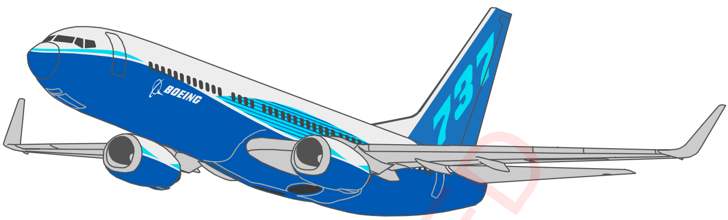

737-800

Flight Crew Operations Manual

flydubai

Document Number D6-27370-8KN-JXB

Revision Number: 29

Revision Date: October 15, 2021

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General

The aircraft listed in the table below are covered in the 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 number is 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.

Line Number	Registry Number	Serial Number	Tabulation Number
4081	A6-FDZ	40253	YR017
4096	A6-FEA	40254	YR018
4216	A6-FEB	40255	YR019
4243	A6-FEC	40256	YR020
4277	A6-FED	40257	YR021
4433	A6-FEE	40258	YR022
4467	N-402FP	40259	YR023
4534	A6-FEG	40281	YR024
4648	A6-FEH	40260	YR025
4671	A6-FEI	40261	YR026
4699	A6-FEJ	40262	YR027
4738	A6-FEK	40282	YR028
4781	A6-FEL	40263	YR029
4979	A6-FEN	40265	YR030

Line Number	Registry Number	Serial Number	Tabulation Number
4988	A6-FEM	40264	YR031
5004	A6-FEO	40266	YR032
5083	A6-FEP	40269	YR033
5117	A6-FEQ	40267	YR034
5163	A6-FER	40268	YR035
5187	A6-FES	40270	YR036
5241	A6-FET	40271	YR037
5285	A6-FEU	40273	YR038
5323	A6-FEV	40275	YR039
5364	A6-FEW	40276	YR040
5397	A6-FEX	40278	YR041
5465	A6-FEY	40274	YR042
5553	A6-FEZ	40272	YR044
5887	A6-FGA	60954	YR045
5950	A6-FGB	60955	YR046
6004	A6-FGC	60956	YR047
6042	A6-FGD	60957	YR048
6069	A6-FGE	60958	YR049
6116	A6-FGF	60959	YR050
6175	A6-FGG	60960	YV391
6201	A6-FGH	60961	YV392
6277	A6-FGI	60962	YV393
6351	A6-FGJ	60963	YV394

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 Service 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.
- 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.

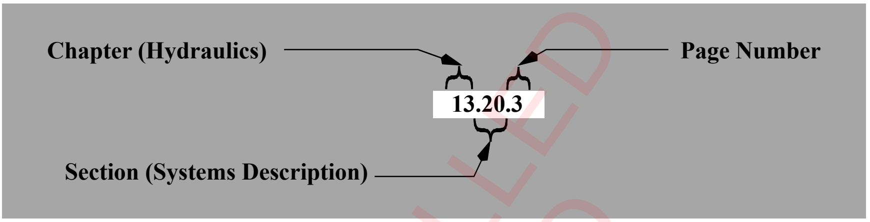
Volume 2 – Chapters 1 through 15 contain general airplane and systems information. These chapters are generally subdivided into sections covering controls and indicators and systems descriptions.

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.

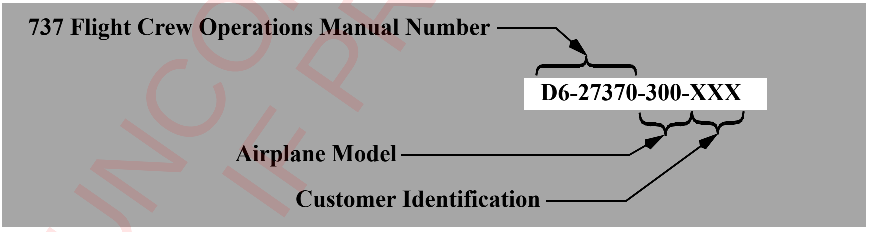
Example Page Number



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.....).

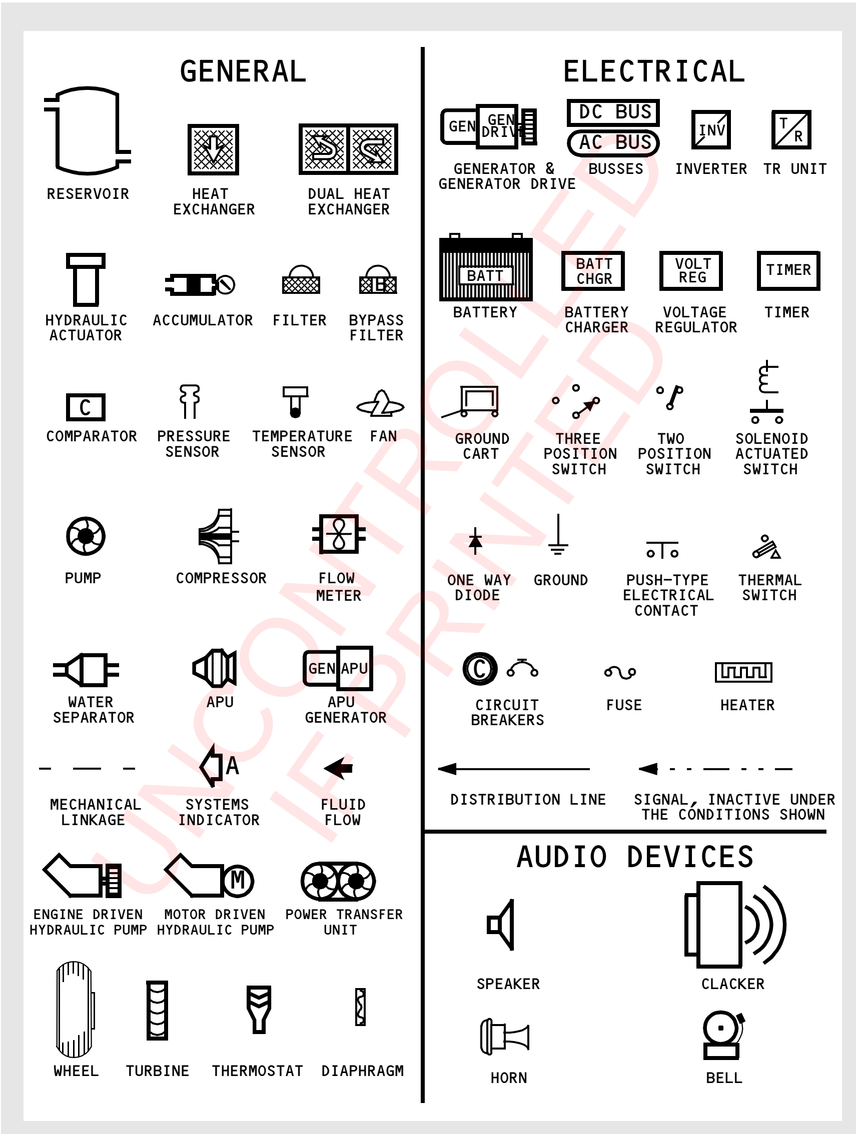
When airplane effectivities are centered immediately below a checklist title, the entire checklist applies to the listed airplanes. In the following example, the PACK checklist is applicable to YZ008 - YZ014 only:

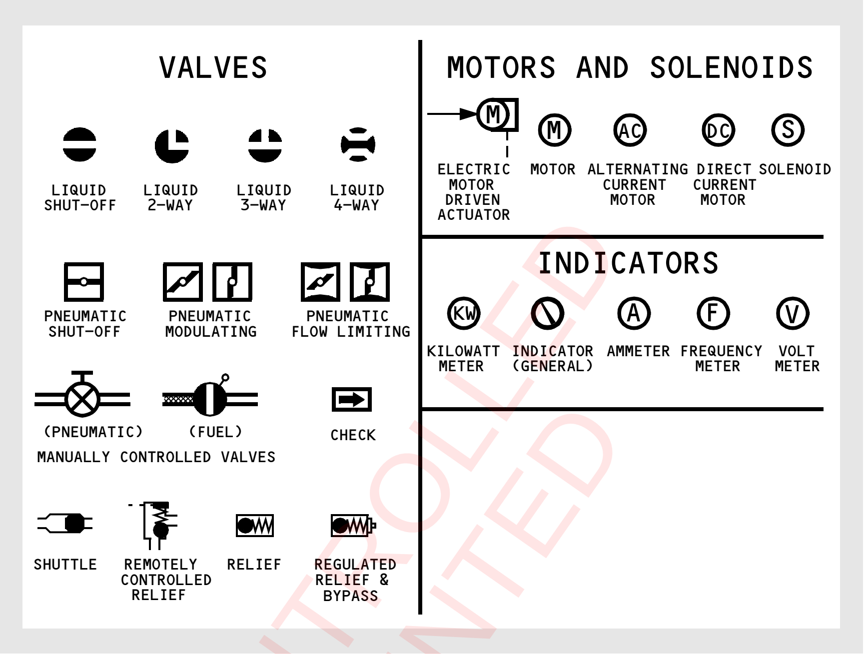
PACK

YZ008 - YZ014

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. The abbreviations are general in nature and may or may not apply to a customer's airplane configuration.

A	
A/P	Autopilot
A/T	Autothrottle
AC	Alternating Current
ACARS	Aircraft Communications Addressing and Reporting System
ACP	Audio Control Panel
ACQ	Acquire
ACT	Active
ADF	Automatic Direction Finder
ADIRU	Air Data Inertial Reference Unit
ADM	Air Data Module
ADS-B	Automatic Dependent Surveillance-Broadcast
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
AOR	Area of Responsibility
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 Celsius Center
CANC/ RCL	Cancel/Recall
CB	Circuit Breaker
CDFA	Continuous Descent Final Approach
CDU	Control Display Unit
CG	Center of Gravity
CHKL	Checklist
CLB	Climb
COMM	Communication
CON	Continuous
CONFIG	Configuration
CRZ	Cruise
CTL	Control
D	
DA	Decision Altitude
DDA	Derived Decision Altitude
DC	Direct Current

DDG	Dispatch Deviations Guide
DEP ARR	Departure Arrival
DES	Descent
DEU	Display Electronics Unit
DISC	Disconnect
DME	Distance Measuring Equipment
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
EOSID	Engine Out Standard Instrument Departure
EXEC	Execute
EXT	Extend

F	
F	Fahrenheit
F/D or FLT DIR	Flight Director
F/O	First Officer
FA	Flight Attendant
FAF	Final Approach Fix
FAP	Final Approach Point
FAS	Final Approach Segment
FCC	Flight Control Computer
FCTL	Flight Control
FCTM	Flight Crew Training Manual
FFM	Force Fight Monitor
FL	Flight Level
FMA	Flight Mode Annunciation
FMC	Flight Management Computer
FMS	Flight Management System
FPA	Flight Path Angle
FPV	Flight Path Vector
FSEU	Flap Slat Electronic Unit
G	
G/P	Glide Path
G/S	Glide Slope
GA	Go-Around
GBAS	Ground-Based Augmentation System
GEN	Generator
GLS	GBAS Landing 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	
IAN	Integrated Approach Navigation
IAP	Instrument Approach Procedure
IAS	Indicated Airspeed
IAW	In Accordance With
IDENT	Identification
ILS	Instrument Landing System
IMMR	Integrated Multi-Mode Receiver
IN	Inches
INBD	Inboard
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
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
MCP	Mode Control Panel
MDA	Minimum Descent Altitude
MEL	Minimum Equipment List
MFD	Multifunction Display
MIN	Minimum
MKR	Marker
MMO	Maximum Mach Operating Speed
MOD	Modify
MTRS	Meters
MVA	Minimum Vectoring Altitude
MX	Maintenance
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
NPS	Navigation Performance Scales
O	
OHU	Overhead Unit
OPT	Onboard Performance Tool
OVHD	Overhead
OVRD	Override
P	
PASS	Passenger
PCU	Power Control Unit
PERF INIT	Performance Initialization
PF	Pilot Flying
PFC	Primary Flight Computers
PIC	Pilot In Command
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
S	
S/C	Step Climb
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	
UPR DSPL	Upper Display
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
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 flydubai 737 Flight Crew Operations Manual (FCOM), Boeing Document Number D6-27370-8KN-JXB.

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	Date Filed	No.	Revision Date	Date Filed
14	March 31, 2016		15	September 15, 2016	
16	March 16, 2017		17	September 14, 2017	
18	March 15, 2018		19	May 17, 2018	
20	September 20, 2018		21	March 21, 2019	
22	September 19, 2019		23	March 19, 2020	
24	September 17, 2020		25	October 30, 2020	
26	March 18, 2021		27	May 1, 2021	
28	September 2, 2021		29	October 15, 2021	

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.

Performance Data:

The Table of Contents designator for the Alternate Deceleration Rate option selection has been updated from AB4 to ALT-AB to more correctly align with the option description and the associated performance data changes. This change will cause the publishing system to identify each performance package affected as new even when the section existed previously. Revision information for other changes will still be included.

Chapter L - Limitations

Section 10 - Limitations and Operational Information

Autopilot/Flight Director System

L.10.4 - Deleted Minimum Use Height of 158 ft AGL for single channel autopilot operation.

L.10.5 - Deleted maximum allowable CAT II landing wind speeds. Wind speed was applicable to airplanes operating under EASA rules.

Engines and APU

L.10.6 - Deleted APU limitation no longer applies. Limitation was applicable to airplanes operating under EASA rules.

Flight Controls

L.10.7 - Deleted flaps restriction no longer applies. Restriction was applicable to airplanes operating under EASA rules.

Landing Gear

L.10.8 - Deleted towing restriction. Restriction was applicable to airplanes operating under EASA rules.

Chapter NP - Normal Procedures

Section 21 - Amplified Procedures

Preliminary Preflight Procedure – Captain or First Officer

NP.21.1 - Deleted step "VOICE RECORDER switch . . . As needed".

Preflight Procedure – Captain

NP.21.23 - Deleted step "Standby RMI . . . Set"

Go–Around and Missed Approach Procedure

NP.21.49 - Revised to move step order.

NP.21.49 - Revised step to "Call "FLAPS 15" or "FLAPS ___" as needed.

NP.21.49 - Revised step to "Verify the rotation to go-around attitude."

Chapter SP - Supplementary Procedures

Section 4 - Automatic Flight

Instrument Approach - RNAV (RNP) AR

SP.4.8 - Deleted Warning "If an UNABLE REQD NAV . . . is established and maintained." In U14, the UNABLE REQD NAV PERF - RNP message logic is updated to also alert for divergence in IRU-L/IRU-R altitude or inertial vertical speed, when operating in approach navigation phase, VNAV is in descent, and the aircraft is on an RNP-AR approach leg. The UNABLE REQD NAV PERF-RNP alert could be annunciated for RNP AR approach when the IRS divergence condition is detected while ANP is less than the displayed RNP.

Section 5 - Communications

Cockpit Voice Recorder Test

SP.5.1 - Deleted instruction "The Cockpit VOICE RECORDER switch must be in the ON position or at least one engine must be operating to perform this test." for aircraft with the optional Voice Recorder switch.

Section 6 - Electrical

Provided standard Standby Power Test procedure for fleets consisting exclusively of airplanes equipped with Boeing-installed supplemental batteries.

Section 16 - Adverse Weather

Cold Weather Operations

SP.16.17 - Deleted bullet beginning "batteries removed. If the batteries will be exposed to temperatures . . . " for aircraft with dual batteries.

Performance Package 10
737-800WSFP1 CFM56-7B27B1 C KG M FAA CATC/N (FMC Model 737-800W.1) TALPA

Section 10 - Pkg Model Identification

737-800WSFP1 CFM56-7B27B1 C KG M FAA CATC/N (FMC Model 737-800W.1) TALPA moved from Section 20 to 10.

Section 10 - Takeoff

737-800WSFP1 CFM56-7B27B1 C KG M FAA CATC/N (FMC Model 737-800W.1) TALPA moved from Section 20 to 10.

Section 11 - Enroute

Section "21" moved to "11".

Flight Crew Oxygen Requirements

PD.11.7 - Removed empty space. No data change.

Section 12 - Landing

Section "22" moved to "12".

Section 13 - Gear Down

Section "23" moved to "13".

Section 14 - Text

Section "24" moved to "14".

Performance Package 10
737-800WSFP1 CFM56-7B27B1 C KG M FAA CATC/N (FMC Model 737-800W.1) TALPA

Section 10 - Pkg Model Identification

737-800WSFP1 CFM56-7B27B1 C KG M FAA CATC/N (FMC Model 737-800W.1) TALPA moved from Section 20 to 10.

Section 10 - General

737-800WSFP1 CFM56-7B27B1 C KG M FAA CATC/N (FMC Model 737-800W.1) TALPA moved from Section 20 to 10.

Section 11 - All Engine

Section "21" moved to "11".

Section 12 - Advisory Information

Section "22" moved to "12".

Section 13 - Engine Inoperative

Section "23" moved to "13".

Section 14 - Alternate Mode EEC

Section "24" moved to "14".

Section 15 - Gear Down

Section "25" moved to "15".

Section 16 - Gear Down, Engine Inop

Section "26" moved to "16".

Section 17 - Text

Section "27" moved to "17".

Chapter 1 - Airplane General, Emergency Equipment, Doors, Windows

Section 20 - Instrument Panels

Auxiliary Panels

1.20.15 - Deleted Attendant Panels title.

Section 40 - Systems Description

Lighting Systems

1.40.6 - Deleted text, and a table which describe the photoluminescent lighting system.

1.40.6 - Deleted text, and a table which describe the photoluminescent lighting system with blue strips.

Chapter 4 - Automatic Flight

Section 10 - Controls and Indicators

Flight Mode Annunciations (FMAs)

4.10.23 - Deleted Block Point 06 and below software configuration.

Chapter 5 - Communications

Section 10 - Controls and Indicators

Audio Control Panel (ACP)

5.10.6 - Changed description for cross-model consistency.

Cockpit Voice Recorder

5.10.12 - Deleted paragraph for aircraft with Automatic Off option enabled on cockpit voice recorder.

5.10.13 - Deleted Callout describing cockpit voice recorder TEST Light operation.

5.10.13 - Deleted Voice recorder Switch per fleet configuration.

Chapter 6 - Electrical

Section 10 - Controls and Indicators

Electrical Panel

6.10.1 - Deleted single battery electrical graphic.

AC and DC Metering Panel

6.10.2 - Deleted dual battery ac and dc metering panel graphic.

Section 20 - System Description

Introduction

6.20.1 - Deleted information on dual aircraft battery configuration.

Electrical Power Generation

6.20.2 - Deleted illustration "Electric Power Schematic".

Electrical Power Controls and Monitoring

6.20.7 - Deleted illustration "Electrical Power Controls and Monitoring Schematic".

DC Power System

6.20.8 - Deleted information on dual aircraft battery configuration.

6.20.9 - Deleted section to delete customer originated data.

6.20.10 - Added dual battery DC power system schematic.

Standby Power System

6.20.11 - Added bullet referencing auxiliary battery.

6.20.11 - Added information on single aircraft battery configuration.

6.20.13 - Added Standby Power System Schematic.

6.20.14 - Added dual battery information.

6.20.15 - Deleted flight instruments from the list of equipment powered with all generators inoperative.

6.20.16 - Deleted Captain panel equipment operating with all generators inoperative to reflect fleet configuration.

Chapter 7 - Engines, APU

Section 30 - APU System Description

APU Operation

7.30.2 - Deleted APU battery start uses main battery only after incorporating SB 737-24-1120.

Chapter 9 - Flight Controls

Section 10 - Controls and Indicators

Rudder

9.10.7 - Deleted graphic for aircraft with Yaw Damper indicator on Center Forward Panel.

9.10.7 - Deleted information on Yaw Damper indicator.

Section 20 - System Description

Yaw Control

9.20.12 - Deleted paragraph "Either yaw damper is capable . . . The pilot can . . . rudder pedals or trim inputs."

Flaps and Slats

9.20.17 - Deleted text with regards to regulatory requirements.

Chapter 10 - Flight Instruments, Displays

Section 11 - PFD/ND – Displays

PFD – Attitude Indications

10.11.14 - Deleted for CDS Block point software configuration change.

10.11.15 - Deleted for CDS Block point software configuration change.

PFD Failure Flags

10.11.26 - Deleted illustration of PFD failure flags when RA is below ADI and equipped with IAN.

PFD Annunciations and Alerts

10.11.29 - Deleted CDS Block point 06 or below software configuration.

Section 16 - PFD/ND – Controls and Indicators

Standby Flight Instruments

10.16.11 - Deleted bullet about standby radio magnetic indicator.

10.16.15 - Deleted section for the Standby Radio Magnetic Indicator.

Section 21 - PFD/ND – System Description

DISPLAYS SOURCE Panel

10.21.2 - Deleted to reflect fleet configuration.

Standby Flight Instruments

10.21.14 - Deleted bullet for the standby radio magnetic indicator no longer applicable to fleet.

10.21.15 - Added section describing Standby Radio Magnetic Indicator.

Aircraft Condition Monitoring System (ACMS)

10.21.16 - Deleted quick access recorder.

Section 42 - Head-Up Display System, Symbology

Head-Up Guidance Display Symbology

10.42.17 - Deleted Roll alerting configuration option.

Chapter 11 - Flight Management, Navigation

Section 10 - Controls and Indicators

Radio Navigation Systems

11.10.18 - Deleted standby RMI indicator.

11.10.18 - Deleted standby RMI indicator.

11.10.19 - Deleted standby RMI indicator.

Section 20 - Navigation Systems Description

Radio Navigation Systems

11.20.7 - Deleted dual ADF receivers.

11.20.7 - Deleted reference to ADF bearing pointers on the DU's and RMI.

11.20.9 - Deleted Boeing Standby RMI Indicator.

Section 31 - Flight Management System Operation

Navigation Position

11.31.8 - Deleted FMC Update U14and above for RNP

Vertical Navigation (VNAV)

11.31.23 - Deleted information for path descent speed intervention for FMC U14 and above.

Section 40 - FMC Preflight

Preflight Pages

11.40.7 - Deleted FMC U14.0 configuration.

11.40.10 - Deleted for FMC U13 and below description for position initialization..

11.40.18 - Deleted FMC U14.0 and above VIA functionality.

11.40.31 - Deleted non-aspirated TAT probe without thrust bump and with FMC U14.0 and above.

Section 42 - FMC Cruise

LNAV Modifications

11.42.10 - Deleted airway to airway intercept statement.

VNAV Modifications

11.42.18 - Deleted paragraph for VNAV operation.

11.42.19 - Deleted FMC U14 software.

Section 60 - FMC Messages

FMC Alerting Messages

11.60.7 - Deleted MISSED CAPTURE removal text for FMC U14 and above.

11.60.12 - Deleted for FMC Update U14 and above which includes additional conditions for IRU and IRS on RNP-AR approach.

11.60.12 - Deleted for FMC Update U14 and above which includes additional conditions for IRU and IRS on RNP-AR approach.

FMC Advisory Messages

11.60.19 - U13 and below LOC CAP ACTIVE message.

11.60.20 - U13 and below LOC CAP Steering

FMC Data Link Messages

11.60.24 - Deleted U14.0 and later FMC Alerting Message ATC DATABASE INVALID.

Chapter 12 - Fuel

Section 10 - Controls and Indicators

Fuel Alert Indications

12.10.5 - Deleted aircraft with CDS Software upgrade Block 02, 04, 06 or 99.

Chapter 15 - Warning Systems

Section 10 - Controls and Indicators

Fire Warning and Master Caution System

15.10.1 - Added Fire Warning and Master Caution System callout number one per customer request.

Section 20 - System Description

Master Caution Lights

15.20.4 - Added annunicator content.

15.20.4 - Added annunicator content.

15.20.4 - Added annunicator content.

