUND DISTANCE (NM) | AIR DISTANCE (NM) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| HEAD WIND COMPONENT (KTS) | | | | | | TAIL WIND COMPONENT (KTS) | | | | |
| 100 | 80 | 60 | 40 | 20 | | 20 | 40 | 60 | 80 | 100 |
| 93 | 79 | 69 | 61 | 55 | 50 | 46 | 42 | 39 | 36 | 34 |
| 160 | 143 | 129 | 118 | 108 | 100 | 93 | 87 | 82 | 77 | 73 |
| 226 | 205 | 188 | 173 | 161 | 150 | 141 | 132 | 125 | 118 | 112 |
| 290 | 266 | 246 | 228 | 213 | 200 | 188 | 178 | 169 | 160 | 153 |
| 353 | 326 | 303 | 283 | 266 | 250 | 236 | 224 | 213 | 203 | 193 |
| 416 | 386 | 360 | 338 | 318 | 300 | 284 | 270 | 257 | 245 | 235 |
| 479 | 446 | 417 | 392 | 370 | 350 | 332 | 316 | 301 | 288 | 276 |
| 542 | 506 | 475 | 447 | 422 | 400 | 380 | 362 | 346 | 331 | 317 |
| 607 | 567 | 532 | 502 | 475 | 450 | 428 | 408 | 390 | 373 | 358 |
| 673 | 629 | 591 | 557 | 527 | 500 | 476 | 453 | 433 | 415 | 398 |

### Table 2 of 2: Trip Fuel and Time Required

| AIR DIST (NM) | | LANDING WEIGHT (1000 KG) | | | | | | | TIME (HR:MIN) |
|---|---|---|---|---|---|---|---|---|---|
| | | 40 | 45 | 50 | 55 | 60 | 65 | 70 | |
| 50 | FUEL (1000 KG) | 0.4 | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0:14 |
| | ALT (FT) | 13000 | 11000 | 11000 | 9000 | 9000 | 9000 | 9000 | |
| 100 | FUEL (1000 KG) | 0.7 | 0.7 | 0.8 | 0.8 | 0.8 | 0.9 | 0.9 | 0:22 |
| | ALT (FT) | 19000 | 19000 | 17000 | 17000 | 17000 | 15000 | 15000 | |
| 150 | FUEL (1000 KG) | 0.9 | 1.0 | 1.0 | 1.1 | 1.1 | 1.2 | 1.2 | 0:30 |
| | ALT (FT) | 27000 | 25000 | 25000 | 25000 | 23000 | 23000 | 21000 | |
| 200 | FUEL (1000 KG) | 1.1 | 1.2 | 1.2 | 1.3 | 1.4 | 1.4 | 1.5 | 0:37 |
| | ALT (FT) | 31000 | 29000 | 29000 | 29000 | 29000 | 27000 | 27000 | |
| 250 | FUEL (1000 KG) | 1.3 | 1.4 | 1.4 | 1.5 | 1.6 | 1.7 | 1.7 | 0:44 |
| | ALT (FT) | 41000 | 41000 | 37000 | 35000 | 33000 | 31000 | 31000 | |
| 300 | FUEL (1000 KG) | 1.5 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 0:50 |
| | ALT (FT) | 41000 | 41000 | 41000 | 39000 | 37000 | 35000 | 33000 | |
| 350 | FUEL (1000 KG) | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 0:56 |
| | ALT (FT) | 41000 | 41000 | 41000 | 39000 | 37000 | 35000 | 35000 | |
| 400 | FUEL (1000 KG) | 1.8 | 1.9 | 2.0 | 2.1 | 2.2 | 2.4 | 2.5 | 1:03 |
| | ALT (FT) | 41000 | 41000 | 41000 | 39000 | 37000 | 37000 | 35000 | |
| 450 | FUEL (1000 KG) | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 | 2.6 | 2.7 | 1:09 |
| | ALT (FT) | 41000 | 41000 | 41000 | 39000 | 39000 | 37000 | 35000 | |
| 500 | FUEL (1000 KG) | 2.1 | 2.2 | 2.4 | 2.5 | 2.7 | 2.8 | 3.0 | 1:17 |
| | ALT (FT) | 41000 | 41000 | 41000 | 41000 | 39000 | 37000 | 35000 | |

**Based on 280/.78 climb, Long Range Cruise and .78/280/250 descent.**

# Holding Planning

## Flaps Up

| WEIGHT (1000 KG) | TOTAL FUEL FLOW (KG/HR) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PRESSURE ALTITUDE (FT) | | | | | | | | |
| | 1500 | 5000 | 10000 | 15000 | 20000 | 25000 | 30000 | 35000 | 41000 |
| 85 | 2430 | 2400 | 2400 | 2370 | 2370 | 2390 | 2440 | | |
| 80 | 2310 | 2270 | 2270 | 2250 | 2240 | 2240 | 2270 | 2380 | |
| 75 | 2180 | 2150 | 2130 | 2140 | 2130 | 2100 | 2120 | 2200 | |
| 70 | 2050 | 2030 | 2000 | 2020 | 2000 | 1950 | 1970 | 2030 | |
| 65 | 1930 | 1910 | 1870 | 1880 | 1870 | 1810 | 1830 | 1860 | |
| 60 | 1810 | 1790 | 1750 | 1740 | 1730 | 1680 | 1690 | 1710 | 1860 |
| 55 | 1690 | 1670 | 1630 | 1610 | 1600 | 1560 | 1560 | 1580 | 1690 |
| 50 | 1580 | 1560 | 1510 | 1480 | 1460 | 1450 | 1440 | 1450 | 1550 |
| 45 | 1480 | 1450 | 1400 | 1360 | 1340 | 1330 | 1310 | 1320 | 1390 |
| 40 | 1370 | 1330 | 1290 | 1250 | 1220 | 1200 | 1190 | 1190 | 1240 |

**This table includes 5% additional fuel for holding in a racetrack pattern.**

# Flight Crew Requirements for Chemical Passenger Oxygen System

## Required Pressure (PSI) for 114/115 Cubic Ft. Cylinder

| BOTTLE TEMPERATURE | | NUMBER OF CREW USING OXYGEN | | |
|---|---|---|---|---|
| °C | °F | 2 | 3 | 4 |
| 50 | 122 | 530 | 735 | 945 |
| 45 | 113 | 520 | 725 | 930 |
| 40 | 104 | 510 | 715 | 915 |
| 35 | 95 | 505 | 700 | 900 |
| 30 | 86 | 495 | 690 | 885 |
| 25 | 77 | 485 | 680 | 870 |
| 20 | 68 | 480 | 670 | 860 |
| 15 | 59 | 470 | 655 | 840 |
| 10 | 50 | 460 | 645 | 830 |
| 5 | 41 | 455 | 635 | 815 |
| 0 | 32 | 445 | 620 | 800 |
| -5 | 23 | 440 | 610 | 785 |
| -10 | 14 | 430 | 600 | 770 |

## Flight Crew Requirements for Large Capacity Descent Passenger Oxygen

### Table 1 of 5

| NUMBER OF CREW | OXYGEN REQUIRED (LITERS) |
|---|---|
| 2 | 660 |
| 3 | 990 |
| 4 | 1320 |

### Table 2 of 5

| NUMBER OF CREW | OXYGEN REQUIRED FOR LEVEL OFF AT 14000 FT (LITERS) | | | |
|---|---|---|---|---|
| | TOTAL POST DECOMPRESSION TIME (HR) | | | |
| | 2 | 3 | 4 | 5 |
| 2 | 660 | 960 | 1270 | 1570 |
| 3 | 980 | 1440 | 1900 | 2360 |
| 4 | 1310 | 1920 | 2530 | 3140 |

### Table 3 of 5

| NUMBER OF CREW | ADDITIONAL LITERS REQUIRED FOR EACH MINUTE HELD AT INTERMEDIATE ALTITUDE OTHER THAN 14000 FT | | | | |
|---|---|---|---|---|---|
| | INTERMEDIATE PRESSURE ALTITUDE (FT) | | | | |
| | UP TO 13999 | 14000 | 14001 TO 17999 | 18000 TO 21999 | 22000 TO 29000 |
| | REGULATOR ON "NORMAL" OR (100%) | | | | |
| 2 | 0 (26) | 0 (22) | 1 (20) | 3 (16) | 6 (12) |
| 3 | 0 (39) | 0 (33) | 2 (30) | 5 (24) | 8 (18) |
| 4 | 0 (52) | 0 (44) | 2 (40) | 6 (32) | 11 (24) |

**For more extensive than normal crew usage, add 2.05 liters/person/minute for each crew member at 6000 ft cabin altitude when regulator setting is NORMAL or 13 liters/person/minute when regulator setting is 100%.**

**Instructions:**

1. **Determine protective breathing requirements from Table 1.**
2. **Determine supplemental requirements for level off at 14000 ft from Table 2 and correct for level off altitudes other than 14000 ft using Table 3.**
3. **Flight crew system oxygen requirement is the larger of protective breathing (Table 1) and supplemental breathing (Tables 2 and 3) requirements.**

# Flight Crew Requirements for Large Capacity Descent Passenger Oxygen

## Cylinder Volume to Pressure Conversion

### Table 4(a) of 5: One 115 Cubic Ft. Cylinder

| OXYGEN VOLUME (1000 LITERS) | CYLINDER PRESSURE AT 21°C (PSI) |
|---|---|
| 0.1 | 200 |
| 0.3 | 300 |
| 0.5 | 400 |
| 0.7 | 500 |
| 0.8 | 600 |
| 1.0 | 700 |
| 1.2 | 800 |
| 1.4 | 900 |
| 1.5 | 1000 |
| 1.7 | 1100 |
| 1.9 | 1200 |
| 2.1 | 1300 |
| 2.2 | 1400 |
| 2.4 | 1500 |
| 2.6 | 1600 |
| 2.7 | 1700 |
| 2.9 | 1800 |
| 3.1 | 1900 |
| 3.3 | 2000 |

**Check maximum pressure in shaded area. Maximum cylinder pressure is 1850 PSI at 21°C.**
**Adjust maximum cylinder pressure by +32 PSI/-32 PSI for every 5°C above/below 21°C.**

### Table 4(b) of 5: Two 115 Cubic Ft. Cylinders

| OXYGEN VOLUME (1000 LITERS) | CYLINDER PRESSURE AT 21°C (PSI) |
|---|---|
| 0.3 | 200 |
| 0.7 | 300 |
| 1.0 | 400 |
| 1.4 | 500 |
| 1.7 | 600 |
| 2.1 | 700 |
| 2.4 | 800 |
| 2.8 | 900 |
| 3.1 | 1000 |
| 3.5 | 1100 |
| 3.8 | 1200 |
| 4.2 | 1300 |
| 4.5 | 1400 |
| 4.9 | 1500 |
| 5.2 | 1600 |
| 5.5 | 1700 |
| 5.9 | 1800 |
| 6.2 | 1900 |
| 6.6 | 2000 |

**Check maximum pressure in shaded area. Maximum cylinder pressure is 1850 PSI at 21°C.**
**Adjust maximum cylinder pressure by +32 PSI/-32 PSI for every 5°C above/below 21°C.**

## Flight Crew Requirements for Large Capacity Descent Passenger Oxygen

### Table 5 of 5: Temperature Corrections

| CYLINDER PRESSURE AT 21°C (PSI) | PRESSURE CORRECTION FOR EACH 5°C ABOVE/BELOW 21°C (PSI) |
|---|---|
| 400 | +7/-7 |
| 600 | +11/-11 |
| 800 | +14/-14 |
| 1000 | +17/-17 |
| 1200 | +21/-21 |
| 1400 | +24/-24 |
| 1600 | +28/-28 |
| 1800 | +31/-31 |
| 2000 | +34/-34 |

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Net Level Off Weight

| PRESSURE ALTITUDE (1000 FT) | LEVEL OFF WEIGHT (1000 KG) | | | ANTI-ICE ADJUSTMENT (1000 KG) | |
|---|---|---|---|---|---|
| | ISA + 10°C & BELOW | ISA + 15°C | ISA + 20°C | ENGINE ON | ENGINE AND WING ON |
| 28 | 47.4 | 46.5 | 44.8 | -1.2 | |
| 27 | 49.5 | 48.2 | 46.4 | -1.4 | |
| 26 | 51.6 | 50.0 | 48.2 | -1.6 | -5.5 |
| 25 | 53.7 | 51.8 | 49.8 | -1.6 | -5.7 |
| 24 | 56.2 | 54.2 | 51.9 | -1.7 | -6.3 |
| 23 | 58.3 | 56.0 | 53.3 | -1.9 | -6.8 |
| 22 | 60.6 | 58.1 | 54.5 | -2.3 | -7.4 |
| 21 | 62.7 | 60.1 | 55.2 | -2.7 | -7.7 |
| 20 | 64.4 | 61.0 | 55.3 | -1.9 | -7.2 |
| 19 | 63.4 | 62.0 | 56.8 | -2.0 | -7.7 |
| 18 | 65.1 | 62.8 | 58.3 | -1.9 | -7.7 |
| 17 | 66.7 | 63.6 | 59.7 | -1.8 | -7.6 |
| 16 | 68.3 | 64.8 | 61.2 | -1.7 | -7.4 |
| 15 | 69.8 | 66.4 | 62.7 | -1.7 | -7.1 |
| 14 | 72.5 | 69.6 | 65.8 | -2.5 | -7.9 |
| 13 | 75.2 | 72.9 | 69.1 | -2.2 | -7.4 |
| 12 | 78.0 | 75.9 | 72.6 | -2.2 | -7.3 |
| 11 | 81.2 | 79.1 | 76.3 | -2.2 | -7.4 |
| 10 | 84.7 | 82.4 | 80.2 | -2.4 | -7.6 |
| 9 | 87.1 | 84.9 | 82.4 | -1.2 | -3.4 |
| 8 | 89.3 | 87.3 | 84.5 | -0.1 | -0.4 |
| 7 | 90.7 | 89.7 | 86.6 | 0.0 | 0.0 |
| 6 | 90.7 | 90.7 | 88.7 | 0.0 | 0.0 |
| 5 | 90.7 | 90.7 | 90.7 | 0.0 | 0.0 |

Intentionally
Blank

## Landing Field Limit Weight - Dry Runway - Low Altitudes

### Flaps 40

### Based on anti-skid operative and automatic speedbrakes

### Table 1 of 2: Wind Adjusted Field Length (FT)

| FIELD LENGTH AVAILABLE (FT) | WIND COMPONENT (KTS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | -15 | -10 | -5 | 0 | 10 | 20 | 30 | 40 |
| 3000 | | | 2670 | 3000 | 3090 | 3190 | 3280 | 3380 |
| 3400 | | 2690 | 3040 | 3400 | 3520 | 3630 | 3750 | 3870 |
| 3800 | 2640 | 3030 | 3410 | 3800 | 3940 | 4080 | 4220 | 4360 |
| 4200 | 2960 | 3370 | 3790 | 4200 | 4360 | 4520 | 4680 | 4840 |
| 4600 | 3270 | 3710 | 4160 | 4600 | 4780 | 4970 | 5150 | 5330 |
| 5000 | 3590 | 4060 | 4530 | 5000 | 5200 | 5410 | 5610 | 5820 |
| 5400 | 3900 | 4400 | 4900 | 5400 | 5630 | 5850 | 6080 | 6310 |
| 5800 | 4210 | 4740 | 5270 | 5800 | 6050 | 6300 | 6550 | 6800 |
| 6200 | 4530 | 5090 | 5640 | 6200 | 6470 | 6740 | 7010 | 7280 |
| 6600 | 4840 | 5430 | 6010 | 6600 | 6890 | 7190 | 7480 | 7770 |
| 7000 | 5160 | 5770 | 6390 | 7000 | 7310 | 7630 | 7940 | 8260 |
| 7400 | 5470 | 6110 | 6760 | 7400 | 7740 | 8070 | 8410 | 8750 |
| 7800 | 5790 | 6460 | 7130 | 7800 | 8160 | 8520 | 8880 | 9240 |
| 8200 | 6100 | 6800 | 7500 | 8200 | 8580 | 8960 | 9340 | 9720 |
| 8600 | 6410 | 7140 | 7870 | 8600 | 9000 | 9410 | 9810 | 10210 |
| 9000 | 6730 | 7490 | 8240 | 9000 | 9430 | 9850 | 10280 | 10700 |
| 9400 | 7040 | 7830 | 8610 | 9400 | 9850 | 10290 | 10740 | 11190 |
| 9800 | 7360 | 8170 | 8990 | 9800 | 10270 | 10740 | 11210 | 11680 |
| 10200 | 7670 | 8510 | 9360 | 10200 | 10690 | 11180 | 11670 | 12160 |
| 10600 | 7990 | 8860 | 9730 | 10600 | 11110 | 11630 | 12140 | |

### Table 2 of 2: Field Limit Weight (1000 KG)

| WIND CORRECTED FIELD LENGTH (FT) | AIRPORT PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 2000 | 4000 | 6000 | 8000 | 10000 |
| 3400 | 41.8 | | | | | |
| 3800 | 48.6 | 45.8 | 43.1 | 40.4 | | |
| 4200 | 55.4 | 52.2 | 49.1 | 46.0 | 43.1 | 40.3 |
| 4600 | 61.9 | 58.5 | 55.1 | 51.6 | 48.3 | 45.2 |
| 5000 | 69.4 | 64.5 | 60.9 | 57.1 | 53.5 | 50.1 |
| 5400 | 76.8 | 72.7 | 66.8 | 62.5 | 58.7 | 55.0 |
| 5800 | 80.6 | 78.0 | 74.4 | 69.0 | 63.8 | 59.9 |
| 6200 | 84.1 | 81.5 | 78.8 | 75.6 | 70.8 | 64.8 |
| 6600 | 87.0 | 84.4 | 81.7 | 79.0 | 76.2 | 71.9 |
| 7000 | 89.6 | 86.9 | 84.2 | 81.5 | 78.8 | 76.1 |
| 7400 | 92.1 | 89.3 | 86.5 | 83.8 | 81.1 | 78.3 |
| 7800 | | 91.6 | 88.8 | 86.0 | 83.2 | 80.4 |
| 8200 | | | 90.9 | 88.0 | 85.2 | 82.4 |
| 8600 | | | | 90.0 | 87.1 | 84.2 |
| 9000 | | | | 91.9 | 89.0 | 86.0 |
| 9400 | | | | | 90.7 | 87.7 |
| 9800 | | | | | 92.4 | 89.3 |
| 10200 | | | | | | 90.9 |

**Decrease field limit weight by 7150 kg when using manual speedbrakes.**

# Landing Field Limit Weight - Dry Runway - Low Altitudes

## Flaps 40

### Based on anti-skid inoperative and manual speedbrakes

### Table 1 of 2: Wind Adjusted Field Length (FT)

| FIELD LENGTH AVAILABLE (FT) | WIND COMPONENT (KTS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | -15 | -10 | -5 | 0 | 10 | 20 | 30 | 40 |
| 6000 | | | | 6000 | 6510 | 7040 | 7560 | 8100 |
| 6400 | | | | 6400 | 6930 | 7460 | 8000 | 8550 |
| 6800 | | | 5970 | 6800 | 7340 | 7880 | 8430 | 8990 |
| 7200 | | | 6360 | 7200 | 7750 | 8300 | 8860 | 9440 |
| 7600 | | 5890 | 6740 | 7600 | 8160 | 8720 | 9300 | 9880 |
| 8000 | | 6270 | 7130 | 8000 | 8570 | 9140 | 9730 | 10330 |
| 8400 | 5780 | 6640 | 7520 | 8400 | 8980 | 9570 | 10160 | 10770 |
| 8800 | 6140 | 7010 | 7900 | 8800 | 9390 | 9990 | 10600 | 11220 |
| 9200 | 6500 | 7390 | 8290 | 9200 | 9800 | 10410 | 11030 | 11660 |
| 9600 | 6860 | 7760 | 8670 | 9600 | 10210 | 10830 | 11460 | 12110 |
| 10000 | 7220 | 8130 | 9060 | 10000 | 10620 | 11250 | 11900 | 12560 |
| 10400 | 7580 | 8510 | 9450 | 10400 | 11030 | 11670 | 12330 | 13000 |
| 10800 | 7940 | 8880 | 9830 | 10800 | 11440 | 12100 | 12760 | 13450 |
| 11200 | 8300 | 9250 | 10220 | 11200 | 11850 | 12520 | 13200 | 13890 |
| 11600 | 8670 | 9630 | 10600 | 11600 | 12260 | 12940 | 13630 | 14340 |
| 12000 | 9030 | 10000 | 10990 | 12000 | 12670 | 13360 | 14070 | 14780 |
| 12400 | 9390 | 10370 | 11380 | 12400 | 13080 | 13780 | 14500 | 15230 |
| 12800 | 9750 | 10750 | 11760 | 12800 | 13490 | 14200 | 14930 | 15670 |
| 13200 | 10110 | 11120 | 12150 | 13200 | 13910 | 14630 | 15370 | 16120 |
| 13600 | 10470 | 11490 | 12530 | 13600 | 14320 | 15050 | 15800 | 16560 |
| 14000 | 10830 | 11860 | 12910 | 14000 | 14730 | 15470 | 16230 | 17010 |
| 14400 | 11190 | 12230 | 13290 | 14400 | 15140 | 15890 | 16660 | 17450 |
| 14800 | 11550 | 12600 | 13670 | 14800 | 15550 | 16310 | 17090 | 17900 |
| 15200 | 11910 | 12970 | 14050 | 15200 | 15960 | 16730 | 17520 | 18340 |
| 15600 | 12270 | 13340 | 14430 | 15600 | 16370 | 17150 | 17950 | 18790 |
| 16000 | 12630 | 13710 | 14810 | 16000 | 16780 | 17570 | 18380 | 19230 |
| 16400 | 12990 | 14080 | 15190 | 16400 | 17190 | 17990 | 18810 | 19680 |
| 16800 | 13350 | 14450 | 15570 | 16800 | 17600 | 18410 | 19240 | 20120 |
| 17200 | 13710 | 14820 | 15950 | 17200 | 18010 | 18830 | 19670 | 20570 |
| 17600 | 14070 | 15190 | 16330 | 17600 | 18420 | 19250 | 20100 | 21010 |

# Landing Field Limit Weight - Dry Runway - Low Altitudes

## Flaps 40

### Based on anti-skid inoperative and manual speedbrakes

### Table 2 of 2: Field Limit Weight (1000 KG)

| WIND CORRECTED FIELD LENGTH (FT) | AIRPORT PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 2000 | 4000 | 6000 | 8000 | 10000 |
| 6800 | 40.8 | | | | | |
| 7200 | 44.1 | 41.3 | | | | |
| 7600 | 47.3 | 44.3 | 41.0 | | | |
| 8000 | 50.6 | 47.4 | 43.9 | 40.7 | | |
| 8400 | 53.7 | 50.5 | 46.8 | 43.4 | 40.5 | |
| 8800 | 56.9 | 53.5 | 49.7 | 46.1 | 43.0 | 40.0 |
| 9200 | 60.0 | 56.4 | 52.5 | 48.8 | 45.5 | 42.3 |
| 9600 | 63.1 | 59.3 | 55.3 | 51.4 | 48.0 | 44.7 |
| 10000 | 66.3 | 62.3 | 58.1 | 54.0 | 50.4 | 47.0 |
| 10400 | 70.1 | 65.2 | 60.8 | 56.6 | 52.9 | 49.3 |
| 10800 | 73.6 | 68.3 | 63.6 | 59.2 | 55.3 | 51.6 |
| 11200 | 76.5 | 72.1 | 66.5 | 61.8 | 57.8 | 53.9 |
| 11600 | 79.2 | 75.0 | 69.8 | 64.5 | 60.2 | 56.3 |
| 12000 | 81.9 | 77.7 | 72.9 | 67.3 | 62.7 | 58.6 |
| 12400 | 84.5 | 80.3 | 75.6 | 70.6 | 65.2 | 60.9 |
| 12800 | 87.1 | 82.8 | 78.1 | 73.5 | 67.9 | 63.2 |
| 13200 | 89.7 | 85.3 | 80.6 | 76.0 | 71.3 | 65.7 |
| 13600 | 92.2 | 87.7 | 83.0 | 78.4 | 73.8 | 68.2 |
| 14000 | | 90.2 | 85.3 | 80.7 | 76.2 | 71.4 |
| 14400 | | 92.6 | 87.7 | 83.0 | 78.4 | 73.8 |
| 14800 | | | 90.0 | 85.2 | 80.6 | 76.1 |
| 15200 | | | 92.3 | 87.4 | 82.8 | 78.1 |
| 15600 | | | | 89.5 | 84.9 | 80.2 |
| 16000 | | | | 91.7 | 86.9 | 82.2 |
| 16400 | | | | | 89.0 | 84.2 |
| 16800 | | | | | 91.0 | 86.1 |
| 17200 | | | | | | 88.0 |
| 17600 | | | | | | 89.9 |

# Landing Field Limit Weight - Dry Runway - High Altitudes

## Flaps 40

### Based on anti-skid operative and automatic speedbrakes

### Table 1 of 2: Wind Adjusted Field Length (FT)

| FIELD LENGTH AVAILABLE (FT) | WIND COMPONENT (KTS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | -15 | -10 | -5 | 0 | 10 | 20 | 30 | 40 |
| 3800 | 2810 | 3140 | 3470 | 3800 | 3910 | 4030 | 4140 | 4260 |
| 4200 | 3110 | 3480 | 3840 | 4200 | 4340 | 4470 | 4610 | 4740 |
| 4600 | 3420 | 3810 | 4210 | 4600 | 4760 | 4910 | 5070 | 5230 |
| 5000 | 3730 | 4150 | 4580 | 5000 | 5180 | 5360 | 5540 | 5710 |
| 5400 | 4030 | 4490 | 4940 | 5400 | 5600 | 5800 | 6000 | 6200 |
| 5800 | 4340 | 4830 | 5310 | 5800 | 6020 | 6240 | 6460 | 6690 |
| 6200 | 4640 | 5160 | 5680 | 6200 | 6440 | 6690 | 6930 | 7170 |
| 6600 | 4950 | 5500 | 6050 | 6600 | 6860 | 7130 | 7390 | 7660 |
| 7000 | 5260 | 5840 | 6420 | 7000 | 7290 | 7570 | 7860 | 8140 |
| 7400 | 5560 | 6180 | 6790 | 7400 | 7710 | 8010 | 8320 | 8630 |
| 7800 | 5870 | 6510 | 7160 | 7800 | 8130 | 8460 | 8790 | 9110 |
| 8200 | 6180 | 6850 | 7530 | 8200 | 8550 | 8900 | 9250 | 9600 |
| 8600 | 6480 | 7190 | 7890 | 8600 | 8970 | 9340 | 9710 | 10090 |
| 9000 | 6790 | 7530 | 8260 | 9000 | 9390 | 9790 | 10180 | 10570 |
| 9400 | 7090 | 7860 | 8630 | 9400 | 9810 | 10230 | 10640 | 11060 |
| 9800 | 7400 | 8200 | 9000 | 9800 | 10240 | 10670 | 11110 | 11540 |
| 10200 | 7710 | 8540 | 9370 | 10200 | 10660 | 11110 | 11570 | 12030 |
| 10600 | 8010 | 8880 | 9740 | 10600 | 11080 | 11560 | 12040 | 12510 |
| 11000 | 8310 | 9220 | 10110 | 11000 | 11500 | 12010 | 12510 | 12990 |
| 11400 | 8620 | 9560 | 10480 | 11400 | 11920 | 12450 | 12970 | 13480 |
| 11800 | 8920 | 9900 | 10850 | 11800 | 12340 | 12900 | 13440 | 13960 |
| 12200 | 9230 | 10240 | 11220 | 12200 | 12760 | 13340 | 13900 | 14450 |
| 12600 | 9540 | 10580 | 11590 | 12600 | 13180 | 13780 | 14360 | 14940 |

## Landing Field Limit Weight - Dry Runway - High Altitudes

### Flaps 40

### Based on anti-skid operative and automatic speedbrakes

### Table 2 of 2: Field Limit Weight (1000 KG)

| WIND CORRECTED FIELD LENGTH (FT) | AIRPORT PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|
| | 10000 | 11000 | 12000 | 13000 | 14000 | 14500 |
| 4200 | 40.3 | | | | | |
| 4600 | 45.2 | 43.7 | 42.2 | 40.8 | | |
| 5000 | 50.1 | 48.4 | 46.8 | 45.2 | 43.7 | 42.9 |
| 5400 | 55.0 | 53.2 | 51.4 | 49.7 | 48.0 | 47.2 |
| 5800 | 59.9 | 58.0 | 56.1 | 54.2 | 52.4 | 51.5 |
| 6200 | 64.8 | 62.8 | 60.8 | 58.9 | 56.9 | 56.0 |
| 6600 | 71.9 | 68.0 | 65.6 | 63.4 | 61.4 | 60.4 |
| 7000 | 76.1 | 74.2 | 72.3 | 69.1 | 65.9 | 64.7 |
| 7400 | 78.3 | 77.0 | 75.7 | 74.0 | 72.3 | 71.2 |
| 7800 | 80.4 | 79.0 | 77.7 | 76.4 | 75.0 | 74.3 |
| 8200 | 82.4 | 81.0 | 79.6 | 78.2 | 76.9 | 76.2 |
| 8600 | 84.2 | 82.8 | 81.4 | 80.0 | 78.6 | 77.9 |
| 9000 | 86.0 | 84.5 | 83.1 | 81.7 | 80.2 | 79.5 |
| 9400 | 87.7 | 86.2 | 84.7 | 83.3 | 81.8 | 81.1 |
| 9800 | 89.3 | 87.8 | 86.3 | 84.8 | 83.3 | 82.6 |
| 10200 | 90.9 | 89.3 | 87.8 | 86.3 | 84.8 | 84.0 |
| 10600 | | 90.8 | 89.2 | 87.7 | 86.2 | 85.4 |
| 11000 | | | 90.6 | 89.1 | 87.5 | 86.8 |
| 11400 | | | 92.0 | 90.4 | 88.8 | 88.0 |
| 11800 | | | | 91.7 | 90.1 | 89.3 |
| 12200 | | | | | 91.3 | 90.5 |
| 12600 | | | | | | 91.6 |

**Decrease field limit weight by 6500 kg when using manual speedbrakes.**

# Landing Field Limit Weight - Dry Runway - High Altitudes

## Flaps 40

**Based on anti-skid inoperative and manual speedbrakes**

**Table 1 of 2: Wind Adjusted Field Length (FT)**

| FIELD LENGTH AVAILABLE (FT) | WIND COMPONENT (KTS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | -15 | -10 | -5 | 0 | 10 | 20 | 30 | 40 |
| 8000 | | | | 8000 | 8600 | 9200 | 9800 | 10410 |
| 8400 | | | | 8400 | 9010 | 9620 | 10230 | 10850 |
| 8800 | | | 7870 | 8800 | 9420 | 10040 | 10660 | 11290 |
| 9200 | | | 8260 | 9200 | 9820 | 10450 | 11090 | 11730 |
| 9600 | | 7690 | 8640 | 9600 | 10230 | 10870 | 11520 | 12170 |
| 10000 | | 8070 | 9030 | 10000 | 10640 | 11290 | 11950 | 12610 |
| 10400 | | 8450 | 9420 | 10400 | 11050 | 11710 | 12370 | 13050 |
| 10800 | 7840 | 8820 | 9810 | 10800 | 11460 | 12130 | 12800 | 13490 |
| 11200 | 8210 | 9200 | 10190 | 11200 | 11870 | 12550 | 13230 | 13930 |
| 11600 | 8570 | 9570 | 10580 | 11600 | 12280 | 12970 | 13660 | 14370 |
| 12000 | 8940 | 9950 | 10970 | 12000 | 12690 | 13380 | 14090 | 14810 |
| 12400 | 9310 | 10330 | 11360 | 12400 | 13100 | 13800 | 14520 | 15250 |
| 12800 | 9670 | 10700 | 11740 | 12800 | 13510 | 14220 | 14950 | 15690 |
| 13200 | 10040 | 11080 | 12130 | 13200 | 13920 | 14640 | 15380 | 16130 |
| 13600 | 10400 | 11450 | 12520 | 13600 | 14320 | 15060 | 15810 | 16570 |
| 14000 | 10770 | 11830 | 12910 | 14000 | 14730 | 15480 | 16230 | 17010 |
| 14400 | 11130 | 12210 | 13300 | 14400 | 15140 | 15900 | 16660 | 17450 |
| 14800 | 11500 | 12580 | 13680 | 14800 | 15550 | 16310 | 17090 | 17880 |
| 15200 | 11860 | 12960 | 14070 | 15200 | 15960 | 16730 | 17520 | 18320 |
| 15600 | 12230 | 13340 | 14460 | 15600 | 16370 | 17150 | 17950 | 18760 |
| 16000 | 12600 | 13710 | 14850 | 16000 | 16780 | 17570 | 18380 | 19200 |
| 16400 | 12960 | 14090 | 15240 | 16400 | 17190 | 17990 | 18810 | 19640 |
| 16800 | 13330 | 14460 | 15630 | 16800 | 17600 | 18410 | 19240 | 20080 |
| 17200 | 13690 | 14840 | 16020 | 17200 | 18010 | 18830 | 19670 | 20520 |
| 17600 | 14060 | 15210 | 16410 | 17600 | 18420 | 19250 | 20100 | 20960 |
| 18000 | 14420 | 15590 | 16800 | 18000 | 18830 | 19670 | 20530 | 21400 |
| 18400 | 14790 | 15960 | 17190 | 18400 | 19240 | 20090 | 20960 | 21840 |
| 18800 | 15150 | 16340 | 17580 | 18800 | 19650 | 20510 | 21390 | 22280 |
| 19200 | 15520 | 16710 | 17970 | 19200 | 20060 | 20930 | 21820 | 22720 |
| 19600 | 15880 | 17090 | 18360 | 19600 | 20470 | 21350 | 22250 | 23160 |

## Landing Field Limit Weight - Dry Runway - High Altitudes

### Flaps 40

### Based on anti-skid inoperative and manual speedbrakes

### Table 2 of 2: Field Limit Weight (1000 KG)

| WIND CORRECTED FIELD LENGTH (FT) | AIRPORT PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|
| | 10000 | 11000 | 12000 | 13000 | 14000 | 14500 |
| 8800 | 40.0 | | | | | |
| 9200 | 42.3 | 40.9 | | | | |
| 9600 | 44.7 | 43.1 | 41.5 | 40.1 | | |
| 10000 | 47.0 | 45.3 | 43.7 | 42.2 | 40.7 | |
| 10400 | 49.3 | 47.6 | 45.9 | 44.3 | 42.7 | 41.9 |
| 10800 | 51.6 | 49.8 | 48.1 | 46.4 | 44.8 | 43.9 |
| 11200 | 53.9 | 52.1 | 50.2 | 48.5 | 46.8 | 46.0 |
| 11600 | 56.3 | 54.3 | 52.4 | 50.6 | 48.9 | 48.0 |
| 12000 | 58.6 | 56.6 | 54.6 | 52.7 | 50.9 | 50.0 |
| 12400 | 60.9 | 58.9 | 56.9 | 54.9 | 53.0 | 52.0 |
| 12800 | 63.2 | 61.1 | 59.1 | 57.0 | 55.1 | 54.1 |
| 13200 | 65.7 | 63.4 | 61.3 | 59.2 | 57.2 | 56.2 |
| 13600 | 68.2 | 65.8 | 63.5 | 61.4 | 59.3 | 58.2 |
| 14000 | 71.4 | 68.3 | 65.8 | 63.6 | 61.4 | 60.3 |
| 14400 | 73.8 | 71.1 | 68.2 | 65.8 | 63.5 | 62.4 |
| 14800 | 76.1 | 73.7 | 71.3 | 68.1 | 65.7 | 64.5 |
| 15200 | 78.1 | 75.8 | 73.6 | 70.8 | 67.9 | 66.6 |
| 15600 | 80.2 | 77.9 | 75.7 | 73.2 | 70.8 | 69.2 |
| 16000 | 82.2 | 79.8 | 77.6 | 75.3 | 72.9 | 71.7 |
| 16400 | 84.2 | 81.8 | 79.5 | 77.2 | 75.0 | 73.7 |
| 16800 | 86.1 | 83.7 | 81.3 | 79.0 | 76.8 | 75.6 |
| 17200 | 88.0 | 85.6 | 83.2 | 80.8 | 78.5 | 77.4 |
| 17600 | 89.9 | 87.5 | 85.0 | 82.6 | 80.2 | 79.1 |
| 18000 | 91.9 | 89.3 | 86.8 | 84.4 | 81.9 | 80.8 |
| 18400 | | 91.2 | 88.6 | 86.1 | 83.7 | 82.4 |
| 18800 | | | 90.4 | 87.9 | 85.4 | 84.1 |
| 19200 | | | 92.2 | 89.6 | 87.1 | 85.8 |
| 19600 | | | | 91.4 | 88.8 | 87.4 |

# Landing Field Limit Weight - Wet Runway - Low Altitudes

## Flaps 40

### Based on anti-skid operative and automatic speedbrakes

### Table 1 of 2: Wind Adjusted Field Length (FT)

| FIELD LENGTH AVAILABLE (FT) | WIND COMPONENT (KTS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | -15 | -10 | -5 | 0 | 10 | 20 | 30 | 40 |
| 3400 | | | 3030 | 3400 | 3510 | 3610 | 3720 | 3830 |
| 3800 | | 2990 | 3400 | 3800 | 3930 | 4060 | 4190 | 4310 |
| 4200 | | 3340 | 3770 | 4200 | 4350 | 4500 | 4650 | 4800 |
| 4600 | 3220 | 3680 | 4140 | 4600 | 4770 | 4950 | 5120 | 5290 |
| 5000 | 3530 | 4020 | 4510 | 5000 | 5190 | 5390 | 5580 | 5780 |
| 5400 | 3850 | 4370 | 4880 | 5400 | 5620 | 5830 | 6050 | 6270 |
| 5800 | 4160 | 4710 | 5250 | 5800 | 6040 | 6280 | 6520 | 6750 |
| 6200 | 4480 | 5050 | 5630 | 6200 | 6460 | 6720 | 6980 | 7240 |
| 6600 | 4790 | 5390 | 6000 | 6600 | 6880 | 7160 | 7450 | 7730 |
| 7000 | 5110 | 5740 | 6370 | 7000 | 7300 | 7610 | 7910 | 8220 |
| 7400 | 5420 | 6080 | 6740 | 7400 | 7730 | 8050 | 8380 | 8710 |
| 7800 | 5730 | 6420 | 7110 | 7800 | 8150 | 8500 | 8850 | 9190 |
| 8200 | 6050 | 6770 | 7480 | 8200 | 8570 | 8940 | 9310 | 9680 |
| 8600 | 6360 | 7110 | 7850 | 8600 | 8990 | 9390 | 9780 | 10170 |
| 9000 | 6680 | 7450 | 8230 | 9000 | 9410 | 9830 | 10240 | 10660 |
| 9400 | 6990 | 7790 | 8600 | 9400 | 9840 | 10270 | 10710 | 11150 |
| 9800 | 7310 | 8140 | 8970 | 9800 | 10260 | 10720 | 11180 | 11630 |
| 10200 | 7620 | 8480 | 9340 | 10200 | 10680 | 11160 | 11640 | 12120 |
| 10600 | 7930 | 8820 | 9710 | 10600 | 11100 | 11600 | 12110 | 12610 |
| 11000 | 8240 | 9160 | 10080 | 11000 | 11520 | 12040 | 12580 | 13100 |
| 11400 | 8550 | 9500 | 10450 | 11400 | 11940 | 12480 | 13040 | 13590 |
| 11800 | 8860 | 9840 | 10820 | 11800 | 12360 | 12920 | 13510 | 14080 |

### Table 2 of 2: Field Limit Weight (1000 KG)

| WIND CORRECTED FIELD LENGTH (FT) | AIRPORT PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 2000 | 4000 | 6000 | 8000 | 10000 |
| 3800 | 40.2 | | | | | |
| 4200 | 46.1 | 43.4 | 40.8 | | | |
| 4600 | 52.0 | 49.0 | 46.1 | 43.2 | 40.5 | |
| 5000 | 57.8 | 54.6 | 51.3 | 48.1 | 45.1 | 42.1 |
| 5400 | 63.4 | 59.9 | 56.5 | 52.9 | 49.6 | 46.4 |
| 5800 | 70.6 | 65.2 | 61.5 | 57.7 | 54.1 | 50.6 |
| 6200 | 76.7 | 72.6 | 66.7 | 62.4 | 58.6 | 54.9 |
| 6600 | 80.1 | 77.5 | 73.5 | 67.5 | 63.0 | 59.2 |
| 7000 | 83.1 | 80.6 | 77.9 | 74.1 | 68.0 | 63.4 |
| 7400 | 85.9 | 83.3 | 80.6 | 78.0 | 74.3 | 68.2 |
| 7800 | 88.2 | 85.5 | 82.9 | 80.2 | 77.5 | 74.2 |
| 8200 | 90.4 | 87.7 | 85.0 | 82.3 | 79.6 | 76.9 |
| 8600 | 92.6 | 89.8 | 87.0 | 84.2 | 81.5 | 78.8 |
| 9000 | | 91.8 | 88.9 | 86.1 | 83.4 | 80.6 |
| 9400 | | | 90.8 | 87.9 | 85.1 | 82.3 |
| 9800 | | | | 89.6 | 86.8 | 83.9 |
| 10200 | | | | 91.3 | 88.4 | 85.4 |
| 10600 | | | | | 89.9 | 86.9 |
| 11000 | | | | | 91.4 | 88.4 |
| 11400 | | | | | | 89.8 |
| 11800 | | | | | | 91.1 |

**Decrease field limit weight by 7150 kg when using manual speedbrakes.**

## Landing Field Limit Weight - Wet Runway - Low Altitudes

### Flaps 40

### Based on anti-skid inoperative and manual speedbrakes

### Table 1 of 2: Wind Adjusted Field Length (FT)

| FIELD LENGTH AVAILABLE (FT) | WIND COMPONENT (KTS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | -15 | -10 | -5 | 0 | 10 | 20 | 30 | 40 |
| 6000 | | | | | 6570 | 7140 | 7720 | 8310 |
| 6400 | | | | | 6980 | 7560 | 8160 | 8760 |
| 6800 | | | | 6800 | 7390 | 7990 | 8590 | 9200 |
| 7200 | | | | 7200 | 7800 | 8410 | 9020 | 9650 |
| 7600 | | | 6660 | 7600 | 8210 | 8830 | 9460 | 10100 |
| 8000 | | | 7040 | 8000 | 8620 | 9250 | 9890 | 10540 |
| 8400 | | 6460 | 7430 | 8400 | 9030 | 9670 | 10320 | 10990 |
| 8800 | | 6830 | 7810 | 8800 | 9440 | 10090 | 10760 | 11430 |
| 9200 | | 7210 | 8200 | 9200 | 9850 | 10520 | 11190 | 11880 |
| 9600 | 6590 | 7580 | 8590 | 9600 | 10260 | 10940 | 11620 | 12320 |
| 10000 | 6950 | 7950 | 8970 | 10000 | 10670 | 11360 | 12060 | 12770 |
| 10400 | 7310 | 8330 | 9360 | 10400 | 11080 | 11780 | 12490 | 13210 |
| 10800 | 7670 | 8700 | 9740 | 10800 | 11500 | 12200 | 12920 | 13660 |
| 11200 | 8030 | 9070 | 10130 | 11200 | 11910 | 12620 | 13360 | 14100 |
| 11600 | 8390 | 9450 | 10520 | 11600 | 12320 | 13050 | 13790 | 14550 |
| 12000 | 8760 | 9820 | 10900 | 12000 | 12730 | 13470 | 14220 | 15000 |
| 12400 | 9120 | 10190 | 11290 | 12400 | 13140 | 13890 | 14660 | 15440 |
| 12800 | 9480 | 10570 | 11670 | 12800 | 13550 | 14310 | 15090 | 15890 |
| 13200 | 9840 | 10940 | 12060 | 13200 | 13960 | 14730 | 15520 | 16330 |
| 13600 | 10200 | 11310 | 12450 | 13600 | 14370 | 15150 | 15960 | 16780 |
| 14000 | 10560 | 11680 | 12840 | 14000 | 14780 | 15570 | 16400 | 17230 |
| 14400 | 10910 | 12050 | 13220 | 14400 | 15190 | 15990 | 16830 | 17670 |
| 14800 | 11270 | 12420 | 13610 | 14800 | 15600 | 16410 | 17270 | 18120 |
| 15200 | 11620 | 12790 | 13990 | 15200 | 16010 | 16830 | 17700 | 18560 |
| 15600 | 11980 | 13160 | 14380 | 15600 | 16420 | 17250 | 18140 | 19010 |
| 16000 | 12330 | 13530 | 14760 | 16000 | 16830 | 17670 | 18570 | 19450 |
| 16400 | 12690 | 13900 | 15150 | 16400 | 17240 | 18090 | 19010 | 19900 |
| 16800 | 13040 | 14270 | 15530 | 16800 | 17650 | 18510 | 19440 | 20340 |
| 17200 | 13400 | 14640 | 15920 | 17200 | 18060 | 18930 | 19880 | 20790 |
| 17600 | 13750 | 15010 | 16300 | 17600 | 18470 | 19350 | 20310 | 21230 |

## Landing Field Limit Weight - Wet Runway - Low Altitudes

### Flaps 40

**Based on anti-skid inoperative and manual speedbrakes**

**Table 2 of 2: Field Limit Weight (1000 KG)**

| WIND CORRECTED FIELD LENGTH (FT) | AIRPORT PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 2000 | 4000 | 6000 | 8000 | 10000 |
| 8000 | 42.1 | | | | | |
| 8400 | 44.9 | 42.1 | | | | |
| 8800 | 47.7 | 44.7 | 41.4 | | | |
| 9200 | 50.6 | 47.4 | 43.9 | 40.7 | | |
| 9600 | 53.3 | 50.1 | 46.5 | 43.1 | 40.2 | |
| 10000 | 56.0 | 52.7 | 48.9 | 45.4 | 42.4 | |
| 10400 | 58.8 | 55.3 | 51.4 | 47.7 | 44.5 | 41.4 |
| 10800 | 61.5 | 57.8 | 53.9 | 50.0 | 46.7 | 43.5 |
| 11200 | 64.2 | 60.4 | 56.3 | 52.3 | 48.8 | 45.5 |
| 11600 | 67.0 | 62.9 | 58.7 | 54.6 | 51.0 | 47.5 |
| 12000 | 70.4 | 65.5 | 61.1 | 56.9 | 53.1 | 49.5 |
| 12400 | 73.4 | 68.2 | 63.5 | 59.1 | 55.2 | 51.5 |
| 12800 | 76.0 | 71.5 | 66.0 | 61.4 | 57.4 | 53.5 |
| 13200 | 78.4 | 74.2 | 68.8 | 63.7 | 59.5 | 55.6 |
| 13600 | 80.7 | 76.5 | 71.7 | 66.0 | 61.6 | 57.6 |
| 14000 | 83.0 | 78.8 | 74.1 | 68.6 | 63.8 | 59.6 |
| 14400 | 85.3 | 81.0 | 76.4 | 71.6 | 66.0 | 61.6 |
| 14800 | 87.5 | 83.2 | 78.6 | 73.9 | 68.4 | 63.7 |
| 15200 | 89.8 | 85.4 | 80.7 | 76.1 | 71.4 | 65.8 |
| 15600 | 92.0 | 87.5 | 82.8 | 78.1 | 73.6 | 68.0 |
| 16000 | | 89.6 | 84.8 | 80.2 | 75.7 | 70.9 |
| 16400 | | 91.8 | 86.9 | 82.2 | 77.7 | 73.0 |
| 16800 | | | 88.9 | 84.1 | 79.6 | 75.0 |
| 17200 | | | 90.9 | 86.0 | 81.5 | 76.9 |
| 17600 | | | | 87.9 | 83.3 | 78.7 |

# Landing Field Limit Weight - Wet Runway - High Altitudes

## Flaps 40

### Based on anti-skid operative and automatic speedbrakes

### Table 1 of 2: Wind Adjusted Field Length (FT)

| FIELD LENGTH AVAILABLE (FT) | WIND COMPONENT (KTS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | -15 | -10 | -5 | 0 | 10 | 20 | 30 | 40 |
| 4600 | 3400 | 3800 | 4200 | 4600 | 4740 | 4890 | 5030 | 5180 |
| 5000 | 3710 | 4140 | 4570 | 5000 | 5170 | 5330 | 5500 | 5660 |
| 5400 | 4020 | 4480 | 4940 | 5400 | 5590 | 5770 | 5960 | 6150 |
| 5800 | 4320 | 4810 | 5310 | 5800 | 6010 | 6220 | 6420 | 6630 |
| 6200 | 4630 | 5150 | 5680 | 6200 | 6430 | 6660 | 6890 | 7120 |
| 6600 | 4930 | 5490 | 6040 | 6600 | 6850 | 7100 | 7350 | 7600 |
| 7000 | 5240 | 5830 | 6410 | 7000 | 7270 | 7540 | 7820 | 8090 |
| 7400 | 5550 | 6160 | 6780 | 7400 | 7690 | 7990 | 8280 | 8580 |
| 7800 | 5850 | 6500 | 7150 | 7800 | 8120 | 8430 | 8750 | 9060 |
| 8200 | 6160 | 6840 | 7520 | 8200 | 8540 | 8870 | 9210 | 9550 |
| 8600 | 6470 | 7180 | 7890 | 8600 | 8960 | 9320 | 9670 | 10030 |
| 9000 | 6770 | 7510 | 8260 | 9000 | 9380 | 9760 | 10140 | 10520 |
| 9400 | 7080 | 7850 | 8630 | 9400 | 9800 | 10200 | 10600 | 11000 |
| 9800 | 7380 | 8190 | 8990 | 9800 | 10220 | 10640 | 11070 | 11490 |
| 10200 | 7690 | 8530 | 9360 | 10200 | 10640 | 11090 | 11530 | 11980 |
| 10600 | 8000 | 8860 | 9730 | 10600 | 11070 | 11530 | 12000 | 12460 |
| 11000 | 8310 | 9190 | 10100 | 11000 | 11500 | 11970 | 12470 | 12940 |
| 11400 | 8620 | 9520 | 10470 | 11400 | 11920 | 12420 | 12930 | 13430 |
| 11800 | 8930 | 9850 | 10840 | 11800 | 12350 | 12860 | 13400 | 13910 |
| 12200 | 9240 | 10180 | 11210 | 12200 | 12770 | 13310 | 13860 | 14400 |
| 12600 | 9550 | 10510 | 11580 | 12600 | 13200 | 13750 | 14330 | 14880 |
| 13000 | 9860 | 10840 | 11950 | 13000 | 13620 | 14200 | 14790 | 15370 |
| 13400 | 10170 | 11170 | 12320 | 13400 | 14050 | 14640 | 15260 | 15850 |
| 13800 | 10480 | 11500 | 12690 | 13800 | 14470 | 15090 | 15720 | 16340 |
| 14200 | 10790 | 11830 | 13060 | 14200 | 14890 | 15540 | 16180 | 16830 |
| 14600 | 11100 | 12160 | 13430 | 14600 | 15310 | 15990 | 16640 | 17320 |

# Landing Field Limit Weight - Wet Runway - High Altitudes

## Flaps 40

## Based on anti-skid operative and automatic speedbrakes

## Table 2 of 2: Field Limit Weight (1000 KG)

| WIND CORRECTED FIELD LENGTH (FT) | AIRPORT PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|
| | 10000 | 11000 | 12000 | 13000 | 14000 | 14500 |
| 5000 | 42.1 | 40.7 | | | | |
| 5400 | 46.4 | 44.8 | 43.3 | 41.9 | 40.4 | |
| 5800 | 50.6 | 48.9 | 47.3 | 45.7 | 44.2 | 43.4 |
| 6200 | 54.9 | 53.1 | 51.3 | 49.6 | 47.9 | 47.1 |
| 6600 | 59.2 | 57.3 | 55.4 | 53.5 | 51.7 | 50.9 |
| 7000 | 63.4 | 61.5 | 59.5 | 57.6 | 55.6 | 54.7 |
| 7400 | 68.2 | 65.7 | 63.6 | 61.5 | 59.6 | 58.6 |
| 7800 | 74.2 | 71.4 | 68.1 | 65.6 | 63.4 | 62.4 |
| 8200 | 76.9 | 75.3 | 73.8 | 71.1 | 67.6 | 66.3 |
| 8600 | 78.8 | 77.4 | 76.1 | 74.6 | 73.1 | 72.0 |
| 9000 | 80.6 | 79.2 | 77.8 | 76.5 | 75.2 | 74.5 |
| 9400 | 82.3 | 80.9 | 79.5 | 78.1 | 76.8 | 76.1 |
| 9800 | 83.9 | 82.5 | 81.0 | 79.6 | 78.3 | 77.6 |
| 10200 | 85.4 | 84.0 | 82.5 | 81.1 | 79.7 | 79.0 |
| 10600 | 86.9 | 85.5 | 84.0 | 82.5 | 81.1 | 80.4 |
| 11000 | 88.4 | 86.9 | 85.4 | 83.9 | 82.4 | 81.7 |
| 11400 | 89.8 | 88.2 | 86.7 | 85.2 | 83.8 | 83.0 |
| 11800 | 91.1 | 89.6 | 88.0 | 86.5 | 85.0 | 84.3 |
| 12200 | | 90.9 | 89.3 | 87.7 | 86.2 | 85.5 |
| 12600 | | | 90.5 | 88.9 | 87.4 | 86.6 |
| 13000 | | | 91.7 | 90.1 | 88.5 | 87.7 |
| 13400 | | | | 91.2 | 89.6 | 88.8 |
| 13800 | | | | | 90.7 | 89.9 |
| 14200 | | | | | 91.7 | 90.9 |

**Decrease field limit weight by 6500 kg when using manual speedbrakes.**

# Landing Field Limit Weight - Wet Runway - High Altitudes

## Flaps 40

### Based on anti-skid inoperative and manual speedbrakes

### Table 1 of 2: Wind Adjusted Field Length (FT)

| FIELD LENGTH AVAILABLE (FT) | WIND COMPONENT (KTS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | -15 | -10 | -5 | 0 | 10 | 20 | 30 | 40 |
| 8000 | | | | | | 9320 | 9990 | 10650 |
| 8400 | | | | | 9070 | 9740 | 10410 | 11090 |
| 8800 | | | | 8800 | 9480 | 10160 | 10840 | 11530 |
| 9200 | | | | 9200 | 9890 | 10580 | 11270 | 11970 |
| 9600 | | | | 9600 | 10300 | 11000 | 11700 | 12410 |
| 10000 | | | 8930 | 10000 | 10710 | 11420 | 12130 | 12850 |
| 10400 | | | 9320 | 10400 | 11110 | 11830 | 12560 | 13290 |
| 10800 | | | 9710 | 10800 | 11520 | 12250 | 12990 | 13730 |
| 11200 | | 9000 | 10100 | 11200 | 11930 | 12670 | 13420 | 14170 |
| 11600 | | 9370 | 10480 | 11600 | 12340 | 13090 | 13840 | 14610 |
| 12000 | | 9750 | 10870 | 12000 | 12750 | 13510 | 14270 | 15050 |
| 12400 | 9000 | 10130 | 11260 | 12400 | 13160 | 13930 | 14700 | 15490 |
| 12800 | 9370 | 10500 | 11650 | 12800 | 13570 | 14340 | 15130 | 15930 |
| 13200 | 9730 | 10880 | 12030 | 13200 | 13980 | 14760 | 15560 | 16370 |
| 13600 | 10100 | 11250 | 12420 | 13600 | 14390 | 15180 | 15990 | 16810 |
| 14000 | 10460 | 11630 | 12810 | 14000 | 14800 | 15600 | 16420 | 17250 |
| 14400 | 10830 | 12010 | 13200 | 14400 | 15200 | 16020 | 16850 | 17690 |
| 14800 | 11200 | 12380 | 13580 | 14800 | 15610 | 16440 | 17280 | 18130 |
| 15200 | 11560 | 12760 | 13970 | 15200 | 16020 | 16860 | 17700 | 18570 |
| 15600 | 11930 | 13140 | 14360 | 15600 | 16430 | 17270 | 18130 | 19010 |
| 16000 | 12290 | 13520 | 14750 | 16000 | 16840 | 17690 | 18560 | 19450 |
| 16400 | 12650 | 13890 | 15130 | 16400 | 17250 | 18110 | 18990 | 19890 |
| 16800 | 13010 | 14270 | 15520 | 16800 | 17660 | 18530 | 19420 | 20330 |
| 17200 | 13370 | 14640 | 15900 | 17200 | 18070 | 18950 | 19850 | 20770 |
| 17600 | 13730 | 15020 | 16290 | 17600 | 18480 | 19370 | 20280 | 21210 |
| 18000 | 14090 | 15390 | 16670 | 18000 | 18890 | 19790 | 20710 | 21650 |
| 18400 | 14450 | 15770 | 17060 | 18400 | 19300 | 20210 | 21140 | 22090 |
| 18800 | 14810 | 16140 | 17440 | 18800 | 19710 | 20630 | 21570 | 22530 |
| 19200 | 15170 | 16520 | 17830 | 19200 | 20120 | 21050 | 22000 | 22970 |
| 19600 | 15530 | 16890 | 18210 | 19600 | 20530 | 21470 | 22430 | 23410 |

# Landing Field Limit Weight - Wet Runway - High Altitudes

## Flaps 40

**Based on anti-skid inoperative and manual speedbrakes**

**Table 2 of 2: Field Limit Weight (1000 KG)**

| WIND CORRECTED FIELD LENGTH (FT) | AIRPORT PRESSURE ALTITUDE (FT) | | | | | |
|---|---|---|---|---|---|---|
| | 10000 | 11000 | 12000 | 13000 | 14000 | 14500 |
| 10400 | 41.4 | 40.0 | | | | |
| 10800 | 43.5 | 41.9 | 40.4 | | | |
| 11200 | 45.5 | 43.9 | 42.3 | 40.8 | | |
| 11600 | 47.5 | 45.8 | 44.2 | 42.6 | 41.1 | 40.3 |
| 12000 | 49.5 | 47.8 | 46.1 | 44.5 | 42.9 | 42.1 |
| 12400 | 51.5 | 49.7 | 48.0 | 46.3 | 44.7 | 43.9 |
| 12800 | 53.5 | 51.7 | 49.9 | 48.1 | 46.5 | 45.6 |
| 13200 | 55.6 | 53.6 | 51.7 | 50.0 | 48.2 | 47.4 |
| 13600 | 57.6 | 55.6 | 53.7 | 51.8 | 50.0 | 49.1 |
| 14000 | 59.6 | 57.6 | 55.6 | 53.6 | 51.8 | 50.9 |
| 14400 | 61.6 | 59.6 | 57.5 | 55.5 | 53.6 | 52.6 |
| 14800 | 63.7 | 61.5 | 59.5 | 57.4 | 55.4 | 54.4 |
| 15200 | 65.8 | 63.5 | 61.4 | 59.3 | 57.3 | 56.2 |
| 15600 | 68.0 | 65.6 | 63.3 | 61.2 | 59.1 | 58.1 |
| 16000 | 70.9 | 67.7 | 65.3 | 63.1 | 60.9 | 59.9 |
| 16400 | 73.0 | 70.2 | 67.4 | 65.0 | 62.8 | 61.7 |
| 16800 | 75.0 | 72.5 | 69.9 | 67.0 | 64.6 | 63.5 |
| 17200 | 76.9 | 74.5 | 72.2 | 69.4 | 66.5 | 65.3 |
| 17600 | 78.7 | 76.4 | 74.1 | 71.6 | 68.7 | 67.2 |
| 18000 | 80.4 | 78.1 | 75.9 | 73.5 | 71.1 | 69.6 |
| 18400 | 82.2 | 79.8 | 77.6 | 75.3 | 72.9 | 71.7 |
| 18800 | 83.9 | 81.5 | 79.2 | 77.0 | 74.7 | 73.5 |
| 19200 | 85.6 | 83.2 | 80.8 | 78.6 | 76.3 | 75.2 |
| 19600 | 87.3 | 84.8 | 82.4 | 80.1 | 77.8 | 76.7 |

## Landing Climb Limit Weight

### Valid for approach with flaps 15 and landing with flaps 40

### Based on engine bleed for packs on and anti-ice off

| AIRPORT OAT (°C) | LANDING CLIMB LIMIT WEIGHT (1000 KG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | AIRPORT PRESSURE ALTITUDE (FT) | | | | | | | | |
| | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14000 | 14500 |
| 54 | 66.3 | | | | | | | | |
| 52 | 67.8 | | | | | | | | |
| 50 | 69.6 | 63.3 | | | | | | | |
| 48 | 70.8 | 64.4 | | | | | | | |
| 46 | 72.1 | 65.5 | 59.6 | | | | | | |
| 44 | 73.5 | 67.1 | 60.6 | | | | | | |
| 42 | 74.9 | 68.9 | 61.8 | 56.1 | | | | | |
| 40 | 76.4 | 70.6 | 63.6 | 57.2 | | | | | |
| 38 | 77.8 | 72.0 | 65.6 | 58.3 | 52.8 | | | | |
| 36 | 79.2 | 73.5 | 67.4 | 60.4 | 53.8 | | | | |
| 34 | 80.6 | 74.8 | 69.0 | 62.6 | 54.8 | 49.5 | | | |
| 32 | 82.0 | 76.2 | 70.4 | 64.5 | 55.8 | 50.5 | 44.5 | | |
| 30 | 83.3 | 77.3 | 71.6 | 65.9 | 56.9 | 51.5 | 45.4 | | |
| 28 | 83.3 | 78.2 | 72.8 | 67.1 | 58.0 | 52.5 | 46.3 | | |
| 26 | 83.4 | 79.0 | 73.6 | 68.1 | 59.1 | 53.5 | 47.2 | | |
| 24 | 83.4 | 79.0 | 74.1 | 69.2 | 60.2 | 54.5 | 48.2 | | |
| 22 | 83.4 | 79.0 | 74.6 | 69.8 | 61.4 | 55.6 | 49.2 | 43.4 | |
| 20 | 83.4 | 78.9 | 74.6 | 70.0 | 62.5 | 56.7 | 50.2 | 44.3 | 42.9 |
| 18 | 83.4 | 78.9 | 74.6 | 70.2 | 63.7 | 57.8 | 51.2 | 45.3 | 43.9 |
| 16 | 83.4 | 78.9 | 74.5 | 70.2 | 64.9 | 58.9 | 52.3 | 46.3 | 44.8 |
| 14 | 83.4 | 78.9 | 74.5 | 70.2 | 66.1 | 60.1 | 53.3 | 47.3 | 45.8 |
| 12 | 83.4 | 78.9 | 74.5 | 70.2 | 66.0 | 61.4 | 54.4 | 48.3 | 46.9 |
| 10 | 83.4 | 78.9 | 74.5 | 70.3 | 66.0 | 62.5 | 55.5 | 49.3 | 47.9 |
| 0 | 83.5 | 79.0 | 74.6 | 70.3 | 66.1 | 62.5 | 58.0 | 53.6 | 52.6 |
| -10 | 83.5 | 79.1 | 74.6 | 70.3 | 66.2 | 62.7 | 58.1 | 53.7 | 52.7 |
| -20 | 83.6 | 79.2 | 74.6 | 70.4 | 66.3 | 62.8 | 58.2 | 53.9 | 52.8 |
| -30 | 83.6 | 79.2 | 74.7 | 70.5 | 66.4 | 62.9 | 58.3 | 54.0 | 52.9 |
| -40 | 83.6 | 79.2 | 74.8 | 70.6 | 66.5 | 62.9 | 58.4 | 54.1 | 53.0 |

**With engine bleed for packs off, increase weight by 1250 kg.**

### Icing Adjustments

| LANDING CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AIRPORT PRESSURE ALTITUDE (FT) | | | | | | | | |
| 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14000 | 14500 |
| -5800 | -5650 | -5650 | -5600 | -4950 | -4650 | -4350 | -4050 | -3950 |

**When operating in icing conditions during any part of the flight with forecast landing temperature at or below 10°C, decrease weight by the Landing Climb Limit Weight Icing Adjustment shown above.**

### Anti-Ice Adjustments

### Pressure Altitude ≤ 8000 FT

| ANTI-ICE CONFIGURATION | LANDING CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -100 | -1000 |
| ENGINE AND WING ON | -250 | -2050 |

### Pressure Altitude > 8000 FT

| ANTI-ICE CONFIGURATION | LANDING CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1300 | -1300 |
| ENGINE AND WING ON | -3600 | -3850 |

# ENGINE INOP

## Go-Around Climb Gradient

### Flaps 15, Gear Up

### Based on engine bleed for packs on and anti-ice off

### Table 1 of 3: Reference Go-Around Gradient (%)

| AIRPORT OAT (°C) | REFERENCE GO-AROUND GRADIENT (%) | | | | | | |
|---|---|---|---|---|---|---|---|
| | PRESSURE ALTITUDE (FT) | | | | | | |
| | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 |
| 54 | 2.55 | | | | | | |
| 50 | 3.14 | 2.01 | | | | | |
| 46 | 3.62 | 2.42 | 1.35 | | | | |
| 42 | 4.14 | 3.06 | 1.74 | 0.72 | | | |
| 38 | 4.72 | 3.62 | 2.48 | 1.11 | 0.12 | | |
| 34 | 5.28 | 4.16 | 3.08 | 1.93 | 0.49 | | |
| 30 | 5.85 | 4.64 | 3.56 | 2.56 | 0.89 | | |
| 26 | 5.85 | 4.99 | 3.95 | 2.96 | 1.31 | 0.29 | |
| 22 | 5.86 | 4.98 | 4.14 | 3.25 | 1.74 | 0.69 | |
| 18 | 5.86 | 4.98 | 4.14 | 3.33 | 2.18 | 1.09 | |
| 14 | 5.87 | 4.97 | 4.14 | 3.34 | 2.62 | 1.52 | 0.28 |
| 10 | 5.87 | 4.97 | 4.13 | 3.34 | 2.62 | 1.98 | 0.70 |
| 6 | 5.88 | 4.98 | 4.13 | 3.34 | 2.62 | 1.98 | 1.12 |
| 2 | 5.88 | 4.99 | 4.14 | 3.34 | 2.62 | 1.99 | 1.14 |

### Table 2 of 3: Weight Adjustment

| WEIGHT (1000 KG) | REFERENCE GO-AROUND GRADIENT (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 90 | -2.40 | -2.73 | -3.05 | -3.37 | -3.68 | -3.97 | -4.27 | -4.55 |
| 85 | -2.10 | -2.38 | -2.66 | -2.93 | -3.19 | -3.45 | -3.70 | -3.95 |
| 80 | -1.71 | -1.94 | -2.15 | -2.37 | -2.58 | -2.79 | -2.99 | -3.19 |
| 75 | -1.23 | -1.39 | -1.54 | -1.70 | -1.85 | -1.99 | -2.14 | -2.28 |
| 70 | -0.66 | -0.75 | -0.83 | -0.91 | -0.99 | -1.07 | -1.14 | -1.22 |
| 65 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 60 | 0.71 | 0.80 | 0.88 | 0.97 | 1.06 | 1.15 | 1.25 | 1.34 |
| 55 | 1.65 | 1.84 | 2.05 | 2.25 | 2.46 | 2.67 | 2.88 | 3.10 |
| 50 | 2.80 | 3.14 | 3.48 | 3.83 | 4.19 | 4.54 | 4.91 | 5.28 |
| 45 | 4.18 | 4.68 | 5.20 | 5.72 | 6.24 | 6.78 | 7.32 | 7.86 |
| 40 | 5.77 | 6.47 | 7.19 | 7.90 | 8.63 | 9.37 | 10.11 | 10.86 |

### Table 3 of 3: Speed Adjustment

| SPEED (KIAS) | WEIGHT ADJUSTED GO-AROUND GRADIENT (%) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| VREF40 | -0.64 | -0.65 | -0.66 | -0.67 | -0.67 | -0.68 | -0.68 | -0.68 | -0.68 | -0.68 | -0.68 |
| VREF40+5 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| VREF40+10 | 0.09 | 0.09 | 0.10 | 0.10 | 0.10 | 0.11 | 0.11 | 0.11 | 0.11 | 0.10 | 0.10 |
| VREF40+15 | 0.13 | 0.13 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 | 0.13 | 0.12 | 0.12 |
| VREF40+20 | 0.13 | 0.12 | 0.12 | 0.11 | 0.11 | 0.10 | 0.09 | 0.08 | 0.07 | 0.06 | 0.05 |
| VREF40+25 | 0.08 | 0.06 | 0.04 | 0.02 | 0.00 | -0.02 | -0.04 | -0.06 | -0.08 | -0.10 | -0.11 |
| VREF40+30 | -0.02 | -0.06 | -0.10 | -0.14 | -0.18 | -0.22 | -0.25 | -0.28 | -0.31 | -0.34 | -0.36 |

**With engine bleed for packs off, increase gradient by 0.2%.**
**With engine anti-ice on, decrease gradient by 0.3%.**
**With engine and wing anti-ice on, decrease gradient by 0.9%.**
**When operating in icing conditions during any part of the flight with forecast landing temperature at or below 10°C, decrease gradient by 1.2%.**

# Quick Turnaround Limit Weight

## Flaps 40 Limit Weight (1000 KG)

| AIRPORT OAT (°C) | AIRPORT PRESSURE ALTITUDE (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14000 | 14500 |
| 54 | 74.7 | | | | | | | | |
| 50 | 75.2 | 72.4 | | | | | | | |
| 45 | 75.8 | 73.0 | 70.3 | | | | | | |
| 40 | 76.3 | 73.6 | 70.8 | 67.7 | | | | | |
| 35 | 76.9 | 74.2 | 71.4 | 68.3 | 65.5 | | | | |
| 30 | 77.5 | 74.8 | 72.0 | 69.1 | 66.1 | 63.5 | 60.9 | | |
| 25 | 78.1 | 75.4 | 72.6 | 69.8 | 66.7 | 64.0 | 61.4 | 58.9 | 58.3 |
| 20 | 78.7 | 76.0 | 73.2 | 70.4 | 67.2 | 64.5 | 62.0 | 59.4 | 58.8 |
| 15 | 79.3 | 76.6 | 73.9 | 71.0 | 67.8 | 65.1 | 62.5 | 60.0 | 59.3 |
| 10 | 79.9 | 77.2 | 74.5 | 71.6 | 68.5 | 65.7 | 63.0 | 60.5 | 59.8 |
| 5 | 80.6 | 77.8 | 75.1 | 72.2 | 69.3 | 66.2 | 63.6 | 61.0 | 60.3 |
| 0 | 81.3 | 78.5 | 75.7 | 72.9 | 70.0 | 66.8 | 64.1 | 61.5 | 60.9 |
| -5 | 81.9 | 79.1 | 76.3 | 73.5 | 70.6 | 67.4 | 64.7 | 62.1 | 61.4 |
| -10 | 82.7 | 79.8 | 77.0 | 74.2 | 71.3 | 68.1 | 65.3 | 62.7 | 62.0 |
| -15 | 83.4 | 80.5 | 77.7 | 74.9 | 72.0 | 69.0 | 66.0 | 63.3 | 62.6 |
| -20 | 84.2 | 81.3 | 78.4 | 75.6 | 72.8 | 69.9 | 66.6 | 63.9 | 63.3 |
| -30 | 85.8 | 82.8 | 79.9 | 77.0 | 74.2 | 71.3 | 68.1 | 65.2 | 64.5 |
| -40 | 87.4 | 84.4 | 81.5 | 78.6 | 75.8 | 72.8 | 69.9 | 66.7 | 65.9 |
| -50 | 89.2 | 86.2 | 83.2 | 80.2 | 77.3 | 74.4 | 71.5 | 68.2 | 67.5 |
| -54 | 90.0 | 86.9 | 83.9 | 80.9 | 77.9 | 75.1 | 72.1 | 69.0 | 68.1 |

**Increase weight by 600 kg per 1% uphill slope. Decrease weight by 1000 kg per 1% downhill slope.**
**Increase weight by 1500 kg per 10 knots headwind. Decrease weight by 7600 kg per 10 knots tailwind.**
**After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 48 minutes and check that wheel thermal plugs have not melted before executing a takeoff.**

**If a Brake Temperature Monitoring System (BTMS) is installed:**

**No sooner than 10 and no later than 15 minutes after parking, check the BRAKE TEMP light. If the BRAKE TEMP light is not on, no ground waiting period is required. If the BRAKE TEMP light is on, do not dispatch until at least 48 minutes after landing, or until all the BTMS readings on the systems Display are below 3.0 and the BRAKE TEMP light is off. Check that wheel thermal plugs have not melted before making a subsequent takeoff.**
**Note: If any brake temperature display digit is blank or indicates 0.0 or 0.1, then this method cannot be used.**

Intentionally
Blank

# GEAR DOWN

## Takeoff Climb Limit Weight

### Flaps 5

### Based on engine bleed for packs on and anti-ice off

| AIRPORT OAT °C | TAKEOFF CLIMB WEIGHT (1000 KG) | | | | | | |
|---|---|---|---|---|---|---|---|
| | AIRPORT PRESSURE ALTITUDE (FT) | | | | | | |
| | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 |
| 54 | 58.4 | 55.6 | 50.6 | 45.0 | | | |
| 52 | 59.6 | 55.5 | 51.8 | 46.0 | | | |
| 50 | 60.8 | 55.8 | 52.9 | 47.1 | | | |
| 48 | 62.1 | 57.0 | 52.9 | 48.1 | 42.8 | | |
| 46 | 63.5 | 58.2 | 53.2 | 49.2 | 43.7 | | |
| 44 | 65.0 | 59.5 | 54.4 | 49.7 | 44.7 | | |
| 42 | 66.5 | 60.8 | 55.5 | 50.0 | 45.7 | | |
| 40 | 68.1 | 62.2 | 56.7 | 51.2 | 46.7 | | |
| 38 | 69.9 | 63.6 | 58.0 | 52.3 | 47.1 | | |
| 36 | 71.4 | 65.1 | 59.4 | 53.5 | 48.2 | | |
| 34 | 73.0 | 66.6 | 60.7 | 54.7 | 49.3 | | |
| 32 | 74.7 | 68.1 | 62.1 | 56.0 | 50.4 | 43.5 | |
| 30 | 76.2 | 69.9 | 63.5 | 57.3 | 51.6 | 44.6 | |
| 28 | 77.3 | 71.4 | 64.9 | 58.6 | 52.8 | 45.6 | |
| 26 | 77.3 | 72.9 | 66.3 | 59.9 | 54.0 | 46.7 | |
| 24 | 77.3 | 72.9 | 67.6 | 61.2 | 55.2 | 47.7 | |
| 22 | 77.3 | 72.9 | 68.6 | 62.3 | 56.4 | 48.9 | |
| 20 | 77.3 | 72.9 | 68.6 | 63.4 | 57.6 | 50.0 | |
| 18 | 77.3 | 72.9 | 68.6 | 64.4 | 58.7 | 51.1 | 43.4 |
| 16 | 77.3 | 72.8 | 68.6 | 64.6 | 59.5 | 52.3 | 44.5 |
| 14 | 77.3 | 72.8 | 68.6 | 64.6 | 60.4 | 53.4 | 45.5 |
| 12 | 77.3 | 72.8 | 68.6 | 64.6 | 61.0 | 54.5 | 46.7 |
| 10 & BLW | 77.3 | 72.8 | 68.6 | 64.6 | 61.0 | 55.6 | 47.9 |

**With engine bleed for packs off, increase weight by 50 kg.**
**With engine anti-ice on, decrease weight by 1500 kg.**
**With engine and wing anti-ice on, decrease weight by 5600 kg.**

# GEAR DOWN

## Takeoff Obstacle Limit Weight

### Flaps 5

### Based on engine bleed for packs on and anti-ice off

### Table 1 of 4: Sea Level, 30°C and Below, Zero Wind

| OBSTACLE HEIGHT (FT) | REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DISTANCE FROM BRAKE RELEASE (1000 FT) | | | | | | | | | | | |
| | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
| 10 | 75.9 | | | | | | | | | | | |
| 50 | 69.9 | 75.5 | | | | | | | | | | |
| 100 | 65.0 | 70.6 | 74.5 | 77.1 | | | | | | | | |
| 150 | 61.4 | 67.0 | 71.0 | 73.9 | 76.1 | | | | | | | |
| 200 | 58.5 | 63.9 | 68.1 | 71.2 | 73.6 | 75.4 | 76.9 | | | | | |
| 250 | 56.0 | 61.4 | 65.5 | 68.8 | 71.3 | 73.3 | 74.9 | 76.2 | 77.3 | 77.6 | 77.6 | 77.6 |
| 300 | 53.8 | 59.1 | 63.3 | 66.6 | 69.3 | 71.4 | 73.1 | 74.5 | 75.7 | 76.7 | 77.5 | 77.5 |
| 350 | 51.8 | 57.1 | 61.3 | 64.7 | 67.4 | 69.6 | 71.4 | 72.9 | 74.2 | 75.3 | 76.2 | 77.0 |
| 400 | 50.0 | 55.3 | 59.5 | 62.9 | 65.6 | 67.9 | 69.8 | 71.4 | 72.8 | 73.9 | 74.9 | 75.8 |
| 450 | 48.3 | 53.6 | 57.8 | 61.2 | 64.0 | 66.4 | 68.3 | 70.0 | 71.4 | 72.6 | 73.7 | 74.6 |
| 500 | 46.7 | 52.1 | 56.3 | 59.7 | 62.6 | 64.9 | 66.9 | 68.7 | 70.1 | 71.4 | 72.5 | 73.5 |
| 550 | 45.2 | 50.7 | 54.9 | 58.3 | 61.2 | 63.6 | 65.6 | 67.4 | 68.9 | 70.2 | 71.4 | 72.4 |
| 600 | 43.7 | 49.3 | 53.5 | 57.0 | 59.9 | 62.3 | 64.4 | 66.2 | 67.7 | 69.1 | 70.3 | 71.3 |
| 650 | 42.7 | 48.0 | 52.2 | 55.7 | 58.6 | 61.1 | 63.2 | 65.0 | 66.6 | 68.0 | 69.3 | 70.3 |
| 700 | | 46.8 | 51.1 | 54.5 | 57.4 | 59.9 | 62.1 | 63.9 | 65.5 | 67.0 | 68.3 | 69.4 |
| 750 | | 45.6 | 49.9 | 53.4 | 56.3 | 58.8 | 61.0 | 62.9 | 64.5 | 66.0 | 67.3 | 68.4 |
| 800 | | 44.4 | 48.8 | 52.3 | 55.3 | 57.8 | 60.0 | 61.9 | 63.5 | 65.0 | 66.4 | 67.5 |
| 850 | | 43.3 | 47.8 | 51.3 | 54.2 | 56.8 | 59.0 | 60.9 | 62.6 | 64.1 | 65.4 | 66.7 |
| 900 | | 42.7 | 46.8 | 50.3 | 53.3 | 55.8 | 58.0 | 60.0 | 61.7 | 63.2 | 64.6 | 65.8 |
| 950 | | | 45.8 | 49.4 | 52.3 | 54.9 | 57.1 | 59.1 | 60.8 | 62.4 | 63.7 | 65.0 |
| 1000 | | | 44.9 | 48.5 | 51.4 | 54.0 | 56.3 | 58.2 | 60.0 | 61.5 | 62.9 | 64.2 |

**Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.**
**For FAA operators adhering to EASA standards, when using line-up allowances, the obstacle distance from brake release must be reduced by the ASDA adjustment.**

### Table 2 of 4: OAT Adjustment

| OAT (°C) | OBSTACLE LIMIT WEIGHT ADJUSTMENT (1000 KG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG) | | | | | | | | |
| | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 |
| 30 & BELOW | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 32 | -0.7 | -0.8 | -0.9 | -1.0 | -1.1 | -1.2 | -1.3 | -1.4 | -1.5 |
| 34 | -1.3 | -1.5 | -1.7 | -1.9 | -2.1 | -2.3 | -2.5 | -2.7 | -2.9 |
| 36 | -2.0 | -2.3 | -2.6 | -2.9 | -3.2 | -3.5 | -3.8 | -4.1 | -4.4 |
| 38 | -2.7 | -3.1 | -3.5 | -3.9 | -4.3 | -4.7 | -5.1 | -5.5 | -5.9 |
| 40 | -3.3 | -3.8 | -4.3 | -4.8 | -5.3 | -5.8 | -6.3 | -6.8 | -7.3 |
| 42 | -3.9 | -4.5 | -5.1 | -5.7 | -6.3 | -6.9 | -7.5 | -8.0 | -8.6 |
| 44 | -4.5 | -5.2 | -5.8 | -6.5 | -7.2 | -7.9 | -8.6 | -9.3 | -10.0 |
| 46 | -5.0 | -5.8 | -6.6 | -7.4 | -8.2 | -8.9 | -9.7 | -10.5 | -11.3 |
| 48 | -5.6 | -6.5 | -7.4 | -8.2 | -9.1 | -10.0 | -10.9 | -11.7 | -12.6 |
| 50 | -6.2 | -7.1 | -8.1 | -9.1 | -10.1 | -11.0 | -12.0 | -13.0 | -13.9 |

# GEAR DOWN

## Takeoff Obstacle Limit Weight

### Flaps 5

### Based on engine bleed for packs on and anti-ice off

### Table 3 of 4: Pressure Altitude Adjustment

| PRESS ALT (FT) | OBSTACLE LIMIT WEIGHT ADJUSTMENT (1000 KG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG) | | | | | | | | |
| | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 |
| S.L. & BELOW | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1000 | -1.5 | -1.8 | -2.0 | -2.2 | -2.4 | -2.6 | -2.8 | -3.0 | -3.2 |
| 2000 | -3.1 | -3.5 | -3.9 | -4.4 | -4.8 | -5.2 | -5.6 | -6.1 | -6.5 |
| 3000 | -4.5 | -5.1 | -5.7 | -6.3 | -6.9 | -7.5 | -8.1 | -8.7 | -9.3 |
| 4000 | -6.0 | -6.8 | -7.5 | -8.3 | -9.1 | -9.8 | -10.6 | -11.3 | -12.1 |
| 5000 | -7.2 | -8.2 | -9.1 | -10.0 | -11.0 | -11.9 | -12.8 | -13.8 | -14.7 |
| 6000 | -8.5 | -9.6 | -10.7 | -11.8 | -12.9 | -14.0 | -15.1 | -16.2 | -17.2 |
| 7000 | -10.4 | -11.8 | -13.2 | -14.6 | -16.0 | -17.4 | -18.8 | -20.1 | -21.5 |
| 8000 | -12.3 | -14.0 | -15.7 | -17.4 | -19.1 | -20.8 | -22.5 | -24.1 | -25.8 |
| 9000 | -13.2 | -15.1 | -17.0 | -19.0 | -20.9 | -22.9 | -24.8 | -26.7 | -28.7 |
| 10000 | -14.0 | -16.2 | -18.4 | -20.6 | -22.8 | -24.9 | -27.1 | -29.3 | -31.5 |