Intentionally
Blank

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Model Identification

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Revision Record (tab)

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	NP.21.19	May 1, 2021
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	NP.21.21	May 1, 2021
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* SP.16.25	October 15, 2021
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Performance Dispatch (tab)

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* PI.17.2	October 15, 2021
* PI.17.3	October 15, 2021
* PI.17.4	October 15, 2021
* PI.17.5	October 15, 2021
* PI.17.6	October 15, 2021
* PI.17.7	October 15, 2021
* PI.17.8	October 15, 2021
* PI.17.9	October 15, 2021
* PI.17.10	October 15, 2021
* PI.17.11	October 15, 2021
* PI.17.12	October 15, 2021
* PI.17.13	October 15, 2021
* PI.17.14	October 15, 2021

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* = Revised, Added, or Deleted

Volume 2

1 Airplane General, Emergency Equipment, Doors, Windows (tab)

	Page	Date
*	1.TOC.1-4	October 15, 2021
	1.10.1	March 19, 2020
	1.10.2	September 15, 2016
	1.20.1	April 24, 2009
	1.20.2	September 30, 2011
	1.20.3	April 24, 2009
	1.20.4	March 18, 2011
	1.20.5	April 24, 2009
	1.20.6	March 19, 2020
	1.20.7	March 19, 2020
	1.20.8	April 24, 2009
	1.20.9	April 24, 2009
	1.20.10	April 24, 2009
*	1.20.11	October 15, 2021
	1.20.12	September 17, 2020
	1.20.13	March 31, 2016
	1.20.14	March 31, 2016
*	1.20.15	October 15, 2021
*	1.20.16	October 15, 2021
*	1.20.17	October 15, 2021
*	1.20.18	October 15, 2021
*	1.20.19-20	Deleted
	1.30.1	April 24, 2009
	1.30.2	September 17, 2020
	1.30.3	March 16, 2017
	1.30.4	September 26, 2013
*	1.30.5	October 15, 2021
	1.30.6	March 16, 2017
	1.30.7	September 24, 2015
	1.30.8	September 24, 2015
	1.30.9	September 24, 2015
	1.30.10	September 24, 2015
	1.30.11	September 24, 2015
	1.30.12	September 24, 2015
*	1.30.13	October 15, 2021
	1.30.14	May 17, 2018
	1.30.15	May 17, 2018
	1.30.16	May 17, 2018
	1.30.17	October 30, 2020
	1.30.18	October 30, 2020
	1.30.19	May 17, 2018
	1.30.20	May 17, 2018
	1.30.21	September 2, 2021
	1.30.22	May 17, 2018
*	1.40.1	October 15, 2021
*	1.40.2	October 15, 2021
*	1.40.3	October 15, 2021
	1.40.4	September 17, 2020
	1.40.5	March 31, 2016
*	1.40.6	October 15, 2021
*	1.40.7	October 15, 2021
*	1.40.8	October 15, 2021
*	1.40.9	October 15, 2021
*	1.40.10	October 15, 2021
*	1.40.11	October 15, 2021
*	1.40.12	October 15, 2021
*	1.40.13	October 15, 2021
*	1.40.14	October 15, 2021
*	1.40.15	October 15, 2021
*	1.40.16	October 15, 2021
*	1.40.17	October 15, 2021
*	1.40.18	October 15, 2021
*	1.40.19	October 15, 2021
*	1.40.20	October 15, 2021
*	1.40.21	October 15, 2021
*	1.40.22	October 15, 2021
*	1.40.23	October 15, 2021
*	1.40.24	October 15, 2021
*	1.40.25-32	Deleted
*	1.40.33-34	Deleted
*	1.40.25	October 15, 2021
*	1.40.26	October 15, 2021
*	1.40.35-36	Deleted
*	1.40.27	October 15, 2021
*	1.40.28	October 15, 2021
*	1.40.37-54	Deleted
*	1.40.29	October 15, 2021
*	1.40.30	October 15, 2021
*	1.40.31	October 15, 2021
*	1.40.32	October 15, 2021
*	1.40.33	October 15, 2021
*	1.40.34	October 15, 2021
*	1.40.35	October 15, 2021
*	1.40.36	October 15, 2021
*	1.40.37	October 15, 2021
*	1.40.38	October 15, 2021
*	1.40.39	October 15, 2021
*	1.40.40	October 15, 2021

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	Page	Date
*	1.40.41	October 15, 2021
*	1.40.42	October 15, 2021
*	1.40.43	October 15, 2021
*	1.40.44	October 15, 2021
*	1.40.45	October 15, 2021
*	1.40.46	October 15, 2021

2 Air Systems (tab)

	Page	Date
	2.TOC.1-2	May 1, 2021
	2.10.1	September 27, 2012
	2.10.2	March 28, 2013
	2.10.3	March 18, 2011
	2.10.4	March 21, 2019
	2.10.5	March 21, 2019
	2.10.6	April 24, 2009
	2.10.7	March 21, 2019
*	2.10.8	October 15, 2021
	2.10.9	May 1, 2021
	2.10.10	September 14, 2017
	2.10.11	September 26, 2013
	2.10.12	September 26, 2013
	2.20.1	May 1, 2021
	2.20.2	May 1, 2021
	2.20.3	May 1, 2021
	2.20.4	March 31, 2016
	2.31.1	September 19, 2019
	2.31.2	September 19, 2019
	2.31.3	September 19, 2019
	2.31.4	September 19, 2019
	2.31.5	September 19, 2019
	2.31.6	September 19, 2019
	2.31.7	September 19, 2019
	2.31.8	September 19, 2019
	2.40.1	April 24, 2009
	2.40.2	April 24, 2009
	2.40.3	March 31, 2016
	2.40.4	September 30, 2011
	2.40.5	September 30, 2011
	2.40.6	May 1, 2021

3 Anti-Ice, Rain (tab)

	Page	Date
	3.TOC.1-2	March 16, 2017
	3.10.1	September 30, 2011
	3.10.2	September 30, 2011
	3.10.3	September 15, 2016
	3.10.4	March 19, 2020
	3.10.5	March 31, 2016
	3.10.6	March 31, 2016
	3.20.1	March 16, 2017
	3.20.2	March 16, 2017
*	3.20.3	October 15, 2021
	3.20.4	March 16, 2017
	3.20.5	March 26, 2015
	3.20.6	March 26, 2015
	3.20.7	March 26, 2015
	3.20.8	March 26, 2015

4 Automatic Flight (tab)

	Page	Date
	4.TOC.1-2	March 15, 2018
	4.10.1	September 20, 2018
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	4.10.3	March 28, 2013
	4.10.4	September 30, 2011
	4.10.5	September 30, 2011
	4.10.6	September 30, 2011
	4.10.7	September 26, 2013
	4.10.8	September 26, 2013
	4.10.9	September 20, 2018
	4.10.10	September 20, 2018
*	4.10.11	October 15, 2021
	4.10.12	March 19, 2020
	4.10.13	September 20, 2018
*	4.10.14	October 15, 2021
*	4.10.15	October 15, 2021
*	4.10.16	October 15, 2021
	4.10.17	September 20, 2018
	4.10.18	March 15, 2018
*	4.10.19	October 15, 2021
	4.10.20	March 15, 2018
	4.10.21	March 15, 2018
*	4.10.22	October 15, 2021
*	4.10.23	October 15, 2021
	4.10.24	September 15, 2016
	4.20.1	April 24, 2009
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	4.20.3	March 15, 2018
*	4.20.4	October 15, 2021
	4.20.5	March 31, 2016
	4.20.6	March 21, 2019
	4.20.7	March 31, 2016
	4.20.8	September 2, 2021
	4.20.9	March 31, 2016
	4.20.10	September 14, 2017
	4.20.11	September 14, 2017

* = Revised, Added, or Deleted

	4.20.12	September 19, 2019
	4.20.13	September 19, 2019
*	4.20.14	October 15, 2021
	4.20.15	March 15, 2018
*	4.20.16	October 15, 2021
*	4.20.17	October 15, 2021
	4.20.18	March 15, 2018
	4.20.19	March 31, 2016
	4.20.20	March 31, 2016
	4.20.21	September 19, 2019
	4.20.22	March 16, 2017
	4.20.23	March 16, 2017
	4.20.24	March 16, 2017
	4.20.25	March 15, 2018
	4.20.26	March 16, 2017
*	4.20.27	October 15, 2021
*	4.20.28	October 15, 2021

5 Communications (tab)

*	5.TOC.1-2	October 15, 2021
*	5.10.1	October 15, 2021
*	5.10.2	October 15, 2021
*	5.10.3	October 15, 2021
*	5.10.4	October 15, 2021
	5.10.5	March 15, 2018
*	5.10.6	October 15, 2021
*	5.10.7	October 15, 2021
	5.10.8	March 21, 2019
	5.10.9	March 21, 2019
	5.10.10	March 21, 2019
	5.10.11	March 21, 2019
*	5.10.12	October 15, 2021
*	5.10.13	October 15, 2021
*	5.10.14	October 15, 2021
*	5.10.15	October 15, 2021
*	5.10.16	October 15, 2021
	5.20.1	September 17, 2020
	5.20.2	September 17, 2020
*	5.20.3	October 15, 2021
	5.20.4	May 1, 2021
*	5.20.5	October 15, 2021
	5.20.6	September 19, 2019
	5.20.7	September 17, 2020
	5.20.8	March 16, 2017

6 Electrical (tab)

*	6.TOC.1-2	October 15, 2021
*	6.10.1	October 15, 2021
*	6.10.2	October 15, 2021
*	6.10.3	October 15, 2021
*	6.10.4	October 15, 2021
*	6.10.5	October 15, 2021
*	6.10.6	October 15, 2021
*	6.10.7	October 15, 2021
*	6.10.8	October 15, 2021
*	6.10.9	October 15, 2021
*	6.10.10	October 15, 2021
*	6.10.11-12	Deleted
*	6.20.1	October 15, 2021
*	6.20.2	October 15, 2021
*	6.20.3	October 15, 2021
*	6.20.4	October 15, 2021
*	6.20.5	October 15, 2021
*	6.20.6	October 15, 2021
*	6.20.7	October 15, 2021
*	6.20.8	October 15, 2021
*	6.20.9	October 15, 2021
*	6.20.10	October 15, 2021
*	6.20.11	October 15, 2021
*	6.20.12	October 15, 2021
*	6.20.13	October 15, 2021
*	6.20.14	October 15, 2021
*	6.20.15	October 15, 2021
*	6.20.16	October 15, 2021
*	6.20.17	October 15, 2021
*	6.20.18	October 15, 2021
*	6.20.19-24	Deleted

7 Engines, APU (tab)

*	7.TOC.1-4	October 15, 2021
	7.11.1	March 19, 2020
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	7.11.3	September 2, 2021
	7.11.4	September 2, 2021
	7.11.5	September 2, 2021
	7.11.6	September 2, 2021
	7.11.7	September 2, 2021
	7.11.8	September 2, 2021
	7.11.9	March 19, 2020
	7.11.10	March 19, 2020
	7.11.11	March 19, 2020
	7.11.12	October 30, 2020
	7.11.13	October 30, 2020
	7.11.14	March 19, 2020

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	7.11.15	September 17, 2020
	7.11.16	September 17, 2020
	7.15.1	April 24, 2009
	7.15.2	September 15, 2016
	7.15.3	March 31, 2016
*	7.15.4	October 15, 2021
	7.15.5	March 16, 2017
	7.15.6	March 16, 2017
	7.15.7	September 14, 2017
	7.15.8	September 14, 2017
	7.15.9	September 14, 2017
	7.15.10	September 14, 2017
	7.20.1	March 19, 2020
	7.20.2	March 19, 2020
	7.20.3	March 19, 2020
	7.20.4	September 2, 2021
	7.20.5	September 2, 2021
	7.20.6	March 31, 2016
	7.20.7	March 31, 2016
	7.20.8	March 31, 2016
	7.20.9	March 31, 2016
	7.20.10	March 16, 2017
*	7.20.11	October 15, 2021
	7.20.12	March 16, 2017
	7.20.13	March 31, 2016
	7.20.14	September 19, 2019
	7.20.15	March 31, 2016
	7.20.16	March 31, 2016
	7.30.1	September 26, 2013
*	7.30.2	October 15, 2021
*	7.30.3	October 15, 2021
*	7.30.4	October 15, 2021

8 Fire Protection (tab)

	8.TOC.1-2	March 15, 2018
	8.10.1	March 18, 2011
	8.10.2	March 18, 2011
	8.10.3	September 14, 2017
	8.10.4	September 24, 2015
	8.10.5	September 24, 2015
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	8.10.7	March 15, 2018
	8.10.8	September 24, 2015
	8.10.9	September 24, 2015
	8.10.10	September 24, 2015
	8.20.1	September 14, 2017
	8.20.2	September 14, 2017
	8.20.3	April 24, 2009
	8.20.4	April 24, 2009
	8.20.5	March 15, 2018
*	8.20.6	October 15, 2021
*	8.20.7	October 15, 2021
	8.20.8	May 17, 2018
	8.20.9	March 21, 2019
	8.20.10	March 15, 2018

9 Flight Controls (tab)

*	9.TOC.1-2	October 15, 2021
	9.10.1	April 24, 2009
	9.10.2	September 24, 2015
	9.10.3	September 24, 2015
	9.10.4	September 24, 2015
	9.10.5	September 15, 2016
	9.10.6	April 24, 2009
*	9.10.7	October 15, 2021
*	9.10.8	October 15, 2021
*	9.10.9	October 15, 2021
*	9.10.10	October 15, 2021
*	9.10.11	October 15, 2021
*	9.10.12	October 15, 2021
*	9.10.13	October 15, 2021
*	9.10.14	October 15, 2021
	9.20.1	April 24, 2009
	9.20.2	April 24, 2009
	9.20.3	March 15, 2018
	9.20.4	April 24, 2009
	9.20.5	April 24, 2009
	9.20.6	April 24, 2009
	9.20.7	September 26, 2013
	9.20.8	September 26, 2013
	9.20.9	April 24, 2009
	9.20.10	September 14, 2017
	9.20.11	September 17, 2020
*	9.20.12	October 15, 2021
	9.20.13	March 31, 2016
	9.20.14	March 31, 2016
	9.20.15	March 31, 2016
	9.20.16	March 19, 2020
*	9.20.17	October 15, 2021
*	9.20.18	October 15, 2021
	9.20.19	September 17, 2020
	9.20.20	March 31, 2016
	9.20.21	September 15, 2016
	9.20.22	March 31, 2016

* = Revised, Added, or Deleted

10 Flight Instruments, Displays (tab)

*	10.TOC.1-6	October 15, 2021
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	10.11.2	April 24, 2009
	10.11.3	September 25, 2009
	10.11.4	September 25, 2009
	10.11.5	April 24, 2009
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	10.11.7	March 15, 2018
	10.11.8	May 1, 2021
	10.11.9	September 15, 2016
*	10.11.10	October 15, 2021
	10.11.11	March 19, 2020
	10.11.12	March 31, 2016
	10.11.13	September 17, 2020
*	10.11.14	October 15, 2021
*	10.11.15	October 15, 2021
*	10.11.16	October 15, 2021
*	10.11.17	October 15, 2021
*	10.11.18	October 15, 2021
*	10.11.19	October 15, 2021
	10.11.20	March 31, 2016
	10.11.21	March 31, 2016
	10.11.22	March 19, 2020
	10.11.23	March 19, 2020
	10.11.24	March 19, 2020
	10.11.25	March 19, 2020
*	10.11.26	October 15, 2021
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*	10.11.28	October 15, 2021
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*	10.11.30	October 15, 2021
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*	10.11.32	October 15, 2021
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*	10.11.34	October 15, 2021
*	10.11.35	October 15, 2021
*	10.11.36	October 15, 2021
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*	10.11.38	October 15, 2021
*	10.11.39	October 15, 2021
*	10.11.40	October 15, 2021
*	10.11.41	October 15, 2021
*	10.11.42	October 15, 2021
*	10.11.43	October 15, 2021
*	10.11.44	October 15, 2021
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*	10.11.46	October 15, 2021
*	10.11.47	October 15, 2021
*	10.11.48	October 15, 2021
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*	10.11.50	October 15, 2021
*	10.11.51	October 15, 2021
*	10.11.52	October 15, 2021
*	10.11.53	October 15, 2021
*	10.11.54	October 15, 2021
*	10.11.55	October 15, 2021
*	10.11.56	October 15, 2021
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	10.12.4	March 31, 2016
	10.12.5	March 31, 2016
	10.12.6	March 31, 2016
	10.12.7	March 31, 2016
	10.12.8	March 31, 2016
	10.12.9	March 31, 2016
	10.12.10	March 31, 2016
	10.12.11	March 31, 2016
	10.12.12	March 31, 2016
	10.12.13	March 31, 2016
	10.12.14	March 31, 2016
	10.16.1	September 14, 2017
	10.16.2	September 14, 2017
	10.16.3	September 17, 2020
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*	10.16.5	October 15, 2021
	10.16.6	May 17, 2018
*	10.16.7	October 15, 2021
	10.16.8	May 17, 2018
*	10.16.9	October 15, 2021
*	10.16.10	October 15, 2021
*	10.16.11	October 15, 2021
	10.16.12	September 20, 2018
	10.16.13	May 17, 2018
	10.16.14	May 17, 2018
*	10.16.15	October 15, 2021
*	10.16.16	October 15, 2021
*	10.16.17	October 15, 2021
*	10.16.18	October 15, 2021
*	10.16.19-20	Deleted
	10.17.1	September 14, 2017
	10.17.2	March 27, 2014

* = Revised, Added, or Deleted

	10.17.3	March 15, 2018
	10.17.4	March 27, 2014
	10.17.5	March 27, 2014
	10.17.6	March 27, 2014
	10.17.7	April 24, 2009
	10.17.8	March 27, 2014
	10.17.9	March 27, 2014
	10.17.10	March 27, 2014
	10.17.11	March 27, 2014
	10.17.12	March 27, 2014
	10.17.13	September 19, 2019
	10.17.14	March 27, 2014
	10.21.1	September 30, 2011
*	10.21.2	October 15, 2021
*	10.21.3	October 15, 2021
	10.21.4	April 24, 2009
	10.21.5	April 24, 2009
	10.21.6	April 24, 2009
	10.21.7	April 24, 2009
	10.21.8	April 24, 2009
	10.21.9	April 24, 2009
	10.21.10	April 24, 2009
	10.21.11	April 24, 2009
	10.21.12	April 24, 2009
	10.21.13	March 27, 2014
*	10.21.14	October 15, 2021
*	10.21.15	October 15, 2021
*	10.21.16	October 15, 2021
*	10.21.17-18	Deleted
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	10.22.2	September 26, 2013
	10.22.3	September 19, 2019
	10.22.4	September 26, 2013
	10.22.5	September 19, 2019
	10.22.6	September 14, 2017
	10.22.7	September 26, 2013
	10.22.8	March 22, 2012
	10.31.1	September 15, 2016
	10.31.2	September 15, 2016
	10.31.3	September 17, 2020
	10.31.4	September 17, 2020
	10.41.1	September 30, 2011
	10.41.2	March 22, 2012
	10.41.3	March 27, 2014
	10.41.4	September 26, 2013
	10.41.5	March 27, 2014
*	10.41.6	October 15, 2021
	10.41.7	March 16, 2017
	10.41.8	March 27, 2014
	10.41.9	March 27, 2014
	10.41.10	March 27, 2014
	10.41.11	March 27, 2014
	10.41.12	March 27, 2014
	10.41.13	March 27, 2014
	10.41.14	September 15, 2016
	10.41.15	September 15, 2016
	10.41.16	March 27, 2014
	10.41.17	March 27, 2014
	10.41.18	March 27, 2014
	10.41.19	March 27, 2014
	10.41.20	March 27, 2014
	10.41.21	September 24, 2015
	10.41.22	March 16, 2017
	10.41.23	September 24, 2015
	10.41.24	September 15, 2016
	10.42.1	September 14, 2017
	10.42.2	September 14, 2017
	10.42.3	September 26, 2013
	10.42.4	September 14, 2017
	10.42.5	September 17, 2020
	10.42.6	September 14, 2017
	10.42.7	September 14, 2017
	10.42.8	March 27, 2014
	10.42.9	March 27, 2014
	10.42.10	March 27, 2014
	10.42.11	March 27, 2014
	10.42.12	September 14, 2017
	10.42.13	September 26, 2013
	10.42.14	September 26, 2013
	10.42.15	September 26, 2013
	10.42.16	September 17, 2020
*	10.42.17	October 15, 2021
*	10.42.18	October 15, 2021
*	10.42.19	October 15, 2021
*	10.42.20	October 15, 2021
*	10.42.21	October 15, 2021
*	10.42.22	October 15, 2021
*	10.42.23-26	Deleted

11 Flight Management, Navigation (tab)

*	11.TOC.1-10	October 15, 2021
*	11.10.1	October 15, 2021
	11.10.2	September 15, 2016
*	11.10.3	October 15, 2021

* = Revised, Added, or Deleted

	11.10.4	March 31, 2016
	11.10.5	March 22, 2012
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	11.10.7	September 20, 2018
	11.10.8	September 20, 2018
	11.10.9	May 17, 2018
	11.10.10	May 17, 2018
*	11.10.11	October 15, 2021
	11.10.12	September 2, 2021
	11.10.13	September 2, 2021
	11.10.14	September 2, 2021
*	11.10.15	October 15, 2021
	11.10.16	September 2, 2021
	11.10.17	September 2, 2021
*	11.10.18	October 15, 2021
*	11.10.19	October 15, 2021
*	11.10.20	October 15, 2021
*	11.10.21	October 15, 2021
*	11.10.22	October 15, 2021
*	11.10.23	October 15, 2021
*	11.10.24	October 15, 2021
*	11.10.25	October 15, 2021
*	11.10.26	October 15, 2021
*	11.10.27	October 15, 2021
*	11.10.28	October 15, 2021
*	11.10.29-30	Deleted
	11.20.1	September 24, 2015
	11.20.2	September 24, 2015
	11.20.3	April 24, 2009
	11.20.4	April 24, 2009
	11.20.5	April 24, 2009
	11.20.6	April 24, 2009
*	11.20.7	October 15, 2021
*	11.20.8	October 15, 2021
*	11.20.9	October 15, 2021
*	11.20.10	October 15, 2021
*	11.20.11	October 15, 2021
	11.20.12	March 16, 2017
	11.20.13	March 16, 2017
	11.20.14	March 26, 2015
	11.30.1	April 24, 2009
	11.30.2	April 24, 2009
	11.30.3	April 24, 2009
	11.30.4	April 24, 2009
	11.31.1	September 20, 2018
	11.31.2	September 20, 2018
	11.31.3	September 20, 2018
	11.31.4	May 17, 2018
	11.31.5	October 30, 2020
	11.31.6	May 17, 2018
	11.31.7	May 17, 2018
*	11.31.8	October 15, 2021
*	11.31.9	October 15, 2021
*	11.31.10	October 15, 2021
*	11.31.11	October 15, 2021
*	11.31.12	October 15, 2021
*	11.31.13	October 15, 2021
*	11.31.14	October 15, 2021
*	11.31.15	October 15, 2021
	11.31.16	May 17, 2018
	11.31.17	May 17, 2018
	11.31.18	May 17, 2018
	11.31.19	May 17, 2018
	11.31.20	September 20, 2018
	11.31.21	September 20, 2018
	11.31.22	May 17, 2018
*	11.31.23	October 15, 2021
*	11.31.24	October 15, 2021
*	11.31.25	October 15, 2021
*	11.31.26	October 15, 2021
*	11.31.27	October 15, 2021
	11.31.28	September 19, 2019
	11.31.29	September 19, 2019
	11.31.30	October 30, 2020
	11.31.31	October 30, 2020
	11.31.32	October 30, 2020
	11.31.33	October 30, 2020
	11.31.34	October 30, 2020
	11.31.35	September 2, 2021
	11.31.36	May 17, 2018
	11.31.37	May 17, 2018
	11.31.38	May 17, 2018
	11.32.1	April 24, 2009
	11.32.2	September 26, 2013
	11.32.3	September 26, 2013
	11.32.4	September 26, 2013
	11.32.5	September 15, 2016
	11.32.6	September 15, 2016
	11.33.1	September 14, 2017
	11.33.2	September 14, 2017
	11.33.3	September 14, 2017
	11.33.4	September 14, 2017
	11.33.5	April 24, 2009
	11.33.6	September 26, 2013

* = Revised, Added, or Deleted

11.33.7	September 26, 2013	11.33.54	September 24, 2015
11.33.8	September 26, 2013	11.33.55	September 24, 2015
11.33.9	September 26, 2013	11.33.56	September 24, 2015
11.33.10	September 26, 2013	11.33.57	September 24, 2015
11.33.11	September 26, 2013	11.33.58	September 24, 2015
11.33.12	April 24, 2009	11.33.59	September 24, 2015
11.33.13	March 15, 2018	11.33.60	September 24, 2015
11.33.14	September 15, 2016	11.33.61	September 24, 2015
11.33.15	September 24, 2015	11.33.62	September 24, 2015
11.33.16	September 24, 2015	11.33.63	September 24, 2015
11.33.17	September 24, 2015	11.33.64	September 24, 2015
11.33.18	September 24, 2015	11.33.65	September 24, 2015
11.33.19	September 24, 2015	11.33.66	September 24, 2015
11.33.20	September 24, 2015	11.34.1	March 16, 2017
11.33.21	September 24, 2015	11.34.2	September 15, 2016
11.33.22	September 24, 2015	11.34.3	March 31, 2016
11.33.23	September 24, 2015	11.34.4	March 31, 2016
11.33.24	September 24, 2015	11.34.5	May 1, 2021
11.33.25	September 24, 2015	11.34.6	March 31, 2016
11.33.26	September 24, 2015	11.34.7	March 31, 2016
11.33.27	September 24, 2015	11.34.8	March 31, 2016
11.33.28	September 24, 2015	11.34.9	March 19, 2020
11.33.29	September 24, 2015	11.34.10	March 31, 2016
11.33.30	September 24, 2015	11.34.11	March 31, 2016
11.33.31	September 24, 2015	11.34.12	March 31, 2016
11.33.32	September 24, 2015	11.34.13	March 31, 2016
11.33.33	September 24, 2015	11.34.14	March 31, 2016
11.33.34	September 24, 2015	11.34.15	March 31, 2016
11.33.35	September 24, 2015	11.34.16	March 31, 2016
11.33.36	September 24, 2015	11.34.17	March 31, 2016
11.33.37	September 24, 2015	11.34.18	March 31, 2016
11.33.38	September 15, 2016	11.34.19	March 31, 2016
11.33.39	September 24, 2015	11.34.20	March 31, 2016
11.33.40	September 24, 2015	11.34.21	March 31, 2016
11.33.41	September 24, 2015	11.34.22	May 1, 2021
11.33.42	September 24, 2015	11.34.23	March 31, 2016
11.33.43	September 24, 2015	11.34.24	March 31, 2016
11.33.44	September 24, 2015	11.34.25	March 31, 2016
11.33.45	September 24, 2015	11.34.26	March 31, 2016
11.33.46	September 24, 2015	11.34.27	March 31, 2016
11.33.47	September 24, 2015	11.34.28	March 31, 2016
11.33.48	September 24, 2015	11.34.29	March 31, 2016
11.33.49	September 24, 2015	11.34.30	March 31, 2016
11.33.50	September 24, 2015	11.34.31	March 31, 2016
11.33.51	September 24, 2015	11.34.32	March 31, 2016
11.33.52	September 24, 2015	11.34.33	March 31, 2016
11.33.53	September 24, 2015	11.34.34	March 21, 2019

* = Revised, Added, or Deleted

11.34.35	March 31, 2016	11.34.82	March 31, 2016
11.34.36	March 31, 2016	11.34.83	March 31, 2016
11.34.37	March 31, 2016	11.34.84	March 31, 2016
11.34.38	March 31, 2016	11.34.85	March 31, 2016
11.34.39	March 31, 2016	11.34.86	March 31, 2016
11.34.40	March 31, 2016	11.34.87	March 31, 2016
11.34.41	March 31, 2016	11.34.88	March 31, 2016
11.34.42	March 31, 2016	11.34.89	March 31, 2016
11.34.43	March 21, 2019	11.34.90	March 31, 2016
11.34.44	March 31, 2016	11.34.91	March 31, 2016
11.34.45	March 31, 2016	11.34.92	March 31, 2016
11.34.46	March 31, 2016	11.40.1	April 24, 2009
11.34.47	March 31, 2016	11.40.2	April 24, 2009
11.34.48	March 31, 2016	11.40.3	April 24, 2009
11.34.49	March 31, 2016	11.40.4	April 24, 2009
11.34.50	March 31, 2016	11.40.5	April 24, 2009
11.34.51	March 31, 2016	* 11.40.6	October 15, 2021
11.34.52	March 31, 2016	* 11.40.7	October 15, 2021
11.34.53	March 31, 2016	* 11.40.8	October 15, 2021
11.34.54	March 31, 2016	* 11.40.9	October 15, 2021
11.34.55	March 31, 2016	* 11.40.10	October 15, 2021
11.34.56	March 31, 2016	* 11.40.11	October 15, 2021
11.34.57	March 31, 2016	* 11.40.12	October 15, 2021
11.34.58	March 31, 2016	* 11.40.13	October 15, 2021
11.34.59	March 31, 2016	* 11.40.14	October 15, 2021
11.34.60	March 31, 2016	* 11.40.15	October 15, 2021
11.34.61	March 31, 2016	* 11.40.16	October 15, 2021
11.34.62	March 31, 2016	* 11.40.17	October 15, 2021
11.34.63	March 31, 2016	* 11.40.18	October 15, 2021
11.34.64	March 31, 2016	* 11.40.19	October 15, 2021
11.34.65	March 31, 2016	* 11.40.20	October 15, 2021
11.34.66	March 31, 2016	* 11.40.21	October 15, 2021
11.34.67	March 31, 2016	* 11.40.22	October 15, 2021
11.34.68	March 31, 2016	* 11.40.23	October 15, 2021
11.34.69	March 31, 2016	* 11.40.24	October 15, 2021
11.34.70	March 31, 2016	* 11.40.25	October 15, 2021
11.34.71	March 31, 2016	* 11.40.26	October 15, 2021
11.34.72	March 31, 2016	* 11.40.27	October 15, 2021
11.34.73	March 31, 2016	* 11.40.28	October 15, 2021
11.34.74	March 31, 2016	* 11.40.29	October 15, 2021
11.34.75	March 31, 2016	* 11.40.30	October 15, 2021
11.34.76	May 17, 2018	* 11.40.31	October 15, 2021
11.34.77	March 31, 2016	* 11.40.32	October 15, 2021
11.34.78	March 31, 2016	* 11.40.33	October 15, 2021
11.34.79	March 31, 2016	* 11.40.34	October 15, 2021
11.34.80	March 31, 2016	* 11.40.35	October 15, 2021
11.34.81	March 31, 2016	* 11.40.36	October 15, 2021

* = Revised, Added, or Deleted

* 11.40.37	October 15, 2021	11.42.7	September 20, 2018
* 11.40.38	October 15, 2021	11.42.8	September 20, 2018
* 11.40.39	October 15, 2021	11.42.9	September 20, 2018
* 11.40.40	October 15, 2021	* 11.42.10	October 15, 2021
* 11.40.41	October 15, 2021	* 11.42.11	October 15, 2021
* 11.40.42	October 15, 2021	11.42.12	May 17, 2018
* 11.40.43	October 15, 2021	11.42.13	May 17, 2018
* 11.40.44	October 15, 2021	11.42.14	September 20, 2018
* 11.40.45-50	Deleted	11.42.15	September 20, 2018
11.41.1	September 26, 2013	11.42.16	September 20, 2018
11.41.2	September 14, 2017	11.42.17	May 17, 2018
11.41.3	September 14, 2017	* 11.42.18	October 15, 2021
11.41.4	September 26, 2013	* 11.42.19	October 15, 2021
11.41.5	March 19, 2020	* 11.42.20	October 15, 2021
11.41.6	September 27, 2012	* 11.42.21	October 15, 2021
11.41.7	September 27, 2012	* 11.42.22	October 15, 2021
11.41.8	May 17, 2018	* 11.42.23	October 15, 2021
11.41.9	May 17, 2018	* 11.42.24	October 15, 2021
11.41.10	September 14, 2017	* 11.42.25	October 15, 2021
11.41.11	May 17, 2018	* 11.42.26	October 15, 2021
11.41.12	May 17, 2018	* 11.42.27	October 15, 2021
11.41.13	May 17, 2018	* 11.42.28	October 15, 2021
11.41.14	May 17, 2018	* 11.42.29	October 15, 2021
11.41.15	May 17, 2018	* 11.42.30	October 15, 2021
11.41.16	May 17, 2018	* 11.42.31	October 15, 2021
11.41.17	May 17, 2018	* 11.42.32	October 15, 2021
11.41.18	May 17, 2018	* 11.42.33	October 15, 2021
11.41.19	May 17, 2018	* 11.42.34	October 15, 2021
11.41.20	May 17, 2018	* 11.42.35	October 15, 2021
11.41.21	May 17, 2018	* 11.42.36	October 15, 2021
11.41.22	May 17, 2018	* 11.42.37	October 15, 2021
11.41.23	May 17, 2018	* 11.42.38	October 15, 2021
11.41.24	May 17, 2018	* 11.42.39	October 15, 2021
11.41.25	May 17, 2018	* 11.42.40	October 15, 2021
11.41.26	May 17, 2018	* 11.42.41	October 15, 2021
11.41.27	September 20, 2018	* 11.42.42	October 15, 2021
11.41.28	September 20, 2018	* 11.42.43	October 15, 2021
11.41.29	May 17, 2018	* 11.42.44	October 15, 2021
11.41.30	May 17, 2018	11.43.1	May 17, 2018
11.41.31	May 17, 2018	11.43.2	September 15, 2016
11.41.32	May 17, 2018	11.43.3	September 24, 2015
11.42.1	April 24, 2009	11.43.4	September 24, 2015
11.42.2	September 20, 2018	11.43.5	September 24, 2015
11.42.3	September 20, 2018	11.43.6	May 17, 2018
11.42.4	May 17, 2018	11.43.7	May 17, 2018
11.42.5	May 17, 2018	11.43.8	May 17, 2018
11.42.6	September 20, 2018	11.43.9	May 17, 2018

* = Revised, Added, or Deleted

	11.43.10	September 20, 2018
	11.43.11	September 20, 2018
	11.43.12	September 20, 2018
	11.43.13	September 20, 2018
	11.43.14	May 17, 2018
	11.43.15	May 17, 2018
	11.43.16	May 17, 2018
	11.43.17	May 17, 2018
	11.43.18	May 17, 2018
*	11.43.19	October 15, 2021
	11.43.20	September 17, 2020
	11.43.21	September 20, 2018
	11.43.22	September 20, 2018
	11.43.23	May 17, 2018
	11.43.24	May 17, 2018
	11.43.25	May 17, 2018
	11.43.26	September 20, 2018
	11.43.27	September 20, 2018
	11.43.28	May 17, 2018
	11.43.29	May 17, 2018
	11.43.30	May 17, 2018
	11.60.1	March 16, 2017
	11.60.2	September 26, 2013
	11.60.3	September 15, 2016
	11.60.4	September 15, 2016
	11.60.5	September 17, 2020
	11.60.6	September 17, 2020
*	11.60.7	October 15, 2021
	11.60.8	September 17, 2020
	11.60.9	March 19, 2020
	11.60.10	March 19, 2020
*	11.60.11	October 15, 2021
*	11.60.12	October 15, 2021
*	11.60.13	October 15, 2021
*	11.60.14	October 15, 2021
*	11.60.15	October 15, 2021
*	11.60.16	October 15, 2021
*	11.60.17	October 15, 2021
*	11.60.18	October 15, 2021
*	11.60.19	October 15, 2021
*	11.60.20	October 15, 2021
*	11.60.21	October 15, 2021
*	11.60.22	October 15, 2021
*	11.60.23	October 15, 2021
*	11.60.24	October 15, 2021
*	11.60.25	October 15, 2021
*	11.60.26	October 15, 2021
*	11.60.27	October 15, 2021
*	11.60.28	October 15, 2021
*	11.60.29	October 15, 2021
*	11.60.30	October 15, 2021
*	11.60.31	October 15, 2021
*	11.60.32	October 15, 2021
*	11.60.33	October 15, 2021
*	11.60.34	October 15, 2021
*	11.60.35	October 15, 2021
*	11.60.36	October 15, 2021
*	11.60.37	October 15, 2021
*	11.60.38	October 15, 2021

12 Fuel (tab)

	12.TOC.1-2	March 19, 2020
	12.10.1	April 24, 2009
	12.10.2	September 26, 2013
	12.10.3	March 19, 2020
	12.10.4	March 19, 2020
*	12.10.5	October 15, 2021
	12.10.6	March 19, 2020
	12.10.7	March 19, 2020
	12.10.8	March 19, 2020
	12.10.9	March 19, 2020
	12.10.10	March 19, 2020
	12.20.1	March 31, 2016
	12.20.2	April 24, 2009
	12.20.3	September 15, 2016
	12.20.4	March 19, 2020
	12.20.5	September 15, 2016
	12.20.6	March 31, 2016

13 Hydraulics (tab)

	13.TOC.1-2	September 17, 2020
	13.10.1	April 24, 2009
	13.10.2	April 24, 2009
	13.10.3	April 24, 2009
	13.10.4	April 24, 2009
	13.20.1	September 17, 2020
	13.20.2	March 16, 2017
	13.20.3	September 17, 2020
	13.20.4	September 17, 2020
	13.20.5	September 17, 2020
	13.20.6	April 24, 2009
	13.20.7	September 17, 2020
	13.20.8	April 24, 2009

* = Revised, Added, or Deleted

14 Landing Gear (tab)

	14.TOC.1-2	September 15, 2016
	14.10.1	April 24, 2009
	14.10.2	April 24, 2009
	14.10.3	April 24, 2009
	14.10.4	April 24, 2009
*	14.10.5	October 15, 2021
	14.10.6	September 15, 2016
	14.10.7	September 15, 2016
	14.10.8	September 15, 2016
	14.20.1	April 24, 2009
	14.20.2	April 24, 2009
	14.20.3	March 25, 2010
	14.20.4	September 19, 2019
	14.20.5	April 24, 2009
	14.20.6	September 26, 2013
	14.20.7	March 15, 2018
	14.20.8	March 31, 2016
	14.20.9	March 31, 2016
	14.20.10	September 26, 2013

15 Warning Systems (tab)

	15.TOC.1-2	May 1, 2021
*	15.10.1	October 15, 2021
	15.10.2	September 24, 2015
	15.10.3	September 24, 2015
	15.10.4	April 24, 2009
*	15.10.5	October 15, 2021
	15.10.6	March 31, 2016
	15.10.7	May 1, 2021
	15.10.8	May 1, 2021
	15.10.9	May 1, 2021
	15.10.10	May 1, 2021
	15.10.11	May 1, 2021
	15.10.12	May 1, 2021
*	15.10.13	October 15, 2021
*	15.10.14	October 15, 2021
	15.20.1	March 15, 2018
	15.20.2	March 15, 2018
	15.20.3	September 20, 2018
*	15.20.4	October 15, 2021
	15.20.5	September 26, 2013
	15.20.6	March 27, 2014
	15.20.7	March 27, 2014
	15.20.8	March 27, 2014
	15.20.9	May 1, 2021
	15.20.10	September 25, 2014
	15.20.11	September 30, 2011
	15.20.12	September 24, 2015
	15.20.13	September 25, 2014
	15.20.14	October 30, 2020
	15.20.15	March 15, 2018
	15.20.16	May 17, 2018
	15.20.17	September 15, 2016
	15.20.18	September 15, 2016
	15.20.19	October 30, 2020
	15.20.20	March 21, 2019
	15.20.21	September 15, 2016
	15.20.22	September 15, 2016

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* = Revised, Added, or Deleted

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
JXB-11 R1	Unwanted "GLIDESLOPE" Advisory During Approaches On IAN-Equipped Airplanes	July 31, 2014	IE
JXB-13	Inflight Elevator Tab Vibration	March 26, 2010	IE
JXB-22	Airspeed Low Aural Alert Anomaly	April 1, 2014	IE
JXB-27 R2	Window Heat Control Unit (WHCU) Initialization Indications	September 19, 2016	IE
JXB-28	NPS Scales Mask ILS/GLS Localizer and Glideslope Fail Flags	April 28, 2016	IE
JXB-30	NAV Display Blanking/Blinking After Installation of Common Display System (CDS) BP15	October 17, 2016	IE
JXB-31 R1	Cabin Pressurization Panel Blanking/Dimming Issues	December 19, 2016	IE
JXB-32	Incorrect FMC Constraint Altitude on a Standard Terminal Arrival Route (STAR) with a Common Waypoint, after Selection of another Approach	December 16, 2016	IE
JXB-33	VNAV INVALID-PERF Scratchpad Message	April 17, 2017	IE
JXB-35	ADIRU P/N HG2050BC02 Position Drift and Ground Speed Errors	July 17, 2017	IE
JXB-36	Descent Below Glide Slope During Approach on 737NG Airplanes With Rockwell Collins Flight Control Computer (FCC) software Version P8.0 or P9.0 Installed	April 20, 2018	IE
JXB-37	Lateral Path Exceedance On Approach Procedures With A Course Reversal	November 19, 2018	IE
JXB-38 R1	All Six Display Units Blanking With CDS BP15 and FMC U12 or Newer Installed	September 19, 2019	IE

Number	Subject	Date	Status
JXB-39	Localizer Overshoot When Using LNAV to Intercept the Localizer for Fail Passive Airplanes with Rockwell Collins FCC 11.1 or Newer	September 2, 2021	IE

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Flight Crew Operations Manual Bulletin
for
flydubai

The Boeing Company
Seattle, Washington 98124-2207

737

Number: JXB-11 R1

IssueDate: July 31, 2014

Subject: Unwanted "GLIDESLOPE" Advisory During Approaches On IAN-Equipped Airplanes

Reason: This bulletin informs flight crews of the potential for receiving an unwanted or nuisance "GLIDESLOPE" advisory on IAN-equipped aircraft in certain unique conditions.

This bulletin has been revised to provide additional information. The unwanted "GLIDESLOPE" advisory is possible anytime an FMC-generated glidepath is present.

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

An operator has reported occurrences of a nuisance GLIDESLOPE advisory at low height above the runway, when an FMC-generated glidepath is present on approach. This advisory can occur anytime an approach other than ILS or GLS is selected in the FMC, the active waypoint is the runway/missed approach point and the aircraft is below 1000 ft AGL. The IAN approach mode need not be selected for this advisory to occur. Boeing has analyzed these events and has concluded these unwanted advisories typically occur when the barometric altimeter setting varies from the actual station pressure as the result of the use of a stale altimeter setting, as a result of rapidly varying barometric pressure changes which lead to an outdated altimeter setting, or as a result of unusual temperature changes. A change in barometric pressure or temperature can cause the VNAV path to be slightly different than the Visual Glide Slope Indicator (VGSI), i.e., PAPI or VASI.

When these situations occur and the crew elects to modify the flight path below the FMC-generated path in order to follow the VGSI, the IAN glideslope protection feature can issue a GLIDESLOPE advisory even though the aircraft may be on a safe and appropriate flight path in visual conditions. This is because the barometric VNAV path does not necessarily exactly coincide with the VGSI path.

The barometric VNAV path can be sensitive to changes in barometric pressure and/or temperature. A small difference in barometric pressure can alter the barometric VNAV path. For example, a .02 inches difference in pressure due to use of a stale or incorrect altimeter setting can alter the FMC generated glide path by approximately 20 feet as the airplane approaches the runway.

Flight crews should be aware that differences in barometric pressure are a common occurrence and that air traffic facilities do not necessarily update the ATIS or settings provided to aircraft when small changes in pressure occur, particularly when the weather is VFR. While most normal operations using good operating practice for altimeter settings will provide nuisance free operations regarding this type of GLIDESLOPE advisory, crews should be aware that such an advisory nonetheless can, in rare instances, occur.

This condition occurs only on airplanes equipped with the IAN option when a stale or erroneous altimeter setting is used, or an unusually high temperature exists at the airport, and can lead to a VNAV path which does not correspond to the VGSI path.

This anomaly is under consideration for correction via a future software update and service bulletin.

Operating Instructions

1. During an approach assure use of a current and accurately set barometric pressure setting. Ensure the appropriate barometric pressure setting is set on each altimeter. At higher temperatures (approximately 25 degrees C and higher), the FMC-generated flight path may be noticeably higher than the guidance provided by the runway VGSI.
2. At and below applicable weather minima, with suitable visual references established, transition to use of the VGSI path for continuation of the approach to landing.
3. In the event an IAN related GLIDESLOPE advisory occurs while in VMC at low altitude, after confirming the aircraft is on a safe path, the crew may elect to do one or more of the following:

a. Silence the GLIDESLOPE advisory and continue on the VGSI path,

b. Re-establish the FMC based barometric VNAV path and transition to a visual approach and landing in the touchdown zone, or

c. Discontinue the approach.

Administrative Information

This bulletin replaces bulletin JXB-11 , dated July 24, 2009. Revise the Flight Crew Operations Manual Bulletin Record Page to show bulletin JXB-11 as “CANCELLED” (CANC).

Insert this bulletin behind the Bulletin Record Page in Volume 1 of your Flight Crew Operations Manual. Amend the Flight Crew Operations Manual Bulletin Record to show bulletin JXB-11 R1 "In Effect" (IE).

This FCOM bulletin will be revised to include Service Bulletin information 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.

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Flight Crew Operations Manual Bulletin
for
flydubai

The Boeing Company
Seattle, Washington 98124-2207

737

Number: JXB-13

IssueDate: March 26, 2010

Subject: Inflight Elevator Tab Vibration

Reason: This bulletin informs 737NG flight crews of the potential for elevator tab vibration that may lead to significant structural damage.

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 recently received a report from an operator that the failure of the aft attach lugs on the left elevator tab control mechanism resulted in unwanted elevator vibration during flight. The flight crew diverted from the intended route and made an uneventful landing.

Investigation revealed that the fractured aft attach lugs on the elevator tab control mechanism allowed free-play of the aft end of the mechanism, which in turn allowed movement of the forward end of the elevator tab control rods. The result of this condition was unexpected vibration of the elevator during flight.

Flight crews should be aware that there are many causes of airframe vibration, including free-play in movable surfaces, system or engine malfunctions, and environmental factors. Elevator tab vibration can occur during any phase of flight and is characterized as a clearly noticeable moderate to severe vertical motion in the flight deck and aft cabin. This vibration is characterized as a low frequency vertical vibration in which motion of items attached to airplane structure, such as sun visors, may be noticeable. In some cases, pilots have reported feeling vibration in the control column and rudder pedals as this vertical motion is transmitted through the structure and cables to the controls. If the cause of the vibration is suspected to be due to empennage control surfaces, the discrepancy should be corrected prior to further revenue flight.

Boeing recommends that operators aggressively investigate, identify, and correct the cause of the vibration prior to returning the airplane to revenue service. If exposed to recurrent or chronic vibration, control surfaces can experience significant structural damage.

Operating Instructions

If vibration is suspected due to the elevator tab, reduce airspeed smoothly until the vibration stops, using the thrust levers and pitch attitude. Do not use speed brakes or change airplane configuration to reduce airspeed. Do not reduce airspeed below the minimum speed for the existing flap setting and gross weight. Consider landing at the nearest suitable airport.

Stay at or below the reduced airspeed at which the vibration stopped for the rest of the flight. Limit bank angle to 15° until below 20,000 feet.

Do not deploy the speedbrakes for the remainder of the flight.

Flaps and landing gear can be extended normally during the approach and landing. The speedbrake can be armed for landing.

The vibration occurrence should be reported to maintenance for resolution before further flight. The logbook entry should emphasize that the vibration is suspected to be in the area of the elevator tab and tab control system.

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 JXB-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
flydubai

The Boeing Company
Seattle, Washington 98124-2207

737

Number: JXB-22

IssueDate: April 1, 2014

Subject: Airspeed Low Aural Alert Anomaly

Reason: This bulletin informs 737NG flight crews of the possibility that the Airspeed Low aural alert may not sound even though airspeed has decreased into the amber band.

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

On the 737NG, the airspeed readout box surrounding the current airspeed changes to amber and flashes for 10 seconds when current airspeed decreases 30% or more into the minimum maneuver speed amber band. If the condition persists after ten seconds, the readout box changes color to solid amber until the airspeed is greater than the top of the amber band. On airplanes equipped with the Airspeed Low aural alert, the voice alert annunciates “Airspeed Low, Airspeed Low” at the onset of the condition.

Flight testing has shown that on those airplanes equipped with the Honeywell Mark V-A (MKV-A) EGPWS Software Part Number 69000940-101, the Airspeed Low aural alert may not sound even though airspeed has decreased into the amber band. The airspeed box turns amber reflecting a drop in airspeed 30% or more into the amber band with no corresponding aural alert.

This anomaly can only be present if the airspeed decreases into the amber band while the amber band is rising, e.g., during flap/slat retraction, turbulence, change in load factor, etc. The crew may not receive the Airspeed Low aural alert although the current speed is below the threshold for the alert.

The Honeywell Mark V-A (MKV-A) EGPWS Software Part Number 69000940-101 was installed on Production Line Number 4763 (delivered January 2014), and on Production Line Number 4777 and on. Honeywell plans to issue EGPWS Software Part Number 69000940-102 to correct this condition.