### Table 4 of 4: Wind Adjustment

| WIND (KTS) | OBSTACLE LIMIT WEIGHT ADJUSTMENT (1000 KG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | OAT AND ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG) | | | | | | | | |
| | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 |
| 15 TW | -9.5 | -9.2 | -9.0 | -8.7 | -8.4 | -8.1 | -7.8 | -7.5 | -7.3 |
| 10 TW | -6.3 | -6.2 | -6.0 | -5.8 | -5.6 | -5.4 | -5.2 | -5.0 | -4.8 |
| 5 TW | -3.2 | -3.1 | -3.0 | -2.9 | -2.8 | -2.7 | -2.6 | -2.5 | -2.4 |
| 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 HW | 0.8 | 0.8 | 0.7 | 0.6 | 0.5 | 0.5 | 0.4 | 0.3 | 0.3 |
| 20 HW | 1.7 | 1.5 | 1.4 | 1.2 | 1.1 | 0.9 | 0.8 | 0.6 | 0.5 |
| 30 HW | 2.5 | 2.3 | 2.0 | 1.8 | 1.6 | 1.4 | 1.2 | 1.0 | 0.8 |
| 40 HW | 3.3 | 3.0 | 2.7 | 2.4 | 2.2 | 1.9 | 1.6 | 1.3 | 1.0 |

**With engine bleed for packs off, increase weight by 100 kg.**

### Anti-Ice Adjustments

### Pressure Altitude ≤ 8000 FT

| ANTI-ICE CONFIGURATION | OBSTACLE LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -300 | -1550 |
| ENGINE AND WING ON | -1050 | -5050 |

### Pressure Altitude > 8000 FT

| ANTI-ICE CONFIGURATION | OBSTACLE LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1300 | -1550 |
| ENGINE AND WING ON | -4800 | -5950 |

# GEAR DOWN

## Fuel Jettison Limit Weight

### Valid for approach with flaps 15 and landing with flaps 40

### Based on engine bleed for packs on and anti-ice off

| AIRPORT OAT (°C) | FUEL JETTISON LIMIT WEIGHT (1000 KG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | AIRPORT PRESSURE ALTITUDE (FT) | | | | | | | | |
| | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14000 | 14500 |
| 54 | 61.1 | | | | | | | | |
| 52 | 62.6 | | | | | | | | |
| 50 | 64.0 | 58.4 | | | | | | | |
| 48 | 65.2 | 59.4 | | | | | | | |
| 46 | 66.4 | 60.4 | 55.0 | | | | | | |
| 44 | 67.6 | 62.0 | 56.0 | | | | | | |
| 42 | 69.0 | 63.5 | 57.0 | 51.9 | | | | | |
| 40 | 70.4 | 65.0 | 58.8 | 52.8 | | | | | |
| 38 | 71.8 | 66.3 | 60.7 | 53.9 | 48.8 | | | | |
| 36 | 73.2 | 67.7 | 62.3 | 55.9 | 49.8 | | | | |
| 34 | 74.6 | 69.0 | 63.6 | 57.9 | 50.7 | | | | |
| 32 | 76.0 | 70.3 | 64.9 | 59.7 | 51.7 | 46.8 | | | |
| 30 | 77.5 | 71.4 | 66.0 | 61.0 | 52.7 | 47.7 | | | |
| 28 | 77.5 | 72.3 | 67.2 | 62.1 | 53.7 | 48.6 | | | |
| 26 | 77.5 | 73.1 | 68.0 | 63.0 | 54.8 | 49.6 | | | |
| 24 | 77.5 | 73.1 | 68.4 | 63.9 | 55.8 | 50.6 | | | |
| 22 | 77.5 | 73.1 | 68.9 | 64.4 | 56.9 | 51.6 | | | |
| 20 | 77.5 | 73.1 | 68.9 | 64.6 | 57.9 | 52.6 | | | |
| 18 | 77.5 | 73.0 | 68.9 | 64.8 | 59.1 | 53.6 | 47.6 | | |
| 16 | 77.5 | 73.0 | 68.8 | 64.8 | 60.2 | 54.6 | 48.5 | | |
| 14 | 77.6 | 73.0 | 68.9 | 64.8 | 61.3 | 55.8 | 49.5 | | |
| 12 | 77.6 | 73.0 | 68.9 | 64.8 | 61.3 | 57.0 | 50.5 | | |
| 10 | 77.6 | 73.0 | 68.9 | 64.9 | 61.2 | 58.0 | 51.6 | | |
| 0 | 77.6 | 73.1 | 68.9 | 64.9 | 61.3 | 58.1 | 53.9 | 49.9 | 48.9 |
| -10 | 77.6 | 73.2 | 68.9 | 64.9 | 61.4 | 58.2 | 54.0 | 50.0 | 49.0 |
| -20 | 77.7 | 73.3 | 68.9 | 65.0 | 61.5 | 58.3 | 54.1 | 50.1 | 49.1 |
| -30 | 77.7 | 73.3 | 69.0 | 65.1 | 61.6 | 58.4 | 54.2 | 50.2 | 49.3 |
| -40 | 77.7 | 73.3 | 69.1 | 65.2 | 61.7 | 58.4 | 54.3 | 50.3 | 49.3 |

**Table valid for Zero Fuel Weight up to 72500 kg.**
**With engine bleed for packs off, increase weight by 1150 kg.**

## Icing Adjustments

| FUEL JETTISON LIMIT WEIGHT ADJUSTMENT (KG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AIRPORT PRESSURE ALTITUDE (FT) | | | | | | | | |
| 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14000 | 14500 |
| -8250 | -7850 | -7400 | -6650 | -6250 | -5900 | -5450 | -5050 | -4950 |

**When operating in icing conditions during any part of the flight with forecast landing temperature at or below 10°C, decrease weight by the Fuel Jettison Limit Weight Icing Adjustment shown above.**

# GEAR DOWN

## Fuel Jettison Limit Weight

### Anti-Ice Adjustments

### Pressure Altitude ≤ 8000 FT

| ANTI-ICE CONFIGURATION | FUEL JETTISON LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -100 | -900 |
| ENGINE AND WING ON | -400 | -2700 |

### Pressure Altitude > 8000 FT

| ANTI-ICE CONFIGURATION | FUEL JETTISON LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1200 | -1250 |
| ENGINE AND WING ON | -4450 | -4450 |

# GEAR DOWN

## Landing Climb Limit Weight

### Valid for approach with flaps 15 and landing with flaps 40

### Based on engine bleed for packs on and anti-ice off

| AIRPORT OAT (°C) | LANDING CLIMB LIMIT WEIGHT (1000 KG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | AIRPORT PRESSURE ALTITUDE (FT) | | | | | | | | |
| | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14000 | 14500 |
| 54 | 60.7 | | | | | | | | |
| 52 | 62.1 | | | | | | | | |
| 50 | 63.6 | 58.0 | | | | | | | |
| 48 | 64.7 | 59.0 | | | | | | | |
| 46 | 65.9 | 60.0 | 54.6 | | | | | | |
| 44 | 67.2 | 61.5 | 55.5 | | | | | | |
| 42 | 68.6 | 63.1 | 56.6 | 51.4 | | | | | |
| 40 | 70.3 | 64.6 | 58.4 | 52.4 | | | | | |
| 38 | 71.6 | 65.9 | 60.2 | 53.4 | 48.4 | | | | |
| 36 | 73.0 | 67.3 | 61.9 | 55.4 | 49.3 | | | | |
| 34 | 74.3 | 68.6 | 63.2 | 57.5 | 50.2 | 45.4 | | | |
| 32 | 75.7 | 70.1 | 64.4 | 59.2 | 51.2 | 46.3 | | | |
| 30 | 77.1 | 71.2 | 65.6 | 60.6 | 52.2 | 47.2 | | | |
| 28 | 77.1 | 72.1 | 66.7 | 61.7 | 53.3 | 48.2 | | | |
| 26 | 77.2 | 72.9 | 67.5 | 62.6 | 54.3 | 49.1 | 43.4 | | |
| 24 | 77.2 | 72.9 | 68.0 | 63.5 | 55.4 | 50.1 | 44.3 | | |
| 22 | 77.2 | 72.9 | 68.5 | 64.0 | 56.4 | 51.1 | 45.2 | | |
| 20 | 77.2 | 72.8 | 68.5 | 64.2 | 57.5 | 52.2 | 46.1 | | |
| 18 | 77.2 | 72.8 | 68.4 | 64.4 | 58.6 | 53.2 | 47.1 | | |
| 16 | 77.2 | 72.8 | 68.4 | 64.4 | 59.8 | 54.2 | 48.1 | | |
| 14 | 77.2 | 72.8 | 68.4 | 64.4 | 60.9 | 55.3 | 49.1 | 43.5 | |
| 12 | 77.2 | 72.8 | 68.4 | 64.4 | 60.8 | 56.5 | 50.1 | 44.4 | 43.1 |
| 10 | 77.2 | 72.8 | 68.4 | 64.4 | 60.8 | 57.6 | 51.1 | 45.4 | 44.1 |
| 0 | 77.3 | 72.9 | 68.5 | 64.4 | 60.9 | 57.6 | 53.4 | 49.4 | 48.5 |
| -10 | 77.3 | 73.0 | 68.5 | 64.5 | 60.9 | 57.8 | 53.6 | 49.5 | 48.6 |
| -20 | 77.4 | 73.1 | 68.5 | 64.6 | 61.0 | 57.9 | 53.7 | 49.7 | 48.7 |
| -30 | 77.4 | 73.1 | 68.7 | 64.7 | 61.2 | 58.0 | 53.8 | 49.8 | 48.8 |
| -40 | 77.4 | 73.1 | 68.7 | 64.7 | 61.2 | 58.0 | 53.8 | 49.8 | 48.9 |

**With engine bleed for packs off, increase weight by 1150 kg.**

## Icing Adjustments

| LANDING CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AIRPORT PRESSURE ALTITUDE (FT) | | | | | | | | |
| 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14000 | 14500 |
| -8250 | -7850 | -7400 | -6650 | -6250 | -5900 | -5450 | -5050 | -4950 |

**When operating in icing conditions during any part of the flight with forecast landing temperature at or below 10°C, decrease weight by the Landing Climb Limit Weight Icing Adjustment shown above.**

# GEAR DOWN

## Landing Climb Limit Weight

### Anti-Ice Adjustments

### Pressure Altitude ≤ 8000 FT

| ANTI-ICE CONFIGURATION | LANDING CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -100 | -900 |
| ENGINE AND WING ON | -400 | -2700 |

### Pressure Altitude > 8000 FT

| ANTI-ICE CONFIGURATION | LANDING CLIMB LIMIT WEIGHT ADJUSTMENT (KG) | |
|---|---|---|
| | OAT≤5°C | 5°C<OAT≤10°C |
| ENGINE ON | -1200 | -1250 |
| ENGINE AND WING ON | -4450 | -4450 |

# GEAR DOWN

## Long Range Cruise Altitude Capability

### Max Cruise Thrust, 100 ft/min residual rate of climb

| WEIGHT (1000 KG) | PRESSURE ALTITUDE (FT) | | |
|---|---|---|---|
| | ISA + 10°C & BELOW | ISA + 15°C | ISA + 20°C |
| 85 | 16500 | 13900 | 11200 |
| 80 | 18800 | 16500 | 13800 |
| 75 | 21500 | 19000 | 16500 |
| 70 | 24900 | 22400 | 19300 |
| 65 | 27000 | 25700 | 23800 |
| 60 | 29100 | 27900 | 26700 |
| 55 | 31300 | 30400 | 29100 |
| 50 | 33300 | 32700 | 32100 |
| 45 | 35600 | 34900 | 34500 |
| 40 | 38000 | 37500 | 37100 |

# GEAR DOWN

## Long Range Cruise Trip Fuel and Time

### Table 1 of 3: Ground to Air Miles Conversion

| AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) | | | | | GROUND DISTANCE (NM) | AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 80 | 60 | 40 | 20 | | 20 | 40 | 60 | 80 | 100 |
| 349 | 305 | 269 | 241 | 219 | 200 | 187 | 175 | 165 | 156 | 148 |
| 523 | 458 | 404 | 362 | 329 | 300 | 280 | 263 | 247 | 234 | 223 |
| 696 | 611 | 538 | 483 | 438 | 400 | 374 | 351 | 330 | 312 | 297 |
| 868 | 762 | 673 | 603 | 548 | 500 | 468 | 439 | 414 | 391 | 371 |
| 1039 | 913 | 806 | 724 | 657 | 600 | 562 | 528 | 497 | 470 | 446 |
| 1209 | 1063 | 939 | 843 | 766 | 700 | 656 | 616 | 580 | 548 | 521 |
| 1378 | 1212 | 1072 | 963 | 876 | 800 | 750 | 704 | 663 | 627 | 596 |
| 1545 | 1361 | 1205 | 1083 | 985 | 900 | 844 | 793 | 747 | 706 | 672 |
| 1712 | 1509 | 1337 | 1202 | 1094 | 1000 | 938 | 881 | 830 | 786 | 747 |
| 1878 | 1657 | 1469 | 1321 | 1203 | 1100 | 1032 | 970 | 914 | 865 | 823 |
| 2043 | 1804 | 1600 | 1440 | 1312 | 1200 | 1126 | 1058 | 998 | 944 | 898 |
| 2207 | 1950 | 1730 | 1559 | 1420 | 1300 | 1219 | 1146 | 1081 | 1023 | 973 |
| 2370 | 2095 | 1861 | 1677 | 1529 | 1400 | 1313 | 1235 | 1165 | 1103 | 1049 |
| 2532 | 2241 | 1992 | 1796 | 1638 | 1500 | 1408 | 1324 | 1249 | 1183 | 1125 |
| 2693 | 2385 | 2122 | 1915 | 1746 | 1600 | 1502 | 1413 | 1333 | 1263 | 1201 |
| 2853 | 2529 | 2251 | 2033 | 1855 | 1700 | 1596 | 1502 | 1417 | 1342 | 1277 |
| 3013 | 2672 | 2380 | 2150 | 1963 | 1800 | 1690 | 1591 | 1502 | 1422 | 1353 |
| 3172 | 2815 | 2509 | 2268 | 2071 | 1900 | 1785 | 1680 | 1586 | 1502 | 1429 |
| 3330 | 2957 | 2638 | 2385 | 2179 | 2000 | 1879 | 1769 | 1670 | 1582 | 1506 |

### Table 2 of 3: Reference Fuel and Time Required

| AIR DIST (NM) | PRESSURE ALTITUDE (1000 FT) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 10 | | 14 | | 20 | | 24 | |
| | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) |
| 200 | 2.1 | 0:55 | 2.0 | 0:53 | 1.9 | 0:50 | 1.8 | 0:49 |
| 300 | 3.1 | 1:21 | 2.9 | 1:17 | 2.7 | 1:12 | 2.6 | 1:09 |
| 400 | 4.1 | 1:46 | 3.9 | 1:41 | 3.6 | 1:34 | 3.4 | 1:30 |
| 500 | 5.1 | 2:11 | 4.8 | 2:05 | 4.5 | 1:55 | 4.2 | 1:50 |
| 600 | 6.2 | 2:36 | 5.8 | 2:28 | 5.3 | 2:17 | 5.1 | 2:10 |
| 700 | 7.2 | 3:01 | 6.7 | 2:52 | 6.2 | 2:38 | 5.9 | 2:30 |
| 800 | 8.2 | 3:26 | 7.7 | 3:15 | 7.1 | 2:59 | 6.7 | 2:50 |
| 900 | 9.3 | 3:50 | 8.7 | 3:38 | 8.0 | 3:20 | 7.6 | 3:10 |
| 1000 | 10.3 | 4:14 | 9.7 | 4:01 | 8.9 | 3:41 | 8.4 | 3:30 |
| 1100 | 11.4 | 4:38 | 10.7 | 4:23 | 9.8 | 4:02 | 9.2 | 3:49 |
| 1200 | 12.5 | 5:02 | 11.7 | 4:46 | 10.7 | 4:22 | 10.1 | 4:09 |
| 1300 | 13.6 | 5:25 | 12.7 | 5:08 | 11.6 | 4:43 | 11.0 | 4:28 |
| 1400 | 14.7 | 5:48 | 13.7 | 5:30 | 12.5 | 5:03 | 11.8 | 4:47 |
| 1500 | 15.8 | 6:11 | 14.7 | 5:52 | 13.5 | 5:23 | 12.7 | 5:06 |
| 1600 | 16.9 | 6:34 | 15.8 | 6:13 | 14.4 | 5:43 | 13.6 | 5:25 |
| 1700 | 18.0 | 6:57 | 16.8 | 6:35 | 15.4 | 6:03 | 14.5 | 5:44 |
| 1800 | 19.1 | 7:19 | 17.9 | 6:56 | 16.3 | 6:23 | 15.4 | 6:03 |
| 1900 | 20.3 | 7:42 | 19.0 | 7:17 | 17.3 | 6:42 | 16.3 | 6:21 |
| 2000 | 21.4 | 8:04 | 20.0 | 7:39 | 18.3 | 7:02 | 17.2 | 6:40 |

# GEAR DOWN

## Long Range Cruise Trip Fuel and Time

### Table 3 of 3: Fuel Required Adjustment (1000 KG)

| REFERENCE FUEL REQUIRED (1000 KG) | LANDING WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|
| | 40 | 45 | 50 | 55 | 60 | 65 |
| 2 | -0.2 | -0.1 | 0.0 | 0.1 | 0.2 | 0.3 |
| 4 | -0.4 | -0.2 | 0.0 | 0.2 | 0.4 | 0.7 |
| 6 | -0.5 | -0.3 | 0.0 | 0.3 | 0.7 | 1.1 |
| 8 | -0.7 | -0.4 | 0.0 | 0.4 | 0.9 | 1.4 |
| 10 | -0.9 | -0.4 | 0.0 | 0.6 | 1.2 | 1.8 |
| 12 | -1.1 | -0.5 | 0.0 | 0.7 | 1.4 | 2.2 |
| 14 | -1.2 | -0.6 | 0.0 | 0.8 | 1.7 | 2.6 |
| 16 | -1.4 | -0.7 | 0.0 | 1.0 | 1.9 | 3.0 |
| 18 | -1.6 | -0.8 | 0.0 | 1.1 | 2.2 | 3.3 |
| 20 | -1.7 | -0.9 | 0.0 | 1.2 | 2.5 | 3.7 |
| 22 | -1.9 | -1.0 | 0.0 | 1.3 | 2.7 | 4.1 |

**Based on VREF40+70 climb, Long Range Cruise, and VREF40+70 descent.**

# GEAR DOWN

## Short Trip Fuel and Time

### Table 1 of 2: Ground to Air Miles Conversion

| AIR DISTANCE (NM) | | | | | GROUND DISTANCE (NM) | AIR DISTANCE (NM) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| HEAD WIND COMPONENT (KTS) | | | | | | TAIL WIND COMPONENT (KTS) | | | | |
| 100 | 80 | 60 | 40 | 20 | | 20 | 40 | 60 | 80 | 100 |
| 102 | 84 | 72 | 63 | 56 | 50 | 45 | 42 | 38 | 36 | 33 |
| 177 | 153 | 135 | 121 | 110 | 100 | 92 | 85 | 79 | 74 | 70 |
| 253 | 222 | 198 | 179 | 163 | 150 | 139 | 129 | 121 | 113 | 107 |
| 328 | 291 | 261 | 237 | 217 | 200 | 186 | 173 | 162 | 152 | 144 |
| 403 | 359 | 324 | 295 | 271 | 250 | 232 | 217 | 204 | 192 | 181 |
| 477 | 427 | 386 | 352 | 324 | 300 | 279 | 261 | 245 | 231 | 219 |
| 551 | 494 | 448 | 410 | 378 | 350 | 326 | 305 | 287 | 271 | 256 |
| 626 | 562 | 511 | 467 | 431 | 400 | 373 | 350 | 329 | 310 | 294 |
| 700 | 630 | 573 | 525 | 485 | 450 | 420 | 394 | 371 | 350 | 331 |
| 776 | 699 | 635 | 583 | 538 | 500 | 467 | 438 | 412 | 389 | 369 |

### Table 2 of 2: Trip Fuel and Time

| AIR DIST (NM) | | LANDING WEIGHT (1000 KG) | | | | | | | TIME (HR:MIN) |
|---|---|---|---|---|---|---|---|---|---|
| | | 40 | 45 | 50 | 55 | 60 | 65 | 70 | |
| 50 | FUEL (1000 KG) | 0.6 | 0.6 | 0.7 | 0.7 | 0.7 | 0.8 | 0.8 | 0:15 |
| | ALT (FT) | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | 5000 | |
| 100 | FUEL (1000 KG) | 1.1 | 1.1 | 1.2 | 1.2 | 1.3 | 1.4 | 1.4 | 0:26 |
| | ALT (FT) | 11000 | 9000 | 9000 | 11000 | 11000 | 11000 | 11000 | |
| 150 | FUEL (1000 KG) | 1.5 | 1.6 | 1.7 | 1.7 | 1.8 | 1.9 | 2.0 | 0:37 |
| | ALT (FT) | 13000 | 15000 | 15000 | 13000 | 13000 | 13000 | 13000 | |
| 200 | FUEL (1000 KG) | 1.9 | 2.0 | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 0:47 |
| | ALT (FT) | 17000 | 15000 | 15000 | 15000 | 15000 | 15000 | 15000 | |
| 250 | FUEL (1000 KG) | 2.3 | 2.5 | 2.6 | 2.7 | 2.8 | 2.9 | 3.1 | 0:57 |
| | ALT (FT) | 17000 | 17000 | 15000 | 17000 | 17000 | 17000 | 17000 | |
| 300 | FUEL (1000 KG) | 2.7 | 2.9 | 3.0 | 3.2 | 3.3 | 3.5 | 3.6 | 1:07 |
| | ALT (FT) | 19000 | 17000 | 17000 | 17000 | 17000 | 17000 | 17000 | |
| 350 | FUEL (1000 KG) | 3.1 | 3.3 | 3.5 | 3.6 | 3.8 | 4.0 | 4.1 | 1:17 |
| | ALT (FT) | 19000 | 19000 | 19000 | 19000 | 19000 | 17000 | 17000 | |
| 400 | FUEL (1000 KG) | 3.5 | 3.7 | 3.9 | 4.1 | 4.3 | 4.5 | 4.7 | 1:27 |
| | ALT (FT) | 19000 | 19000 | 19000 | 19000 | 19000 | 19000 | 19000 | |
| 450 | FUEL (1000 KG) | 3.9 | 4.1 | 4.3 | 4.5 | 4.8 | 5.0 | 5.2 | 1:37 |
| | ALT (FT) | 21000 | 19000 | 19000 | 19000 | 19000 | 19000 | 17000 | |
| 500 | FUEL (1000 KG) | 4.3 | 4.5 | 4.8 | 5.0 | 5.2 | 5.5 | 5.8 | 1:47 |
| | ALT (FT) | 21000 | 21000 | 19000 | 19000 | 19000 | 19000 | 17000 | |

# GEAR DOWN

## Holding Planning

### Flaps Up

| WEIGHT (1000 KG) | TOTAL FUEL FLOW (KG/HR) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | PRESSURE ALTITUDE (FT) | | | | | | | |
| | 1500 | 5000 | 10000 | 15000 | 20000 | 25000 | 30000 | 35000 |
| 85 | 3630 | 3620 | 3650 | 3700 | 3780 | | | |
| 80 | 3420 | 3400 | 3410 | 3460 | 3520 | | | |
| 75 | 3200 | 3190 | 3190 | 3220 | 3270 | 3390 | | |
| 70 | 3000 | 2990 | 2980 | 3000 | 3030 | 3110 | | |
| 65 | 2830 | 2800 | 2790 | 2790 | 2820 | 2870 | | |
| 60 | 2650 | 2620 | 2610 | 2590 | 2610 | 2640 | 2720 | |
| 55 | 2470 | 2440 | 2430 | 2400 | 2400 | 2420 | 2470 | |
| 50 | 2300 | 2270 | 2250 | 2230 | 2220 | 2220 | 2240 | |
| 45 | 2130 | 2120 | 2080 | 2070 | 2060 | 2030 | 2030 | 2090 |
| 40 | 1960 | 1950 | 1910 | 1910 | 1890 | 1840 | 1850 | 1870 |

**This table includes 5% additional fuel for holding in a racetrack pattern.**

# GEAR DOWN

# ENGINE INOP

## MAX CONTINUOUS THRUST

## Net Level Off Weight

| PRESSURE ALTITUDE (1000 FT) | LEVEL OFF WEIGHT (1000 KG) | | | ANTI-ICE ADJUSTMENT (1000 KG) | |
|---|---|---|---|---|---|
| | ISA + 10°C & BELOW | ISA + 15°C | ISA + 20°C | ENGINE ON | ENGINE AND WING ON |
| 20 | 43.9 | | | | |
| 19 | 45.0 | 43.4 | | | |
| 18 | 46.4 | 44.6 | | | |
| 17 | 47.8 | 45.9 | 43.5 | | |
| 16 | 49.3 | 47.1 | 44.6 | -1.2 | |
| 15 | 50.8 | 48.3 | 45.8 | -1.1 | |
| 14 | 52.8 | 50.7 | 48.0 | -1.2 | -4.9 |
| 13 | 54.8 | 53.1 | 50.3 | -1.2 | -4.9 |
| 12 | 56.8 | 55.6 | 52.7 | -1.3 | -4.8 |
| 11 | 59.1 | 57.8 | 55.3 | -1.3 | -4.8 |
| 10 | 61.3 | 60.1 | 58.1 | -1.3 | -4.8 |
| 9 | 63.1 | 61.7 | 59.6 | -0.6 | -2.1 |
| 8 | 64.9 | 63.5 | 61.2 | -0.1 | -0.3 |
| 7 | 66.7 | 65.3 | 62.8 | 0.0 | -0.3 |
| 6 | 68.8 | 67.3 | 64.5 | 0.0 | -0.3 |
| 5 | 70.9 | 69.3 | 66.1 | -0.1 | -0.3 |
| 4 | 72.8 | 70.8 | 67.4 | -0.1 | -0.3 |
| 3 | 74.8 | 72.3 | 68.9 | -0.1 | -0.4 |
| 2 | 76.7 | 73.7 | 70.2 | 0.0 | -0.3 |
| 1 | 78.5 | 75.2 | 71.5 | 0.0 | -0.3 |

**When operating in icing conditions during any part of the flight, decrease net level off weight by 4800 kg.**

Intentionally
Blank

# Performance Dispatch — Chapter PD
## Text — Section 14

## Introduction

This chapter contains self dispatch performance data intended primarily for use by flight crews in the event that information cannot be obtained from the airline dispatch office. The data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between data presented in this chapter and that contained in the approved Airplane Flight Manual, the Flight Manual shall always take precedence.

## Takeoff

The maximum allowable takeoff weight is the least of the Field, Climb, Obstacle, Brake Energy, Tire Speed, and Fuel Jettison Climb Limit Weights as determined from the tables in this chapter.

Brake Energy or Tire Speed Limit Weight tables are only provided if they are limiting for the range of conditions covered in the FCOM Section PD.

For operators following EASA standards, regulations require that the runway length be adjusted to account for alignment of the airplane prior to takeoff. The table below provides TORA, TODA and ASDA adjustments for both 90 degree taxiway entry and 180 degree turnaround. These values may be used when obtaining takeoff weights from the Airplane Flight Manual or a takeoff analysis program. When using line-up allowances with the Field Length Limit chart, the field length available must be reduced by the ASDA adjustment.

| | 90 DEGREE TAXIWAY ENTRY | 180 DEGREE TURNAROUND |
|---|---|---|
| | MINIMUM LINE-UP DISTANCE FT (M) | NOMINAL LINE-UP DISTANCE FT (M) |
| TORA & TODA | 35 (11) | 64 (19) |
| ASDA | 86 (26) | 115 (35) |

## Field Limit Weight - Slope and Wind Corrections

These tables for dry and wet runways provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the Slope Correction table (Table 1) with the available field length and runway slope to determine the slope corrected field length. Next enter the Wind Correction table (Table 2) with slope corrected field length and wind component to determine the slope and wind corrected field length.

## Field and Climb Limit Weight

Tables are presented for selected airport pressure altitudes and runway condition and show both Field and Climb Limit Weights. Enter the appropriate table (Table 3) for pressure altitude and runway condition with “Slope and Wind Corrected Field Length” (determined above) and airport OAT to obtain Field Limit Weight. Also read Climb Limit Weight for the same OAT. Intermediate altitudes may be interpolated or use next higher altitude. If the "Slope and Wind Corrected Field Length" is less than the minimum field length shown in the table, do not extrapolate the data.

When finding a maximum weight for a wet runway, the dry runway limit weight must also be determined and the lower of the two weights used.

## Obstacle Limit Weight

Obtain reference obstacle limit weight by entering Table 1 with obstacle height above the runway surface and distance from brake release. Next enter the correction tables to correct the reference obstacle limit weight for the effects of OAT (Table 2), pressure altitude (Table 3) and wind (Table 4) as indicated. In the case of multiple obstacles, enter the tables successively with each obstacle and determine the most limiting weight.

For operators following EASA standards who are using line-up allowances with the Obstacle Limit chart, the obstacle distance from brake release must be reduced by the ASDA adjustment.

## Brake Energy Limit VMBE

Brake Energy Limit Weight tables are only provided if they are limiting for the range of conditions covered in the FCOM Section PD.

The Maximum Brake Energy Speed table provides the Reference VMBE for a variety of airport pressure altitudes and temperatures. Enter the Weight Adjusted VMBE table to adjust the Reference VMBE for the actual brake release gross weight. Correct VMBE for slope and wind. If V1 exceeds VMBE, decrease brake release weight as indicated for each knot that V1 exceeds VMBE and determine V1, VR, and V2 for the lower brake release weight.

## Tire Speed Limit

Tire Speed Limit Weight tables are only provided if they are limiting for the range of conditions covered in the FCOM Section PD.

Maximum tire speed limited weights are presented for 235 MPH tires. To determine the tire speed limit weight, enter the table with OAT and airport pressure altitude. Adjust the tire speed limit weight according to the notes below the table to account for wind.

## Fuel Jettison Climb Limit Weight

The Return to Land Fuel Jettison Climb Limit weight is defined as the landing climb limit weight plus the fuel burned over 15 minutes.

The table presented provides the Fuel Jettison Climb Limit Weight for a given altitude and temperature. Enter the table with airport OAT and pressure altitude to read Fuel Jettison Climb Limit Weight. Apply the noted adjustments for anti-ice and inflight icing as required. Intermediate altitudes or temperatures may be interpolated.

# Enroute

## Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 100 ft/min residual rate of climb.

For FAA operators adhering to EASA standards, refer to the data for buffet limits corresponding to a maneuver margin of 1.3g (39° bank).

Flying above these altitudes with sustained banks in excess of approximately 13° may cause the airplane to lose speed and/or altitude. The altitudes shown in the table are limited to the maximum certified altitude of 41000 ft.

## Long Range Cruise Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination. Data is based on economy climb and descent speeds, and Long Range Cruise. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table (Table 1) to convert ground distance and enroute wind to an equivalent still-air distance. Next, enter the Reference Fuel and Time table (Table 2) with air distance from the Ground to Air Miles Conversion table and the desired altitude and read reference fuel and time required. Lastly, enter the Fuel Required Adjustment table (Table 3) with the reference fuel and the planned landing weight to obtain fuel required at the planned landing weight.

## Long Range Cruise Step Climb Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table (Table 1) and determine air distance as discussed above. Then enter the Trip Fuel and Time Required table (Table 2) with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

## Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. The data are based on the use of the FMC short trip optimum altitude. Obtain air distance from the Ground to Air Miles Conversion table (Table 1) using the ground distance and wind component to the alternate. Enter the Trip Fuel and Time table (Table 2) with air distance and read trip fuel required for the expected landing weight. Continue across the table to read trip time. For distances greater than shown or other altitudes, use the Long Range Cruise Trip Fuel and Time tables.

## Holding Planning

These tables provide total fuel flow information necessary for planning Flaps Up holding and reserve fuel requirements. Data is based on the FMC holding speed schedule which is the higher of the maximum endurance and flap maneuver speeds. As noted, the fuel flow is based on flight in a racetrack holding pattern. For holding in straight and level flight, reduce table values by 5%.

## Flight Crew Requirements for Chemical Passenger Oxygen System

The flight crew oxygen system is a gaseous system. Flight crew oxygen tables are provided for both chemical and gaseous passenger oxygen systems. Use the tables corresponding to the appropriate passenger oxygen system installed.

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck. The oxygen quantity associated with the above requirements is achieved for the flight crew with the minimum dispatch oxygen cylinder pressure.

Tables are provided to determine the flight crew oxygen dispatch requirements for a chemical passenger oxygen system. To determine the minimum dispatch oxygen cylinder pressure enter the appropriate flight crew oxygen table with the number of crew plus observers using oxygen and read the minimum cylinder pressure required for the appropriate cylinder temperature.

## Flight Crew Requirements for Large Capacity Descent Passenger Oxygen System

The flight crew oxygen system is a gaseous system. Flight crew oxygen tables are provided for both Standard or Medium Capacity Descent passenger oxygen systems and the Large Capacity Descent passenger oxygen. Standard or Medium Capacity Descent options utilize the chemical passenger oxygen system. The Large Capacity Descent option utilizes the pulse oxygen system. Use the tables corresponding to the appropriate passenger oxygen system installed.

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck.

Tables are provided to determine the flight crew oxygen dispatch requirements for a Large Capacity Descent passenger oxygen system. Table 1 shows minimum oxygen quantity necessary to ensure that protective breathing requirements are satisfied. Table 2 shows the supplemental oxygen requirement to complete an emergency descent to 14000 ft, level off and continue for the duration of the post decompression time period to 10000 ft. For post decompression flight times less than 2 hours, use the data provided for 2 hours. Table 3 shows adjustments which must be applied to Table 2 values in situations where the enroute altitude after decompression exceeds 14000 ft. Table 3 adjustments reflect only the incremental increase in oxygen quantity associated with periods of post decompression flight at altitudes other than 14000 ft. Consequently, time spent holding at altitudes other than 14000 must also be included in the total post decompression time used in Table 2.

Table 1, Table 2 and Table 3 values are based on "NORMAL" regulator settings. Table 3 also shows “100%” regulator setting adjustments that can be used if the operator chooses to schedule oxygen dispatch requirements based on pure oxygen availability.

Additional adjustments for more extensive than normal crew usage can be made by adding 2.05 liters/person/minute (1.2 psi/person/minute for the single cylinder system) or 13 liters/person/minute (8 psi/person/minute) if 100% oxygen is selected during normal usage.

After determining the total volume (liters) required for the flight crew by using the larger value from Table 1 or Table 2, obtain the dispatch pressure required from the Cylinder Volume to Pressure Conversion table (Table 4). Adjust this reading for cylinder temperature as required, using the adjustments given (Table 5).

## Net Level Off Weight

The Net Level Off Weight table is provided to determine terrain clearance capability in straight and level flight following an engine failure. Regulations require terrain clearance planning based on net performance, which is the gross (or actual) gradient performance degraded by 1.1%. In addition, the net level off pressure altitude must clear the terrain by 1000 ft.

To determine the maximum weight for terrain clearance, enter the table with required net level off pressure altitude and expected ISA deviation to obtain weight. Adjust weight for anti-ice operation as noted below the table.

# Landing

Tables are provided for determining the maximum landing weight as limited by field length or climb requirements for Flaps 40.

Maximum landing weight is the lowest of the field length limit weight, climb limit weight or maximum certified landing weight.

## Landing Field Limit Weight

Obtain wind corrected field length by entering the Wind Adjusted Field Length table (Table 1) with field length available and wind component along the runway. Next enter the Field Limit Weight table (Table 2) with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

## Landing Climb Limit Weight

Enter the Landing Climb Limit Weight table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required.

## Go-Around Climb Gradient

The Go-Around Climb Gradient table provides one engine inoperative, gear up climb gradients for the go-around configuration. Enter the Reference Go-Around Gradient table (Table 1) with airport OAT and pressure altitude to determine the reference go-around climb gradient. Adjust the reference gradient for airplane weight and speed using Table 2 and Table 3 to determine the weight and speed adjusted go-around gradient. Apply the necessary corrections for engine bleed configuration and icing conditions as noted.

## Quick Turnaround Limit Weight

Enter table with airport pressure altitude and OAT to read maximum quick turnaround weight. Apply the noted adjustments as required.

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff.

## Gear Down

This section provides flight planning data for revenue operation with gear down for limited airport pressure altitudes. The gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

The maximum allowable takeoff weight is the least of the Field, Climb, Obstacle, Brake Energy, Tire Speed, and Fuel Jettison Climb Limit Weights as determined from the tables in this chapter. Brake Energy or Tire Speed Limit Weight tables are only provided if they are limiting for the range of conditions covered in the FCOM Section PD.

To eliminate erroneous displays, the flight crew should enter only gross weight data on the PERF INIT page of the Control Display Unit (CDU). Omission of the cost index and cruise altitude entries on the PERF INIT page will render the VNAV function unavailable during flight. As a result, the following information will not be provided: VNAV guidance and speed schedules, trip fuel and ETA predictions, optimum and maximum altitude data, step climb and top of descent predictions, and the VNAV descent guidance path.

The gross weight entry allows the FMS takeoff and approach speed schedules to be generated. In addition, the flap maneuver speed and VREF speed bugs will be available for display on the primary flight display speed tape. Except for VNAV, normal autopilot and autothrottle modes will remain available for use during the flight, as will the LNAV mode.

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# Performance Inflight — Chapter PI

## Table of Contents — Section TOC

### 737-8 LEAP-1B27 KG C M FAA CATB TO1-10% TO2-20% ALT-AB

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## 737-8 LEAP-1B27 KG C M FAA CATB TO1-10% TO2-20% ALT-AB

### Pkg Model Identification

### General

## Alternate Mode EEC



## Alternate Mode EEC, Engine Inoperative



## GearDown



## Gear Down, Engine Inop



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## General

The table below shows the airplanes that have been identified with the following performance package. Note, some airplanes may be identified with more than one performance package. This configuration table information reflects the Boeing delivered configuration updated for service bulletin incorporations in conformance with the policy stated in the introduction section of the FCOM. The performance data is prepared for the owner/operator named on the title page. The intent of this information is to assist flight crews and airlines in knowing which performance package is applicable to a given airplane. The performance package model identification information is based on Boeing's knowledge of the airline's fleet at a point in time approximately three months prior to the page date. Notice of Change (NOC) will not be provided to airlines to identify airplanes that are moved between performance packages within this manual or airplanes added to the airline's fleet whose performance packages are already represented in this manual. These types of changes will be updated in the next block revision. Owners/operators are responsible for ensuring the operational documentation they are using is complete and matches the current configuration of their airplanes, and the accuracy and validity of all information furnished by the owner/operator or any other party. Owners/operators receiving active revision service are responsible to ensure that any modifications to the listed airplanes are properly reflected in this manual.

Serial and tabulation number are supplied by Boeing.

| Tail Number | Registry Number | Serial Number | Tabulation Number |
|---|---|---|---|
| 901 | C-FFEL | 64942 | 1J107 |
| 902 | C-FLEJ | 64941 | 1J104 |
| 903 | C-FLHI | 61804 | 1J103 |
| 904 | C-FFBC | 61805 | 1J105 |
| 905 | C-FLKA | 64943 | 1J106 |
| 906 | C-FLKC | 61807 | 1J111 |
| 907 | C-FLKD | 61806 | 1J110 |
| 908 | C-FLKI | 64944 | 1J108 |
| 909 | C-FLKJ | 64945 | 1J109 |
| 910 | C-FLRS | 61808 | 1J114 |

| Tail Number | Registry Number | Serial Number | Tabulation Number |
|---|---|---|---|
| 911 | C-FFFX | 61809 | 1J112 |
| 912 | C-FFLZ | 64946 | 1J113 |
| 913 | C-FLDX | 61803 | 1C845 |
| 914 | C-FLER | 62874 | 1L076 |
| 915 | C-FLKO | 62870 | 1L075 |
| 916 | C-FLKS | 62881 | 1L077 |
| 917 | C-FLKZ | 62883 | 1L078 |
| 918 | C-FLUJ | 62884 | 1K003 |
| 919 | C-FLQZ | 44307 | 1K002 |
| 920 | C-FLQO | 43565 | 1B392 |
| 921 | C-FLUT | 60134 | 1J022 |
| 922 | C-FLQF | 43300 | 1B397 |
| 923 | C-FLQG | 43619 | 1B390 |
| 924 | C-FLQP | 43566 | 1B393 |
| 925 | C-FLBG | 60135 | 1J023 |
| 926 | C-FLGD | 43564 | 1B391 |
| 927 | C-GFOF | 44302 | 1K001 |

## Takeoff Speeds - Dry Runway
### Max Takeoff Thrust
### Table 1 of 4: V1, VR, V2

| WEIGHT (1000 KG) | FLAPS 1 | | | FLAPS 5 | | | FLAPS 10 | | | FLAPS 15 | | | FLAPS 25 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 |
| 90 | 168 | 168 | 175 | 159 | 161 | 166 | | | | | | | | | |
| 85 | 161 | 163 | 169 | 155 | 156 | 162 | 151 | 153 | 158 | 149 | 150 | 155 | | | |
| 80 | 156 | 158 | 165 | 150 | 151 | 158 | 147 | 148 | 154 | 145 | 145 | 151 | 142 | 142 | 148 |
| 75 | 151 | 152 | 161 | 144 | 146 | 154 | 141 | 143 | 150 | 139 | 140 | 147 | 136 | 137 | 144 |
| 70 | 145 | 146 | 156 | 139 | 140 | 149 | 136 | 137 | 146 | 133 | 134 | 143 | 131 | 131 | 140 |
| 65 | 139 | 140 | 152 | 133 | 134 | 145 | 130 | 131 | 142 | 128 | 129 | 139 | 125 | 126 | 136 |
| 60 | 132 | 134 | 146 | 126 | 128 | 140 | 123 | 125 | 137 | 121 | 122 | 134 | 119 | 119 | 131 |
| 55 | 125 | 127 | 141 | 120 | 121 | 135 | 117 | 118 | 132 | 115 | 116 | 129 | 113 | 113 | 126 |
| 50 | 117 | 119 | 135 | 113 | 114 | 129 | 110 | 111 | 126 | 108 | 109 | 124 | 106 | 106 | 121 |
| 45 | 110 | 111 | 129 | 105 | 106 | 123 | 102 | 104 | 120 | 101 | 102 | 118 | 99 | 99 | 115 |
| 40 | 102 | 103 | 122 | 97 | 99 | 117 | 95 | 96 | 114 | 93 | 94 | 112 | 92 | 92 | 110 |

**Check V1(MCG).**

### Table 2 of 4: V1, VR, V2 Adjustments*

| TEMP (°C) | TAKEOFF SPEEDS ADJUSTMENTS (KIAS) | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | | | | | | | | | VR | | | | | | | | | V2 | | | | | | | | |
| | PRESS ALT (1000 FT) | | | | | | | | | PRESS ALT (1000 FT) | | | | | | | | | PRESS ALT (1000 FT) | | | | | | | | |
| | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 |
| 60 | 5 | 6 | 6 | 7 | 8 | 9 | 10 | 11 | 13 | 4 | 5 | 5 | 6 | 6 | 7 | 9 | 10 | 10 | -2 | -2 | -2 | -3 | -3 | -3 | -4 | -4 | -4 |
| 50 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 13 | 3 | 3 | 5 | 6 | 6 | 7 | 9 | 10 | 10 | -1 | -1 | -2 | -3 | -3 | -3 | -4 | -4 | -4 |
| 40 | 1 | 2 | 3 | 5 | 7 | 8 | 10 | 11 | 13 | 1 | 2 | 3 | 5 | 6 | 7 | 9 | 10 | 10 | 0 | -1 | -1 | -2 | -2 | -3 | -4 | -4 | -4 |
| 30 | 0 | 0 | 1 | 3 | 4 | 7 | 9 | 11 | 13 | 0 | 0 | 2 | 3 | 4 | 6 | 8 | 9 | 10 | 0 | 0 | 0 | -1 | -1 | -2 | -3 | -3 | -4 |
| 20 | 0 | 0 | 1 | 2 | 3 | 5 | 7 | 9 | 11 | 0 | 0 | 1 | 2 | 3 | 5 | 6 | 8 | 10 | 0 | 0 | 0 | -1 | -1 | -2 | -2 | -3 | -4 |
| 10 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 7 | 10 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 7 | 9 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -3 |
| 0 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 7 | 8 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -3 |
| -60 | 2 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -3 |

***V1 not to exceed VR.**

### Table 3 of 4: Slope and Wind V1 Adjustments*

| WEIGHT (1000 KG) | V1 SPEED ADJUSTMENTS (KIAS) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SLOPE (%) | | | | | WIND (KTS) | | | | | |
| | -2 | -1 | 0 | 1 | 2 | -15 | -10 | -5 | 0 | 20 | 40 |
| 90 | -4 | -2 | 0 | 2 | 5 | -2 | -2 | -1 | 0 | 1 | 2 |
| 80 | -3 | -1 | 0 | 2 | 4 | -2 | -1 | -1 | 0 | 1 | 2 |
| 70 | -2 | -1 | 0 | 1 | 2 | -2 | -1 | -1 | 0 | 1 | 2 |
| 60 | -2 | -1 | 0 | 1 | 2 | -2 | -1 | -1 | 0 | 1 | 2 |
| 50 | -1 | -1 | 0 | 1 | 1 | -2 | -1 | -1 | 0 | 1 | 2 |
| 40 | -1 | -1 | 0 | 1 | 1 | -2 | -1 | -1 | 0 | 1 | 3 |

***V1 not to exceed VR.**

# Takeoff Speeds - Dry Runway

## Max Takeoff Thrust

## Table 4 of 4: V1(MCG)

| TEMP (°C) | V1(MCG) (KIAS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PRESSURE ALTITUDE (FT) | | | | | | | | |
| | -2000 | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14500 |
| 60 | 99 | 96 | 94 | 91 | 89 | 86 | 83 | 79 | 75 |
| 55 | 99 | 96 | 94 | 91 | 89 | 86 | 83 | 79 | 75 |
| 50 | 101 | 99 | 94 | 91 | 89 | 86 | 83 | 79 | 75 |
| 45 | 104 | 102 | 97 | 92 | 89 | 86 | 83 | 79 | 75 |
| 40 | 107 | 104 | 100 | 95 | 90 | 86 | 83 | 79 | 75 |
| 35 | 109 | 107 | 103 | 98 | 93 | 87 | 83 | 79 | 75 |
| 30 | 110 | 109 | 105 | 101 | 97 | 90 | 85 | 80 | 75 |
| 25 | 110 | 109 | 106 | 102 | 99 | 92 | 87 | 82 | 76 |
| 20 | 110 | 110 | 106 | 103 | 100 | 94 | 89 | 84 | 78 |
| 15 | 110 | 110 | 106 | 103 | 100 | 96 | 92 | 86 | 80 |
| 10 | 110 | 110 | 106 | 103 | 100 | 97 | 94 | 89 | 82 |
| 5 | 110 | 110 | 106 | 103 | 100 | 97 | 94 | 90 | 84 |
| 0 | 110 | 110 | 106 | 103 | 100 | 97 | 94 | 90 | 86 |
| -60 | 111 | 111 | 107 | 104 | 101 | 98 | 95 | 91 | 86 |

# Takeoff Speeds - Wet Runway

## Max Takeoff Thrust

### Table 1 of 4: V1, VR, V2

| WEIGHT (1000 KG) | FLAPS 1 | | | FLAPS 5 | | | FLAPS 10 | | | FLAPS 15 | | | FLAPS 25 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 |
| 90 | 158 | 168 | 175 | 152 | 161 | 166 | | | | | | | | | |
| 85 | 153 | 163 | 169 | 146 | 156 | 162 | 143 | 153 | 158 | 141 | 150 | 155 | | | |
| 80 | 147 | 158 | 165 | 140 | 151 | 158 | 137 | 148 | 154 | 135 | 145 | 151 | 132 | 142 | 148 |
| 75 | 141 | 152 | 161 | 134 | 146 | 154 | 131 | 143 | 150 | 129 | 140 | 147 | 126 | 137 | 144 |
| 70 | 134 | 146 | 156 | 128 | 140 | 149 | 125 | 137 | 146 | 123 | 134 | 143 | 120 | 131 | 140 |
| 65 | 128 | 140 | 152 | 122 | 134 | 145 | 119 | 131 | 142 | 117 | 129 | 139 | 114 | 126 | 136 |
| 60 | 121 | 134 | 146 | 115 | 128 | 140 | 113 | 125 | 137 | 110 | 122 | 134 | 108 | 119 | 131 |
| 55 | 114 | 127 | 141 | 108 | 121 | 135 | 106 | 118 | 132 | 104 | 116 | 129 | 101 | 113 | 126 |
| 50 | 106 | 119 | 135 | 101 | 114 | 129 | 98 | 111 | 126 | 96 | 109 | 124 | 94 | 106 | 121 |
| 45 | 98 | 111 | 129 | 93 | 106 | 123 | 91 | 104 | 120 | 89 | 102 | 118 | 87 | 99 | 115 |
| 40 | 90 | 103 | 122 | 85 | 99 | 117 | 83 | 96 | 114 | 81 | 94 | 112 | 79 | 92 | 110 |

**Check V1(MCG).**

### Table 2 of 4: V1, VR, V2 Adjustments*

| TEMP (°C) | TAKEOFF SPEEDS ADJUSTMENTS (KIAS) | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | | | | | | | | | VR | | | | | | | | | V2 | | | | | | | | |
| | PRESS ALT (1000 FT) | | | | | | | | | PRESS ALT (1000 FT) | | | | | | | | | PRESS ALT (1000 FT) | | | | | | | | |
| | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 |
| 60 | 7 | 8 | 8 | 10 | 10 | 12 | 14 | 15 | 19 | 4 | 5 | 5 | 6 | 6 | 7 | 9 | 10 | 10 | -2 | -2 | -2 | -3 | -3 | -3 | -4 | -4 | -4 |
| 50 | 4 | 5 | 8 | 10 | 10 | 12 | 14 | 15 | 19 | 3 | 3 | 5 | 6 | 6 | 7 | 9 | 10 | 10 | -1 | -1 | -2 | -3 | -3 | -3 | -4 | -4 | -4 |
| 40 | 1 | 3 | 5 | 7 | 10 | 12 | 14 | 15 | 19 | 1 | 2 | 3 | 5 | 6 | 7 | 9 | 10 | 10 | 0 | -1 | -1 | -2 | -2 | -3 | -4 | -4 | -4 |
| 30 | 0 | 0 | 1 | 3 | 6 | 10 | 12 | 15 | 19 | 0 | 0 | 2 | 3 | 4 | 6 | 8 | 9 | 10 | 0 | 0 | 0 | -1 | -1 | -2 | -3 | -3 | -4 |
| 20 | 0 | 0 | 1 | 3 | 4 | 7 | 9 | 12 | 16 | 0 | 0 | 1 | 2 | 3 | 5 | 6 | 8 | 10 | 0 | 0 | 0 | -1 | -1 | -2 | -2 | -3 | -4 |
| 10 | 0 | 0 | 1 | 3 | 4 | 5 | 6 | 9 | 13 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 7 | 9 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -3 |
| 0 | 0 | 0 | 1 | 3 | 4 | 5 | 6 | 8 | 11 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -3 |
| -60 | 2 | 2 | 3 | 5 | 6 | 7 | 8 | 10 | 12 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -3 |

***V1 not to exceed VR.**

### Table 3 of 4: Slope and Wind V1 Adjustments*

| WEIGHT (1000 KG) | V1 SPEED ADJUSTMENTS (KIAS) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SLOPE (%) | | | | | WIND (KTS) | | | | | |
| | -2 | -1 | 0 | 1 | 2 | -15 | -10 | -5 | 0 | 20 | 40 |
| 90 | -6 | -3 | 0 | 3 | 6 | -4 | -2 | -1 | 0 | 1 | 3 |
| 80 | -5 | -2 | 0 | 2 | 5 | -4 | -3 | -1 | 0 | 2 | 3 |
| 70 | -4 | -2 | 0 | 2 | 4 | -4 | -3 | -1 | 0 | 2 | 3 |
| 60 | -3 | -2 | 0 | 2 | 3 | -4 | -3 | -1 | 0 | 2 | 3 |
| 50 | -3 | -1 | 0 | 1 | 3 | -4 | -3 | -1 | 0 | 2 | 3 |
| 40 | -2 | -1 | 0 | 1 | 2 | -4 | -3 | -1 | 0 | 2 | 3 |

***V1 not to exceed VR.**

# Takeoff Speeds - Wet Runway

## Max Takeoff Thrust

## Table 4 of 4: V1(MCG)

| TEMP (°C) | V1(MCG) (KIAS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PRESSURE ALTITUDE (FT) | | | | | | | | |
| | -2000 | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14500 |
| 60 | 99 | 96 | 94 | 91 | 89 | 86 | 83 | 79 | 75 |
| 55 | 99 | 96 | 94 | 91 | 89 | 86 | 83 | 79 | 75 |
| 50 | 101 | 99 | 94 | 91 | 89 | 86 | 83 | 79 | 75 |
| 45 | 104 | 102 | 97 | 92 | 89 | 86 | 83 | 79 | 75 |
| 40 | 107 | 104 | 100 | 95 | 90 | 86 | 83 | 79 | 75 |
| 35 | 109 | 107 | 103 | 98 | 93 | 87 | 83 | 79 | 75 |
| 30 | 110 | 109 | 105 | 101 | 97 | 90 | 85 | 80 | 75 |
| 25 | 110 | 109 | 106 | 102 | 99 | 92 | 87 | 82 | 76 |
| 20 | 110 | 110 | 106 | 103 | 100 | 94 | 89 | 84 | 78 |
| 15 | 110 | 110 | 106 | 103 | 100 | 96 | 92 | 86 | 80 |
| 10 | 110 | 110 | 106 | 103 | 100 | 97 | 94 | 89 | 82 |
| 5 | 110 | 110 | 106 | 103 | 100 | 97 | 94 | 90 | 84 |
| 0 | 110 | 110 | 106 | 103 | 100 | 97 | 94 | 90 | 86 |
| -60 | 111 | 111 | 107 | 104 | 101 | 98 | 95 | 91 | 86 |

# Stabilizer Trim Setting
## Max Takeoff Thrust
### Flaps 1 and 5

| WEIGHT (1000 KG) | STABILIZER TRIM SETTING (UNITS) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C.G. (%MAC) | | | | | | | | | | | | | | | |
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 |
| 82 | 8 1/2 | 8 1/2 | 8 1/4 | 7 3/4 | 7 1/2 | 7 1/4 | 6 3/4 | 6 1/2 | 6 1/4 | 5 3/4 | 5 1/2 | 5 | 4 3/4 | 4 1/4 | 4 | 3 1/2 |
| 80 | 8 1/2 | 8 1/2 | 8 | 7 3/4 | 7 1/2 | 7 | 6 3/4 | 6 1/2 | 6 | 5 3/4 | 5 1/4 | 5 | 4 1/2 | 4 1/4 | 3 3/4 | 3 1/2 |
| 70 | 8 1/4 | 8 | 7 1/2 | 7 1/4 | 7 | 6 3/4 | 6 1/4 | 6 | 5 1/2 | 5 1/4 | 4 3/4 | 4 1/2 | 4 | 3 3/4 | 3 1/2 | 3 |
| 60 | 7 1/2 | 7 1/4 | 7 | 6 3/4 | 6 1/4 | 6 | 5 3/4 | 5 1/2 | 5 | 4 3/4 | 4 1/4 | 4 | 3 3/4 | 3 1/4 | 3 | 3 |
| 50 | 6 3/4 | 6 1/4 | 6 | 5 3/4 | 5 1/2 | 5 1/4 | 5 | 4 1/2 | 4 1/4 | 4 | 3 1/2 | 3 1/4 | 3 | 3 | 3 | 3 |
| 40 | 5 1/4 | 5 | 4 3/4 | 4 1/2 | 4 1/4 | 4 | 3 3/4 | 3 1/2 | 3 1/4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

### Flaps 10, 15, and 25

| WEIGHT (1000 KG) | STABILIZER TRIM SETTING (UNITS) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C.G. (%MAC) | | | | | | | | | | | | | | | |
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 |
| 82 | 8 1/2 | 8 1/2 | 8 | 7 1/2 | 7 | 6 1/2 | 6 | 5 1/2 | 5 1/4 | 4 3/4 | 4 1/4 | 4 | 3 1/2 | 3 | 3 | 3 |
| 80 | 8 1/2 | 8 1/2 | 7 3/4 | 7 1/4 | 6 3/4 | 6 1/4 | 6 | 5 1/2 | 5 | 4 3/4 | 4 1/4 | 3 3/4 | 3 1/4 | 3 | 3 | 3 |
| 70 | 8 1/2 | 7 3/4 | 7 1/4 | 6 3/4 | 6 1/4 | 5 3/4 | 5 1/2 | 5 | 4 1/2 | 4 1/4 | 3 3/4 | 3 1/4 | 3 | 3 | 3 | 3 |
| 60 | 7 1/2 | 7 | 6 1/2 | 6 | 5 3/4 | 5 1/4 | 4 3/4 | 4 1/2 | 4 | 3 1/2 | 3 1/4 | 3 | 3 | 3 | 3 | 3 |
| 50 | 6 | 5 3/4 | 5 1/4 | 5 | 4 1/2 | 4 1/4 | 3 3/4 | 3 1/2 | 3 1/4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 40 | 4 1/2 | 4 1/4 | 4 | 3 3/4 | 3 1/2 | 3 1/4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

# VREF

## Based on 14500 ft reference pressure altitude

| WEIGHT (1000 KG) | VREF (KIAS) | | |
|---|---|---|---|
| | FLAPS | | |
| | 40 | 30 | 15 |
| 90 | 169 | 169 | 179 |
| 85 | 163 | 165 | 173 |
| 80 | 156 | 160 | 168 |
| 75 | 149 | 154 | 162 |
| 70 | 144 | 149 | 156 |
| 65 | 140 | 145 | 152 |
| 60 | 134 | 139 | 145 |
| 55 | 128 | 132 | 139 |
| 50 | 121 | 126 | 132 |
| 45 | 115 | 119 | 125 |
| 40 | 108 | 112 | 118 |

# Flap Maneuver Speeds

| FLAP POSITION | MANEUVER SPEED |
|---|---|
| UP | VREF40 + 70 |
| 1 | VREF40 + 50 |
| 5 | VREF40 + 30 |
| 10 | VREF40 + 30 |
| 15 | VREF40 + 20 |
| 25 | VREF40 + 10 |
| 30 | VREF30 |
| 40 | VREF40 |

# ADVISORY INFORMATION

## Slush/Standing Water Takeoff

### Maximum Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -5.9 | -7.6 | -9.3 | -10.9 | -8.2 | -9.9 | -11.6 | -13.2 | -12.4 | -14.2 | -15.9 | -17.4 |
| 80 | -5.2 | -6.9 | -8.7 | -10.2 | -6.9 | -8.7 | -10.4 | -11.9 | -10.2 | -11.9 | -13.6 | -15.1 |
| 70 | -4.2 | -5.9 | -7.7 | -9.2 | -5.4 | -7.2 | -8.9 | -10.5 | -7.7 | -9.4 | -11.2 | -12.7 |
| 60 | -3.0 | -4.7 | -6.4 | -8.0 | -3.8 | -5.5 | -7.2 | -8.8 | -5.2 | -6.9 | -8.6 | -10.2 |
| 50 | -1.5 | -3.2 | -4.9 | -6.5 | -1.9 | -3.6 | -5.3 | -6.8 | -2.5 | -4.2 | -5.9 | -7.5 |
| 40 | 0.0 | -1.5 | -3.2 | -4.7 | 0.0 | -1.4 | -3.1 | -4.7 | 0.0 | -1.5 | -3.2 | -4.7 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 30.4 | | | | 33.0 | | | | 37.7 | | | |
| 4200 | 45.1 | | | | 47.4 | | | | 51.3 | 32.5 | | |
| 4600 | 59.9 | 39.4 | | | 61.9 | 41.8 | | | 64.8 | 46.0 | | |
| 5000 | 75.0 | 54.2 | 33.7 | | 76.5 | 56.3 | 36.2 | | 78.5 | 59.6 | 40.8 | |
| 5400 | 90.3 | 69.1 | 48.4 | 30.1 | 91.2 | 70.8 | 50.6 | 32.7 | 92.2 | 73.2 | 54.3 | 37.4 |
| 5800 | | 84.3 | 63.3 | 44.8 | | 85.5 | 65.2 | 47.1 | | 86.9 | 67.9 | 50.9 |
| 6200 | | 99.7 | 78.4 | 59.6 | | 100.3 | 79.8 | 61.5 | | 100.6 | 81.5 | 64.5 |
| 6600 | | | 93.7 | 74.6 | | | 94.6 | 76.1 | | | 95.3 | 78.1 |
| 7000 | | | | 89.9 | | | | 90.9 | | | | 91.8 |
| 7400 | | | | 105.3 | | | | | | | | |

1. **Enter Table 1 with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable slush/standing water limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -13 | -8 | -3 | 0 | -10 | -5 | 0 | 0 | -2 | 0 | 0 | 0 |
| 80 | -15 | -10 | -5 | 0 | -12 | -7 | -2 | 0 | -4 | 0 | 0 | 0 |
| 70 | -16 | -11 | -6 | -2 | -13 | -8 | -3 | 0 | -7 | -2 | 0 | 0 |
| 60 | -18 | -13 | -8 | -3 | -16 | -11 | -6 | -1 | -10 | -5 | 0 | 0 |
| 50 | -20 | -15 | -10 | -5 | -18 | -13 | -8 | -4 | -15 | -10 | -5 | 0 |
| 40 | -23 | -18 | -13 | -8 | -22 | -17 | -12 | -8 | -20 | -15 | -10 | -6 |

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## Slush/Standing Water Takeoff

### No Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -8.1 | -9.8 | -11.6 | -13.2 | -10.6 | -12.3 | -14.1 | -15.6 | -15.1 | -16.9 | -18.6 | -20.2 |
| 80 | -7.3 | -9.0 | -10.8 | -12.4 | -9.2 | -10.9 | -12.7 | -14.2 | -12.6 | -14.3 | -16.1 | -17.6 |
| 70 | -6.2 | -7.9 | -9.7 | -11.3 | -7.6 | -9.3 | -11.1 | -12.6 | -9.9 | -11.6 | -13.4 | -15.0 |
| 60 | -4.8 | -6.6 | -8.3 | -9.9 | -5.7 | -7.4 | -9.2 | -10.8 | -7.1 | -8.8 | -10.6 | -12.1 |
| 50 | -3.1 | -4.9 | -6.6 | -8.2 | -3.5 | -5.3 | -7.0 | -8.6 | -4.1 | -5.9 | -7.6 | -9.2 |
| 40 | -1.0 | -2.8 | -4.5 | -6.1 | -1.1 | -2.9 | -4.6 | -6.2 | -1.0 | -2.8 | -4.5 | -6.1 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 4600 | | | | | | | | | 29.9 | | | |
| 5000 | 15.5 | | | | 31.2 | | | | 49.5 | 23.9 | | |
| 5400 | 47.2 | | | | 56.8 | 23.2 | | | 67.7 | 43.7 | | |
| 5800 | 72.9 | 37.8 | | | 78.1 | 49.6 | | | 84.5 | 62.4 | 37.8 | |
| 6200 | 93.7 | 65.8 | 28.2 | | 96.6 | 72.1 | 41.9 | | 100.4 | 79.6 | 57.0 | 34.4 |
| 6600 | | 87.8 | 58.3 | 22.8 | | 91.3 | 65.8 | 37.4 | | 95.7 | 74.6 | 53.8 |
| 7000 | | 107.0 | 81.7 | 53.7 | | | 85.8 | 62.0 | | | 91.0 | 71.7 |
| 7400 | | | 101.3 | 78.0 | | | 103.7 | 82.6 | | | | 88.3 |
| 7800 | | | | 98.1 | | | | 100.7 | | | | 104.0 |

1. **Enter Table 1 with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -120 ft/+120 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable slush/standing water limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -18 | -13 | -8 | -4 | -14 | -9 | -4 | 0 | -4 | 0 | 0 | 0 |
| 80 | -20 | -15 | -10 | -5 | -16 | -11 | -6 | -2 | -6 | -1 | 0 | 0 |
| 70 | -22 | -17 | -12 | -8 | -19 | -14 | -9 | -4 | -10 | -5 | 0 | 0 |
| 60 | -25 | -20 | -15 | -11 | -22 | -17 | -12 | -8 | -15 | -10 | -5 | -1 |
| 50 | -28 | -23 | -18 | -14 | -26 | -21 | -16 | -12 | -22 | -17 | -12 | -7 |
| 40 | -32 | -27 | -22 | -18 | -31 | -26 | -21 | -17 | -29 | -24 | -19 | -14 |

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

   **V1 not to exceed VR.**

# ADVISORY INFORMATION

## Dry Snow Takeoff

### Maximum Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -4.4 | -5.8 | -7.0 | -8.2 | -6.2 | -7.5 | -8.8 | -10.0 | -9.6 | -10.8 | -12.2 | -13.3 |
| 80 | -4.4 | -5.7 | -7.0 | -8.2 | -5.8 | -7.1 | -8.3 | -9.5 | -8.3 | -9.6 | -10.9 | -12.1 |
| 70 | -3.9 | -5.2 | -6.5 | -7.7 | -4.9 | -6.2 | -7.5 | -8.7 | -6.8 | -8.0 | -9.3 | -10.5 |
| 60 | -3.0 | -4.3 | -5.6 | -6.8 | -3.7 | -5.0 | -6.3 | -7.4 | -4.9 | -6.2 | -7.5 | -8.7 |
| 50 | -1.7 | -2.9 | -4.3 | -5.4 | -2.0 | -3.3 | -4.6 | -5.8 | -2.8 | -4.0 | -5.4 | -6.5 |
| 40 | 0.0 | -1.2 | -2.5 | -3.6 | 0.0 | -1.2 | -2.5 | -3.7 | -0.3 | -1.6 | -2.9 | -4.0 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 33.9 | | | | 37.8 | | | | 42.2 | | | |
| 4200 | 48.9 | 28.9 | | | 51.9 | 33.0 | | | 55.0 | 37.9 | | |
| 4600 | 64.0 | 43.9 | | | 66.1 | 47.1 | 28.3 | | 68.0 | 50.6 | 33.6 | |
| 5000 | 79.2 | 58.9 | 38.8 | | 80.4 | 61.3 | 42.3 | | 81.1 | 63.6 | 46.3 | 31.0 |
| 5400 | 94.4 | 74.0 | 53.8 | 35.7 | 94.8 | 75.5 | 56.5 | 39.5 | 94.5 | 76.7 | 59.2 | 43.7 |
| 5800 | | 89.2 | 68.9 | 50.7 | | 89.9 | 70.7 | 53.6 | | 90.0 | 72.2 | 56.6 |
| 6200 | | 104.5 | 84.1 | 65.8 | | 104.4 | 85.1 | 67.8 | | 103.4 | 85.5 | 69.6 |
| 6600 | | | 99.4 | 81.0 | | | 99.5 | 82.1 | | | 98.9 | 82.7 |
| 7000 | | | | 96.3 | | | | 96.6 | | | | 96.1 |

1. **Enter Table 1 with dry snow depth and dry field/obstacle limit weight to obtain dry snow weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable dry snow limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -10 | -5 | 0 | 0 | -7 | -2 | 0 | 0 | -2 | 0 | 0 | 0 |
| 80 | -12 | -7 | -2 | 0 | -9 | -4 | 0 | 0 | -4 | 0 | 0 | 0 |
| 70 | -14 | -9 | -4 | 0 | -12 | -7 | -2 | 0 | -7 | -2 | 0 | 0 |
| 60 | -17 | -12 | -7 | -2 | -14 | -9 | -4 | 0 | -10 | -5 | 0 | 0 |
| 50 | -19 | -14 | -9 | -5 | -17 | -12 | -7 | -3 | -13 | -8 | -3 | 0 |
| 40 | -22 | -17 | -12 | -8 | -20 | -15 | -10 | -6 | -17 | -12 | -7 | -2 |

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## Dry Snow Takeoff

### No Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -6.4 | -7.6 | -8.8 | -9.8 | -8.2 | -9.4 | -10.6 | -11.7 | -11.5 | -12.7 | -13.9 | -15.0 |
| 80 | -6.4 | -7.6 | -8.8 | -9.9 | -7.8 | -9.0 | -10.2 | -11.3 | -10.3 | -11.6 | -12.7 | -13.8 |
| 70 | -6.0 | -7.2 | -8.4 | -9.4 | -6.9 | -8.1 | -9.3 | -10.4 | -8.8 | -10.0 | -11.2 | -12.2 |
| 60 | -5.0 | -6.2 | -7.4 | -8.5 | -5.6 | -6.8 | -8.0 | -9.1 | -6.8 | -8.0 | -9.2 | -10.3 |
| 50 | -3.4 | -4.7 | -5.9 | -6.9 | -3.8 | -5.0 | -6.2 | -7.3 | -4.4 | -5.6 | -6.8 | -7.9 |
| 40 | -1.4 | -2.6 | -3.8 | -4.9 | -1.5 | -2.7 | -3.9 | -5.0 | -1.5 | -2.8 | -3.9 | -5.0 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 4200 | | | | | | | | | 30.4 | | | |
| 4600 | | | | | 31.8 | | | | 46.2 | | | |
| 5000 | 41.1 | | | | 53.0 | 25.9 | | | 61.8 | 41.9 | | |
| 5400 | 66.4 | 33.1 | | | 72.3 | 47.3 | | | 77.2 | 57.6 | 37.5 | |
| 5800 | 87.0 | 60.1 | 25.1 | | 89.9 | 67.1 | 41.5 | | 92.2 | 73.0 | 53.3 | 35.2 |
| 6200 | 105.0 | 81.7 | 53.3 | 20.8 | 106.5 | 85.2 | 61.9 | 38.3 | | 88.1 | 68.8 | 51.0 |
| 6600 | | 100.1 | 76.1 | 49.5 | | 101.9 | 80.4 | 59.0 | | 103.1 | 84.0 | 66.5 |
| 7000 | | | 95.2 | 73.0 | | | 97.4 | 77.7 | | | 99.0 | 81.8 |
| 7400 | | | | 92.6 | | | | 94.9 | | | | 96.8 |

1. **Enter Table 1 with dry snow depth and dry field/obstacle limit weight to obtain dry snow weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable dry snow limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -13 | -8 | -3 | 0 | -9 | -4 | 0 | 0 | -2 | 0 | 0 | 0 |
| 80 | -16 | -11 | -6 | -1 | -13 | -8 | -3 | 0 | -6 | -1 | 0 | 0 |
| 70 | -20 | -15 | -10 | -5 | -16 | -11 | -6 | -2 | -10 | -5 | 0 | 0 |
| 60 | -24 | -19 | -14 | -9 | -20 | -15 | -10 | -6 | -14 | -9 | -4 | 0 |
| 50 | -28 | -23 | -18 | -13 | -25 | -20 | -15 | -10 | -19 | -14 | -9 | -4 |
| 40 | -32 | -27 | -22 | -18 | -29 | -24 | -19 | -15 | -24 | -19 | -14 | -10 |

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

   **V1 not to exceed VR.**

# ADVISORY INFORMATION

## Wet Snow Takeoff

### Maximum Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -4.4 | -5.8 | -7.1 | -8.3 | -6.2 | -7.6 | -8.9 | -10.2 | -11.5 | -12.9 | -14.2 | -15.5 |
| 80 | -4.4 | -5.8 | -7.2 | -8.4 | -5.8 | -7.2 | -8.5 | -9.8 | -9.9 | -11.2 | -12.6 | -13.8 |
| 70 | -4.0 | -5.4 | -6.7 | -7.9 | -5.0 | -6.4 | -7.7 | -8.9 | -7.8 | -9.2 | -10.6 | -11.8 |
| 60 | -3.0 | -4.4 | -5.8 | -7.0 | -3.6 | -5.0 | -6.4 | -7.6 | -5.5 | -6.8 | -8.2 | -9.4 |
| 50 | -1.6 | -2.9 | -4.3 | -5.5 | -1.9 | -3.2 | -4.6 | -5.8 | -2.7 | -4.1 | -5.4 | -6.7 |
| 40 | 0.0 | -1.0 | -2.4 | -3.6 | 0.0 | -1.0 | -2.3 | -3.5 | 0.0 | -1.0 | -2.4 | -3.6 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 32.0 | | | | 34.5 | | | | 39.2 | | | |
| 4200 | 47.3 | 27.3 | | | 49.3 | 29.8 | | | 52.7 | 35.0 | | |
| 4600 | 62.6 | 42.5 | | | 64.2 | 44.6 | | | 66.3 | 48.5 | 30.8 | |
| 5000 | 78.2 | 57.8 | 37.7 | | 79.1 | 59.5 | 40.0 | | 80.0 | 62.0 | 44.2 | |
| 5400 | 93.9 | 73.3 | 53.0 | 35.0 | 94.2 | 74.4 | 54.8 | 37.3 | 93.7 | 75.7 | 57.8 | 41.8 |
| 5800 | | 89.0 | 68.4 | 50.2 | | 89.4 | 69.8 | 52.1 | | 89.4 | 71.4 | 55.3 |
| 6200 | | 104.8 | 84.0 | 65.6 | | 104.5 | 84.7 | 67.0 | | 103.2 | 85.1 | 68.9 |
| 6600 | | | 99.8 | 81.2 | | | 99.8 | 82.0 | | | 98.9 | 82.6 |
| 7000 | | | | 96.9 | | | | 97.1 | | | | 96.4 |

1. **Enter Table 1 with wet snow depth and dry field/obstacle limit weight to obtain wet snow weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable wet snow limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -10 | -5 | 0 | 0 | -7 | -2 | 0 | 0 | -1 | 0 | 0 | 0 |
| 80 | -13 | -8 | -3 | 0 | -10 | -5 | 0 | 0 | -2 | 0 | 0 | 0 |
| 70 | -15 | -10 | -5 | -1 | -12 | -7 | -2 | 0 | -5 | 0 | 0 | 0 |
| 60 | -17 | -12 | -7 | -3 | -15 | -10 | -5 | -1 | -9 | -4 | 0 | 0 |
| 50 | -20 | -15 | -10 | -6 | -19 | -14 | -9 | -4 | -14 | -9 | -4 | 0 |
| 40 | -24 | -19 | -14 | -10 | -23 | -18 | -13 | -9 | -21 | -16 | -11 | -6 |

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## Wet Snow Takeoff

### No Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -6.4 | -7.6 | -8.8 | -10.0 | -8.3 | -9.5 | -10.8 | -11.9 | -13.8 | -15.1 | -16.3 | -17.4 |
| 80 | -6.5 | -7.8 | -9.0 | -10.1 | -7.9 | -9.2 | -10.4 | -11.5 | -12.2 | -13.4 | -14.6 | -15.7 |
| 70 | -6.1 | -7.3 | -8.6 | -9.7 | -7.0 | -8.3 | -9.5 | -10.6 | -10.0 | -11.2 | -12.4 | -13.6 |
| 60 | -5.1 | -6.3 | -7.5 | -8.6 | -5.6 | -6.8 | -8.0 | -9.2 | -7.4 | -8.7 | -9.9 | -11.0 |
| 50 | -3.4 | -4.7 | -5.9 | -7.0 | -3.7 | -4.9 | -6.1 | -7.2 | -4.4 | -5.6 | -6.8 | -8.0 |
| 40 | -1.3 | -2.5 | -3.7 | -4.8 | -1.2 | -2.4 | -3.6 | -4.8 | -1.0 | -2.2 | -3.4 | -4.5 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 4600 | | | | | 14.4 | | | | 36.7 | | | |
| 5000 | 31.7 | | | | 43.1 | | | | 56.3 | 31.9 | | |
| 5400 | 62.4 | 23.5 | | | 67.6 | 36.3 | | | 74.1 | 51.8 | 27.1 | |
| 5800 | 85.0 | 56.1 | 15.4 | | 87.5 | 62.3 | 29.5 | | 90.4 | 70.0 | 47.2 | 24.8 |
| 6200 | 104.0 | 80.1 | 49.1 | 11.5 | 105.0 | 83.0 | 56.7 | 26.2 | | 86.6 | 65.8 | 45.0 |
| 6600 | | 99.5 | 74.9 | 45.6 | | 100.9 | 78.4 | 53.9 | | 102.2 | 82.8 | 63.8 |
| 7000 | | | 95.1 | 72.3 | | | 96.8 | 76.2 | | | 98.5 | 80.9 |
| 7400 | | | | 93.0 | | | | 94.8 | | | | 96.8 |

1. **Enter Table 1 with wet snow depth and dry field/obstacle limit weight to obtain wet snow weight adjustment.**
2. **Adjust field length available by -110 ft/+110 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable wet snow limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -13 | -8 | -3 | 0 | -9 | -4 | 0 | 0 | -2 | 0 | 0 | 0 |
| 80 | -17 | -12 | -7 | -2 | -13 | -8 | -3 | 0 | -3 | 0 | 0 | 0 |
| 70 | -21 | -16 | -11 | -6 | -17 | -12 | -7 | -2 | -7 | -2 | 0 | 0 |
| 60 | -24 | -19 | -14 | -10 | -21 | -16 | -11 | -7 | -13 | -8 | -3 | 0 |
| 50 | -29 | -24 | -19 | -15 | -27 | -22 | -17 | -13 | -21 | -16 | -11 | -6 |
| 40 | -35 | -30 | -25 | -21 | -34 | -29 | -24 | -19 | -31 | -26 | -21 | -16 |

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

   **V1 not to exceed VR.**

## ADVISORY INFORMATION

# Slippery Runway Takeoff

## Maximum Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -1.1 | -1.8 | -2.6 | -3.3 | -3.1 | -3.8 | -4.6 | -5.3 | -10.3 | -11.1 | -11.8 | -12.5 |
| 80 | -1.1 | -1.9 | -2.6 | -3.3 | -3.3 | -4.1 | -4.8 | -5.5 | -9.7 | -10.5 | -11.2 | -11.9 |
| 70 | -0.8 | -1.5 | -2.3 | -3.0 | -3.1 | -3.9 | -4.6 | -5.3 | -8.6 | -9.3 | -10.1 | -10.8 |
| 60 | -0.2 | -0.9 | -1.7 | -2.4 | -2.4 | -3.2 | -3.9 | -4.6 | -6.9 | -7.7 | -8.4 | -9.1 |
| 50 | 0.0 | -0.8 | -1.5 | -2.2 | -1.3 | -2.1 | -2.8 | -3.5 | -4.8 | -5.5 | -6.3 | -6.9 |
| 40 | 0.0 | -0.7 | -1.5 | -2.2 | 0.0 | -0.7 | -1.4 | -2.1 | -2.0 | -2.8 | -3.5 | -4.2 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 60.7 | 37.2 | | | 30.4 | | | | | | | |
| 4200 | 80.2 | 58.9 | 35.2 | | 45.9 | | | | | | | |
| 4600 | 98.2 | 78.5 | 57.0 | 35.7 | 61.6 | 40.9 | | | | | | |
| 5000 | | 96.6 | 76.9 | 57.5 | 77.5 | 56.5 | 35.9 | | | | | |
| 5400 | | | 95.1 | 77.3 | 93.7 | 72.3 | 51.4 | 32.9 | | | | |
| 5800 | | | | 95.5 | | 88.4 | 67.1 | 48.4 | | | | |
| 6200 | | | | | | 104.7 | 83.1 | 64.1 | 38.2 | | | |
| 6600 | | | | | | | 99.4 | 80.0 | 45.0 | | | |
| 7000 | | | | | | | | 96.2 | 52.1 | | | |
| 7400 | | | | | | | | | 59.5 | 40.5 | | |
| 7800 | | | | | | | | | 67.4 | 47.4 | | |
| 8200 | | | | | | | | | 75.8 | 54.6 | 36.0 | |
| 8600 | | | | | | | | | 84.7 | 62.2 | 42.8 | |
| 9000 | | | | | | | | | 94.5 | 70.2 | 49.8 | |
| 9400 | | | | | | | | | | 78.7 | 57.1 | 40.1 |
| 9800 | | | | | | | | | | 87.9 | 64.8 | 46.9 |
| 10200 | | | | | | | | | | 97.9 | 73.0 | 54.1 |
| 10600 | | | | | | | | | | | 81.8 | 61.7 |
| 11000 | | | | | | | | | | | 91.2 | 69.7 |
| 11400 | | | | | | | | | | | | 78.2 |
| 11800 | | | | | | | | | | | | 87.4 |
| 12200 | | | | | | | | | | | | 97.3 |

1. **Enter Table 1 with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -80 ft/+80 ft for every 10°C above/below 0°C.**
   **Adjust "Medium" field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
   **Adjust "Poor" field length available by -190 ft/+190 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable slippery runway limited weight is lesser of weights from Table 1 and Table 2.**

# ADVISORY INFORMATION

## Slippery Runway Takeoff
### Maximum Reverse Thrust
### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -8 | -6 | -3 | -1 | -12 | -10 | -7 | -5 | -32 | -30 | -27 | -25 |
| 80 | -10 | -7 | -5 | -2 | -14 | -12 | -9 | -7 | -36 | -34 | -31 | -29 |
| 70 | -11 | -8 | -6 | -3 | -17 | -14 | -12 | -9 | -40 | -37 | -35 | -32 |
| 60 | -12 | -9 | -7 | -4 | -19 | -17 | -14 | -12 | -43 | -40 | -38 | -35 |
| 50 | -12 | -10 | -7 | -5 | -22 | -19 | -17 | -14 | -45 | -43 | -40 | -38 |
| 40 | -13 | -11 | -8 | -6 | -24 | -22 | -19 | -17 | -47 | -44 | -42 | -40 |

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

## ADVISORY INFORMATION

## Slippery Runway Takeoff
### No Reverse Thrust
### Table 1 of 3: Weight Adjustment (1000 KG)

| DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -2.5 | -3.1 | -3.7 | -4.3 | -4.9 | -5.5 | -6.2 | -6.7 | -14.2 | -14.8 | -15.4 | -16.0 |
| 80 | -2.5 | -3.1 | -3.7 | -4.3 | -5.3 | -5.9 | -6.5 | -7.1 | -13.4 | -14.0 | -14.6 | -15.2 |
| 70 | -2.1 | -2.8 | -3.4 | -3.9 | -5.1 | -5.8 | -6.4 | -6.9 | -11.9 | -12.6 | -13.2 | -13.7 |
| 60 | -1.4 | -2.0 | -2.6 | -3.1 | -4.4 | -5.0 | -5.6 | -6.2 | -9.8 | -10.5 | -11.1 | -11.6 |
| 50 | -0.2 | -0.9 | -1.5 | -2.0 | -3.1 | -3.7 | -4.4 | -4.9 | -7.1 | -7.7 | -8.3 | -8.8 |
| 40 | 0.0 | -0.6 | -1.2 | -1.8 | -1.3 | -1.9 | -2.5 | -3.1 | -3.7 | -4.3 | -4.9 | -5.4 |