Operating Instructions

Flight crews should monitor airspeed during all phases of flight and call out deviations or changes to instruments during all conditions. If installed, the Air Speed Low aural is a supplemental means of awareness to the visual indication represented to the flight crew on the primary flight display. With or without the Airspeed Low aural, flight crews are expected to monitor the airspeed and call out any unplanned or unexpected deviations in accordance with the Stabilized Approach Criteria and Recommended Callouts listed in the Flight Crew Training Manual.

Crew response to an airspeed low condition will be same with or without the aural alert. At the onset of this condition, flight crews are expected to promptly correct the airspeed to increase the speed above the amber band as indicated on the Primary Flight Display.

Crews should be especially observant of airspeed when operating near or in the amber minimum maneuver speed band.

Administrative Information

Insert this bulletin behind the FCOM Bulletin Record Page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record Page to show bulletin JXB-22 "In Effect" (IE).

This FCOM bulletin will be cancelled when an operator reports to Boeing that the Honeywell EGPWS Software Part Number 69000940-102 has been installed on all affected 737NGs 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.

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Flight Crew Operations Manual Bulletin for flydubai

The Boeing Company
Seattle, Washington 98124-2207

737

Number: JXB-27 R2

IssueDate: September 19, 2016

Subject: Window Heat Control Unit (WHCU) Initialization Indications

Reason: A new WHCU will be installed on 737NG airplanes at line number 5830 and on. This new WHCU goes through an initialization process when the WINDOW HEAT switches are selected to ON. The initialization process produces indications that could be misinterpreted as abnormal.

This bulletin is being revised to update the functionality of the WHCU during electrical power transfers, and to update the affected line numbers.

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

Selection of the WINDOW HEAT switches to the ON position places the new WHCU into an initialization process. The amber window OVERHEAT lights illuminate along with the two master caution lights and the amber ANTI-ICE light on the system annunciator panel because during the initialization process electrical power is not being applied to the windows.

After the initialization process completes, in approximately 3 seconds, the amber window OVERHEAT lights, the two master caution lights, and the amber ANTI-ICE light on the system annunciator panel extinguish. The green window heat ON lights also illuminate.

The illumination of these amber lights during the initialization process does not change the function of the OVERHEAT light during an overheat or loss of electrical power.

Additionally, selecting a different source of electrical power with the WINDOW HEAT switches in the ON position can potentially illuminate the amber window OVERHEAT lights due to electrical current spikes.

The affected WHCU, Boeing Part # 10-61833-8, will be installed on 737NG airplanes from line numbers 5830 to 6029. Airplanes from line number 6030 and on will be delivered with an updated WHCU, Boeing Part # 10-61833-9.

Operating Instructions

The functionality of the new WHCU will affect the following procedures:

Normal Procedures - NP.21

- Preflight Procedures - First Officer

Supplementary Procedures - SP.3

- Window Heat System Tests

Quick Reference Handbook - QRH 3

- WINDOW OVERHEAT

If the window OVERHEAT lights extinguish within 5 seconds of turning the window heat ON, the WHCU is operating normally.

In order to make it easier to differentiate the temporary differences in these procedures, a revision bar has been used.

The above procedures are amended as follows until the WHCU is updated with Boeing Part # 10-61833-9.

NP.21 - PREFLIGHT PROCEDURE - FIRST OFFICER

WINDOW HEAT switches .... ON

Position switches ON at least 10 minutes before takeoff.

Verify the OVERHEAT lights extinguish within 5 seconds.

Note: The master caution and ANTI-ICE system annunciator lights can illuminate.

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

SP.3 - 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

Verify the OVERHEAT lights extinguish within 5 seconds.

Note: The master caution and ANTI-ICE system annunciator lights can illuminate.

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.

Verify the OVERHEAT lights extinguish within 5 seconds.

Note: The master caution and ANTI-ICE system annunciator lights can illuminate.

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

Verify the OVERHEAT lights extinguish within 5 seconds.

Note: The master caution and ANTI-ICE system annunciator lights can illuminate.

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.

QRH 3 - WINDOW OVERHEAT

Condition: A window overheat occurs.

1. WINDOW HEAT switch (affected window) .... OFF
2. **Wait** 2 - 5 minutes.
3. WINDOW HEAT switch (affected window) .... ON
4. **Wait** 5 seconds

   Note: The master caution and ANTI-ICE system annunciator lights can illuminate.

5. Choose one:

   Window OVERHEAT light **stays extinguished:**

   Continue normal operation.

   (End of Checklist)

   Window OVERHEAT light **illuminates again:**

   Go to step 6

6. WINDOW HEAT switch (affected window) .... OFF

   Limit airspeed to 250 knots maximum below 10,000 feet.

7. Pull both WINDSHIELD AIR controls. This vents conditioned air to the inside of the windshield for defogging.

   (End of Checklist)

For illumination of the amber window OVERHEAT lights following electrical power transfers, the crew should cycle electrical power to the affected window by completing the above WINDOW OVERHEAT non-normal checklist.

Administrative Information

This bulletin replaces bulletin JXB-27 R1 , dated April 4, 2016. Revise the Flight Crew Operations Manual Bulletin Record Page to show bulletin JXB-27 R1 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 JXB-27 R2 "In Effect" (IE).

This FCOM bulletin will be cancelled when the operator reports to Boeing that all the airplanes in their fleet between line numbers 5830 and 6029 have been retrofitted with the updated WHCU, Boeing Part # 10-61833-9.

Airplanes from line number 6030 and on will be delivered with an updated WHCU, Boeing Part # 10-61833-9. These WHCUs will not necessitate the use of the procedures outlined in this bulletin.

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
flydubai

The Boeing Company
Seattle, Washington 98124-2207

737

Number: JXB-28

IssueDate: April 28, 2016

Subject: NPS Scales Mask ILS/GLS Localizer and Glideslope Fail Flags

Reason: This bulletin informs 737NG flight crews that the ILS/GLS Localizer (LOC) and Glideslope (GS) fail flags are masked by the Navigation Performance Scales.

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

Operators with the Navigation Performance Scales (NPS) option need to be aware that if there is an internal failure of the ILS or GLS component of the Multi-Mode Receiver (MMR), the LOC and/or G/S flags are masked by the NPS scales on the failed side Primary Flight Display (PFD).

There are some failures in the ILS /GLS component of the MMR, that cause the station identifier or ILS frequency/GLS channel to remain displayed in the approach reference section of the PFD despite the failure. The aural identifier may or may not be available. However, the anticipation cues (ghost pointers) are not displayed with any type of failure of the ILS/GLS component in the MMR. The approach mode (APP) is still capable of being armed, although it does not capture if the master flight director is on the failed side.

Operating Instructions

Operators with the NPS option should emphasize to their flight crews, the importance of confirming that the localizer and glideslope pointers are shown when preparing to execute an ILS/GLS approach, in accordance with ILS or GLS Landing Procedure in the FCOM. In addition, the anticipation cues should be confirmed to be in view as well. If an MMR failure is suspected, set the EFIS mode selector to APP to confirm the LOC and/or G/S fail flags are shown on the Navigation Display (ND). When a failure of the ILS or GLS component of the MMR is confirmed, select an approach other than an ILS or GLS.

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 JXB-28 "In Effect" (IE).

This anomaly will be corrected with CDS BP15, currently scheduled for release in mid-2016.

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
flydubai

The Boeing Company
Seattle, Washington 98124-2207

737

Number: JXB-30

IssueDate: October 17, 2016

Subject: NAV Display Blanking/Blinking After Installation of Common Display System (CDS) BP15

Reason: To Make Flight Crews Aware of Potential NAV Display Blanking/ Blinking with the Installation of Common Display System (CDS) BP15.

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 bench testing of the Common Display System (CDS) software BP15, a combination of conditions were discovered which may cause some Display Units (DUs) to blank or blink.

This situation may manifest itself when all of the following conditions are met:

1. Two (2) functioning Display Electronics Units (DEUs).
2. DISPLAY SOURCE selector is set to AUTO.
3. Six (6) functioning Display Units (DUs).
4. Captain's ND shows MAP with Vertical Situation Display (VSD) selected on the Left Inboard DU.
5. Captain's MAIN PANEL DU and LOWER DU Display selector set to NORM.
6. First Officer's ND shows MAP with VSD selected on the Right Inboard DU.
7. First Officer's MAIN PANEL DU selector set to NORM and LOWER DU Display selector set to ND.

If all of the conditions above are met, and depending on the DEU equipment installed, one of the following anomalies may result:

A. The First Officer's Right Inboard DU and Lower Center DU will blank or blink, or

B. The First Officer's Right Inboard DU and Lower DU map background data will freeze or not appear, and the MAP fail flag will appear if the problem persists for more than 30 seconds.

If any of the seven (7) conditions is not met, the Display Units (DUs) will stabilize and the anomaly will stop.

Operating Instructions

On airplanes with CDS BP15 and VSD selected on the inboard DUs by both pilots, the First Officer should not select ND on the lower center display unit to avoid this situation.

Research is being conducted to confirm the root cause of this anomaly. Once the root cause is confirmed, this bulletin will be updated as necessary.

Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin JXB-30 "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.

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Flight Crew Operations Manual Bulletin
for
flydubai

The Boeing Company
Seattle, Washington 98124-2207

737

Number: JXB-31 R1

IssueDate: December 19, 2016

Subject: Cabin Pressurization Panel Blanking/Dimming Issues

Reason: To inform the crew of failures of the Cabin Pressurization Panel where the indications flicker, become too dim to read, or completely blank.

This bulletin is being revised to update the flight crew procedure in the event the FLT ALT needs to be changed to a higher altitude than the current setting due to a change in cruise altitude.

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 Cabin Pressurization Panel was redesigned to replace obsolete components and was introduced on the 737NG in April 2013 beginning with line number 4413. Similar to the previous panels, it includes three displays: the FLT ALT indicator, LAND ALT indicator, and the outflow Valve Position Indicator, all of which now use LED lighting technology.

Several operators have reported occurrences where the new LED display indications either flicker, become too dim to read, or completely blank. Most of the blanking reports indicate a self-recovery of the panel after a short duration of time. The duration of the effects can vary but it is typically momentary.

The cause of these occurrences is still under investigation by the manufacturer of the Cabin Pressurization Panel but early testing points to possible Electromagnetic Interference (EMI).

The Cabin Pressurization Panel is supplied by United Technologies (UTAS) and is P/N 1019439-1-001, equivalent Boeing P/N is 10-62231-31.

Boeing is working with UTAS to determine the cause of the Cabin Pressurization Panel failures. Once the cause of the problem and the appropriate fix is confirmed it will be introduced at the factory for new airplanes. For airplanes already in service Boeing will communicate appropriate fix instructions.

Currently only the first line number is known for the affected airplanes, 4413. Once the line number for the last affected airplane is determined this FCOM bulletin will be revised. Also included in the revision will be confirmation of the cause of the Cabin Pressurization Panel failures and a time line for the fix.

Operating Instructions

If the Cabin Pressurization Panel display indications flicker, become too dim to read, or completely blank, it is important to note that the pressurization system will function as initially set by the crew. Cabin Pressurization Panel changes do not need to be made if a failure occurs and crew action is not needed or recommended.

If a Cabin Pressurization Panel failure occurs the crew should follow operator specific procedures or policies for reporting the failure.

The following action should be taken:

On the ground:

Do not takeoff.

In flight:

The Cabin Pressurization Panel failure should be momentary. Allow the Cabin Pressurization Panel to self-recover.

If the Cabin Pressurization Panel self-recovers, continue normal operation.

If the Cabin Pressurization Panel does not self-recover, avoid flight plan amendments requiring a change to the FLT ALT or LAND ALT on the Cabin Pressurization Panel.

If a situation requires a change on the Cabin Pressurization Panel to FLT ALT and the display is not visible:

Do not attempt to change the FLT ALT.

If the FLT ALT needs to be changed to a lower altitude than the current setting due to a change in cruise altitude:

No crew action is required. Operate the airplane at the new lower cruise altitude.

If the FLT ALT needs to be changed to a higher altitude than the current setting due to a change in cruise altitude:

No crew action is required. Operate the airplane at the new higher cruise altitude.

Note: Flying above the selected FLT ALT will drive the cabin to the maximum differential pressure. When the maximum cabin differential pressure is reached, the automatic control system will prioritize limiting differential pressure and will stop controlling cabin rate. If the airplane climbs after the maximum differential pressure is reached, the cabin rate will equal the airplane rate.

If a situation requires a change on the Cabin Pressurization Panel to LAND ALT and the display is not visible:

Do not attempt to change the LAND ALT.

Manually control cabin altitude when below 10,000 feet MSL or 3,000 feet above airport elevation, whichever is higher.

Landing must be accomplished with the airplane unpressurized.

Follow guidance provided in the Supplementary Procedures chapter of the Flight Crew Operations Manual (FCOM). Refer to SP.2, Air Systems, Manual Mode Operation.

Note: Verify desired outflow valve movement with changes on the cabin altimeter/differential pressure indicator and the cabin rate of climb indicator.

Administrative Information

This bulletin replaces bulletin JXB-31 , dated October 21, 2016. Revise the Flight Crew Operations Manual Bulletin Record Page to show bulletin JXB-31 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 JXB-31 R1 "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.

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Flight Crew Operations Manual Bulletin for flydubai

The Boeing Company **Seattle, Washington 98124-2207**	**737**

Number: JXB-32

IssueDate: December 16, 2016

Airplane Effectivity: B737-600/700/800/900 and BBJ Airplanes with existing FMC Software including Update U13 (scheduled to be released April 2017).

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 the existing FMC Software, including Update 13, 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 JXB-32 as "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
flydubai

The Boeing Company
Seattle, Washington 98124-2207

Number: JXB-33

IssueDate: April 17, 2017

Airplane Effectivity: B737-600/700/800/900/BBJ Airplanes with FMC Software U11/U12/U13 installed

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 JXB-33 as "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.

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Flight Crew Operations Manual Bulletin for flydubai

The Boeing Company
Seattle, Washington 98124-2207

737

Number: JXB-35

IssueDate: July 17, 2017

Airplane Effectivity: B737-600/700/800/900/BBJ Airplanes

Subject: ADIRU P/N HG2050BC02 Position Drift and Ground Speed Errors

Reason: To inform flight crews of potential ADIRU position drift and ground speed errors when ADIRU P/N HG2050BC02 is installed.

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 several 737NG operators of ADIRU position drift and ground speed errors in airplanes equipped with ADIRU P/N HG2050BC02. The root cause of these drift and groundspeed errors has been identified as a reduced accuracy performance caused by a software error in the ADIRU P/N HG2050BC02. The reduced accuracy performance errors are cumulative and increase if the ADIRU goes through a full alignment multiple times during the course of daily operations. The following FMC Alerting messages can be experienced as the drift and ground speed errors increase:

Airplanes with FMC update U10.0 to U10.6:

- “VERIFY POSITION”, or
- “UNABLE REQD NAV PERF – RNP”,

Airplanes with FMC update U10.7 to U10.8A:

- “VERIFY POSITION”,
- “UNABLE REQD NAV PERF – RNP”,
- “IRS POS/ORIGIN DISAGREE”,
- “VERIFY POS: IRS-FMC”,
- “VERIFY POS: IRS-IRS”.

Airplanes with FMC update U11 and onwards:

- “VERIFY POSITION”,
- “UNABLE REQD NAV PERF – RNP”,
- “IRS-L DRIFT”,
- “IRS-R DRIFT”,
- “IRS POS/ORIGIN DISAGREE”,
- “VERIFY POS: IRS-FMC”,
- “VERIFY POS: IRS-IRS”.

Operating Instructions

The following procedure is recommended for B737NG airplanes with at least one HG2050BC02 ADIRU installed.

During the Preliminary Preflight Procedure perform a full IRS alignment for one or more of the following:

- On the first flight of the day
- If continuous AC electrical power is not available to the airplane during ground stops
- If 18 hours have elapsed since the last full alignment
- If before the start of a flight, 18 hours will be exceeded since the last full alignment, during the course of the next flight leg.

After alignment is complete, remain in NAV mode as long as possible.

A Fast Realignment, as described in the FCOM SP.11, Supplementary Procedures, may be performed between successive flight legs. This will reset the accumulated position and groundspeed error from the previous flight.

1. Boeing recommends checking the residual ground speed error at the end of each flight and within five (5) minutes of reaching the final parking position. The serviceable limits are:
   a. If operating two consecutive flights: less than fifteen (15) knots at the end of each flight.
   b. If operating a single flight: less than twenty one (21) knots at the end of the flight.
2. This is done by taking the following steps:
   - On the CDU select POS REF page 2/3
   - Note the residual groundspeed on IRS L and IRS R
3. If the residual ground speed error of either IRS is in excess of the serviceable limits in 1 a) and b), record in the appropriate Maintenance Document for maintenance action.

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 JXB-35 as "In Effect" (IE).

Boeing and Honeywell are in the process of finalizing the solution for ADIRU P/N HG2050BC02. When the solution is determined, a Service Bulletin will be issued on the fix to correct this anomaly for ADIRU P/N HG2050BC02.

This FCOM Bulletin will be revised to include Service Bulletin information when available.

This FCOM Bulletin will be cancelled after Boeing is advised that all airplanes in your fleet have been modified, per the subject Service Bulletin.

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
flydubai

The Boeing Company
Seattle, Washington 98124-2207

737

Number: JXB-36

IssueDate: April 20, 2018

Airplane Effectivity: B737-600/700/800/900/BBJ Airplanes with Rockwell Collins FCC Software Version P8.0 or P9.0 installed

Subject: Descent Below Glide Slope During Approach on 737NG Airplanes With Rockwell Collins Flight Control Computer (FCC) software Version P8.0 or P9.0 Installed

Reason: This bulletin informs flight crews operating 737NG airplanes equipped with Rockwell Collins FCC software P8.0 or P9.0 of the potential to descend below the glideslope during approach.

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 737NG operators that when conducting an ILS approach with the autopilot engaged, APP mode selected on the MCP, and G/S annunciated in green on the Flight Mode Annunciation (FMA), the autopilot did not properly acquire the glideslope. As the airplane descended away from the glideslope centerline the Flight Director (F/D) indicated close to the centered position and the glideslope pointer indicated the airplane below glideslope on the deviation scale.

These events occurred with the autopilot engaged while capturing the glideslope from above with high descent rates (approximately greater than 2000 feet per minute) and late arming of the APP mode. The high descent rate is maintained by the autopilot and can result in the airplane descending below the glideslope requiring flight crew intervention to return to the glideslope centerline.

Boeing has determined that the condition was introduced in FCC software versions P8.0 and P9.0 when a change was incorporated to reduce aggressive pitch-up maneuvers at glideslope capture. The result of the design change is that, following a high descent rate capture, the autopilot may not provide sufficient pitch-up command to reduce the descent rate and acquire the glideslope.

The described descents below glideslope can occur when all of the following conditions are met:

- Glideslope capture above approximately 2500 feet AGL.
- Glideslope capture from above with a descent rate in excess of approximately 2000 fpm.
- Arming the APP mode late, i.e., arming when descending through the glideslope centerline.
- Autopilot engaged (glideslope captures using F/D only are not affected)

It is important to note that even though the reported events occurred during an ILS approach, this anomaly can also occur during a GLS approach or when conducting an instrument approach using IAN.

This anomaly affects 737NG airplanes with the following FCC Operational Program Software (OPS):

P8.0 FCC OPS (227A-COL-AC1-09)

- Boeing Part Number S241A100-509
- Rockwell Collins Part Number 831-5854-180

P9.0 FCC OPS (2272-COL-AC1-10)

- Boeing Part Number S241A100-510
- Rockwell Collins Part Number 831-5854-190

Operating Instructions

Normally the glideslope is captured from below while in level flight. In the event the glideslope needs to be captured from above with the autopilot engaged, use the following recommended techniques and considerations as paraphrased from the Flight Crew Training Manual (FCTM):

- attempt to capture the glideslope prior to the Final Approach Fix (FAF)
- verify the localizer is captured before descending below the cleared altitude or the FAF altitude
- select APP on the MCP and verify that the glideslope is armed
- establish final landing configuration and set the MCP altitude no lower than 1,000 feet AFE
- select the V/S mode and set -1000 to -1500 fpm to achieve glideslope capture and be stabilized for the approach by 1,000 feet AFE. Use of the VSD (as installed) or the green altitude range arc may assist in establishing the correct rate of descent.

- monitor rate of descent and airspeed
- verify correct Flight Mode Annunciations and monitor glideslope deviations.

Note: If the glideslope is not captured or the approach is not stabilized by 1,000 feet AFE, initiate a go-around.

For complete recommended techniques and considerations refer to “Intercepting Glide Slope from Above” in the FCTM found in Chapter 5.

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 JXB-36 as "In Effect" (IE).

This anomaly will be corrected with the following FCC OPS update which is expected to be available in 3Q2018:

P11.1 FCC OPS (2270-COL-AC2-22)

- Boeing Part Number S241A100-521
- Rockwell Collins Part Number 831-5854-211

This FCOM Bulletin will be canceled after Boeing is notified that all of the affected airplanes in your fleet have been retrofitted with FCC OPS P11.1 or newer.

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
flydubai

The Boeing Company
Seattle, Washington 98124-2207

737

Number: JXB-37

IssueDate: November 19, 2018

Airplane Effectivity: B737-600/700/800/900/BBJ Airplanes with FMC Software U11/U12/U13 installed

Subject: Lateral Path Exceedance On Approach Procedures With A Course Reversal

Reason: This bulletin informs flight crews of an FMC software U11, U12 and 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 condition was introduced in FMC U11 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 U11, U12 and 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 JXB-37 as "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
flydubai

The Boeing Company
Seattle, Washington 98124-2207

737

Number: JXB-38 R1

IssueDate: September 19, 2019

Subject: All Six Display Units Blanking With CDS BP15 and FMC U12 or Newer Installed

Reason: To make flight crews aware that all six Display Units (DUs) can blank if a runway with a 270 degree true heading is selected on the FMC ARRIVALS page.

This bulletin is being revised to include affected runways 4500 ft or greater in length and 75 ft or greater in width, to update HUD information, and to provide Service Bulletin information.

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

An operator recently experienced blanking of all six DUs with a selected instrument approach to a runway with a 270 degree true heading, RWY 25 at PABR. All six DUs stayed blank until a different runway was selected on the FMC ARRIVALS page.

Boeing and Honeywell have determined that all six DUs can blank if certain runways with a 270 degree true heading are selected on the FMC ARRIVALS page and one of the conditions below is met (whichever occurs first):

- the airplane is more than 400 NM from the origin airport
- the airplane is more than half way between the origin and destination airports
- the airplane is within two minutes of the Top of Descent (T/D).

This applies only to airplanes with CDS BP15 and FMC U12 or newer installed. It is important to note that only certain runways with a true heading of 270 degrees selected in the FMC can be affected. The actual landing runway has no effect on displays. Standby instruments are not affected. The HUD (if installed) is available, but the digital barometric altitude on the HUD is referenced to 29.92 and cannot be changed.

Boeing and Honeywell are reviewing worldwide airports with a runway 4500 ft or greater in length and 75 ft or greater in width. At this point, the following runways at the airports listed below are known to be affected:

- 82V RW26 (Pine Bluffs, Wyoming, USA)
- KBJJ RW28 (Wayne County, Ohio, USA)
- KCIU RW28 (Chippewa County, Michigan, USA)
- KCNM RW26 (Cavern City, New Mexico, USA)
- PABR RW25 (Barrow, Alaska, USA)
- SKLM RW28 (La Mina, La Guajira, Colombia)
- SYCJ RW29 (Cheddi Jagan, Georgetown, Guyana)

As Honeywell continues to develop a software solution and to process data, operators are encouraged to report any DU blanking issues to Honeywell and Boeing in order to provide the most effective solution possible to this anomaly.

Operating Instructions

With CDS BP15 and FMC U12 or newer, do not select a runway listed above in the FMC.

If all six DUs blank, select a different runway on the FMC ARRIVALS page. The newly selected runway must have a different runway heading.

Administrative Information

This bulletin replaces bulletin JXB-38. Revise the Flight Crew Operations Manual Bulletin Record Page to show bulletin JXB-38 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 JXB-38 R1 as "In Effect" (IE).

Retrofit information will be provided by Service Bulletin SB 737-31A1880, currently scheduled for release in 4Q2019. This bulletin will be canceled after Boeing is notified that all affected airplanes in your fleet have been retrofitted with CDS BP 15A software. Please report to Boeing the Line Number, Serial Number, or Tabulation Number of all airplanes for which the above has been confirmed.

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
flydubai

The Boeing Company
Seattle, Washington 98124-2207

Number: JXB-39

IssueDate: September 2, 2021

Airplane Effectivity: All 737-600/700/800/900/BBJ (Fail Passive) with Rockwell Collins FCC 11.1 or Newer

Subject: Localizer Overshoot When Using LNAV to Intercept the Localizer for Fail Passive Airplanes with Rockwell Collins FCC 11.1 or Newer

Reason: This bulletin informs flight crews of affected 737-600/700/800/900/BBJ (Fail Passive) airplanes with Rockwell Collins FCC 11.1 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 737-600/700/800/900/BBJ (Fail Passive) airplanes with Rockwell Collins FCC 11.1 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 JXB-39 "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.

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General

This chapter contains:

- Airplane Flight Manual (AFM) limitations
- AFM operational information
- 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. They meet the following criterion - flight crew access by reference cannot assure timely compliance, e.g., Maximum Takeoff and Landing Tailwind Component. They 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 **Note:** The capability of the airplane(s) has been satisfactorily demonstrated for takeoff and manual landing with tailwinds up to 15 knots. **Note:** Airplanes operating under FAA Rules: This finding does not constitute operational approval to conduct takeoffs or landings with tailwind components greater than 10 knots.	15 knots (see note(s))
Maximum speeds	Observe gear and flap placards
Maximum Operating Altitude	41,000 feet pressure altitude
Maximum Takeoff and Landing Altitude	8,400 feet pressure altitude

YR017 - YR029
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 130 ° West longitude, the maximum flight operating latitude is 70° North, and the region between 120° East and 160° East longitude, the maximum flight operating latitude is 60° South.

YR030 - YV394
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.

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

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

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

79,242 Kilograms

Maximum Takeoff Weight

79,015 Kilograms

Maximum Landing Weight

66,360 Kilograms

Maximum Zero Fuel Weight

62,731 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.

Airplanes operating under FAA Rules:

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

Airplanes operating with FAA Rules: 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.

Non–AFM Operational Information

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

Communications

AFM Limitations

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

Aircraft Communications Addressing and Reporting System

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 conditions:

- 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.

YR021 - YV394
With Protected Mode – Controller Pilot Datalink Communications (PM-CPDLC): The PM-CPDLC installation is only intended to be used in cruise flight phase and for non-critical messaging.

Non–AFM Operational Information

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

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

Operation with assumed temperature reduced takeoff thrust is not permitted with anti-skid inoperative.

Reverse Thrust

Intentional selection of reverse thrust in flight is prohibited.

APU

Airplanes operating under FAA Rules: Inflight - APU bleed + electrical load: max alt 10,000 ft.

Airplanes operating under FAA Rules: Ground only - APU bleed + electrical load: max alt 15,000 ft.

APU bleed: max alt 17,000 ft.

APU electrical load: max alt 41,000 ft.

Non–AFM Operational Information

APU bleed valve must be closed when:

- ground air connected and isolation valve open
- engine no. 1 bleed valve 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 fifteen minute cooling period is required.

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

Flight Controls

AFM Limitations

The maximum altitude with flaps extended is 20,000 ft.

Holding in icing conditions with flaps extended is prohibited.

In flight, do not extend the SPEED BRAKE lever beyond the FLIGHT DETENT.

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

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 AFM Normal Procedures/Inertial Reference System section 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.

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.

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

Lateral imbalance between main tanks 1 and 2 must be scheduled to be zero. Random fuel imbalance must not exceed 453 kgs for taxi, takeoff, flight or landing.

Fuel Loading

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

Landing Gear

Non–AFM Operational Information

Do not apply brakes until after touchdown.

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Normal Procedures — Chapter NP
Introduction — Section 11

General

This chapter contains:

- 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

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

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.

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

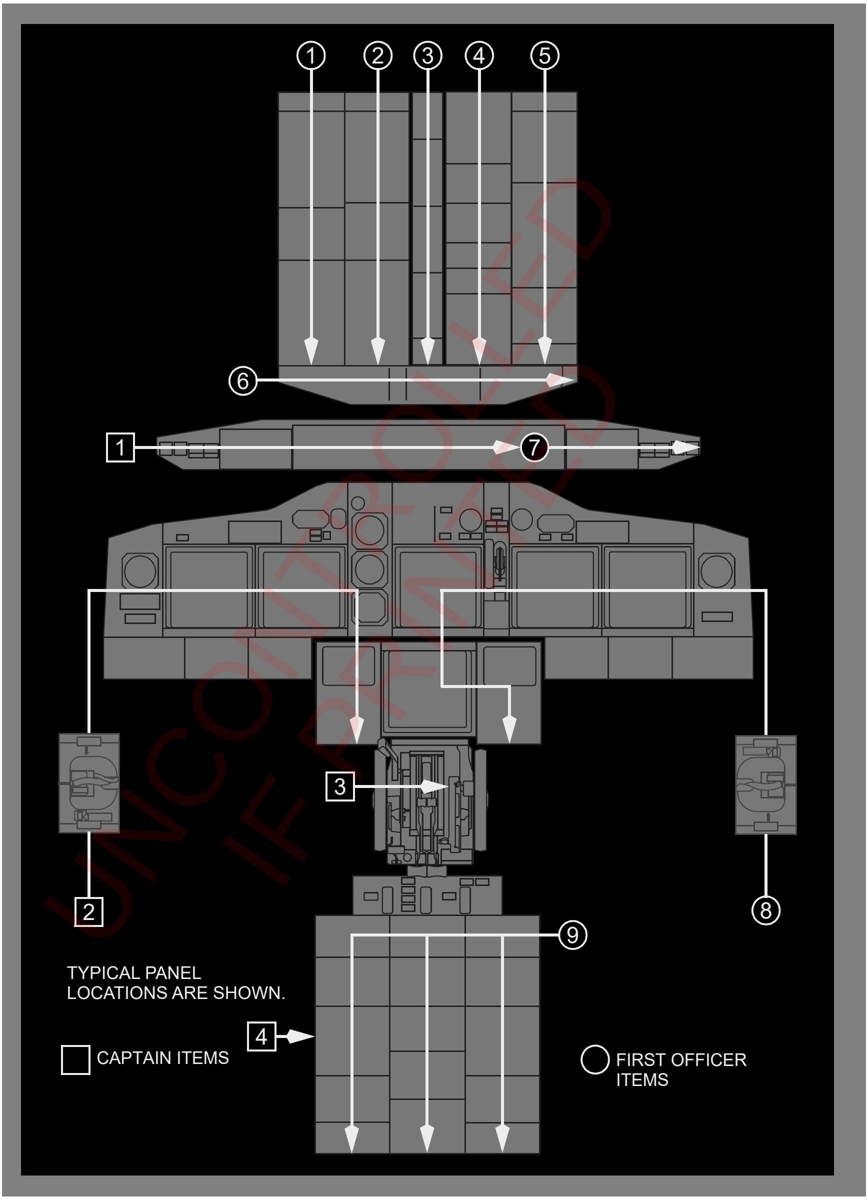
Announcing changes on the FMA and thrust mode display when they occur is a good CRM practice.

Scan Flow and Areas of Responsibility

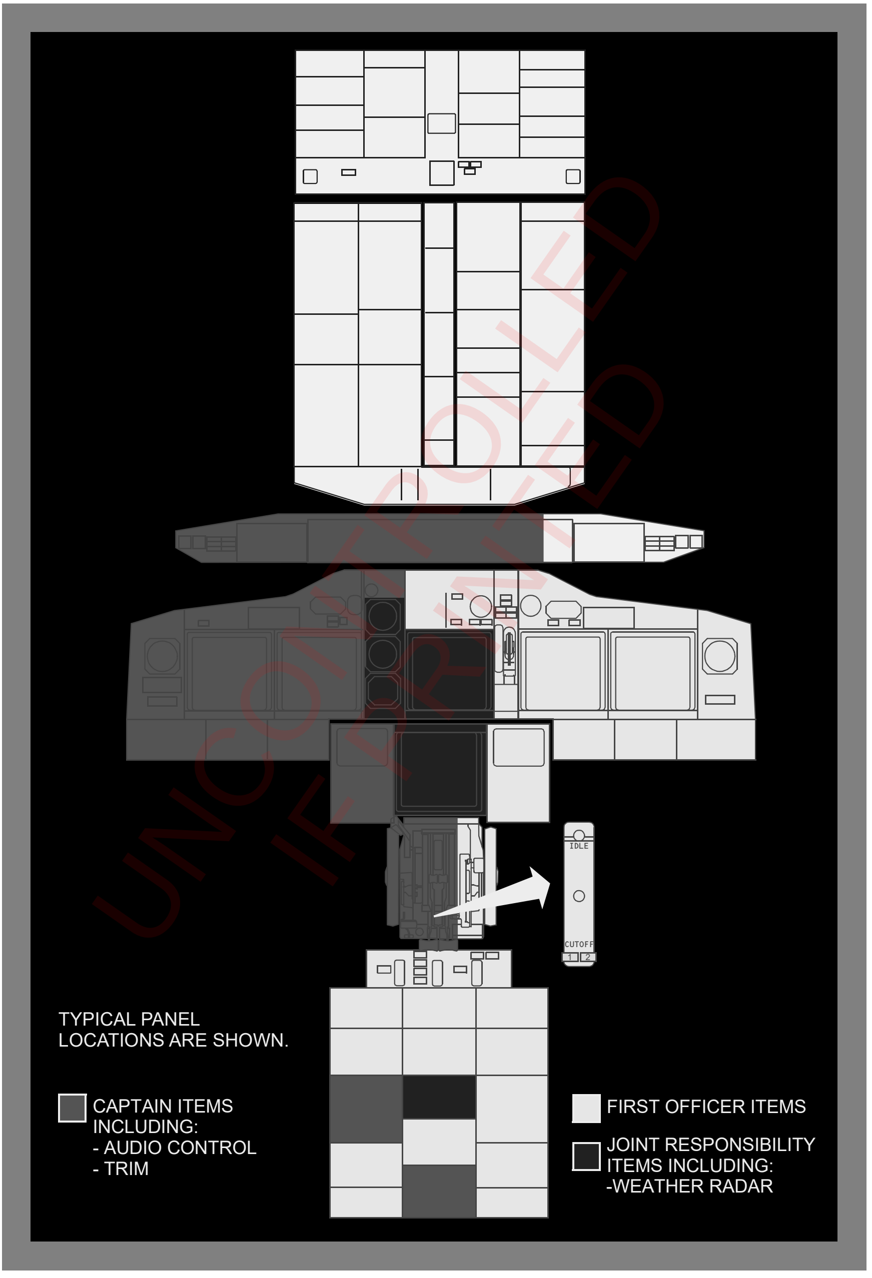
The scan flow and areas of responsibility diagrams shown below are representative and may not match the configuration(s) of your airplanes.

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.

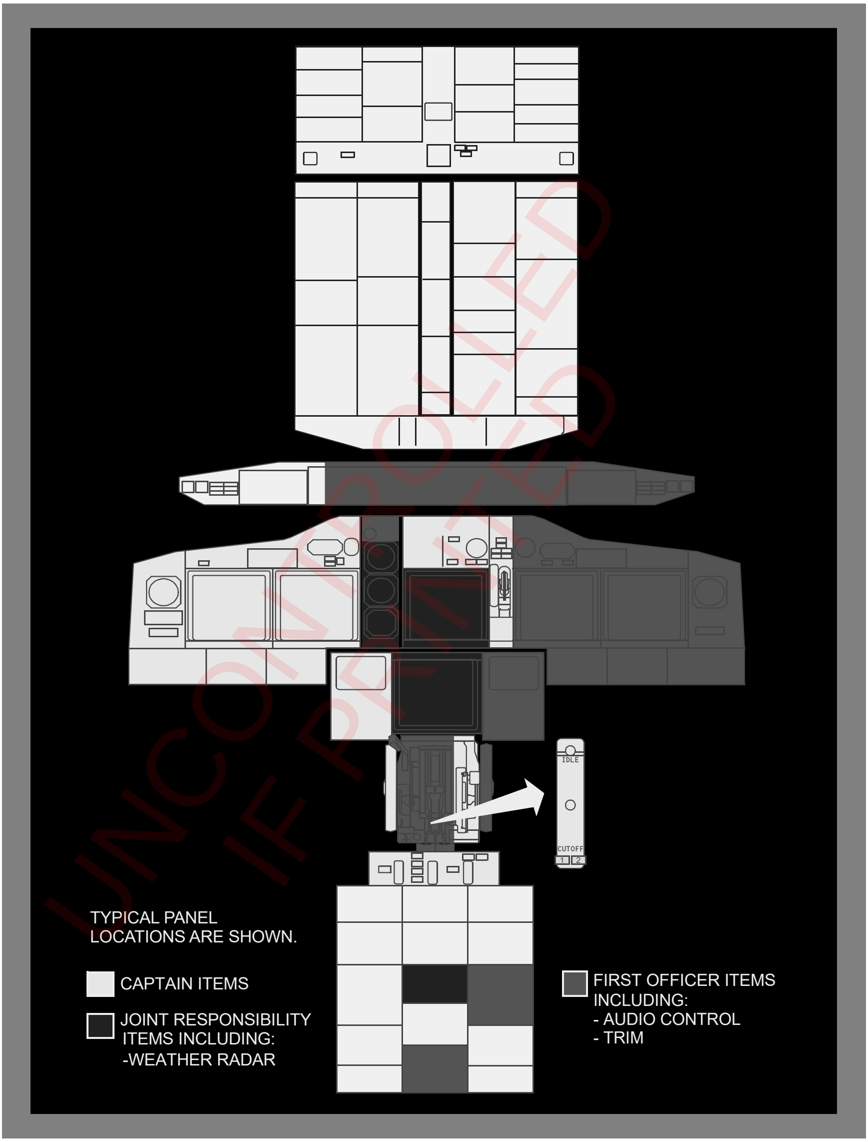
Preflight and Postflight Scan Flow



Areas of Responsibility - Captain as Pilot Flying or Taxiing



Areas of Responsibility - First Officer as Pilot Flying or Taxiing



Intentionally
Blank

Preliminary Preflight Procedure – Captain or First Officer

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

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.

Verify that the following are sufficient for flight:

- oxygen pressure
- hydraulic quantity
- engine oil quantity

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.

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.

EMERGENCY/Test selector – Push and hold

Continue to hold the TEST/RESET 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 TEST/RESET 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.

Maintenance documents .... Check

FLIGHT DECK ACCESS SYSTEM switch .... Guard closed

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.

PSEU light .... Verify extinguished

GPS light .... Verify extinguished

YR034 - YV394
ILS light .... Verify extinguished

YR034 - YV394
GLS light .... Verify extinguished

SERVICE INTERPHONE switch .... OFF

ENGINE panel .... Set

Verify that the REVERSER 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. At the completion of the test, turn the “B” system electric pump “OFF”.

Circuit breakers (P6 panel) .... Check

Manual gear extension access door ....Closed

Circuit breakers (control stand, P18 panel) .... Check

Parking brake ....As needed

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

CDU Preflight Procedure - Captain and First Officer

Start the CDU Preflight Procedure any time 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:

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.

Performance Data ....Set

PERF INIT page:

Enter the ZFW.

Verify that the FUEL on the CDU, the dispatch papers, and the fuel quantity indicators agree.

If refueling is not complete, enter the PLAN trip fuel as needed.

Verify that the fuel is sufficient for flight.

Verify that the gross weight and cruise CG (GW/CRZ CG) on the CDU and the dispatch papers agree.

Thrust mode display:

Verify that dashes are shown.

N1 LIMIT page:

Enter or verify OAT. Confirm the OAT value is correct and reasonable for the ambient conditions.

Select an assumed temperature, or a fixed derate takeoff, or both as needed.

Select a full or a derated climb thrust as needed.

TAKEOFF REF page:

Make data entries on page 2/2 before page 1/2.

Enter the CG.

Verify that a trim value is shown.

Select or enter the takeoff V speeds.

Verify or enter an acceleration height.

Verify or enter an engine out acceleration height.

Verify or enter a thrust reduction altitude.

Verify that the preflight is complete.

Exterior Inspection

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

Items at each location may be checked in any sequence.

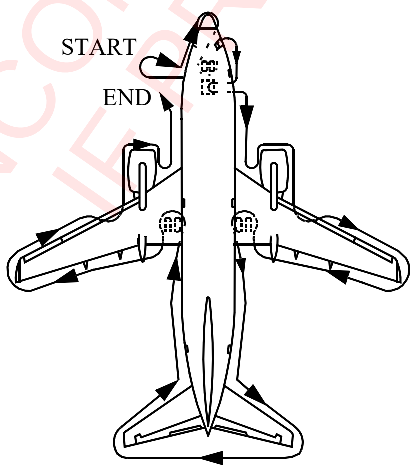
Use the detailed inspection route below to check that:

- 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
- 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

YR017 - YR044
Exterior light .... 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 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

Strobe light .... Check

APU cooling air inlet and 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 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.

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.

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.

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.

YR045 - YV394

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.

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.

EQUIPMENT COOLING switches .... NORM

Verify that the OFF lights are extinguished.

EMERGENCY EXIT LIGHTS switch .... Guard closed

Verify that the NOT ARMED light is extinguished.

Passenger signs .... Set

NO SMOKING switch – AUTO or ON

FASTEN BELTS switch – AUTO or ON

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 VALVE OPEN lights are extinguished.

ENGINE ANTI–ICE switches .... OFF

Verify that the COWL ANTI–ICE lights are extinguished.

Verify that the COWL VALVE OPEN 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.

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

Verify that the RAM DOOR FULL OPEN lights are illuminated.

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 TRIP OFF 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 – 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

YR017 - YR044
LANDING light switches – RETRACT and OFF

YR045 - YV394
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

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

MINIMUMS selector – Set decision height or altitude reference

FLIGHT PATH VECTOR 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

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

TEST/RESET switch – Push and hold

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

TEST/RESET switch - Release

Normal/100% switch – 100%

EMERGENCY/TEST selector – Normal (non-emergency)

Clock..Set

TIME/DATE pushbutton - UTC time

Display select panel ....Set

MAIN PANEL DISPLAY UNITS selector – NORM

LOWER DISPLAY UNIT selector – NORM

TAKEOFF CONFIG light
(if installed and operative) .... Verify extinguished

CABIN ALTITUDE light
(if installed and operative) .... 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

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.

GROUND PROXIMITY panel .... Check

FLAP INHIBIT switch – Guard closed

GEAR INHIBIT switch – Guard closed

TERRAIN INHIBIT switch – Guard closed

Verify that the GROUND PROXIMITY INOP light is extinguished.

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.

AUTO BRAKE select switch ....RTO

Verify that the AUTO BRAKE DISARM light is extinguished

ANTISKID INOP light .... Verify extinguished

Engine display control panel ....Set

N1 SET selector – AUTO

SPEED REFERENCE selector – AUTO

FUEL FLOW switch – RATE

Move switch to RESET, then RATE.

Engine instruments .... Check

Verify that the primary and secondary engine indications show existing conditions.

Verify that no exceedance is shown.

Verify that the hydraulic quantity indications do not show RF.

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.

HUD system ....As needed

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 NAVIGATION radios .... Set for departure

Audio control panel .... Set

ADF radios .... Set

WEATHER RADAR control panel .... Set

Transponder panel .... Set

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

MINIMUMS selector – Set decision height or altitude reference

FLIGHT PATH VECTOR 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

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

TEST/RESET switch – Push and hold

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

TEST/RESET switch – Release

Normal/100% switch – 100%

EMERGENCY/TEST selector – Normal (non-emergency)

Clock .... Set

TIME/DATE pushbutton - UTC time

NOSE WHEEL STEERING switch .... Guard closed

Display select panel .... Set

MAIN PANEL DISPLAY UNITS selector – NORM

LOWER DISPLAY UNIT selector – NORM

TAKEOFF CONFIG light
(if installed and operative) .... Verify extinguished

CABIN ALTITUDE light
(if installed and operative) .... 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

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.

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.

SPEED BRAKE lever ....DOWN detent

Verify that the SPEED BRAKE ARMED light is extinguished.

Verify that the SPEED BRAKE DO NOT ARM 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

HUD system ....As needed

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 NAVIGATION radios .... Set for departure

Audio control panel .... Set

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 papers are on board.

Flight deck door .... Closed and locked F/O

Verify that the LOCK FAIL light is extinguished.

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

Arm VNAV

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 airplanes 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 airplane flight altitude above 10,000 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

Obtain a clearance to pressurize the hydraulic systems.

Obtain a clearance to start the engines.

If pushback is needed:

Verify that the nose gear steering lockout pin is installed, or, if the nose gear steering lockout pin is not used, depressurize hydraulic system A during the hydraulic panel set step C, F/O

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.

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

Check each trim for freedom of movement.

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

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

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 2 minutes of starter usage.
- A minimum of 10 seconds is needed between start attempts.

Extended engine motorings:

- Starter usage is limited to 15 minutes for the first two extended engine motorings. A minimum of 2 minutes is needed between each attempt.
- For the third and subsequent extended engine motorings, starter usage is limited to 5 minutes. A minimum of 10 minutes is needed between each attempt.

Normal engine start considerations:

- 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

When 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.

YR045 - YV394

CAUTION: Do not apply rotational force when moving the engine start lever.

Engine start lever	IDLE detent	C
Monitor fuel flow and EGT indications.		C, F/O
At 56% 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.

Before Taxi Procedure

Start the Before Taxi Procedure after the engines are stable at idle.

GENERATOR 1 and 2 switches .... ON F/O

PROBE HEAT switches ....ON F/O

WING ANTI–ICE switch....................................As needed F/O

ENGINE ANTI–ICE switches ....As needed F/O

PACK switches.. AUTO F/O

ISOLATION VALVE switch .... AUTO F/O

APU BLEED air switch .... OFF F/O

APU switch .... OFF F/O

ENGINE START switches ....CONT F/O

Engine start levers ....IDLE detent C

Verify that the ground equipment is clear. C, F/O

Call "FLAPS ___" as needed for takeoff. C

Flap lever.. Set takeoff flaps F/O

Verify that the LE FLAPS EXT green light is illuminated.

Flight controls .... Check C

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

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

Blank the lower display unit. F/O

Transponder...As needed F/O

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

Before Takeoff Procedure

Engine warm up requirement:

- verify an increase in engine oil temperature before takeoff.

Engine warm up recommendations:

- run the engines for at least 2 minutes
- use a thrust setting normally used for taxi operations.

Pilot Flying	Pilot Monitoring
	Notify the cabin crew to prepare for takeoff. Verify that the cabin is secure.
The pilot who will do the takeoff updates changes to the takeoff briefing as needed.	
Set the weather radar display as needed. Set the terrain display as needed.	
Call “BEFORE TAKEOFF CHECKLIST.”	Do the BEFORE TAKEOFF checklist.

Takeoff Procedure

Pilot Flying	Pilot Monitoring
Before entering the departure runway, verify that the runway and runway entry point are correct.	
	When entering the departure runway, set the STROBE light switch to ON. Use other lights as needed. Set the transponder mode selector to TA/RA.
Verify that the brakes are released. Align the airplane with the runway.	
Verify that the airplane heading agrees with the assigned runway heading.	
	YR017 - YR044 When cleared for takeoff, set the FIXED LANDING light switches to ON. **YR045 - YV394** When cleared for takeoff, set the LANDING light switches to ON.
Advance the thrust levers to approximately 40% N1. Allow the engines to stabilize.	
Push the TO/GA switch.	
Verify that the correct takeoff thrust is set.	
	Monitor the engine instruments during the takeoff. Call out any abnormal indications. Adjust takeoff thrust before 60 knots as needed. During strong headwinds, if the thrust levers do not advance to the planned takeoff thrust, manually advance the thrust levers before 60 knots. Call "THRUST SET".