## ADVISORY INFORMATION

## Slippery Runway Takeoff
### No Reverse Thrust
### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 19.2 | | | | | | | | | | | |
| 4000 | 43.7 | | | | | | | | | | | |
| 4200 | 61.8 | | | | | | | | | | | |
| 4400 | 75.2 | 40.6 | | | | | | | | | | |
| 4600 | 86.3 | 59.9 | | | | | | | | | | |
| 4800 | 96.0 | 73.7 | 37.6 | | | | | | | | | |
| 5000 | | 85.0 | 57.9 | | | | | | | | | |
| 5200 | | 94.8 | 72.1 | 39.7 | 41.2 | | | | | | | |
| 5400 | | | 83.7 | 59.3 | 58.0 | | | | | | | |
| 5600 | | | 93.7 | 73.2 | 71.5 | 31.0 | | | | | | |
| 5800 | | | | 84.6 | 83.1 | 49.8 | | | | | | |
| 6000 | | | | 94.5 | 93.5 | 64.7 | | | | | | |
| 6200 | | | | | | 77.2 | 40.3 | | | | | |
| 6400 | | | | | | 88.2 | 57.3 | | | | | |
| 6600 | | | | | | 98.1 | 70.9 | 35.0 | | | | |
| 6800 | | | | | | | 82.6 | 53.1 | | | | |
| 7000 | | | | | | | 93.0 | 67.4 | | | | |
| 7200 | | | | | | | | 79.5 | | | | |
| 7400 | | | | | | | | 90.2 | | | | |
| 12000 | | | | | | | | | 63.9 | | | |
| 12200 | | | | | | | | | 78.1 | | | |
| 12400 | | | | | | | | | 88.0 | | | |
| 12600 | | | | | | | | | 96.1 | | | |
| 13200 | | | | | | | | | | 69.3 | | |
| 13400 | | | | | | | | | | 81.6 | | |
| 13600 | | | | | | | | | | 90.8 | | |
| 14200 | | | | | | | | | | | 54.9 | |
| 14400 | | | | | | | | | | | 73.8 | |
| 14600 | | | | | | | | | | | 84.8 | |
| 14800 | | | | | | | | | | | 93.4 | |
| 15200 | | | | | | | | | | | | 51.1 |
| 15400 | | | | | | | | | | | | 72.4 |
| 15600 | | | | | | | | | | | | 83.8 |
| 15800 | | | | | | | | | | | | 92.6 |

1. **Enter Table 1 with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -90 ft/+90 ft for every 10°C above/below 0°C.**
   **Adjust "Medium" field length available by -110 ft/+110 ft for every 10°C above/below 0°C.**
   **Adjust "Poor" field length available by -280 ft/+280 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable slippery runway limited weight is lesser of weights from Table 1 and Table 2.**

# ADVISORY INFORMATION

## Slippery Runway Takeoff
### No Reverse Thrust
### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -11 | -6 | -1 | 0 | -16 | -11 | -6 | -1 | -50 | -45 | -40 | -35 |
| 80 | -13 | -8 | -3 | 0 | -19 | -14 | -9 | -5 | -57 | -52 | -47 | -42 |
| 70 | -14 | -9 | -4 | 0 | -23 | -18 | -13 | -8 | -63 | -58 | -53 | -49 |
| 60 | -15 | -10 | -5 | -1 | -27 | -22 | -17 | -12 | -69 | -64 | -59 | -55 |
| 50 | -17 | -12 | -7 | -2 | -31 | -26 | -21 | -16 | -75 | -70 | -65 | -60 |
| 40 | -18 | -13 | -8 | -3 | -35 | -30 | -25 | -21 | -80 | -75 | -70 | -66 |

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# Takeoff %N1

## Max Takeoff Thrust

### Based on engine bleed for packs on and anti-ice off

| AIRPORT OAT (°C) | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| 60 | 85.6 | 86.1 | 86.6 | 86.7 | 86.2 | 85.7 | 85.2 | 84.8 | 84.3 | 83.9 | 83.5 | 83.0 | 82.5 | 81.6 | 80.6 | 79.5 | 78.6 | 78.2 |
| 55 | 86.9 | 87.3 | 87.7 | 87.8 | 87.4 | 86.9 | 86.4 | 85.9 | 85.5 | 85.1 | 84.6 | 84.2 | 83.7 | 82.7 | 81.8 | 80.7 | 79.8 | 79.4 |
| 50 | 88.0 | 88.6 | 89.2 | 88.8 | 88.4 | 88.0 | 87.5 | 87.1 | 86.6 | 86.2 | 85.8 | 85.3 | 84.8 | 83.9 | 83.0 | 81.9 | 81.0 | 80.6 |
| 45 | 88.9 | 89.5 | 90.0 | 89.9 | 89.5 | 88.9 | 88.6 | 88.2 | 87.7 | 87.3 | 86.9 | 86.4 | 86.0 | 85.0 | 84.1 | 83.0 | 82.2 | 81.7 |
| 40 | 89.9 | 90.4 | 91.0 | 90.9 | 90.9 | 90.6 | 89.9 | 89.1 | 88.7 | 88.3 | 88.0 | 87.5 | 87.0 | 86.1 | 85.2 | 84.1 | 83.3 | 82.8 |
| 35 | 90.7 | 91.3 | 91.9 | 91.9 | 91.8 | 91.7 | 91.6 | 91.3 | 90.7 | 89.7 | 88.9 | 88.5 | 88.1 | 87.2 | 86.3 | 85.3 | 84.4 | 84.0 |
| 30 | 90.2 | 91.5 | 92.8 | 92.6 | 92.6 | 92.6 | 92.5 | 92.4 | 92.4 | 92.2 | 89.8 | 89.5 | 89.1 | 88.2 | 87.4 | 86.4 | 85.6 | 85.2 |
| 25 | 89.4 | 90.7 | 92.0 | 92.3 | 92.7 | 92.8 | 92.9 | 93.2 | 93.0 | 93.0 | 90.8 | 90.4 | 90.0 | 89.2 | 88.4 | 87.6 | 86.7 | 86.3 |
| 20 | 88.6 | 89.9 | 91.2 | 91.5 | 91.8 | 92.1 | 92.5 | 92.8 | 93.0 | 93.1 | 91.7 | 91.3 | 91.0 | 90.2 | 89.5 | 88.7 | 87.9 | 87.5 |
| 15 | 87.8 | 89.1 | 90.4 | 90.7 | 91.0 | 91.3 | 91.6 | 91.9 | 92.3 | 92.6 | 92.7 | 92.4 | 92.0 | 91.2 | 90.5 | 89.8 | 89.0 | 88.7 |
| 10 | 87.0 | 88.3 | 89.6 | 89.9 | 90.2 | 90.5 | 90.8 | 91.1 | 91.5 | 91.8 | 92.2 | 92.6 | 93.0 | 92.2 | 91.6 | 90.9 | 90.2 | 89.9 |
| 5 | 86.2 | 87.5 | 88.8 | 89.1 | 89.4 | 89.7 | 90.0 | 90.3 | 90.7 | 91.0 | 91.4 | 91.8 | 92.2 | 92.2 | 92.2 | 92.0 | 91.4 | 91.1 |
| 0 | 85.4 | 86.7 | 87.9 | 88.3 | 88.6 | 88.9 | 89.2 | 89.5 | 89.8 | 90.2 | 90.6 | 91.0 | 91.4 | 91.4 | 91.5 | 91.5 | 91.5 | 91.6 |
| -5 | 84.6 | 85.8 | 87.1 | 87.4 | 87.8 | 88.0 | 88.3 | 88.7 | 89.0 | 89.4 | 89.8 | 90.2 | 90.5 | 90.6 | 90.7 | 90.7 | 90.7 | 90.8 |
| -10 | 83.8 | 85.0 | 86.3 | 86.6 | 86.9 | 87.2 | 87.5 | 87.8 | 88.1 | 88.5 | 88.9 | 89.3 | 89.7 | 89.8 | 89.8 | 89.9 | 89.9 | 89.9 |
| -15 | 83.0 | 84.2 | 85.5 | 85.8 | 86.1 | 86.3 | 86.6 | 86.9 | 87.3 | 87.7 | 88.1 | 88.5 | 88.9 | 89.0 | 89.0 | 89.1 | 89.1 | 89.1 |
| -20 | 82.2 | 83.4 | 84.6 | 84.9 | 85.2 | 85.5 | 85.7 | 86.1 | 86.4 | 86.8 | 87.3 | 87.7 | 88.1 | 88.1 | 88.2 | 88.2 | 88.3 | 88.3 |
| -25 | 81.4 | 82.6 | 83.8 | 84.1 | 84.4 | 84.7 | 84.9 | 85.2 | 85.6 | 86.0 | 86.4 | 86.8 | 87.2 | 87.3 | 87.4 | 87.4 | 87.4 | 87.5 |
| -30 | 80.5 | 81.8 | 83.0 | 83.3 | 83.6 | 83.8 | 84.1 | 84.4 | 84.7 | 85.1 | 85.5 | 86.0 | 86.4 | 86.5 | 86.5 | 86.6 | 86.6 | 86.6 |
| -35 | 79.7 | 80.9 | 82.1 | 82.4 | 82.7 | 83.0 | 83.2 | 83.5 | 83.9 | 84.3 | 84.7 | 85.1 | 85.5 | 85.6 | 85.6 | 85.7 | 85.8 | 85.8 |
| -40 | 78.9 | 80.1 | 81.2 | 81.6 | 81.8 | 82.1 | 82.4 | 82.7 | 83.0 | 83.4 | 83.8 | 84.2 | 84.6 | 84.7 | 84.7 | 84.8 | 84.9 | 84.9 |
| -45 | 78.0 | 79.2 | 80.4 | 80.7 | 81.0 | 81.2 | 81.5 | 81.8 | 82.1 | 82.5 | 82.9 | 83.3 | 83.7 | 83.8 | 83.8 | 83.9 | 84.0 | 84.0 |
| -50 | 77.2 | 78.3 | 79.5 | 79.8 | 80.1 | 80.3 | 80.6 | 80.9 | 81.3 | 81.6 | 82.0 | 82.4 | 82.7 | 82.8 | 82.9 | 83.0 | 83.1 | 83.2 |

### %N1 Adjustment for Engine Bleeds

| BLEED CONFIGURATION | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| PACKS OFF | 0.5 | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.7 | 1.8 |
| ENGINE ANTI-ICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 |

# Assumed Temperature Reduced Thrust

## Maximum Assumed Temperature (Table 1 of 3)

## Based on 25% Takeoff Thrust Reduction

| OAT (°C) | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| 60 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 86 | 84 | 83 | 82 | | | | 74 | 71 | 68 | 67 |
| 55 | 81 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | | | | 74 | 71 | 68 | 67 |
| 50 | 77 | 77 | 77 | 78 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | 77 | | 74 | 71 | 68 | 67 |
| 45 | 73 | 73 | 72 | 73 | 73 | 73 | 73 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 72 | 71 | 68 | 67 |
| 40 | 68 | 68 | 68 | 68 | 67 | 67 | 67 | 68 | 68 | 68 | 68 | 67 | 67 | 67 | 67 | 67 | 67 | 67 |
| 35 | 64 | 64 | 63 | 64 | 63 | 62 | 61 | 60 | 61 | 62 | 63 | 63 | 63 | 62 | 62 | 62 | 62 | 62 |
| 30 | 63 | 61 | 59 | 60 | 58 | 57 | 56 | 55 | 54 | 53 | 58 | 58 | 58 | 58 | 58 | 58 | 57 | 57 |
| 25 | 63 | 61 | 59 | 58 | 56 | 54 | 53 | 51 | 50 | 49 | 54 | 53 | 53 | 53 | 53 | 53 | 53 | 53 |
| 20 | 63 | 62 | 59 | 58 | 56 | 54 | 52 | 49 | 48 | 46 | 49 | 49 | 49 | 48 | 48 | 48 | 48 | 48 |
| 15 | 63 | 62 | 59 | 59 | 57 | 54 | 52 | 50 | 48 | 46 | 44 | 44 | 44 | 43 | 43 | 43 | 43 | 42 |
| 10 | 64 | 62 | 59 | 59 | 57 | 54 | 52 | 50 | 48 | 46 | 43 | 41 | 39 | 38 | 38 | 37 | 37 | 37 |
| 5 | 64 | 62 | 59 | 59 | 57 | 54 | 52 | 50 | 48 | 46 | 43 | 41 | 39 | 37 | 34 | 32 | 32 | 32 |
| 0 | 64 | 62 | 59 | 59 | 57 | 54 | 52 | 50 | 48 | 46 | 43 | 41 | 39 | 37 | 34 | 32 | 29 | 28 |
| -5 & BELOW | 64 | 62 | 59 | 59 | 57 | 54 | 52 | 50 | 48 | 46 | 43 | 41 | 39 | 37 | 34 | 32 | 29 | 28 |

## Takeoff %N1 (Table 2 of 3)

## Based on engine bleed for packs on and engine anti-ice off

| ASSUMED TEMP (°C) | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| 75 | 81.9 | 82.4 | 83.0 | 83.1 | 82.6 | 82.1 | 81.6 | 81.1 | 80.7 | 80.2 | 79.8 | 79.3 | 78.8 | 77.8 | 77.0 | 76.6 | 76.5 | 76.4 |
| 70 | 83.2 | 83.7 | 84.2 | 84.3 | 83.8 | 83.3 | 82.8 | 82.4 | 81.9 | 81.5 | 81.0 | 80.6 | 80.1 | 79.1 | 78.2 | 77.0 | 76.1 | 75.8 |
| 65 | 84.4 | 84.9 | 85.4 | 85.5 | 85.0 | 84.5 | 84.1 | 83.6 | 83.2 | 82.7 | 82.3 | 81.8 | 81.3 | 80.3 | 79.4 | 78.3 | 77.4 | 77.0 |
| 60 | 85.6 | 86.1 | 86.6 | 86.7 | 86.2 | 85.7 | 85.2 | 84.8 | 84.3 | 83.9 | 83.5 | 83.0 | 82.5 | 81.6 | 80.6 | 79.5 | 78.6 | 78.2 |
| 55 | 86.9 | 87.3 | 87.7 | 87.8 | 87.4 | 86.9 | 86.4 | 85.9 | 85.5 | 85.1 | 84.6 | 84.2 | 83.7 | 82.7 | 81.8 | 80.7 | 79.8 | 79.4 |
| 50 | 88.0 | 88.6 | 89.2 | 88.8 | 88.4 | 88.0 | 87.5 | 87.1 | 86.6 | 86.2 | 85.8 | 85.3 | 84.8 | 83.9 | 83.0 | 81.9 | 81.0 | 80.6 |
| 45 | 88.9 | 89.5 | 90.0 | 89.9 | 89.5 | 88.9 | 88.6 | 88.2 | 87.7 | 87.3 | 86.9 | 86.4 | 86.0 | 85.0 | 84.1 | 83.0 | 82.2 | 81.7 |
| 40 | 89.9 | 90.4 | 91.0 | 90.9 | 90.9 | 90.6 | 89.9 | 89.1 | 88.7 | 88.3 | 88.0 | 87.5 | 87.0 | 86.1 | 85.2 | 84.1 | 83.3 | 82.8 |
| 35 | 90.7 | 91.3 | 91.9 | 91.9 | 91.8 | 91.7 | 91.6 | 91.3 | 90.7 | 89.7 | 88.9 | 88.5 | 88.1 | 87.2 | 86.3 | 85.3 | 84.4 | 84.0 |
| 30 | 90.2 | 91.5 | 92.8 | 92.6 | 92.6 | 92.6 | 92.5 | 92.4 | 92.4 | 92.2 | 89.8 | 89.5 | 89.1 | 88.2 | 87.4 | 86.4 | 85.6 | 85.2 |
| 25 | 89.4 | 90.7 | 92.0 | 92.3 | 92.7 | 92.8 | 92.9 | 93.2 | 93.0 | 93.0 | 90.8 | 90.4 | 90.0 | 89.2 | 88.4 | 87.6 | 86.7 | 86.3 |
| 20 | 88.6 | 89.9 | 91.2 | 91.5 | 91.8 | 92.1 | 92.5 | 92.8 | 93.0 | 93.1 | 91.7 | 91.3 | 91.0 | 90.2 | 89.5 | 88.7 | 87.9 | 87.5 |
| 15 | 87.8 | 89.1 | 90.4 | 90.7 | 91.0 | 91.3 | 91.6 | 91.9 | 92.3 | 92.6 | 92.7 | 92.4 | 92.0 | 91.2 | 90.5 | 89.8 | 89.0 | 88.7 |
| 10 | 87.0 | 88.3 | 89.6 | 89.9 | 90.2 | 90.5 | 90.8 | 91.1 | 91.5 | 91.8 | 92.2 | 92.6 | 93.0 | 92.2 | 91.6 | 90.9 | 90.2 | 89.9 |
| 5 | 86.2 | 87.5 | 88.8 | 89.1 | 89.4 | 89.7 | 90.0 | 90.3 | 90.7 | 91.0 | 91.4 | 91.8 | 92.2 | 92.2 | 92.2 | 92.0 | 91.4 | 91.1 |
| 0 | 85.4 | 86.7 | 87.9 | 88.3 | 88.6 | 88.9 | 89.2 | 89.5 | 89.8 | 90.2 | 90.6 | 91.0 | 91.4 | 91.4 | 91.5 | 91.5 | 91.5 | 91.6 |
| -5 | 84.6 | 85.8 | 87.1 | 87.4 | 87.8 | 88.0 | 88.3 | 88.7 | 89.0 | 89.4 | 89.8 | 90.2 | 90.5 | 90.6 | 90.7 | 90.7 | 90.7 | 90.8 |
| -20 | 82.2 | 83.4 | 84.6 | 84.9 | 85.2 | 85.5 | 85.7 | 86.1 | 86.4 | 86.8 | 87.3 | 87.7 | 88.1 | 88.1 | 88.2 | 88.2 | 88.3 | 88.3 |
| -40 | 78.9 | 80.1 | 81.2 | 81.6 | 81.8 | 82.1 | 82.4 | 82.7 | 83.0 | 83.4 | 83.8 | 84.2 | 84.6 | 84.7 | 84.7 | 84.8 | 84.9 | 84.9 |
| MINIMUM ASSUMED TEMP (°C) | 34 | 32 | 30 | 28 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 10 | 8 | 6 | 4 | 2 | 1 |

# Assumed Temperature Reduced Thrust
## %N1 Adjustment for Temperature Difference (Table 3 of 3)

| ASSUMED TEMP MINUS OAT (°C) | OUTSIDE AIR TEMPERATURE (°C) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -40 | -20 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 115 | 8.5 | | | | | | | | | | | | | |
| 110 | 8.5 | | | | | | | | | | | | | |
| 105 | 8.5 | | | | | | | | | | | | | |
| 100 | 7.4 | | | | | | | | | | | | | |
| 95 | 5.6 | 8.9 | | | | | | | | | | | | |
| 90 | 4.2 | 8.9 | | | | | | | | | | | | |
| 85 | 2.8 | 8.9 | | | | | | | | | | | | |
| 80 | 1.4 | 7.6 | | | | | | | | | | | | |
| 75 | 0.1 | 5.9 | 9.2 | | | | | | | | | | | |
| 70 | 0.0 | 4.4 | 9.2 | 9.2 | | | | | | | | | | |
| 65 | 0.0 | 2.9 | 8.6 | 8.6 | 8.5 | | | | | | | | | |
| 60 | 0.0 | 1.4 | 8.0 | 8.0 | 8.0 | 7.9 | | | | | | | | |
| 55 | 0.0 | 0.0 | 6.1 | 7.4 | 7.4 | 7.3 | 7.2 | | | | | | | |
| 50 | 0.0 | 0.0 | 4.5 | 6.2 | 6.8 | 6.8 | 6.6 | 6.4 | | | | | | |
| 45 | 0.0 | 0.0 | 3.0 | 4.6 | 6.2 | 6.1 | 6.0 | 5.8 | 5.7 | | | | | |
| 40 | 0.0 | 0.0 | 1.5 | 3.1 | 4.7 | 5.5 | 5.4 | 5.2 | 5.1 | 4.9 | | | | |
| 35 | | 0.0 | 0.0 | 1.6 | 3.1 | 4.8 | 4.8 | 4.6 | 4.5 | 4.4 | 4.2 | | | |
| 30 | | 0.0 | 0.0 | 0.1 | 1.6 | 3.2 | 4.1 | 4.0 | 3.9 | 3.8 | 3.7 | 3.6 | | |
| 25 | | 0.0 | 0.0 | 0.0 | 0.1 | 1.6 | 3.3 | 3.4 | 3.3 | 3.2 | 3.1 | 3.0 | 2.9 | |
| 20 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 1.7 | 2.7 | 2.7 | 2.6 | 2.5 | 2.4 | 2.4 | 2.3 |
| 15 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 1.8 | 2.0 | 2.0 | 1.9 | 1.8 | 1.8 | 1.7 |
| 10 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 1.4 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 |
| 5 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.7 | 0.6 | 0.6 | 0.6 | 0.6 |
| 0 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

1. **Determine Maximum Assumed Temperature allowed from Table 1.**
2. **Find Maximum %N1 from Table 2 using the desired assumed temperature (no greater than temperature from Table 1).**
3. **Use the difference between assumed temperature and OAT to determine the %N1 adjustment from Table 3.**
4. **Subtract %N1 adjustment from Maximum %N1 in Table 2.**

# TO1 Takeoff Speeds - Dry Runway

## 10% Thrust Reduction

### Table 1 of 4: V1, VR, V2

| WEIGHT (1000 KG) | FLAPS 1 | | | FLAPS 5 | | | FLAPS 10 | | | FLAPS 15 | | | FLAPS 25 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 |
| 80 | 159 | 160 | 165 | 153 | 153 | 158 | | | | | | | | | |
| 75 | 154 | 154 | 160 | 148 | 148 | 153 | 144 | 144 | 150 | 141 | 141 | 147 | | | |
| 70 | 148 | 148 | 156 | 142 | 142 | 149 | 138 | 139 | 146 | 136 | 136 | 143 | 133 | 133 | 139 |
| 65 | 142 | 142 | 151 | 136 | 136 | 144 | 132 | 133 | 141 | 130 | 130 | 138 | 127 | 127 | 135 |
| 60 | 135 | 135 | 146 | 129 | 130 | 139 | 126 | 127 | 136 | 124 | 124 | 133 | 121 | 121 | 130 |
| 55 | 128 | 128 | 140 | 122 | 123 | 134 | 119 | 120 | 131 | 117 | 117 | 128 | 115 | 115 | 125 |
| 50 | 120 | 121 | 134 | 115 | 116 | 128 | 112 | 113 | 125 | 110 | 110 | 123 | 108 | 108 | 120 |
| 45 | 113 | 113 | 128 | 107 | 108 | 122 | 105 | 105 | 120 | 103 | 103 | 117 | 101 | 101 | 115 |
| 40 | 104 | 105 | 121 | 100 | 100 | 116 | 97 | 98 | 113 | 95 | 96 | 111 | 93 | 93 | 109 |

**Check V1(MCG).**

### Table 2 of 4: V1, VR, V2 Adjustments*

| TEMP (°C) | TAKEOFF SPEEDS ADJUSTMENTS (KIAS) | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | | | | | | | | | VR | | | | | | | | | V2 | | | | | | | | |
| | PRESS ALT (1000 FT) | | | | | | | | | PRESS ALT (1000 FT) | | | | | | | | | PRESS ALT (1000 FT) | | | | | | | | |
| | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 |
| 60 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 13 | 4 | 5 | 5 | 6 | 6 | 7 | 9 | 10 | 10 | -1 | -2 | -2 | -3 | -3 | -3 | -4 | -4 | -4 |
| 50 | 3 | 3 | 5 | 7 | 8 | 9 | 10 | 11 | 13 | 3 | 3 | 4 | 6 | 6 | 7 | 9 | 10 | 10 | -1 | -1 | -2 | -2 | -3 | -3 | -4 | -4 | -4 |
| 40 | 1 | 2 | 3 | 5 | 7 | 8 | 10 | 11 | 13 | 1 | 2 | 3 | 4 | 6 | 7 | 9 | 10 | 10 | 0 | -1 | -1 | -2 | -2 | -3 | -3 | -4 | -4 |
| 30 | 0 | 0 | 1 | 3 | 4 | 7 | 8 | 11 | 13 | 0 | 0 | 2 | 3 | 4 | 6 | 8 | 9 | 10 | 0 | 0 | 0 | -1 | -1 | -2 | -3 | -3 | -3 |
| 20 | 0 | 0 | 1 | 2 | 3 | 5 | 7 | 9 | 10 | 0 | 0 | 1 | 2 | 3 | 5 | 6 | 8 | 10 | 0 | 0 | 0 | -1 | -1 | -2 | -2 | -3 | -3 |
| 10 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 7 | 9 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 9 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -3 |
| 0 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 8 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -2 |
| -60 | 1 | 0 | 1 | 3 | 3 | 4 | 5 | 6 | 8 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -2 |

***V1 not to exceed VR.**

### Table 3 of 4: Slope and Wind V1 Adjustments*

| WEIGHT (1000 KG) | V1 SPEED ADJUSTMENTS (KIAS) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SLOPE (%) | | | | | WIND (KTS) | | | | | |
| | -2 | -1 | 0 | 1 | 2 | -15 | -10 | -5 | 0 | 20 | 40 |
| 80 | -3 | -2 | 0 | 2 | 2 | -1 | -1 | -1 | 0 | 1 | 1 |
| 70 | -2 | -1 | 0 | 1 | 1 | -2 | -1 | -1 | 0 | 1 | 1 |
| 60 | -2 | -1 | 0 | 1 | 1 | -2 | -1 | -1 | 0 | 1 | 1 |
| 50 | -1 | -1 | 0 | 1 | 1 | -2 | -1 | -1 | 0 | 1 | 1 |
| 40 | -1 | -1 | 0 | 1 | 1 | -2 | -1 | -1 | 0 | 1 | 1 |

***V1 not to exceed VR.**

# TO1 Takeoff Speeds - Dry Runway
## 10% Thrust Reduction
## Table 4 of 4: V1(MCG)

| TEMP (°C) | V1(MCG) (KIAS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PRESSURE ALTITUDE (FT) | | | | | | | | |
| | -2000 | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14500 |
| 60 | 94 | 92 | 90 | 87 | 84 | 82 | 79 | 75 | 71 |
| 55 | 94 | 92 | 90 | 87 | 84 | 82 | 79 | 75 | 71 |
| 50 | 96 | 94 | 90 | 87 | 84 | 82 | 79 | 75 | 71 |
| 45 | 99 | 96 | 92 | 88 | 84 | 82 | 79 | 75 | 71 |
| 40 | 101 | 99 | 95 | 90 | 85 | 82 | 79 | 75 | 71 |
| 35 | 103 | 101 | 97 | 93 | 88 | 83 | 79 | 75 | 71 |
| 30 | 104 | 104 | 99 | 95 | 92 | 85 | 81 | 76 | 71 |
| 25 | 104 | 104 | 101 | 97 | 94 | 87 | 83 | 78 | 72 |
| 20 | 104 | 104 | 101 | 98 | 95 | 89 | 85 | 80 | 74 |
| 15 | 104 | 104 | 101 | 98 | 95 | 92 | 87 | 82 | 76 |
| 10 | 104 | 104 | 101 | 98 | 95 | 92 | 89 | 84 | 78 |
| 5 | 104 | 104 | 101 | 98 | 95 | 92 | 89 | 86 | 80 |
| 0 | 104 | 104 | 101 | 98 | 95 | 92 | 89 | 86 | 82 |
| -60 | 105 | 105 | 102 | 99 | 96 | 93 | 90 | 86 | 82 |

# TO1 Takeoff Speeds - Wet Runway

## 10% Thrust Reduction

### Table 1 of 4: V1, VR, V2

| WEIGHT (1000 KG) | FLAPS 1 | | | FLAPS 5 | | | FLAPS 10 | | | FLAPS 15 | | | FLAPS 25 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 |
| 80 | 151 | 160 | 165 | 145 | 153 | 158 | | | | | | | | | |
| 75 | 145 | 154 | 160 | 138 | 148 | 153 | 135 | 144 | 150 | 133 | 141 | 147 | | | |
| 70 | 138 | 148 | 156 | 132 | 142 | 149 | 129 | 139 | 146 | 127 | 136 | 143 | 124 | 133 | 139 |
| 65 | 131 | 142 | 151 | 126 | 136 | 144 | 123 | 133 | 141 | 121 | 130 | 138 | 118 | 127 | 135 |
| 60 | 124 | 135 | 146 | 119 | 130 | 139 | 116 | 127 | 136 | 114 | 124 | 133 | 111 | 121 | 130 |
| 55 | 117 | 128 | 140 | 112 | 123 | 134 | 109 | 120 | 131 | 107 | 117 | 128 | 104 | 115 | 125 |
| 50 | 109 | 121 | 134 | 104 | 116 | 128 | 102 | 113 | 125 | 100 | 110 | 123 | 97 | 108 | 120 |
| 45 | 101 | 113 | 128 | 96 | 108 | 122 | 94 | 105 | 120 | 92 | 103 | 117 | 90 | 101 | 115 |
| 40 | 93 | 105 | 121 | 88 | 100 | 116 | 86 | 98 | 113 | 84 | 96 | 111 | 82 | 93 | 109 |

**Check V1(MCG).**

### Table 2 of 4: V1, VR, V2 Adjustments*

| TEMP (°C) | TAKEOFF SPEEDS ADJUSTMENTS (KIAS) | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | | | | | | | | | VR | | | | | | | | | V2 | | | | | | | | |
| | PRESS ALT (1000 FT) | | | | | | | | | PRESS ALT (1000 FT) | | | | | | | | | PRESS ALT (1000 FT) | | | | | | | | |
| | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 |
| 60 | 7 | 8 | 8 | 10 | 10 | 12 | 14 | 15 | 16 | 4 | 5 | 5 | 6 | 6 | 7 | 9 | 10 | 10 | -1 | -2 | -2 | -3 | -3 | -3 | -4 | -4 | -4 |
| 50 | 4 | 5 | 7 | 10 | 10 | 12 | 14 | 15 | 16 | 3 | 3 | 4 | 6 | 6 | 7 | 9 | 10 | 10 | -1 | -1 | -2 | -2 | -3 | -3 | -4 | -4 | -4 |
| 40 | 1 | 2 | 4 | 7 | 9 | 12 | 14 | 15 | 16 | 1 | 2 | 3 | 4 | 6 | 7 | 9 | 10 | 10 | 0 | -1 | -1 | -2 | -2 | -3 | -3 | -4 | -4 |
| 30 | 0 | 0 | 1 | 3 | 5 | 9 | 11 | 15 | 16 | 0 | 0 | 2 | 3 | 4 | 6 | 8 | 9 | 10 | 0 | 0 | 0 | -1 | -1 | -2 | -3 | -3 | -3 |
| 20 | 0 | 0 | 1 | 3 | 4 | 6 | 9 | 12 | 16 | 0 | 0 | 1 | 2 | 3 | 5 | 6 | 8 | 10 | 0 | 0 | 0 | -1 | -1 | -2 | -2 | -3 | -3 |
| 10 | 0 | 0 | 1 | 3 | 4 | 5 | 7 | 9 | 13 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 9 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -3 |
| 0 | 0 | 0 | 1 | 3 | 4 | 5 | 7 | 8 | 11 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -2 |
| -60 | 3 | 2 | 3 | 4 | 6 | 7 | 8 | 10 | 12 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -2 |

***V1 not to exceed VR.**

### Table 3 of 4: Slope and Wind V1 Adjustments*

| WEIGHT (1000 KG) | V1 SPEED ADJUSTMENTS (KIAS) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SLOPE (%) | | | | | WIND (KTS) | | | | | |
| | -2 | -1 | 0 | 1 | 2 | -15 | -10 | -5 | 0 | 20 | 40 |
| 80 | -5 | -3 | 0 | 3 | 5 | -3 | -2 | -1 | 0 | 1 | 3 |
| 70 | -4 | -2 | 0 | 2 | 4 | -4 | -2 | -1 | 0 | 1 | 3 |
| 60 | -3 | -2 | 0 | 2 | 4 | -4 | -3 | -1 | 0 | 2 | 3 |
| 50 | -3 | -1 | 0 | 1 | 3 | -4 | -3 | -1 | 0 | 2 | 3 |
| 40 | -2 | -1 | 0 | 1 | 2 | -4 | -3 | -1 | 0 | 2 | 3 |

***V1 not to exceed VR.**

# TO1 Takeoff Speeds - Wet Runway
## 10% Thrust Reduction
## Table 4 of 4: V1(MCG)

| TEMP (°C) | V1(MCG) (KIAS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PRESSURE ALTITUDE (FT) | | | | | | | | |
| | -2000 | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14500 |
| 60 | 94 | 92 | 90 | 87 | 84 | 82 | 79 | 75 | 71 |
| 55 | 94 | 92 | 90 | 87 | 84 | 82 | 79 | 75 | 71 |
| 50 | 96 | 94 | 90 | 87 | 84 | 82 | 79 | 75 | 71 |
| 45 | 99 | 96 | 92 | 88 | 84 | 82 | 79 | 75 | 71 |
| 40 | 101 | 99 | 95 | 90 | 85 | 82 | 79 | 75 | 71 |
| 35 | 103 | 101 | 97 | 93 | 88 | 83 | 79 | 75 | 71 |
| 30 | 104 | 104 | 99 | 95 | 92 | 85 | 81 | 76 | 71 |
| 25 | 104 | 104 | 101 | 97 | 94 | 87 | 83 | 78 | 72 |
| 20 | 104 | 104 | 101 | 98 | 95 | 89 | 85 | 80 | 74 |
| 15 | 104 | 104 | 101 | 98 | 95 | 92 | 87 | 82 | 76 |
| 10 | 104 | 104 | 101 | 98 | 95 | 92 | 89 | 84 | 78 |
| 5 | 104 | 104 | 101 | 98 | 95 | 92 | 89 | 86 | 80 |
| 0 | 104 | 104 | 101 | 98 | 95 | 92 | 89 | 86 | 82 |
| -60 | 105 | 105 | 102 | 99 | 96 | 93 | 90 | 86 | 82 |

# TO1 Stabilizer Trim Setting

## 10% Thrust Reduction

## Flaps 1 and 5

| WEIGHT (1000 KG) | STABILIZER TRIM SETTING (UNITS) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C.G. (%MAC) | | | | | | | | | | | | | | | |
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 |
| 82 | 8 1/2 | 8 1/2 | 8 1/2 | 8 1/4 | 7 3/4 | 7 1/2 | 7 1/4 | 6 3/4 | 6 1/2 | 6 | 5 3/4 | 5 1/2 | 5 | 4 3/4 | 4 1/4 | 4 |
| 80 | 8 1/2 | 8 1/2 | 8 1/2 | 8 1/4 | 7 3/4 | 7 1/2 | 7 | 6 3/4 | 6 1/2 | 6 | 5 3/4 | 5 1/4 | 5 | 4 1/2 | 4 1/4 | 3 3/4 |
| 70 | 8 1/2 | 8 1/2 | 8 1/4 | 7 3/4 | 7 1/2 | 7 1/4 | 6 3/4 | 6 1/2 | 6 | 5 3/4 | 5 1/4 | 5 | 4 1/2 | 4 1/4 | 3 3/4 | 3 1/2 |
| 60 | 8 1/4 | 8 | 7 3/4 | 7 1/4 | 7 | 6 3/4 | 6 1/4 | 6 | 5 3/4 | 5 1/4 | 5 | 4 1/2 | 4 1/4 | 3 3/4 | 3 1/2 | 3 1/4 |
| 50 | 7 1/2 | 7 1/4 | 7 | 6 3/4 | 6 1/4 | 6 | 5 3/4 | 5 1/4 | 5 | 4 3/4 | 4 1/4 | 4 | 3 1/2 | 3 1/4 | 3 | 3 |
| 40 | 6 1/2 | 6 1/4 | 5 3/4 | 5 1/2 | 5 1/4 | 5 | 4 3/4 | 4 1/4 | 4 | 3 3/4 | 3 1/2 | 3 1/4 | 3 | 3 | 3 | 3 |

## Flaps 10, 15, and 25

| WEIGHT (1000 KG) | STABILIZER TRIM SETTING (UNITS) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C.G. (%MAC) | | | | | | | | | | | | | | | |
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 |
| 82 | 8 1/2 | 8 1/2 | 8 1/4 | 7 3/4 | 7 1/4 | 6 3/4 | 6 1/2 | 6 | 5 1/2 | 5 1/4 | 4 3/4 | 4 1/4 | 3 3/4 | 3 1/2 | 3 | 3 |
| 80 | 8 1/2 | 8 1/2 | 8 1/4 | 7 3/4 | 7 1/4 | 6 3/4 | 6 1/4 | 6 | 5 1/2 | 5 | 4 3/4 | 4 1/4 | 3 3/4 | 3 1/4 | 3 | 3 |
| 70 | 8 1/2 | 8 1/4 | 7 3/4 | 7 1/4 | 6 3/4 | 6 1/4 | 6 | 5 1/2 | 5 1/4 | 4 3/4 | 4 1/4 | 3 3/4 | 3 1/2 | 3 | 3 | 3 |
| 60 | 8 1/4 | 7 3/4 | 7 1/4 | 6 3/4 | 6 1/4 | 5 3/4 | 5 1/2 | 5 | 4 3/4 | 4 1/4 | 3 3/4 | 3 1/2 | 3 | 3 | 3 | 3 |
| 50 | 7 | 6 3/4 | 6 1/4 | 5 3/4 | 5 1/2 | 5 | 4 3/4 | 4 1/4 | 4 | 3 1/2 | 3 1/4 | 3 | 3 | 3 | 3 | 3 |
| 40 | 5 1/2 | 5 1/4 | 5 | 4 1/2 | 4 1/4 | 4 | 3 1/2 | 3 1/4 | 3 1/4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

# ADVISORY INFORMATION

## TO1 Slush/Standing Water Takeoff

### 10% Thrust Reduction

### Maximum Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -6.4 | -8.2 | -9.9 | -11.4 | -8.8 | -10.5 | -12.2 | -13.7 | -13.2 | -14.9 | -16.6 | -18.2 |
| 80 | -5.6 | -7.3 | -9.1 | -10.6 | -7.4 | -9.2 | -10.9 | -12.4 | -10.8 | -12.5 | -14.2 | -15.8 |
| 70 | -4.6 | -6.3 | -8.0 | -9.6 | -5.9 | -7.6 | -9.3 | -10.9 | -8.3 | -10.0 | -11.7 | -13.3 |
| 60 | -3.2 | -4.9 | -6.7 | -8.2 | -4.1 | -5.8 | -7.5 | -9.1 | -5.6 | -7.3 | -9.1 | -10.6 |
| 50 | -1.6 | -3.3 | -5.0 | -6.6 | -2.0 | -3.8 | -5.5 | -7.0 | -2.8 | -4.5 | -6.3 | -7.8 |
| 40 | 0.0 | -1.5 | -3.2 | -4.7 | 0.0 | -1.5 | -3.2 | -4.8 | 0.0 | -1.6 | -3.3 | -4.9 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 39.8 | | | | 42.2 | | | | 46.4 | | | |
| 4200 | 55.3 | 33.8 | | | 57.4 | 36.4 | | | 60.6 | 40.9 | | |
| 4600 | 71.1 | 49.3 | 27.9 | | 72.7 | 51.5 | 30.5 | | 75.0 | 55.1 | 35.4 | |
| 5000 | 87.1 | 65.0 | 43.3 | | 88.2 | 66.8 | 45.6 | | 89.3 | 69.4 | 49.6 | 31.9 |
| 5400 | 103.3 | 80.9 | 58.9 | 39.4 | 103.7 | 82.2 | 60.8 | 41.9 | 103.8 | 83.8 | 63.9 | 46.1 |
| 5800 | | 97.0 | 74.7 | 55.0 | | 97.7 | 76.2 | 57.0 | | 98.2 | 78.2 | 60.3 |
| 6200 | | | 90.7 | 70.7 | | | 91.7 | 72.4 | | | 92.6 | 74.6 |
| 6600 | | | | 86.7 | | | | 87.8 | | | | 89.0 |
| 7000 | | | | 102.9 | | | | 103.4 | | | | 103.4 |

1. **Enter Table 1 with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable slush/standing water limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -11 | -6 | -1 | 0 | -7 | -2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | -13 | -8 | -3 | 0 | -10 | -5 | 0 | 0 | -1 | 0 | 0 | 0 |
| 70 | -14 | -9 | -4 | 0 | -12 | -7 | -2 | 0 | -4 | 0 | 0 | 0 |
| 60 | -16 | -11 | -6 | -2 | -14 | -9 | -4 | 0 | -8 | -3 | 0 | 0 |
| 50 | -18 | -13 | -8 | -4 | -17 | -12 | -7 | -2 | -13 | -8 | -3 | 0 |
| 40 | -22 | -17 | -12 | -7 | -21 | -16 | -11 | -6 | -19 | -14 | -9 | -4 |

1. **Obtain V1, VR and V2 for the actual weight using the TO1 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## TO1 Slush/Standing Water Takeoff
### 10% Thrust Reduction
### No Reverse Thrust
### Table 1 of 3: Weight Adjustment (1000 KG)

| TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -8.3 | -10.0 | -11.7 | -13.3 | -10.8 | -12.6 | -14.3 | -15.9 | -15.7 | -17.4 | -19.2 | -20.7 |
| 80 | -7.5 | -9.3 | -11.0 | -12.6 | -9.5 | -11.2 | -13.0 | -14.6 | -13.1 | -14.8 | -16.6 | -18.1 |
| 70 | -6.4 | -8.2 | -9.9 | -11.5 | -7.8 | -9.6 | -11.3 | -12.9 | -10.4 | -12.1 | -13.9 | -15.4 |
| 60 | -5.0 | -6.8 | -8.5 | -10.1 | -5.9 | -7.7 | -9.4 | -11.0 | -7.5 | -9.3 | -11.0 | -12.6 |
| 50 | -3.3 | -5.0 | -6.8 | -8.3 | -3.8 | -5.5 | -7.3 | -8.8 | -4.4 | -6.2 | -7.9 | -9.5 |
| 40 | -1.2 | -2.9 | -4.7 | -6.2 | -1.3 | -3.0 | -4.8 | -6.4 | -1.3 | -3.0 | -4.8 | -6.4 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 4200 | | | | | | | | | 26.4 | | | |
| 4600 | 12.9 | | | | 29.1 | | | | 48.0 | | | |
| 5000 | 47.6 | | | | 57.2 | 20.3 | | | 68.0 | 41.6 | | |
| 5400 | 75.4 | 37.4 | | | 80.3 | 49.3 | | | 86.3 | 62.2 | 35.1 | |
| 5800 | 97.6 | 67.8 | 26.9 | | 100.2 | 73.8 | 40.8 | | 103.6 | 81.0 | 56.2 | 31.4 |
| 6200 | | 91.3 | 59.7 | 20.9 | | 94.5 | 66.9 | 35.8 | | 98.4 | 75.5 | 52.7 |
| 6600 | | | 84.7 | 54.7 | | | 88.5 | 62.9 | | | 93.3 | 72.3 |
| 7000 | | | 105.9 | 80.9 | | | 107.9 | 85.1 | | | | 90.4 |
| 7400 | | | | 102.4 | | | | 104.7 | | | | |

1. **Enter Table 1 with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -120 ft/+120 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable slush/standing water limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -15 | -10 | -5 | 0 | -10 | -5 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | -17 | -12 | -7 | -3 | -13 | -8 | -3 | 0 | -2 | 0 | 0 | 0 |
| 70 | -20 | -15 | -10 | -5 | -16 | -11 | -6 | -1 | -6 | -1 | 0 | 0 |
| 60 | -23 | -18 | -13 | -8 | -20 | -15 | -10 | -5 | -12 | -7 | -2 | 0 |
| 50 | -26 | -21 | -16 | -12 | -24 | -19 | -14 | -10 | -19 | -14 | -9 | -4 |
| 40 | -30 | -25 | -20 | -16 | -29 | -24 | -19 | -15 | -27 | -22 | -17 | -12 |

1. **Obtain V1, VR and V2 for the actual weight using the TO1 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## TO1 Dry Snow Takeoff

### 10% Thrust Reduction

### Maximum Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -4.1 | -5.4 | -6.7 | -7.9 | -6.0 | -7.3 | -8.6 | -9.7 | -9.6 | -10.9 | -12.2 | -13.3 |
| 80 | -4.3 | -5.6 | -6.9 | -8.1 | -5.8 | -7.0 | -8.3 | -9.5 | -8.4 | -9.8 | -11.0 | -12.2 |
| 70 | -4.0 | -5.3 | -6.6 | -7.8 | -5.1 | -6.4 | -7.7 | -8.8 | -7.0 | -8.3 | -9.6 | -10.8 |
| 60 | -3.2 | -4.5 | -5.8 | -7.0 | -3.9 | -5.3 | -6.5 | -7.7 | -5.3 | -6.5 | -7.8 | -9.0 |
| 50 | -2.0 | -3.3 | -4.6 | -5.8 | -2.4 | -3.7 | -5.0 | -6.2 | -3.2 | -4.5 | -5.8 | -6.9 |
| 40 | -0.3 | -1.6 | -2.9 | -4.0 | -0.4 | -1.7 | -3.0 | -4.1 | -0.8 | -2.1 | -3.4 | -4.5 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 42.3 | | | | 45.6 | | | | 49.3 | 31.9 | | |
| 4200 | 57.6 | 37.1 | | | 60.1 | 40.7 | | | 62.5 | 44.9 | | |
| 4600 | 73.1 | 52.4 | 31.9 | | 74.6 | 55.2 | 35.9 | | 75.9 | 58.0 | 40.5 | |
| 5000 | 88.6 | 67.9 | 47.2 | 28.8 | 89.4 | 69.7 | 50.3 | 33.0 | 89.4 | 71.3 | 53.6 | 37.9 |
| 5400 | 104.2 | 83.4 | 62.6 | 44.1 | 104.2 | 84.4 | 64.8 | 47.3 | 103.2 | 84.8 | 66.8 | 50.9 |
| 5800 | | 99.0 | 78.1 | 59.5 | | 99.2 | 79.4 | 61.8 | | 98.5 | 80.2 | 64.1 |
| 6200 | | | 93.7 | 75.0 | | | 94.2 | 76.4 | | | 93.9 | 77.5 |
| 6600 | | | | 90.5 | | | | 91.1 | | | | 91.1 |

1. **Enter Table 1 with dry snow depth and TO1 dry field/obstacle limit weight to obtain dry snow weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable dry snow limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -8 | -3 | 0 | 0 | -5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | -10 | -5 | 0 | 0 | -7 | -2 | 0 | 0 | -2 | 0 | 0 | 0 |
| 70 | -13 | -8 | -3 | 0 | -10 | -5 | 0 | 0 | -5 | 0 | 0 | 0 |
| 60 | -15 | -10 | -5 | -1 | -13 | -8 | -3 | 0 | -8 | -3 | 0 | 0 |
| 50 | -18 | -13 | -8 | -4 | -16 | -11 | -6 | -1 | -12 | -7 | -2 | 0 |
| 40 | -21 | -16 | -11 | -6 | -19 | -14 | -9 | -4 | -15 | -10 | -5 | -1 |

1. **Obtain V1, VR and V2 for the actual weight using the TO1 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## TO1 Dry Snow Takeoff

### 10% Thrust Reduction

### No Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -5.9 | -7.0 | -8.3 | -9.3 | -7.8 | -9.0 | -10.2 | -11.2 | -11.2 | -12.5 | -13.7 | -14.7 |
| 80 | -6.2 | -7.3 | -8.6 | -9.7 | -7.6 | -8.8 | -10.0 | -11.1 | -10.3 | -11.5 | -12.7 | -13.8 |
| 70 | -5.9 | -7.1 | -8.3 | -9.4 | -7.0 | -8.2 | -9.4 | -10.5 | -8.9 | -10.2 | -11.3 | -12.4 |
| 60 | -5.1 | -6.3 | -7.5 | -8.6 | -5.8 | -7.0 | -8.2 | -9.3 | -7.1 | -8.3 | -9.5 | -10.6 |
| 50 | -3.8 | -4.9 | -6.2 | -7.2 | -4.1 | -5.3 | -6.5 | -7.6 | -4.8 | -6.0 | -7.2 | -8.3 |
| 40 | -1.8 | -3.0 | -4.2 | -5.3 | -1.9 | -3.1 | -4.3 | -5.4 | -2.0 | -3.3 | -4.4 | -5.5 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 4200 | | | | | 25.9 | | | | 41.9 | | | |
| 4600 | 34.3 | | | | 48.2 | 19.8 | | | 58.2 | 37.4 | | |
| 5000 | 62.0 | 26.0 | | | 68.7 | 42.2 | | | 74.2 | 53.8 | 32.9 | |
| 5400 | 84.0 | 55.1 | 17.7 | | 87.2 | 63.3 | 36.0 | | 89.9 | 69.8 | 49.3 | 30.5 |
| 5800 | 103.0 | 78.3 | 47.7 | 13.2 | 104.6 | 82.3 | 57.7 | 32.7 | 105.4 | 85.6 | 65.4 | 46.9 |
| 6200 | | 97.9 | 72.4 | 43.4 | | 99.8 | 77.2 | 54.6 | | 101.2 | 81.3 | 63.1 |
| 6600 | | | 92.7 | 69.1 | | | 95.1 | 74.5 | | | 96.9 | 79.0 |
| 7000 | | | | 89.9 | | | | 92.5 | | | | 94.6 |
| 7400 | | | | 108.6 | | | | | | | | |

1. **Enter Table 1 with dry snow depth and TO1 dry field/obstacle limit weight to obtain dry snow weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable dry snow limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -10 | -5 | 0 | 0 | -6 | -1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | -13 | -8 | -3 | 0 | -10 | -5 | 0 | 0 | -3 | 0 | 0 | 0 |
| 70 | -17 | -12 | -7 | -2 | -13 | -8 | -3 | 0 | -7 | -2 | 0 | 0 |
| 60 | -21 | -16 | -11 | -7 | -18 | -13 | -8 | -3 | -11 | -6 | -1 | 0 |
| 50 | -25 | -20 | -15 | -11 | -22 | -17 | -12 | -8 | -16 | -11 | -6 | -2 |
| 40 | -30 | -25 | -20 | -16 | -27 | -22 | -17 | -12 | -22 | -17 | -12 | -7 |

1. **Obtain V1, VR and V2 for the actual weight using the TO1 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## TO1 Wet Snow Takeoff

### 10% Thrust Reduction

### Maximum Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -5.0 | -6.4 | -7.8 | -9.0 | -6.8 | -8.2 | -9.6 | -10.8 | -12.3 | -13.7 | -15.1 | -16.3 |
| 80 | -4.9 | -6.3 | -7.7 | -8.9 | -6.4 | -7.8 | -9.1 | -10.3 | -10.6 | -11.9 | -13.3 | -14.5 |
| 70 | -4.4 | -5.8 | -7.1 | -8.3 | -5.4 | -6.8 | -8.1 | -9.3 | -8.4 | -9.8 | -11.2 | -12.4 |
| 60 | -3.3 | -4.6 | -6.0 | -7.2 | -3.9 | -5.3 | -6.7 | -7.9 | -5.9 | -7.3 | -8.6 | -9.8 |
| 50 | -1.7 | -3.0 | -4.4 | -5.6 | -2.0 | -3.4 | -4.7 | -5.9 | -3.0 | -4.4 | -5.7 | -6.9 |
| 40 | 0.0 | -0.9 | -2.3 | -3.5 | 0.0 | -0.9 | -2.3 | -3.5 | 0.0 | -1.1 | -2.4 | -3.7 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 40.6 | | | | 42.7 | | | | 46.7 | 28.5 | | |
| 4200 | 56.3 | 35.7 | | | 58.0 | 38.0 | | | 60.7 | 42.4 | | |
| 4600 | 72.2 | 51.4 | 30.8 | | 73.3 | 53.2 | 33.2 | | 74.7 | 56.3 | 38.1 | |
| 5000 | 88.3 | 67.2 | 46.4 | 27.9 | 88.8 | 68.5 | 48.5 | 30.5 | 88.8 | 70.3 | 52.0 | 35.6 |
| 5400 | 104.5 | 83.2 | 62.2 | 43.6 | 104.3 | 83.9 | 63.7 | 45.7 | 103.0 | 84.4 | 65.9 | 49.4 |
| 5800 | | 99.4 | 78.2 | 59.3 | | 99.4 | 79.1 | 61.0 | | 98.6 | 80.0 | 63.4 |
| 6200 | | | 94.3 | 75.3 | | | 94.6 | 76.3 | | | 94.1 | 77.4 |
| 6600 | | | | 91.4 | | | | 91.8 | | | | 91.6 |

1. **Enter Table 1 with wet snow depth and TO1 dry field/obstacle limit weight to obtain wet snow weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable wet snow limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -8 | -3 | 0 | 0 | -5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | -11 | -6 | -1 | 0 | -8 | -3 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70 | -13 | -8 | -3 | 0 | -10 | -5 | 0 | 0 | -3 | 0 | 0 | 0 |
| 60 | -16 | -11 | -6 | -1 | -13 | -8 | -3 | 0 | -7 | -2 | 0 | 0 |
| 50 | -19 | -14 | -9 | -4 | -17 | -12 | -7 | -3 | -12 | -7 | -2 | 0 |
| 40 | -23 | -18 | -13 | -9 | -22 | -17 | -12 | -8 | -20 | -15 | -10 | -5 |

1. **Obtain V1, VR and V2 for the actual weight using the TO1 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

## ADVISORY INFORMATION

# TO1 Wet Snow Takeoff

## 10% Thrust Reduction

## No Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -6.4 | -7.6 | -8.8 | -9.9 | -8.4 | -9.6 | -10.8 | -11.9 | -14.2 | -15.4 | -16.6 | -17.7 |
| 80 | -6.6 | -7.8 | -9.0 | -10.2 | -8.1 | -9.3 | -10.5 | -11.6 | -12.5 | -13.7 | -15.0 | -16.1 |
| 70 | -6.2 | -7.4 | -8.7 | -9.8 | -7.2 | -8.4 | -9.7 | -10.8 | -10.4 | -11.6 | -12.8 | -14.0 |
| 60 | -5.3 | -6.5 | -7.7 | -8.8 | -5.9 | -7.1 | -8.3 | -9.4 | -7.8 | -9.1 | -10.3 | -11.4 |
| 50 | -3.6 | -4.9 | -6.1 | -7.2 | -3.9 | -5.1 | -6.4 | -7.4 | -4.8 | -6.0 | -7.3 | -8.4 |
| 40 | -1.4 | -2.6 | -3.9 | -5.0 | -1.4 | -2.6 | -3.9 | -4.9 | -1.4 | -2.6 | -3.8 | -4.9 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 4200 | | | | | | | | | 31.2 | | | |
| 4600 | 23.8 | | | | 36.5 | | | | 52.0 | 26.2 | | |
| 5000 | 57.4 | 15.3 | | | 63.4 | 29.4 | | | 70.8 | 47.2 | 21.2 | |
| 5400 | 82.0 | 50.3 | 6.8 | | 84.8 | 57.7 | 22.3 | | 88.1 | 66.5 | 42.3 | |
| 5800 | 102.0 | 76.7 | 42.5 | | 103.2 | 80.0 | 51.6 | 18.9 | 104.2 | 84.1 | 62.1 | 39.9 |
| 6200 | | 97.4 | 71.1 | 38.4 | | 98.9 | 75.1 | 48.5 | | 100.4 | 80.1 | 59.9 |
| 6600 | | | 92.8 | 68.3 | | | 94.6 | 72.7 | | | 96.6 | 78.1 |
| 7000 | | | | 90.6 | | | | 92.5 | | | | 94.8 |

1. **Enter Table 1 with wet snow depth and TO1 dry field/obstacle limit weight to obtain wet snow weight adjustment.**
2. **Adjust field length available by -110 ft/+110 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable wet snow limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -10 | -5 | 0 | 0 | -6 | -1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | -14 | -9 | -4 | 0 | -10 | -5 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70 | -18 | -13 | -8 | -3 | -14 | -9 | -4 | 0 | -4 | 0 | 0 | 0 |
| 60 | -22 | -17 | -12 | -7 | -19 | -14 | -9 | -4 | -10 | -5 | 0 | 0 |
| 50 | -27 | -22 | -17 | -12 | -25 | -20 | -15 | -10 | -18 | -13 | -8 | -4 |
| 40 | -33 | -28 | -23 | -19 | -32 | -27 | -22 | -17 | -28 | -23 | -18 | -14 |

1. **Obtain V1, VR and V2 for the actual weight using the TO1 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## TO1 Slippery Runway Takeoff

### 10% Thrust Reduction

### Maximum Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -0.8 | -1.5 | -2.3 | -2.9 | -2.5 | -3.2 | -4.0 | -4.7 | -9.6 | -10.3 | -11.1 | -11.8 |
| 80 | -1.0 | -1.8 | -2.5 | -3.2 | -3.0 | -3.7 | -4.5 | -5.2 | -9.3 | -10.1 | -10.8 | -11.5 |
| 70 | -0.9 | -1.6 | -2.4 | -3.1 | -3.0 | -3.8 | -4.5 | -5.2 | -8.4 | -9.2 | -9.9 | -10.6 |
| 60 | -0.4 | -1.1 | -1.9 | -2.6 | -2.5 | -3.3 | -4.0 | -4.7 | -7.0 | -7.8 | -8.5 | -9.2 |
| 50 | 0.0 | -0.8 | -1.5 | -2.2 | -1.5 | -2.3 | -3.0 | -3.7 | -5.0 | -5.8 | -6.5 | -7.2 |
| 40 | 0.0 | -0.8 | -1.5 | -2.2 | -0.1 | -0.9 | -1.6 | -2.3 | -2.4 | -3.2 | -3.9 | -4.6 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 72.5 | 49.2 | 23.6 | | 39.7 | | | | | | | |
| 4200 | 92.0 | 70.7 | 47.2 | 24.1 | 56.1 | 34.4 | | | | | | |
| 4600 | | 90.3 | 68.9 | 47.6 | 72.7 | 50.7 | 29.1 | | | | | |
| 5000 | | | 88.7 | 69.3 | 89.6 | 67.3 | 45.4 | 26.0 | | | | |
| 5400 | | | 107.2 | 89.1 | 106.7 | 84.1 | 61.8 | 42.2 | | | | |
| 5800 | | | | 107.6 | | 101.2 | 78.6 | 58.7 | 37.2 | | | |
| 6200 | | | | | | | 95.6 | 75.3 | 44.3 | | | |
| 6600 | | | | | | | | 92.3 | 51.8 | | | |
| 7000 | | | | | | | | | 59.6 | 39.6 | | |
| 7400 | | | | | | | | | 67.9 | 46.8 | | |
| 7800 | | | | | | | | | 76.8 | 54.4 | 34.9 | |
| 8200 | | | | | | | | | 86.3 | 62.4 | 42.0 | |
| 8600 | | | | | | | | | 96.7 | 70.8 | 49.3 | |
| 9000 | | | | | | | | | | 79.9 | 57.0 | 39.2 |
| 9400 | | | | | | | | | | 89.7 | 65.2 | 46.4 |
| 9800 | | | | | | | | | | 100.3 | 73.8 | 53.9 |
| 10200 | | | | | | | | | | | 83.1 | 61.9 |
| 10600 | | | | | | | | | | | 93.2 | 70.3 |
| 11000 | | | | | | | | | | | | 79.3 |
| 11400 | | | | | | | | | | | | 89.1 |
| 11800 | | | | | | | | | | | | 99.7 |

1. **Enter Table 1 with reported braking action and TO1 dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -80 ft/+80 ft for every 10°C above/below 0°C.**
   **Adjust "Medium" field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
   **Adjust "Poor" field length available by -190 ft/+190 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable slippery runway limited weight is lesser of weights from Table 1 and Table 2.**

# ADVISORY INFORMATION

## TO1 Slippery Runway Takeoff
### 10% Thrust Reduction
### Maximum Reverse Thrust
### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -8 | -5 | -3 | 0 | -11 | -9 | -6 | -4 | -29 | -27 | -24 | -22 |
| 80 | -9 | -6 | -4 | -1 | -13 | -11 | -8 | -6 | -33 | -30 | -28 | -26 |
| 70 | -10 | -7 | -5 | -2 | -15 | -13 | -10 | -8 | -36 | -34 | -31 | -29 |
| 60 | -11 | -8 | -6 | -3 | -17 | -15 | -12 | -10 | -39 | -36 | -34 | -32 |
| 50 | -11 | -9 | -6 | -4 | -20 | -17 | -15 | -12 | -41 | -39 | -36 | -34 |
| 40 | -12 | -9 | -7 | -5 | -22 | -19 | -17 | -15 | -43 | -40 | -38 | -36 |

1. **Obtain V1, VR and V2 for the actual weight using the TO1 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## TO1 Slippery Runway Takeoff

### 10% Thrust Reduction

### No Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -2.3 | -2.9 | -3.5 | -4.1 | -4.3 | -4.9 | -5.5 | -6.0 | -13.4 | -14.0 | -14.6 | -15.1 |
| 80 | -2.4 | -3.1 | -3.7 | -4.3 | -4.9 | -5.5 | -6.1 | -6.7 | -12.9 | -13.5 | -14.1 | -14.7 |
| 70 | -2.2 | -2.9 | -3.4 | -4.0 | -4.9 | -5.5 | -6.2 | -6.7 | -11.7 | -12.3 | -13.0 | -13.5 |
| 60 | -1.6 | -2.2 | -2.8 | -3.4 | -4.4 | -5.0 | -5.6 | -6.2 | -9.8 | -10.5 | -11.1 | -11.6 |
| 50 | -0.5 | -1.1 | -1.8 | -2.3 | -3.3 | -3.9 | -4.5 | -5.0 | -7.3 | -7.9 | -8.5 | -9.0 |
| 40 | 0.0 | -0.6 | -1.2 | -1.8 | -1.5 | -2.1 | -2.7 | -3.3 | -3.9 | -4.6 | -5.2 | -5.8 |

## ADVISORY INFORMATION

# TO1 Slippery Runway Takeoff

## 10% Thrust Reduction

## No Reverse Thrust

## Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 53.1 | | | | | | | | | | | |
| 4000 | 69.3 | 26.0 | | | | | | | | | | |
| 4200 | 81.9 | 50.6 | | | | | | | | | | |
| 4400 | 92.7 | 67.5 | 22.7 | | | | | | | | | |
| 4600 | | 80.5 | 48.0 | | | | | | | | | |
| 4800 | | 91.4 | 65.7 | 25.0 | 36.7 | | | | | | | |
| 5000 | | | 79.0 | 49.9 | 55.4 | | | | | | | |
| 5200 | | | 90.1 | 66.9 | 70.1 | 25.9 | | | | | | |
| 5400 | | | | 80.0 | 82.5 | 46.3 | | | | | | |
| 5600 | | | | 91.0 | 93.5 | 62.7 | | | | | | |
| 5800 | | | | | | 76.2 | 35.7 | | | | | |
| 6000 | | | | | | 87.9 | 54.6 | | | | | |
| 6200 | | | | | | 98.4 | 69.4 | 30.1 | | | | |
| 6400 | | | | | | | 82.0 | 50.0 | | | | |
| 6600 | | | | | | | 93.0 | 65.7 | | | | |
| 6800 | | | | | | | | 78.7 | | | | |
| 7000 | | | | | | | | 90.1 | | | | |
| 11200 | | | | | | | | | 55.9 | | | |
| 11400 | | | | | | | | | 75.0 | | | |
| 11600 | | | | | | | | | 86.2 | | | |
| 11800 | | | | | | | | | 95.0 | | | |
| 12400 | | | | | | | | | | 64.3 | | |
| 12600 | | | | | | | | | | 79.0 | | |
| 12800 | | | | | | | | | | 89.2 | | |
| 13000 | | | | | | | | | | 97.7 | | |
| 13600 | | | | | | | | | | | 69.9 | |
| 13800 | | | | | | | | | | | 82.6 | |
| 14000 | | | | | | | | | | | 92.1 | |
| 14600 | | | | | | | | | | | | 68.3 |
| 14800 | | | | | | | | | | | | 81.5 |
| 15000 | | | | | | | | | | | | 91.2 |

1. **Enter Table 1 with reported braking action and TO1 dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -90 ft/+90 ft for every 10°C above/below 0°C.**
   **Adjust "Medium" field length available by -110 ft/+110 ft for every 10°C above/below 0°C.**
   **Adjust "Poor" field length available by -280 ft/+280 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable slippery runway limited weight is lesser of weights from Table 1 and Table 2.**

## ADVISORY INFORMATION

# TO1 Slippery Runway Takeoff

### 10% Thrust Reduction

### No Reverse Thrust

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -10 | -5 | 0 | 0 | -14 | -9 | -4 | 0 | -45 | -40 | -35 | -31 |
| 80 | -11 | -6 | -1 | 0 | -17 | -12 | -7 | -3 | -51 | -46 | -41 | -37 |
| 70 | -13 | -8 | -3 | 0 | -21 | -16 | -11 | -6 | -57 | -52 | -47 | -43 |
| 60 | -14 | -9 | -4 | 0 | -24 | -19 | -14 | -10 | -63 | -58 | -53 | -48 |
| 50 | -15 | -10 | -5 | 0 | -28 | -23 | -18 | -13 | -68 | -63 | -58 | -54 |
| 40 | -16 | -11 | -6 | -1 | -32 | -27 | -22 | -17 | -73 | -68 | -63 | -58 |

1. **Obtain V1, VR and V2 for the actual weight using the TO1 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

   **V1 not to exceed VR.**

# TO1 Takeoff %N1

## 10% Thrust Reduction

## Based on engine bleed for packs on and anti-ice off

| AIRPORT OAT (°C) | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| 60 | 81.9 | 82.4 | 82.9 | 83.0 | 82.5 | 82.0 | 81.6 | 81.1 | 80.7 | 80.3 | 79.8 | 79.4 | 78.9 | 78.0 | 77.1 | 76.0 | 75.5 | 75.5 |
| 55 | 83.3 | 83.6 | 84.1 | 84.1 | 83.7 | 83.2 | 82.7 | 82.3 | 81.9 | 81.4 | 81.0 | 80.6 | 80.1 | 79.1 | 78.2 | 77.2 | 76.3 | 75.9 |
| 50 | 84.3 | 84.9 | 85.5 | 85.1 | 84.8 | 84.3 | 83.8 | 83.4 | 83.0 | 82.5 | 82.1 | 81.7 | 81.2 | 80.3 | 79.4 | 78.3 | 77.5 | 77.0 |
| 45 | 85.2 | 85.8 | 86.3 | 86.1 | 85.7 | 85.2 | 84.9 | 84.5 | 84.1 | 83.6 | 83.2 | 82.8 | 82.3 | 81.4 | 80.5 | 79.4 | 78.6 | 78.2 |
| 40 | 86.1 | 86.7 | 87.2 | 87.2 | 87.1 | 86.8 | 86.2 | 85.4 | 85.1 | 84.7 | 84.3 | 83.9 | 83.4 | 82.5 | 81.6 | 80.5 | 79.7 | 79.3 |
| 35 | 86.9 | 87.6 | 88.1 | 88.1 | 88.0 | 87.9 | 87.8 | 87.5 | 86.9 | 86.0 | 85.2 | 84.8 | 84.4 | 83.5 | 82.7 | 81.7 | 80.8 | 80.4 |
| 30 | 86.5 | 87.7 | 89.0 | 88.8 | 88.8 | 88.8 | 88.7 | 88.6 | 88.5 | 88.3 | 86.1 | 85.8 | 85.4 | 84.6 | 83.7 | 82.8 | 82.0 | 81.6 |
| 25 | 85.7 | 87.0 | 88.2 | 88.5 | 88.9 | 89.0 | 89.0 | 89.3 | 89.2 | 89.2 | 87.0 | 86.6 | 86.3 | 85.5 | 84.7 | 83.9 | 83.1 | 82.7 |
| 20 | 84.9 | 86.2 | 87.4 | 87.7 | 88.0 | 88.3 | 88.6 | 88.9 | 89.1 | 89.2 | 87.9 | 87.6 | 87.2 | 86.5 | 85.7 | 85.0 | 84.2 | 83.8 |
| 15 | 84.2 | 85.4 | 86.6 | 86.9 | 87.2 | 87.5 | 87.8 | 88.1 | 88.5 | 88.8 | 88.9 | 88.5 | 88.2 | 87.4 | 86.7 | 86.0 | 85.3 | 85.0 |
| 10 | 83.4 | 84.7 | 85.9 | 86.1 | 86.4 | 86.7 | 87.1 | 87.4 | 87.7 | 88.0 | 88.4 | 88.8 | 89.1 | 88.4 | 87.8 | 87.2 | 86.5 | 86.1 |
| 5 | 82.7 | 83.9 | 85.1 | 85.4 | 85.7 | 86.0 | 86.3 | 86.6 | 86.9 | 87.2 | 87.6 | 88.0 | 88.3 | 88.3 | 88.4 | 88.2 | 87.6 | 87.3 |
| 0 | 81.9 | 83.1 | 84.3 | 84.6 | 84.9 | 85.2 | 85.5 | 85.8 | 86.1 | 86.5 | 86.8 | 87.2 | 87.6 | 87.6 | 87.7 | 87.7 | 87.7 | 87.8 |
| -5 | 81.1 | 82.3 | 83.5 | 83.8 | 84.1 | 84.4 | 84.7 | 85.0 | 85.3 | 85.6 | 86.0 | 86.4 | 86.8 | 86.8 | 86.9 | 86.9 | 87.0 | 87.0 |
| -10 | 80.3 | 81.5 | 82.7 | 83.0 | 83.3 | 83.6 | 83.8 | 84.2 | 84.5 | 84.8 | 85.2 | 85.6 | 86.0 | 86.1 | 86.1 | 86.2 | 86.2 | 86.2 |
| -15 | 79.6 | 80.7 | 81.9 | 82.2 | 82.5 | 82.8 | 83.0 | 83.3 | 83.7 | 84.0 | 84.4 | 84.9 | 85.2 | 85.3 | 85.3 | 85.4 | 85.4 | 85.4 |
| -20 | 78.8 | 80.0 | 81.1 | 81.4 | 81.7 | 82.0 | 82.2 | 82.5 | 82.8 | 83.2 | 83.6 | 84.1 | 84.4 | 84.5 | 84.5 | 84.6 | 84.6 | 84.6 |
| -25 | 78.0 | 79.2 | 80.3 | 80.6 | 80.9 | 81.2 | 81.4 | 81.7 | 82.0 | 82.4 | 82.8 | 83.2 | 83.6 | 83.7 | 83.7 | 83.8 | 83.8 | 83.8 |
| -30 | 77.2 | 78.4 | 79.5 | 79.8 | 80.1 | 80.4 | 80.6 | 80.9 | 81.2 | 81.6 | 82.0 | 82.4 | 82.8 | 82.9 | 82.9 | 83.0 | 83.0 | 83.0 |
| -35 | 76.4 | 77.6 | 78.7 | 79.0 | 79.3 | 79.5 | 79.8 | 80.1 | 80.4 | 80.8 | 81.2 | 81.6 | 81.9 | 82.0 | 82.1 | 82.2 | 82.2 | 82.2 |
| -40 | 75.6 | 76.8 | 77.9 | 78.2 | 78.5 | 78.7 | 79.0 | 79.3 | 79.6 | 79.9 | 80.3 | 80.7 | 81.1 | 81.2 | 81.2 | 81.3 | 81.4 | 81.4 |
| -45 | 74.8 | 75.9 | 77.1 | 77.3 | 77.6 | 77.9 | 78.1 | 78.4 | 78.7 | 79.1 | 79.5 | 79.9 | 80.2 | 80.3 | 80.4 | 80.5 | 80.5 | 80.6 |
| -50 | 74.0 | 75.1 | 76.2 | 76.5 | 76.8 | 77.0 | 77.3 | 77.6 | 77.9 | 78.2 | 78.6 | 79.0 | 79.3 | 79.4 | 79.5 | 79.6 | 79.7 | 79.7 |

## %N1 Adjustments for Engine Bleeds

| BLEED CONFIGURATION | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| PACKS OFF | 0.5 | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.7 | 1.8 |
| ENGINE ANTI-ICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -0.6 | -0.6 | -0.6 | -0.5 | 0.0 | 0.0 |

# TO1 Assumed Temperature Reduced Thrust

## Maximum Assumed Temperature (Table 1 of 3)

## Based on 25% Takeoff Thrust Reduction

| OAT (°C) | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| 60 | 78 | 80 | 81 | 81 | 80 | 79 | 77 | 76 | 75 | 73 | 72 | 71 | 69 | 67 | 64 | 61 | 60 | 59 |
| 55 | 78 | 80 | 81 | 81 | 80 | 79 | 77 | 76 | 75 | 73 | 72 | 71 | 69 | 67 | 64 | 61 | 59 | 57 |
| 50 | 77 | 77 | 77 | 78 | 77 | 77 | 77 | 76 | 75 | 73 | 72 | 71 | 69 | 67 | 64 | 61 | 59 | 57 |
| 45 | 72 | 72 | 72 | 73 | 73 | 73 | 73 | 72 | 72 | 72 | 72 | 71 | 69 | 67 | 64 | 61 | 59 | 57 |
| 40 | 68 | 68 | 68 | 68 | 67 | 67 | 67 | 68 | 68 | 68 | 67 | 67 | 67 | 67 | 64 | 61 | 59 | 57 |
| 35 | 64 | 64 | 64 | 64 | 63 | 62 | 61 | 60 | 61 | 62 | 63 | 63 | 63 | 62 | 62 | 62 | 59 | 58 |
| 30 | 63 | 61 | 59 | 60 | 59 | 57 | 56 | 55 | 54 | 53 | 58 | 58 | 58 | 58 | 58 | 57 | 57 | 57 |
| 25 | 63 | 62 | 59 | 59 | 56 | 54 | 53 | 51 | 50 | 49 | 54 | 54 | 54 | 53 | 53 | 53 | 53 | 53 |
| 20 | 64 | 62 | 59 | 59 | 57 | 54 | 52 | 50 | 48 | 46 | 49 | 49 | 49 | 49 | 48 | 48 | 48 | 48 |
| 15 | 64 | 62 | 59 | 59 | 57 | 54 | 52 | 50 | 48 | 46 | 44 | 44 | 44 | 43 | 43 | 43 | 43 | 43 |
| 10 | 64 | 62 | 60 | 59 | 57 | 54 | 52 | 50 | 48 | 46 | 43 | 41 | 39 | 38 | 38 | 38 | 37 | 37 |
| 5 | 64 | 62 | 60 | 59 | 57 | 54 | 52 | 50 | 48 | 46 | 43 | 41 | 39 | 37 | 34 | 32 | 32 | 32 |
| 0 | 64 | 62 | 60 | 59 | 57 | 54 | 52 | 50 | 48 | 46 | 43 | 41 | 39 | 37 | 34 | 32 | 29 | 28 |
| -5 & BELOW | 64 | 62 | 60 | 59 | 57 | 54 | 52 | 50 | 48 | 46 | 43 | 41 | 39 | 37 | 34 | 32 | 29 | 28 |

## Takeoff %N1 (Table 2 of 3)

## Based on engine bleed for packs on and engine anti-ice off

| ASSUMED TEMP (°C) | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| 75 | 78.3 | 78.8 | 79.3 | 79.4 | 78.9 | 78.4 | 78.0 | 77.5 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.0 | 76.6 | 76.5 | 76.4 |
| 70 | 79.5 | 80.0 | 80.6 | 80.6 | 80.2 | 79.7 | 79.2 | 78.7 | 78.3 | 77.8 | 77.4 | 77.0 | 76.6 | 76.6 | 76.6 | 76.6 | 76.1 | 75.8 |
| 65 | 80.7 | 81.2 | 81.8 | 81.8 | 81.4 | 80.9 | 80.4 | 79.9 | 79.5 | 79.1 | 78.7 | 78.2 | 77.7 | 76.8 | 76.0 | 76.0 | 76.0 | 76.0 |
| 60 | 81.9 | 82.4 | 82.9 | 83.0 | 82.5 | 82.0 | 81.6 | 81.1 | 80.7 | 80.3 | 79.8 | 79.4 | 78.9 | 78.0 | 77.1 | 76.0 | 75.5 | 75.5 |
| 55 | 83.3 | 83.6 | 84.1 | 84.1 | 83.7 | 83.2 | 82.7 | 82.3 | 81.9 | 81.4 | 81.0 | 80.6 | 80.1 | 79.1 | 78.2 | 77.2 | 76.3 | 75.9 |
| 50 | 84.3 | 84.9 | 85.5 | 85.1 | 84.8 | 84.3 | 83.8 | 83.4 | 83.0 | 82.5 | 82.1 | 81.7 | 81.2 | 80.3 | 79.4 | 78.3 | 77.5 | 77.0 |
| 45 | 85.2 | 85.8 | 86.3 | 86.1 | 85.7 | 85.2 | 84.9 | 84.5 | 84.1 | 83.6 | 83.2 | 82.8 | 82.3 | 81.4 | 80.5 | 79.4 | 78.6 | 78.2 |
| 40 | 86.1 | 86.7 | 87.2 | 87.2 | 87.1 | 86.8 | 86.2 | 85.4 | 85.1 | 84.7 | 84.3 | 83.9 | 83.4 | 82.5 | 81.6 | 80.5 | 79.7 | 79.3 |
| 35 | 86.9 | 87.6 | 88.1 | 88.1 | 88.0 | 87.9 | 87.8 | 87.5 | 86.9 | 86.0 | 85.2 | 84.8 | 84.4 | 83.5 | 82.7 | 81.7 | 80.8 | 80.4 |
| 30 | 86.5 | 87.7 | 89.0 | 88.8 | 88.8 | 88.8 | 88.7 | 88.6 | 88.5 | 88.3 | 86.1 | 85.8 | 85.4 | 84.6 | 83.7 | 82.8 | 82.0 | 81.6 |
| 25 | 85.7 | 87.0 | 88.2 | 88.5 | 88.9 | 89.0 | 89.0 | 89.3 | 89.2 | 89.2 | 87.0 | 86.6 | 86.3 | 85.5 | 84.7 | 83.9 | 83.1 | 82.7 |
| 20 | 84.9 | 86.2 | 87.4 | 87.7 | 88.0 | 88.3 | 88.6 | 88.9 | 89.1 | 89.2 | 87.9 | 87.6 | 87.2 | 86.5 | 85.7 | 85.0 | 84.2 | 83.8 |
| 15 | 84.2 | 85.4 | 86.6 | 86.9 | 87.2 | 87.5 | 87.8 | 88.1 | 88.5 | 88.8 | 88.9 | 88.5 | 88.2 | 87.4 | 86.7 | 86.0 | 85.3 | 85.0 |
| 10 | 83.4 | 84.7 | 85.9 | 86.1 | 86.4 | 86.7 | 87.1 | 87.4 | 87.7 | 88.0 | 88.4 | 88.8 | 89.1 | 88.4 | 87.8 | 87.2 | 86.5 | 86.1 |
| 5 | 82.7 | 83.9 | 85.1 | 85.4 | 85.7 | 86.0 | 86.3 | 86.6 | 86.9 | 87.2 | 87.6 | 88.0 | 88.3 | 88.3 | 88.4 | 88.2 | 87.6 | 87.3 |
| 0 | 81.9 | 83.1 | 84.3 | 84.6 | 84.9 | 85.2 | 85.5 | 85.8 | 86.1 | 86.5 | 86.8 | 87.2 | 87.6 | 87.6 | 87.7 | 87.7 | 87.7 | 87.8 |
| -5 | 81.1 | 82.3 | 83.5 | 83.8 | 84.1 | 84.4 | 84.7 | 85.0 | 85.3 | 85.6 | 86.0 | 86.4 | 86.8 | 86.8 | 86.9 | 86.9 | 87.0 | 87.0 |
| -20 | 78.8 | 80.0 | 81.1 | 81.4 | 81.7 | 82.0 | 82.2 | 82.5 | 82.8 | 83.2 | 83.6 | 84.1 | 84.4 | 84.5 | 84.5 | 84.6 | 84.6 | 84.6 |
| -40 | 75.6 | 76.8 | 77.9 | 78.2 | 78.5 | 78.7 | 79.0 | 79.3 | 79.6 | 79.9 | 80.3 | 80.7 | 81.1 | 81.2 | 81.2 | 81.3 | 81.4 | 81.4 |
| MINIMUM ASSUMED TEMP (°C) | 34 | 32 | 30 | 28 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 10 | 8 | 6 | 4 | 2 | 1 |

# TO1 Assumed Temperature Reduced Thrust
## %N1 Adjustment for Temperature Difference (Table 3 of 3)

| ASSUMED TEMP MINUS OAT (°C) | OUTSIDE AIR TEMPERATURE (°C) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -40 | -20 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 115 | 8.3 | | | | | | | | | | | | | |
| 110 | 8.3 | | | | | | | | | | | | | |
| 105 | 8.3 | | | | | | | | | | | | | |
| 100 | 7.2 | | | | | | | | | | | | | |
| 95 | 5.5 | 8.6 | | | | | | | | | | | | |
| 90 | 4.1 | 8.6 | | | | | | | | | | | | |
| 85 | 2.7 | 8.6 | | | | | | | | | | | | |
| 80 | 1.4 | 7.4 | | | | | | | | | | | | |
| 75 | 0.1 | 5.7 | 9.0 | | | | | | | | | | | |
| 70 | 0.0 | 4.2 | 8.8 | 8.8 | | | | | | | | | | |
| 65 | 0.0 | 2.8 | 8.3 | 8.2 | 8.2 | | | | | | | | | |
| 60 | 0.0 | 1.4 | 7.7 | 7.7 | 7.6 | 7.6 | | | | | | | | |
| 55 | 0.0 | 0.0 | 5.9 | 7.1 | 7.1 | 7.0 | 6.9 | | | | | | | |
| 50 | 0.0 | 0.0 | 4.4 | 6.0 | 6.5 | 6.5 | 6.3 | 6.1 | | | | | | |
| 45 | 0.0 | 0.0 | 2.9 | 4.5 | 5.9 | 5.9 | 5.7 | 5.6 | 5.4 | | | | | |
| 40 | 0.0 | 0.0 | 1.4 | 3.0 | 4.5 | 5.3 | 5.2 | 5.0 | 4.9 | 4.7 | | | | |
| 35 | | 0.0 | 0.0 | 1.5 | 3.0 | 4.6 | 4.6 | 4.4 | 4.3 | 4.2 | 4.1 | | | |
| 30 | | 0.0 | 0.0 | 0.1 | 1.5 | 3.1 | 4.0 | 3.8 | 3.7 | 3.6 | 3.5 | 3.4 | | |
| 25 | | 0.0 | 0.0 | 0.0 | 0.1 | 1.6 | 3.1 | 3.2 | 3.1 | 3.1 | 3.0 | 2.9 | 1.9 | |
| 20 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 1.6 | 2.6 | 2.5 | 2.5 | 2.4 | 2.3 | 1.9 | 0.2 |
| 15 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 1.7 | 1.9 | 1.9 | 1.8 | 1.8 | 1.7 | 0.2 |
| 10 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 0.2 |
| 5 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.6 | 0.6 | 0.6 | 0.6 | 0.2 |
| 0 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

1. **Determine Maximum Assumed Temperature allowed from Table 1.**
2. **Find Maximum %N1 from Table 2 using the desired assumed temperature (no greater than temperature from Table 1).**
3. **Use the difference between assumed temperature and OAT to determine the %N1 adjustment from Table 3.**
4. **Subtract %N1 adjustment from Maximum %N1 in Table 2.**