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td colspan="2">After takeoff thrust is set, the captain’s hand must be on the thrust levers until V1.</td></tr>
<tr><td>Monitor airspeed.
Maintain light forward pressure on the control column.</td><td>Monitor airspeed and call out any abnormal indications.</td></tr>
<tr><td>Verify 80 knots and call “CHECK.”</td><td>Call “80 KNOTS.”</td></tr>
<tr><td>Verify V1 speed.</td><td>Verify the automatic V1 callout or call “V1.”</td></tr>
<tr><td>At VR, rotate toward 15° pitch attitude. After liftoff, follow F/D commands.</td><td>At VR, call “ROTATE.”
Monitor airspeed and vertical speed.</td></tr>
<tr><td>Establish a positive rate of climb.</td><td></td></tr>
<tr><td></td><td>Verify a positive rate of climb on the altimeter and call “POSITIVE RATE.”</td></tr>
<tr><td>Verify a positive rate of climb on the altimeter and call “GEAR UP.”</td><td></td></tr>
<tr><td></td><td>Set the landing gear lever to UP.</td></tr>
<tr><td>Above 400 feet radio altitude, call for a roll mode as needed.</td><td>Select or verify the roll mode.
Verify VNAV engaged.</td></tr>
<tr><td colspan="2">At thrust reduction height, verify that climb thrust is set.</td></tr>
<tr><td>Verify acceleration at the acceleration height.
Call “FLAPS ___” according to the flap retraction schedule.</td><td></td></tr>
<tr><td></td><td>Set the FLAP lever as directed.</td></tr>
<tr><td>Engage the autopilot when above the minimum altitude for autopilot engagement.</td><td></td></tr>
</table>

Pilot Flying	Pilot Monitoring
	After flap retraction is complete: • Set or verify engine bleeds and air conditioning packs are operating • Set the engine start switches as needed • Set the AUTO BRAKE select switch to OFF • Set the landing gear lever to OFF after landing gear retraction is complete.
Call "AFTER TAKEOFF CHECKLIST."	
	Do the AFTER TAKEOFF checklist.

CAUTION: Do not allow the shoulder harness straps to retract quickly. Buckles can pull or damage circuit breakers.

Takeoff Flap Retraction Speed Schedule

Takeoff Flaps	At Speed (display)	Select Flaps
25	V2 + 15 "15" "5" "1"	15 5 1 UP
15 or 10	V2 + 15 "5" "1"	5 1 UP
5	V2 + 15 "1"	1 UP
1	"1"	UP
Limit bank angle to 15° until reaching V2 + 15		

Climb and Cruise Procedure

Complete the After Takeoff Checklist before starting the Climb and Cruise Procedure.

Pilot Flying	Pilot Monitoring
	During climb and cruise, verify the RNP as needed.
	At or above 10,000 feet MSL, set the LANDING light switches to OFF.
	Set the passenger signs as needed.
When climbing above transition altitude, set and crosscheck the altimeters to standard.	
	During climb, set the affected center tank fuel pump switch to OFF when a center tank fuel pump LOW PRESSURE light illuminates. 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.
	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. Set the affected center tank fuel pump switch to OFF when a center tank fuel pump LOW PRESSURE light illuminates. 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.
	During an ETOPS flight, additional steps must be done. See the ETOPS supplementary procedure in SP.1.

Pilot Flying	Pilot Monitoring
	Before the top of descent, modify the active route as needed for the arrival and approach.

Descent Procedure

Start the Descent Procedure before the airplane descends below the cruise altitude for arrival at destination.

Complete the Descent Procedure by 10,000 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. 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.
	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. Set the affected center tank fuel pump switch to OFF when a center tank fuel pump LOW PRESSURE light illuminates. 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.
	Verify that pressurization is set to landing altitude.

Pilot Flying	Pilot Monitoring
Review the system annunciator lights.	Recall and review the system annunciator lights.
Check landing performance	
Verify VREF on the APPROACH REF page.	Enter VREF on the APPROACH REF page.
Set the RADIO/BARO minimums as needed for the approach.	
Set or verify the navigation radios and course for the approach.	
	Set the AUTO BRAKE select switch to the needed brake setting.
Do the approach briefing.	
Call “DESCENT CHECKLIST.”	Do the DESCENT checklist.

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 an instrument approach using IAN, select the approach procedure on the ARRIVALS page. 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.

When using QFE, the use of LNAV/VNAV and IAN are not authorized.

YR034 - YV394
For a GLS approach, select the appropriate GLS channel.

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 a VOR frequency in both VHF control panels.

If a flaps 15 landing is needed because of performance:

GROUND PROXIMITY FLAP INHIBIT
switch ....FLAP INHIBIT F/O

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.

Pilot Flying	Pilot Monitoring
	During arrival and approach, verify the RNP as needed.

Pilot Flying	Pilot Monitoring
	Set the passenger signs as needed.
	YR017 - YR044 At or above 10,000 feet MSL, set the FIXED LANDING light switches to ON. **YR045 - YV394** At or above 10,000 feet MSL, set the LANDING light switches to ON.
When descending below the transition level, set and crosscheck the altimeters.	
Update the arrival and approach, as needed.	
Update the approach briefing as needed.	
Call “APPROACH CHECKLIST.”	Do the APPROACH checklist.

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

Landing Procedure - GLS

YR034 - YV394

Pilot Flying	Pilot Monitoring

Initially
• If on radar vectors
  • HDG SEL
  • Pitch mode (as needed)
• If enroute to a fix
  • LNAV or other roll mode
  • VNAV or other pitch mode	

	Notify the cabin crew to prepare for landing. Verify that the cabin is secure.
Call "FLAPS ___" according to the flap extension schedule.	Set the flap lever as directed. Monitor flaps and slats extension.
When on localizer intercept heading: • verify that the GLS is tuned and identified • verify that the LOC and G/S pointers are shown.	
Arm the APP mode. If a dual channel approach is desired, engage the second autopilot.	
Note: When using LNAV to intercept the final approach course, LNAV might parallel the localizer without capturing it.	
Use LNAV or HDG SEL to intercept the final approach course as needed.	
Verify that the localizer is captured. Verify the final approach course heading.	
	Call "GLIDESLOPE ALIVE."
At glideslope alive, call: • "GEAR DOWN" • "FLAPS 15"	

Pilot Flying	Pilot Monitoring
	Set the landing gear lever to DN. Verify that the green landing gear indicator lights are illuminated. Set the flap lever to 15. Set the engine start switches to CONT.
Set the speed brake lever to ARM. Verify that the SPEED BRAKE ARMED light is illuminated.	
At glideslope capture, call “FLAPS ___” as needed for landing.	Set the flap lever as directed.
Set the missed approach altitude on the MCP.	
Call “LANDING CHECKLIST.”	Do the LANDING checklist.
At the final approach fix (LOM, MKR, DME), verify the crossing altitude.	
Monitor the approach. If an autoland is planned, verify the AFDS status at 500 feet AGL.	
For a single channel approach, disengage the autopilot and autothrottle no later than the minimum use height for single autopilot operation. For a dual channel approach, disengage the autopilot after touchdown.	

Landing Procedure - ILS

Pilot Flying	Pilot Monitoring

Initially
• If on radar vectors
  • HDG SEL
  • Pitch mode (as needed)
• If enroute to a fix
  • LNAV or other roll mode
  • VNAV or other pitch mode	

Pilot Flying	Pilot Monitoring
	Notify the cabin crew to prepare for landing. Verify that the cabin is secure.
Call “FLAPS ___” according to the flap extension schedule.	Set the flap lever as directed. Monitor flaps and slats extension.
When on localizer intercept heading: • verify that the ILS is tuned and identified • verify that the LOC and G/S pointers are shown.	
Arm the APP mode. If a dual channel approach is desired, engage the second autopilot.	
Note: When using LNAV to intercept the final approach course, LNAV might parallel the localizer without capturing it.	
Use LNAV or HDG SEL to intercept the final approach course as needed.	
Verify that the localizer is captured. Verify the final approach course heading.	
	Call “GLIDESLOPE ALIVE.”
At glideslope alive, call: • “GEAR DOWN” • “FLAPS 15”	
	Set the landing gear lever to DN. Verify that the green landing gear indicator lights are illuminated. Set the flap lever to 15. Set the engine start switches to CONT.
Set the speed brake lever to ARM. Verify that the SPEED BRAKE ARMED light is illuminated.	
At glideslope capture, call “FLAPS ___” as needed for landing.	Set the flap lever as directed.
Set the missed approach altitude on the MCP.	

<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 (LOM, MKR, DME), verify the crossing altitude.</td></tr>
<tr><td colspan="2">Monitor the approach.
If an autoland is planned, verify the AFDS status at 500 feet AGL.</td></tr>
<tr><td>For a single channel approach, disengage the autopilot and autothrottle no later than the minimum use height for single autopilot operation.
For a dual channel approach, disengage the autopilot after touchdown.</td><td></td></tr>
</table>

Landing Procedure - Instrument Approach using IAN

IAN 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 IAN is not recommended when an approach has a visual maneuver segment that is not in the FMC database.

This procedure is not authorized using QFE.

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Initially
• If on radar vectors
  • HDG SEL
  • Pitch mode (as needed)
• If enroute to a fix
  • LNAV or other roll mode
  • VNAV or other pitch mode</td><td></td></tr>
<tr><td></td><td>Notify the cabin crew to prepare for landing. Verify that the cabin is secure.</td></tr>
<tr><td>Call “FLAPS ___” according to the flap extension schedule.</td><td>Set the flap lever as directed. Monitor flaps and slats extension.</td></tr>
<tr><td colspan="2">When on localizer/final approach course intercept heading:
• verify that the navigation radios are tuned and identified (as needed)
• verify that the deviation pointers are shown.</td></tr>
<tr><td>Arm the APP mode.</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 airplane can then descend on the glide path with the localizer not captured.</td></tr>
<tr><td>Use LNAV or HDG SEL to intercept the final approach course as needed.</td><td></td></tr>
<tr><td colspan="2">Verify that the localizer/final approach course is captured.

Verify final approach course heading.</td></tr>
</table>

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td></td><td>Approximately 2 NM before the final approach fix, call “APPROACHING GLIDE PATH.”</td></tr>
<tr><td>Approximately 2 NM before the final approach fix, call:
• “GEAR DOWN”
• “FLAPS 15”</td><td></td></tr>
<tr><td></td><td>Set the landing gear lever to DN.
Verify that the green landing gear indicator lights are illuminated.
Set the flap lever to 15.
Set the engine start switches to CONT.</td></tr>
<tr><td>Set the speed brake lever to ARM.
Verify that the SPEED BRAKE ARMED light is illuminated.</td><td></td></tr>
<tr><td>At glide path capture, call “FLAPS ___” as needed for landing.</td><td>Set the flap lever as directed.</td></tr>
<tr><td>Set the missed approach altitude on the MCP.</td><td></td></tr>
<tr><td>Call “LANDING CHECKLIST.”</td><td>Do the LANDING checklist.</td></tr>
<tr><td colspan="2">At the final approach fix:
• verify the crossing altitude
• crosscheck the altimeters. Verify they agree within 100 feet.</td></tr>
<tr><td colspan="2">Monitor the approach.</td></tr>
<tr><td>If suitable visual reference is established at MDA(H), DA(H), or the missed approach point, disengage the autopilot in accordance with regulatory requirements, and disengage the autothrottle at the same time.
Maintain the glide path to landing.</td><td></td></tr>
</table>

Landing Procedure - Instrument Approach using VNAV

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).

This procedure is not authorized using QFE.

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Initially
• If on radar vectors
  • HDG SEL
  • Pitch mode (as needed)
• If enroute to a fix
  • LNAV or other roll mode
  • VNAV or other pitch mode</td><td></td></tr>
<tr><td></td><td>Notify the cabin crew to prepare for landing. Verify that the cabin is secure.</td></tr>
<tr><td>Call “FLAPS ___” according to the flap extension schedule.</td><td>Set the flap lever as directed. Monitor flaps and slats extension.</td></tr>
<tr><td colspan="2">The recommended roll modes for the final approach are:
• for an RNAV or GPS approach use LNAV
• for a LOC-BC, VOR or NDB approach use LNAV
• for a LOC, SDF or LDA approach use LNAV or VOR/LOC.</td></tr>
<tr><td colspan="2">When on the final approach course intercept heading for LOC, LOC-BC, SDF or LDA approaches:
• verify that the localizer is tuned and identified
• verify that the anticipation cue or LOC pointer is shown</td></tr>
<tr><td>Select LNAV or arm the VOR/LOC mode.</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 airplane can then descend on the VNAV path with the localizer not captured.</td></tr>
<tr><td>Use LNAV or HDG SEL to intercept the final approach course as needed.</td><td></td></tr>
</table>

Pilot Flying	Pilot Monitoring
Verify that LNAV is engaged or that VOR/LOC is captured.	
Approximately 2 NM before the final approach fix and after ALT HOLD or VNAV PTH or VNAV ALT is annunciated: • set DA(H) or MDA(H) on the MCP • select or verify VNAV • select or verify speed intervention, (as installed).	Approximately 2 NM before the final approach fix, call "APPROACHING GLIDE PATH."
Call: • "GEAR DOWN" • "FLAPS 15."	
	Set the landing gear lever to DN. Verify that the green landing gear indicator lights are illuminated. Set the flap lever to 15. Set the engine start switches to CONT.
Set the speed brake lever to ARM. Verify that the SPEED BRAKE ARMED light is illuminated.	
Beginning the final approach descent, call "FLAPS ___" as needed for landing.	Set the flap lever as directed.
Call "LANDING CHECKLIST."	Do the LANDING checklist.
At the final approach fix: • verify the crossing altitude • crosscheck the altimeters. Verify they agree within 100 feet.	
When at least 300 feet below the missed approach altitude, set the missed approach altitude on the MCP.	
Monitor the approach.	

Pilot Flying	Pilot Monitoring
If suitable visual reference is established at DA(H), MDA(H) or the missed approach point, disengage the autopilot in accordance with regulatory requirements, and disengage the autothrottle at the same time. Maintain the glide path to landing.	

Go–Around and Missed Approach Procedure

Pilot Flying	Pilot Monitoring
Push the TO/GA switch.	
Verify that the thrust increases.	
Call "FLAPS 15" or "FLAPS ___" 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.” Set the landing gear lever to UP.
	Verify that the missed approach altitude is set.
If the airspeed is within the amber band, limit bank angle to 15°.	
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, call “FLAPS ___” according to the flap retraction schedule.	Set the FLAP lever as directed. Monitor flaps and slats retraction.
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 landing gear lever to OFF after landing gear retraction is complete. Set the engine start switches as needed.

Pilot Flying	Pilot Monitoring
Call “AFTER TAKEOFF CHECKLIST.”	Do the AFTER TAKEOFF checklist.

Landing Roll Procedure

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>If an autoland was accomplished, disengage the autopilot. Control the airplane manually.</td><td></td></tr>
<tr><td>Verify that the thrust levers are closed.

Verify that the SPEED BRAKE lever is UP.

Without delay, fly the nose wheel smoothly onto the runway.</td><td>Verify that the SPEED BRAKE lever is UP.

Call “SPEED BRAKES UP.”

If the SPEED BRAKE lever is not UP, call “SPEED BRAKES NOT UP.”</td></tr>
<tr><td colspan="2">Monitor the rollout progress.</td></tr>
<tr><td colspan="2">Verify correct autobrake operation.</td></tr>
<tr><td colspan="2">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.</td></tr>
<tr><td>Without delay, move the reverse thrust levers to the interlocks and hold light pressure until the interlocks release.

Apply reverse thrust as needed.</td><td>Verify that the forward thrust levers are closed.

When both REV indications are green, call "REVERSERS NORMAL".

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".</td></tr>
<tr><td>By 60 knots, start movement of the reverse thrust levers to be at the reverse idle detent before taxi speed.</td><td>Call “60 KNOTS.”</td></tr>
<tr><td>After the engines are at reverse idle, move the reverse thrust levers full down.</td><td></td></tr>
<tr><td>Before taxi speed, disarm the autobrake. Use manual braking as needed.</td><td></td></tr>
</table>

After Landing Procedure

Start the After Landing Procedure when clear of the active runway.

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 SPEED BRAKE lever is DOWN.	
	Start the APU, as needed.
	Set the PROBE HEAT switches to AUTO.
	Set the exterior lights as needed.
	Set the ENGINE START switches to OFF.
Set the weather radar to OFF.	
	Set the AUTO BRAKE select switch to OFF.
	Set the flap lever to UP.
	Set the transponder as needed.

Shutdown Procedure

Start the Shutdown Procedure after taxi is complete.

Parking brake .... Set C or F/O

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.

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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		F/O
CAB/UTIL power switch ....As needed		F/O
IFE/PASS SEAT power switch ....As needed		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 - OFF

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
Exterior lights switches ....As needed	F/O
FLIGHT DIRECTOR switches .... OFF	C, F/O
Transponder mode selector .... STBY	F/O

After the wheel chocks are in place:

Parking brake – Release — C or F/O

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.

Call “SHUTDOWN CHECKLIST.”	C
Do the SHUTDOWN checklist.	F/O

Secure Procedure

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

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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

- below the forward 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

Oxygen Mask Microphone Test

FLT INT switch .... Push

SPKR switch .... On

TEST/RESET switch .... Push and hold

EMERGENCY/Test selector .... Push and hold

Push-to-Talk switch .... I/C

Simultaneously push the Push-to-Talk switch, the EMERGENCY/Test selector and the TEST/RESET switch.

Verify oxygen flow sound is heard through the flight deck speaker.

Push-to-Talk switch .... Release

EMERGENCY/Test selector .... Release

TEST/RESET switch .... Release

SPKR switch .... As needed

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.

During the last hour of cruise, do the following steps:

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 – 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

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

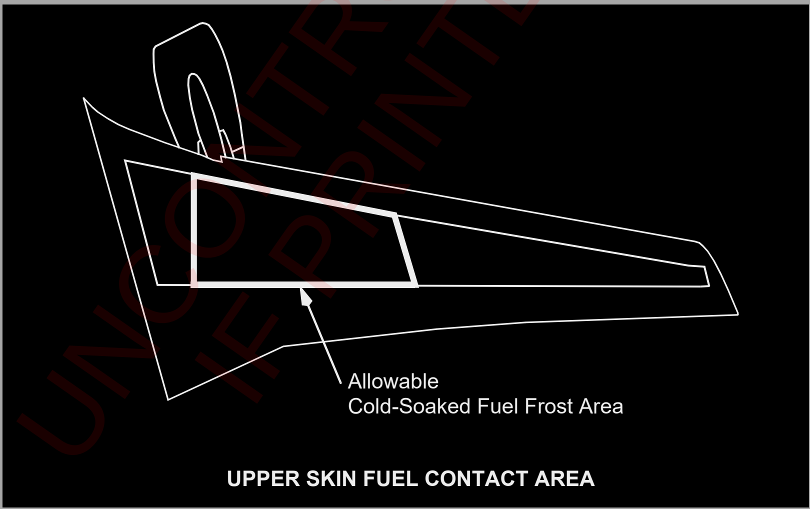
Anti–Ice Operation

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



Note: The presence of the painted cold soaked fuel frost area on the upper wing and the inclusion of these procedures in the FCOM do not constitute operational approval. Operators may be allowed to use these procedures by referring to the appropriate regulatory authority for approval or exemption, as required, to implement the procedure.

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 allowed 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 the following condition 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, or +3°F
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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 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 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 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
• If on radar vectors
  • HDG SEL
  • Pitch mode (as needed)
• If enroute to a fix
  • LNAV or other roll mode
  • 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). Set the MCP altitude to the nearest 100 foot increment at or above each intermediate altitude constraint or MDA(H). 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: • “GEAR DOWN” • “FLAPS 15.”	Set the landing gear lever to DN. Verify that the green landing gear indicator lights are illuminated. Set the flap lever to 15. Set the engine start switches to CONT.
Set the speed brake lever to ARM. 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.

Pilot Flying	Pilot Monitoring
Call "LANDING CHECKLIST."	Do the LANDING checklist.

At the final approach fix, crosscheck the altimeters. Verify they agree within 100 feet.

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
- 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

Instrument Approach - RNAV (RNP) AR

Note: Operators need approval to conduct RNAV (RNP) AR Instrument Approaches.

Note: For RNAV (GPS) and RNAV (GNSS) procedures use the Landing Procedure - Instrument Approach using VNAV or Landing Procedure - Instrument Approach using IAN in Normal Procedures.

Note: This procedure is not authorized using QFE.

The procedure below supplements Normal Preflight, Cruise, Descent and Approach Procedures and replaces the Landing Procedure.

Preflight Procedure

Review RNP availability predictions.

Pre-approach Requirements

Airplane equipment required to begin the approach:

- EGPWS
- 2 FMCs
- 2 CDUs
- 2 GPS Receivers
- 2 Radio Altimeters
- 2 ADIRUs, IRSs in NAV mode
- 2 EFIS/MAP or PFD/ND displays (as installed)
- 1 A/P and 2 F/Ds capable of LNAV and VNAV(for RNP 0.15 or greater)
- 2 A/P and 2 F/Ds capable of LNAV and VNAV(for RNP less than 0.15)

Note: Do the Go-Around and Missed Approach Procedure if the UNABLE REQD NAV PERF-RNP, FMC DISAGREE, or any VERIFY POS alerting message is shown 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:
  - 0.10 (A/P or 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.

Cruise Procedure

Pilot Flying	Pilot Monitoring
	When selecting the approach from the navigation database verify ACT RTE X LEGS page matches the charted approach. 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 allowed as long as the maximum published speed is not exceeded.

Descent Procedure

Pilot Flying	Pilot Monitoring
In the approach briefing include speed and altitude restrictions, missed approach, engine failure, and unable RNP procedures.	Select VOR UPDATE - OFF on the NAV OPTIONS page. Inhibit other navaids as needed per NOTAM.

Approach Procedure

Complete the Approach Procedure before the initial approach fix, or the start of radar vectors to the final approach course.

Note: 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.

Note: Direct To modifications are not permitted when:

- The fix is the beginning of an RF leg
- The fix is the Final Approach Fix (FAF) for the procedure.

Pilot Flying	Pilot Monitoring
	On the RNP PROGRESS page verify RNP for the approach.

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.

Landing Procedure

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Initially
• If on radar vectors
  • HDG SEL
  • Pitch mode (as needed)
• If enroute to a fix
  • LNAV or other roll mode
  • VNAV or other pitch mode</td><td></td></tr>
<tr><td></td><td>Notify the cabin crew to prepare for landing. Verify that the cabin is secure.</td></tr>
<tr><td>Select TERR on map.

Select CDU: ACT RTE X LEGS page.</td><td>Select TERR or WX radar on map.</td></tr>
<tr><td colspan="2">Use LNAV and VNAV or other pitch mode for initial descent. VNAV is required from the FAF inbound.

Some approach procedures can require use of VNAV from the IAF inbound.

On intercept heading, select or verify LNAV.</td></tr>
</table>

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Call “FLAPS ___” according to the flap extension schedule or approach speed constraint.</td><td>Set the flap lever as directed. Monitor flaps and slats extension.</td></tr>
<tr><td>Approximately 2 NM before the final approach fix and after ALT HOLD or VNAV PTH or VNAV ALT (as installed) is annunciated:
• set DA(H) on the MCP
• select or verify VNAV
• select or verify speed intervention (as installed)</td><td></td></tr>
<tr><td colspan="2">Maximum Lateral Deviation (XTK ERROR): NPS amber indication or 1 x RNP
Maximum Vertical Deviation - FAF to DA: 75 feet
Monitor NPS</td></tr>
<tr><td>Approaching glide path, call:
• “GEAR DOWN”
• “FLAPS 15”</td><td>Set the landing gear lever to DN.
Verify that the green landing gear indicator lights are illuminated.
Set the flap lever to 15.
Set the engine start switches to CONT.</td></tr>
<tr><td>Set the speed brake lever to ARM.
Verify that the SPEED BRAKE ARMED light is illuminated.</td><td></td></tr>
<tr><td>Beginning the final approach descent, call “FLAPS ___” as needed for landing.</td><td>Set the flap lever as directed.</td></tr>
<tr><td>Call “LANDING CHECKLIST.”</td><td>Do the LANDING checklist.</td></tr>
<tr><td>When at least 300 feet below the missed approach altitude, set the missed approach altitude on the MCP.</td><td></td></tr>
<tr><td colspan="2">At the final approach fix, verify the crossing altitude and crosscheck altimeters within 100 feet between primary altimeters.</td></tr>
</table>

Pilot Flying	Pilot Monitoring
Monitor the approach.	
If suitable visual reference is established at DA(H), disengage the autopilot in accordance with regulatory requirements, and disengage the autothrottle at the same time. Maintain the glide path to landing.	

Intentionally
Blank

Aircraft Communication Addressing and Reporting System (ACARS)

The following procedures are applicable to the noted ACARS functions from the company pages.

Pre-Departure Clearance

The flight crew shall manually verify (compare) the filed flight plan versus the digital pre-departure clearance and shall initiate voice contact with Air Traffic Control if any question/confusion exists between the filed flight plan and the digital pre-departure clearance.

Digital-Automatic Information Service

The flight crew shall verify that the D-ATIS altimeter setting numeric value and alpha value are identical. If the D-ATIS altimeter setting numeric value and alpha values are different, the flight crew must not accept the D-ATIS altimeter setting.