# TO2 Takeoff Speeds - Dry Runway

## 20% Thrust Reduction

### Table 1 of 4: V1, VR, V2

| WEIGHT (1000 KG) | FLAPS 1 | | | FLAPS 5 | | | FLAPS 10 | | | FLAPS 15 | | | FLAPS 25 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 |
| 70 | 150 | 150 | 155 | 144 | 144 | 148 | 140 | 140 | 144 | 138 | 138 | 142 | | | |
| 65 | 144 | 144 | 150 | 138 | 138 | 143 | 134 | 134 | 140 | 132 | 132 | 137 | 129 | 129 | 135 |
| 60 | 137 | 137 | 145 | 131 | 131 | 138 | 128 | 128 | 135 | 126 | 126 | 132 | 123 | 123 | 130 |
| 55 | 130 | 130 | 139 | 124 | 124 | 133 | 121 | 121 | 130 | 119 | 119 | 127 | 117 | 117 | 125 |
| 50 | 123 | 123 | 133 | 117 | 117 | 127 | 114 | 114 | 124 | 112 | 112 | 122 | 110 | 110 | 119 |
| 45 | 115 | 115 | 127 | 110 | 110 | 121 | 107 | 107 | 119 | 105 | 105 | 116 | 103 | 103 | 114 |
| 40 | 106 | 106 | 120 | 102 | 102 | 115 | 99 | 99 | 112 | 97 | 97 | 110 | 95 | 95 | 108 |

**Check V1(MCG).**

### Table 2 of 4: V1, VR, V2 Adjustments*

| TEMP (°C) | TAKEOFF SPEEDS ADJUSTMENTS (KIAS) | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | | | | | | | | | VR | | | | | | | | | V2 | | | | | | | | |
| | PRESS ALT (1000 FT) | | | | | | | | | PRESS ALT (1000 FT) | | | | | | | | | PRESS ALT (1000 FT) | | | | | | | | |
| | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 |
| 60 | 4 | 5 | 6 | 6 | 6 | 7 | 9 | 10 | 10 | 4 | 5 | 5 | 6 | 6 | 7 | 9 | 10 | 10 | -2 | -2 | -2 | -3 | -3 | -3 | -4 | -4 | -4 |
| 50 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 10 | 3 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 10 | -1 | -1 | -1 | -2 | -3 | -3 | -4 | -4 | -4 |
| 40 | 1 | 2 | 3 | 4 | 6 | 7 | 9 | 10 | 10 | 1 | 2 | 3 | 4 | 6 | 7 | 9 | 10 | 10 | 0 | 0 | -1 | -1 | -2 | -2 | -3 | -4 | -4 |
| 30 | 0 | 0 | 2 | 3 | 4 | 6 | 7 | 10 | 10 | 0 | 0 | 2 | 3 | 4 | 6 | 7 | 9 | 10 | 0 | 0 | 0 | -1 | -1 | -2 | -2 | -2 | -4 |
| 20 | 0 | 0 | 1 | 2 | 3 | 5 | 7 | 8 | 10 | 0 | 0 | 1 | 2 | 3 | 5 | 6 | 8 | 10 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -4 |
| 10 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 9 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 9 | 0 | 0 | 0 | -1 | -1 | -1 | -1 | -2 | -2 |
| 0 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 0 | -1 | -1 | -1 | -1 | -1 | -2 |
| -60 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 0 | -1 | -1 | -1 | -1 | -1 | -2 |

***V1 not to exceed VR.**

### Table 3 of 4: Slope and Wind V1 Adjustments*

| WEIGHT (1000 KG) | V1 SPEED ADJUSTMENTS (KIAS) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SLOPE (%) | | | | | WIND (KTS) | | | | | | |
| | -2 | -1 | 0 | 1 | 2 | -15 | -10 | -5 | 0 | 20 | 40 |
| 70 | -3 | -2 | 0 | 0 | 0 | -1 | 0 | 0 | 0 | 0 | 0 |
| 60 | -2 | -1 | 0 | 0 | 0 | -2 | -1 | -1 | 0 | 0 | 0 |
| 50 | -1 | -1 | 0 | 0 | 0 | -2 | -1 | -1 | 0 | 0 | 0 |
| 40 | -1 | -1 | 0 | 0 | 0 | -2 | -1 | -1 | 0 | 0 | 0 |

***V1 not to exceed VR.**

# TO2 Takeoff Speeds - Dry Runway

## 20% Thrust Reduction

## Table 4 of 4: V1(MCG)

| TEMP (°C) | V1(MCG) (KIAS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PRESSURE ALTITUDE (FT) | | | | | | | | |
| | -2000 | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14500 |
| 60 | 89 | 87 | 85 | 82 | 80 | 77 | 75 | 71 | 68 |
| 55 | 89 | 87 | 85 | 82 | 80 | 77 | 75 | 71 | 68 |
| 50 | 91 | 89 | 85 | 82 | 80 | 77 | 75 | 71 | 68 |
| 45 | 93 | 91 | 87 | 83 | 80 | 77 | 75 | 71 | 68 |
| 40 | 96 | 94 | 90 | 85 | 81 | 77 | 75 | 71 | 68 |
| 35 | 98 | 96 | 92 | 88 | 84 | 79 | 75 | 71 | 68 |
| 30 | 98 | 98 | 94 | 90 | 87 | 81 | 77 | 72 | 68 |
| 25 | 98 | 98 | 95 | 92 | 88 | 82 | 78 | 74 | 68 |
| 20 | 98 | 98 | 95 | 92 | 89 | 84 | 80 | 76 | 70 |
| 15 | 98 | 98 | 95 | 92 | 89 | 86 | 82 | 77 | 72 |
| 10 | 98 | 98 | 95 | 92 | 89 | 87 | 84 | 80 | 74 |
| 5 | 98 | 98 | 95 | 92 | 90 | 87 | 84 | 81 | 76 |
| 0 | 98 | 98 | 95 | 92 | 90 | 87 | 84 | 81 | 77 |
| -60 | 99 | 99 | 96 | 93 | 90 | 87 | 85 | 82 | 77 |

# TO2 Takeoff Speeds - Wet Runway

## 20% Thrust Reduction

### Table 1 of 4: V1, VR, V2

| WEIGHT (1000 KG) | FLAPS 1 | | | FLAPS 5 | | | FLAPS 10 | | | FLAPS 15 | | | FLAPS 25 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 | V1 | VR | V2 |
| 70 | 142 | 150 | 155 | 136 | 144 | 148 | 133 | 140 | 144 | 132 | 138 | 142 | | | |
| 65 | 135 | 144 | 150 | 130 | 138 | 143 | 127 | 134 | 140 | 125 | 132 | 137 | 122 | 129 | 135 |
| 60 | 128 | 137 | 145 | 123 | 131 | 138 | 120 | 128 | 135 | 118 | 126 | 132 | 115 | 123 | 130 |
| 55 | 121 | 130 | 139 | 116 | 124 | 133 | 113 | 121 | 130 | 111 | 119 | 127 | 108 | 117 | 125 |
| 50 | 113 | 123 | 133 | 108 | 117 | 127 | 106 | 114 | 124 | 103 | 112 | 122 | 101 | 110 | 119 |
| 45 | 105 | 115 | 127 | 100 | 110 | 121 | 98 | 107 | 119 | 96 | 105 | 116 | 94 | 103 | 114 |
| 40 | 97 | 106 | 120 | 92 | 102 | 115 | 90 | 99 | 112 | 88 | 97 | 110 | 86 | 95 | 108 |

**Check V1(MCG).**

### Table 2 of 4: V1, VR, V2 Adjustments*

| TEMP (°C) | TAKEOFF SPEEDS ADJUSTMENTS (KIAS) | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | | | | | | | | | VR | | | | | | | | | V2 | | | | | | | | |
| | PRESS ALT (1000 FT) | | | | | | | | | PRESS ALT (1000 FT) | | | | | | | | | PRESS ALT (1000 FT) | | | | | | | | |
| | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 | -2 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14.5 |
| 60 | 6 | 7 | 7 | 9 | 10 | 11 | 13 | 13 | 13 | 4 | 5 | 5 | 6 | 6 | 7 | 9 | 10 | 10 | -2 | -2 | -2 | -3 | -3 | -3 | -4 | -4 | -4 |
| 50 | 3 | 4 | 7 | 9 | 10 | 11 | 13 | 13 | 13 | 3 | 3 | 4 | 5 | 6 | 7 | 9 | 10 | 10 | -1 | -1 | -1 | -2 | -3 | -3 | -4 | -4 | -4 |
| 40 | 1 | 2 | 4 | 6 | 9 | 11 | 13 | 13 | 13 | 1 | 2 | 3 | 4 | 6 | 7 | 9 | 10 | 10 | 0 | 0 | -1 | -1 | -2 | -2 | -3 | -4 | -4 |
| 30 | 0 | 0 | 1 | 3 | 5 | 9 | 11 | 11 | 11 | 0 | 0 | 2 | 3 | 4 | 6 | 7 | 9 | 10 | 0 | 0 | 0 | -1 | -1 | -2 | -2 | -2 | -4 |
| 20 | 0 | 0 | 1 | 2 | 4 | 6 | 8 | 11 | 11 | 0 | 0 | 1 | 2 | 3 | 5 | 6 | 8 | 10 | 0 | 0 | 0 | -1 | -1 | -1 | -2 | -2 | -4 |
| 10 | 0 | 0 | 1 | 2 | 4 | 5 | 6 | 9 | 11 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 9 | 0 | 0 | 0 | -1 | -1 | -1 | -1 | -2 | -2 |
| 0 | 0 | 0 | 1 | 2 | 4 | 5 | 6 | 8 | 10 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 0 | -1 | -1 | -1 | -1 | -1 | -2 |
| -60 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 9 | 11 | 0 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 0 | 0 | -1 | -1 | -1 | -1 | -1 | -2 |

***V1 not to exceed VR.**

### Table 3 of 4: Slope and Wind V1 Adjustments*

| WEIGHT (1000 KG) | V1 SPEED ADJUSTMENTS (KIAS) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | SLOPE (%) | | | | | WIND (KTS) | | | | | |
| | -2 | -1 | 0 | 1 | 2 | -15 | -10 | -5 | 0 | 20 | 40 |
| 70 | -5 | -2 | 0 | 2 | 5 | -3 | -2 | -1 | 0 | 1 | 3 |
| 60 | -3 | -2 | 0 | 2 | 4 | -4 | -2 | -1 | 0 | 1 | 3 |
| 50 | -3 | -1 | 0 | 1 | 3 | -4 | -3 | -1 | 0 | 2 | 3 |
| 40 | -2 | -1 | 0 | 1 | 2 | -4 | -3 | -1 | 0 | 2 | 3 |

***V1 not to exceed VR.**

### Table 4 of 4: V1(MCG)

| TEMP (°C) | V1(MCG) (KIAS) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PRESSURE ALTITUDE (FT) | | | | | | | | |
| | -2000 | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14500 |
| 60 | 89 | 87 | 85 | 82 | 80 | 77 | 75 | 71 | 68 |
| 55 | 89 | 87 | 85 | 82 | 80 | 77 | 75 | 71 | 68 |
| 50 | 91 | 89 | 85 | 82 | 80 | 77 | 75 | 71 | 68 |
| 45 | 93 | 91 | 87 | 83 | 80 | 77 | 75 | 71 | 68 |
| 40 | 96 | 94 | 90 | 85 | 81 | 77 | 75 | 71 | 68 |
| 35 | 98 | 96 | 92 | 88 | 84 | 79 | 75 | 71 | 68 |
| 30 | 98 | 98 | 94 | 90 | 87 | 81 | 77 | 72 | 68 |
| 25 | 98 | 98 | 95 | 92 | 88 | 82 | 78 | 74 | 68 |
| 20 | 98 | 98 | 95 | 92 | 89 | 84 | 80 | 76 | 70 |
| 15 | 98 | 98 | 95 | 92 | 89 | 86 | 82 | 77 | 72 |
| 10 | 98 | 98 | 95 | 92 | 89 | 87 | 84 | 80 | 74 |
| 5 | 98 | 98 | 95 | 92 | 90 | 87 | 84 | 81 | 76 |
| 0 | 98 | 98 | 95 | 92 | 90 | 87 | 84 | 81 | 77 |
| -60 | 99 | 99 | 96 | 93 | 90 | 87 | 85 | 82 | 77 |

# TO2 Stabilizer Trim Setting
## 20% Thrust Reduction
### Flaps 1 and 5

| WEIGHT (1000 KG) | STABILIZER TRIM SETTING (UNITS) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C.G. (%MAC) | | | | | | | | | | | | | | | |
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 |
| 82 | 8 1/2 | 8 1/2 | 8 1/2 | 8 1/2 | 8 1/4 | 8 | 7 1/2 | 7 1/4 | 6 3/4 | 6 1/2 | 6 | 5 3/4 | 5 1/2 | 5 | 4 3/4 | 4 1/4 |
| 80 | 8 1/2 | 8 1/2 | 8 1/2 | 8 1/2 | 8 1/4 | 7 3/4 | 7 1/2 | 7 1/4 | 6 3/4 | 6 1/2 | 6 | 5 3/4 | 5 1/4 | 5 | 4 1/2 | 4 1/4 |
| 70 | 8 1/2 | 8 1/2 | 8 1/2 | 8 1/4 | 8 | 7 3/4 | 7 1/4 | 7 | 6 1/2 | 6 1/4 | 5 3/4 | 5 1/2 | 5 | 4 3/4 | 4 1/4 | 4 |
| 60 | 8 1/2 | 8 1/2 | 8 1/4 | 8 | 7 3/4 | 7 1/4 | 7 | 6 3/4 | 6 1/4 | 6 | 5 1/2 | 5 1/4 | 4 3/4 | 4 1/2 | 4 | 3 3/4 |
| 50 | 8 1/2 | 8 1/4 | 7 3/4 | 7 1/2 | 7 1/4 | 6 3/4 | 6 1/2 | 6 1/4 | 5 3/4 | 5 1/2 | 5 | 4 3/4 | 4 1/4 | 4 | 3 1/2 | 3 1/4 |
| 40 | 7 1/2 | 7 1/4 | 7 | 6 1/2 | 6 1/4 | 6 | 5 1/2 | 5 1/4 | 5 | 4 1/2 | 4 1/4 | 4 | 3 1/2 | 3 1/4 | 3 | 3 |

### Flaps 10, 15, and 25

| WEIGHT (1000 KG) | STABILIZER TRIM SETTING (UNITS) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C.G. (%MAC) | | | | | | | | | | | | | | | |
| | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 |
| 82 | 8 1/2 | 8 1/2 | 8 1/2 | 8 1/4 | 7 3/4 | 7 1/4 | 6 3/4 | 6 1/2 | 6 | 5 1/2 | 5 1/4 | 4 3/4 | 4 1/4 | 3 3/4 | 3 1/2 | 3 |
| 80 | 8 1/2 | 8 1/2 | 8 1/2 | 8 1/4 | 7 3/4 | 7 | 6 3/4 | 6 1/4 | 6 | 5 1/2 | 5 | 4 3/4 | 4 1/4 | 3 3/4 | 3 1/2 | 3 |
| 70 | 8 1/2 | 8 1/2 | 8 1/2 | 8 | 7 1/2 | 7 | 6 1/2 | 6 | 5 3/4 | 5 1/4 | 4 3/4 | 4 1/4 | 4 | 3 1/2 | 3 | 3 |
| 60 | 8 1/2 | 8 1/2 | 8 | 7 1/2 | 7 | 6 1/2 | 6 1/4 | 5 3/4 | 5 1/4 | 4 3/4 | 4 1/2 | 4 | 3 1/2 | 3 | 3 | 3 |
| 50 | 8 | 7 1/2 | 7 1/4 | 6 3/4 | 6 1/4 | 6 | 5 1/2 | 5 | 4 3/4 | 4 1/4 | 3 3/4 | 3 1/2 | 3 | 3 | 3 | 3 |
| 40 | 6 3/4 | 6 1/2 | 6 | 5 3/4 | 5 1/4 | 5 | 4 1/2 | 4 1/4 | 3 3/4 | 3 1/4 | 3 | 3 | 3 | 3 | 3 | 3 |

# ADVISORY INFORMATION

## TO2 Slush/Standing Water Takeoff

### 20% Thrust Reduction

### Maximum Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -6.0 | -7.8 | -9.5 | -11.0 | -8.5 | -10.2 | -11.9 | -13.5 | -13.3 | -15.0 | -16.7 | -18.3 |
| 80 | -5.4 | -7.1 | -8.8 | -10.4 | -7.3 | -9.0 | -10.8 | -12.3 | -11.0 | -12.7 | -14.4 | -16.0 |
| 70 | -4.5 | -6.2 | -7.9 | -9.5 | -5.9 | -7.7 | -9.4 | -10.9 | -8.6 | -10.3 | -12.0 | -13.6 |
| 60 | -3.4 | -5.1 | -6.8 | -8.3 | -4.3 | -6.0 | -7.7 | -9.3 | -6.0 | -7.7 | -9.4 | -11.0 |
| 50 | -1.9 | -3.6 | -5.3 | -6.8 | -2.4 | -4.1 | -5.8 | -7.3 | -3.3 | -5.0 | -6.7 | -8.3 |
| 40 | -0.1 | -1.8 | -3.5 | -5.1 | -0.2 | -1.9 | -3.6 | -5.2 | -0.4 | -2.1 | -3.9 | -5.4 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 50.4 | 28.1 | | | 52.6 | 30.7 | | | 56.1 | 35.6 | | |
| 4200 | 66.7 | 44.2 | | | 68.5 | 46.5 | | | 71.0 | 50.4 | 29.9 | |
| 4600 | 83.3 | 60.4 | 37.9 | | 84.5 | 62.3 | 40.4 | | 86.0 | 65.2 | 44.7 | |
| 5000 | 100.2 | 76.9 | 54.1 | 33.9 | 100.7 | 78.3 | 56.2 | 36.5 | 101.0 | 80.2 | 59.5 | 41.0 |
| 5400 | | 93.6 | 70.5 | 50.0 | | 94.4 | 72.1 | 52.2 | | 95.1 | 74.4 | 55.8 |
| 5800 | | | 87.1 | 66.4 | | | 88.2 | 68.1 | | | 89.3 | 70.7 |
| 6200 | | | 104.0 | 82.9 | | | 104.4 | 84.2 | | | 104.3 | 85.6 |
| 6600 | | | | 99.8 | | | | 100.3 | | | | 100.6 |

1. **Enter Table 1 with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable slush/standing water limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -8 | -3 | 0 | 0 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | -10 | -5 | 0 | 0 | -6 | -1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70 | -11 | -6 | -1 | 0 | -8 | -3 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60 | -13 | -8 | -3 | 0 | -11 | -6 | -1 | 0 | -5 | 0 | 0 | 0 |
| 50 | -16 | -11 | -6 | -1 | -14 | -9 | -4 | 0 | -10 | -5 | 0 | 0 |
| 40 | -20 | -15 | -10 | -5 | -19 | -14 | -9 | -4 | -16 | -11 | -6 | -2 |

1. **Obtain V1, VR and V2 for the actual weight using the TO2 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

## ADVISORY INFORMATION

# TO2 Slush/Standing Water Takeoff

## 20% Thrust Reduction

## No Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -7.6 | -9.3 | -11.1 | -12.7 | -10.4 | -12.1 | -13.9 | -15.5 | -15.6 | -17.4 | -19.1 | -20.7 |
| 80 | -7.0 | -8.8 | -10.5 | -12.1 | -9.2 | -10.9 | -12.7 | -14.2 | -13.2 | -14.9 | -16.6 | -18.2 |
| 70 | -6.2 | -8.0 | -9.7 | -11.3 | -7.8 | -9.5 | -11.3 | -12.8 | -10.6 | -12.3 | -14.1 | -15.6 |
| 60 | -5.0 | -6.8 | -8.5 | -10.1 | -6.1 | -7.8 | -9.6 | -11.1 | -7.8 | -9.6 | -11.3 | -12.9 |
| 50 | -3.4 | -5.2 | -6.9 | -8.5 | -4.0 | -5.8 | -7.5 | -9.1 | -4.9 | -6.7 | -8.4 | -10.0 |
| 40 | -1.5 | -3.3 | -5.0 | -6.6 | -1.7 | -3.4 | -5.2 | -6.8 | -1.8 | -3.6 | -5.3 | -6.9 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 4200 | 12.3 | | | | 28.6 | | | | 47.6 | | | |
| 4600 | 48.8 | | | | 58.1 | 19.4 | | | 68.7 | 40.9 | | |
| 5000 | 77.6 | 38.2 | | | 82.3 | 49.9 | | | 88.0 | 62.6 | 34.0 | |
| 5400 | 100.7 | 69.8 | 27.1 | | 103.1 | 75.5 | 41.0 | | 106.1 | 82.4 | 56.3 | 30.1 |
| 5800 | | 94.1 | 61.4 | 20.8 | | 97.0 | 68.3 | 35.7 | | 100.7 | 76.6 | 52.7 |
| 6200 | | | 87.3 | 56.2 | | | 90.8 | 64.1 | | | 95.3 | 73.3 |
| 6600 | | | 109.5 | 83.3 | | | | 87.3 | | | | 92.2 |
| 7000 | | | | 105.8 | | | | 107.8 | | | | |

1. **Enter Table 1 with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -120 ft/+120 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable slush/standing water limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | SLUSH/STANDING WATER DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 mm (0.12 INCHES) | | | | 6 mm (0.25 INCHES) | | | | 13 mm (0.50 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -10 | -5 | 0 | 0 | -5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | -13 | -8 | -3 | 0 | -8 | -3 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70 | -15 | -10 | -5 | -1 | -11 | -6 | -1 | 0 | 0 | 0 | 0 | 0 |
| 60 | -19 | -14 | -9 | -4 | -15 | -10 | -5 | -1 | -7 | -2 | 0 | 0 |
| 50 | -23 | -18 | -13 | -8 | -21 | -16 | -11 | -6 | -15 | -10 | -5 | 0 |
| 40 | -27 | -22 | -17 | -13 | -26 | -21 | -16 | -12 | -23 | -18 | -13 | -9 |

1. **Obtain V1, VR and V2 for the actual weight using the TO2 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## TO2 Dry Snow Takeoff

### 20% Thrust Reduction

### Maximum Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -3.6 | -4.9 | -6.2 | -7.3 | -5.5 | -6.8 | -8.1 | -9.2 | -9.3 | -10.7 | -11.9 | -13.1 |
| 80 | -3.9 | -5.2 | -6.5 | -7.6 | -5.4 | -6.7 | -8.0 | -9.2 | -8.3 | -9.6 | -10.9 | -12.1 |
| 70 | -3.8 | -5.1 | -6.4 | -7.6 | -4.9 | -6.3 | -7.5 | -8.7 | -7.1 | -8.3 | -9.7 | -10.8 |
| 60 | -3.3 | -4.5 | -5.9 | -7.0 | -4.0 | -5.3 | -6.6 | -7.8 | -5.4 | -6.7 | -8.0 | -9.2 |
| 50 | -2.2 | -3.4 | -4.8 | -5.9 | -2.6 | -3.9 | -5.2 | -6.4 | -3.4 | -4.8 | -6.0 | -7.2 |
| 40 | -0.5 | -1.9 | -3.1 | -4.3 | -0.7 | -2.0 | -3.3 | -4.4 | -1.1 | -2.4 | -3.7 | -4.9 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 51.0 | 30.0 | | | 53.8 | 34.1 | | | 56.8 | 38.9 | | |
| 4200 | 66.8 | 45.7 | | | 68.7 | 48.8 | 29.1 | | 70.4 | 52.2 | 34.4 | |
| 4600 | 82.7 | 61.5 | 40.4 | | 83.7 | 63.7 | 43.8 | | 84.2 | 65.8 | 47.7 | 31.7 |
| 5000 | 98.7 | 77.3 | 56.1 | 37.2 | 98.9 | 78.7 | 58.7 | 40.8 | 98.3 | 79.5 | 61.2 | 45.0 |
| 5400 | | 93.3 | 72.0 | 52.9 | | 93.8 | 73.6 | 55.6 | | 93.5 | 74.9 | 58.4 |
| 5800 | | | 87.9 | 68.7 | | | 88.6 | 70.5 | | | 88.8 | 72.1 |
| 6200 | | | 103.9 | 84.6 | | | 103.8 | 85.6 | | | 102.9 | 85.9 |
| 6600 | | | | 100.6 | | | | 100.7 | | | | 100.0 |

1. **Enter Table 1 with dry snow depth and TO2 dry field/obstacle limit weight to obtain dry snow weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable dry snow limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -5 | 0 | 0 | 0 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | -7 | -2 | 0 | 0 | -5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70 | -10 | -5 | 0 | 0 | -7 | -2 | 0 | 0 | -2 | 0 | 0 | 0 |
| 60 | -13 | -8 | -3 | 0 | -10 | -5 | 0 | 0 | -5 | 0 | 0 | 0 |
| 50 | -16 | -11 | -6 | -1 | -13 | -8 | -3 | 0 | -9 | -4 | 0 | 0 |
| 40 | -19 | -14 | -9 | -4 | -16 | -11 | -6 | -2 | -13 | -8 | -3 | 0 |

1. **Obtain V1, VR and V2 for the actual weight using the TO2 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## TO2 Dry Snow Takeoff

### 20% Thrust Reduction

### No Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -4.9 | -6.1 | -7.3 | -8.4 | -6.9 | -8.2 | -9.3 | -10.4 | -10.7 | -11.8 | -13.1 | -14.2 |
| 80 | -5.4 | -6.6 | -7.8 | -8.9 | -7.0 | -8.2 | -9.4 | -10.5 | -9.9 | -11.1 | -12.3 | -13.4 |
| 70 | -5.5 | -6.8 | -7.9 | -9.0 | -6.7 | -7.9 | -9.1 | -10.2 | -8.8 | -10.0 | -11.2 | -12.3 |
| 60 | -5.0 | -6.2 | -7.4 | -8.5 | -5.8 | -7.0 | -8.2 | -9.3 | -7.2 | -8.4 | -9.6 | -10.7 |
| 50 | -3.9 | -5.1 | -6.3 | -7.3 | -4.3 | -5.5 | -6.7 | -7.8 | -5.1 | -6.3 | -7.5 | -8.6 |
| 40 | -2.1 | -3.3 | -4.5 | -5.6 | -2.2 | -3.4 | -4.6 | -5.7 | -2.4 | -3.7 | -4.9 | -5.9 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 4200 | 27.4 | | | | 43.2 | | | | 54.5 | 33.0 | | |
| 4600 | 57.2 | 18.8 | | | 64.9 | 36.9 | | | 71.1 | 49.9 | 28.3 | |
| 5000 | 80.7 | 49.6 | | | 84.4 | 59.1 | 30.5 | | 87.4 | 66.6 | 45.3 | 25.8 |
| 5400 | 100.6 | 74.7 | 41.5 | | 102.4 | 79.2 | 53.3 | 27.1 | 103.5 | 83.0 | 62.0 | 42.8 |
| 5800 | | 95.3 | 68.4 | 36.9 | | 97.5 | 73.9 | 50.0 | | 99.1 | 78.5 | 59.6 |
| 6200 | | | 90.0 | 64.8 | | | 92.6 | 70.9 | | | 94.6 | 76.1 |
| 6600 | | | 109.2 | 87.0 | | | | 89.9 | | | | 92.3 |
| 7000 | | | | 106.4 | | | | 107.8 | | | | |

1. **Enter Table 1 with dry snow depth and TO2 dry field/obstacle limit weight to obtain dry snow weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable dry snow limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | DRY SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 mm (1.18 INCHES) | | | | 60 mm (2.36 INCHES) | | | | 100 mm (4.00 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -6 | -1 | 0 | 0 | -2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | -9 | -4 | 0 | 0 | -6 | -1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70 | -13 | -8 | -3 | 0 | -9 | -4 | 0 | 0 | -3 | 0 | 0 | 0 |
| 60 | -17 | -12 | -7 | -3 | -14 | -9 | -4 | 0 | -7 | -2 | 0 | 0 |
| 50 | -22 | -17 | -12 | -7 | -18 | -13 | -8 | -4 | -12 | -7 | -2 | 0 |
| 40 | -27 | -22 | -17 | -12 | -23 | -18 | -13 | -9 | -18 | -13 | -8 | -3 |

1. **Obtain V1, VR and V2 for the actual weight using the TO2 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## TO2 Wet Snow Takeoff

### 20% Thrust Reduction

### Maximum Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -4.4 | -5.7 | -7.1 | -8.3 | -6.3 | -7.6 | -9.0 | -10.2 | -12.1 | -13.5 | -14.8 | -16.1 |
| 80 | -4.5 | -5.9 | -7.2 | -8.4 | -6.0 | -7.3 | -8.7 | -9.9 | -10.5 | -11.8 | -13.2 | -14.4 |
| 70 | -4.2 | -5.6 | -6.9 | -8.2 | -5.4 | -6.7 | -8.1 | -9.3 | -8.6 | -10.0 | -11.3 | -12.6 |
| 60 | -3.4 | -4.8 | -6.1 | -7.3 | -4.1 | -5.5 | -6.8 | -8.1 | -6.3 | -7.6 | -9.0 | -10.2 |
| 50 | -2.0 | -3.4 | -4.7 | -5.9 | -2.4 | -3.7 | -5.1 | -6.3 | -3.5 | -4.9 | -6.3 | -7.5 |
| 40 | 0.0 | -1.4 | -2.8 | -4.0 | 0.0 | -1.4 | -2.8 | -4.0 | -0.4 | -1.7 | -3.1 | -4.3 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 49.8 | 28.7 | | | 51.7 | 31.2 | | | 54.9 | 36.3 | | |
| 4200 | 66.0 | 44.7 | | | 67.3 | 46.8 | | | 69.2 | 50.5 | 31.8 | |
| 4600 | 82.3 | 60.9 | 39.7 | | 83.1 | 62.4 | 41.9 | | 83.6 | 64.7 | 46.0 | 29.3 |
| 5000 | 98.9 | 77.2 | 55.8 | 36.8 | 98.9 | 78.2 | 57.5 | 39.1 | 98.1 | 79.1 | 60.3 | 43.4 |
| 5400 | | 93.7 | 72.1 | 52.9 | | 94.0 | 73.2 | 54.7 | | 93.6 | 74.6 | 57.7 |
| 5800 | | | 88.5 | 69.1 | | | 89.0 | 70.4 | | | 89.0 | 72.0 |
| 6200 | | | 105.1 | 85.5 | | | 104.9 | 86.2 | | | 103.6 | 86.4 |
| 6600 | | | | 102.1 | | | | 102.0 | | | | 100.9 |

1. **Enter Table 1 with wet snow depth and TO2 dry field/obstacle limit weight to obtain wet snow weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable wet snow limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -4 | 0 | 0 | 0 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | -8 | -3 | 0 | 0 | -4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70 | -10 | -5 | 0 | 0 | -7 | -2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60 | -13 | -8 | -3 | 0 | -10 | -5 | 0 | 0 | -3 | 0 | 0 | 0 |
| 50 | -16 | -11 | -6 | -2 | -15 | -10 | -5 | 0 | -9 | -4 | 0 | 0 |
| 40 | -21 | -16 | -11 | -7 | -20 | -15 | -10 | -5 | -17 | -12 | -7 | -3 |

1. **Obtain V1, VR and V2 for the actual weight using the TO2 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## TO2 Wet Snow Takeoff
### 20% Thrust Reduction
### No Reverse Thrust
### Table 1 of 3: Weight Adjustment (1000 KG)

| TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -5.2 | -6.4 | -7.6 | -8.7 | -7.4 | -8.6 | -9.8 | -10.9 | -13.6 | -14.8 | -16.0 | -17.1 |
| 80 | -5.7 | -6.9 | -8.2 | -9.3 | -7.4 | -8.6 | -9.8 | -10.9 | -12.2 | -13.4 | -14.6 | -15.7 |
| 70 | -5.8 | -7.0 | -8.3 | -9.3 | -6.9 | -8.2 | -9.4 | -10.5 | -10.4 | -11.6 | -12.8 | -14.0 |
| 60 | -5.2 | -6.4 | -7.6 | -8.8 | -5.9 | -7.1 | -8.3 | -9.4 | -8.1 | -9.3 | -10.6 | -11.7 |
| 50 | -3.9 | -5.1 | -6.4 | -7.4 | -4.2 | -5.4 | -6.6 | -7.8 | -5.4 | -6.6 | -7.8 | -8.9 |
| 40 | -1.9 | -3.1 | -4.4 | -5.4 | -1.9 | -3.1 | -4.4 | -5.4 | -2.0 | -3.3 | -4.5 | -5.6 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 4200 | 16.9 | | | | 30.7 | | | | 48.1 | 21.7 | | |
| 4600 | 52.3 | 8.3 | | | 59.2 | 23.5 | | | 67.7 | 43.1 | | |
| 5000 | 78.6 | 44.5 | | | 81.7 | 53.1 | 16.3 | | 85.5 | 63.2 | 38.1 | |
| 5400 | 99.4 | 73.0 | 36.0 | | 100.7 | 76.7 | 46.6 | 12.8 | 102.0 | 81.4 | 58.6 | 35.6 |
| 5800 | | 94.7 | 67.1 | 31.9 | | 96.3 | 71.6 | 43.3 | | 98.1 | 77.2 | 56.4 |
| 6200 | | | 89.9 | 64.1 | | | 91.9 | 69.0 | | | 94.2 | 75.2 |
| 6600 | | | 109.7 | 87.6 | | | | 89.8 | | | | 92.4 |
| 7000 | | | | 107.4 | | | | 108.2 | | | | |

1. **Enter Table 1 with wet snow depth and TO2 dry field/obstacle limit weight to obtain wet snow weight adjustment.**
2. **Adjust field length available by -110 ft/+110 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable wet snow limited weight is lesser of weights from Table 1 and Table 2.**

### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | WET SNOW DEPTH | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 mm (0.20 INCHES) | | | | 13 mm (0.50 INCHES) | | | | 30 mm (1.18 INCHES) | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -5 | 0 | 0 | 0 | -1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80 | -9 | -4 | 0 | 0 | -5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70 | -14 | -9 | -4 | 0 | -9 | -4 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60 | -18 | -13 | -8 | -3 | -15 | -10 | -5 | 0 | -5 | 0 | 0 | 0 |
| 50 | -23 | -18 | -13 | -9 | -21 | -16 | -11 | -6 | -14 | -9 | -4 | 0 |
| 40 | -30 | -25 | -20 | -15 | -28 | -23 | -18 | -14 | -25 | -20 | -15 | -10 |

1. **Obtain V1, VR and V2 for the actual weight using the TO2 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## TO2 Slippery Runway Takeoff

### 20% Thrust Reduction

### Maximum Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | 0.0 | -0.7 | -1.4 | -2.1 | -1.2 | -2.0 | -2.7 | -3.4 | -8.3 | -9.0 | -9.8 | -10.5 |
| 80 | -0.4 | -1.1 | -1.9 | -2.6 | -2.0 | -2.8 | -3.5 | -4.2 | -8.3 | -9.1 | -9.8 | -10.5 |
| 70 | -0.6 | -1.4 | -2.1 | -2.8 | -2.5 | -3.2 | -4.0 | -4.6 | -7.9 | -8.7 | -9.4 | -10.1 |
| 60 | -0.4 | -1.1 | -1.9 | -2.5 | -2.4 | -3.1 | -3.9 | -4.5 | -6.8 | -7.6 | -8.3 | -9.0 |
| 50 | 0.0 | -0.7 | -1.5 | -2.1 | -1.7 | -2.4 | -3.2 | -3.9 | -5.1 | -5.9 | -6.6 | -7.3 |
| 40 | -0.1 | -0.8 | -1.6 | -2.2 | -0.5 | -1.2 | -2.0 | -2.6 | -2.8 | -3.5 | -4.3 | -4.9 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 84.6 | 61.2 | 35.0 | | 49.6 | 26.8 | | | | | | |
| 4200 | 104.4 | 82.8 | 59.2 | 35.5 | 67.2 | 44.0 | | | | | | |
| 4600 | | 102.6 | 81.0 | 59.7 | 85.0 | 61.4 | 38.4 | | | | | |
| 5000 | | | 100.9 | 81.4 | 103.1 | 79.2 | 55.7 | 35.1 | | | | |
| 5400 | | | | 101.3 | | 97.2 | 73.4 | 52.4 | 36.1 | | | |
| 5800 | | | | | | | 91.3 | 70.0 | 43.7 | | | |
| 6200 | | | | | | | | 87.8 | 51.5 | | | |
| 6600 | | | | | | | | 106.0 | 59.8 | 38.6 | | |
| 7000 | | | | | | | | | 68.6 | 46.3 | | |
| 7400 | | | | | | | | | 78.1 | 54.3 | | |
| 7800 | | | | | | | | | 88.3 | 62.7 | 41.2 | |
| 8200 | | | | | | | | | 99.4 | 71.7 | 48.9 | |
| 8600 | | | | | | | | | | 81.4 | 57.1 | 38.2 |
| 9000 | | | | | | | | | | 92.0 | 65.7 | 45.8 |
| 9400 | | | | | | | | | | | 74.9 | 53.8 |
| 9800 | | | | | | | | | | | 84.9 | 62.2 |
| 10200 | | | | | | | | | | | 95.8 | 71.2 |
| 10600 | | | | | | | | | | | | 80.8 |
| 11000 | | | | | | | | | | | | 91.3 |

1. **Enter Table 1 with reported braking action and TO2 dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -80 ft/+80 ft for every 10°C above/below 0°C.**
   **Adjust "Medium" field length available by -100 ft/+100 ft for every 10°C above/below 0°C.**
   **Adjust "Poor" field length available by -190 ft/+190 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable slippery runway limited weight is lesser of weights from Table 1 and Table 2.**

# ADVISORY INFORMATION

## TO2 Slippery Runway Takeoff
### 20% Thrust Reduction
### Maximum Reverse Thrust
### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -6 | -3 | -1 | 0 | -9 | -7 | -4 | -2 | -26 | -23 | -21 | -18 |
| 80 | -7 | -5 | -2 | 0 | -11 | -9 | -6 | -4 | -29 | -26 | -24 | -22 |
| 70 | -8 | -5 | -3 | -1 | -13 | -10 | -8 | -6 | -32 | -29 | -27 | -25 |
| 60 | -9 | -6 | -4 | -2 | -15 | -12 | -10 | -8 | -34 | -32 | -29 | -27 |
| 50 | -9 | -7 | -4 | -2 | -17 | -14 | -12 | -10 | -36 | -34 | -31 | -29 |
| 40 | -10 | -7 | -5 | -3 | -19 | -17 | -14 | -12 | -38 | -35 | -33 | -31 |

1. **Obtain V1, VR and V2 for the actual weight using the TO2 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# ADVISORY INFORMATION

## TO2 Slippery Runway Takeoff

### 20% Thrust Reduction

### No Reverse Thrust

### Table 1 of 3: Weight Adjustment (1000 KG)

| TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -1.6 | -2.2 | -2.8 | -3.4 | -3.0 | -3.6 | -4.3 | -4.8 | -12.0 | -12.6 | -13.2 | -13.8 |
| 80 | -2.0 | -2.6 | -3.2 | -3.8 | -3.9 | -4.5 | -5.2 | -5.7 | -11.9 | -12.5 | -13.1 | -13.7 |
| 70 | -2.0 | -2.6 | -3.3 | -3.8 | -4.4 | -5.0 | -5.6 | -6.2 | -11.2 | -11.7 | -12.4 | -12.9 |
| 60 | -1.6 | -2.2 | -2.9 | -3.4 | -4.2 | -4.8 | -5.4 | -5.9 | -9.7 | -10.3 | -10.9 | -11.4 |
| 50 | -0.8 | -1.4 | -2.0 | -2.5 | -3.3 | -3.9 | -4.5 | -5.0 | -7.3 | -7.9 | -8.6 | -9.1 |
| 40 | 0.0 | -0.6 | -1.2 | -1.8 | -1.7 | -2.4 | -2.9 | -3.5 | -4.3 | -4.9 | -5.5 | -6.0 |

### Table 2 of 3: V1(MCG) Limit Weight (1000 KG)

| ADJUSTED FIELD LENGTH (FT) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 3800 | 75.7 | 35.0 | | | | | | | | | | |
| 4000 | 88.1 | 58.3 | | | | | | | | | | |
| 4200 | 98.8 | 74.0 | 31.5 | | | | | | | | | |
| 4400 | | 86.6 | 56.0 | | 30.3 | | | | | | | |
| 4600 | | 97.5 | 72.3 | 34.0 | 51.3 | | | | | | | |
| 4800 | | | 85.2 | 57.6 | 67.6 | | | | | | | |
| 5000 | | | 96.2 | 73.5 | 81.2 | 40.7 | | | | | | |
| 5200 | | | | 86.2 | 93.0 | 59.5 | | | | | | |
| 5400 | | | | 97.1 | | 74.4 | 29.2 | | | | | |
| 5600 | | | | | | 87.0 | 50.3 | | | | | |
| 5800 | | | | | | 98.3 | 66.9 | 23.2 | | | | |
| 6000 | | | | | | | 80.6 | 45.0 | | | | |
| 6200 | | | | | | | 92.5 | 62.7 | | | | |
| 6400 | | | | | | | | 77.1 | | | | |
| 6600 | | | | | | | | 89.4 | | | | |
| 6800 | | | | | | | | 100.5 | | | | |
| 10600 | | | | | | | | | 71.3 | | | |
| 10800 | | | | | | | | | 84.3 | | | |
| 11000 | | | | | | | | | 94.0 | | | |
| 11600 | | | | | | | | | | 56.7 | | |
| 11800 | | | | | | | | | | 76.1 | | |
| 12000 | | | | | | | | | | 87.7 | | |
| 12200 | | | | | | | | | | 96.8 | | |
| 12800 | | | | | | | | | | | 65.1 | |
| 13000 | | | | | | | | | | | 80.2 | |
| 13200 | | | | | | | | | | | 90.8 | |
| 13800 | | | | | | | | | | | | 62.7 |
| 14000 | | | | | | | | | | | | 78.9 |
| 14200 | | | | | | | | | | | | 89.8 |
| 14400 | | | | | | | | | | | | 98.7 |

1. **Enter Table 1 with reported braking action and TO2 dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -90 ft/+90 ft for every 10°C above/below 0°C.**
   **Adjust "Medium" field length available by -110 ft/+110 ft for every 10°C above/below 0°C.**
   **Adjust "Poor" field length available by -280 ft/+280 ft for every 10°C above/below 0°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude (Table 2).**
4. **Max allowable slippery runway limited weight is lesser of weights from Table 1 and Table 2.**

# ADVISORY INFORMATION

## TO2 Slippery Runway Takeoff
### 20% Thrust Reduction
### No Reverse Thrust
### Table 3 of 3: V1 Adjustment (KIAS)

| WEIGHT (1000 KG) | REPORTED BRAKING ACTION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GOOD | | | | MEDIUM | | | | POOR | | | |
| | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | | PRESS ALT (FT) | | | |
| | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 | S.L. | 5000 | 10000 | 14500 |
| 90 | -8 | -3 | 0 | 0 | -12 | -7 | -2 | 0 | -39 | -34 | -29 | -25 |
| 80 | -9 | -4 | 0 | 0 | -15 | -10 | -5 | 0 | -45 | -40 | -35 | -31 |
| 70 | -11 | -6 | -1 | 0 | -18 | -13 | -8 | -3 | -50 | -45 | -40 | -36 |
| 60 | -12 | -7 | -2 | 0 | -21 | -16 | -11 | -6 | -55 | -50 | -45 | -41 |
| 50 | -13 | -8 | -3 | 0 | -24 | -19 | -14 | -10 | -60 | -55 | -50 | -45 |
| 40 | -13 | -8 | -3 | 0 | -28 | -23 | -18 | -13 | -64 | -59 | -54 | -50 |

1. **Obtain V1, VR and V2 for the actual weight using the TO2 Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter Table 3 with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.**

# TO2 Takeoff %N1

## 20% Thrust Reduction

## Based on bleed packs on and anti-ice off

| AIRPORT OAT (°C) | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| 60 | 77.8 | 78.3 | 78.8 | 78.9 | 78.4 | 78.0 | 77.5 | 77.1 | 76.7 | 76.3 | 75.9 | 75.5 | 75.4 | 75.4 | 75.4 | 75.4 | 75.5 | 75.5 |
| 55 | 79.2 | 79.6 | 80.0 | 80.1 | 79.6 | 79.1 | 78.7 | 78.2 | 77.8 | 77.3 | 76.9 | 76.5 | 76.1 | 75.2 | 74.9 | 74.9 | 74.9 | 74.9 |
| 50 | 80.3 | 80.8 | 81.4 | 81.1 | 80.7 | 80.3 | 79.8 | 79.4 | 78.9 | 78.5 | 78.1 | 77.7 | 77.2 | 76.3 | 75.4 | 74.4 | 74.3 | 74.3 |
| 45 | 81.2 | 81.8 | 82.3 | 82.1 | 81.7 | 81.2 | 80.9 | 80.5 | 80.1 | 79.6 | 79.2 | 78.8 | 78.3 | 77.4 | 76.5 | 75.4 | 74.6 | 74.2 |
| 40 | 82.1 | 82.7 | 83.2 | 83.1 | 83.1 | 82.8 | 82.2 | 81.4 | 81.1 | 80.7 | 80.3 | 79.9 | 79.4 | 78.5 | 77.6 | 76.6 | 75.7 | 75.3 |
| 35 | 82.9 | 83.5 | 84.1 | 84.1 | 84.0 | 83.9 | 83.8 | 83.5 | 82.9 | 82.0 | 81.3 | 80.9 | 80.5 | 79.6 | 78.7 | 77.7 | 76.9 | 76.5 |
| 30 | 82.5 | 83.7 | 84.9 | 84.7 | 84.7 | 84.7 | 84.6 | 84.6 | 84.5 | 84.3 | 82.1 | 81.8 | 81.4 | 80.6 | 79.8 | 78.9 | 78.1 | 77.7 |
| 25 | 81.8 | 83.0 | 84.2 | 84.5 | 84.8 | 84.9 | 85.0 | 85.2 | 85.1 | 85.1 | 83.0 | 82.7 | 82.3 | 81.6 | 80.8 | 80.0 | 79.2 | 78.8 |
| 20 | 81.0 | 82.2 | 83.4 | 83.7 | 84.0 | 84.3 | 84.6 | 84.9 | 85.0 | 85.2 | 83.9 | 83.6 | 83.2 | 82.5 | 81.8 | 81.1 | 80.3 | 79.9 |
| 15 | 80.3 | 81.5 | 82.7 | 83.0 | 83.3 | 83.5 | 83.8 | 84.1 | 84.4 | 84.7 | 84.8 | 84.5 | 84.2 | 83.4 | 82.7 | 82.1 | 81.4 | 81.1 |
| 10 | 79.6 | 80.8 | 82.0 | 82.2 | 82.5 | 82.8 | 83.1 | 83.4 | 83.7 | 84.0 | 84.3 | 84.7 | 85.0 | 84.4 | 83.8 | 83.2 | 82.5 | 82.2 |
| 5 | 78.9 | 80.0 | 81.2 | 81.5 | 81.8 | 82.0 | 82.4 | 82.6 | 82.9 | 83.3 | 83.6 | 84.0 | 84.3 | 84.3 | 84.4 | 84.2 | 83.6 | 83.3 |
| 0 | 78.1 | 79.3 | 80.5 | 80.8 | 81.1 | 81.3 | 81.6 | 81.9 | 82.2 | 82.5 | 82.9 | 83.2 | 83.6 | 83.6 | 83.7 | 83.7 | 83.7 | 83.8 |
| -5 | 77.4 | 78.5 | 79.7 | 80.0 | 80.3 | 80.5 | 80.8 | 81.1 | 81.4 | 81.7 | 82.1 | 82.5 | 82.8 | 82.9 | 82.9 | 83.0 | 83.0 | 83.0 |
| -10 | 76.6 | 77.8 | 79.0 | 79.2 | 79.5 | 79.8 | 80.0 | 80.3 | 80.6 | 81.0 | 81.4 | 81.7 | 82.1 | 82.2 | 82.2 | 82.2 | 82.3 | 82.3 |
| -15 | 75.9 | 77.1 | 78.2 | 78.5 | 78.8 | 79.0 | 79.2 | 79.5 | 79.9 | 80.2 | 80.6 | 81.0 | 81.3 | 81.4 | 81.5 | 81.5 | 81.5 | 81.5 |
| -20 | 75.2 | 76.3 | 77.5 | 77.7 | 78.0 | 78.2 | 78.5 | 78.8 | 79.1 | 79.4 | 79.8 | 80.2 | 80.6 | 80.6 | 80.7 | 80.7 | 80.8 | 80.8 |
| -25 | 74.4 | 75.6 | 76.7 | 77.0 | 77.2 | 77.5 | 77.7 | 78.0 | 78.3 | 78.7 | 79.1 | 79.5 | 79.8 | 79.9 | 79.9 | 80.0 | 80.0 | 80.0 |
| -30 | 73.7 | 74.8 | 75.9 | 76.2 | 76.5 | 76.7 | 76.9 | 77.2 | 77.5 | 77.9 | 78.3 | 78.7 | 79.0 | 79.1 | 79.2 | 79.2 | 79.2 | 79.3 |
| -35 | 72.9 | 74.0 | 75.1 | 75.4 | 75.7 | 75.9 | 76.2 | 76.4 | 76.7 | 77.1 | 77.5 | 77.9 | 78.2 | 78.3 | 78.4 | 78.4 | 78.5 | 78.5 |
| -40 | 72.1 | 73.2 | 74.3 | 74.6 | 74.9 | 75.1 | 75.4 | 75.7 | 76.0 | 76.3 | 76.7 | 77.1 | 77.4 | 77.5 | 77.5 | 77.6 | 77.7 | 77.7 |
| -45 | 71.4 | 72.5 | 73.6 | 73.8 | 74.1 | 74.3 | 74.6 | 74.9 | 75.2 | 75.5 | 75.9 | 76.2 | 76.6 | 76.6 | 76.7 | 76.8 | 76.9 | 76.9 |
| -50 | 70.6 | 71.7 | 72.7 | 73.0 | 73.3 | 73.5 | 73.8 | 74.0 | 74.4 | 74.7 | 75.0 | 75.4 | 75.7 | 75.8 | 75.9 | 76.0 | 76.1 | 76.1 |

## %N1 Adjustments for Engine Bleeds

| BLEED CONFIGURATION | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| PACKS OFF | 0.5 | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 | 1.1 | 1.2 | 1.3 | 1.6 | 1.7 | 1.7 |
| ENGINE ANTI-ICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

# TO2 Assumed Temperature Reduced Thrust

## Maximum Assumed Temperature (Table 1 of 3)

## Based on 25% Takeoff Thrust Reduction

| OAT (°C) | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| 60 | 67 | 69 | 70 | 70 | 69 | 68 | 66 | 65 | 64 | 62 | 61 | 60 | 59 | 59 | 57 | 59 | 58 | 57 |
| 55 | 67 | 69 | 70 | 70 | 69 | 68 | 66 | 65 | 64 | 62 | 61 | 60 | 58 | 56 | 54 | 55 | 53 | 52 |
| 50 | 67 | 69 | 70 | 70 | 69 | 68 | 66 | 65 | 64 | 62 | 61 | 60 | 58 | 56 | 53 | 50 | 49 | 49 |
| 45 | 67 | 69 | 70 | 70 | 69 | 68 | 66 | 65 | 64 | 62 | 61 | 60 | 58 | 56 | 53 | 50 | 47 | 46 |
| 40 | 67 | 68 | 68 | 68 | 67 | 67 | 66 | 65 | 64 | 62 | 61 | 60 | 58 | 56 | 53 | 50 | 47 | 46 |
| 35 | 64 | 63 | 63 | 63 | 63 | 61 | 60 | 59 | 60 | 61 | 61 | 60 | 58 | 56 | 53 | 50 | 48 | 47 |
| 30 | 63 | 61 | 59 | 59 | 58 | 57 | 56 | 54 | 53 | 52 | 55 | 57 | 57 | 56 | 53 | 51 | 48 | 47 |
| 25 | 63 | 61 | 59 | 58 | 56 | 54 | 53 | 51 | 49 | 48 | 50 | 52 | 52 | 52 | 51 | 51 | 48 | 47 |
| 20 | 63 | 61 | 59 | 58 | 56 | 54 | 52 | 49 | 47 | 46 | 46 | 48 | 48 | 47 | 47 | 46 | 46 | 46 |
| 15 | 63 | 61 | 59 | 58 | 56 | 54 | 52 | 49 | 47 | 45 | 43 | 43 | 43 | 42 | 42 | 41 | 41 | 41 |
| 10 | 63 | 61 | 59 | 58 | 56 | 54 | 52 | 49 | 47 | 45 | 43 | 41 | 38 | 37 | 37 | 36 | 36 | 36 |
| 5 | 63 | 61 | 59 | 58 | 56 | 54 | 52 | 49 | 47 | 45 | 43 | 41 | 38 | 36 | 33 | 32 | 31 | 31 |
| 0 | 63 | 61 | 59 | 59 | 57 | 54 | 52 | 49 | 47 | 45 | 43 | 41 | 39 | 36 | 33 | 31 | 28 | 27 |
| -5 & BELOW | 63 | 61 | 59 | 59 | 57 | 54 | 52 | 49 | 47 | 45 | 43 | 41 | 39 | 36 | 34 | 31 | 28 | 27 |

## Takeoff %N1 (Table 2 of 3)

## Based on engine bleed for packs on and engine anti-ice off

| ASSUMED TEMP (°C) | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| 75 | 77.0 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.1 | 77.0 | 76.6 | 76.5 | 76.4 |
| 70 | 76.5 | 76.5 | 76.6 | 76.7 | 76.5 | 76.5 | 76.5 | 76.5 | 76.5 | 76.5 | 76.5 | 76.5 | 76.6 | 76.6 | 76.6 | 76.6 | 76.1 | 75.8 |
| 65 | 76.8 | 77.2 | 77.7 | 77.8 | 77.3 | 76.9 | 76.4 | 76.0 | 76.0 | 76.0 | 76.0 | 76.0 | 76.0 | 76.0 | 76.0 | 76.0 | 76.0 | 76.0 |
| 60 | 77.8 | 78.3 | 78.8 | 78.9 | 78.4 | 78.0 | 77.5 | 77.1 | 76.7 | 76.3 | 75.9 | 75.5 | 75.4 | 75.4 | 75.4 | 75.4 | 75.5 | 75.5 |
| 55 | 79.2 | 79.6 | 80.0 | 80.1 | 79.6 | 79.1 | 78.7 | 78.2 | 77.8 | 77.3 | 76.9 | 76.5 | 76.1 | 75.2 | 74.9 | 74.9 | 74.9 | 74.9 |
| 50 | 80.3 | 80.8 | 81.4 | 81.1 | 80.7 | 80.3 | 79.8 | 79.4 | 78.9 | 78.5 | 78.1 | 77.7 | 77.2 | 76.3 | 75.4 | 74.4 | 74.3 | 74.3 |
| 45 | 81.2 | 81.8 | 82.3 | 82.1 | 81.7 | 81.2 | 80.9 | 80.5 | 80.1 | 79.6 | 79.2 | 78.8 | 78.3 | 77.4 | 76.5 | 75.4 | 74.6 | 74.2 |
| 40 | 82.1 | 82.7 | 83.2 | 83.1 | 83.1 | 82.8 | 82.2 | 81.4 | 81.1 | 80.7 | 80.3 | 79.9 | 79.4 | 78.5 | 77.6 | 76.6 | 75.7 | 75.3 |
| 35 | 82.9 | 83.5 | 84.1 | 84.1 | 84.0 | 83.9 | 83.8 | 83.5 | 82.9 | 82.0 | 81.3 | 80.9 | 80.5 | 79.6 | 78.7 | 77.7 | 76.9 | 76.5 |
| 30 | 82.5 | 83.7 | 84.9 | 84.7 | 84.7 | 84.7 | 84.6 | 84.6 | 84.5 | 84.3 | 82.1 | 81.8 | 81.4 | 80.6 | 79.8 | 78.9 | 78.1 | 77.7 |
| 25 | 81.8 | 83.0 | 84.2 | 84.5 | 84.8 | 84.9 | 85.0 | 85.2 | 85.1 | 85.1 | 83.0 | 82.7 | 82.3 | 81.6 | 80.8 | 80.0 | 79.2 | 78.8 |
| 20 | 81.0 | 82.2 | 83.4 | 83.7 | 84.0 | 84.3 | 84.6 | 84.9 | 85.0 | 85.2 | 83.9 | 83.6 | 83.2 | 82.5 | 81.8 | 81.1 | 80.3 | 79.9 |
| 15 | 80.3 | 81.5 | 82.7 | 83.0 | 83.3 | 83.5 | 83.8 | 84.1 | 84.4 | 84.7 | 84.8 | 84.5 | 84.2 | 83.4 | 82.7 | 82.1 | 81.4 | 81.1 |
| 10 | 79.6 | 80.8 | 82.0 | 82.2 | 82.5 | 82.8 | 83.1 | 83.4 | 83.7 | 84.0 | 84.3 | 84.7 | 85.0 | 84.4 | 83.8 | 83.2 | 82.5 | 82.2 |
| 5 | 78.9 | 80.0 | 81.2 | 81.5 | 81.8 | 82.0 | 82.4 | 82.6 | 82.9 | 83.3 | 83.6 | 84.0 | 84.3 | 84.3 | 84.4 | 84.2 | 83.6 | 83.3 |
| 0 | 78.1 | 79.3 | 80.5 | 80.8 | 81.1 | 81.3 | 81.6 | 81.9 | 82.2 | 82.5 | 82.9 | 83.2 | 83.6 | 83.6 | 83.7 | 83.7 | 83.7 | 83.8 |
| -5 | 77.4 | 78.5 | 79.7 | 80.0 | 80.3 | 80.5 | 80.8 | 81.1 | 81.4 | 81.7 | 82.1 | 82.5 | 82.8 | 82.9 | 82.9 | 83.0 | 83.0 | 83.0 |
| -20 | 75.2 | 76.3 | 77.5 | 77.7 | 78.0 | 78.2 | 78.5 | 78.8 | 79.1 | 79.4 | 79.8 | 80.2 | 80.6 | 80.6 | 80.7 | 80.7 | 80.8 | 80.8 |
| -40 | 72.1 | 73.2 | 74.3 | 74.6 | 74.9 | 75.1 | 75.4 | 75.7 | 76.0 | 76.3 | 76.7 | 77.1 | 77.4 | 77.5 | 77.5 | 77.6 | 77.7 | 77.7 |
| MINIMUM ASSUMED TEMP (°C) | 34 | 32 | 30 | 28 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 10 | 8 | 6 | 4 | 2 | 1 |

# TO2 Assumed Temperature Reduced Thrust
## %N1 Adjustment for Temperature Difference (Table 3 of 3)

| ASSUMED TEMP MINUS OAT (°C) | OUTSIDE AIR TEMPERATURE (°C) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -40 | -20 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| 115 | 7.9 | | | | | | | | | | | | | |
| 110 | 7.9 | | | | | | | | | | | | | |
| 105 | 7.9 | | | | | | | | | | | | | |
| 100 | 7.1 | | | | | | | | | | | | | |
| 95 | 5.4 | 8.2 | | | | | | | | | | | | |
| 90 | 4.0 | 8.2 | | | | | | | | | | | | |
| 85 | 2.6 | 8.2 | | | | | | | | | | | | |
| 80 | 1.3 | 7.4 | | | | | | | | | | | | |
| 75 | 0.1 | 5.6 | 8.5 | | | | | | | | | | | |
| 70 | 0.0 | 4.2 | 8.4 | 8.4 | | | | | | | | | | |
| 65 | 0.0 | 2.7 | 7.9 | 7.9 | 7.8 | | | | | | | | | |
| 60 | 0.0 | 1.4 | 7.4 | 7.3 | 7.3 | 7.2 | | | | | | | | |
| 55 | 0.0 | 0.0 | 5.9 | 6.8 | 6.8 | 6.7 | 6.5 | | | | | | | |
| 50 | 0.0 | 0.0 | 4.3 | 5.9 | 6.2 | 6.2 | 6.0 | 5.8 | | | | | | |
| 45 | 0.0 | 0.0 | 2.9 | 4.4 | 5.7 | 5.6 | 5.5 | 5.3 | 5.0 | | | | | |
| 40 | 0.0 | 0.0 | 1.4 | 2.9 | 4.5 | 5.1 | 4.9 | 4.8 | 4.6 | 3.3 | | | | |
| 35 | | 0.0 | 0.0 | 1.5 | 3.0 | 4.5 | 4.4 | 4.2 | 4.1 | 3.3 | 1.4 | | | |
| 30 | | 0.0 | 0.0 | 0.1 | 1.5 | 3.0 | 3.8 | 3.7 | 3.6 | 3.3 | 1.4 | 0.0 | | |
| 25 | | 0.0 | 0.0 | 0.0 | 0.1 | 1.5 | 3.1 | 3.1 | 3.0 | 2.9 | 1.4 | 0.0 | 0.0 | |
| 20 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 1.6 | 2.5 | 2.4 | 2.4 | 1.4 | 0.0 | 0.0 | 0.0 |
| 15 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 1.6 | 1.8 | 1.8 | 1.4 | 0.0 | 0.0 | 0.0 |
| 10 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 1.2 | 1.2 | 1.2 | 0.0 | 0.0 | 0.0 |
| 5 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.6 | 0.6 | 0.0 | 0.0 | 0.0 |
| 0 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

1. **Determine Maximum Assumed Temperature allowed from Table 1.**
2. **Find Maximum %N1 from Table 2 using the desired assumed temperature (no greater than temperature from Table 1).**
3. **Use the difference between assumed temperature and OAT to determine the %N1 adjustment from Table 3.**
4. **Subtract %N1 adjustment from Maximum %N1 in Table 2.**

# Max Climb %N1

## Based on engine bleed for packs on and anti-ice off

| TAT (°C) | PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 33 | 35 | 37 | 39 | 41 |
| | 280 | 280 | 280 | 280 | 280 | 280 | 280 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 |
| 60 | 80.8 | 81.3 | 84.0 | 86.0 | 88.3 | 90.3 | 93.1 | 94.6 | 95.7 | 96.0 | 95.4 | 94.7 |
| 55 | 81.6 | 81.6 | 83.3 | 85.3 | 87.7 | 89.6 | 92.4 | 93.9 | 94.9 | 95.2 | 94.6 | 94.0 |
| 50 | 82.6 | 82.5 | 82.8 | 84.7 | 87.0 | 88.9 | 91.7 | 93.1 | 94.2 | 94.5 | 93.9 | 93.3 |
| 45 | 83.6 | 83.4 | 83.6 | 84.0 | 86.3 | 88.2 | 90.9 | 92.4 | 93.5 | 93.8 | 93.2 | 92.6 |
| 40 | 84.5 | 84.5 | 84.5 | 84.3 | 85.6 | 87.5 | 90.2 | 91.7 | 92.7 | 93.0 | 92.4 | 91.8 |
| 35 | 85.2 | 85.5 | 85.5 | 85.2 | 85.2 | 86.8 | 89.5 | 91.0 | 92.0 | 92.3 | 91.7 | 91.1 |
| 30 | 84.5 | 86.5 | 86.5 | 86.2 | 85.7 | 86.1 | 88.8 | 90.2 | 91.2 | 91.5 | 91.0 | 90.4 |
| 25 | 83.8 | 86.6 | 87.5 | 87.1 | 86.6 | 87.7 | 88.0 | 89.5 | 90.5 | 90.8 | 90.2 | 89.6 |
| 20 | 83.1 | 85.8 | 88.4 | 88.0 | 87.5 | 88.7 | 89.2 | 89.1 | 89.7 | 90.0 | 89.4 | 88.9 |
| 15 | 82.3 | 85.1 | 87.8 | 89.0 | 88.5 | 89.8 | 90.2 | 90.5 | 89.6 | 89.2 | 88.7 | 88.1 |
| 10 | 81.6 | 84.3 | 87.1 | 89.4 | 89.5 | 90.9 | 91.1 | 91.3 | 91.0 | 90.0 | 89.5 | 88.9 |
| 5 | 80.8 | 83.6 | 86.3 | 88.7 | 90.6 | 91.9 | 91.9 | 92.0 | 91.8 | 91.1 | 90.7 | 90.1 |
| 0 | 80.1 | 82.8 | 85.5 | 87.9 | 89.9 | 92.9 | 92.6 | 92.6 | 92.3 | 91.8 | 91.3 | 90.6 |
| -5 | 79.4 | 82.0 | 84.7 | 87.1 | 89.2 | 92.7 | 93.4 | 93.4 | 93.1 | 92.4 | 91.9 | 91.2 |
| -10 | 78.6 | 81.2 | 84.0 | 86.4 | 88.3 | 91.9 | 93.6 | 94.3 | 94.0 | 93.2 | 92.6 | 91.8 |
| -15 | 77.9 | 80.5 | 83.2 | 85.6 | 87.5 | 91.1 | 92.8 | 94.1 | 94.8 | 94.1 | 93.5 | 92.7 |
| -20 | 77.1 | 79.7 | 82.4 | 84.8 | 86.7 | 90.2 | 91.9 | 93.2 | 94.4 | 94.4 | 93.9 | 93.1 |
| -25 | 76.3 | 78.9 | 81.5 | 84.0 | 85.8 | 89.4 | 91.0 | 92.3 | 93.4 | 93.5 | 93.0 | 92.2 |
| -30 | 75.6 | 78.1 | 80.7 | 83.2 | 85.0 | 88.5 | 90.1 | 91.4 | 92.5 | 92.6 | 92.1 | 91.3 |
| -35 | 74.8 | 77.3 | 79.9 | 82.4 | 84.1 | 87.6 | 89.3 | 90.5 | 91.6 | 91.7 | 91.2 | 90.4 |
| -40 | 74.0 | 76.5 | 79.0 | 81.5 | 83.3 | 86.7 | 88.4 | 89.6 | 90.7 | 90.7 | 90.2 | 89.5 |

## %N1 Adjustments for Engine Bleeds

| BLEED CONFIGURATION | PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 33 | 35 | 37 | 39 | 41 |
| ENGINE ANTI-ICE | 0.0 | 0.0 | -0.6 | -0.7 | -0.8 | -0.9 | -1.2 | -1.5 | -1.8 | -2.0 | -2.1 | -2.1 |
| ENGINE & WING ANTI-ICE | 0.0 | 0.0 | -1.5 | -1.7 | -2.0 | -2.1 | -2.6 | -3.2 | -4.0 | -4.2 | -4.2 | -4.2 |

# Go-Around %N1

## Based on engine bleed for packs on and anti-ice off

| REPORTED OAT (°C) | TAT (°C) | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| 59 | 60 | 85.8 | 86.3 | 86.8 | 86.9 | 86.4 | 86.0 | 85.5 | 85.0 | 84.6 | 84.2 | 83.8 | 83.3 | 82.9 | 81.9 | 81.0 | 79.9 | 79.0 | 78.6 |
| 54 | 55 | 87.2 | 87.6 | 88.0 | 88.0 | 87.6 | 87.1 | 86.7 | 86.2 | 85.8 | 85.3 | 84.9 | 84.5 | 84.0 | 83.1 | 82.2 | 81.1 | 80.2 | 79.8 |
| 49 | 50 | 88.1 | 88.7 | 89.3 | 89.0 | 88.6 | 88.2 | 87.8 | 87.3 | 86.9 | 86.5 | 86.1 | 85.6 | 85.1 | 84.2 | 83.3 | 82.3 | 81.4 | 81.0 |
| 44 | 45 | 89.1 | 89.7 | 90.2 | 90.1 | 89.8 | 89.1 | 88.8 | 88.4 | 88.0 | 87.5 | 87.1 | 86.7 | 86.2 | 85.3 | 84.4 | 83.4 | 82.5 | 82.1 |
| 39 | 40 | 90.0 | 90.6 | 91.2 | 91.1 | 91.0 | 90.9 | 90.4 | 89.6 | 89.0 | 88.6 | 88.2 | 87.8 | 87.3 | 86.4 | 85.5 | 84.5 | 83.6 | 83.2 |
| 34 | 35 | 90.8 | 91.5 | 92.1 | 92.1 | 92.0 | 91.9 | 91.8 | 91.6 | 91.2 | 90.3 | 89.1 | 88.8 | 88.3 | 87.5 | 86.6 | 85.6 | 84.8 | 84.4 |
| 29 | 30 | 90.1 | 91.4 | 92.7 | 92.7 | 92.7 | 92.7 | 92.7 | 92.6 | 92.6 | 92.5 | 90.0 | 89.7 | 89.3 | 88.5 | 87.7 | 86.8 | 85.9 | 85.5 |
| 24 | 25 | 89.3 | 90.6 | 91.9 | 92.2 | 92.5 | 92.8 | 92.9 | 93.1 | 93.2 | 93.1 | 91.0 | 90.6 | 90.2 | 89.5 | 88.7 | 87.9 | 87.1 | 86.7 |
| 19 | 20 | 88.5 | 89.8 | 91.0 | 91.4 | 91.7 | 92.0 | 92.3 | 92.6 | 92.8 | 93.0 | 91.9 | 91.6 | 91.2 | 90.5 | 89.7 | 89.0 | 88.2 | 87.8 |
| 14 | 15 | 87.7 | 89.0 | 90.2 | 90.5 | 90.8 | 91.2 | 91.5 | 91.8 | 92.1 | 92.4 | 92.8 | 92.6 | 92.3 | 91.5 | 90.8 | 90.1 | 89.4 | 89.0 |
| 9 | 10 | 86.9 | 88.2 | 89.4 | 89.7 | 90.0 | 90.3 | 90.7 | 91.0 | 91.3 | 91.6 | 92.0 | 92.4 | 92.8 | 92.5 | 91.9 | 91.3 | 90.6 | 90.2 |
| 4 | 5 | 86.1 | 87.4 | 88.6 | 88.9 | 89.2 | 89.5 | 89.9 | 90.2 | 90.5 | 90.8 | 91.2 | 91.6 | 92.0 | 92.0 | 92.0 | 92.1 | 91.7 | 91.3 |
| -1 | 0 | 85.3 | 86.5 | 87.8 | 88.1 | 88.5 | 88.7 | 89.0 | 89.3 | 89.7 | 90.0 | 90.4 | 90.8 | 91.2 | 91.2 | 91.3 | 91.3 | 91.3 | 91.3 |
| -6 | -5 | 84.5 | 85.7 | 87.0 | 87.3 | 87.6 | 87.9 | 88.2 | 88.5 | 88.8 | 89.2 | 89.6 | 90.0 | 90.4 | 90.4 | 90.5 | 90.5 | 90.5 | 90.5 |
| -11 | -10 | 83.7 | 84.9 | 86.2 | 86.5 | 86.8 | 87.0 | 87.3 | 87.6 | 88.0 | 88.3 | 88.8 | 89.2 | 89.6 | 89.6 | 89.7 | 89.7 | 89.7 | 89.7 |
| -16 | -15 | 82.9 | 84.1 | 85.3 | 85.6 | 85.9 | 86.2 | 86.4 | 86.8 | 87.1 | 87.5 | 87.9 | 88.3 | 88.7 | 88.8 | 88.8 | 88.9 | 88.9 | 88.9 |
| -21 | -20 | 82.1 | 83.3 | 84.5 | 84.8 | 85.1 | 85.4 | 85.6 | 85.9 | 86.3 | 86.7 | 87.1 | 87.5 | 87.9 | 88.0 | 88.0 | 88.0 | 88.1 | 88.1 |
| -26 | -25 | 81.3 | 82.5 | 83.7 | 84.0 | 84.3 | 84.5 | 84.8 | 85.1 | 85.4 | 85.8 | 86.2 | 86.7 | 87.0 | 87.1 | 87.2 | 87.2 | 87.2 | 87.3 |
| -31 | -30 | 80.4 | 81.6 | 82.8 | 83.1 | 83.4 | 83.7 | 83.9 | 84.2 | 84.6 | 85.0 | 85.4 | 85.8 | 86.2 | 86.3 | 86.3 | 86.4 | 86.4 | 86.4 |
| -36 | -35 | 79.6 | 80.8 | 82.0 | 82.3 | 82.6 | 82.8 | 83.1 | 83.4 | 83.7 | 84.1 | 84.5 | 84.9 | 85.3 | 85.4 | 85.4 | 85.5 | 85.6 | 85.6 |
| -41 | -40 | 78.8 | 80.0 | 81.1 | 81.4 | 81.7 | 82.0 | 82.2 | 82.5 | 82.9 | 83.2 | 83.6 | 84.0 | 84.4 | 84.5 | 84.6 | 84.6 | 84.7 | 84.7 |
| -46 | -45 | 77.9 | 79.1 | 80.3 | 80.6 | 80.9 | 81.1 | 81.4 | 81.7 | 82.0 | 82.4 | 82.7 | 83.1 | 83.5 | 83.6 | 83.6 | 83.7 | 83.8 | 83.8 |
| -51 | -50 | 77.1 | 78.2 | 79.4 | 79.7 | 80.0 | 80.2 | 80.5 | 80.8 | 81.1 | 81.5 | 81.8 | 82.2 | 82.6 | 82.7 | 82.7 | 82.8 | 82.9 | 82.9 |

## %N1 Adjustment forEngine Bleeds

| BLEED CONFIGURATION | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| PACKS OFF | 0.5 | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.7 | 1.8 |
| A/C HIGH | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ENGINE & WING ANTI-ICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.5 | -1.4 | -1.5 | -1.4 | -1.4 | -1.5 | -1.5 |
| ENGINE & WING ANTI-ICE* | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.8 | -2.2 | -2.3 | -2.3 | -2.3 | -2.4 | -2.5 |

***Single Bleed Source**

## Flight With Unreliable Airspeed/ Turbulent Air Penetration
**Altitude and/or vertical speed indications may also be unreliable.**

**CLIMB (280/.76)**
Flaps Up, Set Max Climb Thrust

| PRESSURE ALTITUDE (FT) | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| 40000 | **PITCH ATT** | **4.0** | **4.0** | **4.5** | | | |
| | V/S (FT/MIN) | 1700 | 1100 | 600 | | | |
| 30000 | **PITCH ATT** | **4.0** | **4.0** | **4.0** | **4.0** | **4.0** | **4.0** |
| | V/S (FT/MIN) | 2500 | 1900 | 1500 | 1100 | 800 | 600 |
| 20000 | **PITCH ATT** | **6.5** | **6.0** | **5.5** | **5.5** | **5.5** | **6.0** |
| | V/S (FT/MIN) | 3700 | 2900 | 2300 | 1800 | 1500 | 1200 |
| 10000 | **PITCH ATT** | **10.0** | **8.5** | **8.0** | **7.5** | **7.5** | **7.5** |
| | V/S (FT/MIN) | 5100 | 4000 | 3200 | 2700 | 2200 | 1900 |
| SEA LEVEL | **PITCH ATT** | **14.0** | **11.5** | **10.5** | **9.5** | **9.0** | **9.0** |
| | V/S (FT/MIN) | 6300 | 4900 | 4000 | 3300 | 2800 | 2400 |

**CRUISE (.76/280)**
Flaps Up, Set Thrust for Level Flight

| PRESSURE ALTITUDE (FT) | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| 40000 | **PITCH ATT** | **2.0** | **2.5** | **3.5** | | | |
| | **%N1** | **78.4** | **80.9** | **84.5** | | | |
| 35000 | **PITCH ATT** | **1.5** | **2.0** | **2.5** | **3.0** | **3.5** | |
| | **%N1** | **76.8** | **78.2** | **80.0** | **82.5** | **85.7** | |
| 30000 | **PITCH ATT** | **1.0** | **1.5** | **2.0** | **2.5** | **3.0** | **3.5** |
| | **%N1** | **76.2** | **77.1** | **78.3** | **79.8** | **81.6** | **84.2** |
| 25000 | **PITCH ATT** | **1.0** | **1.5** | **2.0** | **2.5** | **3.0** | **4.0** |
| | **%N1** | **72.2** | **73.0** | **74.3** | **75.7** | **77.6** | **79.8** |
| 20000 | **PITCH ATT** | **1.0** | **1.5** | **2.0** | **3.0** | **3.5** | **4.0** |
| | **%N1** | **68.1** | **69.0** | **70.1** | **71.5** | **73.2** | **75.4** |
| 15000 | **PITCH ATT** | **1.0** | **1.5** | **2.5** | **3.0** | **3.5** | **4.0** |
| | **%N1** | **64.3** | **65.0** | **66.1** | **67.3** | **68.9** | **70.9** |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**DESCENT (.76/280)**
Flaps Up, Set Idle Thrust

| PRESSURE ALTITUDE (FT) | | WEIGHT (1000 KG) 40 | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|---|
| 40000 | **PITCH ATT** | **-1.0** | **0.0** | **0.5** | **1.5** | **1.5** | **1.0** |
| | V/S (FT/MIN) | -2400 | -2200 | -2200 | -2300 | -2800 | -3600 |
| 30000 | **PITCH ATT** | **-3.0** | **-2.0** | **-1.0** | **0.0** | **0.5** | **1.0** |
| | V/S (FT/MIN) | -3000 | -2500 | -2200 | -2000 | -1900 | -1900 |
| 20000 | **PITCH ATT** | **-3.5** | **-2.0** | **-1.0** | **0.0** | **0.5** | **1.5** |
| | V/S (FT/MIN) | -2900 | -2400 | -2100 | -1900 | -1800 | -1700 |
| 10000 | **PITCH ATT** | **-3.5** | **-2.0** | **-1.0** | **0.0** | **0.5** | **1.5** |
| | V/S (FT/MIN) | -2700 | -2200 | -1900 | -1800 | -1600 | -1600 |
| SEA LEVEL | **PITCH ATT** | **-4.0** | **-2.5** | **-1.5** | **-0.5** | **0.5** | **1.0** |
| | V/S (FT/MIN) | -2400 | -2000 | -1800 | -1600 | -1500 | -1400 |

**HOLDING (VREF40 + 70)**
Flaps Up, Set Thrust for Level Flight

| PRESSURE ALTITUDE (FT) | | WEIGHT (1000 KG) 40 | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|---|
| 15000 | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.0** | **5.5** | **5.0** |
| | **%N1** | **49.9** | **54.5** | **59.1** | **63.2** | **66.8** | **70.1** |
| | KIAS | 178 | 191 | 206 | 224 | 240 | 254 |
| 10000 | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **5.5** | **5.5** |
| | **%N1** | **46.7** | **51.0** | **55.1** | **59.0** | **62.6** | **65.7** |
| | KIAS | 178 | 191 | 206 | 222 | 238 | 253 |
| 5000 | **PITCH ATT** | **5.0** | **5.0** | **5.5** | **5.5** | **5.5** | **5.5** |
| | **%N1** | **43.7** | **47.8** | **51.7** | **55.3** | **58.8** | **61.9** |
| | KIAS | 178 | 191 | 204 | 222 | 237 | 251 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration
**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**
Set Thrust for Level Flight
**Airport Altitude = -2000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.5** |
| (GEAR UP) | **%N1** | **41.9** | **45.9** | **49.7** | **53.1** | **56.4** | **59.7** |
| (VREF40+70) | KIAS | 176 | 189 | 202 | 212 | 223 | 236 |
| FLAPS 1 | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **44.1** | **48.2** | **52.1** | **55.6** | **59.1** | **62.5** |
| (VREF40+50) | KIAS | 156 | 169 | 182 | 192 | 203 | 216 |
| FLAPS 5 | **PITCH ATT** | **5.5** | **5.5** | **6.0** | **6.0** | **6.5** | **6.0** |
| (GEAR UP) | **%N1** | **43.5** | **48.1** | **52.4** | **56.0** | **59.7** | **63.1** |
| (VREF40+30) | KIAS | 136 | 149 | 162 | 172 | 183 | 196 |
| FLAPS 10 | **PITCH ATT** | **4.0** | **4.5** | **5.0** | **5.0** | **5.0** | **5.0** |
| (GEAR UP) | **%N1** | **44.7** | **49.4** | **53.6** | **57.4** | **61.1** | **64.6** |
| (VREF40+30) | KIAS | 136 | 149 | 162 | 172 | 183 | 196 |
| FLAPS 15 | **PITCH ATT** | **5.0** | **5.0** | **5.5** | **5.5** | **5.5** | **5.5** |
| (GEAR UP) | **%N1** | **44.9** | **49.9** | **54.2** | **58.2** | **62.0** | **65.5** |
| (VREF40+20) | KIAS | 126 | 139 | 152 | 162 | 173 | 186 |
| FLAPS 25 | **PITCH ATT** | **6.0** | **6.0** | **6.0** | **6.5** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **45.7** | **50.8** | **55.3** | **59.5** | **63.3** | **66.7** |
| (VREF40+10) | KIAS | 116 | 129 | 142 | 152 | 163 | 176 |
| FLAPS 15 | **PITCH ATT** | **5.0** | **5.0** | **5.5** | **5.5** | **5.5** | **5.5** |
| (GEAR DOWN) | **%N1** | **49.1** | **54.2** | **58.9** | **63.2** | **67.2** | **70.9** |
| (VREF40+20) | KIAS | 126 | 139 | 152 | 162 | 173 | 186 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**
Set Thrust for Level Flight
**Airport Altitude = -1000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP (GEAR UP) (VREF40+70) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.5** |
| | **%N1** | **42.4** | **46.5** | **50.4** | **53.8** | **57.1** | **60.4** |
| | KIAS | 176 | 189 | 202 | 212 | 223 | 236 |
| FLAPS 1 (GEAR UP) (VREF40+50) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **44.6** | **48.8** | **52.8** | **56.3** | **59.9** | **63.3** |
| | KIAS | 156 | 169 | 182 | 192 | 203 | 216 |
| FLAPS 5 (GEAR UP) (VREF40+30) | **PITCH ATT** | **5.5** | **5.5** | **6.0** | **6.0** | **6.5** | **6.0** |
| | **%N1** | **44.1** | **48.8** | **53.0** | **56.7** | **60.4** | **63.9** |
| | KIAS | 136 | 149 | 162 | 172 | 183 | 196 |
| FLAPS 10 (GEAR UP) (VREF40+30) | **PITCH ATT** | **4.0** | **4.5** | **5.0** | **5.0** | **5.0** | **5.0** |
| | **%N1** | **45.3** | **50.0** | **54.3** | **58.2** | **61.9** | **65.5** |
| | KIAS | 136 | 149 | 162 | 172 | 183 | 196 |
| FLAPS 15 (GEAR UP) (VREF40+20) | **PITCH ATT** | **5.0** | **5.0** | **5.5** | **5.5** | **5.5** | **5.5** |
| | **%N1** | **45.6** | **50.6** | **54.9** | **59.0** | **62.8** | **66.4** |
| | KIAS | 126 | 139 | 152 | 162 | 173 | 186 |
| FLAPS 25 (GEAR UP) (VREF40+10) | **PITCH ATT** | **6.0** | **6.0** | **6.0** | **6.5** | **6.0** | **6.0** |
| | **%N1** | **46.3** | **51.5** | **56.0** | **60.3** | **64.2** | **67.5** |
| | KIAS | 116 | 129 | 142 | 152 | 163 | 176 |
| FLAPS 15 (GEAR DOWN) (VREF40+20) | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.5** |
| | **%N1** | **49.7** | **54.9** | **59.7** | **64.0** | **68.0** | **71.8** |
| | KIAS | 126 | 139 | 152 | 162 | 173 | 186 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**

Set Thrust for Level Flight

**Airport Altitude = SEA LEVEL**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP<br>(GEAR UP)<br>(VREF40+70) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.5** |
| | **%N1** | **43.0** | **47.1** | **51.0** | **54.5** | **57.9** | **61.2** |
| | KIAS | 176 | 190 | 202 | 212 | 224 | 236 |
| FLAPS 1<br>(GEAR UP)<br>(VREF40+50) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** |
| | **%N1** | **45.1** | **49.5** | **53.5** | **57.0** | **60.7** | **64.1** |
| | KIAS | 156 | 170 | 182 | 192 | 204 | 216 |
| FLAPS 5<br>(GEAR UP)<br>(VREF40+30) | **PITCH ATT** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **44.7** | **49.4** | **53.6** | **57.4** | **61.2** | **64.7** |
| | KIAS | 136 | 150 | 162 | 172 | 184 | 196 |
| FLAPS 10<br>(GEAR UP)<br>(VREF40+30) | **PITCH ATT** | **4.0** | **4.5** | **5.0** | **5.0** | **5.0** | **5.0** |
| | **%N1** | **45.9** | **50.7** | **54.9** | **58.9** | **62.7** | **66.3** |
| | KIAS | 136 | 150 | 162 | 172 | 184 | 196 |
| FLAPS 15<br>(GEAR UP)<br>(VREF40+20) | **PITCH ATT** | **5.0** | **5.0** | **5.5** | **5.5** | **5.5** | **5.5** |
| | **%N1** | **46.2** | **51.2** | **55.5** | **59.7** | **63.6** | **67.2** |
| | KIAS | 126 | 140 | 152 | 162 | 174 | 186 |
| FLAPS 25<br>(GEAR UP)<br>(VREF40+10) | **PITCH ATT** | **6.0** | **6.0** | **6.0** | **6.5** | **6.0** | **6.0** |
| | **%N1** | **46.9** | **52.1** | **56.6** | **61.0** | **65.0** | **68.4** |
| | KIAS | 116 | 130 | 142 | 152 | 164 | 176 |
| FLAPS 15<br>(GEAR DOWN)<br>(VREF40+20) | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| | **%N1** | **50.3** | **55.5** | **60.5** | **64.9** | **68.9** | **72.7** |
| | KIAS | 126 | 140 | 152 | 162 | 174 | 186 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**

Set Thrust for Level Flight
**Airport Altitude = 1000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP (GEAR UP) (VREF40+70) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.5** |
| | **%N1** | **43.6** | **47.7** | **51.6** | **55.2** | **58.7** | **61.9** |
| | KIAS | 177 | 190 | 202 | 212 | 224 | 236 |
| FLAPS 1 (GEAR UP) (VREF40+50) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** |
| | **%N1** | **45.7** | **50.1** | **54.1** | **57.8** | **61.5** | **65.0** |
| | KIAS | 157 | 170 | 182 | 192 | 204 | 216 |
| FLAPS 5 (GEAR UP) (VREF40+30) | **PITCH ATT** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **45.3** | **50.1** | **54.3** | **58.2** | **62.0** | **65.6** |
| | KIAS | 137 | 150 | 162 | 172 | 184 | 196 |
| FLAPS 10 (GEAR UP) (VREF40+30) | **PITCH ATT** | **4.0** | **4.5** | **5.0** | **5.0** | **5.0** | **5.0** |
| | **%N1** | **46.5** | **51.4** | **55.6** | **59.7** | **63.6** | **67.2** |
| | KIAS | 137 | 150 | 162 | 172 | 184 | 196 |
| FLAPS 15 (GEAR UP) (VREF40+20) | **PITCH ATT** | **5.0** | **5.0** | **5.5** | **5.5** | **5.5** | **5.5** |
| | **%N1** | **46.7** | **51.8** | **56.2** | **60.5** | **64.5** | **68.0** |
| | KIAS | 127 | 140 | 152 | 162 | 174 | 186 |
| FLAPS 25 (GEAR UP) (VREF40+10) | **PITCH ATT** | **6.0** | **6.0** | **6.0** | **6.5** | **6.0** | **6.0** |
| | **%N1** | **47.5** | **52.7** | **57.4** | **61.9** | **65.9** | **69.3** |
| | KIAS | 117 | 130 | 142 | 152 | 164 | 176 |
| FLAPS 15 (GEAR DOWN) (VREF40+20) | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| | **%N1** | **50.9** | **56.2** | **61.3** | **65.8** | **69.8** | **73.8** |
| | KIAS | 127 | 140 | 152 | 162 | 174 | 186 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration
**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**
Set Thrust for Level Flight
**Airport Altitude = 2000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP (GEAR UP) (VREF40+70) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.5** |
| | **%N1** | **44.2** | **48.4** | **52.3** | **55.9** | **59.4** | **62.7** |
| | KIAS | 177 | 190 | 202 | 213 | 224 | 236 |
| FLAPS 1 (GEAR UP) (VREF40+50) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** |
| | **%N1** | **46.3** | **50.8** | **54.9** | **58.6** | **62.3** | **65.8** |
| | KIAS | 157 | 170 | 182 | 193 | 204 | 216 |
| FLAPS 5 (GEAR UP) (VREF40+30) | **PITCH ATT** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **45.9** | **50.8** | **55.0** | **59.1** | **62.9** | **66.5** |
| | KIAS | 137 | 150 | 162 | 173 | 184 | 196 |
| FLAPS 10 (GEAR UP) (VREF40+30) | **PITCH ATT** | **4.0** | **4.5** | **5.0** | **5.0** | **5.0** | **5.0** |
| | **%N1** | **47.1** | **52.0** | **56.4** | **60.6** | **64.5** | **68.1** |
| | KIAS | 137 | 150 | 162 | 173 | 184 | 196 |
| FLAPS 15 (GEAR UP) (VREF40+20) | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.5** |
| | **%N1** | **47.3** | **52.4** | **57.0** | **61.4** | **65.5** | **68.9** |
| | KIAS | 127 | 140 | 152 | 163 | 174 | 186 |
| FLAPS 25 (GEAR UP) (VREF40+10) | **PITCH ATT** | **6.0** | **6.0** | **6.0** | **6.0** | **6.0** | **5.5** |
| | **%N1** | **48.1** | **53.4** | **58.1** | **62.7** | **66.7** | **70.2** |
| | KIAS | 117 | 130 | 142 | 153 | 164 | 176 |
| FLAPS 15 (GEAR DOWN) (VREF40+20) | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| | **%N1** | **51.6** | **57.0** | **62.2** | **66.7** | **70.8** | **74.8** |
| | KIAS | 127 | 140 | 152 | 163 | 174 | 186 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**
Set Thrust for Level Flight
**Airport Altitude = 3000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.5** |
| (GEAR UP) | **%N1** | **44.7** | **49.1** | **53.0** | **56.6** | **60.2** | **63.5** |
| (VREF40+70) | KIAS | 177 | 190 | 203 | 213 | 224 | 237 |
| FLAPS 1 | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **46.9** | **51.6** | **55.6** | **59.4** | **63.2** | **66.7** |
| (VREF40+50) | KIAS | 157 | 170 | 183 | 193 | 204 | 217 |
| FLAPS 5 | **PITCH ATT** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **46.4** | **51.4** | **55.8** | **59.9** | **63.8** | **67.4** |
| (VREF40+30) | KIAS | 137 | 150 | 163 | 173 | 184 | 197 |
| FLAPS 10 | **PITCH ATT** | **4.0** | **4.5** | **4.5** | **5.0** | **5.0** | **5.0** |
| (GEAR UP) | **%N1** | **47.6** | **52.6** | **57.1** | **61.5** | **65.4** | **69.0** |
| (VREF40+30) | KIAS | 137 | 150 | 163 | 173 | 184 | 197 |
| FLAPS 15 | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.5** |
| (GEAR UP) | **%N1** | **47.9** | **53.1** | **57.8** | **62.3** | **66.3** | **69.9** |
| (VREF40+20) | KIAS | 127 | 140 | 153 | 163 | 174 | 187 |
| FLAPS 25 | **PITCH ATT** | **6.0** | **6.0** | **6.0** | **6.0** | **6.0** | **5.5** |
| (GEAR UP) | **%N1** | **48.8** | **54.0** | **58.9** | **63.7** | **67.6** | **71.2** |
| (VREF40+10) | KIAS | 117 | 130 | 143 | 153 | 164 | 177 |
| FLAPS 15 | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| (GEAR DOWN) | **%N1** | **52.2** | **57.8** | **63.1** | **67.6** | **71.8** | **75.8** |
| (VREF40+20) | KIAS | 127 | 140 | 153 | 163 | 174 | 187 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration
**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**
Set Thrust for Level Flight
**Airport Altitude = 4000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **45.3** | **49.7** | **53.7** | **57.4** | **61.0** | **64.3** |
| (VREF40+70) | KIAS | 177 | 190 | 203 | 213 | 224 | 237 |
| FLAPS 1 | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **47.6** | **52.3** | **56.4** | **60.3** | **64.1** | **67.6** |
| (VREF40+50) | KIAS | 157 | 170 | 183 | 193 | 204 | 217 |
| FLAPS 5 | **PITCH ATT** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **47.0** | **52.1** | **56.5** | **60.8** | **64.7** | **68.3** |
| (VREF40+30) | KIAS | 137 | 150 | 163 | 173 | 184 | 197 |
| FLAPS 10 | **PITCH ATT** | **4.0** | **4.5** | **4.5** | **5.0** | **5.0** | **5.0** |
| (GEAR UP) | **%N1** | **48.3** | **53.3** | **58.0** | **62.4** | **66.3** | **70.0** |
| (VREF40+30) | KIAS | 137 | 150 | 163 | 173 | 184 | 197 |
| FLAPS 15 | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.5** |
| (GEAR UP) | **%N1** | **48.5** | **53.7** | **58.6** | **63.2** | **67.2** | **70.9** |
| (VREF40+20) | KIAS | 127 | 140 | 153 | 163 | 174 | 187 |
| FLAPS 25 | **PITCH ATT** | **6.0** | **6.0** | **6.0** | **6.0** | **6.0** | **5.5** |
| (GEAR UP) | **%N1** | **49.4** | **54.7** | **59.7** | **64.6** | **68.5** | **72.2** |
| (VREF40+10) | KIAS | 117 | 130 | 143 | 153 | 164 | 177 |
| FLAPS 15 | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| (GEAR DOWN) | **%N1** | **52.9** | **58.6** | **64.1** | **68.5** | **72.8** | **76.9** |
| (VREF40+20) | KIAS | 127 | 140 | 153 | 163 | 174 | 187 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration
**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**
Set Thrust for Level Flight
**Airport Altitude = 5000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **45.9** | **50.4** | **54.4** | **58.2** | **61.8** | **65.1** |
| (VREF40+70) | KIAS | 177 | 191 | 203 | 213 | 225 | 237 |
| FLAPS 1 | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **48.2** | **53.0** | **57.2** | **61.2** | **65.0** | **68.5** |
| (VREF40+50) | KIAS | 157 | 171 | 183 | 193 | 205 | 217 |
| FLAPS 5 | **PITCH ATT** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **47.7** | **52.7** | **57.4** | **61.7** | **65.7** | **69.3** |
| (VREF40+30) | KIAS | 137 | 151 | 163 | 173 | 185 | 197 |
| FLAPS 10 | **PITCH ATT** | **4.0** | **4.5** | **4.5** | **5.0** | **5.0** | **5.0** |
| (GEAR UP) | **%N1** | **49.0** | **54.0** | **58.9** | **63.3** | **67.2** | **71.0** |
| (VREF40+30) | KIAS | 137 | 151 | 163 | 173 | 185 | 197 |
| FLAPS 15 | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| (GEAR UP) | **%N1** | **49.2** | **54.4** | **59.5** | **64.2** | **68.1** | **71.9** |
| (VREF40+20) | KIAS | 127 | 141 | 153 | 163 | 175 | 187 |
| FLAPS 25 | **PITCH ATT** | **6.0** | **6.0** | **6.0** | **6.0** | **6.0** | **5.5** |
| (GEAR UP) | **%N1** | **50.0** | **55.4** | **60.6** | **65.5** | **69.5** | **73.2** |
| (VREF40+10) | KIAS | 117 | 131 | 143 | 153 | 165 | 177 |
| FLAPS 15 | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| (GEAR DOWN) | **%N1** | **53.5** | **59.5** | **65.0** | **69.5** | **73.8** | **78.0** |
| (VREF40+20) | KIAS | 127 | 141 | 153 | 163 | 175 | 187 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**
Set Thrust for Level Flight
**Airport Altitude = 6000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP<br>(GEAR UP)<br>(VREF40+70) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **46.5** | **51.0** | **55.1** | **59.0** | **62.7** | **66.0** |
| | KIAS | 177 | 191 | 203 | 213 | 225 | 238 |
| FLAPS 1<br>(GEAR UP)<br>(VREF40+50) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** |
| | **%N1** | **48.9** | **53.7** | **58.0** | **62.0** | **65.9** | **69.4** |
| | KIAS | 157 | 171 | 183 | 193 | 205 | 218 |
| FLAPS 5<br>(GEAR UP)<br>(VREF40+30) | **PITCH ATT** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **48.3** | **53.5** | **58.3** | **62.6** | **66.6** | **70.2** |
| | KIAS | 137 | 151 | 163 | 173 | 185 | 198 |
| FLAPS 10<br>(GEAR UP)<br>(VREF40+30) | **PITCH ATT** | **4.0** | **4.5** | **4.5** | **5.0** | **5.0** | **5.0** |
| | **%N1** | **49.7** | **54.8** | **59.8** | **64.2** | **68.2** | **72.0** |
| | KIAS | 137 | 151 | 163 | 173 | 185 | 198 |
| FLAPS 15<br>(GEAR UP)<br>(VREF40+20) | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| | **%N1** | **49.8** | **55.2** | **60.4** | **65.1** | **69.1** | **72.9** |
| | KIAS | 127 | 141 | 153 | 163 | 175 | 188 |
| FLAPS 25<br>(GEAR UP)<br>(VREF40+10) | **PITCH ATT** | **6.0** | **6.0** | **6.0** | **6.0** | **6.0** | **5.5** |
| | **%N1** | **50.6** | **56.2** | **61.6** | **66.4** | **70.5** | **74.2** |
| | KIAS | 117 | 131 | 143 | 153 | 165 | 178 |
| FLAPS 15<br>(GEAR DOWN)<br>(VREF40+20) | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| | **%N1** | **54.3** | **60.4** | **65.9** | **70.5** | **74.9** | **79.1** |
| | KIAS | 127 | 141 | 153 | 163 | 175 | 188 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration
**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**
Set Thrust for Level Flight
**Airport Altitude = 7000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **47.1** | **51.7** | **55.9** | **59.8** | **63.5** | **66.9** |
| (VREF40+70) | KIAS | 177 | 191 | 203 | 213 | 225 | 238 |
| FLAPS 1 | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **49.7** | **54.4** | **58.9** | **63.0** | **66.8** | **70.4** |
| (VREF40+50) | KIAS | 157 | 171 | 183 | 193 | 205 | 218 |
| FLAPS 5 | **PITCH ATT** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **49.1** | **54.3** | **59.1** | **63.5** | **67.5** | **71.2** |
| (VREF40+30) | KIAS | 137 | 151 | 163 | 173 | 185 | 198 |
| FLAPS 10 | **PITCH ATT** | **4.0** | **4.5** | **4.5** | **5.0** | **5.0** | **5.0** |
| (GEAR UP) | **%N1** | **50.4** | **55.7** | **60.7** | **65.2** | **69.2** | **72.9** |
| (VREF40+30) | KIAS | 137 | 151 | 163 | 173 | 185 | 198 |
| FLAPS 15 | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| (GEAR UP) | **%N1** | **50.5** | **56.0** | **61.4** | **66.0** | **70.1** | **73.9** |
| (VREF40+20) | KIAS | 127 | 141 | 153 | 163 | 175 | 188 |
| FLAPS 25 | **PITCH ATT** | **6.0** | **6.0** | **6.0** | **6.0** | **6.0** | **5.5** |
| (GEAR UP) | **%N1** | **51.3** | **57.0** | **62.6** | **67.3** | **71.5** | **75.3** |
| (VREF40+10) | KIAS | 117 | 131 | 143 | 153 | 165 | 178 |
| FLAPS 15 | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| (GEAR DOWN) | **%N1** | **55.0** | **61.4** | **66.9** | **71.5** | **75.9** | **80.1** |
| (VREF40+20) | KIAS | 127 | 141 | 153 | 163 | 175 | 188 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**

Set Thrust for Level Flight

**Airport Altitude = 8000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **47.8** | **52.4** | **56.7** | **60.7** | **64.4** | **67.8** |
| (VREF40+70) | KIAS | 177 | 191 | 204 | 214 | 226 | 238 |
| FLAPS 1 | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **50.4** | **55.2** | **59.8** | **63.9** | **67.7** | **71.3** |
| (VREF40+50) | KIAS | 157 | 171 | 184 | 194 | 206 | 218 |
| FLAPS 5 | **PITCH ATT** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **49.8** | **55.1** | **60.0** | **64.5** | **68.5** | **72.2** |
| (VREF40+30) | KIAS | 137 | 151 | 164 | 174 | 186 | 198 |
| FLAPS 10 | **PITCH ATT** | **4.0** | **4.5** | **4.5** | **5.0** | **5.0** | **5.0** |
| (GEAR UP) | **%N1** | **51.0** | **56.5** | **61.6** | **66.1** | **70.2** | **74.0** |
| (VREF40+30) | KIAS | 137 | 151 | 164 | 174 | 186 | 198 |
| FLAPS 15 | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| (GEAR UP) | **%N1** | **51.2** | **56.9** | **62.3** | **66.9** | **71.1** | **74.9** |
| (VREF40+20) | KIAS | 127 | 141 | 154 | 164 | 176 | 188 |
| FLAPS 25 | **PITCH ATT** | **6.0** | **6.0** | **6.0** | **6.0** | **6.0** | **5.5** |
| (GEAR UP) | **%N1** | **52.0** | **57.9** | **63.5** | **68.3** | **72.5** | **76.3** |
| (VREF40+10) | KIAS | 117 | 131 | 144 | 154 | 166 | 178 |
| FLAPS 15 | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| (GEAR DOWN) | **%N1** | **55.8** | **62.4** | **67.9** | **72.6** | **77.0** | **81.1** |
| (VREF40+20) | KIAS | 127 | 141 | 154 | 164 | 176 | 188 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**

Set Thrust for Level Flight

**Airport Altitude = 9000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP (GEAR UP) (VREF40+70) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **48.5** | **53.2** | **57.6** | **61.6** | **65.3** | **68.7** |
| | KIAS | 178 | 191 | 204 | 214 | 226 | 239 |
| FLAPS 1 (GEAR UP) (VREF40+50) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** |
| | **%N1** | **51.2** | **56.0** | **60.7** | **64.8** | **68.7** | **72.3** |
| | KIAS | 158 | 171 | 184 | 194 | 206 | 219 |
| FLAPS 5 (GEAR UP) (VREF40+30) | **PITCH ATT** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **50.5** | **56.0** | **61.0** | **65.4** | **69.5** | **73.2** |
| | KIAS | 138 | 151 | 164 | 174 | 186 | 199 |
| FLAPS 10 (GEAR UP) (VREF40+30) | **PITCH ATT** | **4.0** | **4.5** | **4.5** | **5.0** | **5.0** | **5.0** |
| | **%N1** | **51.8** | **57.5** | **62.6** | **67.0** | **71.2** | **75.0** |
| | KIAS | 138 | 151 | 164 | 174 | 186 | 199 |
| FLAPS 15 (GEAR UP) (VREF40+20) | **PITCH ATT** | **5.0** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| | **%N1** | **51.9** | **57.8** | **63.3** | **67.9** | **72.1** | **76.0** |
| | KIAS | 128 | 141 | 154 | 164 | 176 | 189 |
| FLAPS 25 (GEAR UP) (VREF40+10) | **PITCH ATT** | **5.5** | **6.0** | **6.0** | **6.0** | **6.0** | **5.5** |
| | **%N1** | **52.7** | **58.8** | **64.5** | **69.3** | **73.5** | **77.4** |
| | KIAS | 118 | 131 | 144 | 154 | 166 | 179 |
| FLAPS 15 (GEAR DOWN) (VREF40+20) | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| | **%N1** | **56.7** | **63.4** | **68.9** | **73.6** | **78.1** | **82.1** |
| | KIAS | 128 | 141 | 154 | 164 | 176 | 189 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**

Set Thrust for Level Flight

**Airport Altitude = 10000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP (GEAR UP) (VREF40+70) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **49.2** | **53.9** | **58.4** | **62.4** | **66.2** | **69.6** |
| | KIAS | 178 | 192 | 204 | 214 | 226 | 239 |
| FLAPS 1 (GEAR UP) (VREF40+50) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** |
| | **%N1** | **51.9** | **56.9** | **61.6** | **65.7** | **69.7** | **73.3** |
| | KIAS | 158 | 172 | 184 | 194 | 206 | 219 |
| FLAPS 5 (GEAR UP) (VREF40+30) | **PITCH ATT** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **51.2** | **56.8** | **61.9** | **66.4** | **70.5** | **74.3** |
| | KIAS | 138 | 152 | 164 | 174 | 186 | 199 |
| FLAPS 10 (GEAR UP) (VREF40+30) | **PITCH ATT** | **4.0** | **4.5** | **4.5** | **5.0** | **5.0** | **5.0** |
| | **%N1** | **52.5** | **58.4** | **63.5** | **68.0** | **72.2** | **76.0** |
| | KIAS | 138 | 152 | 164 | 174 | 186 | 199 |
| FLAPS 15 (GEAR UP) (VREF40+20) | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| | **%N1** | **52.7** | **58.8** | **64.3** | **68.9** | **73.2** | **77.0** |
| | KIAS | 128 | 142 | 154 | 164 | 176 | 189 |
| FLAPS 25 (GEAR UP) (VREF40+10) | **PITCH ATT** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** | **5.5** |
| | **%N1** | **53.5** | **59.8** | **65.4** | **70.3** | **74.6** | **78.4** |
| | KIAS | 118 | 132 | 144 | 154 | 166 | 179 |
| FLAPS 15 (GEAR DOWN) (VREF40+20) | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.0** | **5.0** |
| | **%N1** | **57.7** | **64.4** | **69.9** | **74.7** | **79.2** | **83.1** |
| | KIAS | 128 | 142 | 154 | 164 | 176 | 189 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**
Set Thrust for Level Flight
**Airport Altitude = 11000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP (GEAR UP) (VREF40+70) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **49.9** | **54.7** | **59.2** | **63.3** | **67.1** | **70.6** |
| | KIAS | 178 | 192 | 204 | 214 | 227 | 240 |
| FLAPS 1 (GEAR UP) (VREF40+50) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **5.5** |
| | **%N1** | **52.6** | **57.8** | **62.6** | **66.6** | **70.6** | **74.3** |
| | KIAS | 158 | 172 | 184 | 194 | 207 | 220 |
| FLAPS 5 (GEAR UP) (VREF40+30) | **PITCH ATT** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **52.0** | **57.7** | **62.9** | **67.3** | **71.5** | **75.3** |
| | KIAS | 138 | 152 | 164 | 174 | 187 | 200 |
| FLAPS 10 (GEAR UP) (VREF40+30) | **PITCH ATT** | **4.0** | **4.5** | **4.5** | **5.0** | **5.0** | **5.0** |
| | **%N1** | **53.4** | **59.3** | **64.5** | **69.0** | **73.2** | **77.1** |
| | KIAS | 138 | 152 | 164 | 174 | 187 | 200 |
| FLAPS 15 (GEAR UP) (VREF40+20) | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| | **%N1** | **53.5** | **59.8** | **65.2** | **69.9** | **74.2** | **78.1** |
| | KIAS | 128 | 142 | 154 | 164 | 177 | 190 |
| FLAPS 25 (GEAR UP) (VREF40+10) | **PITCH ATT** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** | **5.5** |
| | **%N1** | **54.4** | **60.9** | **66.4** | **71.3** | **75.6** | **79.4** |
| | KIAS | 118 | 132 | 144 | 154 | 167 | 180 |
| FLAPS 15 (GEAR DOWN) (VREF40+20) | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.0** | **5.0** |
| | **%N1** | **58.8** | **65.4** | **70.9** | **75.7** | **80.2** | **84.2** |
| | KIAS | 128 | 142 | 154 | 164 | 177 | 190 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration
**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**
Set Thrust for Level Flight
**Airport Altitude = 12000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **50.6** | **55.5** | **60.1** | **64.3** | **68.0** | **71.6** |
| (VREF40+70) | KIAS | 178 | 192 | 204 | 214 | 227 | 240 |
| FLAPS 1 | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **6.0** | **5.5** |
| (GEAR UP) | **%N1** | **53.4** | **58.7** | **63.5** | **67.6** | **71.6** | **75.3** |
| (VREF40+50) | KIAS | 158 | 172 | 184 | 194 | 207 | 220 |
| FLAPS 5 | **PITCH ATT** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **52.8** | **58.6** | **63.9** | **68.3** | **72.5** | **76.3** |
| (VREF40+30) | KIAS | 138 | 152 | 164 | 174 | 187 | 200 |
| FLAPS 10 | **PITCH ATT** | **4.0** | **4.5** | **4.5** | **5.0** | **5.0** | **5.0** |
| (GEAR UP) | **%N1** | **54.3** | **60.3** | **65.4** | **70.0** | **74.2** | **78.1** |
| (VREF40+30) | KIAS | 138 | 152 | 164 | 174 | 187 | 200 |
| FLAPS 15 | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.5** | **5.0** |
| (GEAR UP) | **%N1** | **54.5** | **60.8** | **66.2** | **70.9** | **75.2** | **79.1** |
| (VREF40+20) | KIAS | 128 | 142 | 154 | 164 | 177 | 190 |
| FLAPS 25 | **PITCH ATT** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** | **5.5** |
| (GEAR UP) | **%N1** | **55.3** | **62.0** | **67.4** | **72.4** | **76.7** | **80.4** |
| (VREF40+10) | KIAS | 118 | 132 | 144 | 154 | 167 | 180 |
| FLAPS 15 | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.0** | **5.0** |
| (GEAR DOWN) | **%N1** | **59.9** | **66.4** | **72.0** | **76.8** | **81.2** | **85.3** |
| (VREF40+20) | KIAS | 128 | 142 | 154 | 164 | 177 | 190 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration
**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**
Set Thrust for Level Flight
**Airport Altitude = 13000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP (GEAR UP) (VREF40+70) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **51.3** | **56.4** | **61.0** | **65.2** | **69.0** | **72.5** |
| | KIAS | 178 | 192 | 204 | 215 | 227 | 241 |
| FLAPS 1 (GEAR UP) (VREF40+50) | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **5.5** | **5.5** |
| | **%N1** | **54.2** | **59.6** | **64.4** | **68.6** | **72.6** | **76.4** |
| | KIAS | 158 | 172 | 184 | 195 | 207 | 221 |
| FLAPS 5 (GEAR UP) (VREF40+30) | **PITCH ATT** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** |
| | **%N1** | **53.7** | **59.6** | **64.8** | **69.3** | **73.5** | **77.4** |
| | KIAS | 138 | 152 | 164 | 175 | 187 | 201 |
| FLAPS 10 (GEAR UP) (VREF40+30) | **PITCH ATT** | **4.0** | **4.5** | **4.5** | **5.0** | **5.0** | **5.0** |
| | **%N1** | **55.2** | **61.3** | **66.4** | **71.0** | **75.3** | **79.1** |
| | KIAS | 138 | 152 | 164 | 175 | 187 | 201 |
| FLAPS 15 (GEAR UP) (VREF40+20) | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.0** | **5.0** |
| | **%N1** | **55.4** | **61.8** | **67.2** | **72.0** | **76.3** | **80.1** |
| | KIAS | 128 | 142 | 154 | 165 | 177 | 191 |
| FLAPS 25 (GEAR UP) (VREF40+10) | **PITCH ATT** | **5.5** | **5.5** | **5.5** | **6.0** | **5.5** | **5.5** |
| | **%N1** | **56.3** | **63.0** | **68.4** | **73.4** | **77.7** | **81.4** |
| | KIAS | 118 | 132 | 144 | 155 | 167 | 181 |
| FLAPS 15 (GEAR DOWN) (VREF40+20) | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.0** | **5.0** |
| | **%N1** | **61.0** | **67.4** | **73.0** | **77.9** | **82.3** | **86.4** |
| | KIAS | 128 | 142 | 154 | 165 | 177 | 191 |

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**TERMINAL AREA (5000 FT)**
Set Thrust for Level Flight
**Airport Altitude = 14000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS UP | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **52.1** | **57.2** | **61.9** | **66.1** | **69.9** | **73.5** |
| (VREF40+70) | KIAS | 179 | 192 | 205 | 215 | 228 | 241 |
| FLAPS 1 | **PITCH ATT** | **4.5** | **5.0** | **5.5** | **5.5** | **5.5** | **5.5** |
| (GEAR UP) | **%N1** | **55.1** | **60.6** | **65.4** | **69.6** | **73.7** | **77.4** |
| (VREF40+50) | KIAS | 159 | 172 | 185 | 195 | 208 | 221 |
| FLAPS 5 | **PITCH ATT** | **5.0** | **5.5** | **5.5** | **6.0** | **6.0** | **6.0** |
| (GEAR UP) | **%N1** | **54.5** | **60.6** | **65.8** | **70.3** | **74.6** | **78.4** |
| (VREF40+30) | KIAS | 139 | 152 | 165 | 175 | 188 | 201 |
| FLAPS 10 | **PITCH ATT** | **4.0** | **4.5** | **4.5** | **5.0** | **5.0** | **4.5** |
| (GEAR UP) | **%N1** | **56.1** | **62.2** | **67.4** | **72.0** | **76.4** | **80.1** |
| (VREF40+30) | KIAS | 139 | 152 | 165 | 175 | 188 | 201 |
| FLAPS 15 | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.0** | **5.0** |
| (GEAR UP) | **%N1** | **56.4** | **62.9** | **68.2** | **73.0** | **77.4** | **81.1** |
| (VREF40+20) | KIAS | 129 | 142 | 155 | 165 | 178 | 191 |
| FLAPS 25 | **PITCH ATT** | **5.5** | **5.5** | **5.5** | **6.0** | **5.5** | **5.5** |
| (GEAR UP) | **%N1** | **57.3** | **63.9** | **69.4** | **74.5** | **78.8** | **82.5** |
| (VREF40+10) | KIAS | 119 | 132 | 145 | 155 | 168 | 181 |
| FLAPS 15 | **PITCH ATT** | **4.5** | **5.0** | **5.0** | **5.5** | **5.0** | **5.0** |
| (GEAR DOWN) | **%N1** | **62.1** | **68.4** | **74.1** | **79.0** | **83.3** | **87.5** |
| (VREF40+20) | KIAS | 129 | 142 | 155 | 165 | 178 | 191 |

# Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

## FINAL APPROACH (1500 FT)

Gear Down, Set Thrust for 3° Glideslope

**Airport Altitude = -2000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **35.5** | **38.9** | **42.0** | **44.8** | **47.4** | **49.9** |
| | KIAS | 128 | 142 | 155 | 166 | 176 | 186 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **40.0** | **44.2** | **48.1** | **51.6** | **54.7** | **57.6** |
| | KIAS | 122 | 135 | 148 | 158 | 169 | 178 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **0.0** | **0.0** | **0.0** | **0.5** | **0.0** | **-0.5** |
| | **%N1** | **44.4** | **49.2** | **53.5** | **57.2** | **61.0** | **64.9** |
| | KIAS | 116 | 129 | 141 | 151 | 162 | 175 |

**Flap placard speed exceeded in shaded area.**

**Airport Altitude = -1000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **35.8** | **39.2** | **42.5** | **45.3** | **48.0** | **50.5** |
| | KIAS | 128 | 142 | 155 | 166 | 176 | 186 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **40.5** | **44.8** | **48.7** | **52.2** | **55.3** | **58.2** |
| | KIAS | 122 | 135 | 148 | 159 | 169 | 178 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **0.0** | **0.0** | **0.0** | **0.5** | **0.0** | **-0.5** |
| | **%N1** | **45.0** | **49.8** | **54.2** | **57.9** | **61.8** | **65.7** |
| | KIAS | 116 | 129 | 141 | 151 | 163 | 175 |

**Flap placard speed exceeded in shaded area.**

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**FINAL APPROACH (1500 FT)**

Gear Down, Set Thrust for 3° Glideslope

**Airport Altitude = SEA LEVEL**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **36.1** | **39.6** | **43.0** | **45.8** | **48.6** | **51.1** |
| | KIAS | 128 | 142 | 155 | 166 | 176 | 187 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **41.0** | **45.4** | **49.4** | **52.8** | **55.9** | **58.9** |
| | KIAS | 122 | 135 | 148 | 159 | 169 | 178 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **45.6** | **50.5** | **54.8** | **58.6** | **62.5** | **66.5** |
| | KIAS | 116 | 129 | 141 | 151 | 163 | 175 |

**Flap placard speed exceeded in shaded area.**

**Airport Altitude = 1000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **36.4** | **40.1** | **43.5** | **46.4** | **49.2** | **51.8** |
| | KIAS | 128 | 142 | 155 | 166 | 176 | 187 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **41.6** | **46.0** | **50.0** | **53.4** | **56.6** | **59.6** |
| | KIAS | 122 | 135 | 148 | 159 | 169 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **46.2** | **51.1** | **55.5** | **59.3** | **63.3** | **67.2** |
| | KIAS | 116 | 129 | 141 | 151 | 163 | 175 |

**Flap placard speed exceeded in shaded area.**

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

### FINAL APPROACH (1500 FT)

Gear Down, Set Thrust for 3° Glideslope

**Airport Altitude = 2000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **36.7** | **40.5** | **44.0** | **46.9** | **49.7** | **52.4** |
| | KIAS | 128 | 142 | 155 | 166 | 177 | 187 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **42.1** | **46.6** | **50.7** | **54.0** | **57.2** | **60.3** |
| | KIAS | 122 | 135 | 148 | 159 | 169 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **46.8** | **51.7** | **56.1** | **60.1** | **64.1** | **68.0** |
| | KIAS | 116 | 129 | 141 | 152 | 163 | 176 |

**Flap placard speed exceeded in shaded area.**

**Airport Altitude = 3000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **37.1** | **41.1** | **44.5** | **47.5** | **50.3** | **53.0** |
| | KIAS | 128 | 142 | 155 | 166 | 177 | 187 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **42.7** | **47.2** | **51.3** | **54.6** | **57.9** | **61.0** |
| | KIAS | 122 | 136 | 148 | 159 | 169 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **47.4** | **52.3** | **56.8** | **60.9** | **65.0** | **68.9** |
| | KIAS | 116 | 129 | 142 | 152 | 163 | 176 |

**Flap placard speed exceeded in shaded area.**

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

**FINAL APPROACH (1500 FT)**

Gear Down, Set Thrust for 3° Glideslope

**Airport Altitude = 4000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **37.5** | **41.6** | **45.0** | **48.1** | **51.0** | **53.6** |
| | KIAS | 128 | 142 | 155 | 166 | 177 | 187 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **43.2** | **47.8** | **51.9** | **55.3** | **58.7** | **61.8** |
| | KIAS | 122 | 136 | 148 | 159 | 169 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **48.0** | **53.0** | **57.6** | **61.7** | **65.8** | **69.8** |
| | KIAS | 116 | 129 | 142 | 152 | 163 | 176 |

**Flap placard speed exceeded in shaded area.**

**Airport Altitude = 5000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **37.9** | **42.1** | **45.6** | **48.7** | **51.6** | **54.3** |
| | KIAS | 128 | 142 | 155 | 166 | 177 | 187 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **43.7** | **48.3** | **52.5** | **56.0** | **59.4** | **62.7** |
| | KIAS | 122 | 136 | 148 | 159 | 169 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **48.7** | **53.7** | **58.3** | **62.5** | **66.7** | **70.7** |
| | KIAS | 116 | 130 | 142 | 152 | 164 | 176 |

**Flap placard speed exceeded in shaded area.**

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

### FINAL APPROACH (1500 FT)

Gear Down, Set Thrust for 3° Glideslope

**Airport Altitude = 6000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **38.3** | **42.5** | **46.1** | **49.3** | **52.3** | **54.9** |
| | KIAS | 128 | 142 | 155 | 166 | 177 | 187 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **44.3** | **49.0** | **53.1** | **56.7** | **60.2** | **63.5** |
| | KIAS | 122 | 136 | 148 | 159 | 169 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **49.3** | **54.3** | **59.2** | **63.5** | **67.6** | **71.7** |
| | KIAS | 117 | 130 | 142 | 152 | 164 | 176 |

**Flap placard speed exceeded in shaded area.**

**Airport Altitude = 7000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **38.8** | **43.0** | **46.7** | **49.9** | **52.9** | **55.6** |
| | KIAS | 128 | 142 | 155 | 166 | 177 | 187 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **44.9** | **49.6** | **53.7** | **57.4** | **61.1** | **64.4** |
| | KIAS | 122 | 136 | 148 | 159 | 169 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **49.8** | **55.0** | **60.1** | **64.4** | **68.5** | **72.7** |
| | KIAS | 117 | 130 | 142 | 153 | 164 | 176 |

**Flap placard speed exceeded in shaded area.**

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

### FINAL APPROACH (1500 FT)

Gear Down, Set Thrust for 3° Glideslope

**Airport Altitude = 8000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **39.3** | **43.5** | **47.4** | **50.6** | **53.6** | **56.3** |
| | KIAS | 128 | 142 | 155 | 166 | 177 | 187 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **45.4** | **50.2** | **54.4** | **58.3** | **62.0** | **65.3** |
| | KIAS | 122 | 136 | 148 | 159 | 169 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **50.5** | **55.8** | **61.0** | **65.3** | **69.5** | **73.7** |
| | KIAS | 117 | 130 | 143 | 153 | 164 | 177 |

**Flap placard speed exceeded in shaded area.**

**Airport Altitude = 9000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **39.8** | **44.1** | **48.0** | **51.3** | **54.2** | **57.0** |
| | KIAS | 128 | 142 | 155 | 166 | 177 | 187 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **46.0** | **50.8** | **55.1** | **59.1** | **62.8** | **66.1** |
| | KIAS | 122 | 136 | 148 | 159 | 169 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **51.1** | **56.6** | **62.0** | **66.2** | **70.5** | **74.8** |
| | KIAS | 117 | 130 | 143 | 153 | 164 | 177 |

**Flap placard speed exceeded in shaded area.**

# Flight With Unreliable Airspeed/ Turbulent Air Penetration
**Altitude and/or vertical speed indications may also be unreliable.**

## FINAL APPROACH (1500 FT)
Gear Down, Set Thrust for 3° Glideslope
**Airport Altitude = 10000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **40.4** | **44.7** | **48.6** | **51.9** | **54.9** | **57.8** |
| | KIAS | 128 | 142 | 155 | 166 | 177 | 188 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **46.6** | **51.5** | **55.9** | **60.0** | **63.7** | **67.0** |
| | KIAS | 122 | 136 | 148 | 159 | 169 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **-0.5** | **0.0** | **0.0** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **51.9** | **57.5** | **63.0** | **67.2** | **71.5** | **75.8** |
| | KIAS | 117 | 131 | 143 | 153 | 165 | 177 |

**Flap placard speed exceeded in shaded area.**

**Airport Altitude = 11000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **40.9** | **45.3** | **49.3** | **52.6** | **55.6** | **58.6** |
| | KIAS | 128 | 142 | 155 | 166 | 177 | 188 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **47.2** | **52.1** | **56.8** | **60.9** | **64.6** | **67.9** |
| | KIAS | 122 | 136 | 148 | 159 | 169 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **-0.5** | **-0.5** | **-0.5** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **52.6** | **58.4** | **63.9** | **68.1** | **72.5** | **76.9** |
| | KIAS | 117 | 131 | 143 | 153 | 165 | 178 |

**Flap placard speed exceeded in shaded area.**

## Flight With Unreliable Airspeed/ Turbulent Air Penetration

**Altitude and/or vertical speed indications may also be unreliable.**

### FINAL APPROACH (1500 FT)

Gear Down, Set Thrust for 3° Glideslope

**Airport Altitude = 12000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **41.5** | **46.0** | **50.0** | **53.2** | **56.4** | **59.4** |
| | KIAS | 128 | 142 | 155 | 166 | 177 | 188 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **47.9** | **52.9** | **57.6** | **61.8** | **65.5** | **68.8** |
| | KIAS | 122 | 136 | 149 | 159 | 169 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **-0.5** | **-0.5** | **-0.5** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **53.3** | **59.4** | **64.9** | **69.1** | **73.6** | **78.0** |
| | KIAS | 117 | 131 | 143 | 153 | 165 | 178 |

**Flap placard speed exceeded in shaded area.**

**Airport Altitude = 13000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **42.0** | **46.6** | **50.7** | **53.9** | **57.1** | **60.2** |
| | KIAS | 128 | 142 | 155 | 166 | 177 | 188 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **48.6** | **53.6** | **58.5** | **62.6** | **66.4** | **69.8** |
| | KIAS | 122 | 136 | 149 | 159 | 170 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **-0.5** | **-0.5** | **-0.5** | **0.0** | **0.0** | **-0.5** |
| | **%N1** | **54.1** | **60.4** | **65.8** | **70.1** | **74.6** | **79.1** |
| | KIAS | 117 | 131 | 144 | 154 | 166 | 178 |

**Flap placard speed exceeded in shaded area.**

## Flight With Unreliable Airspeed/ Turbulent Air Penetration
**Altitude and/or vertical speed indications may also be unreliable.**

**FINAL APPROACH (1500 FT)**
Gear Down, Set Thrust for 3° Glideslope
**Airport Altitude = 14000 FT**

| FLAP/GEAR POSITION | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| FLAPS 15 (VREF15+10) | **PITCH ATT** | **1.5** | **1.5** | **2.0** | **2.0** | **2.0** | **2.0** |
| | **%N1** | **42.7** | **47.3** | **51.3** | **54.6** | **57.9** | **61.1** |
| | KIAS | 128 | 142 | 155 | 166 | 178 | 189 |
| FLAPS 30 (VREF30+10) | **PITCH ATT** | **0.5** | **0.5** | **1.0** | **1.0** | **1.0** | **1.0** |
| | **%N1** | **49.3** | **54.4** | **59.4** | **63.6** | **67.3** | **70.7** |
| | KIAS | 122 | 136 | 149 | 159 | 170 | 179 |
| FLAPS 40 (VREF40+10) | **PITCH ATT** | **-0.5** | **-0.5** | **-0.5** | **0.0** | **-0.5** | **-0.5** |
| | **%N1** | **55.0** | **61.5** | **66.8** | **71.2** | **75.7** | **80.1** |
| | KIAS | 118 | 131 | 144 | 154 | 166 | 179 |

**Flap placard speed exceeded in shaded area.**

**GO-AROUND**
Flaps 15, Gear Up, Set Go-Around Thrust

| PRESSURE ALTITUDE (FT) | | WEIGHT (1000 KG) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 40 | 50 | 60 | 70 | 80 | 90 |
| 14000 | **PITCH ATT** | **17.5** | **13.5** | **11.5** | **10.0** | **8.5** | **7.5** |
| | V/S (FT/MIN) | 3500 | 2700 | 2100 | 1600 | 1300 | 900 |
| | KIAS | 128 | 141 | 154 | 164 | 176 | 189 |
| 10000 | **PITCH ATT** | **20.5** | **16.5** | **13.5** | **11.5** | **10.0** | **9.0** |
| | V/S (FT/MIN) | 4200 | 3300 | 2600 | 2100 | 1700 | 1400 |
| | KIAS | 127 | 141 | 153 | 163 | 175 | 187 |
| 5000 | **PITCH ATT** | **24.0** | **19.0** | **16.0** | **13.5** | **12.0** | **10.5** |
| | V/S (FT/MIN) | 4700 | 3800 | 3100 | 2500 | 2100 | 1800 |
| | KIAS | 126 | 140 | 152 | 162 | 174 | 186 |
| SEA LEVEL | **PITCH ATT** | **28.5** | **22.5** | **18.5** | **16.0** | **14.0** | **12.0** |
| | V/S (FT/MIN) | 5300 | 4300 | 3600 | 3000 | 2600 | 2200 |
| | KIAS | 126 | 139 | 151 | 161 | 173 | 185 |
| -2000 | **PITCH ATT** | **29.0** | **23.0** | **19.0** | **16.5** | **14.0** | **12.5** |
| | V/S (FT/MIN) | 5200 | 4300 | 3600 | 3000 | 2500 | 2200 |
| | KIAS | 126 | 139 | 151 | 161 | 172 | 185 |

Intentionally
Blank

## Long Range Cruise Maximum Operating Altitude
### Max Cruise Thrust
### ISA + 10°C and Below

| WEIGHT (1000 KG) | OPTIMUM ALT (FT) | TAT (°C) | MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1.20 (33°) | 1.25 (36°) | 1.30 (39°) | 1.40 (44°) | 1.50 (48°) |
| 85 | 33500 | -12 | 35000* | 35000* | 35000* | 34200 | 32600 |
| 80 | 34800 | -15 | 36200* | 36200* | 36200* | 35500 | 33900 |
| 75 | 36200 | -18 | 37400* | 37400* | 37400* | 36800 | 35200 |
| 70 | 37600 | -18 | 38700* | 38700* | 38700* | 38200 | 36700 |
| 65 | 39100 | -18 | 40000* | 40000* | 40000* | 39800 | 38200 |
| 60 | 40800 | -18 | 41000 | 41000 | 41000 | 41000 | 39900 |
| 55 | 41000 | -18 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 50 | 41000 | -18 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 45 | 41000 | -18 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 40 | 41000 | -18 | 41000 | 41000 | 41000 | 41000 | 41000 |

### ISA + 15°C

| WEIGHT (1000 KG) | OPTIMUM ALT (FT) | TAT (°C) | MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1.20 (33°) | 1.25 (36°) | 1.30 (39°) | 1.40 (44°) | 1.50 (48°) |
| 85 | 33500 | -6 | 34000* | 34000* | 34000* | 34000* | 32600 |
| 80 | 34800 | -9 | 35500* | 35500* | 35500* | 35500 | 33900 |
| 75 | 36200 | -12 | 36700* | 36700* | 36700* | 36700* | 35200 |
| 70 | 37600 | -12 | 37900* | 37900* | 37900* | 37900* | 36700 |
| 65 | 39100 | -12 | 39200* | 39200* | 39200* | 39200* | 38200 |
| 60 | 40800 | -12 | 40400* | 40400* | 40400* | 40400* | 39900 |
| 55 | 41000 | -12 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 50 | 41000 | -12 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 45 | 41000 | -12 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 40 | 41000 | -12 | 41000 | 41000 | 41000 | 41000 | 41000 |

### ISA + 20°C

| WEIGHT (1000 KG) | OPTIMUM ALT (FT) | TAT (°C) | MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1.20 (33°) | 1.25 (36°) | 1.30 (39°) | 1.40 (44°) | 1.50 (48°) |
| 85 | 33500 | -1 | 32400* | 32400* | 32400* | 32400* | 32400* |
| 80 | 34800 | -4 | 34300* | 34300* | 34300* | 34300* | 33900 |
| 75 | 36200 | -7 | 35800* | 35800* | 35800* | 35800* | 35200 |
| 70 | 37600 | -7 | 37000* | 37000* | 37000* | 37000* | 36700 |
| 65 | 39100 | -7 | 38200* | 38200* | 38200* | 38200* | 38200 |
| 60 | 40800 | -7 | 39500* | 39500* | 39500* | 39500* | 39500* |
| 55 | 41000 | -7 | 40900* | 40900* | 40900* | 40900* | 40900* |
| 50 | 41000 | -7 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 45 | 41000 | -7 | 41000 | 41000 | 41000 | 41000 | 41000 |
| 40 | 41000 | -7 | 41000 | 41000 | 41000 | 41000 | 41000 |

***Denotes altitude thrust limited in level flight, 100 fpm residual rate of climb.**

## Long Range Cruise Control

| WEIGHT (1000 KG) | | PRESSURE ALTITUDE (1000 FT) 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 |
|---|---|---|---|---|---|---|---|---|---|---|
| 85 | %N1 | 80.4 | 81.8 | 83.4 | 84.7 | 86.2 | 88.1 | | | |
| | MACH | .737 | .762 | .787 | .796 | .797 | .789 | | | |
| | KIAS | 309 | 307 | 305 | 296 | 283 | 268 | | | |
| | FF/ENG | 1312 | 1305 | 1303 | 1289 | 1276 | 1278 | | | |
| 80 | %N1 | 79.1 | 80.6 | 82.0 | 83.5 | 84.9 | 86.4 | | | |
| | MACH | .719 | .744 | .770 | .792 | .797 | .795 | | | |
| | KIAS | 301 | 300 | 298 | 294 | 283 | 270 | | | |
| | FF/ENG | 1239 | 1234 | 1228 | 1225 | 1210 | 1200 | | | |
| 75 | %N1 | 77.7 | 79.2 | 80.6 | 82.1 | 83.5 | 85.0 | 87.0 | | |
| | MACH | .700 | .726 | .751 | .778 | .794 | .797 | .793 | | |
| | KIAS | 292 | 292 | 290 | 289 | 282 | 271 | 257 | | |
| | FF/ENG | 1165 | 1161 | 1155 | 1153 | 1146 | 1134 | 1134 | | |
| 70 | %N1 | 76.0 | 77.7 | 79.1 | 80.6 | 82.1 | 83.4 | 85.3 | 88.2 | |
| | MACH | .679 | .706 | .732 | .758 | .784 | .796 | .797 | .789 | |
| | KIAS | 283 | 283 | 282 | 280 | 278 | 270 | 259 | 244 | |
| | FF/ENG | 1089 | 1088 | 1083 | 1077 | 1079 | 1068 | 1063 | 1078 | |
| 65 | %N1 | 74.2 | 75.9 | 77.5 | 79.0 | 80.4 | 82.0 | 83.7 | 86.0 | |
| | MACH | .656 | .683 | .710 | .737 | .763 | .788 | .796 | .796 | |
| | KIAS | 273 | 273 | 273 | 272 | 270 | 268 | 258 | 247 | |
| | FF/ENG | 1013 | 1012 | 1010 | 1006 | 1002 | 1004 | 997 | 1001 | |
| 60 | %N1 | 72.3 | 74.0 | 75.7 | 77.3 | 78.8 | 80.2 | 82.1 | 84.2 | 86.6 |
| | MACH | .633 | .658 | .686 | .714 | .740 | .767 | .791 | .797 | .795 |
| | KIAS | 263 | 263 | 263 | 262 | 261 | 260 | 256 | 247 | 235 |
| | FF/ENG | 939 | 935 | 935 | 933 | 930 | 928 | 935 | 933 | 936 |
| 55 | %N1 | 70.3 | 71.9 | 73.6 | 75.3 | 76.9 | 78.4 | 80.2 | 82.5 | 84.6 |
| | MACH | .612 | .633 | .659 | .687 | .715 | .742 | .770 | .792 | .797 |
| | KIAS | 254 | 252 | 252 | 252 | 252 | 250 | 249 | 245 | 236 |
| | FF/ENG | 872 | 861 | 858 | 859 | 858 | 861 | 864 | 870 | 868 |
| 50 | %N1 | 68.2 | 69.8 | 71.3 | 73.1 | 74.8 | 76.4 | 78.2 | 80.4 | 82.7 |
| | MACH | .589 | .610 | .632 | .658 | .686 | .715 | .742 | .770 | .792 |
| | KIAS | 244 | 242 | 241 | 240 | 241 | 240 | 239 | 238 | 234 |
| | FF/ENG | 804 | 796 | 783 | 785 | 783 | 794 | 797 | 808 | 803 |
| 45 | %N1 | 65.5 | 67.4 | 69.0 | 70.6 | 72.3 | 74.0 | 76.0 | 78.2 | 80.4 |
| | MACH | .558 | .584 | .607 | .628 | .654 | .683 | .712 | .740 | .767 |
| | KIAS | 230 | 231 | 231 | 229 | 229 | 229 | 228 | 227 | 226 |
| | FF/ENG | 727 | 734 | 722 | 717 | 715 | 725 | 731 | 739 | 747 |
| 40 | %N1 | 62.6 | 64.3 | 66.2 | 68.0 | 69.6 | 71.2 | 73.4 | 75.8 | 77.9 |
| | MACH | .527 | .550 | .576 | .600 | .622 | .647 | .676 | .706 | .734 |
| | KIAS | 217 | 217 | 218 | 218 | 217 | 216 | 216 | 216 | 215 |
| | FF/ENG | 669 | 661 | 665 | 657 | 659 | 654 | 663 | 670 | 679 |

**Shaded area approximates optimum altitude.**

## Long Range Cruise Enroute Fuel and Time - Low Altitudes

### Table 1 of 3: Ground to Air Miles Conversion

| AIR DISTANCE (NM) | | | | | GROUND DISTANCE (NM) | AIR DISTANCE (NM) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| HEADWIND COMPONENT (KTS) | | | | | | TAILWIND COMPONENT (KTS) | | | | |
| 100 | 80 | 60 | 40 | 20 | | 20 | 40 | 60 | 80 | 100 |
| 295 | 270 | 248 | 230 | 214 | 200 | 190 | 181 | 173 | 166 | 159 |
| 444 | 406 | 373 | 345 | 321 | 300 | 286 | 272 | 260 | 249 | 239 |
| 594 | 543 | 498 | 461 | 429 | 400 | 381 | 363 | 347 | 332 | 319 |
| 744 | 680 | 623 | 576 | 536 | 500 | 476 | 454 | 434 | 415 | 398 |
| 894 | 817 | 749 | 692 | 643 | 600 | 571 | 544 | 520 | 498 | 478 |
| 1044 | 953 | 874 | 807 | 750 | 700 | 666 | 635 | 607 | 581 | 558 |
| 1195 | 1091 | 999 | 923 | 858 | 800 | 761 | 726 | 693 | 664 | 638 |
| 1346 | 1228 | 1125 | 1039 | 965 | 900 | 857 | 817 | 780 | 747 | 718 |
| 1498 | 1366 | 1251 | 1155 | 1073 | 1000 | 952 | 908 | 867 | 830 | 797 |
| 1650 | 1504 | 1377 | 1270 | 1180 | 1100 | 1047 | 998 | 954 | 913 | 876 |
| 1802 | 1643 | 1503 | 1386 | 1288 | 1200 | 1142 | 1089 | 1040 | 995 | 955 |
| 1955 | 1781 | 1629 | 1503 | 1395 | 1300 | 1238 | 1180 | 1127 | 1078 | 1035 |
| 2108 | 1920 | 1756 | 1619 | 1503 | 1400 | 1333 | 1270 | 1213 | 1161 | 1114 |
| 2261 | 2059 | 1882 | 1735 | 1611 | 1500 | 1427 | 1360 | 1299 | 1243 | 1193 |
| 2415 | 2199 | 2009 | 1852 | 1718 | 1600 | 1522 | 1451 | 1385 | 1325 | 1272 |
| 2569 | 2338 | 2136 | 1968 | 1826 | 1700 | 1617 | 1541 | 1472 | 1408 | 1351 |
| 2724 | 2478 | 2263 | 2085 | 1934 | 1800 | 1713 | 1632 | 1558 | 1491 | 1430 |
| 2879 | 2619 | 2391 | 2202 | 2042 | 1900 | 1807 | 1722 | 1644 | 1573 | 1509 |
| 3035 | 2760 | 2519 | 2319 | 2150 | 2000 | 1902 | 1812 | 1730 | 1655 | 1588 |

### Table 2 of 3: Reference Fuel And Time Required at Check Point

| AIR DIST (NM) | PRESSURE ALTITUDE (1000 FT) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | | 14 | | 20 | | 24 | | 28 | |
| | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) |
| 200 | 1.2 | 0:42 | 1.1 | 0:40 | 0.9 | 0:38 | 0.8 | 0:37 | 0.7 | 0:35 |
| 300 | 1.9 | 1:02 | 1.7 | 0:59 | 1.5 | 0:55 | 1.3 | 0:53 | 1.2 | 0:50 |
| 400 | 2.5 | 1:22 | 2.3 | 1:18 | 2.0 | 1:12 | 1.8 | 1:09 | 1.6 | 1:06 |
| 500 | 3.2 | 1:42 | 2.9 | 1:37 | 2.6 | 1:29 | 2.3 | 1:25 | 2.1 | 1:21 |
| 600 | 3.8 | 2:02 | 3.5 | 1:56 | 3.1 | 1:46 | 2.8 | 1:41 | 2.6 | 1:36 |
| 700 | 4.4 | 2:22 | 4.1 | 2:15 | 3.7 | 2:04 | 3.3 | 1:57 | 3.0 | 1:51 |
| 800 | 5.1 | 2:42 | 4.7 | 2:34 | 4.2 | 2:21 | 3.8 | 2:13 | 3.5 | 2:07 |
| 900 | 5.7 | 3:02 | 5.3 | 2:53 | 4.7 | 2:38 | 4.3 | 2:30 | 3.9 | 2:22 |
| 1000 | 6.3 | 3:23 | 5.9 | 3:12 | 5.3 | 2:56 | 4.8 | 2:46 | 4.4 | 2:38 |
| 1100 | 7.0 | 3:43 | 6.5 | 3:32 | 5.8 | 3:14 | 5.2 | 3:03 | 4.8 | 2:53 |
| 1200 | 7.6 | 4:04 | 7.1 | 3:51 | 6.3 | 3:31 | 5.7 | 3:19 | 5.3 | 3:09 |
| 1300 | 8.2 | 4:25 | 7.7 | 4:11 | 6.9 | 3:49 | 6.2 | 3:36 | 5.7 | 3:25 |
| 1400 | 8.9 | 4:45 | 8.2 | 4:31 | 7.4 | 4:07 | 6.7 | 3:52 | 6.2 | 3:40 |
| 1500 | 9.5 | 5:06 | 8.8 | 4:50 | 7.9 | 4:25 | 7.2 | 4:09 | 6.6 | 3:56 |
| 1600 | 10.1 | 5:27 | 9.4 | 5:10 | 8.5 | 4:43 | 7.6 | 4:26 | 7.1 | 4:12 |
| 1700 | 10.7 | 5:49 | 10.0 | 5:30 | 9.0 | 5:01 | 8.1 | 4:43 | 7.5 | 4:28 |
| 1800 | 11.3 | 6:10 | 10.6 | 5:50 | 9.5 | 5:20 | 8.6 | 5:00 | 8.0 | 4:44 |
| 1900 | 11.9 | 6:31 | 11.1 | 6:11 | 10.0 | 5:38 | 9.1 | 5:17 | 8.4 | 5:00 |
| 2000 | 12.6 | 6:53 | 11.7 | 6:31 | 10.5 | 5:57 | 9.5 | 5:34 | 8.8 | 5:16 |

# Long Range Cruise Enroute Fuel and Time - Low Altitudes
## Table 3 of 3: Fuel Required Adjustment (1000 KG)

| REFERENCE FUEL REQUIRED (1000 KG) | WEIGHT AT CHECK POINT (1000 KG) | | | | |
|---|---|---|---|---|---|
| | 40 | 50 | 60 | 70 | 80 |
| 1 | -0.1 | 0.0 | 0.0 | 0.0 | 0.1 |
| 2 | -0.2 | -0.1 | 0.0 | 0.1 | 0.3 |
| 3 | -0.3 | -0.2 | 0.0 | 0.2 | 0.4 |
| 4 | -0.4 | -0.2 | 0.0 | 0.3 | 0.6 |
| 5 | -0.5 | -0.3 | 0.0 | 0.4 | 0.8 |
| 6 | -0.7 | -0.3 | 0.0 | 0.5 | 0.9 |
| 7 | -0.8 | -0.4 | 0.0 | 0.6 | 1.1 |
| 8 | -0.9 | -0.4 | 0.0 | 0.7 | 1.3 |
| 9 | -1.0 | -0.5 | 0.0 | 0.7 | 1.5 |
| 10 | -1.1 | -0.6 | 0.0 | 0.8 | 1.6 |
| 11 | -1.3 | -0.6 | 0.0 | 0.9 | 1.8 |
| 12 | -1.4 | -0.7 | 0.0 | 1.0 | 2.0 |
| 13 | -1.5 | -0.7 | 0.0 | 1.1 | 2.2 |

# Long Range Cruise Enroute Fuel and Time - High Altitudes

## Table 1 of 3: Ground to Air Miles Conversion

| AIR DISTANCE (NM) | | | | | GROUND DISTANCE (NM) | AIR DISTANCE (NM) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| HEADWIND COMPONENT (KTS) | | | | | | TAILWIND COMPONENT (KTS) | | | | |
| 100 | 80 | 60 | 40 | 20 | | 20 | 40 | 60 | 80 | 100 |
| 538 | 504 | 473 | 446 | 422 | 400 | 382 | 366 | 351 | 337 | 325 |
| 804 | 754 | 708 | 668 | 633 | 600 | 574 | 549 | 527 | 507 | 489 |
| 1071 | 1005 | 944 | 891 | 843 | 800 | 765 | 733 | 704 | 677 | 653 |
| 1339 | 1256 | 1180 | 1113 | 1054 | 1000 | 957 | 917 | 880 | 846 | 816 |
| 1607 | 1507 | 1416 | 1336 | 1265 | 1200 | 1149 | 1101 | 1057 | 1016 | 979 |
| 1876 | 1759 | 1652 | 1559 | 1476 | 1400 | 1340 | 1284 | 1233 | 1186 | 1142 |
| 2146 | 2011 | 1889 | 1782 | 1687 | 1600 | 1531 | 1468 | 1409 | 1355 | 1305 |
| 2417 | 2264 | 2126 | 2005 | 1898 | 1800 | 1723 | 1651 | 1584 | 1524 | 1468 |
| 2688 | 2518 | 2364 | 2229 | 2109 | 2000 | 1914 | 1834 | 1760 | 1692 | 1631 |
| 2960 | 2772 | 2602 | 2453 | 2321 | 2200 | 2105 | 2017 | 1935 | 1861 | 1794 |
| 3233 | 3027 | 2840 | 2677 | 2532 | 2400 | 2296 | 2200 | 2111 | 2030 | 1956 |
| 3507 | 3282 | 3079 | 2901 | 2744 | 2600 | 2487 | 2383 | 2287 | 2198 | 2118 |
| 3780 | 3537 | 3318 | 3126 | 2955 | 2800 | 2679 | 2566 | 2462 | 2366 | 2279 |
| 4055 | 3793 | 3557 | 3350 | 3167 | 3000 | 2870 | 2749 | 2637 | 2535 | 2441 |
| 4331 | 4050 | 3796 | 3575 | 3379 | 3200 | 3061 | 2931 | 2812 | 2702 | 2603 |
| 4607 | 4307 | 4036 | 3800 | 3590 | 3400 | 3252 | 3114 | 2987 | 2870 | 2764 |
| 4883 | 4564 | 4277 | 4025 | 3802 | 3600 | 3442 | 3296 | 3161 | 3038 | 2925 |
| 5161 | 4823 | 4517 | 4251 | 4015 | 3800 | 3633 | 3479 | 3336 | 3205 | 3086 |
| 5439 | 5081 | 4758 | 4477 | 4227 | 4000 | 3824 | 3661 | 3510 | 3372 | 3247 |
| 5718 | 5340 | 4999 | 4702 | 4439 | 4200 | 4015 | 3843 | 3684 | 3539 | 3408 |
| 5998 | 5600 | 5241 | 4928 | 4651 | 4400 | 4205 | 4025 | 3859 | 3706 | 3568 |
| 6279 | 5860 | 5483 | 5154 | 4864 | 4600 | 4396 | 4207 | 4033 | 3873 | 3728 |
| 6561 | 6121 | 5725 | 5381 | 5076 | 4800 | 4587 | 4389 | 4207 | 4040 | 3888 |
| 6844 | 6383 | 5968 | 5608 | 5289 | 5000 | 4778 | 4571 | 4381 | 4206 | 4048 |
| 7128 | 6646 | 6212 | 5835 | 5502 | 5200 | 4968 | 4753 | 4554 | 4372 | 4207 |
| 7414 | 6909 | 6456 | 6062 | 5715 | 5400 | 5158 | 4934 | 4727 | 4538 | 4367 |
| 7701 | 7174 | 6701 | 6290 | 5928 | 5600 | 5348 | 5115 | 4900 | 4704 | 4525 |
| 7989 | 7440 | 6946 | 6518 | 6141 | 5800 | 5539 | 5296 | 5073 | 4869 | 4684 |
| 8278 | 7706 | 7192 | 6747 | 6355 | 6000 | 5729 | 5477 | 5246 | 5034 | 4842 |

## Long Range Cruise Enroute Fuel and Time - High Altitudes

### Table 2 of 3: Reference Fuel And Time Required at Check Point

| AIR DIST (NM) | PRESSURE ALTITUDE (1000 FT) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 29 | | 31 | | 33 | | 35 | | 37 | |
| | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) |
| 400 | 1.6 | 1:05 | 1.6 | 1:03 | 1.5 | 1:02 | 1.4 | 1:01 | 1.4 | 1:00 |
| 600 | 2.5 | 1:35 | 2.4 | 1:32 | 2.3 | 1:30 | 2.3 | 1:28 | 2.2 | 1:27 |
| 800 | 3.4 | 2:05 | 3.3 | 2:02 | 3.2 | 1:59 | 3.1 | 1:56 | 3.0 | 1:53 |
| 1000 | 4.3 | 2:35 | 4.2 | 2:31 | 4.0 | 2:27 | 3.9 | 2:24 | 3.8 | 2:20 |
| 1200 | 5.2 | 3:06 | 5.0 | 3:01 | 4.9 | 2:56 | 4.7 | 2:52 | 4.6 | 2:47 |
| 1400 | 6.1 | 3:37 | 5.9 | 3:30 | 5.7 | 3:25 | 5.5 | 3:20 | 5.4 | 3:14 |
| 1600 | 6.9 | 4:08 | 6.7 | 4:00 | 6.5 | 3:54 | 6.3 | 3:48 | 6.2 | 3:41 |
| 1800 | 7.8 | 4:39 | 7.6 | 4:31 | 7.3 | 4:23 | 7.1 | 4:16 | 6.9 | 4:09 |
| 2000 | 8.7 | 5:11 | 8.4 | 5:01 | 8.1 | 4:52 | 7.9 | 4:44 | 7.7 | 4:36 |
| 2200 | 9.5 | 5:43 | 9.2 | 5:32 | 8.9 | 5:22 | 8.7 | 5:13 | 8.5 | 5:04 |
| 2400 | 10.4 | 6:15 | 10.0 | 6:03 | 9.7 | 5:52 | 9.5 | 5:42 | 9.2 | 5:32 |
| 2600 | 11.2 | 6:47 | 10.9 | 6:34 | 10.5 | 6:22 | 10.3 | 6:11 | 10.0 | 6:00 |
| 2800 | 12.0 | 7:19 | 11.7 | 7:05 | 11.3 | 6:52 | 11.0 | 6:40 | 10.7 | 6:28 |
| 3000 | 12.9 | 7:52 | 12.5 | 7:37 | 12.1 | 7:22 | 11.8 | 7:09 | 11.5 | 6:56 |
| 3200 | 13.7 | 8:25 | 13.3 | 8:09 | 12.8 | 7:53 | 12.6 | 7:39 | 12.2 | 7:25 |
| 3400 | 14.5 | 8:58 | 14.0 | 8:41 | 13.6 | 8:24 | 13.3 | 8:09 | 13.0 | 7:54 |
| 3600 | 15.3 | 9:31 | 14.8 | 9:13 | 14.4 | 8:55 | 14.1 | 8:39 | 13.7 | 8:23 |
| 3800 | 16.1 | 10:05 | 15.6 | 9:46 | 15.1 | 9:27 | 14.8 | 9:09 | 14.4 | 8:52 |
| 4000 | 16.9 | 10:39 | 16.4 | 10:18 | 15.9 | 9:58 | 15.5 | 9:40 | 15.1 | 9:21 |
| 4200 | 17.7 | 11:13 | 17.2 | 10:51 | 16.6 | 10:30 | 16.3 | 10:10 | 15.9 | 9:50 |
| 4400 | 18.5 | 11:47 | 17.9 | 11:25 | 17.4 | 11:02 | 17.0 | 10:41 | 16.6 | 10:20 |
| 4600 | 19.3 | 12:22 | 18.7 | 11:58 | 18.1 | 11:34 | 17.7 | 11:12 | 17.3 | 10:50 |
| 4800 | 20.0 | 12:57 | 19.4 | 12:32 | 18.9 | 12:07 | 18.4 | 11:44 | 18.0 | 11:20 |
| 5000 | 20.8 | 13:32 | 20.2 | 13:06 | 19.6 | 12:40 | 19.2 | 12:15 | 18.7 | 11:50 |
| 5200 | 21.6 | 14:08 | 20.9 | 13:40 | 20.3 | 13:13 | 19.9 | 12:48 | 19.4 | 12:21 |
| 5400 | 22.4 | 14:44 | 21.7 | 14:14 | 21.1 | 13:46 | 20.6 | 13:20 | 20.1 | 12:51 |
| 5600 | 23.1 | 15:20 | 22.4 | 14:49 | 21.8 | 14:20 | 21.3 | 13:52 | 20.8 | 13:22 |
| 5800 | 23.9 | 15:57 | 23.1 | 15:24 | 22.5 | 14:54 | 22.0 | 14:25 | 21.4 | 13:54 |
| 6000 | 24.7 | 16:34 | 23.9 | 16:00 | 23.2 | 15:28 | 22.7 | 14:58 | 22.1 | 14:25 |

### Table 3 of 3: Fuel Required Adjustment (1000 KG)

| REFERENCE FUEL REQUIRED (1000 KG) | WEIGHT AT CHECK POINT (1000 KG) | | | | |
|---|---|---|---|---|---|
| | 40 | 50 | 60 | 70 | 80 |
| 2 | -0.2 | -0.1 | 0.0 | 0.2 | 0.5 |
| 4 | -0.5 | -0.3 | 0.0 | 0.4 | 1.0 |
| 6 | -0.8 | -0.5 | 0.0 | 0.6 | 1.5 |
| 8 | -1.1 | -0.6 | 0.0 | 0.8 | 2.0 |
| 10 | -1.4 | -0.7 | 0.0 | 1.0 | 2.4 |
| 12 | -1.7 | -0.9 | 0.0 | 1.2 | 2.8 |
| 14 | -2.0 | -1.0 | 0.0 | 1.4 | 3.2 |
| 16 | -2.3 | -1.2 | 0.0 | 1.5 | 3.6 |
| 18 | -2.6 | -1.3 | 0.0 | 1.7 | 3.9 |
| 20 | -2.9 | -1.4 | 0.0 | 1.8 | 4.2 |
| 22 | -3.3 | -1.6 | 0.0 | 2.0 | 4.5 |
| 24 | -3.6 | -1.7 | 0.0 | 2.1 | 4.7 |
| 26 | -4.0 | -1.9 | 0.0 | 2.2 | 4.9 |

## Long Range Cruise Wind-Altitude Trade

| PRESSURE ALTITUDE (1000 FT) | CRUISE WEIGHT (1000 KG) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 85 | 80 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 |
| 41 | | | | | 13 | 1 | 0 | 3 | 14 | 30 |
| 39 | | | 25 | 8 | 0 | 0 | 3 | 13 | 27 | 44 |
| 37 | | 16 | 4 | 0 | 0 | 4 | 13 | 26 | 41 | 59 |
| 35 | 9 | 1 | 0 | 0 | 5 | 14 | 26 | 40 | 56 | 72 |
| 33 | 0 | 0 | 1 | 7 | 16 | 27 | 40 | 54 | 69 | 85 |
| 31 | 0 | 3 | 10 | 18 | 29 | 40 | 53 | 67 | 82 | 97 |
| 29 | 6 | 13 | 21 | 31 | 42 | 54 | 67 | 80 | 93 | 107 |
| 27 | 16 | 25 | 34 | 44 | 55 | 67 | 79 | 91 | 104 | 116 |
| 25 | 29 | 38 | 47 | 58 | 68 | 79 | 91 | 102 | 113 | 124 |
| 23 | 41 | 51 | 60 | 70 | 80 | 90 | 101 | 111 | 121 | 131 |

**The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.**

**Method:**

1. **Read wind factors for present and new altitudes from table.**
2. **Determine difference (new altitude wind factor minus present altitude wind factor); this difference may be negative or positive.**
3. **Break-even wind at new altitude is present altitude wind plus difference from step 2.**

## Descent at .78/280/250 KIAS

| PRESSURE ALTITUDE (FT) | TIME (MIN) | FUEL (KG) | DISTANCE (NM) | | | |
|---|---|---|---|---|---|---|
| | | | LANDING WEIGHT (1000 KG) | | | |
| | | | 40 | 50 | 60 | 70 |
| 41000 | 26 | 270 | 102 | 119 | 132 | 141 |
| 39000 | 25 | 260 | 96 | 113 | 126 | 135 |
| 37000 | 24 | 250 | 91 | 107 | 119 | 128 |
| 35000 | 24 | 250 | 87 | 102 | 114 | 123 |
| 33000 | 23 | 240 | 83 | 97 | 108 | 117 |
| 31000 | 22 | 240 | 78 | 91 | 102 | 110 |
| 29000 | 21 | 230 | 73 | 86 | 95 | 103 |
| 27000 | 20 | 230 | 69 | 80 | 89 | 96 |
| 25000 | 19 | 220 | 64 | 74 | 83 | 89 |
| 23000 | 18 | 210 | 59 | 69 | 76 | 82 |
| 21000 | 17 | 200 | 55 | 63 | 70 | 75 |
| 19000 | 16 | 190 | 51 | 58 | 64 | 69 |
| 17000 | 15 | 190 | 46 | 53 | 58 | 62 |
| 15000 | 14 | 180 | 42 | 48 | 53 | 56 |
| 10000 | 10 | 140 | 30 | 33 | 36 | 37 |
| 5000 | 7 | 110 | 18 | 19 | 20 | 21 |
| 1500 | 4 | 80 | 10 | 10 | 10 | 10 |

**Allowances for a straight-in approach are included.**

# Holding
## Flaps Up

| WEIGHT (1000 KG) | | PRESSURE ALTITUDE (FT) 1500 | 5000 | 10000 | 15000 | 20000 | 25000 | 30000 | 35000 | 41000 |
|---|---|---|---|---|---|---|---|---|---|---|
| 85 | %N1 | 57.8 | 60.4 | 64.2 | 68.4 | 73.2 | 78.1 | 82.6 | | |
| | KIAS | 244 | 244 | 246 | 247 | 249 | 251 | 254 | | |
| | FF/ENG | 1220 | 1200 | 1200 | 1190 | 1190 | 1200 | 1220 | | |
| 80 | %N1 | 56.2 | 58.8 | 62.6 | 66.8 | 71.5 | 76.4 | 81.0 | 85.9 | |
| | KIAS | 237 | 237 | 238 | 239 | 242 | 243 | 246 | 249 | |
| | FF/ENG | 1150 | 1140 | 1130 | 1130 | 1120 | 1120 | 1140 | 1190 | |
| 75 | %N1 | 54.6 | 57.1 | 60.8 | 65.1 | 69.6 | 74.6 | 79.4 | 84.1 | |
| | KIAS | 229 | 229 | 230 | 232 | 233 | 235 | 238 | 241 | |
| | FF/ENG | 1090 | 1070 | 1070 | 1070 | 1070 | 1050 | 1060 | 1100 | |
| 70 | %N1 | 53.0 | 55.3 | 59.0 | 63.2 | 67.7 | 72.7 | 77.6 | 82.2 | |
| | KIAS | 220 | 222 | 222 | 224 | 225 | 227 | 229 | 232 | |
| | FF/ENG | 1030 | 1010 | 1000 | 1010 | 1000 | 980 | 990 | 1010 | |
| 65 | %N1 | 51.3 | 53.5 | 57.1 | 61.2 | 65.7 | 70.5 | 75.7 | 80.3 | |
| | KIAS | 211 | 214 | 214 | 215 | 216 | 218 | 220 | 223 | |
| | FF/ENG | 960 | 950 | 930 | 940 | 930 | 910 | 920 | 930 | |
| 60 | %N1 | 49.5 | 51.7 | 55.1 | 59.1 | 63.6 | 68.3 | 73.5 | 78.3 | 86.0 |
| | KIAS | 204 | 204 | 206 | 206 | 208 | 209 | 211 | 213 | 217 |
| | FF/ENG | 900 | 890 | 870 | 870 | 870 | 840 | 840 | 860 | 930 |
| 55 | %N1 | 47.6 | 49.8 | 53.1 | 56.9 | 61.3 | 65.9 | 71.0 | 76.1 | 83.7 |
| | KIAS | 198 | 198 | 198 | 198 | 199 | 200 | 201 | 203 | 207 |
| | FF/ENG | 850 | 840 | 810 | 800 | 800 | 780 | 780 | 790 | 850 |
| 50 | %N1 | 45.7 | 47.8 | 51.0 | 54.5 | 58.8 | 63.4 | 68.3 | 73.6 | 81.1 |
| | KIAS | 191 | 191 | 191 | 191 | 191 | 191 | 192 | 193 | 196 |
| | FF/ENG | 790 | 780 | 760 | 740 | 730 | 730 | 720 | 730 | 770 |
| 45 | %N1 | 43.8 | 45.8 | 48.9 | 52.2 | 56.2 | 60.8 | 65.4 | 70.6 | 78.4 |
| | KIAS | 185 | 185 | 185 | 185 | 185 | 185 | 185 | 185 | 185 |
| | FF/ENG | 740 | 720 | 700 | 680 | 670 | 660 | 660 | 660 | 690 |
| 40 | %N1 | 41.8 | 43.7 | 46.7 | 49.9 | 53.5 | 57.9 | 62.5 | 67.5 | 75.4 |
| | KIAS | 178 | 178 | 178 | 178 | 178 | 178 | 178 | 178 | 178 |
| | FF/ENG | 690 | 670 | 640 | 620 | 610 | 600 | 590 | 590 | 620 |

**This table includes 5% additional fuel for holding in a racetrack pattern.**

Intentionally
Blank

# ADVISORY INFORMATION

## Runway Surface Condition Correlation

| RUNWAY CONDITION CODE | RUNWAY SURFACE CONDITION DESCRIPTION | REPORTED BRAKING ACTION |
|---|---|---|
| 6 | Dry | Dry |
| 5 | Wet (Smooth, Grooved or PFC) or Frost<br>3 mm (0.12 inches) or less of: Water, Slush, Dry Snow or Wet Snow | Good |
| 4 | Compacted Snow at or below -15°C OAT | Good to Medium |
| 3 | Wet (Slippery), Dry Snow or Wet Snow (any depth) over Compacted Snow<br>Greater than 3 mm (0.12 inches) of : Dry Snow or Wet Snow<br>Compacted Snow at OAT warmer than -15°C | Medium |
| 2 | Greater than 3 mm (0.12 inches) of: Water or Slush | Medium to Poor |
| 1 | Ice | Poor |
| 0 | Wet Ice, Water on top of Compacted Snow, Dry Snow or Wet Snow over Ice | Nil |

# ADVISORY INFORMATION

## Normal Configuration Landing Distance

### Flaps 15

| BRAKING CONFIGURATION | REF DIST 65000 KG LANDING WEIGHT | WT ADJ PER 5000 KG ABV/BLW 65000 KG | ALT ADJ PER 1000 FT STD/HIGH* | WIND ADJ PER 10 KTS HEAD/TAIL WIND | SLOPE ADJ PER 1% DOWN/UP HILL | TEMP ADJ PER 10°C ABV/BLW ISA | APP SPD ADJ PER 5 KTS ABOVE VREF15 | REVERSE THRUST ADJ ONE REV | REVERSE THRUST ADJ NO REV |
|---|---|---|---|---|---|---|---|---|---|

LANDING DISTANCE AND ADJUSTMENTS (FT)

### Dry Runway

| BRAKING CONFIGURATION | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | ONE REV | NO REV |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4820 | 280/-290 | 120/160 | -210/700 | 50/-50 | 120/-130 | 210 | 90 | 150 |
| AUTOBRAKE MAX | 5400 | 290/-330 | 140/180 | -240/770 | 10/0 | 150/-150 | 280 | 10 | 40 |
| AUTOBRAKE 3 | 6170 | 350/-400 | 170/220 | -280/920 | 0/0 | 180/-180 | 340 | 0 | 0 |
| AUTOBRAKE 2 | 7280 | 440/-490 | 210/270 | -350/1140 | 0/0 | 220/-220 | 420 | 0 | 0 |
| AUTOBRAKE 1 | 9170 | 600/-660 | 290/380 | -460/1520 | 50/-120 | 290/-290 | 470 | 100 | 100 |

### Good Reported Braking Action

| BRAKING CONFIGURATION | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | ONE REV | NO REV |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6070 | 440/-440 | 220/300 | -330/1170 | 130/-110 | 200/-200 | 320 | 320 | 630 |
| AUTOBRAKE MAX | 6130 | 440/-440 | 220/300 | -330/1160 | 120/-110 | 200/-200 | 340 | 330 | 650 |
| AUTOBRAKE 3 | 6390 | 410/-420 | 200/290 | -310/1060 | 60/-50 | 190/-190 | 350 | 190 | 470 |
| AUTOBRAKE 2 | 7390 | 450/-500 | 220/280 | -360/1180 | 40/-30 | 220/-230 | 430 | 0 | 0 |
| AUTOBRAKE 1 | 9190 | 610/-670 | 300/380 | -460/1540 | 90/-130 | 290/-290 | 480 | 110 | 110 |

### Good To Medium Reported Braking Action

| BRAKING CONFIGURATION | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | ONE REV | NO REV |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6670 | 450/-450 | 220/300 | -350/1240 | 180/-150 | 210/-210 | 320 | 430 | 890 |
| AUTOBRAKE MAX | 6730 | 450/-460 | 220/300 | -350/1230 | 170/-150 | 210/-210 | 340 | 440 | 910 |
| AUTOBRAKE 3 | 6750 | 440/-460 | 220/310 | -350/1210 | 160/-120 | 210/-210 | 350 | 410 | 880 |
| AUTOBRAKE 2 | 7460 | 450/-500 | 220/290 | -370/1240 | 80/-60 | 230/-230 | 430 | 70 | 290 |
| AUTOBRAKE 1 | 9190 | 610/-670 | 300/380 | -460/1540 | 90/-130 | 290/-290 | 480 | 110 | 110 |

### Medium Reported Braking Action

| BRAKING CONFIGURATION | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | ONE REV | NO REV |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7110 | 460/-470 | 230/310 | -370/1310 | 220/-190 | 210/-210 | 320 | 550 | 1200 |
| AUTOBRAKE MAX | 7170 | 470/-490 | 230/310 | -370/1300 | 220/-180 | 210/-210 | 340 | 560 | 1230 |
| AUTOBRAKE 3 | 7160 | 470/-480 | 230/310 | -370/1300 | 220/-180 | 220/-210 | 340 | 560 | 1220 |
| AUTOBRAKE 2 | 7640 | 470/-510 | 240/300 | -390/1340 | 140/-90 | 230/-240 | 430 | 260 | 810 |
| AUTOBRAKE 1 | 9190 | 610/-660 | 300/380 | -470/1550 | 130/-130 | 290/-290 | 480 | 140 | 230 |