Oceanic Clearances

The flight crew shall manually verify (compare) the filed flight plan versus the digital oceanic clearance and initiate voice contact with Air Traffic Control if any questions/confusion exists between the filed flight plan and the digital oceanic clearance.

Weight and Balance

The flight crew shall verify the Weight and Balance numeric and alphabetical values are identical. If the Weight and Balance numeric and alphabetical values are different, the flight crew must not accept the Weight and Balance data.

Takeoff Data

The flight crew shall verify the Takeoff Data numeric and alphabetic values are identical. If the Takeoff Data numeric and alphabetic values are different, the flight crew must not accept the Takeoff Data message.

Cockpit Voice Recorder Test

Test switch .... Push

Hold switch for 5 seconds. Observe that the TEST light illuminates. A tone may be heard through a headset plugged into the headset jack.

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.

STANDBY POWER switch .... Guard closed

ALTERNATE FLAPS master switch .... Guard closed

Windshield WIPER selector(s) .... 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.

YR045 - YV394
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 MAINT 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 2 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:

BUS TRANSFER switch .... OFF

APU GEN No. 2 switch or GRD PWR switch .... OFF

Turn OFF appropriate switch depending on power source in use. Removes power from TR 3.

STANDBY POWER switch .... OFF

Check STANDBY PWR OFF light illuminated.

AC–DC voltmeters .... Zero

STANDBY POWER switch .... BAT

Check STANDBY PWR OFF Light extinguished

AC–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.

STANDBY POWER switch .... AUTO

BUS TRANS switch .... AUTO

APU GEN No. 2 switch or GRD PWR switch .... ON

Note: It can take up to 3 minutes for CDS displays to recover when power is interrupted for more than 2 seconds on the ground.

Battery Start

(With APU bleed or ground air available)

Maintenance documents .... Check

FLIGHT DECK ACCESS SYSTEM
switch .... Guard closed

BATTERY switch .... Guard closed

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.

Emergency equipment .... Check

Fire extinguisher - Checked and stowed

Crash axe - Stowed

Escape ropes - Stowed

Other needed equipment - Checked and stowed.

Flight recorder switch .... Guard closed

Circuit breakers (P6 panel) .... Check

Circuit breakers (control stand, P18 panel) .... Check

Accomplish the Interior and Exterior Inspection if required, except for items requiring electrical or hydraulic power.

Verify that the oxygen pressure is sufficient for flight.

Accomplish the following Preflight Procedure - First Officer items:

Overheat and fire protection panel .... Check

OVERHEAT DETECTOR switches - NORMAL

TEST switch - Hold to FAULT/INOP

TEST switch - Hold to OVHT/FIRE

EXTINGUISHER TEST switch - Check

APU switch
(bleed air source, if available) .... START

On the captain's command, the first officer reads and the captain does the following items:

Oxygen .... Test and set

CAB/UTIL power switch .... ON

IFE/PASS seat power switch .... ON

EMERGENCY EXIT LIGHTS switch ....Guard closed

Passenger signs .... Set

HYDRAULIC PUMP switches .... ON

Air conditioning panel .... Set

PACK switches - AUTO or HIGH

Engine BLEED air switches - ON

APU BLEED air switch - ON

SPEED BRAKE lever ....DOWN detent

Reverse thrust levers .... Down

Forward thrust levers ....Closed

Parking brake .... Set

Note: The wheels should be chocked in case the brake pressure has bled down.

Engine start levers ....CUTOFF

Papers .... Aboard

When cleared for Engine Start, do the following:

Air conditioning PACK switches ....OFF

ANTICOLLISION light switch .... ON

Ignition select switch ....IGN-R

Engine Start

Engine No. 1 start .... Accomplish

Only N1, N2, and oil quantity are displayed until the EECs are powered.

Generator 1 switch ....ON

IRS mode selectors .... OFF, then NAV

Verify that the ON DC lights illuminate, then extinguish

Verify that the ALIGN lights are illuminated.

FMC/CDU .... Set IRS position

Verify that the following are sufficient for flight:

- hydraulic quantity
- engine oil quantity

WARNING: If engine No. 1 was started using a ground air source, 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 No. 2 start .... Accomplish

Generator 2 switch ....ON

Cabin pressurization panel .... Set

FLIGHT ALTITUDE indicator - 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.

Complete the Preliminary Preflight Procedure - Captain or First Officer by doing the following items:

PSEU light .... Verify extinguished

GPS light .... Verify extinguished

YR034 - YV394
ILS light .... Verify extinguished

YR034 - YV394
GLS light .... Verify extinguished

SERVICE INTERPHONE switch ....OFF

ENGINE panel ....Set

Verify that the REVERSER lights are extinguished

Verify that the ENGINE CONTROL lights are extinguished

EEC switches - ALTN then ON

Oxygen panel ....Set

CREW OXYGEN pressure indicator - Check

Verify that the pressure meets dispatch requirements.

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

Manual gear extension access door ....Closed

Accomplish the normal CDU Preflight Procedure - Captain and First Officer, Preflight Procedure - First Officer, Preflight Procedure - Captain, Before Start Procedure and Before Taxi Procedure to ensure that the flight deck preparation is complete.

BEFORE TAXI checklist ....Accomplish

IRS alignment .... Complete

The airplane is ready for taxi. Refer to the normal checklists for subsequent checks.

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) .... Advance thrust lever

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.

N1 SET outer knob .... BOTH

The last FMC computed value is displayed by reference N1 bugs and readouts. If the FMC has not calculated an input since power up, a default value of 104% is displayed.

N1 SET inner knob .... Set N1

Note: If the N1 SET outer knob is returned to the AUTO position, 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.

Intentionally
Blank

Fire and Overheat System Test with an Inoperative Loop

YR017 - YR044

To determine the specific inoperative loop:

OVHT DET switches .... A

Test switch .... OVHT/FIRE

If the FAULT light stays extinguished and both ENG OVERHEAT lights and engine fire switches illuminate, loop A is good.

If the FAULT light illuminates and the ENG OVERHEAT light and engine fire switch for an engine stay extinguished, there is a fault in loop A of the detection system for that engine.

OVHT DET switches .... B

Test switch .... OVHT/FIRE

If the FAULT light stays extinguished and both ENG OVERHEAT lights and engine fire switches illuminate, loop B is good.

If the FAULT light illuminates and the ENG OVERHEAT light and engine fire switch for an engine extinguished, there is a fault in loop B of the detection system for 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.

Fire and Overheat System Test with an Inoperative Loop

YR045 - YV394

To determine the specific inoperative loop:

OVHT DET switches .... A

Test switch .... OVHT/FIRE

If the FAULT light stays extinguished and both ENG OVERHEAT lights, engine start lever lights, and engine fire switches illuminate, loop A is good.

If the FAULT light illuminates and the ENG OVERHEAT light, engine start lever light, and engine fire switch for an engine stay extinguished, there is a fault in loop A of the detection system for that engine.

OVHT DET switches .... B

Test switch .... OVHT/FIRE

If the FAULT light stays extinguished and both ENG OVERHEAT lights, engine start lever lights, and engine fire switches illuminate, loop B is good.

If the FAULT light illuminates and the ENG OVERHEAT light, engine start lever light, and engine fire switch for an engine stay extinguished, there is a fault in loop B of the detection system for 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.

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	CDS/CDS	CDS/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:

Speed reference selector (outer) V1

Default speed of 80 knots is displayed.

Speed reference selector (inner) .... Set V1 speed

V1 bug is displayed when a speed greater than 80 knots is set. The NO VSPD flag is displayed until both V1 and VR are set.

Speed reference selector (outer) ....VR

Default speed of 80 knots is displayed.

Speed reference selector (inner) ....Set VR speed

VR bug is displayed when a speed greater than 80 knots is set. The NO VSPD flag is removed after both V1 and VR are set.

MCP speed selector ....Set V2

Airspeed cursor and V2+15 bug move to the correct speeds.

Speed reference selector (outer) .... WT

Default weight of 32,000 kgs is displayed.

Speed reference selector (inner) ....Set takeoff gross weight

Flaps up maneuver speed bug is displayed.

Note: If VREF is selected on the ground, INVALID ENTRY is displayed.

To set the spare bug, if desired:

Speed Reference selector (outer) ....Spare bug

Default speed of 60 knots is displayed.

Speed reference selector (inner) ....Set

Set speed as desired.

Speed reference selector (outer) .... SET

Digital readout is removed.

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 will be displayed.

To set reference airspeed bugs for approach:

Speed reference selector (outer) .... WT

Default weight of 32,000 kgs is displayed.

Speed reference selector (inner) .... Set current gross weight

Flaps up maneuver speed bug is displayed.

Speed reference selector (outer) .... VREF

Default speed of 80 knots is displayed.

Speed reference selector (inner) .... Set VREF speed

The green VREF bug and white VREF +20 bug are shown when a speed greater than 80 knots is set.

Note: If V1 or VR is selected in flight, INVALID ENTRY is displayed.

To set the spare bug, if desired:

Speed reference selector (outer) .... Spare bug

Default speed of 60 knots is displayed.

Speed reference selector (inner) .... Set

Set speed as desired.

Speed reference selector (outer) .... SET

Digital readout is removed.

HUD System Procedures

HUD system procedures supplement normal procedures and should be accomplished when applicable.

Preflight Procedure

If the HUD will be used for takeoff, or configured for a possible return for landing, accomplish the following during the Preflight Procedure:

HUD System ....Set

Combiner – Lowered, cover removed

Runway Data – Set in control panel

Enter runway length

The runway length entered must be between 7,500 and 13,500 feet (2,287 and 4,114 meters).

Enter TDZE (if available) or field elevation

Enter glideslope angle for possible return for landing.

The glideslope angle must be set between -2.50° and -3.00° for an AIII approach.

Mode – Set

Select IMC or VMC to verify proper alignment

ALIGN HUD light – Extinguished

After checking alignment, select PRI mode

Note: CLR may be selected to blank display during taxi. Push CLR again to restore display. If the HUD will not be used for takeoff, the combiner should be stowed.

For a low visibility takeoff, enter the ILS frequency and set the course to takeoff runway magnetic heading.

Descent

If HUD will be used for approach and landing, accomplish the following steps:

Prior to completing the DESCENT checklist:

HUD System .... Set

Combiner – Lowered, cover removed

Runway Data – Set in control panel

Enter runway length.

The runway length entered must be between 7,500 and 13,500 feet (2,287 and 4,114 meters) for an AIII guided landing rollout.

Enter runway TDZE (if available) or field elevation

Enter glideslope angle

The glideslope angle must be set between -2.50° and -3.00° for an AIII approach.

Mode – Set

Select IMC or VMC to verify proper alignment

ALIGN HUD light – Extinguished

After checking alignment, select PRI mode

Prior to intercepting final on a visual approach:

Select VMC mode

After intercepting final on an instrument approach:

Select IMC mode, if needed

IMC mode is an alternate approach mode primarily intended for AFDS approaches.

Note: During approach, the PM will monitor the HUD ANNUNCIATOR panel.

Landing

If HUD will be used for a CAT II or CAT IIIa approach:

At glideslope capture:

Select/verify AIII mode active

Shutdown

Accomplish the following step during the Shutdown Procedure:

HUD Combiner .... Stowed

If the airplane will be secured, install cover before stowing.

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.

YR017 - YR044

AURAL ALERTS	DEFINITION
“TCAS TEST” “TCAS TEST FAIL”	Test failed. Maintenance required.
“TCAS TEST” “TCAS TEST OK”	Test complete. System operable.

YR045 - YV394

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.

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

RTE page .... 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 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 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 3, 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

TAKEOFF REF page .... Select

TO SHIFT distance .... Enter

Enter distance desired from runway threshold. When TO/GA is pushed, FMC will update position to runway threshold plus entered 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.

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Spar Fuel Shutoff Valve Operational Check

YR017 - YR032

Note: Regulatory approval for use of the following flight crew procedure(s) is required.

Note: The check is considered failed for any of the following procedures if the SPAR VALVE CLOSED light (located on the fuel control panel) fails to illuminate bright during the check.

Unless accomplished by maintenance personnel, do **one** of the 3 following spar fuel shutoff valve checks once per flight day:

1. Spar Fuel Shutoff Valve Operational Check with Engine(s) Shutdown

With AC power established on the airplane:

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

ENGINE START switches .... OFF

Engine start lever (first engine) .... IDLE

Note: During this check it is normal for the ENG VALVE CLOSED light to transition from dim to bright, and remain bright.

Wait for approximately 10 seconds

Engine start lever (first engine) .... CUTOFF

Verify SPAR VALVE CLOSED light transitions from extinguished, to bright and then dim.

Engine start lever (second engine) .... IDLE

Note: During this check it is normal for the ENG VALVE CLOSED light to transition from dim to bright, and remain bright.

Wait for approximately 10 seconds

Engine start lever (second engine) .... CUTOFF

Verify SPAR VALVE CLOSED light transitions from extinguished, to bright and then dim.

2. Spar Fuel Shutoff Valve Operational Check During Engine Start

Engine start lever (first engine) .... IDLE

Verify SPAR VALVE CLOSED light transitions from dim, to bright and then extinguishes.

Engine start lever (second engine) .... IDLE

Verify SPAR VALVE CLOSED light transitions from dim, to bright and then extinguishes.

3. Spar Fuel Shutoff Valve Operational Check During Engine Shutdown

Engine start lever (first engine) .... CUTOFF

Verify SPAR VALVE CLOSED light transitions from extinguished, to bright and then dim.

Engine start lever (second engine) .... CUTOFF

Verify SPAR VALVE CLOSED light transitions from extinguished, to bright and then dim.

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

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) 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
- "AIRSPEED LOW" aural sounds

Note: If the test switch is held until the aurals begin, additional GPWS aural warnings are tested.

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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.
- If ambient temperature is below -35°C, idle the engine for two minutes before changing thrust lever position.
- 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 VALVE OPEN lights illuminate bright, then dim.

Verify that the COWL ANTI-ICE lights are extinguished.

Note: If the COWL VALVE OPEN lights remain illuminated bright 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

Verify that the COWL VALVE OPEN lights illuminate bright, then extinguish.

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

Verify that the L and R VALVE OPEN lights illuminate bright, then dim.

Note: The wing anti-ice VALVE OPEN lights may cycle bright/dim due to the control valves cycling closed/open in response to thrust setting and duct temperature logic.

When wing anti-ice is no longer needed:

WING ANTI-ICE switch .... OFF F/O

Verify that the L and R VALVE OPEN lights illuminate bright, then extinguish.

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.

Flaps .... Check F/O

Move the flaps from Flaps up to Flaps 40 back to Flaps up (i.e., full travel) to ensure freedom of movement.

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, an engine run up is recommended to minimize ice build-up. Use the following procedure:

Check that the area behind the airplane is clear. C

Run-up to a minimum of 70% N1 for approximately 30 seconds duration at intervals no greater than 30 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 30 minute interval.

If airport surface conditions and the concentration of aircraft do not allow the engine thrust level to be increased to 70% N1, then set a thrust level as high as practical and time at that thrust level. C

Note: When operating in conditions of freezing rain, freezing drizzle, freezing fog or heavy snow, run-ups to a minimum of 70% N1 for approximately 1 second duration at intervals no greater than 10 minutes enhance ice shedding.

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.

Takeoff Procedure

Do the normal Takeoff Procedure with the following modification:

When engine anti-ice is required and the OAT is 3°C or below, the takeoff must be preceded by a static engine run-up. Use the following procedure:

Run-up to a minimum of 70% N1 and confirm stable engine operation before the start of the takeoff roll. A 30-second run-up is highly recommended whenever possible.

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 VALVE OPEN lights illuminate bright, then dim.

Verify that the COWL ANTI-ICE lights are extinguished.

Note: If the COWL VALVE OPEN lights remain illuminated bright 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

Verify that the COWL VALVE OPEN lights illuminate bright, then extinguish.

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

Verify that the L and R VALVE OPEN lights illuminate bright, then dim.

When wing anti-ice is no longer needed:

WING ANTI-ICE switch .... OFF PM

Verify that the L and R VALVE OPEN lights illuminate bright, then extinguish.

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 or if the airport temperature is at or above the minimum published temperature for the procedure being flown.

Note: Regulatory authorities may have other requirements for cold temperature altitude corrections.

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 VALVE OPEN lights illuminate bright, then dim.

Verify that the COWL ANTI-ICE lights are extinguished.

Note: If the COWL VALVE OPEN lights remain illuminated bright 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

Verify that the COWL VALVE OPEN lights illuminate bright, then extinguish.

ENGINE START switches .... OFF F/O

When engine anti-ice is required and the OAT is 3°C or below, an engine run up is recommended to minimize ice build-up. Use the following procedure: C

Check that the area behind the airplane is clear.

Run-up to a minimum of 70% N1 for approximately 30 seconds duration at intervals no greater than 30 minutes.

If airport surface conditions and the concentration of aircraft do not allow the engine thrust level to be increased to 70% N1, then set a thrust level as high as practical and time at that thrust level.

Note: When operating in conditions of freezing rain, freezing drizzle, freezing fog or heavy snow, run-ups to a minimum of 70% N1 for approximately 1 second duration at intervals no greater than 10 minutes should be considered.

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
- battery removed. If the battery will be exposed to temperatures below -18°C, the battery should be removed and stored in an area warmer than -18°C, but below 40°C. Subsequent installation of the warm battery 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

PACK switches .... HIGH

After engine start with the engines at ground idle, the pneumatic pressure available to the bleed air system may not be sufficient to provide adequate cooling during extended ground operations. 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.

YR045 - YV394

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.
- Before takeoff, allow sand and dust to settle if conditions allow.
- 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 the cabin crew 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.
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 glide path 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. CFM56-7 engines have experienced several power loss events resulting from ice accumulation in the engine.

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:

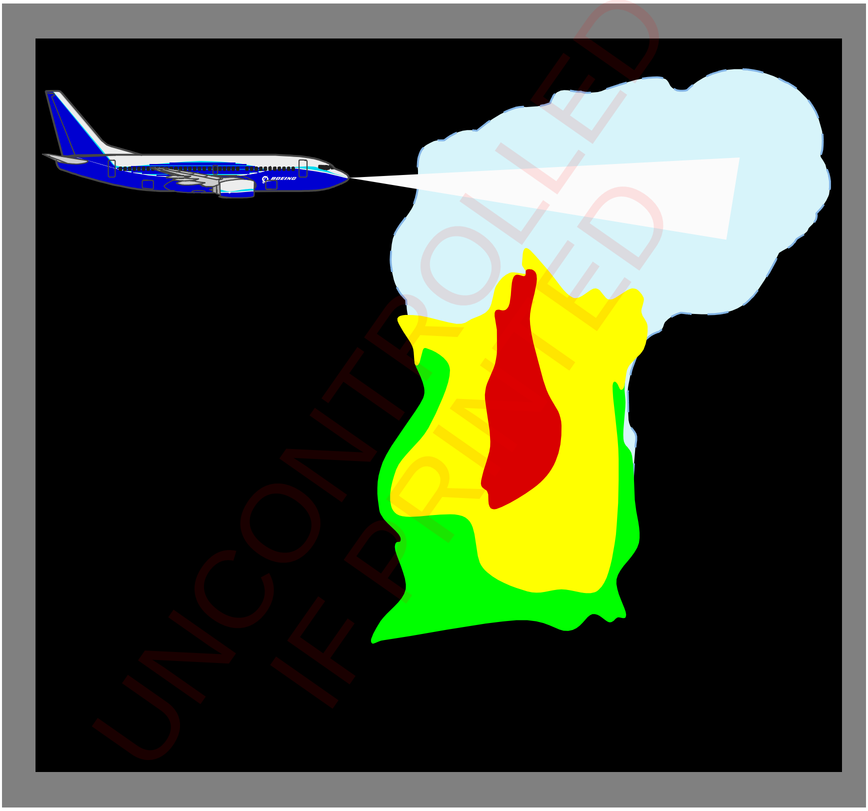
- appearance of rain on the windshield at temperatures too cold for liquid water to exist. This is due to ice crystals melting on the heated windows (sounds different than rain)
- Areas of light to moderate turbulence
- In IMC with:
  - No significant airframe icing and
  - no significant radar returns 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.



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.

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Gear Down PD.14.5

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 Errata (NOE) 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.

Line Number	Registry Number	Serial Number	Tabulation Number
4081	A6-FDZ	40253	YR017
4096	A6-FEA	40254	YR018
4216	A6-FEB	40255	YR019
4243	A6-FEC	40256	YR020
4277	A6-FED	40257	YR021
4433	A6-FEE	40258	YR022
4467	N-402FP	40259	YR023
4534	A6-FEG	40281	YR024
4648	A6-FEH	40260	YR025

Line Number	Registry Number	Serial Number	Tabulation Number
4671	A6-FEI	40261	YR026
4699	A6-FEJ	40262	YR027
4738	A6-FEK	40282	YR028
4781	A6-FEL	40263	YR029
4979	A6-FEN	40265	YR030
4988	A6-FEM	40264	YR031
5004	A6-FEO	40266	YR032
5083	A6-FEP	40269	YR033
5117	A6-FEQ	40267	YR034
5163	A6-FER	40268	YR035
5187	A6-FES	40270	YR036
5241	A6-FET	40271	YR037
5285	A6-FEU	40273	YR038
5323	A6-FEV	40275	YR039
5364	A6-FEW	40276	YR040
5397	A6-FEX	40278	YR041
5465	A6-FEY	40274	YR042
5553	A6-FEZ	40272	YR044
5887	A6-FGA	60954	YR045
5950	A6-FGB	60955	YR046
6004	A6-FGC	60956	YR047
6042	A6-FGD	60957	YR048
6069	A6-FGE	60958	YR049
6116	A6-FGF	60959	YR050
6175	A6-FGG	60960	YV391

Line Number	Registry Number	Serial Number	Tabulation Number
6201	A6-FGH	60961	YV392
6277	A6-FGI	60962	YV393
6351	A6-FGJ	60963	YV394

Intentionally
Blank

Takeoff Field Corrections - Dry Runway

Slope Corrections

FIELD LENGTH AVAILABLE (M)	SLOPE CORRECTED FIELD LENGTH (M)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
1200	1250	1240	1230	1210	1200	1190	1180	1170	1160
1400	1470	1450	1430	1420	1400	1380	1350	1330	1310
1600	1690	1670	1640	1620	1600	1570	1530	1500	1460
1800	1910	1880	1850	1830	1800	1750	1710	1660	1610
2000	2120	2090	2060	2030	2000	1940	1880	1830	1770
2200	2340	2310	2270	2240	2200	2130	2060	1990	1920
2400	2560	2520	2480	2440	2400	2320	2240	2160	2070
2600	2780	2730	2690	2640	2600	2510	2410	2320	2230
2800	3000	2950	2900	2850	2800	2690	2590	2480	2380
3000	3220	3160	3110	3050	3000	2880	2770	2650	2530
3200	3430	3380	3320	3260	3200	3070	2940	2810	2690
3400	3650	3590	3530	3460	3400	3260	3120	2980	2840
3600	3870	3800	3740	3670	3600	3450	3300	3140	2990
3800	4090	4020	3950	3870	3800	3640	3470	3310	3140
4000	4310	4230	4150	4080	4000	3820	3650	3470	3300
4200	4530	4450	4360	4280	4200	4010	3820	3640	3450
4400	4750	4660	4570	4490	4400	4200	4000	3800	3600
4600	4960	4870	4780	4690	4600	4390	4180	3970	3760
4800	5180	5090	4990	4900	4800	4580	4350	4130	3910
5000	5400	5300	5200	5100	5000	4770	4530	4300	4060

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200	890	990	1100	1200	1270	1340	1410	1480
1400	1050	1170	1280	1400	1470	1550	1630	1710
1600	1220	1350	1470	1600	1680	1760	1840	1930
1800	1390	1530	1660	1800	1880	1970	2060	2150
2000	1560	1710	1850	2000	2090	2180	2280	2380
2200	1730	1890	2040	2200	2290	2390	2490	2600
2400	1900	2070	2230	2400	2500	2600	2710	2820
2600	2070	2240	2420	2600	2700	2810	2930	3050
2800	2240	2420	2610	2800	2910	3020	3140	3270
3000	2400	2600	2800	3000	3110	3230	3360	3490
3200	2570	2780	2990	3200	3320	3440	3570	3720
3400	2740	2960	3180	3400	3520	3650	3790	3940
3600	2910	3140	3370	3600	3730	3860	4010	4160
3800	3080	3320	3560	3800	3930	4070	4220	4390
4000	3250	3500	3750	4000	4140	4280	4440	4610
4200	3420	3680	3940	4200	4340	4490	4660	4830
4400	3590	3860	4130	4400	4550	4700	4870	5060
4600	3750	4040	4320	4600	4750	4910	5090	5280
4800	3920	4220	4510	4800	4960	5120	5310	5500
5000	4090	4390	4700	5000	5160	5330	5520	5730

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 5

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG) OAT (°C)										
	-40	-13	-9	-5	-1	3	7	11	15	30	50
1200	60.3	57.7	57.3	56.9	56.5	56.2	55.8	55.4	55.0	53.2	46.9
1400	66.2	63.4	63.0	62.5	62.1	61.7	61.3	60.9	60.5	58.4	51.5
1600	71.7	68.6	68.2	67.7	67.2	66.8	66.3	65.9	65.4	63.2	55.7
1800	76.8	73.4	72.9	72.4	71.9	71.5	71.0	70.5	70.0	67.6	59.4
2000	81.5	77.9	77.4	76.9	76.4	75.8	75.3	74.8	74.3	71.7	63.0
2200	85.9	82.1	81.5	81.0	80.4	79.9	79.3	78.8	78.2	75.5	66.3
2400	86.1	85.8	85.3	84.7	84.1	83.5	82.9	82.4	81.8	78.9	69.2
2600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.7	85.1	82.0	71.9
2800	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.0	74.5
3000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	76.9
3200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	79.0
3400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	81.1
3600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	83.0
3800	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.8
4000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1
4200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1
4400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1
4600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1
CLIMB LIMIT WT (1000 KG)	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	74.2

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG) OAT (°C)										
	-40	-13	-9	-5	-1	3	7	11	15	30	50
1200	57.1	54.4	54.0	53.7	53.3	53.0	52.6	52.3	51.7	49.6	43.4
1400	62.7	59.8	59.4	59.0	58.6	58.2	57.8	57.4	56.8	54.5	47.7
1600	67.9	64.7	64.2	63.8	63.4	63.0	62.6	62.1	61.5	59.0	51.5
1800	72.7	69.2	68.7	68.3	67.8	67.3	66.9	66.4	65.7	63.0	55.0
2000	77.2	73.4	72.9	72.4	71.9	71.4	71.0	70.4	69.7	66.8	58.2
2200	81.3	77.3	76.8	76.2	75.7	75.2	74.7	74.2	73.4	70.3	61.2
2400	85.0	80.8	80.2	79.7	79.1	78.6	78.1	77.5	76.7	73.5	63.9
2600	86.1	84.1	83.5	82.9	82.3	81.7	81.2	80.6	79.7	76.4	66.4
2800	86.1	86.1	86.1	85.9	85.3	84.7	84.1	83.5	82.6	79.1	68.7
3000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.3	81.7	70.9
3200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.0	72.9
3400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	74.7
3600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	76.5
3800	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	78.2
4000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	79.9
4200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	81.5
4400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	83.1
4600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.6
CLIMB LIMIT WT (1000 KG)	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.8	82.1	68.4

With engine bleed for packs off, increase field limit weight by 350 kg and climb limit weight by 1350 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 300 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 850 kg and climb limit weight by 1650 kg.