# ADVISORY INFORMATION

## Normal Configuration Landing Distance

### Flaps 15

| BRAKING CONFIGURATION | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF15 | ONE REV | NO REV |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8160 | 640/-630 | 320/440 | -480/1720 | 330/-270 | 280/-280 | 380 | 1000 | 2470 |
| AUTOBRAKE MAX | 8210 | 640/-630 | 320/440 | -480/1720 | 360/-290 | 280/-290 | 380 | 1010 | 2500 |
| AUTOBRAKE 3 | 8210 | 640/-630 | 320/440 | -480/1720 | 360/-290 | 280/-290 | 380 | 1010 | 2500 |
| AUTOBRAKE 2 | 8210 | 640/-580 | 320/440 | -460/1720 | 360/-250 | 280/-290 | 390 | 1010 | 2500 |
| AUTOBRAKE 1 | 9420 | 600/-670 | 300/410 | -470/1550 | 180/-190 | 290/-290 | 430 | 240 | 1320 |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10440 | 750/-760 | 380/500 | -650/2390 | 930/-590 | 330/-330 | 380 | 2080 | 5870 |
| AUTOBRAKE MAX | 10490 | 760/-770 | 390/510 | -650/2390 | 960/-610 | 330/-330 | 380 | 2090 | 5900 |
| AUTOBRAKE 3 | 10490 | 760/-770 | 390/510 | -650/2390 | 960/-610 | 330/-330 | 380 | 2090 | 5900 |
| AUTOBRAKE 2 | 10490 | 760/-770 | 390/510 | -650/2390 | 960/-600 | 330/-330 | 390 | 2090 | 5900 |
| AUTOBRAKE 1 | 10900 | 770/-790 | 390/510 | -670/2440 | 880/-570 | 350/-350 | 430 | 1740 | 5500 |

**Reference distance is based on sea level, standard day, no wind or slope, VREF15, two-engine detent No. 2 reverse thrust, and auto or manual speedbrakes.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**All reference distances and adjustments shown have been increased by 15%.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Normal Configuration Landing Distance

### Flaps 30

| BRAKING CONFIGURATION | REF DIST 65000 KG LANDING WEIGHT | WT ADJ PER 5000 KG ABV/BLW 65000 KG | ALT ADJ PER 1000 FT STD/HIGH* | WIND ADJ PER 10 KTS HEAD/ TAIL WIND | SLOPE ADJ PER 1% DOWN/ UP HILL | TEMP ADJ PER 10°C ABV/ BLW ISA | APP SPD ADJ PER 5 KTS ABOVE VREF30 | REVERSE THRUST ADJ ONE REV | REVERSE THRUST ADJ NO REV |
|---|---|---|---|---|---|---|---|---|---|
| **Dry Runway** | | | | | | | | | |
| MAX MANUAL | 4480 | 260/-270 | 110/140 | -210/680 | 50/-40 | 110/-120 | 210 | 70 | 120 |
| AUTOBRAKE MAX | 5030 | 270/-310 | 130/160 | -230/740 | 10/0 | 130/-140 | 270 | 10 | 30 |
| AUTOBRAKE 3 | 5720 | 330/-370 | 160/200 | -270/890 | 0/0 | 160/-170 | 330 | 0 | 0 |
| AUTOBRAKE 2 | 6730 | 400/-450 | 200/250 | -330/1100 | 0/0 | 200/-200 | 410 | 0 | 0 |
| AUTOBRAKE 1 | 8420 | 550/-610 | 270/340 | -440/1460 | 50/-120 | 260/-260 | 430 | 110 | 110 |
| **Good Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 5510 | 380/-390 | 190/260 | -310/1100 | 110/-90 | 180/-180 | 300 | 230 | 450 |
| AUTOBRAKE MAX | 5630 | 390/-400 | 190/260 | -310/1090 | 110/-90 | 180/-180 | 320 | 250 | 480 |
| AUTOBRAKE 3 | 5890 | 360/-390 | 180/260 | -290/990 | 50/-40 | 170/-180 | 330 | 100 | 290 |
| AUTOBRAKE 2 | 6820 | 410/-460 | 200/260 | -340/1120 | 30/-30 | 200/-210 | 420 | 0 | 0 |
| AUTOBRAKE 1 | 8430 | 550/-610 | 270/350 | -440/1480 | 90/-120 | 260/-270 | 430 | 110 | 110 |
| **Good To Medium Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 6100 | 400/-410 | 200/270 | -330/1180 | 160/-130 | 190/-190 | 300 | 330 | 680 |
| AUTOBRAKE MAX | 6220 | 400/-420 | 200/270 | -330/1170 | 160/-130 | 190/-190 | 320 | 350 | 710 |
| AUTOBRAKE 3 | 6230 | 390/-410 | 200/270 | -330/1150 | 150/-110 | 190/-190 | 330 | 320 | 680 |
| AUTOBRAKE 2 | 6900 | 410/-470 | 200/260 | -350/1180 | 70/-50 | 210/-210 | 420 | 70 | 230 |
| AUTOBRAKE 1 | 8430 | 550/-610 | 270/350 | -440/1480 | 90/-120 | 260/-270 | 430 | 110 | 110 |
| **Medium Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 6530 | 410/-430 | 200/280 | -350/1250 | 200/-170 | 190/-190 | 290 | 440 | 950 |
| AUTOBRAKE MAX | 6640 | 420/-440 | 210/280 | -360/1240 | 200/-170 | 190/-200 | 320 | 460 | 980 |
| AUTOBRAKE 3 | 6630 | 420/-440 | 210/280 | -360/1240 | 200/-170 | 190/-200 | 320 | 460 | 980 |
| AUTOBRAKE 2 | 7070 | 430/-470 | 210/280 | -370/1280 | 130/-90 | 210/-220 | 410 | 210 | 630 |
| AUTOBRAKE 1 | 8440 | 550/-600 | 270/350 | -440/1490 | 130/-130 | 260/-270 | 430 | 140 | 220 |

# ADVISORY INFORMATION

## Normal Configuration Landing Distance

### Flaps 30

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF30 | ONE REV | NO REV |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7370 | 560/-560 | 280/380 | -450/1630 | 280/-230 | 250/-250 | 360 | 740 | 1730 |
| AUTOBRAKE MAX | 7420 | 570/-570 | 280/390 | -460/1630 | 310/-260 | 260/-260 | 360 | 750 | 1760 |
| AUTOBRAKE 3 | 7420 | 570/-570 | 280/390 | -460/1630 | 310/-260 | 260/-260 | 360 | 750 | 1760 |
| AUTOBRAKE 2 | 7440 | 570/-530 | 280/390 | -420/1630 | 300/-180 | 260/-250 | 370 | 750 | 1760 |
| AUTOBRAKE 1 | 8580 | 550/-610 | 270/360 | -440/1480 | 170/-170 | 260/-260 | 400 | 170 | 630 |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9580 | 670/-690 | 340/440 | -620/2310 | 860/-540 | 300/-300 | 350 | 1690 | 4590 |
| AUTOBRAKE MAX | 9630 | 680/-690 | 350/450 | -630/2310 | 890/-560 | 300/-300 | 360 | 1700 | 4620 |
| AUTOBRAKE 3 | 9630 | 680/-690 | 350/450 | -630/2310 | 890/-560 | 300/-300 | 360 | 1700 | 4620 |
| AUTOBRAKE 2 | 9630 | 680/-690 | 350/450 | -630/2320 | 880/-540 | 300/-300 | 380 | 1700 | 4620 |
| AUTOBRAKE 1 | 10000 | 690/-720 | 350/460 | -640/2360 | 830/-520 | 320/-320 | 400 | 1430 | 4260 |

**Reference distance is based on sea level, standard day, no wind or slope, VREF30, two-engine detent No. 2 reverse thrust, and auto or manual speedbrakes.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**All reference distances and adjustments shown have been increased by 15%.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Normal Configuration Landing Distance
### Flaps 40

| BRAKING CONFIGURATION | LANDING DISTANCE AND ADJUSTMENTS (FT) REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
|---|---|---|---|---|---|---|---|---|---|
| | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF40 | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4210 | 290/-250 | 110/140 | -200/670 | 50/-40 | 110/-110 | 210 | 60 | 100 |
| AUTOBRAKE MAX | 4670 | 310/-290 | 130/160 | -220/720 | 10/0 | 120/-130 | 270 | 10 | 30 |
| AUTOBRAKE 3 | 5280 | 370/-340 | 160/200 | -260/860 | 0/0 | 150/-150 | 320 | 0 | 0 |
| AUTOBRAKE 2 | 6190 | 450/-420 | 190/250 | -320/1060 | 0/0 | 180/-190 | 390 | 0 | 0 |
| AUTOBRAKE 1 | 7780 | 600/-550 | 260/330 | -420/1410 | 20/-90 | 240/-240 | 430 | 40 | 40 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5110 | 420/-360 | 180/250 | -300/1060 | 100/-90 | 160/-170 | 290 | 190 | 360 |
| AUTOBRAKE MAX | 5240 | 430/-360 | 190/260 | -300/1050 | 100/-90 | 170/-170 | 310 | 210 | 390 |
| AUTOBRAKE 3 | 5460 | 400/-360 | 180/250 | -280/970 | 50/-40 | 160/-160 | 330 | 90 | 240 |
| AUTOBRAKE 2 | 6280 | 460/-420 | 200/250 | -330/1080 | 30/-20 | 190/-190 | 400 | 0 | 0 |
| AUTOBRAKE 1 | 7790 | 600/-560 | 260/340 | -430/1430 | 60/-100 | 240/-250 | 440 | 50 | 50 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5710 | 430/-370 | 190/260 | -320/1140 | 150/-130 | 170/-170 | 290 | 290 | 590 |
| AUTOBRAKE MAX | 5830 | 440/-380 | 190/260 | -320/1130 | 150/-130 | 170/-170 | 310 | 300 | 620 |
| AUTOBRAKE 3 | 5820 | 440/-380 | 190/260 | -320/1130 | 150/-110 | 170/-170 | 330 | 300 | 610 |
| AUTOBRAKE 2 | 6360 | 460/-430 | 200/260 | -340/1140 | 70/-50 | 190/-190 | 400 | 70 | 230 |
| AUTOBRAKE 1 | 7790 | 600/-560 | 260/340 | -430/1430 | 60/-100 | 240/-250 | 440 | 50 | 50 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6140 | 440/-400 | 200/270 | -340/1210 | 200/-160 | 180/-180 | 290 | 390 | 830 |
| AUTOBRAKE MAX | 6240 | 460/-420 | 200/270 | -350/1210 | 190/-160 | 180/-180 | 320 | 400 | 860 |
| AUTOBRAKE 3 | 6240 | 460/-410 | 200/270 | -350/1210 | 200/-160 | 180/-180 | 310 | 400 | 860 |
| AUTOBRAKE 2 | 6540 | 480/-430 | 210/270 | -360/1240 | 130/-90 | 200/-200 | 400 | 220 | 610 |
| AUTOBRAKE 1 | 7800 | 600/-550 | 260/340 | -420/1440 | 100/-100 | 240/-240 | 440 | 80 | 150 |

# ADVISORY INFORMATION

## Normal Configuration Landing Distance

### Flaps 40

| BRAKING CONFIGURATION | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF40 | ONE REV | NO REV |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6830 | 590/-520 | 270/370 | -440/1590 | 270/-220 | 230/-230 | 350 | 600 | 1390 |
| AUTOBRAKE MAX | 6890 | 600/-530 | 270/380 | -440/1590 | 290/-240 | 240/-240 | 350 | 620 | 1420 |
| AUTOBRAKE 3 | 6890 | 600/-530 | 270/380 | -440/1590 | 290/-240 | 240/-240 | 350 | 620 | 1420 |
| AUTOBRAKE 2 | 6900 | 610/-500 | 280/370 | -420/1590 | 290/-170 | 240/-230 | 370 | 620 | 1420 |
| AUTOBRAKE 1 | 7950 | 590/-570 | 260/350 | -430/1440 | 140/-150 | 240/-240 | 400 | 100 | 420 |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9020 | 700/-640 | 330/430 | -610/2280 | 840/-520 | 280/-280 | 350 | 1510 | 4020 |
| AUTOBRAKE MAX | 9090 | 710/-650 | 340/440 | -610/2280 | 870/-550 | 290/-290 | 350 | 1520 | 4050 |
| AUTOBRAKE 3 | 9090 | 710/-650 | 340/440 | -610/2280 | 870/-550 | 290/-290 | 350 | 1520 | 4050 |
| AUTOBRAKE 2 | 9090 | 720/-650 | 340/440 | -610/2280 | 870/-530 | 290/-290 | 370 | 1520 | 4050 |
| AUTOBRAKE 1 | 9380 | 730/-670 | 340/450 | -630/2310 | 800/-510 | 300/-300 | 400 | 1270 | 3780 |

**Reference distance is based on sea level, standard day, no wind or slope, VREF40, two-engine detent No. 2 reverse thrust, and auto or manual speedbrakes.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**All reference distances and adjustments shown have been increased by 15%.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### Airspeed Unreliable (Flaps 15)

### VREF15

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |
| **Dry Runway** | | | | | | | | | |
| MAX MANUAL | 4550 | 290/-270 | 120/150 | -190/630 | 50/-40 | 120/-120 | N/A | 100 | 160 |
| AUTOBRAKE MAX | 5170 | 270/-300 | 140/170 | -210/690 | 10/0 | 140/-140 | N/A | 10 | 30 |
| AUTOBRAKE 2 | 7050 | 400/-450 | 210/260 | -320/1040 | 0/0 | 210/-210 | N/A | 0 | 0 |
| **Good Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 5770 | 400/-400 | 210/280 | -300/1050 | 120/-100 | 190/-190 | N/A | 340 | 690 |
| AUTOBRAKE MAX | 5870 | 410/-400 | 210/280 | -300/1040 | 120/-100 | 190/-190 | N/A | 360 | 730 |
| AUTOBRAKE 2 | 7160 | 410/-460 | 210/270 | -320/1060 | 30/-30 | 220/-220 | N/A | 0 | 0 |
| **Good To Medium Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 6290 | 410/-410 | 210/290 | -320/1110 | 160/-140 | 200/-200 | N/A | 440 | 920 |
| AUTOBRAKE MAX | 6380 | 420/-420 | 210/290 | -320/1110 | 160/-140 | 200/-200 | N/A | 460 | 960 |
| AUTOBRAKE 2 | 7230 | 410/-460 | 210/280 | -340/1120 | 70/-50 | 220/-220 | N/A | 60 | 250 |
| **Medium Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 6650 | 430/-430 | 220/300 | -340/1180 | 200/-170 | 200/-200 | N/A | 550 | 1210 |
| AUTOBRAKE MAX | 6750 | 430/-440 | 220/300 | -330/1170 | 200/-170 | 200/-200 | N/A | 570 | 1250 |
| AUTOBRAKE 3 | 6750 | 430/-440 | 220/300 | -340/1160 | 200/-150 | 210/-210 | N/A | 560 | 1230 |
| **Medium To Poor Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 7640 | 580/-560 | 300/400 | -420/1510 | 290/-240 | 260/-260 | N/A | 1000 | 2530 |
| AUTOBRAKE MAX | 7680 | 580/-560 | 300/410 | -430/1510 | 320/-260 | 260/-260 | N/A | 1010 | 2560 |
| AUTOBRAKE 3 | 7680 | 580/-560 | 300/410 | -430/1510 | 320/-260 | 260/-260 | N/A | 1010 | 2560 |
| **Poor Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 9560 | 670/-680 | 350/460 | -570/2090 | 800/-510 | 300/-300 | N/A | 1940 | 5550 |
| AUTOBRAKE MAX | 9610 | 680/-680 | 360/470 | -570/2090 | 820/-530 | 300/-300 | N/A | 1950 | 5580 |
| AUTOBRAKE 3 | 9610 | 680/-680 | 360/470 | -570/2090 | 820/-530 | 300/-300 | N/A | 1950 | 5580 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance
### Airspeed Unreliable (Flaps 30)
### VREF30

| BRAKING CONFIGURATION | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4240 | 250/-250 | 110/140 | -190/610 | 40/-40 | 110/-110 | N/A | 80 | 130 |
| AUTOBRAKE MAX | 4840 | 250/-280 | 130/160 | -210/670 | 10/0 | 130/-130 | N/A | 10 | 30 |
| AUTOBRAKE 2 | 6550 | 370/-420 | 190/240 | -310/1000 | 0/-10 | 200/-200 | N/A | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5260 | 360/-360 | 180/250 | -280/990 | 100/-90 | 170/-170 | N/A | 250 | 500 |
| AUTOBRAKE MAX | 5410 | 360/-360 | 190/250 | -280/990 | 100/-90 | 180/-170 | N/A | 270 | 540 |
| AUTOBRAKE 2 | 6640 | 370/-420 | 190/250 | -310/1020 | 20/-30 | 200/-200 | N/A | 0 | 0 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5770 | 370/-370 | 190/250 | -300/1060 | 140/-120 | 180/-180 | N/A | 340 | 710 |
| AUTOBRAKE MAX | 5910 | 370/-380 | 190/260 | -300/1050 | 140/-120 | 180/-180 | N/A | 360 | 750 |
| AUTOBRAKE 2 | 6710 | 380/-430 | 200/250 | -320/1070 | 60/-60 | 200/-200 | N/A | 50 | 200 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6130 | 380/-390 | 200/260 | -320/1120 | 180/-150 | 180/-180 | N/A | 440 | 960 |
| AUTOBRAKE MAX | 6270 | 390/-400 | 200/270 | -320/1120 | 180/-150 | 190/-190 | N/A | 460 | 1000 |
| AUTOBRAKE 3 | 6270 | 390/-400 | 200/270 | -320/1120 | 180/-130 | 190/-190 | N/A | 450 | 990 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6930 | 510/-500 | 260/350 | -400/1430 | 250/-210 | 230/-230 | N/A | 750 | 1790 |
| AUTOBRAKE MAX | 6980 | 520/-510 | 260/360 | -400/1440 | 280/-230 | 240/-240 | N/A | 760 | 1820 |
| AUTOBRAKE 3 | 6980 | 520/-500 | 260/360 | -400/1440 | 280/-220 | 240/-240 | N/A | 760 | 1820 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8800 | 600/-610 | 310/410 | -550/2030 | 740/-470 | 270/-280 | N/A | 1580 | 4330 |
| AUTOBRAKE MAX | 8840 | 610/-620 | 320/420 | -550/2030 | 760/-480 | 280/-280 | N/A | 1590 | 4360 |
| AUTOBRAKE 3 | 8840 | 610/-620 | 320/420 | -550/2030 | 760/-480 | 280/-280 | N/A | 1590 | 4360 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### Airspeed Unreliable (Flaps 40)

### VREF40

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

#### Dry Runway

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4000 | 270/-230 | 110/140 | -180/600 | 40/-40 | 100/-100 | N/A | 70 | 110 |
| AUTOBRAKE MAX | 4520 | 290/-260 | 130/160 | -200/650 | 20/-10 | 120/-120 | N/A | 10 | 30 |
| AUTOBRAKE 2 | 6050 | 430/-380 | 190/240 | -290/970 | 0/-10 | 180/-180 | N/A | 0 | 0 |

#### Good Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4910 | 400/-330 | 180/240 | -270/960 | 90/-80 | 160/-160 | N/A | 210 | 410 |
| AUTOBRAKE MAX | 5060 | 410/-330 | 180/250 | -270/960 | 100/-80 | 160/-160 | N/A | 230 | 450 |
| AUTOBRAKE 2 | 6150 | 440/-390 | 190/240 | -300/990 | 20/-30 | 180/-190 | N/A | 0 | 0 |

#### Good To Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5420 | 410/-340 | 180/250 | -290/1030 | 140/-120 | 160/-170 | N/A | 300 | 610 |
| AUTOBRAKE MAX | 5570 | 420/-350 | 190/250 | -290/1020 | 140/-120 | 170/-170 | N/A | 320 | 650 |
| AUTOBRAKE 2 | 6220 | 440/-390 | 190/250 | -310/1040 | 60/-60 | 190/-190 | N/A | 60 | 200 |

#### Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5780 | 420/-360 | 190/250 | -310/1090 | 180/-150 | 170/-170 | N/A | 390 | 840 |
| AUTOBRAKE MAX | 5930 | 430/-380 | 200/260 | -310/1090 | 180/-150 | 170/-170 | N/A | 410 | 880 |
| AUTOBRAKE 3 | 5920 | 430/-370 | 200/260 | -310/1090 | 180/-140 | 170/-170 | N/A | 410 | 880 |

#### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6470 | 550/-470 | 250/340 | -390/1400 | 240/-200 | 220/-220 | N/A | 620 | 1460 |
| AUTOBRAKE MAX | 6520 | 560/-470 | 260/350 | -390/1400 | 260/-220 | 220/-220 | N/A | 640 | 1490 |
| AUTOBRAKE 3 | 6520 | 560/-470 | 260/350 | -390/1400 | 260/-210 | 220/-220 | N/A | 640 | 1490 |

#### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8330 | 640/-570 | 310/400 | -540/2000 | 730/-460 | 260/-260 | N/A | 1410 | 3800 |
| AUTOBRAKE MAX | 8380 | 650/-580 | 310/400 | -540/2000 | 750/-480 | 260/-260 | N/A | 1420 | 3830 |
| AUTOBRAKE 3 | 8380 | 650/-580 | 310/400 | -540/2000 | 750/-470 | 260/-260 | N/A | 1420 | 3830 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### All Flaps Up Landing

### VREF40 + 55

| BRAKING CONFIGURATION | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |
| **Dry Runway** | | | | | | | | | |
| MAX MANUAL | 5660 | 580/-290 | 160/260 | -210/680 | 60/-50 | 150/-150 | 190 | 150 | 240 |
| AUTOBRAKE MAX | 6780 | 410/-320 | 190/240 | -240/780 | 10/-10 | 190/-190 | 280 | 10 | 40 |
| AUTOBRAKE 2 | 9500 | 500/-500 | 290/370 | -370/1190 | 0/0 | 290/-290 | 440 | 0 | 0 |
| **Good Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 7610 | 530/-470 | 290/400 | -350/1200 | 160/-140 | 260/-260 | 300 | 620 | 1290 |
| AUTOBRAKE MAX | 7710 | 530/-460 | 300/400 | -350/1200 | 160/-140 | 260/-260 | 320 | 640 | 1330 |
| AUTOBRAKE 2 | 9650 | 510/-510 | 300/380 | -370/1210 | 30/-40 | 300/-300 | 440 | 0 | 0 |
| **Good To Medium Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 8130 | 540/-480 | 300/400 | -370/1260 | 200/-180 | 270/-270 | 300 | 720 | 1530 |
| AUTOBRAKE MAX | 8220 | 540/-480 | 300/410 | -370/1260 | 200/-170 | 270/-270 | 320 | 740 | 1570 |
| AUTOBRAKE 2 | 9720 | 520/-520 | 300/390 | -390/1260 | 70/-60 | 300/-300 | 440 | 60 | 270 |
| **Medium Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 8510 | 550/-500 | 310/410 | -390/1320 | 240/-210 | 270/-270 | 300 | 850 | 1860 |
| AUTOBRAKE MAX | 8610 | 550/-500 | 310/420 | -380/1320 | 240/-200 | 270/-270 | 320 | 870 | 1900 |
| AUTOBRAKE 3 | 8760 | 520/-460 | 300/410 | -380/1270 | 200/-150 | 270/-270 | 350 | 730 | 1760 |
| **Medium To Poor Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 10090 | 750/-670 | 410/560 | -490/1690 | 390/-320 | 340/-350 | 340 | 1730 | 4640 |
| AUTOBRAKE MAX | 10130 | 750/-670 | 420/560 | -490/1690 | 420/-340 | 350/-350 | 340 | 1740 | 4660 |
| AUTOBRAKE 3 | 10130 | 750/-670 | 420/560 | -490/1690 | 420/-340 | 350/-350 | 340 | 1740 | 4660 |
| **Poor Reported Braking Action** | | | | | | | | | |
| MAX MANUAL | 12110 | 850/-790 | 470/620 | -630/2250 | 910/-600 | 380/-380 | 340 | 2810 | 8340 |
| AUTOBRAKE MAX | 12140 | 850/-790 | 470/620 | -630/2260 | 940/-620 | 390/-390 | 340 | 2820 | 8360 |
| AUTOBRAKE 3 | 12140 | 850/-790 | 470/620 | -630/2260 | 940/-620 | 390/-390 | 340 | 2820 | 8360 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### ANTISKID INOPERATIVE (Flaps 15)

### VREF15

| BRAKING CONFIGURATION | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
|---|---|---|---|---|---|---|---|---|---|
| | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6410 | 390/-420 | 200/250 | -330/1130 | 200/-160 | 180/-180 | 270 | 510 | 1140 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7460 | 570/-550 | 280/390 | -430/1590 | 310/-250 | 250/-250 | 330 | 980 | 2510 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8650 | 620/-620 | 320/420 | -530/1930 | 620/-420 | 270/-270 | 330 | 1510 | 4170 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9170 | 660/-660 | 330/440 | -570/2120 | 810/-500 | 290/-290 | 330 | 1850 | 5390 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9550 | 750/-720 | 380/510 | -620/2310 | 860/-540 | 320/-320 | 360 | 2120 | 6410 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 11550 | 880/-870 | 460/590 | -860/3440 | 4410/-1020 | 380/-380 | 360 | 4210 | ** |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

****Deceleration insufficient to stop airplane on the runway.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance
### ANTISKID INOPERATIVE (Flaps 30)
### VREF30

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

### Dry Runway

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5900 | 360/-380 | 180/230 | -320/1090 | 180/-150 | 170/-170 | 250 | 410 | 900 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Good Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6770 | 500/-490 | 250/340 | -410/1510 | 270/-220 | 220/-220 | 310 | 750 | 1830 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Good To Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7920 | 550/-550 | 280/370 | -500/1850 | 570/-380 | 250/-250 | 310 | 1220 | 3250 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8420 | 590/-600 | 300/390 | -550/2040 | 750/-460 | 260/-260 | 310 | 1510 | 4210 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8700 | 660/-650 | 330/440 | -590/2220 | 790/-490 | 290/-290 | 340 | 1670 | 4760 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10630 | 790/-790 | 410/520 | -820/3350 | 4350/-950 | 350/-340 | 340 | 3530 | ** |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

****Deceleration insufficient to stop airplane on the runway.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### ANTISKID INOPERATIVE (Flaps 40)

### VREF40

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5540 | 400/-360 | 170/220 | -310/1070 | 170/-140 | 160/-160 | 250 | 360 | 780 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6290 | 550/-450 | 240/320 | -400/1460 | 260/-210 | 200/-210 | 310 | 630 | 1510 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7450 | 590/-520 | 270/350 | -490/1810 | 560/-370 | 230/-230 | 310 | 1080 | 2830 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7930 | 630/-560 | 290/370 | -540/2010 | 740/-450 | 240/-240 | 310 | 1340 | 3670 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8150 | 700/-600 | 320/420 | -580/2180 | 770/-470 | 270/-270 | 330 | 1450 | 4030 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10070 | 830/-740 | 400/500 | -810/3330 | 4560/-930 | 330/-320 | 330 | 3230 | 14990 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### Jammed or Restricted Flight Controls (Flaps 15)

### VREF15 + 10

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4550 | 290/-270 | 120/150 | -190/630 | 50/-40 | 120/-120 | 190 | 100 | 160 |
| AUTOBRAKE MAX | 5170 | 270/-300 | 140/170 | -210/690 | 10/0 | 140/-140 | 250 | 10 | 30 |
| AUTOBRAKE 2 | 7050 | 400/-450 | 210/260 | -320/1040 | 0/0 | 210/-210 | 380 | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5770 | 400/-400 | 210/280 | -300/1050 | 120/-100 | 190/-190 | 280 | 340 | 690 |
| AUTOBRAKE MAX | 5870 | 410/-400 | 210/280 | -300/1040 | 120/-100 | 190/-190 | 300 | 360 | 730 |
| AUTOBRAKE 2 | 7160 | 410/-460 | 210/270 | -320/1060 | 30/-30 | 220/-220 | 390 | 0 | 0 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6290 | 410/-410 | 210/290 | -320/1110 | 160/-140 | 200/-200 | 280 | 440 | 920 |
| AUTOBRAKE MAX | 6380 | 420/-420 | 210/290 | -320/1110 | 160/-140 | 200/-200 | 300 | 460 | 960 |
| AUTOBRAKE 2 | 7230 | 410/-460 | 210/280 | -340/1120 | 70/-50 | 220/-220 | 390 | 60 | 250 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6650 | 430/-430 | 220/300 | -340/1180 | 200/-170 | 200/-200 | 280 | 550 | 1210 |
| AUTOBRAKE MAX | 6750 | 430/-440 | 220/300 | -330/1170 | 200/-170 | 200/-200 | 300 | 570 | 1250 |
| AUTOBRAKE 3 | 6750 | 430/-440 | 220/300 | -340/1160 | 200/-150 | 210/-210 | 310 | 560 | 1230 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7640 | 580/-560 | 300/400 | -420/1510 | 290/-240 | 260/-260 | 320 | 1000 | 2530 |
| AUTOBRAKE MAX | 7680 | 580/-560 | 300/410 | -430/1510 | 320/-260 | 260/-260 | 320 | 1010 | 2560 |
| AUTOBRAKE 3 | 7680 | 580/-560 | 300/410 | -430/1510 | 320/-260 | 260/-260 | 320 | 1010 | 2560 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9560 | 670/-680 | 350/460 | -570/2090 | 800/-510 | 300/-300 | 320 | 1940 | 5550 |
| AUTOBRAKE MAX | 9610 | 680/-680 | 360/470 | -570/2090 | 820/-530 | 300/-300 | 320 | 1950 | 5580 |
| AUTOBRAKE 3 | 9610 | 680/-680 | 360/470 | -570/2090 | 820/-530 | 300/-300 | 320 | 1950 | 5580 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance
### LEADING EDGE FLAPS TRANSIT (Flaps 15)
### VREF15 + 15

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

### Dry Runway

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4790 | 300/-270 | 130/160 | -200/640 | 50/-50 | 130/-130 | 200 | 110 | 180 |
| AUTOBRAKE MAX | 5420 | 280/-310 | 140/180 | -220/710 | 20/-10 | 150/-150 | 270 | 10 | 40 |
| AUTOBRAKE 2 | 7420 | 410/-460 | 220/280 | -330/1060 | 0/0 | 220/-230 | 390 | 0 | 0 |

### Good Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6160 | 430/-420 | 220/300 | -310/1090 | 130/-120 | 210/-210 | 290 | 410 | 840 |
| AUTOBRAKE MAX | 6280 | 430/-420 | 220/310 | -310/1080 | 130/-110 | 210/-210 | 310 | 430 | 880 |
| AUTOBRAKE 2 | 7580 | 420/-470 | 220/290 | -330/1100 | 40/-30 | 230/-230 | 400 | 0 | 10 |

### Good To Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6680 | 440/-440 | 230/310 | -330/1150 | 180/-150 | 210/-210 | 290 | 510 | 1080 |
| AUTOBRAKE MAX | 6800 | 440/-440 | 230/310 | -330/1140 | 180/-150 | 210/-210 | 310 | 530 | 1120 |
| AUTOBRAKE 2 | 7650 | 430/-470 | 230/290 | -340/1150 | 80/-50 | 230/-230 | 400 | 70 | 310 |

### Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7060 | 450/-460 | 240/320 | -350/1210 | 220/-180 | 220/-220 | 290 | 630 | 1380 |
| AUTOBRAKE MAX | 7170 | 450/-460 | 240/320 | -350/1210 | 220/-180 | 220/-220 | 310 | 650 | 1420 |
| AUTOBRAKE 3 | 7170 | 450/-460 | 240/320 | -350/1200 | 210/-160 | 220/-220 | 320 | 640 | 1410 |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8110 | 610/-590 | 320/430 | -440/1550 | 320/-260 | 280/-280 | 330 | 1140 | 2930 |
| AUTOBRAKE MAX | 8180 | 610/-590 | 320/440 | -440/1550 | 350/-280 | 280/-280 | 330 | 1160 | 2980 |
| AUTOBRAKE 3 | 8180 | 610/-590 | 320/440 | -440/1550 | 350/-280 | 280/-280 | 330 | 1160 | 2970 |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10060 | 700/-710 | 370/490 | -590/2130 | 830/-540 | 320/-320 | 330 | 2120 | 6100 |
| AUTOBRAKE MAX | 10130 | 710/-710 | 380/500 | -590/2140 | 860/-560 | 320/-320 | 330 | 2130 | 6140 |
| AUTOBRAKE 3 | 10130 | 710/-710 | 380/500 | -590/2140 | 860/-560 | 320/-320 | 330 | 2130 | 6140 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance
## LOSS OF BOTH ENGINE DRIVEN GENERATORS (Flaps 15)
## VREF15

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

### Dry Runway

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7530 | 500/-520 | 250/330 | -370/1260 | 300/-240 | 220/-220 | 380 | 920 | 2150 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Good Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8830 | 730/-690 | 370/510 | -500/1790 | 480/-370 | 300/-300 | 450 | 1790 | 5200 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Good To Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10130 | 790/-760 | 400/540 | -590/2130 | 840/-570 | 330/-330 | 450 | 2480 | 7640 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10720 | 830/-810 | 430/570 | -640/2330 | 1080/-670 | 340/-340 | 450 | 2960 | 9710 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 11160 | 940/-880 | 480/660 | -700/2560 | 1160/-720 | 380/-380 | 470 | 3460 | 12540 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 13400 | 1100/-1050 | 580/760 | -950/3730 | 5590/-1280 | 450/-440 | 470 | 6180 | ** |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

****Deceleration insufficient to stop airplane on the runway.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance
### LOSS OF BOTH ENGINE DRIVEN GENERATORS (Flaps 30)
### VREF30

| BRAKING CONFIGURATION | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7030 | 460/-480 | 230/300 | -360/1230 | 280/-230 | 210/-210 | 370 | 780 | 1790 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8110 | 650/-620 | 320/450 | -470/1720 | 440/-340 | 270/-270 | 420 | 1420 | 3880 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9390 | 710/-690 | 360/480 | -570/2060 | 800/-530 | 300/-300 | 420 | 2050 | 6000 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9950 | 750/-740 | 380/510 | -620/2260 | 1030/-630 | 320/-320 | 420 | 2460 | 7640 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10280 | 840/-800 | 430/580 | -670/2470 | 1090/-670 | 350/-350 | 440 | 2770 | 9120 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 12470 | 990/-960 | 520/680 | -930/3660 | 5660/-1210 | 420/-410 | 440 | 5250 | ** |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

****Deceleration insufficient to stop airplane on the runway.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### LOSS OF BOTH ENGINE DRIVEN GENERATORS (Flaps 40)

### VREF40

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6620 | 530/-450 | 230/290 | -360/1210 | 280/-220 | 190/-200 | 370 | 690 | 1560 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7550 | 710/-570 | 310/430 | -460/1670 | 420/-320 | 250/-250 | 420 | 1200 | 3170 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8830 | 770/-640 | 350/460 | -560/2020 | 780/-510 | 280/-280 | 420 | 1800 | 5120 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9370 | 810/-690 | 370/490 | -610/2230 | 1010/-610 | 300/-300 | 420 | 2170 | 6530 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9610 | 890/-730 | 410/550 | -650/2420 | 1060/-640 | 320/-320 | 430 | 2380 | 7440 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 11790 | 1050/-900 | 500/650 | -910/3630 | 5950/-1190 | 400/-390 | 430 | 4740 | ** |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

****Deceleration insufficient to stop airplane on the runway.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### LOSS OF SYSTEM A (Flaps 15)

### VREF15

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4700 | 290/-290 | 130/160 | -200/660 | 70/-60 | 120/-130 | 250 | 110 | 170 |
| AUTOBRAKE MAX | 4790 | 280/-300 | 130/160 | -210/670 | 40/-20 | 130/-130 | 260 | 80 | 140 |
| AUTOBRAKE 2 | 6330 | 380/-430 | 190/240 | -300/990 | 0/0 | 190/-190 | 370 | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6190 | 470/-460 | 230/320 | -330/1160 | 180/-150 | 210/-210 | 380 | 550 | 1030 |
| AUTOBRAKE MAX | 6190 | 470/-460 | 230/330 | -330/1170 | 200/-170 | 210/-210 | 380 | 510 | 960 |
| AUTOBRAKE 2 | 6680 | 450/-470 | 220/320 | -340/1130 | 120/-80 | 220/-220 | 400 | 250 | 580 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6750 | 480/-470 | 240/330 | -350/1220 | 230/-190 | 220/-220 | 380 | 670 | 1320 |
| AUTOBRAKE MAX | 6750 | 480/-470 | 240/330 | -350/1220 | 250/-210 | 220/-220 | 380 | 630 | 1250 |
| AUTOBRAKE 2 | 6770 | 450/-470 | 230/330 | -350/1200 | 180/-110 | 220/-220 | 400 | 470 | 1090 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7170 | 500/-490 | 250/340 | -360/1280 | 280/-230 | 220/-220 | 380 | 820 | 1750 |
| AUTOBRAKE MAX | 7170 | 500/-480 | 250/340 | -360/1280 | 300/-250 | 220/-220 | 380 | 790 | 1680 |
| AUTOBRAKE 3 | 7170 | 500/-480 | 250/340 | -360/1280 | 300/-250 | 220/-220 | 380 | 790 | 1680 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8280 | 680/-650 | 340/470 | -470/1660 | 420/-330 | 290/-290 | 430 | 1590 | 4190 |
| AUTOBRAKE MAX | 8280 | 680/-650 | 340/480 | -470/1660 | 450/-360 | 290/-290 | 420 | 1580 | 4140 |
| AUTOBRAKE 3 | 8280 | 680/-650 | 340/480 | -470/1660 | 450/-360 | 290/-290 | 420 | 1580 | 4140 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10400 | 790/-770 | 400/540 | -620/2250 | 1020/-640 | 330/-330 | 430 | 2810 | 8570 |
| AUTOBRAKE MAX | 10400 | 790/-770 | 400/540 | -620/2240 | 1050/-670 | 330/-330 | 420 | 2790 | 8520 |
| AUTOBRAKE 3 | 10400 | 790/-770 | 400/540 | -620/2240 | 1050/-670 | 330/-330 | 420 | 2790 | 8520 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### LOSS OF SYSTEM A (Flaps 30)

### VREF30

| BRAKING CONFIGURATION | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4320 | 260/-260 | 110/150 | -200/630 | 60/-50 | 110/-120 | 240 | 80 | 120 |
| AUTOBRAKE MAX | 4440 | 260/-270 | 120/150 | -200/650 | 30/-20 | 120/-120 | 240 | 60 | 110 |
| AUTOBRAKE 2 | 5850 | 350/-390 | 170/220 | -290/960 | 0/0 | 170/-180 | 350 | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5540 | 410/-400 | 200/280 | -310/1090 | 150/-130 | 190/-190 | 340 | 380 | 670 |
| AUTOBRAKE MAX | 5540 | 410/-400 | 200/280 | -310/1090 | 170/-140 | 190/-190 | 350 | 360 | 640 |
| AUTOBRAKE 2 | 6080 | 390/-420 | 190/260 | -320/1050 | 80/-60 | 190/-190 | 380 | 130 | 290 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6090 | 420/-420 | 210/280 | -330/1140 | 200/-170 | 190/-190 | 340 | 490 | 940 |
| AUTOBRAKE MAX | 6090 | 420/-410 | 210/290 | -330/1150 | 220/-180 | 190/-190 | 350 | 470 | 900 |
| AUTOBRAKE 2 | 6170 | 400/-420 | 200/270 | -330/1110 | 140/-90 | 190/-200 | 380 | 320 | 760 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6500 | 430/-440 | 220/290 | -340/1200 | 250/-200 | 200/-190 | 340 | 630 | 1300 |
| AUTOBRAKE MAX | 6500 | 440/-430 | 220/300 | -340/1200 | 270/-220 | 200/-200 | 350 | 610 | 1260 |
| AUTOBRAKE 3 | 6500 | 440/-430 | 220/300 | -340/1200 | 270/-220 | 200/-200 | 350 | 610 | 1260 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7390 | 590/-580 | 290/400 | -440/1570 | 350/-280 | 250/-250 | 390 | 1130 | 2680 |
| AUTOBRAKE MAX | 7390 | 590/-580 | 290/410 | -440/1560 | 380/-310 | 260/-260 | 390 | 1120 | 2650 |
| AUTOBRAKE 3 | 7390 | 590/-580 | 290/410 | -440/1560 | 380/-310 | 260/-260 | 390 | 1120 | 2650 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9450 | 690/-690 | 350/470 | -590/2160 | 930/-580 | 300/-300 | 390 | 2200 | 6260 |
| AUTOBRAKE MAX | 9450 | 690/-690 | 360/470 | -590/2160 | 960/-600 | 300/-300 | 390 | 2190 | 6240 |
| AUTOBRAKE 3 | 9450 | 690/-690 | 360/470 | -590/2160 | 960/-600 | 300/-300 | 390 | 2190 | 6240 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### LOSS OF SYSTEM A (Flaps 40)

### VREF40

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

### Dry Runway

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4040 | 300/-240 | 110/140 | -190/620 | 60/-50 | 110/-110 | 230 | 70 | 100 |
| AUTOBRAKE MAX | 4140 | 300/-250 | 120/150 | -200/630 | 40/-20 | 110/-110 | 240 | 60 | 100 |
| AUTOBRAKE 2 | 5390 | 410/-360 | 170/210 | -280/920 | 0/0 | 160/-160 | 340 | 0 | 0 |

### Good Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5080 | 460/-360 | 190/270 | -290/1040 | 130/-120 | 170/-170 | 330 | 290 | 510 |
| AUTOBRAKE MAX | 5080 | 460/-360 | 200/270 | -290/1040 | 150/-130 | 170/-170 | 340 | 280 | 490 |
| AUTOBRAKE 2 | 5590 | 450/-390 | 190/250 | -300/1010 | 70/-60 | 170/-180 | 360 | 100 | 200 |

### Good To Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5630 | 470/-380 | 200/270 | -310/1100 | 190/-150 | 170/-170 | 330 | 400 | 770 |
| AUTOBRAKE MAX | 5630 | 470/-370 | 200/280 | -310/1100 | 200/-170 | 180/-180 | 340 | 390 | 740 |
| AUTOBRAKE 2 | 5690 | 460/-380 | 190/270 | -310/1080 | 140/-90 | 180/-180 | 360 | 300 | 660 |

### Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6050 | 480/-400 | 210/280 | -330/1150 | 230/-190 | 180/-180 | 330 | 530 | 1080 |
| AUTOBRAKE MAX | 6050 | 490/-400 | 210/280 | -330/1150 | 250/-210 | 180/-180 | 330 | 520 | 1050 |
| AUTOBRAKE 3 | 6050 | 490/-400 | 210/280 | -330/1150 | 250/-210 | 180/-180 | 330 | 520 | 1050 |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6770 | 640/-520 | 280/380 | -430/1510 | 320/-260 | 230/-230 | 380 | 890 | 2000 |
| AUTOBRAKE MAX | 6770 | 640/-530 | 280/390 | -430/1510 | 350/-280 | 230/-240 | 370 | 890 | 1990 |
| AUTOBRAKE 3 | 6770 | 640/-530 | 280/390 | -430/1510 | 350/-280 | 230/-240 | 370 | 890 | 1990 |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8810 | 740/-640 | 340/440 | -580/2120 | 900/-560 | 280/-280 | 380 | 1890 | 5210 |
| AUTOBRAKE MAX | 8810 | 740/-630 | 340/450 | -580/2120 | 930/-580 | 280/-280 | 380 | 1890 | 5200 |
| AUTOBRAKE 3 | 8810 | 740/-630 | 340/450 | -580/2120 | 930/-580 | 280/-280 | 380 | 1890 | 5200 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance
### LOSS OF SYSTEM A AND SYSTEM B (Flaps 15)
### VREF15

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

### Dry Runway

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6120 | 380/-380 | 170/220 | -270/880 | 160/-140 | 170/-170 | 370 | 60 | 310 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Good Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8230 | 630/-610 | 320/440 | -440/1530 | 390/-310 | 280/-270 | 510 | 460 | 1940 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Good To Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8940 | 640/-630 | 330/450 | -470/1630 | 480/-380 | 290/-280 | 510 | 680 | 2530 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9440 | 670/-640 | 340/460 | -480/1710 | 560/-430 | 300/-290 | 500 | 930 | 3360 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10690 | 850/-810 | 430/600 | -590/2070 | 750/-560 | 360/-350 | 520 | 1620 | 7320 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 13110 | 990/-960 | 520/690 | -790/2900 | 1860/-1000 | 420/-400 | 520 | 3500 | 16020 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### LOSS OF SYSTEM B (Flaps 15)

### VREF15

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

### Dry Runway

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4820 | 300/-300 | 130/170 | -220/730 | 80/-70 | 130/-130 | 220 | 150 | 240 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Good Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6110 | 460/-450 | 230/310 | -340/1190 | 170/-150 | 210/-210 | 320 | 510 | 980 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Good To Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6730 | 470/-470 | 230/320 | -370/1290 | 240/-200 | 210/-210 | 320 | 660 | 1360 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7160 | 490/-490 | 250/330 | -380/1370 | 300/-240 | 220/-220 | 320 | 820 | 1820 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8050 | 640/-620 | 320/440 | -470/1700 | 400/-320 | 270/-270 | 360 | 1350 | 3370 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10190 | 760/-750 | 390/510 | -660/2450 | 1200/-670 | 330/-320 | 360 | 2660 | 8180 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance
### MANUAL REVERSION (Flaps 15)
### VREF15

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

### Dry Runway

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6120 | 380/-380 | 170/220 | -270/880 | 160/-140 | 170/-170 | 370 | 60 | 310 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Good Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8230 | 630/-610 | 320/440 | -440/1530 | 390/-310 | 280/-270 | 510 | 460 | 1940 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Good To Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8940 | 640/-630 | 330/450 | -470/1630 | 480/-380 | 290/-280 | 510 | 680 | 2530 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 2 | Autobrake Inoperative | | | | | | | | |

### Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9440 | 670/-640 | 340/460 | -480/1710 | 560/-430 | 300/-290 | 500 | 930 | 3360 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10690 | 850/-810 | 430/600 | -590/2070 | 750/-560 | 360/-350 | 520 | 1620 | 7320 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 13110 | 990/-960 | 520/690 | -790/2900 | 1860/-1000 | 420/-400 | 520 | 3500 | 16020 |
| AUTOBRAKE MAX | Autobrake Inoperative | | | | | | | | |
| AUTOBRAKE 3 | Autobrake Inoperative | | | | | | | | |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### One Engine Inoperative Landing (Flaps 15)

### VREF15

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4220 | 270/-260 | 110/140 | -190/620 | 50/-40 | 110/-110 | 190 | 0 | 70 |
| AUTOBRAKE MAX | 4700 | 260/-290 | 120/150 | -210/670 | 10/-10 | 130/-130 | 240 | 0 | 20 |
| AUTOBRAKE 2 | 6330 | 380/-430 | 190/240 | -300/990 | 0/0 | 190/-190 | 370 | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5400 | 410/-400 | 200/270 | -300/1090 | 120/-110 | 190/-190 | 300 | 0 | 310 |
| AUTOBRAKE MAX | 5480 | 410/-400 | 200/270 | -300/1070 | 120/-110 | 190/-190 | 320 | 0 | 320 |
| AUTOBRAKE 2 | 6400 | 390/-440 | 190/250 | -310/1010 | 30/-20 | 190/-200 | 370 | 0 | 0 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5990 | 410/-410 | 200/270 | -320/1140 | 180/-150 | 190/-190 | 300 | 0 | 430 |
| AUTOBRAKE MAX | 6060 | 420/-410 | 200/270 | -320/1130 | 170/-150 | 190/-190 | 320 | 0 | 450 |
| AUTOBRAKE 2 | 6500 | 400/-440 | 190/250 | -320/1080 | 90/-60 | 200/-200 | 370 | 0 | 160 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6440 | 430/-430 | 210/280 | -340/1200 | 230/-190 | 200/-200 | 300 | 0 | 600 |
| AUTOBRAKE MAX | 6520 | 430/-440 | 210/280 | -340/1190 | 230/-190 | 200/-200 | 310 | 0 | 610 |
| AUTOBRAKE 3 | 6510 | 430/-440 | 210/280 | -340/1190 | 230/-190 | 200/-200 | 310 | 0 | 610 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7620 | 630/-610 | 300/410 | -470/1700 | 370/-300 | 280/-280 | 380 | 0 | 1280 |
| AUTOBRAKE MAX | 7650 | 630/-620 | 310/420 | -470/1700 | 400/-320 | 280/-280 | 380 | 0 | 1290 |
| AUTOBRAKE 3 | 7650 | 630/-620 | 310/420 | -470/1700 | 400/-320 | 280/-280 | 380 | 0 | 1290 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10140 | 730/-740 | 360/470 | -630/2290 | 1100/-670 | 330/-330 | 380 | 0 | 3000 |
| AUTOBRAKE MAX | 10170 | 740/-750 | 370/480 | -630/2290 | 1130/-690 | 330/-330 | 380 | 0 | 3010 |
| AUTOBRAKE 3 | 10170 | 740/-750 | 370/480 | -630/2290 | 1130/-690 | 330/-330 | 380 | 0 | 3010 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### One Engine Inoperative Landing (Flaps 30)

### VREF30

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 3910 | 230/-240 | 100/130 | -180/600 | 40/-40 | 100/-100 | 180 | 0 | 60 |
| AUTOBRAKE MAX | 4380 | 240/-270 | 110/140 | -200/650 | 10/0 | 120/-120 | 230 | 0 | 20 |
| AUTOBRAKE 2 | 5850 | 350/-390 | 170/220 | -290/960 | 0/0 | 170/-180 | 350 | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4880 | 350/-350 | 170/230 | -280/1010 | 100/-90 | 170/-160 | 270 | 0 | 220 |
| AUTOBRAKE MAX | 5000 | 360/-360 | 170/240 | -280/1000 | 100/-90 | 170/-170 | 290 | 0 | 230 |
| AUTOBRAKE 2 | 5910 | 360/-400 | 170/220 | -300/970 | 20/-20 | 180/-180 | 360 | 0 | 0 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5440 | 360/-360 | 180/240 | -300/1070 | 150/-130 | 170/-170 | 270 | 0 | 330 |
| AUTOBRAKE MAX | 5570 | 370/-370 | 180/240 | -300/1060 | 150/-130 | 170/-170 | 290 | 0 | 350 |
| AUTOBRAKE 2 | 6000 | 360/-410 | 180/230 | -310/1040 | 80/-50 | 180/-180 | 360 | 0 | 130 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5880 | 380/-390 | 180/240 | -320/1130 | 200/-170 | 180/-170 | 270 | 0 | 470 |
| AUTOBRAKE MAX | 5990 | 380/-400 | 190/250 | -320/1120 | 200/-170 | 180/-180 | 290 | 0 | 480 |
| AUTOBRAKE 3 | 5980 | 380/-400 | 190/250 | -320/1120 | 200/-170 | 180/-180 | 290 | 0 | 480 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6770 | 540/-540 | 260/350 | -440/1580 | 310/-240 | 250/-250 | 350 | 0 | 870 |
| AUTOBRAKE MAX | 6800 | 550/-540 | 270/360 | -440/1580 | 330/-270 | 250/-250 | 350 | 0 | 880 |
| AUTOBRAKE 3 | 6800 | 550/-540 | 270/360 | -440/1580 | 330/-270 | 250/-250 | 350 | 0 | 880 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9140 | 640/-660 | 320/410 | -600/2190 | 980/-590 | 290/-290 | 350 | 0 | 2290 |
| AUTOBRAKE MAX | 9180 | 650/-670 | 320/420 | -600/2190 | 1010/-610 | 300/-300 | 350 | 0 | 2300 |
| AUTOBRAKE 3 | 9180 | 650/-670 | 320/420 | -600/2190 | 1010/-610 | 300/-300 | 350 | 0 | 2300 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### SPOILERS (Flaps 15)

### VREF15

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4940 | 300/-310 | 140/180 | -210/680 | 80/-70 | 130/-140 | 300 | 190 | 300 |
| AUTOBRAKE MAX | 4940 | 300/-310 | 140/170 | -210/680 | 60/-30 | 130/-130 | 280 | 180 | 290 |
| AUTOBRAKE 2 | 6330 | 380/-430 | 190/240 | -300/990 | 0/0 | 190/-190 | 370 | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6500 | 520/-490 | 260/360 | -350/1210 | 220/-180 | 230/-230 | 430 | 740 | 1640 |
| AUTOBRAKE MAX | 6500 | 510/-490 | 250/360 | -350/1210 | 240/-200 | 230/-230 | 430 | 680 | 1500 |
| AUTOBRAKE 2 | 6810 | 500/-480 | 240/350 | -350/1180 | 170/-110 | 220/-220 | 430 | 500 | 1230 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7070 | 530/-510 | 260/360 | -360/1260 | 270/-220 | 230/-230 | 430 | 880 | 1970 |
| AUTOBRAKE MAX | 7070 | 520/-500 | 260/360 | -360/1260 | 290/-240 | 230/-230 | 430 | 820 | 1830 |
| AUTOBRAKE 2 | 7070 | 520/-480 | 260/360 | -360/1250 | 280/-140 | 230/-230 | 430 | 790 | 1810 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7500 | 540/-530 | 270/370 | -380/1320 | 330/-260 | 240/-240 | 430 | 1060 | 2480 |
| AUTOBRAKE MAX | 7500 | 540/-520 | 270/370 | -380/1310 | 350/-280 | 240/-240 | 430 | 1000 | 2340 |
| AUTOBRAKE 3 | 7500 | 540/-520 | 270/370 | -380/1310 | 350/-280 | 240/-240 | 430 | 1000 | 2340 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8610 | 750/-690 | 370/520 | -490/1730 | 490/-380 | 310/-310 | 470 | 1960 | 6130 |
| AUTOBRAKE MAX | 8610 | 740/-690 | 370/520 | -490/1720 | 520/-400 | 300/-310 | 470 | 1910 | 5990 |
| AUTOBRAKE 3 | 8610 | 740/-690 | 370/520 | -490/1720 | 520/-400 | 300/-310 | 470 | 1910 | 5990 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10800 | 850/-830 | 440/590 | -640/2310 | 1120/-700 | 350/-350 | 470 | 3310 | 11320 |
| AUTOBRAKE MAX | 10800 | 850/-820 | 440/590 | -640/2300 | 1150/-730 | 350/-350 | 470 | 3270 | 11180 |
| AUTOBRAKE 3 | 10800 | 850/-820 | 440/590 | -640/2300 | 1150/-730 | 350/-350 | 470 | 3270 | 11180 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance
### SPOILERS (Flaps 30)
### VREF30

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4700 | 280/-300 | 130/170 | -210/680 | 80/-70 | 130/-130 | 310 | 180 | 280 |
| AUTOBRAKE MAX | 4700 | 270/-290 | 130/170 | -210/670 | 60/-40 | 130/-130 | 280 | 160 | 260 |
| AUTOBRAKE 2 | 5850 | 350/-390 | 170/220 | -290/960 | 0/0 | 170/-180 | 350 | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6020 | 470/-450 | 230/320 | -330/1160 | 200/-170 | 210/-210 | 420 | 610 | 1300 |
| AUTOBRAKE MAX | 6020 | 460/-450 | 230/320 | -330/1150 | 220/-180 | 210/-210 | 420 | 560 | 1190 |
| AUTOBRAKE 2 | 6290 | 450/-440 | 220/320 | -330/1140 | 160/-110 | 200/-210 | 420 | 410 | 970 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6600 | 480/-470 | 240/330 | -350/1210 | 260/-210 | 210/-210 | 420 | 740 | 1620 |
| AUTOBRAKE MAX | 6600 | 470/-460 | 240/330 | -350/1210 | 280/-230 | 210/-210 | 420 | 690 | 1510 |
| AUTOBRAKE 2 | 6600 | 470/-450 | 240/330 | -350/1210 | 280/-160 | 210/-210 | 420 | 690 | 1510 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7030 | 490/-500 | 250/340 | -360/1270 | 310/-250 | 220/-220 | 420 | 910 | 2090 |
| AUTOBRAKE MAX | 7030 | 490/-480 | 250/340 | -360/1260 | 330/-270 | 220/-220 | 420 | 860 | 1980 |
| AUTOBRAKE 3 | 7030 | 490/-480 | 250/340 | -360/1260 | 330/-270 | 220/-220 | 420 | 860 | 1980 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7900 | 670/-630 | 330/460 | -470/1660 | 440/-340 | 280/-280 | 450 | 1530 | 4410 |
| AUTOBRAKE MAX | 7900 | 670/-630 | 330/470 | -460/1650 | 470/-370 | 280/-280 | 450 | 1500 | 4310 |
| AUTOBRAKE 3 | 7900 | 670/-630 | 330/470 | -460/1650 | 470/-370 | 280/-280 | 450 | 1500 | 4310 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10060 | 780/-760 | 400/530 | -630/2260 | 1080/-670 | 320/-320 | 450 | 2780 | 8940 |
| AUTOBRAKE MAX | 10060 | 770/-760 | 400/530 | -620/2250 | 1100/-690 | 320/-320 | 450 | 2750 | 8830 |
| AUTOBRAKE 3 | 10060 | 770/-760 | 400/530 | -620/2250 | 1100/-690 | 320/-320 | 450 | 2750 | 8830 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### SPOILERS (Flaps 40)

### VREF40

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

### Dry Runway

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4470 | 340/-280 | 140/170 | -210/670 | 90/-80 | 120/-120 | 330 | 160 | 250 |
| AUTOBRAKE MAX | 4470 | 320/-280 | 130/170 | -200/660 | 60/-50 | 120/-120 | 290 | 140 | 230 |
| AUTOBRAKE 2 | 5390 | 410/-360 | 170/210 | -280/920 | 10/0 | 160/-160 | 350 | 0 | 0 |

### Good Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5600 | 540/-420 | 230/310 | -320/1110 | 190/-160 | 190/-190 | 420 | 510 | 1070 |
| AUTOBRAKE MAX | 5600 | 540/-410 | 230/320 | -320/1110 | 210/-180 | 190/-190 | 420 | 470 | 980 |
| AUTOBRAKE 2 | 5830 | 530/-410 | 220/310 | -320/1110 | 160/-110 | 190/-190 | 420 | 350 | 800 |

### Good To Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6190 | 550/-430 | 230/320 | -340/1170 | 250/-200 | 190/-190 | 420 | 640 | 1380 |
| AUTOBRAKE MAX | 6190 | 550/-430 | 230/320 | -330/1170 | 270/-220 | 190/-200 | 420 | 600 | 1290 |
| AUTOBRAKE 2 | 6190 | 550/-420 | 230/320 | -330/1170 | 270/-190 | 190/-200 | 420 | 600 | 1290 |

### Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6620 | 570/-460 | 240/330 | -350/1230 | 310/-240 | 200/-200 | 410 | 800 | 1830 |
| AUTOBRAKE MAX | 6620 | 570/-450 | 240/330 | -350/1220 | 330/-260 | 200/-200 | 420 | 760 | 1740 |
| AUTOBRAKE 3 | 6620 | 570/-450 | 240/330 | -350/1220 | 330/-260 | 200/-200 | 420 | 760 | 1740 |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7300 | 740/-580 | 320/450 | -450/1610 | 410/-320 | 260/-260 | 450 | 1260 | 3430 |
| AUTOBRAKE MAX | 7300 | 730/-580 | 320/450 | -450/1600 | 440/-340 | 260/-260 | 440 | 1230 | 3350 |
| AUTOBRAKE 3 | 7300 | 730/-580 | 320/450 | -450/1600 | 440/-340 | 260/-260 | 440 | 1230 | 3350 |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9460 | 840/-710 | 390/510 | -610/2220 | 1060/-650 | 300/-300 | 450 | 2440 | 7560 |
| AUTOBRAKE MAX | 9460 | 840/-700 | 390/510 | -610/2220 | 1090/-670 | 300/-310 | 440 | 2420 | 7480 |
| AUTOBRAKE 3 | 9460 | 840/-700 | 390/510 | -610/2220 | 1090/-670 | 300/-310 | 440 | 2420 | 7480 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### Stabilizer Trim Inoperative (Flaps 15)

### VREF15 + 10

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

### Dry Runway

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4550 | 290/-270 | 120/150 | -190/630 | 50/-40 | 120/-120 | 190 | 100 | 160 |
| AUTOBRAKE MAX | 5170 | 270/-300 | 140/170 | -210/690 | 10/0 | 140/-140 | 250 | 10 | 30 |
| AUTOBRAKE 2 | 7050 | 400/-450 | 210/260 | -320/1040 | 0/0 | 210/-210 | 380 | 0 | 0 |

### Good Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5770 | 400/-400 | 210/280 | -300/1050 | 120/-100 | 190/-190 | 280 | 340 | 690 |
| AUTOBRAKE MAX | 5870 | 410/-400 | 210/280 | -300/1040 | 120/-100 | 190/-190 | 300 | 360 | 730 |
| AUTOBRAKE 2 | 7160 | 410/-460 | 210/270 | -320/1060 | 30/-30 | 220/-220 | 390 | 0 | 0 |

### Good To Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6290 | 410/-410 | 210/290 | -320/1110 | 160/-140 | 200/-200 | 280 | 440 | 920 |
| AUTOBRAKE MAX | 6380 | 420/-420 | 210/290 | -320/1110 | 160/-140 | 200/-200 | 300 | 460 | 960 |
| AUTOBRAKE 2 | 7230 | 410/-460 | 210/280 | -340/1120 | 70/-50 | 220/-220 | 390 | 60 | 250 |

### Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6650 | 430/-430 | 220/300 | -340/1180 | 200/-170 | 200/-200 | 280 | 550 | 1210 |
| AUTOBRAKE MAX | 6750 | 430/-440 | 220/300 | -330/1170 | 200/-170 | 200/-200 | 300 | 570 | 1250 |
| AUTOBRAKE 3 | 6750 | 430/-440 | 220/300 | -340/1160 | 200/-150 | 210/-210 | 310 | 560 | 1230 |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7640 | 580/-560 | 300/400 | -420/1510 | 290/-240 | 260/-260 | 320 | 1000 | 2530 |
| AUTOBRAKE MAX | 7680 | 580/-560 | 300/410 | -430/1510 | 320/-260 | 260/-260 | 320 | 1010 | 2560 |
| AUTOBRAKE 3 | 7680 | 580/-560 | 300/410 | -430/1510 | 320/-260 | 260/-260 | 320 | 1010 | 2560 |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9560 | 670/-680 | 350/460 | -570/2090 | 800/-510 | 300/-300 | 320 | 1940 | 5550 |
| AUTOBRAKE MAX | 9610 | 680/-680 | 360/470 | -570/2090 | 820/-530 | 300/-300 | 320 | 1950 | 5580 |
| AUTOBRAKE 3 | 9610 | 680/-680 | 360/470 | -570/2090 | 820/-530 | 300/-300 | 320 | 1950 | 5580 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance
### Trailing Edge Flap Asymmetry (1 ≤ Flap Lever < 15)
### VREF40 + 30

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4730 | 370/-260 | 130/160 | -190/630 | 50/-40 | 120/-120 | 180 | 100 | 180 |
| AUTOBRAKE MAX | 5470 | 320/-290 | 150/190 | -220/710 | 10/0 | 150/-150 | 260 | 10 | 30 |
| AUTOBRAKE 2 | 7490 | 450/-430 | 230/300 | -330/1070 | 0/0 | 230/-230 | 390 | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6060 | 450/-390 | 230/310 | -310/1070 | 120/-110 | 200/-200 | 280 | 390 | 790 |
| AUTOBRAKE MAX | 6120 | 450/-380 | 230/310 | -300/1060 | 120/-100 | 200/-200 | 290 | 400 | 820 |
| AUTOBRAKE 2 | 7570 | 460/-440 | 240/300 | -330/1090 | 30/-30 | 230/-230 | 400 | 0 | 0 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6570 | 460/-410 | 240/320 | -330/1140 | 160/-140 | 210/-210 | 280 | 490 | 1030 |
| AUTOBRAKE MAX | 6630 | 460/-400 | 240/320 | -320/1130 | 160/-140 | 210/-210 | 290 | 500 | 1050 |
| AUTOBRAKE 2 | 7630 | 460/-440 | 240/310 | -350/1140 | 60/-50 | 230/-240 | 400 | 60 | 240 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6940 | 470/-420 | 240/320 | -340/1200 | 200/-170 | 210/-210 | 280 | 600 | 1330 |
| AUTOBRAKE MAX | 7000 | 470/-420 | 240/330 | -340/1190 | 200/-170 | 210/-210 | 290 | 610 | 1360 |
| AUTOBRAKE 3 | 7030 | 460/-410 | 240/330 | -340/1170 | 180/-140 | 220/-220 | 320 | 570 | 1310 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8060 | 640/-550 | 330/440 | -430/1530 | 300/-250 | 270/-270 | 320 | 1150 | 2980 |
| AUTOBRAKE MAX | 8060 | 640/-550 | 330/450 | -430/1530 | 330/-270 | 280/-280 | 320 | 1150 | 2980 |
| AUTOBRAKE 3 | 8060 | 640/-550 | 330/450 | -430/1530 | 330/-270 | 280/-280 | 320 | 1150 | 2980 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9980 | 730/-670 | 380/500 | -580/2110 | 800/-520 | 310/-310 | 320 | 2130 | 6210 |
| AUTOBRAKE MAX | 9980 | 730/-670 | 380/500 | -580/2110 | 820/-540 | 320/-320 | 320 | 2130 | 6210 |
| AUTOBRAKE 3 | 9980 | 730/-670 | 380/500 | -580/2110 | 820/-540 | 320/-320 | 320 | 2130 | 6210 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### Trailing Edge Flap Asymmetry (Flap Lever 15 or 25)

### VREF15

| BRAKING CONFIGURATION | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

#### Dry Runway

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4180 | 260/-250 | 110/140 | -190/610 | 40/-40 | 110/-110 | 190 | 80 | 140 |
| AUTOBRAKE MAX | 4700 | 260/-290 | 120/150 | -210/670 | 10/0 | 130/-130 | 240 | 10 | 30 |
| AUTOBRAKE 2 | 6330 | 380/-430 | 190/240 | -300/990 | 0/0 | 190/-190 | 370 | 0 | 0 |

#### Good Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5240 | 380/-370 | 190/260 | -290/1010 | 110/-90 | 170/-170 | 270 | 280 | 570 |
| AUTOBRAKE MAX | 5300 | 380/-380 | 190/260 | -280/990 | 100/-90 | 170/-170 | 290 | 290 | 590 |
| AUTOBRAKE 2 | 6420 | 390/-430 | 190/250 | -310/1020 | 30/-20 | 190/-200 | 370 | 0 | 0 |

#### Good To Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5750 | 390/-390 | 190/260 | -310/1070 | 150/-130 | 180/-180 | 270 | 380 | 800 |
| AUTOBRAKE MAX | 5810 | 390/-390 | 190/260 | -300/1060 | 150/-130 | 180/-180 | 290 | 390 | 820 |
| AUTOBRAKE 2 | 6490 | 400/-440 | 190/250 | -320/1080 | 70/-50 | 200/-200 | 380 | 60 | 250 |

#### Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6130 | 410/-410 | 200/270 | -320/1130 | 190/-160 | 180/-180 | 270 | 490 | 1090 |
| AUTOBRAKE MAX | 6190 | 410/-420 | 200/270 | -320/1120 | 190/-160 | 180/-180 | 290 | 500 | 1110 |
| AUTOBRAKE 3 | 6180 | 410/-420 | 200/270 | -320/1120 | 190/-150 | 190/-190 | 290 | 500 | 1110 |

#### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7010 | 550/-540 | 270/370 | -410/1470 | 270/-230 | 240/-240 | 320 | 880 | 2220 |
| AUTOBRAKE MAX | 7050 | 560/-540 | 280/380 | -410/1470 | 300/-250 | 240/-240 | 330 | 890 | 2250 |
| AUTOBRAKE 3 | 7050 | 560/-540 | 280/380 | -410/1470 | 300/-250 | 240/-240 | 330 | 890 | 2250 |

#### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8930 | 650/-650 | 330/430 | -560/2050 | 780/-490 | 280/-280 | 320 | 1820 | 5240 |
| AUTOBRAKE MAX | 8970 | 650/-650 | 330/440 | -560/2060 | 800/-510 | 280/-280 | 330 | 1830 | 5260 |
| AUTOBRAKE 3 | 8970 | 650/-650 | 330/440 | -560/2060 | 800/-510 | 280/-280 | 330 | 1830 | 5260 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### Trailing Edge Flap Asymmetry (Flap Lever 30)

### VREF30

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 3890 | 230/-230 | 100/130 | -180/590 | 40/-40 | 100/-100 | 180 | 70 | 110 |
| AUTOBRAKE MAX | 4380 | 240/-270 | 110/140 | -200/650 | 10/0 | 120/-120 | 230 | 10 | 30 |
| AUTOBRAKE 2 | 5850 | 350/-390 | 170/220 | -290/960 | 0/0 | 170/-180 | 350 | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4760 | 340/-330 | 160/220 | -270/950 | 90/-80 | 160/-160 | 260 | 210 | 410 |
| AUTOBRAKE MAX | 4870 | 340/-340 | 170/230 | -270/940 | 90/-80 | 160/-160 | 270 | 220 | 440 |
| AUTOBRAKE 2 | 5930 | 360/-400 | 170/220 | -300/980 | 20/-20 | 180/-180 | 360 | 0 | 0 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5270 | 350/-350 | 170/230 | -290/1020 | 130/-110 | 160/-160 | 260 | 300 | 620 |
| AUTOBRAKE MAX | 5380 | 350/-360 | 170/230 | -290/1010 | 130/-110 | 160/-160 | 270 | 310 | 650 |
| AUTOBRAKE 2 | 6000 | 360/-400 | 180/230 | -310/1030 | 60/-50 | 180/-180 | 360 | 60 | 200 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5640 | 360/-370 | 180/240 | -300/1080 | 170/-140 | 160/-160 | 250 | 390 | 860 |
| AUTOBRAKE MAX | 5740 | 370/-380 | 180/240 | -310/1070 | 170/-140 | 170/-170 | 270 | 410 | 890 |
| AUTOBRAKE 3 | 5730 | 370/-380 | 180/240 | -310/1070 | 170/-140 | 170/-170 | 280 | 410 | 890 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6340 | 490/-480 | 240/330 | -390/1390 | 240/-200 | 220/-220 | 300 | 650 | 1560 |
| AUTOBRAKE MAX | 6380 | 490/-490 | 240/330 | -390/1400 | 260/-220 | 220/-220 | 300 | 660 | 1580 |
| AUTOBRAKE 3 | 6380 | 490/-490 | 240/330 | -390/1400 | 260/-220 | 220/-220 | 300 | 660 | 1580 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8200 | 580/-590 | 290/380 | -540/1990 | 720/-450 | 260/-260 | 300 | 1480 | 4100 |
| AUTOBRAKE MAX | 8250 | 590/-590 | 300/390 | -540/1990 | 740/-470 | 260/-260 | 300 | 1490 | 4120 |
| AUTOBRAKE 3 | 8250 | 590/-590 | 300/390 | -540/1990 | 740/-470 | 260/-260 | 300 | 1490 | 4120 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance
### Trailing Edge Flap Disagree (1 ≤ Indicated Flaps < 15)
### VREF40 + 30

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4730 | 370/-260 | 130/160 | -190/630 | 50/-40 | 120/-120 | 180 | 100 | 180 |
| AUTOBRAKE MAX | 5470 | 320/-290 | 150/190 | -220/710 | 10/0 | 150/-150 | 260 | 10 | 30 |
| AUTOBRAKE 2 | 7490 | 450/-430 | 230/300 | -330/1070 | 0/0 | 230/-230 | 390 | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6060 | 450/-390 | 230/310 | -310/1070 | 120/-110 | 200/-200 | 280 | 390 | 790 |
| AUTOBRAKE MAX | 6120 | 450/-380 | 230/310 | -300/1060 | 120/-100 | 200/-200 | 290 | 400 | 820 |
| AUTOBRAKE 2 | 7570 | 460/-440 | 240/300 | -330/1090 | 30/-30 | 230/-230 | 400 | 0 | 0 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6570 | 460/-410 | 240/320 | -330/1140 | 160/-140 | 210/-210 | 280 | 490 | 1030 |
| AUTOBRAKE MAX | 6630 | 460/-400 | 240/320 | -320/1130 | 160/-140 | 210/-210 | 290 | 500 | 1050 |
| AUTOBRAKE 2 | 7630 | 460/-440 | 240/310 | -350/1140 | 60/-50 | 230/-240 | 400 | 60 | 240 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6940 | 470/-420 | 240/320 | -340/1200 | 200/-170 | 210/-210 | 280 | 600 | 1330 |
| AUTOBRAKE MAX | 7000 | 470/-420 | 240/330 | -340/1190 | 200/-170 | 210/-210 | 290 | 610 | 1360 |
| AUTOBRAKE 3 | 7030 | 460/-410 | 240/330 | -340/1170 | 180/-140 | 220/-220 | 320 | 570 | 1310 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8060 | 640/-550 | 330/440 | -430/1530 | 300/-250 | 270/-270 | 320 | 1150 | 2980 |
| AUTOBRAKE MAX | 8060 | 640/-550 | 330/450 | -430/1530 | 330/-270 | 280/-280 | 320 | 1150 | 2980 |
| AUTOBRAKE 3 | 8060 | 640/-550 | 330/450 | -430/1530 | 330/-270 | 280/-280 | 320 | 1150 | 2980 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 9980 | 730/-670 | 380/500 | -580/2110 | 800/-520 | 310/-310 | 320 | 2130 | 6210 |
| AUTOBRAKE MAX | 9980 | 730/-670 | 380/500 | -580/2110 | 820/-540 | 320/-320 | 320 | 2130 | 6210 |
| AUTOBRAKE 3 | 9980 | 730/-670 | 380/500 | -580/2110 | 820/-540 | 320/-320 | 320 | 2130 | 6210 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance

### Trailing Edge Flap Disagree (15 ≤ Indicated Flaps < 30)

### VREF15

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4180 | 260/-250 | 110/140 | -190/610 | 40/-40 | 110/-110 | 190 | 80 | 140 |
| AUTOBRAKE MAX | 4700 | 260/-290 | 120/150 | -210/670 | 10/0 | 130/-130 | 240 | 10 | 30 |
| AUTOBRAKE 2 | 6330 | 380/-430 | 190/240 | -300/990 | 0/0 | 190/-190 | 370 | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5240 | 380/-370 | 190/260 | -290/1010 | 110/-90 | 170/-170 | 270 | 280 | 570 |
| AUTOBRAKE MAX | 5300 | 380/-380 | 190/260 | -280/990 | 100/-90 | 170/-170 | 290 | 290 | 590 |
| AUTOBRAKE 2 | 6420 | 390/-430 | 190/250 | -310/1020 | 30/-20 | 190/-200 | 370 | 0 | 0 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5750 | 390/-390 | 190/260 | -310/1070 | 150/-130 | 180/-180 | 270 | 380 | 800 |
| AUTOBRAKE MAX | 5810 | 390/-390 | 190/260 | -300/1060 | 150/-130 | 180/-180 | 290 | 390 | 820 |
| AUTOBRAKE 2 | 6490 | 400/-440 | 190/250 | -320/1080 | 70/-50 | 200/-200 | 380 | 60 | 250 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6130 | 410/-410 | 200/270 | -320/1130 | 190/-160 | 180/-180 | 270 | 490 | 1090 |
| AUTOBRAKE MAX | 6190 | 410/-420 | 200/270 | -320/1120 | 190/-160 | 180/-180 | 290 | 500 | 1110 |
| AUTOBRAKE 3 | 6180 | 410/-420 | 200/270 | -320/1120 | 190/-150 | 190/-190 | 290 | 500 | 1110 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7010 | 550/-540 | 270/370 | -410/1470 | 270/-230 | 240/-240 | 320 | 880 | 2220 |
| AUTOBRAKE MAX | 7050 | 560/-540 | 280/380 | -410/1470 | 300/-250 | 240/-240 | 330 | 890 | 2250 |
| AUTOBRAKE 3 | 7050 | 560/-540 | 280/380 | -410/1470 | 300/-250 | 240/-240 | 330 | 890 | 2250 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8930 | 650/-650 | 330/430 | -560/2050 | 780/-490 | 280/-280 | 320 | 1820 | 5240 |
| AUTOBRAKE MAX | 8970 | 650/-650 | 330/440 | -560/2060 | 800/-510 | 280/-280 | 330 | 1830 | 5260 |
| AUTOBRAKE 3 | 8970 | 650/-650 | 330/440 | -560/2060 | 800/-510 | 280/-280 | 330 | 1830 | 5260 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance
### Trailing Edge Flap Disagree (30 ≤ Indicated Flaps < 40)
### VREF30

| | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| BRAKING CONFIGURATION | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

**Dry Runway**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 3890 | 230/-230 | 100/130 | -180/590 | 40/-40 | 100/-100 | 180 | 70 | 110 |
| AUTOBRAKE MAX | 4380 | 240/-270 | 110/140 | -200/650 | 10/0 | 120/-120 | 230 | 10 | 30 |
| AUTOBRAKE 2 | 5850 | 350/-390 | 170/220 | -290/960 | 0/0 | 170/-180 | 350 | 0 | 0 |

**Good Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 4760 | 340/-330 | 160/220 | -270/950 | 90/-80 | 160/-160 | 260 | 210 | 410 |
| AUTOBRAKE MAX | 4870 | 340/-340 | 170/230 | -270/940 | 90/-80 | 160/-160 | 270 | 220 | 440 |
| AUTOBRAKE 2 | 5930 | 360/-400 | 170/220 | -300/980 | 20/-20 | 180/-180 | 360 | 0 | 0 |

**Good To Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5270 | 350/-350 | 170/230 | -290/1020 | 130/-110 | 160/-160 | 260 | 300 | 620 |
| AUTOBRAKE MAX | 5380 | 350/-360 | 170/230 | -290/1010 | 130/-110 | 160/-160 | 270 | 310 | 650 |
| AUTOBRAKE 2 | 6000 | 360/-400 | 180/230 | -310/1030 | 60/-50 | 180/-180 | 360 | 60 | 200 |

**Medium Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5640 | 360/-370 | 180/240 | -300/1080 | 170/-140 | 160/-160 | 250 | 390 | 860 |
| AUTOBRAKE MAX | 5740 | 370/-380 | 180/240 | -310/1070 | 170/-140 | 170/-170 | 270 | 410 | 890 |
| AUTOBRAKE 3 | 5730 | 370/-380 | 180/240 | -310/1070 | 170/-140 | 170/-170 | 280 | 410 | 890 |

**Medium To Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6340 | 490/-480 | 240/330 | -390/1390 | 240/-200 | 220/-220 | 300 | 650 | 1560 |
| AUTOBRAKE MAX | 6380 | 490/-490 | 240/330 | -390/1400 | 260/-220 | 220/-220 | 300 | 660 | 1580 |
| AUTOBRAKE 3 | 6380 | 490/-490 | 240/330 | -390/1400 | 260/-220 | 220/-220 | 300 | 660 | 1580 |

**Poor Reported Braking Action**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8200 | 580/-590 | 290/380 | -540/1990 | 720/-450 | 260/-260 | 300 | 1480 | 4100 |
| AUTOBRAKE MAX | 8250 | 590/-590 | 300/390 | -540/1990 | 740/-470 | 260/-260 | 300 | 1490 | 4120 |
| AUTOBRAKE 3 | 8250 | 590/-590 | 300/390 | -540/1990 | 740/-470 | 260/-260 | 300 | 1490 | 4120 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Non-Normal Configuration Landing Distance
### Trailing Edge Flaps Up Landing
### VREF40 + 40

| BRAKING CONFIGURATION | LANDING DISTANCE AND ADJUSTMENTS (FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | REF DIST | WT ADJ | ALT ADJ | WIND ADJ | SLOPE ADJ | TEMP ADJ | APP SPD ADJ | REVERSE THRUST ADJ | |
| | 65000 KG LANDING WEIGHT | PER 5000 KG ABV/BLW 65000 KG | PER 1000 FT STD/HIGH* | PER 10 KTS HEAD/ TAIL WIND | PER 1% DOWN/ UP HILL | PER 10°C ABV/ BLW ISA | PER 5 KTS ABOVE VREF | ONE REV | NO REV |

### Dry Runway

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 5070 | 450/-270 | 140/170 | -200/650 | 50/-50 | 130/-130 | 180 | 120 | 200 |
| AUTOBRAKE MAX | 5980 | 350/-300 | 170/210 | -230/740 | 10/0 | 160/-170 | 270 | 10 | 40 |
| AUTOBRAKE 2 | 8270 | 470/-460 | 260/330 | -340/1110 | 0/0 | 250/-250 | 410 | 0 | 0 |

### Good Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 6610 | 470/-410 | 250/340 | -320/1120 | 130/-120 | 220/-220 | 280 | 450 | 930 |
| AUTOBRAKE MAX | 6660 | 470/-410 | 250/340 | -320/1110 | 130/-110 | 220/-220 | 300 | 460 | 950 |
| AUTOBRAKE 2 | 8340 | 480/-460 | 260/330 | -350/1130 | 30/-30 | 260/-260 | 420 | 0 | 0 |

### Good To Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7120 | 480/-430 | 260/350 | -340/1180 | 170/-150 | 230/-230 | 280 | 550 | 1170 |
| AUTOBRAKE MAX | 7170 | 480/-430 | 260/350 | -340/1170 | 170/-150 | 230/-230 | 300 | 560 | 1190 |
| AUTOBRAKE 2 | 8400 | 480/-470 | 260/340 | -360/1190 | 60/-50 | 260/-260 | 420 | 60 | 240 |

### Medium Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 7490 | 500/-450 | 270/350 | -360/1240 | 210/-180 | 230/-230 | 280 | 670 | 1470 |
| AUTOBRAKE MAX | 7540 | 500/-450 | 270/360 | -350/1230 | 210/-180 | 230/-230 | 300 | 680 | 1500 |
| AUTOBRAKE 3 | 7640 | 480/-430 | 260/350 | -350/1200 | 180/-130 | 230/-240 | 330 | 580 | 1390 |

### Medium To Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 8770 | 670/-590 | 350/480 | -450/1580 | 330/-270 | 300/-300 | 330 | 1320 | 3430 |
| AUTOBRAKE MAX | 8770 | 670/-590 | 360/480 | -450/1580 | 350/-290 | 300/-300 | 320 | 1310 | 3420 |
| AUTOBRAKE 3 | 8770 | 670/-590 | 360/480 | -450/1580 | 350/-290 | 300/-300 | 320 | 1310 | 3420 |

### Poor Reported Braking Action

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| MAX MANUAL | 10710 | 760/-710 | 410/540 | -590/2150 | 830/-540 | 340/-340 | 330 | 2320 | 6770 |
| AUTOBRAKE MAX | 10710 | 770/-710 | 410/540 | -590/2150 | 850/-560 | 340/-340 | 320 | 2320 | 6760 |
| AUTOBRAKE 3 | 10710 | 770/-710 | 410/540 | -590/2150 | 850/-560 | 340/-340 | 320 | 2320 | 6760 |

**Reference distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.**
**MAX MANUAL assumes maximum achievable manual braking.**
**Includes an air distance from threshold to touchdown associated with a flare time of 7 seconds.**
**Actual (unfactored) distances are shown.**

***For landing distance at or below 8000 ft pressure altitude, apply the STD adjustment. For altitudes higher than 8000 ft, first apply the STD adjustment to derive a new reference landing distance for 8000 ft then apply the HIGH adjustment to this new reference distance.**

# ADVISORY INFORMATION

## Recommended Brake Cooling Schedule

### Reference Brake Energy (Millions of Foot Pounds)

### Table 1(a) of 3: Sea Level to 10000 ft Pressure Altitude

| | | BRAKES ON SPEED (KIAS) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 80 | | | 100 | | | 120 | | | 140 | | | 160 | | | 180 | | |
| WEIGHT (1000 KG) | OAT (°C) | PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
| | | 0 | 5 | 10 | 0 | 5 | 10 | 0 | 5 | 10 | 0 | 5 | 10 | 0 | 5 | 10 | 0 | 5 | 10 |
| 90 | 0 | 16.6 | 18.8 | 21.5 | 24.6 | 28.2 | 32.5 | 33.9 | 39.2 | 45.6 | 44.2 | 51.4 | 60.0 | 55.3 | | | | | |
| | 10 | 17.1 | 19.5 | 22.2 | 25.4 | 29.1 | 33.6 | 35.0 | 40.5 | 47.1 | 45.7 | 53.2 | 62.0 | 57.2 | | | | | |
| | 15 | 17.4 | 19.8 | 22.6 | 25.8 | 29.6 | 34.1 | 35.6 | 41.2 | 47.8 | 46.4 | 54.0 | 63.0 | 58.1 | | | | | |
| | 20 | 17.7 | 20.1 | 22.9 | 26.2 | 30.1 | 34.7 | 36.1 | 41.8 | 48.6 | 47.2 | 54.9 | 64.0 | 59.0 | | | | | |
| | 30 | 18.2 | 20.6 | 23.6 | 26.9 | 30.9 | 35.7 | 37.2 | 43.0 | 50.0 | 48.6 | 56.5 | 66.0 | 60.8 | | | | | |
| | 40 | 18.2 | 20.7 | 23.7 | 27.1 | 31.1 | 36.0 | 37.5 | 43.5 | 50.8 | 49.2 | 57.5 | 67.3 | 61.9 | | | | | |
| | 50 | 18.2 | 20.7 | 23.7 | 27.2 | 31.3 | 36.3 | 37.8 | 44.0 | 51.5 | 49.9 | 58.4 | 68.6 | 63.0 | | | | | |
| 80 | 0 | 15.1 | 17.1 | 19.5 | 22.3 | 25.5 | 29.4 | 30.6 | 35.4 | 41.0 | 39.9 | 46.4 | 54.1 | 50.0 | 58.1 | | 60.3 | | |
| | 10 | 15.6 | 17.7 | 20.1 | 23.0 | 26.4 | 30.3 | 31.6 | 36.5 | 42.4 | 41.3 | 47.9 | 55.9 | 51.6 | 60.1 | | 62.3 | | |
| | 15 | 15.9 | 18.0 | 20.5 | 23.4 | 26.8 | 30.8 | 32.1 | 37.1 | 43.1 | 41.9 | 48.7 | 56.8 | 52.5 | 61.0 | | 63.4 | | |
| | 20 | 16.1 | 18.2 | 20.8 | 23.8 | 27.2 | 31.3 | 32.7 | 37.7 | 43.7 | 42.6 | 49.5 | 57.7 | 53.3 | 62.0 | | 64.4 | | |
| | 30 | 16.5 | 18.7 | 21.4 | 24.4 | 28.0 | 32.2 | 33.6 | 38.8 | 45.0 | 43.8 | 50.9 | 59.4 | 54.9 | 63.9 | | 66.3 | | |
| | 40 | 16.6 | 18.8 | 21.4 | 24.6 | 28.2 | 32.5 | 33.9 | 39.2 | 45.6 | 44.4 | 51.7 | 60.5 | 55.8 | 65.1 | | 67.7 | | |
| | 50 | 16.6 | 18.8 | 21.5 | 24.7 | 28.3 | 32.7 | 34.1 | 39.6 | 46.1 | 44.9 | 52.4 | 61.6 | 56.7 | 66.4 | | 69.0 | | |
| 70 | 0 | 13.7 | 15.5 | 17.6 | 20.0 | 22.9 | 26.2 | 27.3 | 31.4 | 36.4 | 35.5 | 41.1 | 47.8 | 44.4 | 51.7 | 60.3 | 53.8 | | |
| | 10 | 14.1 | 16.0 | 18.2 | 20.7 | 23.6 | 27.1 | 28.2 | 32.5 | 37.6 | 36.7 | 42.5 | 49.4 | 45.9 | 53.4 | 62.3 | 55.6 | | |
| | 15 | 14.3 | 16.2 | 18.4 | 21.0 | 24.0 | 27.5 | 28.7 | 33.0 | 38.2 | 37.2 | 43.2 | 50.2 | 46.6 | 54.3 | 63.3 | 56.5 | | |
| | 20 | 14.6 | 16.5 | 18.7 | 21.3 | 24.4 | 27.9 | 29.1 | 33.5 | 38.8 | 37.8 | 43.8 | 51.0 | 47.4 | 55.1 | 64.3 | 57.4 | | |
| | 30 | 15.0 | 16.9 | 19.2 | 21.9 | 25.0 | 28.7 | 29.9 | 34.5 | 39.9 | 38.9 | 45.1 | 52.5 | 48.8 | 56.8 | 66.3 | 59.1 | | |
| | 40 | 15.0 | 17.0 | 19.3 | 22.0 | 25.2 | 28.9 | 30.2 | 34.8 | 40.3 | 39.3 | 45.7 | 53.3 | 49.5 | 57.7 | 67.6 | 60.2 | | |
| | 50 | 15.0 | 17.0 | 19.3 | 22.1 | 25.3 | 29.1 | 30.3 | 35.1 | 40.7 | 39.7 | 46.2 | 54.1 | 50.1 | 58.7 | 69.0 | 61.2 | | |
| 60 | 0 | 12.2 | 13.8 | 15.7 | 17.7 | 20.2 | 23.1 | 24.0 | 27.5 | 31.7 | 31.0 | 35.8 | 41.5 | 38.6 | 44.8 | 52.1 | 46.7 | 54.4 | |
| | 10 | 12.7 | 14.3 | 16.2 | 18.3 | 20.9 | 23.8 | 24.8 | 28.4 | 32.8 | 32.0 | 37.0 | 42.9 | 39.9 | 46.3 | 53.9 | 48.3 | 56.2 | |
| | 15 | 12.8 | 14.5 | 16.4 | 18.6 | 21.2 | 24.2 | 25.2 | 28.9 | 33.3 | 32.5 | 37.5 | 43.6 | 40.5 | 47.0 | 54.8 | 49.1 | 57.1 | |
| | 20 | 13.0 | 14.7 | 16.7 | 18.9 | 21.5 | 24.6 | 25.6 | 29.3 | 33.8 | 33.0 | 38.1 | 44.2 | 41.1 | 47.7 | 55.6 | 49.8 | 58.0 | |
| | 30 | 13.4 | 15.1 | 17.2 | 19.4 | 22.1 | 25.3 | 26.3 | 30.2 | 34.8 | 34.0 | 39.2 | 45.5 | 42.3 | 49.1 | 57.3 | 51.3 | 59.7 | |
| | 40 | 13.4 | 15.2 | 17.2 | 19.5 | 22.2 | 25.4 | 26.5 | 30.4 | 35.1 | 34.3 | 39.7 | 46.1 | 42.8 | 49.8 | 58.3 | 52.1 | 60.8 | |
| | 50 | 13.4 | 15.2 | 17.2 | 19.5 | 22.3 | 25.5 | 26.6 | 30.6 | 35.4 | 34.5 | 40.0 | 46.7 | 43.3 | 50.5 | 59.3 | 52.8 | 61.9 | |
| 50 | 0 | 10.8 | 12.2 | 13.8 | 15.5 | 17.5 | 20.0 | 20.7 | 23.6 | 27.1 | 26.5 | 30.4 | 35.2 | 32.7 | 37.8 | 44.0 | 39.4 | 45.8 | 53.3 |
| | 10 | 11.2 | 12.6 | 14.2 | 16.0 | 18.1 | 20.6 | 21.4 | 24.4 | 28.0 | 27.3 | 31.4 | 36.3 | 33.8 | 39.1 | 45.4 | 40.7 | 47.3 | 55.1 |
| | 15 | 11.4 | 12.8 | 14.5 | 16.2 | 18.4 | 21.0 | 21.7 | 24.8 | 28.5 | 27.8 | 31.9 | 36.9 | 34.4 | 39.7 | 46.2 | 41.4 | 48.1 | 56.0 |
| | 20 | 11.5 | 13.0 | 14.7 | 16.5 | 18.7 | 21.3 | 22.0 | 25.2 | 28.9 | 28.2 | 32.4 | 37.5 | 34.9 | 40.4 | 46.9 | 42.0 | 48.8 | 56.9 |
| | 30 | 11.9 | 13.3 | 15.1 | 16.9 | 19.2 | 21.9 | 22.7 | 25.9 | 29.7 | 29.0 | 33.4 | 38.6 | 35.9 | 41.5 | 48.3 | 43.3 | 50.3 | 58.6 |
| | 40 | 11.9 | 13.4 | 15.1 | 17.0 | 19.3 | 22.0 | 22.8 | 26.0 | 29.9 | 29.2 | 33.6 | 39.0 | 36.2 | 42.0 | 48.9 | 43.8 | 51.0 | 59.6 |
| | 50 | 11.9 | 13.4 | 15.1 | 17.0 | 19.3 | 22.0 | 22.8 | 26.1 | 30.1 | 29.4 | 33.9 | 39.3 | 36.5 | 42.4 | 49.6 | 44.3 | 51.7 | 60.7 |
| 40 | 0 | 9.4 | 10.6 | 11.9 | 13.2 | 14.9 | 16.9 | 17.3 | 19.7 | 22.5 | 21.9 | 25.1 | 28.8 | 26.8 | 30.8 | 35.7 | 32.0 | 37.0 | 42.9 |
| | 10 | 9.8 | 10.9 | 12.3 | 13.6 | 15.4 | 17.5 | 17.9 | 20.4 | 23.3 | 22.6 | 25.9 | 29.8 | 27.7 | 31.9 | 36.8 | 33.1 | 38.2 | 44.4 |
| | 15 | 9.9 | 11.1 | 12.5 | 13.8 | 15.6 | 17.7 | 18.2 | 20.7 | 23.6 | 23.0 | 26.3 | 30.2 | 28.1 | 32.4 | 37.4 | 33.6 | 38.8 | 45.1 |
| | 20 | 10.1 | 11.3 | 12.7 | 14.0 | 15.9 | 18.0 | 18.5 | 21.0 | 24.0 | 23.3 | 26.7 | 30.7 | 28.6 | 32.9 | 38.0 | 34.1 | 39.4 | 45.8 |
| | 30 | 10.3 | 11.6 | 13.1 | 14.4 | 16.3 | 18.5 | 19.0 | 21.6 | 24.7 | 24.0 | 27.5 | 31.6 | 29.4 | 33.8 | 39.1 | 35.1 | 40.6 | 47.1 |
| | 40 | 10.3 | 11.6 | 13.1 | 14.5 | 16.3 | 18.6 | 19.0 | 21.7 | 24.8 | 24.1 | 27.6 | 31.8 | 29.6 | 34.1 | 39.5 | 35.4 | 41.0 | 47.8 |
| | 50 | 10.3 | 11.6 | 13.1 | 14.4 | 16.3 | 18.6 | 19.1 | 21.7 | 24.9 | 24.2 | 27.8 | 32.0 | 29.8 | 34.4 | 39.9 | 35.7 | 41.4 | 48.4 |

**To correct for wind, enter table with the brakes-on speed minus one-half the headwind or plus 1.5 times the tailwind. If ground speed is used for brakes-on speed, ignore wind and enter table with sea level, 15°C.**

# ADVISORY INFORMATION

## Recommended Brake Cooling Schedule

### Reference Brake Energy (Millions of Foot Pounds)

### Table 1(b) of 3: 10000 ft to 14500 ft Pressure Altitude

| | | BRAKES ON SPEED (KIAS) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 80 | | | 100 | | | 120 | | | 140 | | | 160 | | | 180 | | |
| WEIGHT (1000 KG) | OAT (°C) | PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
| | | 10 | 12 | 14.5 | 10 | 12 | 14.5 | 10 | 12 | 14.5 | 10 | 12 | 14.5 | 10 | 12 | 14.5 | 10 | 12 | 14.5 |
| 90 | 0 | 21.5 | 22.7 | 24.1 | 32.5 | 34.4 | 37.0 | 45.6 | 48.4 | 52.2 | 60.0 | | | | | | | | |
| | 10 | 22.2 | 23.4 | 25.0 | 33.6 | 35.6 | 38.2 | 47.1 | 50.0 | 54.0 | 62.0 | | | | | | | | |
| | 15 | 22.6 | 23.8 | 25.4 | 34.1 | 36.1 | 38.9 | 47.8 | 50.8 | 54.9 | 63.0 | | | | | | | | |
| | 20 | 22.9 | 24.1 | 25.8 | 34.7 | 36.7 | 39.5 | 48.6 | 51.6 | 55.8 | 64.0 | | | | | | | | |
| | 30 | 23.6 | 24.8 | 26.5 | 35.7 | 37.8 | 40.6 | 50.0 | 53.2 | 57.4 | 66.0 | | | | | | | | |
| | 40 | 23.7 | 25.0 | 26.7 | 36.0 | 38.2 | 41.0 | 50.8 | 54.0 | 58.4 | 67.3 | | | | | | | | |
| | 50 | 23.7 | 25.1 | 26.8 | 36.3 | 38.5 | 41.4 | 51.5 | 54.8 | 59.4 | 68.6 | | | | | | | | |
| 80 | 0 | 19.5 | 20.5 | 21.9 | 29.4 | 31.1 | 33.3 | 41.0 | 43.5 | 46.9 | 54.1 | 57.5 | | | | | | | |
| | 10 | 20.1 | 21.2 | 22.6 | 30.3 | 32.1 | 34.4 | 42.4 | 45.0 | 48.5 | 55.9 | 59.4 | | | | | | | |
| | 15 | 20.5 | 21.5 | 22.9 | 30.8 | 32.6 | 35.0 | 43.1 | 45.7 | 49.3 | 56.8 | 60.4 | | | | | | | |
| | 20 | 20.8 | 21.9 | 23.3 | 31.3 | 33.1 | 35.5 | 43.7 | 46.4 | 50.1 | 57.7 | 61.4 | | | | | | | |
| | 30 | 21.4 | 22.5 | 23.9 | 32.2 | 34.1 | 36.5 | 45.0 | 47.8 | 51.5 | 59.4 | 63.2 | | | | | | | |
| | 40 | 21.4 | 22.6 | 24.1 | 32.5 | 34.4 | 36.9 | 45.6 | 48.4 | 52.3 | 60.5 | 64.4 | | | | | | | |
| | 50 | 21.5 | 22.7 | 24.1 | 32.7 | 34.6 | 37.2 | 46.1 | 49.1 | 53.1 | 61.6 | 65.7 | | | | | | | |
| 70 | 0 | 17.6 | 18.5 | 19.7 | 26.2 | 27.7 | 29.6 | 36.4 | 38.6 | 41.5 | 47.8 | 50.8 | 54.9 | 60.3 | | | | | |
| | 10 | 18.2 | 19.1 | 20.3 | 27.1 | 28.6 | 30.6 | 37.6 | 39.8 | 42.9 | 49.4 | 52.5 | 56.7 | 62.3 | | | | | |
| | 15 | 18.4 | 19.4 | 20.6 | 27.5 | 29.1 | 31.1 | 38.2 | 40.5 | 43.6 | 50.2 | 53.4 | 57.6 | 63.3 | | | | | |
| | 20 | 18.7 | 19.7 | 21.0 | 27.9 | 29.5 | 31.6 | 38.8 | 41.1 | 44.3 | 51.0 | 54.2 | 58.5 | 64.3 | | | | | |
| | 30 | 19.2 | 20.2 | 21.5 | 28.7 | 30.3 | 32.5 | 39.9 | 42.3 | 45.6 | 52.5 | 55.8 | 60.3 | 66.3 | | | | | |
| | 40 | 19.3 | 20.3 | 21.6 | 28.9 | 30.6 | 32.8 | 40.3 | 42.8 | 46.1 | 53.3 | 56.8 | 61.4 | 67.6 | | | | | |
| | 50 | 19.3 | 20.3 | 21.7 | 29.1 | 30.8 | 33.0 | 40.7 | 43.3 | 46.7 | 54.1 | 57.7 | 62.5 | 69.0 | | | | | |
| 60 | 0 | 15.7 | 16.5 | 17.5 | 23.1 | 24.3 | 26.0 | 31.7 | 33.6 | 36.0 | 41.5 | 44.0 | 47.5 | 52.1 | 55.4 | 59.9 | | | |
| | 10 | 16.2 | 17.0 | 18.0 | 23.8 | 25.1 | 26.9 | 32.8 | 34.7 | 37.3 | 42.9 | 45.5 | 49.1 | 53.9 | 57.3 | 61.9 | | | |
| | 15 | 16.4 | 17.3 | 18.3 | 24.2 | 25.5 | 27.3 | 33.3 | 35.3 | 37.9 | 43.6 | 46.2 | 49.9 | 54.8 | 58.2 | 62.9 | | | |
| | 20 | 16.7 | 17.5 | 18.6 | 24.6 | 25.9 | 27.7 | 33.8 | 35.8 | 38.5 | 44.2 | 47.0 | 50.7 | 55.6 | 59.2 | 63.9 | | | |
| | 30 | 17.2 | 18.0 | 19.1 | 25.3 | 26.7 | 28.5 | 34.8 | 36.8 | 39.6 | 45.5 | 48.4 | 52.1 | 57.3 | 60.9 | 65.9 | | | |
| | 40 | 17.2 | 18.1 | 19.2 | 25.4 | 26.8 | 28.7 | 35.1 | 37.2 | 40.0 | 46.1 | 49.0 | 52.9 | 58.3 | 62.1 | 67.2 | | | |
| | 50 | 17.2 | 18.1 | 19.2 | 25.5 | 27 | 28.8 | 35.4 | 37.5 | 40.4 | 46.7 | 49.7 | 53.7 | 59.3 | 63.2 | 68.5 | | | |
| 50 | 0 | 13.8 | 14.5 | 15.3 | 20.0 | 21.0 | 22.4 | 27.1 | 28.7 | 30.7 | 35.2 | 37.3 | 40.1 | 44.0 | 46.7 | 50.4 | 53.3 | 56.7 | |
| | 10 | 14.2 | 14.9 | 15.8 | 20.6 | 21.7 | 23.1 | 28.0 | 29.6 | 31.7 | 36.3 | 38.5 | 41.4 | 45.4 | 48.3 | 52.0 | 55.1 | 58.6 | |
| | 15 | 14.5 | 15.2 | 16.1 | 21.0 | 22.1 | 23.5 | 28.5 | 30.1 | 32.2 | 36.9 | 39.1 | 42.1 | 46.2 | 49.0 | 52.9 | 56.0 | 59.6 | |
| | 20 | 14.7 | 15.4 | 16.3 | 21.3 | 22.4 | 23.9 | 28.9 | 30.6 | 32.7 | 37.5 | 39.7 | 42.7 | 46.9 | 49.8 | 53.7 | 56.9 | 60.5 | |
| | 30 | 15.1 | 15.8 | 16.8 | 21.9 | 23.0 | 24.5 | 29.7 | 31.4 | 33.7 | 38.6 | 40.9 | 44.0 | 48.3 | 51.3 | 55.3 | 58.6 | 62.3 | |
| | 40 | 15.1 | 15.9 | 16.8 | 22.0 | 23.2 | 24.7 | 29.9 | 31.7 | 34.0 | 39.0 | 41.3 | 44.5 | 48.9 | 52.0 | 56.2 | 59.6 | 63.5 | |
| | 50 | 15.1 | 15.9 | 16.8 | 22.0 | 23.2 | 24.8 | 30.1 | 31.9 | 34.2 | 39.3 | 41.8 | 45.0 | 49.6 | 52.8 | 57.1 | 60.7 | 64.7 | |
| 40 | 0 | 11.9 | 12.5 | 13.2 | 16.9 | 17.8 | 18.9 | 22.5 | 23.8 | 25.4 | 28.8 | 30.5 | 32.7 | 35.7 | 37.8 | 40.7 | 42.9 | 45.6 | 49.2 |
| | 10 | 12.3 | 12.9 | 13.7 | 17.5 | 18.4 | 19.5 | 23.3 | 24.5 | 26.2 | 29.8 | 31.5 | 33.8 | 36.8 | 39.1 | 42.0 | 44.4 | 47.1 | 50.8 |
| | 15 | 12.5 | 13.1 | 13.9 | 17.7 | 18.6 | 19.8 | 23.6 | 24.9 | 26.6 | 30.2 | 32.0 | 34.3 | 37.4 | 39.7 | 42.7 | 45.1 | 47.9 | 51.6 |
| | 20 | 12.7 | 13.3 | 14.1 | 18.0 | 18.9 | 20.1 | 24.0 | 25.3 | 27.1 | 30.7 | 32.5 | 34.8 | 38.0 | 40.3 | 43.4 | 45.8 | 48.6 | 52.4 |
| | 30 | 13.1 | 13.7 | 14.5 | 18.5 | 19.5 | 20.7 | 24.7 | 26.0 | 27.8 | 31.6 | 33.4 | 35.8 | 39.1 | 41.5 | 44.6 | 47.1 | 50.1 | 54.0 |
| | 40 | 13.1 | 13.7 | 14.5 | 18.6 | 19.5 | 20.8 | 24.8 | 26.2 | 28.0 | 31.8 | 33.7 | 36.1 | 39.5 | 41.9 | 45.2 | 47.8 | 50.8 | 54.9 |
| | 50 | 13.1 | 13.7 | 14.5 | 18.6 | 19.6 | 20.8 | 24.9 | 26.3 | 28.1 | 32.0 | 33.9 | 36.4 | 39.9 | 42.4 | 45.7 | 48.4 | 51.5 | 55.7 |

**To correct for wind, enter table with the brakes-on speed minus one-half the headwind or plus 1.5 times the tailwind. If ground speed is used for brakes-on speed, ignore wind and enter table with sea level, 15°C.**

# ADVISORY INFORMATION

## Recommended Brake Cooling Schedule

### Event Adjusted Brake Energy (Millions of Foot Pounds)

### Table 2(a) of 3: No Reverse Thrust

| | | REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS) | | | | | |
|---|---|---|---|---|---|---|---|
| EVENT | | 10 | 20 | 30 | 40 | 50 | 60 |
| RTO MAX MAN | | 10.0 | 20.0 | 30.0 | 40.0 | 50.0 | 60.0 |
| LANDING | MAX MAN | 7.9 | 16.4 | 25.5 | 35.0 | 44.8 | 54.8 |
| | MAX AUTO | 7.4 | 15.3 | 23.7 | 32.6 | 41.9 | 51.5 |
| | AUTOBRAKE 3 | 7.4 | 15.1 | 23.2 | 31.7 | 40.6 | 49.8 |
| | AUTOBRAKE 2 | 7.1 | 14.4 | 22.1 | 30.0 | 38.3 | 47.0 |
| | AUTOBRAKE 1 | 6.6 | 13.3 | 20.1 | 27.1 | 34.3 | 41.8 |

### Table 2(b) of 3: Two Engine Reverse Thrust

| | | REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS) | | | | | |
|---|---|---|---|---|---|---|---|
| EVENT | | 10 | 20 | 30 | 40 | 50 | 60 |
| RTO MAX MAN | | 10.0 | 20.0 | 30.0 | 40.0 | 50.0 | 60.0 |
| LANDING | MAX MAN | 7.2 | 15.2 | 23.7 | 32.6 | 41.8 | 51.0 |
| | MAX AUTO | 6.0 | 12.6 | 19.8 | 27.5 | 35.7 | 44.4 |
| | AUTOBRAKE 3 | 5.4 | 11.3 | 17.7 | 24.7 | 32.1 | 40.0 |
| | AUTOBRAKE 2 | 4.3 | 9.0 | 14.3 | 20.2 | 26.5 | 33.3 |
| | AUTOBRAKE 1 | 2.4 | 5.2 | 8.4 | 12.0 | 16.1 | 20.6 |

### Table 3 of 3: Cooling Time (Minutes)

<table>
<tr><td></td><td colspan="11">EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)</td></tr>
<tr><td></td><td>16.4 & BELOW</td><td>17</td><td>19</td><td>20.9</td><td>22.4</td><td>23.5</td><td>25.1</td><td>26.9</td><td>28.2</td><td>29.9 TO 41</td><td>41 & ABOVE</td></tr>
<tr><td>GEAR DOWN INFLIGHT</td><td rowspan="2">NO SPECIAL PROCEDURE REQUIRED</td><td>1.0</td><td>4.0</td><td>5.0</td><td>5.6</td><td>6.0</td><td>6.5</td><td>7.0</td><td>7.3</td><td rowspan="2">CAUTION</td><td rowspan="2">FUSE PLUG MELT ZONE</td></tr>
<tr><td>GROUND</td><td>6.6</td><td>16.1</td><td>24.2</td><td>30</td><td>34.3</td><td>40</td><td>45.8</td><td>50</td></tr>
<tr><td>BRAKE TEMPERATURE INDICATION</td><td>UP TO 2.5</td><td>2.6</td><td>3.0</td><td>3.3</td><td>3.6</td><td>3.8</td><td>4.1</td><td>4.5</td><td>4.7</td><td>*5.0 TO 7.1</td><td>7.1 & ABOVE</td></tr>
</table>

**Observe maximum quick turnaround limit. Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.**

**Add 1.0 million foot pounds for each taxi mile.**

**When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after one hour. If overheat occurs after takeoff, extend gear soon for at least 7 minutes.**

**When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not approach gear or attempt taxi for one hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.**

**Brake temperature indication on Multifunction Display may be used 10 to 15 minutes after airplane has come to a complete stop, or in flight with gear retracted, to determine recommended cooling schedule.**

***For airplanes with TBMS (combined Tire Pressure and Brake Temperature Monitoring System), the beginning of the caution range can vary from 5.0 to 6.2 depending on wheel temperature.**

Intentionally
Blank

# Performance Inflight — Chapter PI
## Engine Inoperative — Section 13

## ENGINE INOP

### Initial Max Continuous %N1
**Based on .79M, A/C high and anti-ice off**

| TAT (°C) | PRESSURE ALTITUDE (1000 FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 |
| 20 | 88.8 | 88.5 | 88.1 | 88.7 | 88.0 | 88.1 | 88.3 | 87.7 | 87.1 |
| 15 | 89.9 | 89.5 | 89.1 | 89.6 | 89.4 | 88.4 | 87.6 | 87.0 | 86.4 |
| 10 | 91.0 | 90.5 | 90.1 | 90.5 | 90.3 | 89.9 | 88.7 | 88.2 | 87.6 |
| 5 | 91.4 | 91.4 | 91.0 | 91.3 | 91.2 | 90.8 | 90.1 | 89.6 | 89.0 |
| 0 | 90.7 | 91.6 | 91.8 | 92.2 | 92.0 | 91.6 | 90.9 | 90.2 | 89.4 |
| -5 | 89.8 | 90.7 | 91.7 | 92.8 | 92.6 | 92.3 | 91.5 | 90.8 | 89.9 |
| -10 | 88.8 | 89.7 | 90.8 | 92.4 | 93.3 | 93.1 | 92.3 | 91.5 | 90.6 |
| -15 | 88.0 | 88.9 | 89.9 | 91.6 | 92.9 | 93.9 | 93.1 | 92.4 | 91.5 |
| -20 | 87.2 | 88.1 | 89.1 | 90.7 | 92.0 | 93.3 | 93.2 | 92.6 | 91.7 |
| -25 | 86.4 | 87.3 | 88.3 | 89.9 | 91.2 | 92.3 | 92.3 | 91.6 | 90.7 |
| -30 | 85.6 | 86.4 | 87.4 | 89.0 | 90.3 | 91.4 | 91.4 | 90.7 | 89.8 |
| -35 | 84.7 | 85.6 | 86.5 | 88.1 | 89.4 | 90.5 | 90.4 | 89.8 | 88.9 |
| -40 | 83.9 | 84.7 | 85.7 | 87.3 | 88.5 | 89.6 | 89.5 | 88.8 | 88.0 |

### %N1 Adjustments for Engine Bleeds

| BLEED CONFIGURATION | PRESSURE ALTITUDE (1000 FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 |
| ENGINE ANTI-ICE | -0.9 | -1.0 | -1.1 | -1.2 | -1.5 | -1.8 | -2.0 | -2.1 | -2.1 |
| ENGINE & WING ANTI-ICE | -3.3 | -3.5 | -3.8 | -4.1 | -4.9 | -6.1 | -6.3 | -6.4 | -6.4 |

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Max Continuous %N1

**Based on A/C high and anti-ice off**

**37000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -55 | -50 | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 |
| 160 | .51 | 87.9 | 88.8 | 89.8 | 90.8 | 91.8 | 91.9 | 91.9 | 91.9 | 91.5 | 90.5 | 89.5 | 89.9 |
| 200 | .63 | 87.6 | 88.6 | 89.6 | 90.6 | 91.6 | 92.5 | 92.8 | 92.8 | 92.4 | 91.6 | 90.6 | 89.7 |
| 240 | .74 | 87.1 | 88.1 | 89.0 | 90.0 | 91.0 | 91.9 | 92.9 | 93.5 | 93.1 | 92.1 | 91.3 | 90.7 |
| 280 | .86 | 85.3 | 86.2 | 87.2 | 88.2 | 89.1 | 90.0 | 91.0 | 91.9 | 92.8 | 92.6 | 91.8 | 91.2 |

**35000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -55 | -50 | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 |
| 160 | .49 | 87.9 | 88.9 | 89.9 | 90.9 | 91.8 | 92.1 | 92.1 | 92.1 | 92.1 | 91.4 | 90.2 | 90.0 |
| 200 | .60 | 87.1 | 88.1 | 89.0 | 90.0 | 90.9 | 91.9 | 92.3 | 92.3 | 92.3 | 92.3 | 91.4 | 90.4 |
| 240 | .71 | 87.1 | 88.1 | 89.1 | 90.0 | 90.9 | 91.9 | 92.8 | 93.5 | 93.4 | 92.8 | 92.0 | 91.3 |
| 280 | .82 | 86.0 | 87.0 | 87.9 | 88.9 | 89.8 | 90.7 | 91.6 | 92.5 | 93.4 | 93.2 | 92.4 | 91.7 |

**33000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -50 | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 |
| 160 | .47 | 88.9 | 89.9 | 90.8 | 91.8 | 92.6 | 92.6 | 92.6 | 92.2 | 91.6 | 90.8 | 89.5 | 89.9 |
| 200 | .58 | 88.5 | 89.4 | 90.4 | 91.3 | 92.2 | 93.1 | 93.1 | 92.6 | 92.1 | 91.6 | 90.9 | 89.5 |
| 240 | .68 | 87.8 | 88.8 | 89.7 | 90.6 | 91.5 | 92.4 | 93.3 | 93.4 | 92.8 | 92.2 | 91.6 | 90.6 |
| 280 | .79 | 86.7 | 87.6 | 88.5 | 89.4 | 90.3 | 91.2 | 92.1 | 92.9 | 93.3 | 92.6 | 92.0 | 91.2 |
| 320 | .89 | 85.3 | 86.3 | 87.2 | 88.0 | 88.9 | 89.8 | 90.6 | 91.5 | 92.3 | 93.3 | 93.1 | 92.3 |

**31000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -50 | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 |
| 160 | .45 | 88.7 | 89.7 | 90.6 | 91.5 | 92.4 | 93 | 92.9 | 92.5 | 91.7 | 90.9 | 90.0 | 89.0 |
| 200 | .55 | 88.6 | 89.5 | 90.4 | 91.3 | 92.2 | 93.1 | 93.6 | 93.2 | 92.3 | 91.6 | 91.0 | 89.8 |
| 240 | .66 | 87.7 | 88.6 | 89.5 | 90.4 | 91.3 | 92.2 | 93.1 | 93.7 | 93.1 | 92.2 | 91.6 | 90.7 |
| 280 | .76 | 86.1 | 87.0 | 87.9 | 88.8 | 89.7 | 90.5 | 91.4 | 92.2 | 93.1 | 92.7 | 92.1 | 91.2 |
| 320 | .85 | 84.1 | 85.0 | 85.9 | 86.8 | 87.6 | 88.5 | 89.3 | 90.1 | 91 | 91.9 | 92.4 | 91.7 |

**29000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 |
| 160 | .43 | 89.0 | 89.9 | 90.8 | 91.8 | 92.7 | 92.9 | 92.3 | 91.3 | 90.5 | 89.8 | 88.2 | 87.9 |
| 200 | .53 | 88.7 | 89.6 | 90.5 | 91.4 | 92.3 | 93.2 | 93.1 | 92.2 | 91.3 | 90.5 | 89.4 | 87.8 |
| 240 | .63 | 88.0 | 88.9 | 89.8 | 90.7 | 91.6 | 92.5 | 93.3 | 92.9 | 92.0 | 91.1 | 90.1 | 89.0 |
| 280 | .73 | 86.1 | 87.0 | 87.9 | 88.8 | 89.6 | 90.5 | 91.4 | 92.2 | 92.4 | 91.6 | 90.7 | 89.7 |
| 320 | .82 | 84.0 | 84.9 | 85.8 | 86.6 | 87.5 | 88.3 | 89.2 | 90.0 | 90.9 | 91.8 | 91.1 | 90.3 |
| 360 | .91 | 83.5 | 84.4 | 85.3 | 86.2 | 87.0 | 87.9 | 88.7 | 89.5 | 90.4 | 91.3 | 92.0 | 92.0 |

### Max Continuous %N1

**%N1 Adjustments for Engine Bleeds**

| BLEED CONFIGURATION | PRESSURE ALTITUDE (1000 FT) | | | | |
|---|---|---|---|---|---|
| | 37 | 35 | 33 | 31 | 29 |
| ENGINE ANTI-ICE | -2.0 | -1.8 | -1.5 | -1.2 | -1.1 |
| ENGINE & WING ANTI-ICE | -6.1 | -6.0 | -4.8 | -4.0 | -3.7 |

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Max Continuous %N1

**Based on A/C high and anti-ice off**

**27000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 |
| 160 | .41 | 89.0 | 90.0 | 90.9 | 91.8 | 92.7 | 93.5 | 93.1 | 91.8 | 90.9 | 90.3 | 89.1 | 87.1 |
| 200 | .51 | 88.2 | 89.2 | 90.1 | 91.0 | 91.8 | 92.7 | 93.3 | 92.5 | 91.7 | 91.0 | 89.8 | 88.6 |
| 240 | .6 | 87.4 | 88.3 | 89.2 | 90.1 | 91.0 | 91.9 | 92.7 | 93.4 | 92.4 | 91.6 | 90.6 | 89.5 |
| 280 | .7 | 85.7 | 86.6 | 87.5 | 88.4 | 89.2 | 90.1 | 90.9 | 91.7 | 92.7 | 92.1 | 91.1 | 90.0 |
| 320 | .79 | 83.8 | 84.7 | 85.5 | 86.4 | 87.2 | 88.1 | 88.9 | 89.7 | 90.7 | 91.6 | 91.4 | 90.5 |
| 360 | .88 | 82.6 | 83.5 | 84.4 | 85.2 | 86.1 | 86.9 | 87.7 | 88.5 | 89.5 | 90.4 | 91.1 | 91.6 |

**25000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 |
| 160 | .39 | 90.1 | 91.0 | 91.9 | 92.8 | 93.7 | 93.7 | 92.4 | 91.4 | 90.7 | 89.7 | 88.1 | 86.9 |
| 200 | .49 | 89.0 | 89.9 | 90.8 | 91.6 | 92.5 | 93.4 | 93.1 | 92.1 | 91.3 | 90.3 | 89.1 | 87.5 |
| 240 | .58 | 87.7 | 88.6 | 89.4 | 90.3 | 91.2 | 92.0 | 92.9 | 92.8 | 91.9 | 90.9 | 89.8 | 88.6 |
| 280 | .67 | 86.2 | 87.0 | 87.9 | 88.8 | 89.6 | 90.5 | 91.3 | 92.2 | 92.4 | 91.5 | 90.4 | 89.2 |
| 320 | .76 | 84.4 | 85.3 | 86.1 | 87.0 | 87.8 | 88.6 | 89.4 | 90.4 | 91.3 | 91.8 | 90.8 | 89.7 |
| 360 | .85 | 82.6 | 83.4 | 84.3 | 85.1 | 85.9 | 86.7 | 87.5 | 88.4 | 89.3 | 90.0 | 90.8 | 90.2 |

**24000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 |
| 160 | .38 | 89.4 | 90.3 | 91.3 | 92.2 | 93.0 | 93.9 | 92.7 | 91.7 | 90.9 | 89.9 | 88.7 | 86.9 |
| 200 | .48 | 88.9 | 89.8 | 90.7 | 91.6 | 92.5 | 93.4 | 93.8 | 92.8 | 91.8 | 90.9 | 89.8 | 88.6 |
| 240 | .57 | 88.1 | 89.0 | 89.9 | 90.8 | 91.7 | 92.5 | 93.4 | 93.7 | 92.8 | 91.8 | 90.8 | 89.7 |
| 280 | .66 | 86.7 | 87.6 | 88.5 | 89.4 | 90.2 | 91.1 | 91.9 | 92.7 | 93.3 | 92.4 | 91.4 | 90.3 |
| 320 | .75 | 85.0 | 85.9 | 86.8 | 87.7 | 88.5 | 89.3 | 90.2 | 91.0 | 91.8 | 92.6 | 91.8 | 90.8 |
| 360 | .83 | 83.2 | 84.1 | 85.0 | 85.8 | 86.6 | 87.5 | 88.3 | 89.1 | 89.9 | 90.6 | 91.4 | 91.3 |

**22000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 |
| 160 | .37 | 88.2 | 89.1 | 89.9 | 90.8 | 91.7 | 92.0 | 91.2 | 90.3 | 89.4 | 88.3 | 87.2 | 86.5 |
| 200 | .46 | 87.9 | 88.8 | 89.7 | 90.6 | 91.4 | 92.3 | 92.2 | 91.4 | 90.4 | 89.3 | 88.3 | 87.1 |
| 240 | .55 | 88.9 | 89.8 | 90.7 | 91.6 | 92.4 | 93.3 | 94.1 | 93.8 | 92.9 | 92.0 | 91.0 | 89.9 |
| 280 | .63 | 87.7 | 88.6 | 89.5 | 90.4 | 91.2 | 92.1 | 92.9 | 93.7 | 93.5 | 92.5 | 91.5 | 90.5 |
| 320 | .72 | 86.2 | 87.1 | 87.9 | 88.8 | 89.6 | 90.5 | 91.3 | 92.1 | 92.9 | 93.0 | 92.1 | 91.1 |
| 360 | .80 | 84.5 | 85.4 | 86.2 | 87.1 | 87.9 | 88.7 | 89.5 | 90.3 | 91.1 | 91.9 | 92.4 | 91.5 |

**20000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 |
| 160 | .35 | 86.4 | 87.3 | 88.2 | 89.0 | 89.9 | 90.7 | 90.7 | 89.9 | 88.9 | 87.8 | 86.7 | 85.9 |
| 200 | .44 | 86.0 | 86.9 | 87.8 | 88.6 | 89.5 | 90.3 | 91.1 | 90.6 | 89.5 | 88.4 | 87.3 | 86.2 |
| 240 | .53 | 88.7 | 89.6 | 90.5 | 91.4 | 92.3 | 93.1 | 94.0 | 94.7 | 94.0 | 93.0 | 92.0 | 91.0 |
| 280 | .61 | 88.0 | 88.9 | 89.8 | 90.7 | 91.6 | 92.4 | 93.3 | 94.1 | 94.8 | 93.8 | 92.9 | 92.0 |
| 320 | .69 | 86.6 | 87.5 | 88.3 | 89.2 | 90.1 | 90.9 | 91.7 | 92.6 | 93.4 | 94.2 | 93.5 | 92.6 |
| 360 | .77 | 85.1 | 85.9 | 86.8 | 87.6 | 88.4 | 89.3 | 90.1 | 90.9 | 91.7 | 92.5 | 93.3 | 92.9 |

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Max Continuous %N1

#### %N1 Adjustments for Engine Bleeds

| BLEED CONFIGURATION | PRESSURE ALTITUDE (1000 FT) | | | | |
|---|---|---|---|---|---|
| | 27 | 25 | 24 | 22 | 20 |
| ENGINE ANTI-ICE | -0.9 | -0.9 | -0.8 | -0.9 | -0.8 |
| ENGINE & WING ANTI-ICE | -3.4 | -3.3 | -3.3 | -3.3 | -3.2 |

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Max Continuous %N1

**Based on A/C high and anti-ice off**

**18000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 |
| 160 | .34 | 86.6 | 87.4 | 88.3 | 89.1 | 89.9 | 90.7 | 90.2 | 89.2 | 88.1 | 87.0 | 85.9 | 85.1 |
| 200 | .42 | 85.9 | 86.8 | 87.6 | 88.4 | 89.2 | 90.0 | 90.5 | 89.9 | 88.8 | 87.6 | 86.5 | 85.6 |
| 240 | .51 | 88.6 | 89.4 | 90.3 | 91.1 | 92.0 | 92.8 | 93.6 | 93.8 | 93.1 | 92.1 | 90.9 | 90.0 |
| 280 | .59 | 89.1 | 90.0 | 90.8 | 91.7 | 92.5 | 93.3 | 94.2 | 95.0 | 94.9 | 94.1 | 93.2 | 92.4 |
| 320 | .67 | 87.8 | 88.7 | 89.5 | 90.4 | 91.2 | 92.0 | 92.8 | 93.6 | 94.4 | 94.6 | 93.8 | 92.9 |
| 360 | .75 | 86.5 | 87.3 | 88.1 | 88.9 | 89.8 | 90.6 | 91.4 | 92.2 | 92.9 | 93.7 | 94.1 | 93.3 |

**16000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 |
| 160 | .33 | 85.9 | 86.8 | 87.6 | 88.4 | 89.2 | 90.0 | 90.5 | 89.6 | 88.5 | 87.3 | 86.2 | 85.2 |
| 200 | .41 | 85.3 | 86.1 | 86.9 | 87.7 | 88.5 | 89.3 | 90.1 | 90.0 | 89.1 | 87.9 | 86.8 | 85.8 |
| 240 | .49 | 86.3 | 87.1 | 87.9 | 88.7 | 89.5 | 90.3 | 91.2 | 92.0 | 91.9 | 90.9 | 89.8 | 88.7 |
| 280 | .57 | 89.0 | 89.9 | 90.7 | 91.6 | 92.4 | 93.2 | 94.0 | 94.9 | 95.7 | 94.9 | 94.1 | 93.3 |
| 320 | .64 | 87.8 | 88.7 | 89.5 | 90.4 | 91.2 | 92.0 | 92.8 | 93.6 | 94.4 | 95.2 | 94.7 | 93.8 |
| 360 | .72 | 86.6 | 87.4 | 88.3 | 89.1 | 89.9 | 90.7 | 91.5 | 92.3 | 93.1 | 93.9 | 94.7 | 94.2 |

**14000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 |
| 160 | .31 | 86.4 | 87.3 | 88.1 | 88.9 | 89.7 | 90.5 | 90.5 | 89.6 | 88.5 | 87.4 | 86.4 | 85.3 |
| 200 | .39 | 85.8 | 86.6 | 87.4 | 88.2 | 89.0 | 89.7 | 90.5 | 90.1 | 89.1 | 88.0 | 86.9 | 85.9 |
| 240 | .47 | 85.4 | 86.2 | 87.1 | 87.8 | 88.6 | 89.4 | 90.2 | 90.9 | 90.9 | 89.8 | 88.8 | 87.7 |
| 280 | .54 | 89.1 | 90.0 | 90.8 | 91.6 | 92.5 | 93.3 | 94.1 | 94.9 | 95.2 | 94.4 | 93.5 | 92.6 |
| 320 | .62 | 88.3 | 89.2 | 90.0 | 90.8 | 91.7 | 92.5 | 93.3 | 94.0 | 94.8 | 95.0 | 94.3 | 93.4 |
| 360 | .69 | 86.6 | 87.5 | 88.3 | 89.1 | 89.9 | 90.7 | 91.5 | 92.3 | 93.0 | 93.8 | 94.2 | 93.7 |

**12000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 160 | .30 | 87.1 | 87.9 | 88.7 | 89.6 | 90.4 | 91.2 | 91.2 | 90.4 | 89.4 | 88.4 | 87.4 | 86.4 |
| 200 | .38 | 86.3 | 87.1 | 88.0 | 88.8 | 89.6 | 90.4 | 91.0 | 90.9 | 89.9 | 89.0 | 88.0 | 87.0 |
| 240 | .45 | 85.5 | 86.3 | 87.1 | 87.9 | 88.7 | 89.5 | 90.3 | 90.7 | 90.3 | 89.5 | 88.6 | 87.6 |
| 280 | .52 | 88.5 | 89.4 | 90.2 | 91.1 | 91.9 | 92.7 | 93.5 | 94.3 | 94.3 | 93.7 | 92.8 | 91.9 |
| 320 | .60 | 88.3 | 89.1 | 89.9 | 90.8 | 91.6 | 92.4 | 93.2 | 94.0 | 94.8 | 94.3 | 93.4 | 92.6 |
| 360 | .67 | 86.1 | 87.0 | 87.8 | 88.6 | 89.4 | 90.2 | 91.0 | 91.7 | 92.5 | 93.3 | 93.0 | 92.5 |

### Max Continuous %N1

**%N1 Adjustments for Engine Bleeds**

| BLEED CONFIGURATION | PRESSURE ALTITUDE (1000 FT) | | | |
|---|---|---|---|---|
| | 18 | 16 | 14 | 12 |
| ENGINE ANTI-ICE | -0.9 | -0.7 | -0.7 | -0.7 |
| ENGINE & WING ANTI-ICE | -3.2 | -3.0 | -2.9 | -2.7 |

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Max Continuous %N1

**Based on A/C high and anti-ice off**

**10000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 160 | .29 | 87.0 | 87.8 | 88.7 | 89.5 | 90.3 | 91.1 | 91.9 | 91.9 | 91.3 | 90.4 | 89.5 | 88.6 |
| 200 | .36 | 86.3 | 87.2 | 88.0 | 88.8 | 89.6 | 90.5 | 91.3 | 91.7 | 91.5 | 90.9 | 90.0 | 89.1 |
| 240 | .43 | 85.6 | 86.4 | 87.3 | 88.1 | 88.9 | 89.7 | 90.5 | 91.3 | 91.4 | 91.3 | 90.4 | 89.4 |
| 280 | .51 | 88.2 | 89.0 | 89.9 | 90.7 | 91.6 | 92.4 | 93.2 | 94.0 | 94.7 | 93.9 | 93.0 | 92.1 |
| 320 | .58 | 87.3 | 88.2 | 89.0 | 89.8 | 90.7 | 91.5 | 92.3 | 93.1 | 93.9 | 94.3 | 93.4 | 92.5 |
| 360 | .65 | 84.5 | 85.3 | 86.1 | 86.9 | 87.7 | 88.5 | 89.3 | 90.1 | 90.9 | 91.6 | 92.1 | 92.1 |

**5000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| 160 | .26 | 86.8 | 87.7 | 88.5 | 89.3 | 90.1 | 90.9 | 91.6 | 91.3 | 90.4 | 89.5 | 88.6 | 87.6 |
| 200 | .33 | 86.4 | 87.2 | 88.1 | 88.9 | 89.7 | 90.5 | 91.3 | 91.5 | 90.9 | 89.9 | 88.9 | 88.0 |
| 240 | .40 | 85.9 | 86.7 | 87.6 | 88.4 | 89.2 | 90.0 | 90.8 | 91.4 | 91.3 | 90.4 | 89.5 | 88.5 |
| 280 | .46 | 85.7 | 86.5 | 87.3 | 88.2 | 89.0 | 89.8 | 90.6 | 91.4 | 91.6 | 91.1 | 90.2 | 89.3 |
| 320 | .53 | 85.5 | 86.3 | 87.1 | 88.0 | 88.8 | 89.6 | 90.4 | 91.1 | 91.9 | 91.8 | 91.3 | 90.5 |
| 360 | .59 | 81.5 | 82.3 | 83.1 | 83.8 | 84.6 | 85.4 | 86.1 | 86.9 | 87.6 | 88.4 | 88.4 | 88.4 |

**3000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 160 | .26 | 86.8 | 87.7 | 88.5 | 89.3 | 90.1 | 90.9 | 91.2 | 90.5 | 89.6 | 88.6 | 87.6 | 86.6 |
| 200 | .32 | 86.5 | 87.3 | 88.1 | 88.9 | 89.7 | 90.5 | 91.3 | 90.8 | 89.9 | 89.0 | 88.0 | 87.0 |
| 240 | .38 | 86.1 | 86.9 | 87.7 | 88.5 | 89.2 | 90.0 | 90.8 | 91.1 | 90.4 | 89.5 | 88.5 | 87.5 |
| 280 | .45 | 85.4 | 86.2 | 87.0 | 87.8 | 88.6 | 89.4 | 90.2 | 91.0 | 90.7 | 89.9 | 89.0 | 88.1 |
| 320 | .51 | 84.7 | 85.5 | 86.3 | 87.1 | 87.9 | 88.6 | 89.4 | 90.2 | 90.9 | 90.8 | 90.0 | 89.3 |
| 360 | .57 | 80.5 | 81.3 | 82.0 | 82.8 | 83.5 | 84.2 | 85.0 | 85.7 | 86.4 | 86.9 | 86.9 | 86.9 |

**1000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 160 | .25 | 85.9 | 86.7 | 87.5 | 88.3 | 89.1 | 89.9 | 90.7 | 90.4 | 89.6 | 88.7 | 87.7 | 86.7 |
| 200 | .31 | 85.5 | 86.3 | 87.1 | 87.9 | 88.7 | 89.5 | 90.3 | 90.7 | 89.9 | 89.0 | 88.0 | 87.0 |
| 240 | .37 | 85.2 | 86.0 | 86.8 | 87.6 | 88.4 | 89.1 | 89.9 | 90.7 | 90.3 | 89.4 | 88.5 | 87.5 |
| 280 | .43 | 84.6 | 85.4 | 86.2 | 87.0 | 87.8 | 88.5 | 89.3 | 90.1 | 90.6 | 89.9 | 89.0 | 88.1 |
| 320 | .49 | 82.6 | 83.4 | 84.2 | 84.9 | 85.7 | 86.5 | 87.2 | 88.0 | 88.7 | 89.0 | 88.9 | 88.6 |
| 360 | .55 | 78.8 | 79.6 | 80.3 | 81.0 | 81.8 | 82.5 | 83.2 | 83.9 | 84.6 | 85.3 | 85.5 | 85.5 |

### Max Continuous %N1

**%N1 Adjustments for Engine Bleeds**

| BLEED CONFIGURATION | PRESSURE ALTITUDE (1000 FT) | | | |
|---|---|---|---|---|
| | 10 | 5 | 3 | 1 |
| ENGINE ANTI-ICE | -0.6 | 0.0 | 0.0 | 0.0 |
| ENGINE & WING ANTI-ICE | -2.5 | 0.0 | 0.0 | 0.0 |

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Driftdown Speed/Level Off Altitude

**100 ft/min residual rate of climb**

| WEIGHT (1000 KG) | | OPTIMUM DRIFTDOWN SPEED (KIAS) | LEVEL OFF PRESSURE ALTITUDE | | |
|---|---|---|---|---|---|
| START DRIFTDOWN | LEVEL OFF | | ISA + 10°C & BELOW | ISA + 15°C | ISA + 20°C |
| 85 | 81 | 253 | 16800 | 14200 | 12300 |
| 80 | 77 | 246 | 18600 | 16600 | 13400 |
| 75 | 72 | 239 | 20300 | 19000 | 14800 |
| 70 | 67 | 231 | 21900 | 20800 | 19000 |
| 65 | 63 | 223 | 23700 | 22600 | 21300 |
| 60 | 58 | 215 | 25500 | 24500 | 23400 |
| 55 | 53 | 206 | 27600 | 26700 | 25600 |
| 50 | 48 | 197 | 29900 | 29000 | 28200 |
| 45 | 43 | 188 | 32200 | 31700 | 31200 |
| 40 | 38 | 178 | 34600 | 34200 | 33800 |

**Includes APU fuel burn.**

# ENGINE INOP

## MAX CONTINUOUS THRUST

## Driftdown/LRC Cruise Range Capability

### Table 1 of 2: Ground to Air Miles Conversion

| AIR DISTANCE (NM) | | | | | GROUND DISTANCE (NM) | AIR DISTANCE (NM) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| HEADWIND COMPONENT (KTS) | | | | | | TAILWIND COMPONENT (KTS) | | | | |
| 100 | 80 | 60 | 40 | 20 | | 20 | 40 | 60 | 80 | 100 |
| 142 | 131 | 121 | 113 | 106 | 100 | 94 | 89 | 84 | 80 | 77 |
| 284 | 262 | 243 | 226 | 212 | 200 | 188 | 178 | 169 | 161 | 154 |
| 425 | 392 | 364 | 340 | 318 | 300 | 283 | 268 | 254 | 242 | 231 |
| 567 | 523 | 485 | 453 | 425 | 400 | 377 | 357 | 339 | 323 | 308 |
| 707 | 653 | 606 | 566 | 531 | 500 | 472 | 447 | 425 | 404 | 386 |
| 848 | 783 | 727 | 679 | 637 | 600 | 566 | 537 | 510 | 486 | 464 |
| 988 | 913 | 848 | 792 | 743 | 700 | 661 | 626 | 595 | 567 | 541 |
| 1128 | 1042 | 969 | 905 | 849 | 800 | 755 | 716 | 681 | 648 | 619 |
| 1268 | 1172 | 1089 | 1018 | 955 | 900 | 850 | 806 | 766 | 730 | 697 |
| 1407 | 1301 | 1210 | 1131 | 1061 | 1000 | 945 | 896 | 851 | 811 | 775 |
| 1547 | 1431 | 1330 | 1243 | 1167 | 1100 | 1039 | 985 | 937 | 893 | 853 |
| 1686 | 1560 | 1451 | 1356 | 1273 | 1200 | 1134 | 1075 | 1022 | 974 | 931 |
| 1826 | 1689 | 1571 | 1469 | 1379 | 1300 | 1229 | 1165 | 1108 | 1056 | 1009 |
| 1965 | 1818 | 1692 | 1582 | 1485 | 1400 | 1323 | 1255 | 1193 | 1137 | 1087 |
| 2105 | 1948 | 1812 | 1694 | 1591 | 1500 | 1418 | 1345 | 1279 | 1219 | 1164 |
| 2245 | 2077 | 1933 | 1807 | 1697 | 1600 | 1513 | 1435 | 1364 | 1300 | 1242 |
| 2385 | 2207 | 2053 | 1920 | 1803 | 1700 | 1607 | 1524 | 1450 | 1382 | 1320 |
| 2525 | 2336 | 2174 | 2033 | 1909 | 1800 | 1702 | 1614 | 1535 | 1463 | 1398 |

### Table 2 of 2: Driftdown/Cruise Fuel and Time

| AIR DIST (NM) | FUEL REQUIRED (1000 KG) | | | | | | | | | | TIME (HR:MIN) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | WEIGHT AT START OF DRIFTDOWN (1000 KG) | | | | | | | | | | |
| | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | |
| 100 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0:18 |
| 200 | 0.7 | 0.7 | 0.7 | 0.8 | 0.8 | 0.9 | 0.9 | 1.0 | 1.0 | 1.1 | 0:36 |
| 300 | 1.1 | 1.1 | 1.2 | 1.3 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 0:53 |
| 400 | 1.4 | 1.5 | 1.7 | 1.8 | 1.9 | 2.0 | 2.2 | 2.3 | 2.4 | 2.6 | 1:11 |
| 500 | 1.8 | 1.9 | 2.1 | 2.3 | 2.4 | 2.6 | 2.8 | 2.9 | 3.1 | 3.3 | 1:28 |
| 600 | 2.1 | 2.3 | 2.5 | 2.7 | 2.9 | 3.1 | 3.3 | 3.5 | 3.8 | 4.0 | 1:45 |
| 700 | 2.5 | 2.7 | 2.9 | 3.2 | 3.4 | 3.6 | 3.9 | 4.1 | 4.4 | 4.7 | 2:03 |
| 800 | 2.8 | 3.1 | 3.4 | 3.6 | 3.9 | 4.2 | 4.5 | 4.7 | 5.0 | 5.4 | 2:20 |
| 900 | 3.2 | 3.5 | 3.8 | 4.1 | 4.4 | 4.7 | 5.0 | 5.3 | 5.7 | 6.0 | 2:37 |
| 1000 | 3.5 | 3.9 | 4.2 | 4.5 | 4.9 | 5.2 | 5.6 | 5.9 | 6.3 | 6.7 | 2:54 |
| 1100 | 3.8 | 4.2 | 4.6 | 5.0 | 5.3 | 5.7 | 6.1 | 6.5 | 6.9 | 7.4 | 3:11 |
| 1200 | 4.2 | 4.6 | 5.0 | 5.4 | 5.8 | 6.3 | 6.7 | 7.1 | 7.6 | 8.0 | 3:28 |
| 1300 | 4.5 | 5.0 | 5.4 | 5.9 | 6.3 | 6.8 | 7.2 | 7.7 | 8.2 | 8.7 | 3:45 |
| 1400 | 4.8 | 5.3 | 5.8 | 6.3 | 6.8 | 7.3 | 7.8 | 8.3 | 8.8 | 9.3 | 4:02 |
| 1500 | 5.2 | 5.7 | 6.2 | 6.7 | 7.3 | 7.8 | 8.3 | 8.9 | 9.4 | 10.0 | 4:19 |
| 1600 | 5.5 | 6.1 | 6.6 | 7.2 | 7.7 | 8.3 | 8.9 | 9.4 | 10.0 | 10.6 | 4:36 |
| 1700 | 5.8 | 6.4 | 7.0 | 7.6 | 8.2 | 8.8 | 9.4 | 10.0 | 10.6 | 11.3 | 4:53 |
| 1800 | 6.2 | 6.8 | 7.4 | 8.0 | 8.7 | 9.3 | 10.0 | 10.6 | 11.3 | 11.9 | 5:10 |

**Includes APU fuel burn.**
**Driftdown at optimum driftdown speed and cruise at Long Range Cruise speed.**

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Long Range Cruise Altitude Capability

**100 ft/min residual rate of climb**

| WEIGHT (1000 KG) | PRESSURE ALTITUDE (FT) | | |
|---|---|---|---|
| | ISA + 10°C & BELOW | ISA + 15°C | ISA + 20°C |
| 85 | 14700 | 11800 | 9100 |
| 80 | 16400 | 14500 | 11700 |
| 75 | 18000 | 16300 | 14600 |
| 70 | 19600 | 18000 | 16500 |
| 65 | 21300 | 19800 | 18300 |
| 60 | 23000 | 21600 | 20300 |
| 55 | 24900 | 23400 | 22200 |
| 50 | 27500 | 25700 | 24200 |
| 45 | 30200 | 28600 | 27100 |
| 40 | 32700 | 31800 | 30700 |

**With engine anti-ice on, decrease altitude capability by 1500 ft.**
**With engine and wing anti-ice on, decrease altitude capability by 6500 ft.**

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Long Range Cruise Control

| WEIGHT (1000 KG) | | PRESSURE ALTITUDE (1000 FT) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 |
| 85 | %N1 | 87.8 | 91.7 | 93.4 | | | | | | | |
| | MACH | .545 | .587 | .599 | | | | | | | |
| | KIAS | 302 | 297 | 292 | | | | | | | |
| | FF/ENG | 2674 | 2647 | 2625 | | | | | | | |
| 80 | %N1 | 86.1 | 90.3 | 91.8 | 93.7 | | | | | | |
| | MACH | .529 | .577 | .590 | .602 | | | | | | |
| | KIAS | 293 | 292 | 287 | 282 | | | | | | |
| | FF/ENG | 2512 | 2508 | 2487 | 2471 | | | | | | |
| 75 | %N1 | 84.3 | 88.6 | 90.2 | 91.7 | | | | | | |
| | MACH | .513 | .562 | .580 | .593 | | | | | | |
| | KIAS | 284 | 284 | 282 | 277 | | | | | | |
| | FF/ENG | 2352 | 2357 | 2348 | 2328 | | | | | | |
| 70 | %N1 | 82.4 | 86.7 | 88.4 | 90.1 | 91.7 | | | | | |
| | MACH | .496 | .545 | .565 | .582 | .595 | | | | | |
| | KIAS | 275 | 275 | 275 | 272 | 267 | | | | | |
| | FF/ENG | 2193 | 2202 | 2200 | 2188 | 2169 | | | | | |
| 65 | %N1 | 80.2 | 84.6 | 86.4 | 88.2 | 89.8 | 91.6 | | | | |
| | MACH | .479 | .527 | .547 | .567 | .584 | .596 | | | | |
| | KIAS | 265 | 266 | 266 | 265 | 262 | 257 | | | | |
| | FF/ENG | 2034 | 2041 | 2046 | 2043 | 2031 | 2012 | | | | |
| 60 | %N1 | 77.9 | 82.4 | 84.2 | 86.0 | 87.8 | 89.4 | | | | |
| | MACH | .462 | .507 | .527 | .548 | .568 | .585 | | | | |
| | KIAS | 255 | 255 | 256 | 256 | 255 | 252 | | | | |
| | FF/ENG | 1881 | 1883 | 1886 | 1890 | 1886 | 1875 | | | | |
| 55 | %N1 | 75.4 | 79.9 | 81.8 | 83.6 | 85.4 | 87.2 | 88.9 | | | |
| | MACH | .444 | .486 | .505 | .526 | .547 | .567 | .585 | | | |
| | KIAS | 245 | 245 | 245 | 245 | 245 | 244 | 242 | | | |
| | FF/ENG | 1734 | 1726 | 1728 | 1730 | 1733 | 1729 | 1720 | | | |
| 50 | %N1 | 72.8 | 77.2 | 79.1 | 81.0 | 82.8 | 84.7 | 86.5 | 88.3 | 90.4 | |
| | MACH | .425 | .465 | .483 | .502 | .523 | .544 | .565 | .584 | .597 | |
| | KIAS | 235 | 234 | 233 | 234 | 234 | 234 | 233 | 231 | 227 | |
| | FF/ENG | 1590 | 1574 | 1572 | 1573 | 1574 | 1575 | 1572 | 1568 | 1559 | |
| 45 | %N1 | 70.0 | 74.3 | 76.1 | 78.0 | 79.9 | 81.8 | 83.7 | 85.6 | 87.3 | 89.4 |
| | MACH | .406 | .443 | .460 | .478 | .497 | .518 | .540 | .561 | .581 | .595 |
| | KIAS | 224 | 223 | 222 | 222 | 222 | 222 | 222 | 222 | 220 | 216 |
| | FF/ENG | 1452 | 1429 | 1423 | 1418 | 1418 | 1416 | 1418 | 1419 | 1417 | 1408 |
| 40 | %N1 | 67.0 | 71.1 | 72.9 | 74.8 | 76.6 | 78.5 | 80.5 | 82.4 | 84.3 | 86.2 |
| | MACH | .387 | .421 | .436 | .453 | .470 | .489 | .510 | .532 | .555 | .576 |
| | KIAS | 213 | 211 | 210 | 210 | 210 | 209 | 210 | 210 | 210 | 209 |
| | FF/ENG | 1328 | 1286 | 1281 | 1271 | 1265 | 1262 | 1260 | 1262 | 1265 | 1264 |

**Includes APU fuel burn.**

# ENGINE INOP

## MAX CONTINUOUS THRUST

## Long Range Cruise Diversion Fuel and Time

### Table 1 of 3: Ground to Air Miles Conversion

| AIR DISTANCE (NM) | | | | | GROUND DISTANCE (NM) | AIR DISTANCE (NM) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| HEADWIND COMPONENT (KTS) | | | | | | TAILWIND COMPONENT (KTS) | | | | |
| 100 | 80 | 60 | 40 | 20 | | 20 | 40 | 60 | 80 | 100 |
| 300 | 273 | 249 | 230 | 214 | 200 | 190 | 180 | 172 | 164 | 157 |
| 605 | 550 | 502 | 463 | 430 | 400 | 380 | 361 | 344 | 328 | 314 |
| 911 | 828 | 755 | 696 | 645 | 600 | 569 | 540 | 514 | 491 | 470 |
| 1219 | 1107 | 1010 | 929 | 861 | 800 | 759 | 721 | 686 | 655 | 627 |
| 1529 | 1388 | 1264 | 1162 | 1076 | 1000 | 948 | 900 | 857 | 818 | 783 |
| 1840 | 1668 | 1519 | 1396 | 1292 | 1200 | 1137 | 1080 | 1028 | 981 | 939 |
| 2153 | 1951 | 1775 | 1630 | 1508 | 1400 | 1327 | 1259 | 1198 | 1143 | 1094 |
| 2468 | 2235 | 2032 | 1865 | 1724 | 1600 | 1516 | 1439 | 1369 | 1306 | 1250 |
| 2785 | 2520 | 2289 | 2100 | 1940 | 1800 | 1705 | 1618 | 1540 | 1469 | 1406 |
| 3104 | 2806 | 2547 | 2335 | 2157 | 2000 | 1895 | 1798 | 1710 | 1631 | 1561 |

### Table 2 of 3: Reference Fuel and Time Required at Check Point

| AIR DIST (NM) | PRESSURE ALTITUDE (1000 FT) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | | 14 | | 18 | | 22 | | 26 | |
| | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) |
| 200 | 1.2 | 0:43 | 1.1 | 0:41 | 1.0 | 0:39 | 0.9 | 0:38 | 0.8 | 0:37 |
| 400 | 2.4 | 1:25 | 2.3 | 1:20 | 2.1 | 1:16 | 1.9 | 1:12 | 1.8 | 1:10 |
| 600 | 3.7 | 2:06 | 3.4 | 1:59 | 3.2 | 1:53 | 3.0 | 1:47 | 2.8 | 1:44 |
| 800 | 4.9 | 2:48 | 4.6 | 2:39 | 4.3 | 2:30 | 4.0 | 2:22 | 3.8 | 2:17 |
| 1000 | 6.2 | 3:31 | 5.8 | 3:19 | 5.4 | 3:07 | 5.0 | 2:57 | 4.8 | 2:51 |
| 1200 | 7.4 | 4:14 | 6.9 | 4:00 | 6.5 | 3:45 | 6.1 | 3:32 | 5.7 | 3:25 |
| 1400 | 8.6 | 4:57 | 8.0 | 4:40 | 7.5 | 4:23 | 7.1 | 4:08 | 6.7 | 3:59 |
| 1600 | 9.8 | 5:41 | 9.2 | 5:22 | 8.6 | 5:02 | 8.1 | 4:44 | 7.6 | 4:33 |
| 1800 | 11.0 | 6:25 | 10.3 | 6:03 | 9.6 | 5:41 | 9.1 | 5:20 | 8.6 | 5:08 |
| 2000 | 12.1 | 7:10 | 11.4 | 6:45 | 10.7 | 6:20 | 10.0 | 5:57 | 9.5 | 5:42 |

### Table 3 of 3: Fuel Required Adjustment (1000 KG)

| REFERENCE FUEL REQUIRED (1000 KG) | WEIGHT AT CHECK POINT (1000 KG) | | | | |
|---|---|---|---|---|---|
| | 40 | 50 | 60 | 70 | 80 |
| 1 | -0.1 | -0.1 | 0.0 | 0.1 | 0.3 |
| 2 | -0.3 | -0.1 | 0.0 | 0.3 | 0.7 |
| 3 | -0.4 | -0.2 | 0.0 | 0.5 | 1.1 |
| 4 | -0.6 | -0.3 | 0.0 | 0.6 | 1.5 |
| 5 | -0.7 | -0.4 | 0.0 | 0.8 | 1.8 |
| 6 | -0.9 | -0.5 | 0.0 | 0.9 | 2.2 |
| 7 | -1.0 | -0.5 | 0.0 | 1.0 | 2.5 |
| 8 | -1.2 | -0.6 | 0.0 | 1.2 | 2.8 |
| 9 | -1.3 | -0.7 | 0.0 | 1.3 | 3.1 |
| 10 | -1.5 | -0.8 | 0.0 | 1.4 | 3.3 |
| 11 | -1.6 | -0.8 | 0.0 | 1.5 | 3.6 |
| 12 | -1.8 | -0.9 | 0.0 | 1.6 | 3.8 |
| 13 | -1.9 | -1.0 | 0.0 | 1.7 | 4.0 |
| 14 | -2.1 | -1.1 | 0.0 | 1.8 | 4.2 |

**Includes APU fuel burn.**

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Holding

### Flaps Up

| WEIGHT (1000 KG) | | PRESSURE ALTITUDE (FT) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1500 | 5000 | 10000 | 15000 | 20000 | 25000 | 30000 | 35000 |
| 85 | %N1 | 75.8 | 79.2 | 84.0 | 88.9 | | | | |
| | KIAS | 244 | 244 | 246 | 247 | | | | |
| | FF/ENG | 2360 | 2370 | 2400 | 2450 | | | | |
| 80 | %N1 | 73.9 | 77.2 | 82.2 | 86.9 | 93.2 | | | |
| | KIAS | 237 | 237 | 238 | 239 | 242 | | | |
| | FF/ENG | 2230 | 2230 | 2250 | 2280 | 2390 | | | |
| 75 | %N1 | 71.9 | 75.1 | 80.2 | 84.9 | 90.3 | | | |
| | KIAS | 229 | 229 | 230 | 232 | 233 | | | |
| | FF/ENG | 2100 | 2080 | 2100 | 2130 | 2190 | | | |
| 70 | %N1 | 69.8 | 73.0 | 78.0 | 82.8 | 88.0 | | | |
| | KIAS | 220 | 222 | 222 | 224 | 225 | | | |
| | FF/ENG | 1970 | 1950 | 1960 | 1970 | 2010 | | | |
| 65 | %N1 | 67.7 | 70.7 | 75.6 | 80.6 | 85.6 | | | |
| | KIAS | 211 | 214 | 214 | 215 | 216 | | | |
| | FF/ENG | 1830 | 1820 | 1810 | 1830 | 1850 | | | |
| 60 | %N1 | 65.4 | 68.3 | 73.1 | 78.2 | 83.1 | 88.7 | | |
| | KIAS | 204 | 204 | 206 | 206 | 208 | 209 | | |
| | FF/ENG | 1690 | 1690 | 1670 | 1680 | 1700 | 1740 | | |
| 55 | %N1 | 63.0 | 65.9 | 70.4 | 75.5 | 80.6 | 85.7 | | |
| | KIAS | 198 | 198 | 198 | 198 | 199 | 200 | | |
| | FF/ENG | 1570 | 1550 | 1540 | 1540 | 1550 | 1570 | | |
| 50 | %N1 | 60.5 | 63.3 | 67.7 | 72.5 | 77.7 | 82.7 | 89.2 | |
| | KIAS | 191 | 191 | 191 | 191 | 191 | 191 | 192 | |
| | FF/ENG | 1450 | 1430 | 1420 | 1400 | 1410 | 1410 | 1470 | |
| 45 | %N1 | 57.8 | 60.5 | 64.9 | 69.6 | 74.7 | 79.7 | 85.0 | |
| | KIAS | 185 | 185 | 185 | 185 | 185 | 185 | 185 | |
| | FF/ENG | 1330 | 1320 | 1300 | 1280 | 1270 | 1270 | 1290 | |
| 40 | %N1 | 55.0 | 57.5 | 61.9 | 66.4 | 71.3 | 76.6 | 81.6 | 88.4 |
| | KIAS | 178 | 178 | 178 | 178 | 178 | 178 | 178 | 178 |
| | FF/ENG | 1220 | 1210 | 1190 | 1170 | 1160 | 1140 | 1150 | 1200 |

**This table includes 5% additional fuel for holding in a racetrack pattern.**
**Includes APU fuel burn.**

# ENGINE INOP

## ADVISORY INFORMATION

## Gear Down Landing Rate of Climb Available

### Flaps 15

| TAT (°C) | RATE OF CLIMB (FT/MIN) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PRESSURE ALTITUDE (FT) | | | | | | | | |
| | -2000 | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14500 |
| 54 | -80 | -150 | | | | | | | |
| 52 | -60 | -120 | | | | | | | |
| 50 | -30 | -100 | -230 | | | | | | |
| 48 | 0 | -70 | -200 | | | | | | |
| 46 | 30 | -40 | -160 | -310 | | | | | |
| 44 | 60 | -10 | -130 | -270 | | | | | |
| 42 | 90 | 20 | -100 | -230 | -390 | | | | |
| 40 | 120 | 50 | -70 | -200 | -350 | | | | |
| 38 | 150 | 80 | -40 | -170 | -300 | -480 | | | |
| 36 | 160 | 110 | -10 | -140 | -260 | -460 | | | |
| 34 | 160 | 140 | 10 | -110 | -230 | -440 | -570 | | |
| 32 | 160 | 150 | 30 | -90 | -210 | -420 | -550 | | |
| 30 | 160 | 150 | 50 | -70 | -190 | -390 | -530 | -690 | |
| 20 | 160 | 150 | 50 | -50 | -150 | -260 | -410 | -580 | -770 |
| 10 | 170 | 150 | 50 | -50 | -150 | -250 | -340 | -470 | -650 |
| 0 | 160 | 160 | 50 | -60 | -160 | -260 | -350 | -470 | -620 |
| -20 | 170 | 160 | 50 | -60 | -160 | -260 | -360 | -480 | -640 |
| -40 | 170 | 160 | 50 | -60 | -170 | -280 | -380 | -500 | -660 |
| -50 | 170 | 160 | 50 | -60 | -170 | -280 | -380 | -520 | -680 |
| -54 | 170 | 160 | 50 | -70 | -180 | -280 | -390 | -520 | -680 |

**Rate of climb capability shown is valid for 65000 kg, gear down at VREF15+5.**
**Decrease rate of climb 100 ft/min per 5000 kg greater than 65000 kg.**
**Increase rate of climb 150 ft/min per 5000 kg less than 65000 kg.**

# ENGINE INOP

## ADVISORY INFORMATION

### Gear Down Landing Rate of Climb Available

**Flaps 30**

| TAT (°C) | RATE OF CLIMB (FT/MIN) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | PRESSURE ALTITUDE (FT) | | | | | | | | |
| | -2000 | 0 | 2000 | 4000 | 6000 | 8000 | 10000 | 12000 | 14500 |
| 54 | -340 | -410 | | | | | | | |
| 52 | -320 | -390 | | | | | | | |
| 50 | -290 | -360 | -500 | | | | | | |
| 48 | -260 | -340 | -470 | | | | | | |
| 46 | -230 | -310 | -440 | -590 | | | | | |
| 44 | -210 | -280 | -410 | -550 | | | | | |
| 42 | -180 | -260 | -380 | -510 | -670 | | | | |
| 40 | -150 | -230 | -350 | -480 | -630 | | | | |
| 38 | -120 | -200 | -320 | -450 | -590 | -770 | | | |
| 36 | -110 | -170 | -300 | -420 | -550 | -750 | | | |
| 34 | -110 | -140 | -270 | -400 | -520 | -730 | -860 | | |
| 32 | -110 | -130 | -250 | -370 | -500 | -700 | -840 | | |
| 30 | -110 | -130 | -240 | -360 | -480 | -680 | -820 | -980 | |
| 20 | -120 | -130 | -240 | -340 | -440 | -560 | -710 | -880 | -1080 |
| 10 | -120 | -140 | -240 | -350 | -450 | -550 | -650 | -770 | -970 |
| 0 | -130 | -140 | -250 | -360 | -460 | -560 | -660 | -780 | -940 |
| -20 | -130 | -150 | -260 | -370 | -480 | -580 | -680 | -810 | -970 |
| -40 | -140 | -160 | -270 | -390 | -500 | -610 | -710 | -840 | -1010 |
| -50 | -150 | -160 | -280 | -400 | -510 | -620 | -720 | -860 | -1030 |
| -54 | -150 | -170 | -280 | -400 | -520 | -630 | -730 | -870 | -1040 |

**Rate of climb capability shown is valid for 65000 kg, gear down at VREF30+5.**
**Decrease rate of climb 100 ft/min per 5000 kg greater than 65000 kg.**
**Increase rate of climb 160 ft/min per 5000 kg less than 65000 kg.**

# ALTERNATE MODE EEC

## Alternate Mode EEC Limit Weight

| PERFORMANCE LIMIT | NORMAL MODE PERFORMANCE LIMIT WEIGHT (1000 KG) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 |
| FIELD | 39.8 | 44.8 | 49.8 | 54.8 | 59.8 | 64.8 | 69.8 | 74.9 | 79.9 | 84.9 | 89.9 | 94.9 |
| CLIMB | 39.9 | 44.9 | 49.9 | 54.9 | 59.9 | 64.9 | 69.9 | 75.0 | 80.0 | 85.0 | 90.0 | 95.0 |
| OBSTACLE | 39.6 | 44.6 | 49.6 | 54.7 | 59.7 | 64.7 | 69.8 | 74.8 | 79.8 | 84.9 | 89.9 | 94.9 |
| BRAKE ENERGY | 39.1 | 44.0 | 49.0 | 54.0 | 59.0 | 64.0 | 69.0 | 74.0 | 79.0 | 84.0 | 89.0 | 94.0 |

**No adjustments to the takeoff speeds for the reduced weight are necessary.**

# ALTERNATE MODE EEC

## Alternate Mode EEC Max Takeoff %N1

### Based on engine bleeds for packs on and anti-ice off

| AIRPORT | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OAT (°C) | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| 60 | 85.6 | 86.1 | 86.6 | 86.7 | 86.2 | 85.7 | 85.2 | 84.8 | 84.3 | 83.9 | 83.5 | 83.0 | 82.5 | 81.6 | 80.6 | 79.5 | 78.6 | 78.2 |
| 55 | 86.9 | 87.3 | 87.7 | 87.8 | 87.4 | 86.9 | 86.4 | 85.9 | 85.5 | 85.1 | 84.6 | 84.2 | 83.7 | 82.7 | 81.8 | 80.7 | 79.8 | 79.4 |
| 50 | 88.0 | 88.6 | 89.2 | 88.8 | 88.4 | 88.0 | 87.5 | 87.1 | 86.6 | 86.2 | 85.8 | 85.3 | 84.8 | 83.9 | 83.0 | 81.9 | 81.0 | 80.6 |
| 45 | 88.9 | 89.5 | 90.0 | 89.9 | 89.5 | 88.9 | 88.6 | 88.2 | 87.7 | 87.3 | 86.9 | 86.4 | 86.0 | 85.0 | 84.1 | 83.0 | 82.2 | 81.7 |
| 40 | 89.9 | 90.4 | 91.0 | 90.9 | 90.9 | 90.6 | 89.9 | 89.1 | 88.7 | 88.3 | 88.0 | 87.5 | 87.0 | 86.1 | 85.2 | 84.1 | 83.3 | 82.8 |
| 35 | 90.7 | 91.3 | 91.9 | 91.9 | 91.8 | 91.7 | 91.6 | 91.3 | 90.7 | 89.7 | 88.9 | 88.5 | 88.1 | 87.2 | 86.3 | 85.3 | 84.4 | 84.0 |
| 30 | 90.2 | 91.5 | 92.8 | 92.6 | 92.6 | 92.6 | 92.5 | 92.4 | 92.4 | 92.2 | 89.8 | 89.5 | 89.1 | 88.2 | 87.4 | 86.4 | 85.6 | 85.2 |
| 25 | 89.4 | 90.7 | 92.0 | 92.3 | 92.7 | 92.8 | 92.9 | 93.2 | 93.0 | 93.0 | 90.8 | 90.4 | 90.0 | 89.2 | 88.4 | 87.6 | 86.7 | 86.3 |
| 20 | 88.6 | 89.9 | 91.2 | 91.5 | 91.8 | 92.1 | 92.5 | 92.8 | 93.0 | 93.1 | 91.7 | 91.3 | 91.0 | 90.2 | 89.5 | 88.7 | 87.9 | 87.5 |
| 15 | 87.8 | 89.1 | 90.4 | 90.7 | 91.0 | 91.3 | 91.6 | 91.9 | 92.3 | 92.6 | 92.7 | 92.4 | 92.0 | 91.2 | 90.5 | 89.8 | 89.0 | 88.7 |
| 10 | 87.0 | 88.3 | 89.6 | 89.9 | 90.2 | 90.5 | 90.8 | 91.1 | 91.5 | 91.8 | 92.2 | 92.6 | 93.0 | 92.2 | 91.6 | 90.9 | 90.2 | 89.9 |
| 5 | 86.2 | 87.5 | 88.8 | 89.1 | 89.4 | 89.7 | 90.0 | 90.3 | 90.7 | 91.0 | 91.4 | 91.8 | 92.2 | 92.2 | 92.2 | 92.0 | 91.4 | 91.1 |
| 0 | 85.4 | 86.7 | 87.9 | 88.3 | 88.6 | 88.9 | 89.2 | 89.5 | 89.8 | 90.2 | 90.6 | 91.0 | 91.4 | 91.4 | 91.5 | 91.5 | 91.5 | 91.6 |
| -5 | 84.6 | 85.8 | 87.1 | 87.4 | 87.8 | 88.0 | 88.3 | 88.7 | 89.0 | 89.4 | 89.8 | 90.2 | 90.5 | 90.6 | 90.7 | 90.7 | 90.7 | 90.8 |
| -10 | 83.8 | 85.0 | 86.3 | 86.6 | 86.9 | 87.2 | 87.5 | 87.8 | 88.1 | 88.5 | 88.9 | 89.3 | 89.7 | 89.8 | 89.8 | 89.9 | 89.9 | 89.9 |
| -15 | 83.0 | 84.2 | 85.5 | 85.8 | 86.1 | 86.3 | 86.6 | 86.9 | 87.3 | 87.7 | 88.1 | 88.5 | 88.9 | 89.0 | 89.0 | 89.1 | 89.1 | 89.1 |
| -20 | 82.2 | 83.4 | 84.6 | 84.9 | 85.2 | 85.5 | 85.7 | 86.1 | 86.4 | 86.8 | 87.3 | 87.7 | 88.1 | 88.1 | 88.2 | 88.2 | 88.3 | 88.3 |
| -25 | 81.4 | 82.6 | 83.8 | 84.1 | 84.4 | 84.7 | 84.9 | 85.2 | 85.6 | 86.0 | 86.4 | 86.8 | 87.2 | 87.3 | 87.4 | 87.4 | 87.4 | 87.5 |
| -30 | 80.5 | 81.8 | 83.0 | 83.3 | 83.6 | 83.8 | 84.1 | 84.4 | 84.7 | 85.1 | 85.5 | 86.0 | 86.4 | 86.5 | 86.5 | 86.6 | 86.6 | 86.6 |
| -35 | 79.7 | 80.9 | 82.1 | 82.4 | 82.7 | 83.0 | 83.2 | 83.5 | 83.9 | 84.3 | 84.7 | 85.1 | 85.5 | 85.6 | 85.6 | 85.7 | 85.8 | 85.8 |
| -40 | 78.9 | 80.1 | 81.2 | 81.6 | 81.8 | 82.1 | 82.4 | 82.7 | 83.0 | 83.4 | 83.8 | 84.2 | 84.6 | 84.7 | 84.7 | 84.8 | 84.9 | 84.9 |
| -45 | 78.0 | 79.2 | 80.4 | 80.7 | 81.0 | 81.2 | 81.5 | 81.8 | 82.1 | 82.5 | 82.9 | 83.3 | 83.7 | 83.8 | 83.8 | 83.9 | 84.0 | 84.0 |
| -50 | 77.2 | 78.3 | 79.5 | 79.8 | 80.1 | 80.3 | 80.6 | 80.9 | 81.3 | 81.6 | 82.0 | 82.4 | 82.7 | 82.8 | 82.9 | 83.0 | 83.1 | 83.2 |

## %N1 Adjustments for Engine Bleeds

| BLEED | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CONFIGURATION | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| PACKS OFF | 0.5 | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.7 | 1.8 |
| ENGINE ANTI-ICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.2 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 |

# ALTERNATE MODE EEC

## Alternate Mode EEC Max Climb %N1

### Based on engine bleed for packs on and anti-ice off

| TAT (°C) | PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 33 | 35 | 37 | 39 | 41 |
| | 280 | 280 | 280 | 280 | 280 | 280 | 280 | 0.78 | 0.78 | 0.78 | 0.78 | 0.78 |
| 60 | 80.8 | 81.3 | 84.0 | 86.0 | 88.3 | 90.3 | 93.1 | 94.6 | 95.7 | 96.0 | 95.4 | 94.7 |
| 55 | 81.6 | 81.6 | 83.3 | 85.3 | 87.7 | 89.6 | 92.4 | 93.9 | 94.9 | 95.2 | 94.6 | 94.0 |
| 50 | 82.6 | 82.5 | 82.8 | 84.7 | 87.0 | 88.9 | 91.7 | 93.1 | 94.2 | 94.5 | 93.9 | 93.3 |
| 45 | 83.6 | 83.4 | 83.6 | 84.0 | 86.3 | 88.2 | 90.9 | 92.4 | 93.5 | 93.8 | 93.2 | 92.6 |
| 40 | 84.5 | 84.5 | 84.5 | 84.3 | 85.6 | 87.5 | 90.2 | 91.7 | 92.7 | 93.0 | 92.4 | 91.8 |
| 35 | 85.2 | 85.5 | 85.5 | 85.2 | 85.2 | 86.8 | 89.5 | 91.0 | 92.0 | 92.3 | 91.7 | 91.1 |
| 30 | 84.5 | 86.5 | 86.5 | 86.2 | 85.7 | 86.1 | 88.8 | 90.2 | 91.2 | 91.5 | 91.0 | 90.4 |
| 25 | 83.8 | 86.6 | 87.5 | 87.1 | 86.6 | 87.7 | 88.0 | 89.5 | 90.5 | 90.8 | 90.2 | 89.6 |
| 20 | 83.1 | 85.8 | 88.4 | 88.0 | 87.5 | 88.7 | 89.2 | 89.1 | 89.7 | 90.0 | 89.4 | 88.9 |
| 15 | 82.3 | 85.1 | 87.8 | 89.0 | 88.5 | 89.8 | 90.2 | 90.5 | 89.6 | 89.2 | 88.7 | 88.1 |
| 10 | 81.6 | 84.3 | 87.1 | 89.4 | 89.5 | 90.9 | 91.1 | 91.3 | 91.0 | 90.0 | 89.5 | 88.9 |
| 5 | 80.8 | 83.6 | 86.3 | 88.7 | 90.6 | 91.9 | 91.9 | 92.0 | 91.8 | 91.1 | 90.7 | 90.1 |
| 0 | 80.1 | 82.8 | 85.5 | 87.9 | 89.9 | 92.9 | 92.6 | 92.6 | 92.3 | 91.8 | 91.3 | 90.6 |
| -5 | 79.4 | 82.0 | 84.7 | 87.1 | 89.2 | 92.7 | 93.4 | 93.4 | 93.1 | 92.4 | 91.9 | 91.2 |
| -10 | 78.6 | 81.2 | 84.0 | 86.4 | 88.3 | 91.9 | 93.6 | 94.3 | 94.0 | 93.2 | 92.6 | 91.8 |
| -15 | 77.9 | 80.5 | 83.2 | 85.6 | 87.5 | 91.1 | 92.8 | 94.1 | 94.8 | 94.1 | 93.5 | 92.7 |
| -20 | 77.1 | 79.7 | 82.4 | 84.8 | 86.7 | 90.2 | 91.9 | 93.2 | 94.4 | 94.4 | 93.9 | 93.1 |
| -25 | 76.3 | 78.9 | 81.5 | 84.0 | 85.8 | 89.4 | 91.0 | 92.3 | 93.4 | 93.5 | 93.0 | 92.2 |
| -30 | 75.6 | 78.1 | 80.7 | 83.2 | 85.0 | 88.5 | 90.1 | 91.4 | 92.5 | 92.6 | 92.1 | 91.3 |
| -35 | 74.8 | 77.3 | 79.9 | 82.4 | 84.1 | 87.6 | 89.3 | 90.5 | 91.6 | 91.7 | 91.2 | 90.4 |
| -40 | 74.0 | 76.5 | 79.0 | 81.5 | 83.3 | 86.7 | 88.4 | 89.6 | 90.7 | 90.7 | 90.2 | 89.5 |

### %N1 Adjustments for Engine Bleeds

| BLEED CONFIGURATION | PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 33 | 35 | 37 | 39 | 41 |
| ENGINE ANTI-ICE | 0.0 | 0.0 | -0.6 | -0.7 | -0.8 | -0.9 | -1.2 | -1.5 | -1.8 | -2.0 | -2.1 | -2.1 |
| ENGINE & WING ANTI-ICE | 0.0 | 0.0 | -1.5 | -1.7 | -2.0 | -2.1 | -2.6 | -3.2 | -4.0 | -4.2 | -4.2 | -4.2 |

# ALTERNATE MODE EEC

## Alternate Mode EEC Go-Around %N1

### Based on engine bleed for packs on and anti-ice off

| REPORTED OAT (°C) | TAT (°C) | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| 59 | 60 | 85.8 | 86.3 | 86.8 | 86.9 | 86.4 | 86.0 | 85.5 | 85.0 | 84.6 | 84.2 | 83.8 | 83.3 | 82.9 | 81.9 | 81.0 | 79.9 | 79.0 | 78.6 |
| 54 | 55 | 87.2 | 87.6 | 88.0 | 88.0 | 87.6 | 87.1 | 86.7 | 86.2 | 85.8 | 85.3 | 84.9 | 84.5 | 84.0 | 83.1 | 82.2 | 81.1 | 80.2 | 79.8 |
| 49 | 50 | 88.1 | 88.7 | 89.3 | 89.0 | 88.6 | 88.2 | 87.8 | 87.3 | 86.9 | 86.5 | 86.1 | 85.6 | 85.1 | 84.2 | 83.3 | 82.3 | 81.4 | 81.0 |
| 44 | 45 | 89.1 | 89.7 | 90.2 | 90.1 | 89.8 | 89.1 | 88.8 | 88.4 | 88.0 | 87.5 | 87.1 | 86.7 | 86.2 | 85.3 | 84.4 | 83.4 | 82.5 | 82.1 |
| 39 | 40 | 90.0 | 90.6 | 91.2 | 91.1 | 91.0 | 90.9 | 90.4 | 89.6 | 89.0 | 88.6 | 88.2 | 87.8 | 87.3 | 86.4 | 85.5 | 84.5 | 83.6 | 83.2 |
| 34 | 35 | 90.8 | 91.5 | 92.1 | 92.1 | 92.0 | 91.9 | 91.8 | 91.6 | 91.2 | 90.3 | 89.1 | 88.8 | 88.3 | 87.5 | 86.6 | 85.6 | 84.8 | 84.4 |
| 29 | 30 | 90.1 | 91.4 | 92.7 | 92.7 | 92.7 | 92.7 | 92.7 | 92.6 | 92.6 | 92.5 | 90.0 | 89.7 | 89.3 | 88.5 | 87.7 | 86.8 | 85.9 | 85.5 |
| 24 | 25 | 89.3 | 90.6 | 91.9 | 92.2 | 92.5 | 92.8 | 92.9 | 93.1 | 93.2 | 93.1 | 91.0 | 90.6 | 90.2 | 89.5 | 88.7 | 87.9 | 87.1 | 86.7 |
| 19 | 20 | 88.5 | 89.8 | 91.0 | 91.4 | 91.7 | 92.0 | 92.3 | 92.6 | 92.8 | 93.0 | 91.9 | 91.6 | 91.2 | 90.5 | 89.7 | 89.0 | 88.2 | 87.8 |
| 14 | 15 | 87.7 | 89.0 | 90.2 | 90.5 | 90.8 | 91.2 | 91.5 | 91.8 | 92.1 | 92.4 | 92.8 | 92.6 | 92.3 | 91.5 | 90.8 | 90.1 | 89.4 | 89.0 |
| 9 | 10 | 86.9 | 88.2 | 89.4 | 89.7 | 90.0 | 90.3 | 90.7 | 91.0 | 91.3 | 91.6 | 92.0 | 92.4 | 92.8 | 92.5 | 91.9 | 91.3 | 90.6 | 90.2 |
| 4 | 5 | 86.1 | 87.4 | 88.6 | 88.9 | 89.2 | 89.5 | 89.9 | 90.2 | 90.5 | 90.8 | 91.2 | 91.6 | 92.0 | 92.0 | 92.0 | 92.1 | 91.7 | 91.3 |
| -1 | 0 | 85.3 | 86.5 | 87.8 | 88.1 | 88.5 | 88.7 | 89.0 | 89.3 | 89.7 | 90.0 | 90.4 | 90.8 | 91.2 | 91.2 | 91.3 | 91.3 | 91.3 | 91.3 |
| -6 | -5 | 84.5 | 85.7 | 87.0 | 87.3 | 87.6 | 87.9 | 88.2 | 88.5 | 88.8 | 89.2 | 89.6 | 90.0 | 90.4 | 90.4 | 90.5 | 90.5 | 90.5 | 90.5 |
| -11 | -10 | 83.7 | 84.9 | 86.2 | 86.5 | 86.8 | 87.0 | 87.3 | 87.6 | 88.0 | 88.3 | 88.8 | 89.2 | 89.6 | 89.6 | 89.7 | 89.7 | 89.7 | 89.7 |
| -16 | -15 | 82.9 | 84.1 | 85.3 | 85.6 | 85.9 | 86.2 | 86.4 | 86.8 | 87.1 | 87.5 | 87.9 | 88.3 | 88.7 | 88.8 | 88.8 | 88.9 | 88.9 | 88.9 |
| -21 | -20 | 82.1 | 83.3 | 84.5 | 84.8 | 85.1 | 85.4 | 85.6 | 85.9 | 86.3 | 86.7 | 87.1 | 87.5 | 87.9 | 88.0 | 88.0 | 88.0 | 88.1 | 88.1 |
| -26 | -25 | 81.3 | 82.5 | 83.7 | 84.0 | 84.3 | 84.5 | 84.8 | 85.1 | 85.4 | 85.8 | 86.2 | 86.7 | 87.0 | 87.1 | 87.2 | 87.2 | 87.2 | 87.3 |
| -31 | -30 | 80.4 | 81.6 | 82.8 | 83.1 | 83.4 | 83.7 | 83.9 | 84.2 | 84.6 | 85.0 | 85.4 | 85.8 | 86.2 | 86.3 | 86.3 | 86.4 | 86.4 | 86.4 |
| -36 | -35 | 79.6 | 80.8 | 82.0 | 82.3 | 82.6 | 82.8 | 83.1 | 83.4 | 83.7 | 84.1 | 84.5 | 84.9 | 85.3 | 85.4 | 85.4 | 85.5 | 85.6 | 85.6 |
| -41 | -40 | 78.8 | 80.0 | 81.1 | 81.4 | 81.7 | 82.0 | 82.2 | 82.5 | 82.9 | 83.2 | 83.6 | 84.0 | 84.4 | 84.5 | 84.6 | 84.6 | 84.7 | 84.7 |
| -46 | -45 | 77.9 | 79.1 | 80.3 | 80.6 | 80.9 | 81.1 | 81.4 | 81.7 | 82.0 | 82.4 | 82.7 | 83.1 | 83.5 | 83.6 | 83.6 | 83.7 | 83.8 | 83.8 |
| -51 | -50 | 77.1 | 78.2 | 79.4 | 79.7 | 80.0 | 80.2 | 80.5 | 80.8 | 81.1 | 81.5 | 81.8 | 82.2 | 82.6 | 82.7 | 82.7 | 82.8 | 82.9 | 82.9 |

## %N1 Adjustment forEngine Bleeds

| BLEED CONFIGURATION | AIRPORT PRESSURE ALTITUDE (1000 FT) | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14.5 |
| PACKS OFF | 0.5 | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 | 1.1 | 1.2 | 1.4 | 1.6 | 1.7 | 1.8 |
| A/C HIGH | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| ENGINE & WING ANTI-ICE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.5 | -1.4 | -1.5 | -1.4 | -1.4 | -1.5 | -1.5 |
| ENGINE & WING ANTI-ICE* | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -0.8 | -2.2 | -2.3 | -2.3 | -2.3 | -2.4 | -2.5 |

***Single Bleed Source**

# ALTERNATE MODE EEC

## ENGINE INOP

### Alternate Mode EEC Initial Max Continuous %N1

**Based on .79M, A/C high and anti-ice off**

| TAT (°C) | PRESSURE ALTITUDE (1000 FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 |
| 20 | 88.8 | 88.5 | 88.1 | 88.7 | 88.0 | 88.1 | 88.3 | 87.7 | 87.1 |
| 15 | 89.9 | 89.5 | 89.1 | 89.6 | 89.4 | 88.4 | 87.6 | 87.0 | 86.4 |
| 10 | 91.0 | 90.5 | 90.1 | 90.5 | 90.3 | 89.9 | 88.7 | 88.2 | 87.6 |
| 5 | 91.4 | 91.4 | 91.0 | 91.3 | 91.2 | 90.8 | 90.1 | 89.6 | 89.0 |
| 0 | 90.7 | 91.6 | 91.8 | 92.2 | 92.0 | 91.6 | 90.9 | 90.2 | 89.4 |
| -5 | 89.8 | 90.7 | 91.7 | 92.8 | 92.6 | 92.3 | 91.5 | 90.8 | 89.9 |
| -10 | 88.8 | 89.7 | 90.8 | 92.4 | 93.3 | 93.1 | 92.3 | 91.5 | 90.6 |
| -15 | 88.0 | 88.9 | 89.9 | 91.6 | 92.9 | 93.9 | 93.1 | 92.4 | 91.5 |
| -20 | 87.2 | 88.1 | 89.1 | 90.7 | 92.0 | 93.3 | 93.2 | 92.6 | 91.7 |
| -25 | 86.4 | 87.3 | 88.3 | 89.9 | 91.2 | 92.3 | 92.3 | 91.6 | 90.7 |
| -30 | 85.6 | 86.4 | 87.4 | 89.0 | 90.3 | 91.4 | 91.4 | 90.7 | 89.8 |
| -35 | 84.7 | 85.6 | 86.5 | 88.1 | 89.4 | 90.5 | 90.4 | 89.8 | 88.9 |
| -40 | 83.9 | 84.7 | 85.7 | 87.3 | 88.5 | 89.6 | 89.5 | 88.8 | 88.0 |

### %N1 Adjustments for Engine Bleeds

| BLEED CONFIGURATION | PRESSURE ALTITUDE (1000 FT) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 25 | 27 | 29 | 31 | 33 | 35 | 37 | 39 | 41 |
| ENGINE ANTI-ICE | -0.9 | -1.0 | -1.1 | -1.2 | -1.5 | -1.8 | -2.0 | -2.1 | -2.1 |
| ENGINE & WING ANTI-ICE | -3.3 | -3.5 | -3.8 | -4.1 | -4.9 | -6.1 | -6.3 | -6.4 | -6.4 |

# ALTERNATE MODE EEC

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Alternate Mode EEC Max Continuous %N1

**Based on A/C high and anti-ice off**

**37000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -55 | -50 | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 |
| 160 | .51 | 87.9 | 88.8 | 89.8 | 90.8 | 91.8 | 91.9 | 91.9 | 91.9 | 91.5 | 90.5 | 89.5 | 89.9 |
| 200 | .63 | 87.6 | 88.6 | 89.6 | 90.6 | 91.6 | 92.5 | 92.8 | 92.8 | 92.4 | 91.6 | 90.6 | 89.7 |
| 240 | .74 | 87.1 | 88.1 | 89.0 | 90.0 | 91.0 | 91.9 | 92.9 | 93.5 | 93.1 | 92.1 | 91.3 | 90.7 |
| 280 | .86 | 85.3 | 86.2 | 87.2 | 88.2 | 89.1 | 90.0 | 91.0 | 91.9 | 92.8 | 92.6 | 91.8 | 91.2 |

**35000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -55 | -50 | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 |
| 160 | .49 | 87.9 | 88.9 | 89.9 | 90.9 | 91.8 | 92.1 | 92.1 | 92.1 | 92.1 | 91.4 | 90.2 | 90.0 |
| 200 | .60 | 87.1 | 88.1 | 89.0 | 90.0 | 90.9 | 91.9 | 92.3 | 92.3 | 92.3 | 92.3 | 91.4 | 90.4 |
| 240 | .71 | 87.1 | 88.1 | 89.1 | 90.0 | 90.9 | 91.9 | 92.8 | 93.5 | 93.4 | 92.8 | 92.0 | 91.3 |
| 280 | .82 | 86.0 | 87.0 | 87.9 | 88.9 | 89.8 | 90.7 | 91.6 | 92.5 | 93.4 | 93.2 | 92.4 | 91.7 |

**33000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -50 | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 |
| 160 | .47 | 88.9 | 89.9 | 90.8 | 91.8 | 92.6 | 92.6 | 92.6 | 92.2 | 91.6 | 90.8 | 89.5 | 89.9 |
| 200 | .58 | 88.5 | 89.4 | 90.4 | 91.3 | 92.2 | 93.1 | 93.1 | 92.6 | 92.1 | 91.6 | 90.9 | 89.5 |
| 240 | .68 | 87.8 | 88.8 | 89.7 | 90.6 | 91.5 | 92.4 | 93.3 | 93.4 | 92.8 | 92.2 | 91.6 | 90.6 |
| 280 | .79 | 86.7 | 87.6 | 88.5 | 89.4 | 90.3 | 91.2 | 92.1 | 92.9 | 93.3 | 92.6 | 92.0 | 91.2 |
| 320 | .89 | 85.3 | 86.3 | 87.2 | 88.0 | 88.9 | 89.8 | 90.6 | 91.5 | 92.3 | 93.3 | 93.1 | 92.3 |

**31000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -50 | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 |
| 160 | .45 | 88.7 | 89.7 | 90.6 | 91.5 | 92.4 | 93.0 | 92.9 | 92.5 | 91.7 | 90.9 | 90.0 | 89.0 |
| 200 | .55 | 88.6 | 89.5 | 90.4 | 91.3 | 92.2 | 93.1 | 93.6 | 93.2 | 92.3 | 91.6 | 91.0 | 89.8 |
| 240 | .66 | 87.7 | 88.6 | 89.5 | 90.4 | 91.3 | 92.2 | 93.1 | 93.7 | 93.1 | 92.2 | 91.6 | 90.7 |
| 280 | .76 | 86.1 | 87.0 | 87.9 | 88.8 | 89.7 | 90.5 | 91.4 | 92.2 | 93.1 | 92.7 | 92.1 | 91.2 |
| 320 | .85 | 84.1 | 85.0 | 85.9 | 86.8 | 87.6 | 88.5 | 89.3 | 90.1 | 91.0 | 91.9 | 92.4 | 91.7 |

**29000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 |
| 160 | .43 | 89.0 | 89.9 | 90.8 | 91.8 | 92.7 | 92.9 | 92.3 | 91.3 | 90.5 | 89.8 | 88.2 | 87.9 |
| 200 | .53 | 88.7 | 89.6 | 90.5 | 91.4 | 92.3 | 93.2 | 93.1 | 92.2 | 91.3 | 90.5 | 89.4 | 87.8 |
| 240 | .63 | 88.0 | 88.9 | 89.8 | 90.7 | 91.6 | 92.5 | 93.3 | 92.9 | 92.0 | 91.1 | 90.1 | 89.0 |
| 280 | .73 | 86.1 | 87.0 | 87.9 | 88.8 | 89.6 | 90.5 | 91.4 | 92.2 | 92.4 | 91.6 | 90.7 | 89.7 |
| 320 | .82 | 84.0 | 84.9 | 85.8 | 86.6 | 87.5 | 88.3 | 89.2 | 90.0 | 90.9 | 91.8 | 91.1 | 90.3 |
| 360 | .91 | 83.5 | 84.4 | 85.3 | 86.2 | 87.0 | 87.9 | 88.7 | 89.5 | 90.4 | 91.3 | 92.0 | 92.0 |

# ALTERNATE MODE EEC

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Max Continuous %N1

#### %N1 Adjustments for Engine Bleeds

| BLEED CONFIGURATION | PRESSURE ALTITUDE (1000 FT) | | | | |
|---|---|---|---|---|---|
| | 37 | 35 | 33 | 31 | 29 |
| ENGINE ANTI-ICE | -2.0 | -1.8 | -1.5 | -1.2 | -1.1 |
| ENGINE & WING ANTI-ICE | -6.1 | -6.0 | -4.8 | -4.0 | -3.7 |

# ALTERNATE MODE EEC

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Max Continuous %N1

**Based on A/C high and anti-ice off**

**27000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -45 | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 |
| 160 | .41 | 89.0 | 90.0 | 90.9 | 91.8 | 92.7 | 93.5 | 93.1 | 91.8 | 90.9 | 90.3 | 89.1 | 87.1 |
| 200 | .51 | 88.2 | 89.2 | 90.1 | 91.0 | 91.8 | 92.7 | 93.3 | 92.5 | 91.7 | 91.0 | 89.8 | 88.6 |
| 240 | .60 | 87.4 | 88.3 | 89.2 | 90.1 | 91.0 | 91.9 | 92.7 | 93.4 | 92.4 | 91.6 | 90.6 | 89.5 |
| 280 | .70 | 85.7 | 86.6 | 87.5 | 88.4 | 89.2 | 90.1 | 90.9 | 91.7 | 92.7 | 92.1 | 91.1 | 90.0 |
| 320 | .79 | 83.8 | 84.7 | 85.5 | 86.4 | 87.2 | 88.1 | 88.9 | 89.7 | 90.7 | 91.6 | 91.4 | 90.5 |
| 360 | .88 | 82.6 | 83.5 | 84.4 | 85.2 | 86.1 | 86.9 | 87.7 | 88.5 | 89.5 | 90.4 | 91.1 | 91.6 |

**25000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 |
| 160 | .39 | 90.1 | 91.0 | 91.9 | 92.8 | 93.7 | 93.7 | 92.4 | 91.4 | 90.7 | 89.7 | 88.1 | 86.9 |
| 200 | .49 | 89.0 | 89.9 | 90.8 | 91.6 | 92.5 | 93.4 | 93.1 | 92.1 | 91.3 | 90.3 | 89.1 | 87.5 |
| 240 | .58 | 87.7 | 88.6 | 89.4 | 90.3 | 91.2 | 92.0 | 92.9 | 92.8 | 91.9 | 90.9 | 89.8 | 88.6 |
| 280 | .67 | 86.2 | 87.0 | 87.9 | 88.8 | 89.6 | 90.5 | 91.3 | 92.2 | 92.4 | 91.5 | 90.4 | 89.2 |
| 320 | .76 | 84.4 | 85.3 | 86.1 | 87.0 | 87.8 | 88.6 | 89.4 | 90.4 | 91.3 | 91.8 | 90.8 | 89.7 |
| 360 | .85 | 82.6 | 83.4 | 84.3 | 85.1 | 85.9 | 86.7 | 87.5 | 88.4 | 89.3 | 90.0 | 90.8 | 90.2 |

**24000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -40 | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 |
| 160 | .38 | 89.4 | 90.3 | 91.3 | 92.2 | 93.0 | 93.9 | 92.7 | 91.7 | 90.9 | 89.9 | 88.7 | 86.9 |
| 200 | .48 | 88.9 | 89.8 | 90.7 | 91.6 | 92.5 | 93.4 | 93.8 | 92.8 | 91.8 | 90.9 | 89.8 | 88.6 |
| 240 | .57 | 88.1 | 89.0 | 89.9 | 90.8 | 91.7 | 92.5 | 93.4 | 93.7 | 92.8 | 91.8 | 90.8 | 89.7 |
| 280 | .66 | 86.7 | 87.6 | 88.5 | 89.4 | 90.2 | 91.1 | 91.9 | 92.7 | 93.3 | 92.4 | 91.4 | 90.3 |
| 320 | .75 | 85.0 | 85.9 | 86.8 | 87.7 | 88.5 | 89.3 | 90.2 | 91.0 | 91.8 | 92.6 | 91.8 | 90.8 |
| 360 | .83 | 83.2 | 84.1 | 85.0 | 85.8 | 86.6 | 87.5 | 88.3 | 89.1 | 89.9 | 90.6 | 91.4 | 91.3 |

**22000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 |
| 160 | .37 | 88.2 | 89.1 | 89.9 | 90.8 | 91.7 | 92.0 | 91.2 | 90.3 | 89.4 | 88.3 | 87.2 | 86.5 |
| 200 | .46 | 87.9 | 88.8 | 89.7 | 90.6 | 91.4 | 92.3 | 92.2 | 91.4 | 90.4 | 89.3 | 88.3 | 87.1 |
| 240 | .55 | 88.9 | 89.8 | 90.7 | 91.6 | 92.4 | 93.3 | 94.1 | 93.8 | 92.9 | 92.0 | 91.0 | 89.9 |
| 280 | .63 | 87.7 | 88.6 | 89.5 | 90.4 | 91.2 | 92.1 | 92.9 | 93.7 | 93.5 | 92.5 | 91.5 | 90.5 |
| 320 | .72 | 86.2 | 87.1 | 87.9 | 88.8 | 89.6 | 90.5 | 91.3 | 92.1 | 92.9 | 93.0 | 92.1 | 91.1 |
| 360 | .80 | 84.5 | 85.4 | 86.2 | 87.1 | 87.9 | 88.7 | 89.5 | 90.3 | 91.1 | 91.9 | 92.4 | 91.5 |

# ALTERNATE MODE EEC

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Max Continuous %N1

**Based on A/C high and anti-ice off**
**20000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -35 | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 |
| 160 | .35 | 86.4 | 87.3 | 88.2 | 89.0 | 89.9 | 90.7 | 90.7 | 89.9 | 88.9 | 87.8 | 86.7 | 85.9 |
| 200 | .44 | 86.0 | 86.9 | 87.8 | 88.6 | 89.5 | 90.3 | 91.1 | 90.6 | 89.5 | 88.4 | 87.3 | 86.2 |
| 240 | .53 | 88.7 | 89.6 | 90.5 | 91.4 | 92.3 | 93.1 | 94.0 | 94.7 | 94.0 | 93.0 | 92.0 | 91.0 |
| 280 | .61 | 88.0 | 88.9 | 89.8 | 90.7 | 91.6 | 92.4 | 93.3 | 94.1 | 94.8 | 93.8 | 92.9 | 92.0 |
| 320 | .69 | 86.6 | 87.5 | 88.3 | 89.2 | 90.1 | 90.9 | 91.7 | 92.6 | 93.4 | 94.2 | 93.5 | 92.6 |
| 360 | .77 | 85.1 | 85.9 | 86.8 | 87.6 | 88.4 | 89.3 | 90.1 | 90.9 | 91.7 | 92.5 | 93.3 | 92.9 |

### Max Continuous %N1

**%N1 Adjustments for Engine Bleeds**

| BLEED CONFIGURATION | PRESSURE ALTITUDE (1000 FT) | | | | |
|---|---|---|---|---|---|
| | 27 | 25 | 24 | 22 | 20 |
| ENGINE ANTI-ICE | -0.9 | -0.9 | -0.8 | -0.9 | -0.8 |
| ENGINE & WING ANTI-ICE | -3.4 | -3.3 | -3.3 | -3.3 | -3.2 |

# ALTERNATE MODE EEC

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Max Continuous %N1

**Based on A/C high and anti-ice off**

**18000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 |
| 160 | .34 | 86.6 | 87.4 | 88.3 | 89.1 | 89.9 | 90.7 | 90.2 | 89.2 | 88.1 | 87.0 | 85.9 | 85.1 |
| 200 | .42 | 85.9 | 86.8 | 87.6 | 88.4 | 89.2 | 90.0 | 90.5 | 89.9 | 88.8 | 87.6 | 86.5 | 85.6 |
| 240 | .51 | 88.6 | 89.4 | 90.3 | 91.1 | 92.0 | 92.8 | 93.6 | 93.8 | 93.1 | 92.1 | 90.9 | 90.0 |
| 280 | .59 | 89.1 | 90.0 | 90.8 | 91.7 | 92.5 | 93.3 | 94.2 | 95.0 | 94.9 | 94.1 | 93.2 | 92.4 |
| 320 | .67 | 87.8 | 88.7 | 89.5 | 90.4 | 91.2 | 92.0 | 92.8 | 93.6 | 94.4 | 94.6 | 93.8 | 92.9 |
| 360 | .75 | 86.5 | 87.3 | 88.1 | 88.9 | 89.8 | 90.6 | 91.4 | 92.2 | 92.9 | 93.7 | 94.1 | 93.3 |

**16000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -30 | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 |
| 160 | .33 | 85.9 | 86.8 | 87.6 | 88.4 | 89.2 | 90.0 | 90.5 | 89.6 | 88.5 | 87.3 | 86.2 | 85.2 |
| 200 | .41 | 85.3 | 86.1 | 86.9 | 87.7 | 88.5 | 89.3 | 90.1 | 90.0 | 89.1 | 87.9 | 86.8 | 85.8 |
| 240 | .49 | 86.3 | 87.1 | 87.9 | 88.7 | 89.5 | 90.3 | 91.2 | 92.0 | 91.9 | 90.9 | 89.8 | 88.7 |
| 280 | .57 | 89.0 | 89.9 | 90.7 | 91.6 | 92.4 | 93.2 | 94.0 | 94.9 | 95.7 | 94.9 | 94.1 | 93.3 |
| 320 | .64 | 87.8 | 88.7 | 89.5 | 90.4 | 91.2 | 92.0 | 92.8 | 93.6 | 94.4 | 95.2 | 94.7 | 93.8 |
| 360 | .72 | 86.6 | 87.4 | 88.3 | 89.1 | 89.9 | 90.7 | 91.5 | 92.3 | 93.1 | 93.9 | 94.7 | 94.2 |

**14000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -25 | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 |
| 160 | .31 | 86.4 | 87.3 | 88.1 | 88.9 | 89.7 | 90.5 | 90.5 | 89.6 | 88.5 | 87.4 | 86.4 | 85.3 |
| 200 | .39 | 85.8 | 86.6 | 87.4 | 88.2 | 89.0 | 89.7 | 90.5 | 90.1 | 89.1 | 88.0 | 86.9 | 85.9 |
| 240 | .47 | 85.4 | 86.2 | 87.1 | 87.8 | 88.6 | 89.4 | 90.2 | 90.9 | 90.9 | 89.8 | 88.8 | 87.7 |
| 280 | .54 | 89.1 | 90.0 | 90.8 | 91.6 | 92.5 | 93.3 | 94.1 | 94.9 | 95.2 | 94.4 | 93.5 | 92.6 |
| 320 | .62 | 88.3 | 89.2 | 90.0 | 90.8 | 91.7 | 92.5 | 93.3 | 94.0 | 94.8 | 95.0 | 94.3 | 93.4 |
| 360 | .69 | 86.6 | 87.5 | 88.3 | 89.1 | 89.9 | 90.7 | 91.5 | 92.3 | 93.0 | 93.8 | 94.2 | 93.7 |

**12000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 160 | .30 | 87.1 | 87.9 | 88.7 | 89.6 | 90.4 | 91.2 | 91.2 | 90.4 | 89.4 | 88.4 | 87.4 | 86.4 |
| 200 | .38 | 86.3 | 87.1 | 88.0 | 88.8 | 89.6 | 90.4 | 91.0 | 90.9 | 89.9 | 89.0 | 88.0 | 87.0 |
| 240 | .45 | 85.5 | 86.3 | 87.1 | 87.9 | 88.7 | 89.5 | 90.3 | 90.7 | 90.3 | 89.5 | 88.6 | 87.6 |
| 280 | .52 | 88.5 | 89.4 | 90.2 | 91.1 | 91.9 | 92.7 | 93.5 | 94.3 | 94.3 | 93.7 | 92.8 | 91.9 |
| 320 | .60 | 88.3 | 89.1 | 89.9 | 90.8 | 91.6 | 92.4 | 93.2 | 94.0 | 94.8 | 94.3 | 93.4 | 92.6 |
| 360 | .67 | 86.1 | 87.0 | 87.8 | 88.6 | 89.4 | 90.2 | 91.0 | 91.7 | 92.5 | 93.3 | 93.0 | 92.5 |

### Max Continuous %N1

**%N1 Adjustments for Engine Bleeds**

| BLEED CONFIGURATION | PRESSURE ALTITUDE (1000 FT) | | | |
|---|---|---|---|---|
| | 18 | 16 | 14 | 12 |
| ENGINE ANTI-ICE | -0.9 | -0.7 | -0.7 | -0.7 |
| ENGINE & WING ANTI-ICE | -3.2 | -3.0 | -2.9 | -2.7 |

# ALTERNATE MODE EEC

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Max Continuous %N1

**Based on A/C high and anti-ice off**

**10000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -20 | -15 | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 160 | .29 | 87.0 | 87.8 | 88.7 | 89.5 | 90.3 | 91.1 | 91.9 | 91.9 | 91.3 | 90.4 | 89.5 | 88.6 |
| 200 | .36 | 86.3 | 87.2 | 88.0 | 88.8 | 89.6 | 90.5 | 91.3 | 91.7 | 91.5 | 90.9 | 90.0 | 89.1 |
| 240 | .43 | 85.6 | 86.4 | 87.3 | 88.1 | 88.9 | 89.7 | 90.5 | 91.3 | 91.4 | 91.3 | 90.4 | 89.4 |
| 280 | .51 | 88.2 | 89.0 | 89.9 | 90.7 | 91.6 | 92.4 | 93.2 | 94.0 | 94.7 | 93.9 | 93.0 | 92.1 |
| 320 | .58 | 87.3 | 88.2 | 89.0 | 89.8 | 90.7 | 91.5 | 92.3 | 93.1 | 93.9 | 94.3 | 93.4 | 92.5 |
| 360 | .65 | 84.5 | 85.3 | 86.1 | 86.9 | 87.7 | 88.5 | 89.3 | 90.1 | 90.9 | 91.6 | 92.1 | 92.1 |

**5000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -10 | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| 160 | .26 | 86.8 | 87.7 | 88.5 | 89.3 | 90.1 | 90.9 | 91.6 | 91.3 | 90.4 | 89.5 | 88.6 | 87.6 |
| 200 | .33 | 86.4 | 87.2 | 88.1 | 88.9 | 89.7 | 90.5 | 91.3 | 91.5 | 90.9 | 89.9 | 88.9 | 88.0 |
| 240 | .40 | 85.9 | 86.7 | 87.6 | 88.4 | 89.2 | 90.0 | 90.8 | 91.4 | 91.3 | 90.4 | 89.5 | 88.5 |
| 280 | .46 | 85.7 | 86.5 | 87.3 | 88.2 | 89.0 | 89.8 | 90.6 | 91.4 | 91.6 | 91.1 | 90.2 | 89.3 |
| 320 | .53 | 85.5 | 86.3 | 87.1 | 88.0 | 88.8 | 89.6 | 90.4 | 91.1 | 91.9 | 91.8 | 91.3 | 90.5 |
| 360 | .59 | 81.5 | 82.3 | 83.1 | 83.8 | 84.6 | 85.4 | 86.1 | 86.9 | 87.6 | 88.4 | 88.4 | 88.4 |

**3000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 160 | .26 | 86.8 | 87.7 | 88.5 | 89.3 | 90.1 | 90.9 | 91.2 | 90.5 | 89.6 | 88.6 | 87.6 | 86.6 |
| 200 | .32 | 86.5 | 87.3 | 88.1 | 88.9 | 89.7 | 90.5 | 91.3 | 90.8 | 89.9 | 89.0 | 88.0 | 87.0 |
| 240 | .38 | 86.1 | 86.9 | 87.7 | 88.5 | 89.2 | 90.0 | 90.8 | 91.1 | 90.4 | 89.5 | 88.5 | 87.5 |
| 280 | .45 | 85.4 | 86.2 | 87.0 | 87.8 | 88.6 | 89.4 | 90.2 | 91.0 | 90.7 | 89.9 | 89.0 | 88.1 |
| 320 | .51 | 84.7 | 85.5 | 86.3 | 87.1 | 87.9 | 88.6 | 89.4 | 90.2 | 90.9 | 90.8 | 90.0 | 89.3 |
| 360 | .57 | 80.5 | 81.3 | 82.0 | 82.8 | 83.5 | 84.2 | 85.0 | 85.7 | 86.4 | 86.9 | 86.9 | 86.9 |

**1000 FT Pressure Altitude**

| | | TAT (°C) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KIAS | M | -5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 160 | .25 | 85.9 | 86.7 | 87.5 | 88.3 | 89.1 | 89.9 | 90.7 | 90.4 | 89.6 | 88.7 | 87.7 | 86.7 |
| 200 | .31 | 85.5 | 86.3 | 87.1 | 87.9 | 88.7 | 89.5 | 90.3 | 90.7 | 89.9 | 89.0 | 88.0 | 87.0 |
| 240 | .37 | 85.2 | 86.0 | 86.8 | 87.6 | 88.4 | 89.1 | 89.9 | 90.7 | 90.3 | 89.4 | 88.5 | 87.5 |
| 280 | .43 | 84.6 | 85.4 | 86.2 | 87.0 | 87.8 | 88.5 | 89.3 | 90.1 | 90.6 | 89.9 | 89.0 | 88.1 |
| 320 | .49 | 82.6 | 83.4 | 84.2 | 84.9 | 85.7 | 86.5 | 87.2 | 88.0 | 88.7 | 89.0 | 88.9 | 88.6 |
| 360 | .55 | 78.8 | 79.6 | 80.3 | 81.0 | 81.8 | 82.5 | 83.2 | 83.9 | 84.6 | 85.3 | 85.5 | 85.5 |

### Max Continuous %N1

**%N1 Adjustments for Engine Bleeds**

| BLEED CONFIGURATION | PRESSURE ALTITUDE (1000 FT) | | | |
|---|---|---|---|---|
| | 10 | 5 | 3 | 1 |
| ENGINE ANTI-ICE | -0.6 | 0.0 | 0.0 | 0.0 |
| ENGINE & WING ANTI-ICE | -2.5 | 0.0 | 0.0 | 0.0 |

Intentionally
Blank

# Performance Inflight — Chapter PI

## Gear Down — Section 16

## GEAR DOWN

### Long Range Cruise Altitude Capability

**Max Cruise Thrust, 100 ft/min residual rate of climb**

| WEIGHT (1000 KG) | PRESSURE ALTITUDE (FT) | | |
|---|---|---|---|
| | ISA + 10°C & BELOW | ISA + 15°C | ISA + 20°C |
| 85 | 16500 | 13900 | 11200 |
| 80 | 18800 | 16500 | 13800 |
| 75 | 21500 | 19000 | 16500 |
| 70 | 24900 | 22400 | 19300 |
| 65 | 27000 | 25700 | 23800 |
| 60 | 29100 | 27900 | 26700 |
| 55 | 31300 | 30400 | 29100 |
| 50 | 33300 | 32700 | 32100 |
| 45 | 35600 | 34900 | 34500 |
| 40 | 38000 | 37500 | 37100 |

# GEAR DOWN

## Long Range Cruise Control

| WEIGHT (1000 KG) | | PRESSURE ALTITUDE (1000 FT) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 10 | 21 | 23 | 25 | 27 | 29 | 31 | 33 | 35 | 37 |
| 85 | %N1 | 79.7 | | | | | | | | | |
| | MACH | .466 | | | | | | | | | |
| | KIAS | 258 | | | | | | | | | |
| | FF/ENG | 1909 | | | | | | | | | |
| 80 | %N1 | 77.8 | 88.0 | | | | | | | | |
| | MACH | .453 | .559 | | | | | | | | |
| | KIAS | 250 | 251 | | | | | | | | |
| | FF/ENG | 1789 | 1834 | | | | | | | | |
| 75 | %N1 | 75.7 | 86.0 | 88.1 | | | | | | | |
| | MACH | .439 | .541 | .564 | | | | | | | |
| | KIAS | 242 | 242 | 243 | | | | | | | |
| | FF/ENG | 1666 | 1699 | 1720 | | | | | | | |
| 70 | %N1 | 73.6 | 83.9 | 85.9 | 88.1 | | | | | | |
| | MACH | .424 | .524 | .546 | .568 | | | | | | |
| | KIAS | 234 | 234 | 234 | 235 | | | | | | |
| | FF/ENG | 1547 | 1572 | 1588 | 1606 | | | | | | |
| 65 | %N1 | 71.3 | 81.8 | 83.7 | 85.7 | 87.8 | | | | | |
| | MACH | .408 | .506 | .526 | .549 | .572 | | | | | |
| | KIAS | 225 | 226 | 226 | 226 | 226 | | | | | |
| | FF/ENG | 1431 | 1452 | 1458 | 1474 | 1491 | | | | | |
| 60 | %N1 | 68.9 | 79.6 | 81.4 | 83.3 | 85.4 | 87.5 | | | | |
| | MACH | .393 | .488 | .507 | .528 | .551 | .574 | | | | |
| | KIAS | 217 | 218 | 217 | 217 | 218 | 217 | | | | |
| | FF/ENG | 1323 | 1335 | 1337 | 1343 | 1359 | 1375 | | | | |
| 55 | %N1 | 66.4 | 77.1 | 79.0 | 80.8 | 82.7 | 84.9 | 87.1 | | | |
| | MACH | .376 | .468 | .487 | .507 | .528 | .552 | .574 | | | |
| | KIAS | 208 | 209 | 209 | 208 | 208 | 209 | 208 | | | |
| | FF/ENG | 1221 | 1221 | 1222 | 1223 | 1228 | 1243 | 1259 | | | |
| 50 | %N1 | 63.9 | 74.3 | 76.3 | 78.2 | 80.1 | 82.0 | 84.2 | 86.3 | | |
| | MACH | .360 | .447 | .466 | .485 | .505 | .527 | .551 | .574 | | |
| | KIAS | 199 | 199 | 199 | 199 | 199 | 199 | 199 | 199 | | |
| | FF/ENG | 1121 | 1105 | 1108 | 1109 | 1108 | 1112 | 1127 | 1144 | | |
| 45 | %N1 | 61.2 | 71.1 | 73.2 | 75.2 | 77.2 | 79.1 | 81.0 | 83.2 | 85.4 | |
| | MACH | .345 | .424 | .443 | .462 | .481 | .502 | .523 | .547 | .572 | |
| | KIAS | 190 | 189 | 189 | 189 | 189 | 189 | 189 | 189 | 189 | |
| | FF/ENG | 1023 | 997 | 993 | 996 | 996 | 994 | 998 | 1011 | 1028 | |
| 40 | %N1 | 58.2 | 67.6 | 69.7 | 71.7 | 73.9 | 75.9 | 77.8 | 79.7 | 81.8 | 84.5 |
| | MACH | .328 | .400 | .418 | .436 | .456 | .475 | .496 | .517 | .541 | .567 |
| | KIAS | 181 | 178 | 178 | 178 | 179 | 179 | 178 | 178 | 178 | 179 |
| | FF/ENG | 927 | 899 | 887 | 881 | 891 | 886 | 883 | 886 | 895 | 921 |

# GEAR DOWN

## Long Range Cruise Enroute Fuel and Time

### Table 1 of 3: Ground to Air Miles Conversion

| AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) 100 | 80 | 60 | 40 | 20 | GROUND DISTANCE (NM) | AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) 20 | 40 | 60 | 80 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|
| 331 | 294 | 263 | 238 | 218 | 200 | 188 | 178 | 168 | 160 | 153 |
| 670 | 594 | 528 | 477 | 436 | 400 | 377 | 357 | 338 | 321 | 306 |
| 1012 | 896 | 796 | 718 | 655 | 600 | 566 | 534 | 506 | 481 | 459 |
| 1359 | 1200 | 1065 | 959 | 874 | 800 | 754 | 712 | 675 | 641 | 612 |
| 1711 | 1508 | 1336 | 1202 | 1094 | 1000 | 943 | 890 | 843 | 801 | 764 |
| 2066 | 1819 | 1609 | 1446 | 1314 | 1200 | 1131 | 1067 | 1010 | 960 | 915 |
| 2427 | 2133 | 1883 | 1690 | 1534 | 1400 | 1318 | 1244 | 1178 | 1118 | 1066 |
| 2792 | 2449 | 2159 | 1934 | 1755 | 1600 | 1507 | 1421 | 1345 | 1276 | 1216 |
| 3162 | 2769 | 2437 | 2180 | 1976 | 1800 | 1694 | 1598 | 1511 | 1434 | 1366 |
| 3538 | 3093 | 2716 | 2427 | 2198 | 2000 | 1882 | 1774 | 1677 | 1591 | 1515 |
| 3919 | 3420 | 2999 | 2676 | 2420 | 2200 | 2069 | 1950 | 1843 | 1748 | 1664 |

### Table 2 of 3: Reference Fuel and Time Required at Check Point

| AIR DIST (NM) | PRESSURE ALTITUDE (1000 FT) 10 FUEL (1000 KG) | 10 TIME (HR:MIN) | 14 FUEL (1000 KG) | 14 TIME (HR:MIN) | 20 FUEL (1000 KG) | 20 TIME (HR:MIN) | 24 FUEL (1000 KG) | 24 TIME (HR:MIN) | 28 FUEL (1000 KG) | 28 TIME (HR:MIN) |
|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 2.0 | 0:51 | 1.8 | 0:48 | 1.6 | 0:45 | 1.4 | 0:43 | 1.3 | 0:41 |
| 400 | 4.0 | 1:40 | 3.7 | 1:34 | 3.3 | 1:27 | 3.1 | 1:22 | 2.9 | 1:18 |
| 600 | 6.1 | 2:30 | 5.6 | 2:21 | 5.1 | 2:09 | 4.8 | 2:02 | 4.5 | 1:55 |
| 800 | 8.1 | 3:20 | 7.5 | 3:09 | 6.8 | 2:52 | 6.4 | 2:42 | 6.0 | 2:33 |
| 1000 | 10.0 | 4:12 | 9.3 | 3:57 | 8.5 | 3:35 | 8.0 | 3:23 | 7.5 | 3:11 |
| 1200 | 12.0 | 5:05 | 11.1 | 4:46 | 10.1 | 4:20 | 9.5 | 4:04 | 9.0 | 3:49 |
| 1400 | 13.9 | 5:58 | 12.9 | 5:37 | 11.8 | 5:05 | 11.1 | 4:46 | 10.5 | 4:28 |
| 1600 | 15.7 | 6:53 | 14.7 | 6:28 | 13.4 | 5:51 | 12.6 | 5:28 | 11.9 | 5:08 |
| 1800 | 17.6 | 7:48 | 16.4 | 7:20 | 15.0 | 6:37 | 14.1 | 6:12 | 13.3 | 5:48 |
| 2000 | 19.4 | 8:44 | 18.1 | 8:13 | 16.5 | 7:25 | 15.5 | 6:55 | 14.7 | 6:29 |
| 2200 | 21.1 | 9:42 | 19.8 | 9:07 | 18.1 | 8:13 | 17.0 | 7:40 | 16.0 | 7:10 |

### Table 3 of 3: Fuel Required Adjustment (1000 KG)

| REFERENCE FUEL REQUIRED (1000 KG) | WEIGHT AT CHECK POINT (1000 KG) 40 | 50 | 60 | 70 | 80 |
|---|---|---|---|---|---|
| 2 | -0.3 | -0.1 | 0.0 | 0.2 | 0.6 |
| 4 | -0.6 | -0.3 | 0.0 | 0.5 | 1.2 |
| 6 | -0.9 | -0.5 | 0.0 | 0.7 | 1.7 |
| 8 | -1.3 | -0.6 | 0.0 | 0.9 | 2.2 |
| 10 | -1.6 | -0.8 | 0.0 | 1.2 | 2.7 |
| 12 | -1.9 | -1.0 | 0.0 | 1.4 | 3.2 |
| 14 | -2.2 | -1.1 | 0.0 | 1.6 | 3.6 |
| 16 | -2.5 | -1.3 | 0.0 | 1.8 | 4.0 |
| 18 | -2.8 | -1.4 | 0.0 | 2.0 | 4.4 |
| 20 | -3.2 | -1.6 | 0.0 | 2.2 | 4.7 |
| 22 | -3.5 | -1.8 | 0.0 | 2.4 | 5.1 |

# GEAR DOWN

## Descent
### VREF40+70 KIAS

| PRESSURE ALTITUDE (FT) | TIME (MIN) | FUEL (KG) | DISTANCE (NM) |
|---|---|---|---|
| 41000 | 20.8 | 220 | 92 |
| 39000 | 20.1 | 215 | 87 |
| 37000 | 19.3 | 210 | 82 |
| 35000 | 18.6 | 205 | 78 |
| 33000 | 17.9 | 200 | 73 |
| 31000 | 17.2 | 195 | 69 |
| 29000 | 16.4 | 190 | 65 |
| 27000 | 15.6 | 185 | 60 |
| 25000 | 14.8 | 179 | 56 |
| 23000 | 14 | 173 | 52 |
| 21000 | 13.2 | 167 | 48 |
| 19000 | 12.3 | 160 | 44 |
| 17000 | 11.5 | 153 | 40 |
| 15000 | 10.6 | 146 | 36 |
| 10000 | 8.3 | 126 | 26 |
| 5000 | 5.8 | 103 | 16 |
| 1500 | 4 | 84 | 10 |

**Allowances for a straight-in approach are included.**

# GEAR DOWN

## Holding

### Flaps Up

| WEIGHT (1000 KG) | | PRESSURE ALTITUDE (FT) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1500 | 5000 | 10000 | 15000 | 20000 | 25000 | 30000 | 35000 |
| 85 | %N1 | 69.2 | 72.3 | 77.1 | 82.0 | 86.9 | | | |
| | KIAS | 233 | 233 | 233 | 233 | 234 | | | |
| | FF/ENG | 1820 | 1810 | 1820 | 1850 | 1890 | | | |
| 80 | %N1 | 67.5 | 70.4 | 75.2 | 80.1 | 85.0 | | | |
| | KIAS | 226 | 226 | 226 | 226 | 227 | | | |
| | FF/ENG | 1710 | 1700 | 1710 | 1730 | 1760 | | | |
| 75 | %N1 | 65.7 | 68.5 | 73.2 | 78.1 | 83.0 | 88.5 | | |
| | KIAS | 219 | 219 | 219 | 219 | 219 | 221 | | |
| | FF/ENG | 1600 | 1600 | 1590 | 1610 | 1630 | 1690 | | |
| 70 | %N1 | 63.8 | 66.6 | 71.1 | 76.0 | 81.0 | 86.1 | | |
| | KIAS | 214 | 214 | 214 | 214 | 214 | 214 | | |
| | FF/ENG | 1500 | 1490 | 1490 | 1500 | 1520 | 1550 | | |
| 65 | %N1 | 62.0 | 64.8 | 69.1 | 74.0 | 78.9 | 83.9 | | |
| | KIAS | 210 | 210 | 210 | 210 | 210 | 210 | | |
| | FF/ENG | 1410 | 1400 | 1400 | 1400 | 1410 | 1430 | | |
| 60 | %N1 | 60.1 | 62.8 | 67.0 | 71.8 | 76.8 | 81.6 | 87.1 | |
| | KIAS | 204 | 204 | 204 | 204 | 204 | 204 | 204 | |
| | FF/ENG | 1320 | 1310 | 1310 | 1300 | 1300 | 1320 | 1360 | |
| 55 | %N1 | 58.0 | 60.6 | 64.9 | 69.5 | 74.4 | 79.4 | 84.5 | |
| | KIAS | 198 | 198 | 198 | 198 | 198 | 198 | 198 | |
| | FF/ENG | 1240 | 1220 | 1220 | 1200 | 1200 | 1210 | 1230 | |
| 50 | %N1 | 55.9 | 58.4 | 62.6 | 67.1 | 71.9 | 77.0 | 81.9 | |
| | KIAS | 191 | 191 | 191 | 191 | 191 | 191 | 191 | |
| | FF/ENG | 1150 | 1140 | 1130 | 1110 | 1110 | 1110 | 1120 | |
| 45 | %N1 | 53.8 | 56.2 | 60.2 | 64.6 | 69.3 | 74.4 | 79.4 | 84.6 |
| | KIAS | 185 | 185 | 185 | 185 | 185 | 185 | 185 | 185 |
| | FF/ENG | 1060 | 1060 | 1040 | 1040 | 1030 | 1010 | 1020 | 1050 |
| 40 | %N1 | 51.6 | 53.8 | 57.6 | 62.0 | 66.6 | 71.6 | 76.7 | 81.7 |
| | KIAS | 178 | 178 | 178 | 178 | 178 | 178 | 178 | 178 |
| | FF/ENG | 980 | 970 | 950 | 950 | 950 | 920 | 920 | 930 |

**This table includes 5% additional fuel for holding in a racetrack pattern.**

Intentionally
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# GEAR DOWN
# ENGINE INOP

## MAX CONTINUOUS THRUST

### Driftdown Speed/Level Off Altitude

**100 ft/min residual rate of climb**

| WEIGHT (1000 KG) | | OPTIMUM DRIFTDOWN SPEED (KIAS) | LEVEL OFF ALTITUDE (FT) | | |
|---|---|---|---|---|---|
| START DRIFTDOWN | LEVEL OFF | | ISA + 10°C & BELOW | ISA + 15°C | ISA + 20°C |
| 80 | 77 | 225 | 2400 | | |
| 75 | 72 | 219 | 4800 | 3300 | 1400 |
| 70 | 67 | 214 | 6900 | 5800 | 4400 |
| 65 | 62 | 209 | 9200 | 8200 | 7000 |
| 60 | 57 | 204 | 11200 | 10400 | 9600 |
| 55 | 53 | 198 | 13200 | 12100 | 11300 |
| 50 | 48 | 191 | 15500 | 14100 | 13000 |
| 45 | 43 | 185 | 18600 | 16800 | 14800 |
| 40 | 38 | 177 | 22000 | 20200 | 18400 |

**Includes APU fuel burn.**

# GEAR DOWN

# ENGINE INOP

## MAX CONTINUOUS THRUST

## Long Range Cruise Altitude Capability

### 100 ft/min residual rate of climb

| WEIGHT (1000 KG) | PRESSURE ALTITUDE (FT) | | |
|---|---|---|---|
| | ISA + 10°C & BELOW | ISA + 15°C | ISA + 20°C |
| 70 | 2900 | | |
| 65 | 5700 | 4200 | 1800 |
| 60 | 8400 | 7300 | 5800 |
| 55 | 11000 | 10200 | 9300 |
| 50 | 13500 | 12400 | 11500 |
| 45 | 16600 | 14800 | 13600 |
| 40 | 20700 | 18900 | 16900 |

# GEAR DOWN

# ENGINE INOP

## MAX CONTINUOUS THRUST

### Long Range Cruise Control

| WEIGHT (1000 KG) | | PRESSURE ALTITUDE (1000 FT) 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|
| 70 | %N1 | 89.7 | 91.8 | | | | | | | |
| | MACH | .386 | .400 | | | | | | | |
| | KIAS | 233 | 234 | | | | | | | |
| | FF/ENG | 3176 | 3210 | | | | | | | |
| 65 | %N1 | 87.2 | 89.2 | 91.3 | | | | | | |
| | MACH | .372 | .386 | .401 | | | | | | |
| | KIAS | 225 | 225 | 225 | | | | | | |
| | FF/ENG | 2923 | 2942 | 2973 | | | | | | |
| 60 | %N1 | 84.8 | 86.6 | 88.5 | 90.7 | | | | | |
| | MACH | .359 | .371 | .385 | .400 | | | | | |
| | KIAS | 217 | 217 | 217 | 217 | | | | | |
| | FF/ENG | 2689 | 2691 | 2707 | 2735 | | | | | |
| 55 | %N1 | 82.3 | 84.0 | 85.8 | 87.7 | 89.8 | | | | |
| | MACH | .346 | .357 | .370 | .383 | .399 | | | | |
| | KIAS | 210 | 208 | 208 | 208 | 208 | | | | |
| | FF/ENG | 2470 | 2460 | 2460 | 2473 | 2497 | | | | |
| 50 | %N1 | 79.4 | 81.3 | 83.0 | 84.7 | 86.6 | 88.7 | | | |
| | MACH | .333 | .344 | .355 | .367 | .380 | .396 | | | |
| | KIAS | 201 | 200 | 199 | 198 | 198 | 198 | | | |
| | FF/ENG | 2256 | 2245 | 2233 | 2230 | 2240 | 2258 | | | |
| 45 | %N1 | 76.1 | 78.1 | 79.9 | 81.7 | 83.4 | 85.2 | 87.4 | 89.7 | |
| | MACH | .318 | .328 | .339 | .351 | .362 | .376 | .391 | .407 | |
| | KIAS | 192 | 191 | 191 | 190 | 189 | 188 | 188 | 188 | |
| | FF/ENG | 2037 | 2031 | 2021 | 2009 | 2004 | 2008 | 2021 | 2046 | |
| 40 | %N1 | 72.5 | 74.4 | 76.3 | 78.2 | 80.0 | 81.8 | 83.6 | 85.6 | 87.9 |
| | MACH | .302 | .312 | .322 | .334 | .345 | .357 | .369 | .384 | .400 |
| | KIAS | 182 | 182 | 181 | 180 | 179 | 178 | 178 | 178 | 178 |
| | FF/ENG | 1820 | 1813 | 1808 | 1800 | 1790 | 1781 | 1778 | 1786 | 1804 |

**Includes APU fuel burn.**

# GEAR DOWN
# ENGINE INOP

## MAX CONTINUOUS THRUST

## Long Range Cruise Diversion Fuel and Time

### Table 1 of 3: Ground to Air Miles Conversion

| AIR DISTANCE (NM) | | | | | GROUND DISTANCE (NM) | AIR DISTANCE (NM) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| HEADWIND COMPONENT (KTS) | | | | | | TAILWIND COMPONENT (KTS) | | | | |
| 100 | 80 | 60 | 40 | 20 | | 20 | 40 | 60 | 80 | 100 |
| 168 | 149 | 132 | 119 | 109 | 100 | 93 | 88 | 83 | 78 | 75 |
| 343 | 302 | 267 | 240 | 219 | 200 | 187 | 174 | 164 | 155 | 147 |
| 518 | 455 | 402 | 361 | 328 | 300 | 280 | 261 | 245 | 231 | 219 |
| 695 | 610 | 538 | 483 | 438 | 400 | 373 | 348 | 327 | 308 | 292 |
| 873 | 765 | 674 | 604 | 548 | 500 | 466 | 435 | 408 | 384 | 363 |
| 1053 | 922 | 812 | 726 | 659 | 600 | 558 | 521 | 488 | 459 | 435 |
| 1233 | 1079 | 948 | 848 | 769 | 700 | 651 | 608 | 569 | 536 | 507 |
| 1415 | 1237 | 1086 | 970 | 879 | 800 | 744 | 694 | 650 | 611 | 578 |
| 1597 | 1395 | 1224 | 1093 | 989 | 900 | 837 | 780 | 730 | 687 | 650 |
| 1782 | 1555 | 1363 | 1216 | 1100 | 1000 | 929 | 866 | 810 | 762 | 721 |

### Table 2 of 3: Reference Fuel and Time Required at Check Point

| AIR DIST (NM) | PRESSURE ALTITUDE (1000 FT) | | | | | |
|---|---|---|---|---|---|---|
| | 6 | | 10 | | 14 | |
| | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) | FUEL (1000 KG) | TIME (HR:MIN) |
| 100 | 1.0 | 0:27 | 0.9 | 0:26 | 0.8 | 0:25 |
| 200 | 2.2 | 0:53 | 2.0 | 0:51 | 1.9 | 0:48 |
| 300 | 3.3 | 1:19 | 3.0 | 1:15 | 2.9 | 1:11 |
| 400 | 4.4 | 1:45 | 4.1 | 1:40 | 3.9 | 1:34 |
| 500 | 5.5 | 2:11 | 5.1 | 2:05 | 4.9 | 1:58 |
| 600 | 6.5 | 2:38 | 6.2 | 2:30 | 5.9 | 2:21 |
| 700 | 7.6 | 3:04 | 7.2 | 2:55 | 6.9 | 2:45 |
| 800 | 8.6 | 3:31 | 8.2 | 3:21 | 7.8 | 3:09 |
| 900 | 9.7 | 3:59 | 9.1 | 3:46 | 8.8 | 3:33 |
| 1000 | 10.7 | 4:26 | 10.1 | 4:12 | 9.7 | 3:58 |

### Table 3 of 3: Fuel Required Adjustment (1000 KG)

| REFERENCE FUEL REQUIRED (1000 KG) | WEIGHT AT CHECK POINT (1000 KG) | | | | |
|---|---|---|---|---|---|
| | 40 | 50 | 60 | 70 | 80 |
| 1 | -0.2 | -0.1 | 0.0 | 0.2 | 0.4 |
| 2 | -0.4 | -0.2 | 0.0 | 0.4 | 1.0 |
| 3 | -0.6 | -0.3 | 0.0 | 0.6 | 1.5 |
| 4 | -0.7 | -0.4 | 0.0 | 0.8 | 1.9 |
| 5 | -0.9 | -0.5 | 0.0 | 1.0 | 2.4 |
| 6 | -1.1 | -0.5 | 0.0 | 1.2 | 2.8 |
| 7 | -1.3 | -0.6 | 0.0 | 1.4 | 3.2 |
| 8 | -1.5 | -0.7 | 0.0 | 1.5 | 3.5 |
| 9 | -1.7 | -0.8 | 0.0 | 1.7 | 3.9 |
| 10 | -1.9 | -0.9 | 0.0 | 1.8 | 4.2 |
| 11 | -2.1 | -1.0 | 0.0 | 1.9 | 4.5 |

**Includes APU fuel burn.**

# GEAR DOWN
# ENGINE INOP

## MAX CONTINUOUS THRUST

## Holding
### Flaps Up

| WEIGHT (1000 KG) | | PRESSURE ALTITUDE (FT) | | | | |
|---|---|---|---|---|---|---|
| | | 1500 | 5000 | 10000 | 15000 | 20000 |
| 85 | %N1 | 89.9 | | | | |
| | KIAS | 233 | | | | |
| | FF/ENG | 3730 | | | | |
| 80 | %N1 | 87.8 | 91.5 | | | |
| | KIAS | 226 | 226 | | | |
| | FF/ENG | 3480 | 3530 | | | |
| 75 | %N1 | 85.7 | 89.2 | | | |
| | KIAS | 219 | 219 | | | |
| | FF/ENG | 3240 | 3270 | | | |
| 70 | %N1 | 83.5 | 87.0 | | | |
| | KIAS | 214 | 214 | | | |
| | FF/ENG | 3000 | 3030 | | | |
| 65 | %N1 | 81.4 | 84.8 | 89.9 | | |
| | KIAS | 210 | 210 | 210 | | |
| | FF/ENG | 2810 | 2820 | 2880 | | |
| 60 | %N1 | 79.1 | 82.5 | 87.4 | | |
| | KIAS | 204 | 204 | 204 | | |
| | FF/ENG | 2600 | 2610 | 2650 | | |
| 55 | %N1 | 76.5 | 80.0 | 85.0 | | |
| | KIAS | 198 | 198 | 198 | | |
| | FF/ENG | 2400 | 2410 | 2430 | | |
| 50 | %N1 | 73.9 | 77.3 | 82.4 | 87.3 | |
| | KIAS | 191 | 191 | 191 | 191 | |
| | FF/ENG | 2210 | 2220 | 2230 | 2260 | |
| 45 | %N1 | 71.1 | 74.4 | 79.6 | 84.5 | 90.2 |
| | KIAS | 185 | 185 | 185 | 185 | 185 |
| | FF/ENG | 2030 | 2030 | 2040 | 2060 | 2110 |
| 40 | %N1 | 68.3 | 71.4 | 76.5 | 81.6 | 86.7 |
| | KIAS | 178 | 178 | 178 | 178 | 178 |
| | FF/ENG | 1860 | 1850 | 1850 | 1860 | 1880 |

**This table includes 5% additional fuel for holding in a racetrack pattern.**
**Includes APU fuel burn.**

Intentionally
Blank

## Introduction

This chapter contains information to supplement performance data from the Flight Management Computer (FMC). In addition, sufficient inflight data is provided to complete a flight with the FMC inoperative. In the event of conflict between data presented in this chapter and that contained in the approved Airplane Flight Manual, the Flight Manual shall always take precedence.

## General

### Takeoff Speeds

The speeds presented in the Takeoff Speeds table, as well as FMC computed takeoff speeds, can be used for all performance conditions except where adjustments must be made for anti-skid inoperative, thrust reversers inoperative, improved climb, contaminated runway situations, or brake energy limits.

V1 adjustments are not necessary for equal amounts of clearway and stopway. V1 for takeoff limit weights based on unequal clearway and stopway should be obtained from computerized takeoff speed calculations for the specific takeoff conditions.

These speeds may be used for weights less than or equal to the performance limited weight subject to the restrictions noted above.

The FMC will protect minimum control speeds by increasing V1, VR, and V2 as required. However, the FMC will not compute takeoff speeds for weights where the required speed increase exceeds the maximum certified speed increase. This typically occurs at full rated thrust and light weights. In this case, the message "V SPEEDS UNAVAILABLE" will appear on the FMC scratchpad and the takeoff speed entries will be blank. In this situation, manually verify takeoff speeds using an approved source of takeoff performance information. Upon verifying takeoff speeds, takeoff is permitted. When the selected takeoff speeds cannot be verified, the options are to select a lower flap setting, select derate thrust and/or increase airplane gross weight (e.g. add fuel). Selecting derate thrust is the preferred method as this will reduce the minimum control speeds. Note that the assumed temperature method will not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced by an assumed temperature selection.

Takeoff speeds are determined as follows:

1. Determine V1, VR, and V2 from the Takeoff Speeds table (Table 1) with brake release weight.
2. Adjust V1, VR, and V2 for temperature and pressure altitude from the V1, VR, V2 Adjustments table (Table 2).
3. Adjust V1 for wind and slope from the Slope and Wind V1 Adjustments table (Table 3).
4. Determine V1(MCG) from the V1(MCG) table (Table 4).
5. If V1 from Step 3 is less than V1(MCG), set V1=V1(MCG).
6. If the VR from Step 2 is less than V1(MCG), set VR equal to V1(MCG) and determine a new V2 by adding the difference between the VR from Step 2 and V1(MCG) to the normal V2.

**Note:** Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG). It is therefore necessary to compare the adjusted V1 to V1(MCG). The V1(MCG) presented in this manual is conservative for all weight and bleed configurations. No takeoff weight adjustment is necessary provided that the actual field length exceeds the minimum field length shown in the Field and Climb Limit Weight table in the chapter Performance Dispatch.

## Stabilizer Trim Setting

To find takeoff stabilizer trim setting, enter the Stabilizer Trim Setting table with anticipated brake release weight and center of gravity (C.G. % MAC) and read required stabilizer trim units.

## VREF

This table contains flaps 40, 30 and 15 reference speeds for a given weight for a reference pressure altitude of 14500 feet. These data are consistent with the FMC. The FMC uses a reference pressure altitude of 14500 feet to calculate VREF when the origin or destination airports have not been defined. For similar conditions, VREF values at 14500 feet are conservative for lower pressure altitudes.

## Flap Maneuver Speeds

This table provides flap maneuver speeds for various flap settings. During flap retraction, selection of the next flap position is initiated when reaching the maneuver speed for the existing flap position. During flap retraction, at least adequate maneuver capability of 30° of bank (15° of bank and 15° overshoot) to stick shaker is provided at the flap retraction speed. Full maneuvering capability of at least 40° of bank (25° of bank and 15° overshoot) is provided when the airplane has accelerated to the recommended maneuver speed for the selected flap position.

During flap extension, selection of the flaps to the next flap position should be made when approaching, and before decelerating below, the maneuver speed for the existing flap position. The flap extension speed schedule varies with airplane weight and provides full maneuver capability of at least 40° of bank (25° of bank and 15° overshoot) to stick shaker at all weights.

## Slush/Standing Water Takeoff

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 0.5 inches (13 mm) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. The use of assumed temperature for reduced thrust is not allowed on contaminated runways. Interpolation for slush/standing water depths between the values shown is permitted.

Takeoff weight is determined as follows:

1. Determine the dry field/obstacle limit weight for the takeoff flap setting.
2. Enter the Weight Adjustment table (Table 1) with the dry field/obstacle limit weight to obtain the weight reduction for the slush/standing water depth and airport pressure altitude.
3. Adjust field length available for temperature by the amount provided in the notes below the V1(MCG) Limit Weight table (Table 2).

4. Enter the V1(MCG) Limit Weight table (Table 2) with the adjusted field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.
5. The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

1. Determine takeoff speeds V1, VR and V2 for actual brake release weight using the Dry Runway Takeoff Speeds tables in this section.
2. If V1(MCG) limited, set V1=V1(MCG). If not limited by V1(MCG) considerations, enter the V1 Adjustment table (Table 3) with actual brake release weight to determine the V1 reduction to apply to V1 speed. If the adjusted V1 is less than V1(MCG), set V1=V1(MCG).

## Dry Snow Runway Takeoff

In addition to slush/standing water, the data are provided for dry snow covered runways. Takeoff in dry snow depths greater than 4.0 inches (100 mm) is not recommended. The tables provided are used in the same manner as the Slush/Standing Water Takeoff tables.

## Wet Snow Runway Takeoff

In addition to slush/standing water and dry snow, data are provided for wet snow covered runways. The tables provided are used in the same manner as the Slush/Standing Water Takeoff tables.

## Slippery Runway Takeoff

Airplane braking action is reported as good, medium or poor, depending on existing runway conditions. If braking action is reported as good, conditions should not be expected to be as good as on clean, dry runways. The value “good” is comparative and is intended to mean that airplanes should not experience braking or directional control difficulties when stopping. The performance level of good is the same as used by the FAA and EASA to define wet runway rejected takeoff performance. A braking action of good to medium (interpolation between good and medium) is representative of a runway covered with compacted snow. Similarly, poor braking action is representative of a runway covered with ice. Performance is based on reversers operating and a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

## One Thrust Reverser Inoperative

Wet runway takeoff performance presented for all brakes operating is based on the use of one thrust reverser during deceleration. When operating with a thrust reverser inoperative, the runway/obstacle limited takeoff weight and V1 speed must be reduced to account for the reduced deceleration capability.

A simplified method which conservatively accounts for this is to reduce the normal wet runway/obstacle limited weight by 1250 kg and the V1 associated with the reduced weight by two knots.

If the resulting V1 is less than V1(MCG), takeoff is permitted with V1 set equal to V1(MCG) provided the accelerate stop distance available corrected for wind and slope exceeds approximately 4500 ft.

## Anti-Skid Inoperative

When operating with anti-skid inoperative, the field limit weight and V1 must be reduced to account for the effect on accelerate-stop performance. Anti-skid inoperative is only allowed on a dry runway. A simplified method which conservatively accounts for the effects of anti-skid inoperative is to reduce the normal dry field/obstacle limited weight by 8700 kg and the V1 associated with the reduced weight by the amount shown in the table below.

| ANTI-SKID INOPERATIVE V1 ADJUSTMENTS | |
|---|---|
| FIELD LENGTH (FT) | V1 ADJUSTMENT (KIAS) |
| 6000 | -23 |
| 8000 | -19 |
| 10000 | -16 |
| 12000 | -14 |
| 14000 | -12 |

If the resulting V1 is less than V1(MCG), takeoff is permitted with V1 set equal to V1(MCG) provided the dry accelerate-stop distance available adjusted for wind and slope exceeds approximately 6600 ft.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

## Takeoff %N1

To find Max Takeoff %N1 based on normal engine bleed for air conditioning packs on, enter Takeoff %N1 Table with airport pressure altitude and airport OAT and read %N1. Apply %N1 adjustments as provided when applicable.

## Assumed Temperature Reduced Thrust

Regulations permit the use of up to 25% takeoff thrust reduction for operation with assumed temperature reduced thrust. Use of assumed temperature reduced thrust is not allowed with anti-skid inoperative or on runways contaminated with standing water, ice, slush, or snow. Use of assumed temperature reduced thrust is not recommended if potential windshear conditions exist.

To find the maximum allowable assumed temperature enter the Maximum Assumed Temperature table with airport pressure altitude and OAT. Compare this temperature to that at which the airplane is performance limited as determined from available takeoff performance data. Next, enter the Maximum Takeoff %N1 table with airport pressure altitude and the lower of the two temperatures previously determined, to obtain a maximum takeoff %N1. Do not use an assumed temperature less than the minimum assumed temperature shown. Enter the %N1 Adjustment table with OAT and the difference between the assumed and actual OAT to obtain a %N1 adjustment. Subtract the %N1 adjustment from the maximum takeoff %N1 found previously to determine the assumed temperature reduced thrust %N1.

Apply %N1 adjustments as provided when applicable.

## Max Climb %N1

This table shows Max Climb %N1 for a 280/.78 climb speed schedule. Enter the table with airport pressure altitude and TAT and read %N1. Apply %N1 adjustments as provided when applicable.

## Go-Around %N1

To find Go-Around %N1, enter the Go-Around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. Apply %N1 adjustments as provided when applicable.

## Flight with Unreliable Airspeed/ Turbulent Air Penetration

Information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome or turbulent air may also cause unreliable airspeed/Mach indications. The cruise table in this section may also be used for turbulent air penetration. These speeds provide ample protection from stall and high speed buffet, while also providing protection from exceeding the structural limits. For climb, cruise, and descent these tables are based on a speed schedule of 280 KIAS below crossover altitude and .76 Mach above crossover altitude.

Pitch attitude and power setting are shown in bold type to emphasize pilot action. Altitude and/or vertical speed indications may also be unreliable.

## All Engines

### Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 100 ft/min residual rate of climb.

For FAA operators adhering to EASA standards, refer to the data for buffet limits corresponding to a maneuver margin of 1.3g (39° bank).

Flying above these altitudes with sustained banks in excess of approximately 13° may cause the airplane to lose speed and/or altitude. The altitudes shown in the table are limited to the maximum certified altitude of 41000 ft.

### Long Range Cruise Control

This table provides target %N1, Long Range Cruise Mach number, IAS and standard day fuel flow per engine for the airplane weight and pressure altitude. As indicated by the shaded area, at optimum altitude, .79 Mach approximates the Long Range Cruise Mach schedule.

### APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

### Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .78/280/250 descent. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table (Table 1) to convert ground distance and enroute wind to an equivalent still air distance. Next, enter the Reference Fuel and Time table (Table 2) with air distance from Table 1 and the desired altitude and read reference fuel and time required. Lastly, enter the Fuel Required Adjustment table (Table 3) with the reference fuel and the actual weight at checkpoint to obtain fuel required to destination.

## Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

## Descent at .78/280/250

Distance and time for descent are shown for a .78/280/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing flaps at the outer marker.

## Holding

Target %N1, indicated airspeed and fuel flow per engine information is tabulated for holding with Flaps Up based on the FMC optimum holding speed schedule. This is the higher of the maximum endurance speed and the maneuvering speed. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read %N1, IAS and fuel flow per engine.

# Advisory Information

## Runway Surface Condition Correlation

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. A table is provided that correlates runway condition code to runway surface condition description and reported braking action that can then be used to determine the appropriate Normal Configuration Landing Distance or Non-Normal Configuration Landing Distance.

## Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and runways with good, good to medium, medium, medium to poor, and poor reported braking action. Landing distances (reference distances plus adjustments) are 115% of the actual landing distance. The Normal Configuration Landing Distance tables should be used enroute to make a landing distance assessment for time of arrival.

The reference landing distance is the distance from threshold to complete stop. It includes an air distance allowance from threshold to touchdown associated with a flare time of 7 seconds. The reference distance is based on a reference landing weight and speed at sea level, standard day, zero wind, zero slope, two engine detent No. 2 reverse thrust, and auto or manual speedbrakes.

To use these tables, determine the reference landing distance for the selected braking configuration and reported braking action. Adjust this reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers. Each correction is applied independently to the reference landing distance.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" reported braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. It cannot be determined quickly when this will become a factor, therefore it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

## Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing. Landing distances and adjustments are provided for dry runways and runways with good, good-to-medium, medium, medium-to-poor, and poor reported braking action. Landing distances (reference distances plus adjustments) are representative of the actual landing distance, and are not factored. The Non-Normal Configuration Landing Distance tables should be used enroute to make a landing distance assessment for time of arrival.

The reference landing distance is the distance from threshold to complete stop. It includes an air distance allowance from threshold to touchdown associated with a flare time of 7 seconds. The reference distance is based on a reference landing weight and speed at sea level, standard day, zero wind, zero slope, and maximum available reverse thrust.

Tables for Non-Normal Configuration Landing Distance in this section are similar in format and used in the same manner as tables for the Normal Configuration Landing Distance previously described.

For an engine inoperative landing, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

## Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the Reference Brake Energy table (Table 1) with the airplane weight and brakes on speed, adjusted for wind, at the appropriate temperature and altitude condition. Instructions for applying wind adjustments are included below the table. Linear interpolation may be used to obtain intermediate values. The resulting number is the reference brake energy per brake in millions of foot-pounds, and represents the amount of energy absorbed by each brake during a rejected takeoff.

To determine the energy per brake absorbed during landing, enter the Event Adjusted Brake Energy table (Table 2) for no reverse thrust or 2 engine reverse thrust with the reference brake energy per brake and the type of braking used during landing (Max Manual, Max Auto, or Autobrake). The resulting number is the adjusted brake energy per brake and represents the energy absorbed in each brake during the landing. The recommended cooling time is found in the final table (Table 3) by entering with the adjusted brake energy per brake. Times are provided for ground cooling and inflight gear down cooling.

Brake Temperature Monitor System (BTMS) indications are also shown. If brake cooling is determined from the BTMS, use the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted to determine recommended cooling schedule.

# Engine Inoperative

## Initial Max Continuous %N1

The Initial Max Continuous %N1 setting for use following an engine failure is shown. The table is based on the typical all engine cruise speed of .79 Mach to provide a target %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 table should be used to determine %N1 for the given conditions.

## Max Continuous %N1

Power setting is based on one engine operating with one A/C pack operating and all anti-ice bleeds off. Enter the table with pressure altitude, TAT, and IAS or Mach to read %N1. Power settings may be interpolated for intermediate airspeeds. %N1 bleed corrections are provided per pressure altitude.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

## Driftdown Speed/Level Off Altitude

The table shows optimum driftdown speed as a function of cruise weight at start of driftdown. Also shown are the approximate weight and pressure altitude at which the airplane will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

## Driftdown/LRC Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table (Table 1) with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table (Table 2) with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

## Long Range Cruise Altitude Capability

The table shows the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

## Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

## APU Operation During Flight

For APU operation during flight, increase fuel flow according to the following table. These increments include the APU fuel flow and the effect of increased drag from the APU door.

| PRESSURE ALTITUDE (1000 FT) | APU FUEL FLOW (KG/HR) |
|---|---|
| 39 | 45 |
| 35 | 45 |
| 31 | 50 |
| 25 | 60 |
| 20 | 65 |
| 15 | 75 |
| 10 | 85 |
| 5 | 95 |

## Long Range Cruise Diversion Fuel and Time

Tables are provided for crews to determine the fuel and time required to proceed to an alternate airfield with one engine inoperative. The data is based on single engine Long Range Cruise speed and .78/280/250 descent.

To determine the remaining fuel and time required, first enter the Ground to Air Miles Conversion table (Table 1) to convert ground distance and enroute wind to an equivalent still air distance. Next, enter the Reference Fuel and Time table (Table 2) with air distance from Table 1 and the desired altitude and read reference fuel and time required. Lastly, enter the Fuel Required Adjustment table (Table 3) with the reference fuel and the actual weight at checkpoint to obtain fuel required to destination.

## Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

## Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative landing (manual or autoland) is planned. The tables show gear down rate of climb available for Flaps 15 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

# Alternate Mode EEC

## Introduction

This section contains performance data for airplane operation with the Electronic Engine Control (EEC) in the alternate mode (ALTN EEC switch illuminated) for applicable thrust ratings. The data includes engine bleed effects for normal air conditioning operation i.e., two packs on at normal flow all engines operating.

Operation with assumed temperature reduced thrust is not permitted with the EEC in the alternate mode.

## Limit Weight

A simplified method which conservatively accounts for the effects of EEC in the ALTERNATE mode is to reduce the normal mode performance limited weights. The Limit Weight table provides takeoff field, climb, obstacle, tire speed and brake energy weights. No adjustment is necessary for weight limits not shown. To determine limit weights for operations with the EEC in the ALTERNATE mode, enter the table with each of the limit weights for normal mode EEC operation and read the associated limit weight for each performance condition. The most limiting of the takeoff weights must be used.

Derated or reduced takeoff thrust takeoffs are not allowed with the EEC in the ALTERNATE mode. Adjustments to the limit weights provided in this section are not valid for takeoffs using improved climb. Likewise, adjustments to the limit weights are not valid for takeoffs with a contaminated runway. Analysis from the Airplane Flight Manual - Digital Performance Information may yield less restrictive limit weights.

## Takeoff Speed Adjustment

Takeoff speeds computed for the reduced weight need no further adjustment.

## Max Takeoff %N1

To find alternate mode EEC Max Takeoff %N1 based on normal engine bleed for air conditioning packs on, enter the Alternate Mode EEC Max Takeoff %N1 table with airport pressure altitude and airport OAT and read %N1. Apply %N1 adjustments as provided when applicable.

## Max Climb %N1

To find alternate mode EEC Max Climb %N1 based on normal engine bleed for air conditioning packs on, enter the Alternate Mode EEC Max Climb %N1 table with airport pressure altitude and TAT and read %N1. Apply %N1 adjustments as provided when applicable.

## Go-Around %N1

Go-Around power setting for ALTERNATE MODE EEC operation is presented for bleed packs on (AUTO) and anti-ice off. Go-Around %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The ALTERNATE MODE EEC schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

# Alternate Mode EEC, Engine Inoperative

## Initial Max Continuous %N1

Initial Max Continuous %N1 settings for use following an engine failure are presented. The table is based on the typical all engine cruise speed of .79 Mach to provide a target %N1 setting at the start of driftdown. Once driftdown is established, the Max Continuous %N1 table should be used to determine %N1 for the given conditions.

## Max Continuous %N1

Power setting is based on one engine operating with one A/C pack operating and all anti-ice bleeds off. Enter the table with pressure altitude, TAT, and IAS or Mach to read %N1. Power settings may be interpolated for intermediate airspeeds. %N1 bleed corrections are provided per pressure altitude.

It is desirable to maintain engine thrust level within the limits of the Max Cruise thrust rating. However, where thrust level in excess of Max Cruise rating is required, such as for meeting terrain clearance, ATC altitude assignments, or to attain maximum range capability, it is permissible to use the thrust needed up to the Max Continuous thrust rating. The Max Continuous thrust rating is intended primarily for emergency use at the discretion of the pilot and is the maximum thrust that may be used continuously.

## Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight.

**Note:** The Flight Management System (FMS) does not contain special provisions for operation with landing gear extended. As a result, the FMS will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. An accurate estimated time of arrival is available if current speed or Mach is entered into the VNAV cruise page. Estimates of fuel remaining at waypoints or the destination may be computed by the crew based on current fuel flow indications, but should be updated frequently.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.

## Gear Down, Engine Inoperative

This section contains performance for airplane operation with the landing gear extended for use following an engine failure.

The caution provided in the Gear Down section for use of the FMS in a gear down situation is still applicable.

Tables for gear down, engine inoperative performance in this section are identical in format and used in the same manner as tables for the gear up, engine inoperative configuration previously described.