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 5

4000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	-13	-9	-5	-1	3	7	11	15	30	50
1200	53.3	50.9	50.5	50.2	49.9	49.5	49.1	48.7	48.2	46.0	40.9
1400	58.6	55.9	55.5	55.2	54.8	54.4	54.0	53.5	52.9	50.6	44.9
1600	63.4	60.5	60.1	59.7	59.3	58.8	58.4	57.9	57.2	54.7	48.5
1800	67.8	64.6	64.2	63.8	63.4	62.9	62.4	61.8	61.1	58.4	51.7
2000	71.9	68.5	68.1	67.6	67.2	66.7	66.1	65.5	64.8	61.9	54.8
2200	75.7	72.1	71.6	71.2	70.7	70.2	69.6	69.0	68.2	65.1	57.6
2400	79.1	75.4	74.9	74.4	73.9	73.3	72.7	72.0	71.2	67.9	60.1
2600	82.3	78.4	77.8	77.3	76.8	76.2	75.6	74.9	74.0	70.6	62.4
2800	85.3	81.2	80.6	80.1	79.6	78.9	78.3	77.6	76.7	73.1	64.5
3000	86.1	83.9	83.3	82.7	82.2	81.5	80.8	80.1	79.1	75.4	66.6
3200	86.1	86.1	85.6	85.0	84.5	83.8	83.1	82.3	81.4	77.6	68.4
3400	86.1	86.1	86.1	86.1	86.1	86.0	85.2	84.5	83.5	79.5	70.1
3600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.5	81.5	71.8
3800	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	83.2	73.4
4000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.0	74.9
4200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	76.5
4400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	78.0
4600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	79.4
CLIMB LIMIT WT (1000 KG)	82.0	81.6	81.5	81.5	81.4	81.3	81.1	80.4	79.6	75.9	64.5

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	-13	-9	-5	-1	3	7	11	15	30	50
1200	49.7	47.4	47.1	46.8	46.5	46.1	45.7	45.2	44.7	42.8	38.1
1400	54.6	52.1	51.8	51.4	51.1	50.6	50.1	49.6	49.1	47.0	41.8
1600	59.0	56.3	56.0	55.6	55.2	54.7	54.2	53.6	53.0	50.7	45.1
1800	63.1	60.2	59.8	59.4	59.0	58.5	57.9	57.3	56.6	54.1	48.1
2000	66.9	63.8	63.4	62.9	62.5	62.0	61.3	60.7	60.0	57.3	50.8
2200	70.4	67.1	66.6	66.2	65.8	65.2	64.5	63.8	63.1	60.3	53.4
2400	73.6	70.1	69.6	69.1	68.7	68.1	67.4	66.6	65.9	62.9	55.7
2600	76.5	72.8	72.3	71.9	71.4	70.7	70.0	69.2	68.4	65.3	57.8
2800	79.2	75.4	74.9	74.4	73.9	73.2	72.5	71.7	70.9	67.6	59.8
3000	81.8	77.9	77.3	76.8	76.3	75.6	74.8	74.0	73.1	69.8	61.6
3200	84.1	80.0	79.5	79.0	78.4	77.7	76.9	76.0	75.1	71.7	63.3
3400	86.1	82.1	81.5	81.0	80.4	79.7	78.8	78.0	77.1	73.5	64.9
3600	86.1	84.1	83.5	82.9	82.4	81.6	80.7	79.9	78.9	75.3	66.4
3800	86.1	85.9	85.3	84.7	84.2	83.4	82.5	81.6	80.6	76.9	67.9
4000	86.1	86.1	86.1	86.1	85.9	85.1	84.2	83.3	82.3	78.6	69.4
4200	86.1	86.1	86.1	86.1	86.1	86.1	85.9	85.0	84.0	80.1	70.8
4400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.6	81.7	72.2
4600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	83.2	73.6
CLIMB LIMIT WT (1000 KG)	76.7	76.3	76.3	76.2	76.1	76.0	75.3	74.6	73.8	70.3	59.8

With engine bleed for packs off, increase field limit weight by 350 kg and climb limit weight by 1350 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 300 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 850 kg and climb limit weight by 1650 kg.

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 5

8000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG) OAT (°C)										
	-40	-13	-9	-5	-1	3	7	11	15	30	50
1200	46.3	44.2	43.9	43.6	43.3	42.9	42.4	42.0	41.5	39.8	35.2
1400	50.8	48.5	48.2	47.9	47.6	47.1	46.6	46.1	45.6	43.7	38.6
1600	55.0	52.4	52.1	51.7	51.4	50.9	50.3	49.8	49.2	47.1	41.6
1800	58.7	56.0	55.6	55.2	54.9	54.3	53.7	53.1	52.5	50.3	44.3
2000	62.2	59.3	58.9	58.5	58.1	57.5	56.9	56.2	55.6	53.2	46.8
2200	65.4	62.4	61.9	61.5	61.1	60.5	59.8	59.1	58.4	55.9	49.1
2400	68.3	65.1	64.7	64.2	63.8	63.1	62.4	61.7	61.0	58.3	51.2
2600	71.0	67.6	67.2	66.7	66.2	65.6	64.8	64.1	63.3	60.5	53.1
2800	73.5	70.0	69.5	69.1	68.6	67.9	67.1	66.3	65.5	62.6	54.9
3000	75.9	72.2	71.7	71.2	70.7	70.0	69.2	68.4	67.6	64.6	56.5
3200	78.0	74.2	73.7	73.2	72.7	71.9	71.1	70.3	69.5	66.3	58.0
3400	80.0	76.1	75.6	75.1	74.6	73.8	72.9	72.1	71.2	68.0	59.5
3600	81.9	78.0	77.4	76.9	76.3	75.5	74.7	73.8	72.9	69.6	60.9
3800	83.7	79.7	79.1	78.6	78.0	77.2	76.3	75.4	74.5	71.2	62.3
4000	85.5	81.4	80.8	80.2	79.7	78.8	77.9	77.0	76.1	72.7	63.7
4200	86.1	83.0	82.4	81.8	81.3	80.4	79.5	78.6	77.7	74.2	65.0
4400	86.1	84.6	84.0	83.4	82.8	82.0	81.0	80.1	79.2	75.7	66.3
4600	86.1	86.1	85.6	85.0	84.4	83.5	82.6	81.6	80.7	77.1	67.5
CLIMB LIMIT WT (1000 KG)	71.6	71.3	71.2	71.2	71.0	70.5	69.8	69.0	68.3	65.2	54.9

10000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG) OAT (°C)										
	-40	-13	-9	-5	-1	3	7	11	15	30	50
1200	43.2	41.2	41.0	40.6	40.3	39.9	39.4	39.0	38.6	36.9	32.6
1400	47.4	45.3	45.0	44.6	44.2	43.7	43.3	42.8	42.3	40.5	35.7
1600	51.2	48.9	48.5	48.1	47.7	47.2	46.7	46.2	45.7	43.7	38.5
1800	54.6	52.2	51.8	51.3	50.9	50.3	49.8	49.2	48.7	46.6	40.9
2000	57.8	55.2	54.8	54.3	53.9	53.3	52.7	52.1	51.5	49.2	43.2
2200	60.8	58.0	57.6	57.1	56.6	56.0	55.3	54.7	54.1	51.7	45.3
2400	63.5	60.6	60.1	59.6	59.0	58.4	57.7	57.1	56.4	53.9	47.2
2600	65.9	62.9	62.4	61.9	61.3	60.6	59.9	59.2	58.6	55.9	48.9
2800	68.3	65.1	64.6	64.0	63.4	62.7	62.0	61.3	60.6	57.8	50.5
3000	70.4	67.1	66.6	66.0	65.4	64.7	63.9	63.2	62.4	59.6	52.0
3200	72.4	68.9	68.4	67.8	67.2	66.5	65.7	64.9	64.1	61.2	53.4
3400	74.2	70.7	70.2	69.5	68.9	68.1	67.3	66.5	65.8	62.8	54.7
3600	76.0	72.4	71.9	71.2	70.5	69.8	68.9	68.1	67.3	64.3	56.0
3800	77.7	74.0	73.5	72.8	72.1	71.3	70.5	69.6	68.8	65.7	57.3
4000	79.3	75.6	75.0	74.3	73.6	72.8	72.0	71.1	70.3	67.1	58.6
4200	80.9	77.1	76.5	75.8	75.1	74.3	73.5	72.6	71.8	68.5	59.8
4400	82.5	78.6	78.0	77.3	76.6	75.8	74.9	74.0	73.2	69.9	61.0
4600	84.0	80.1	79.5	78.8	78.1	77.2	76.3	75.4	74.5	71.2	62.2
CLIMB LIMIT WT (1000 KG)	66.9	66.5	66.5	66.4	65.8	65.2	64.5	63.8	63.0	60.2	50.0

With engine bleed for packs off, increase field limit weight by 350 kg and climb limit weight by 1350 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 300 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 850 kg and climb limit weight by 1650 kg.

Takeoff Field Corrections - Wet Runway

Slope Corrections

FIELD LENGTH AVAILABLE (M)	SLOPE CORRECTED FIELD LENGTH (M)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
1200	1180	1190	1190	1200	1200	1180	1160	1140	1120
1400	1410	1410	1410	1400	1400	1370	1340	1310	1290
1600	1650	1630	1620	1610	1600	1560	1530	1490	1450
1800	1880	1860	1840	1820	1800	1750	1710	1660	1620
2000	2110	2080	2060	2030	2000	1950	1890	1840	1790
2200	2340	2310	2270	2240	2200	2140	2080	2010	1950
2400	2580	2530	2490	2440	2400	2330	2260	2190	2120
2600	2810	2760	2700	2650	2600	2520	2440	2360	2280
2800	3040	2980	2920	2860	2800	2710	2630	2540	2450
3000	3270	3210	3140	3070	3000	2900	2810	2710	2620
3200	3510	3430	3350	3280	3200	3100	2990	2890	2780
3400	3740	3650	3570	3480	3400	3290	3170	3060	2950
3600	3970	3880	3790	3690	3600	3480	3360	3240	3120
3800	4200	4100	4000	3900	3800	3670	3540	3410	3280
4000	4440	4330	4220	4110	4000	3860	3720	3590	3450
4200	4670	4550	4430	4320	4200	4050	3910	3760	3610
4400	4900	4780	4650	4530	4400	4250	4090	3940	3780
4600	5130	5000	4870	4730	4600	4440	4270	4110	3950
4800	5370	5230	5080	4940	4800	4630	4460	4290	4110
5000	5600	5450	5300	5150	5000	4820	4640	4460	4280

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200	860	970	1090	1200	1260	1320	1400	1480
1400	1030	1150	1280	1400	1460	1530	1620	1710
1600	1200	1330	1470	1600	1670	1750	1840	1940
1800	1370	1510	1660	1800	1880	1960	2060	2170
2000	1540	1690	1850	2000	2080	2170	2280	2390
2200	1710	1870	2040	2200	2290	2390	2500	2620
2400	1880	2050	2230	2400	2500	2600	2720	2850
2600	2050	2230	2420	2600	2700	2820	2940	3080
2800	2220	2410	2610	2800	2910	3030	3160	3310
3000	2390	2590	2800	3000	3120	3240	3380	3540
3200	2560	2770	2990	3200	3320	3460	3600	3760
3400	2730	2950	3180	3400	3530	3670	3830	3990
3600	2900	3130	3370	3600	3740	3880	4050	4220
3800	3070	3310	3560	3800	3940	4100	4270	4450
4000	3240	3490	3750	4000	4150	4310	4490	4680
4200	3410	3670	3940	4200	4360	4530	4710	4910
4400	3580	3850	4130	4400	4560	4740	4930	5130
4600	3750	4030	4320	4600	4770	4950	5150	5360
4800	3920	4210	4510	4800	4980	5170	5370	5590
5000	4090	4390	4700	5000	5180	5380	5590	5820

Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 5

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	-13	-9	-5	-1	3	7	11	15	30	50
1200	61.3	58.5	58.1	57.6	57.2	56.8	56.4	56.0	55.5	53.5	47.2
1400	67.1	63.9	63.5	63.0	62.5	62.1	61.6	61.2	60.7	58.4	51.5
1600	72.5	69.0	68.5	68.0	67.5	67.0	66.5	66.0	65.5	63.0	55.5
1800	77.4	73.8	73.2	72.7	72.1	71.6	71.1	70.5	70.0	67.3	59.2
2000	82.0	78.1	77.5	76.9	76.4	75.8	75.2	74.7	74.1	71.2	62.7
2200	86.1	82.2	81.6	81.0	80.4	79.7	79.1	78.5	77.9	74.9	65.9
2400	86.1	86.0	85.3	84.7	84.1	83.4	82.8	82.2	81.5	78.4	68.8
2600	86.1	86.1	86.1	86.1	86.1	86.1	86.0	85.4	84.7	81.4	71.5
2800	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.3	73.9
3000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	76.2
3200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	78.4
3400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	80.5
3600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	82.6
3800	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.6
4000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1
4200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1
4400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1
4600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1
CLIMB LIMIT WT (1000 KG)	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	74.2

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	-13	-9	-5	-1	3	7	11	15	30	50
1200	57.8	54.9	54.5	54.1	53.7	53.3	52.9	52.5	51.9	49.7	43.7
1400	63.2	60.0	59.5	59.1	58.6	58.2	57.8	57.3	56.7	54.2	47.7
1600	68.3	64.7	64.2	63.8	63.3	62.8	62.3	61.9	61.2	58.4	51.4
1800	72.9	69.1	68.6	68.1	67.6	67.1	66.6	66.0	65.3	62.4	54.8
2000	77.2	73.2	72.6	72.1	71.5	71.0	70.5	69.9	69.1	66.0	57.9
2200	81.2	77.0	76.4	75.8	75.2	74.7	74.1	73.5	72.7	69.4	60.9
2400	85.0	80.5	79.9	79.3	78.7	78.1	77.5	76.9	76.0	72.6	63.6
2600	86.1	83.6	83.0	82.4	81.7	81.1	80.5	79.9	79.0	75.3	66.0
2800	86.1	86.1	85.9	85.3	84.6	84.0	83.3	82.7	81.7	78.0	68.2
3000	86.1	86.1	86.1	86.1	86.1	86.1	86.0	85.3	84.3	80.4	70.3
3200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	82.7	72.3
3400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.0	74.2
3600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	76.1
3800	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	77.9
4000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	79.6
4200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	81.3
4400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	83.0
4600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.6
CLIMB LIMIT WT (1000 KG)	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.8	82.1	68.4

With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1400 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 300 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 900 kg and climb limit weight by 1650 kg.

Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 5

4000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	-13	-9	-5	-1	3	7	11	15	30	50
1200	53.9	51.2	50.8	50.4	50.0	49.6	49.2	48.8	48.2	46.1	41.2
1400	58.9	55.8	55.4	55.0	54.6	54.2	53.7	53.2	52.6	50.2	44.8
1600	63.5	60.3	59.8	59.4	58.9	58.4	57.9	57.4	56.7	54.1	48.3
1800	67.9	64.3	63.8	63.4	62.9	62.4	61.8	61.2	60.5	57.8	51.5
2000	71.8	68.1	67.6	67.1	66.6	66.0	65.4	64.8	64.0	61.1	54.4
2200	75.6	71.6	71.1	70.5	70.0	69.4	68.8	68.1	67.3	64.2	57.2
2400	79.0	74.9	74.3	73.7	73.2	72.5	71.9	71.2	70.4	67.1	59.7
2600	82.1	77.7	77.1	76.6	76.0	75.3	74.7	73.9	73.0	69.6	61.9
2800	85.0	80.5	79.8	79.2	78.6	77.9	77.2	76.5	75.6	72.0	64.0
3000	86.1	83.0	82.3	81.7	81.1	80.4	79.6	78.9	77.9	74.2	65.9
3200	86.1	85.4	84.7	84.1	83.4	82.7	82.0	81.2	80.2	76.4	67.7
3400	86.1	86.1	86.1	86.1	85.7	85.0	84.2	83.4	82.4	78.4	69.5
3600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.5	84.5	80.4	71.3
3800	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	82.3	72.9
4000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.2	74.6
4200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.0	76.1
4400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	77.7
4600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	79.2
CLIMB LIMIT WT (1000 KG)	82.0	81.6	81.5	81.5	81.4	81.3	81.1	80.4	79.6	75.9	64.5

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	-13	-9	-5	-1	3	7	11	15	30	50
1200	50.2	47.7	47.3	47.0	46.6	46.2	45.7	45.2	44.7	42.8	38.3
1400	54.8	52.0	51.6	51.2	50.8	50.4	49.8	49.3	48.7	46.6	41.7
1600	59.1	56.1	55.6	55.2	54.8	54.3	53.7	53.1	52.5	50.2	44.9
1800	63.1	59.8	59.4	58.9	58.5	57.9	57.3	56.7	56.0	53.6	47.8
2000	66.8	63.3	62.8	62.3	61.9	61.3	60.6	60.0	59.3	56.6	50.5
2200	70.2	66.5	66.0	65.5	65.0	64.4	63.7	63.0	62.3	59.5	53.0
2400	73.4	69.6	69.0	68.5	68.0	67.3	66.6	65.9	65.1	62.1	55.4
2600	76.2	72.2	71.6	71.1	70.6	69.9	69.1	68.3	67.5	64.5	57.4
2800	78.9	74.7	74.1	73.5	73.0	72.2	71.5	70.7	69.8	66.6	59.3
3000	81.3	77.0	76.4	75.8	75.2	74.5	73.6	72.8	71.9	68.6	61.0
3200	83.7	79.2	78.6	78.0	77.4	76.6	75.8	74.9	74.0	70.6	62.7
3400	86.0	81.4	80.7	80.1	79.5	78.7	77.8	76.9	76.0	72.5	64.3
3600	86.1	83.5	82.8	82.2	81.5	80.7	79.8	78.9	77.9	74.3	65.9
3800	86.1	85.5	84.8	84.1	83.5	82.6	81.7	80.8	79.8	76.1	67.4
4000	86.1	86.1	86.1	86.0	85.3	84.5	83.5	82.6	81.6	77.7	68.9
4200	86.1	86.1	86.1	86.1	86.1	86.1	85.3	84.3	83.3	79.4	70.4
4400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.0	85.0	81.0	71.8
4600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	82.6	73.2
CLIMB LIMIT WT (1000 KG)	76.7	76.3	76.3	76.2	76.1	76.0	75.3	74.6	73.8	70.3	59.8

With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1400 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 300 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 900 kg and climb limit weight by 1650 kg.

Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 5

8000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	-13	-9	-5	-1	3	7	11	15	30	50
1200	46.8	44.4	44.1	43.7	43.4	43.0	42.5	42.0	41.6	39.8	35.4
1400	51.0	48.4	48.0	47.7	47.3	46.8	46.3	45.8	45.2	43.3	38.4
1600	55.0	52.1	51.7	51.4	51.0	50.4	49.9	49.3	48.7	46.6	41.3
1800	58.7	55.6	55.2	54.8	54.4	53.8	53.2	52.6	52.0	49.7	44.0
2000	62.0	58.8	58.4	57.9	57.5	56.9	56.2	55.6	54.9	52.5	46.5
2200	65.2	61.8	61.3	60.9	60.4	59.8	59.1	58.4	57.7	55.2	48.8
2400	68.2	64.6	64.1	63.6	63.1	62.4	61.7	61.0	60.3	57.6	50.9
2600	70.8	67.0	66.5	66.0	65.5	64.8	64.0	63.2	62.5	59.7	52.7
2800	73.2	69.3	68.7	68.2	67.7	66.9	66.1	65.4	64.6	61.7	54.4
3000	75.4	71.4	70.8	70.3	69.7	69.0	68.1	67.3	66.5	63.5	56.0
3200	77.6	73.4	72.8	72.3	71.7	70.9	70.1	69.2	68.4	65.3	57.5
3400	79.7	75.4	74.8	74.2	73.6	72.8	71.9	71.1	70.2	67.0	59.0
3600	81.8	77.3	76.7	76.1	75.5	74.7	73.8	72.9	72.0	68.7	60.4
3800	83.7	79.1	78.5	77.9	77.3	76.4	75.5	74.6	73.7	70.3	61.8
4000	85.6	80.9	80.3	79.6	79.0	78.1	77.2	76.2	75.3	71.8	63.1
4200	86.1	82.6	82.0	81.3	80.7	79.8	78.8	77.8	76.9	73.4	64.4
4400	86.1	84.3	83.6	83.0	82.3	81.4	80.4	79.4	78.5	74.8	65.7
4600	86.1	85.9	85.3	84.6	83.9	83.0	82.0	81.0	80.0	76.3	67.0
CLIMB LIMIT WT (1000 KG)	71.6	71.3	71.2	71.2	71.0	70.5	69.8	69.0	68.3	65.2	54.9

10000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	-13	-9	-5	-1	3	7	11	15	30	50
1200	43.5	41.4	41.1	40.7	40.3	39.9	39.5	39.0	38.6	36.9	32.8
1400	47.4	45.1	44.7	44.3	43.9	43.4	42.9	42.4	42.0	40.1	35.5
1600	51.1	48.5	48.2	47.7	47.3	46.8	46.2	45.7	45.2	43.2	38.2
1800	54.5	51.8	51.4	50.9	50.4	49.8	49.3	48.7	48.1	46.0	40.7
2000	57.7	54.7	54.3	53.8	53.3	52.7	52.1	51.5	50.9	48.6	42.9
2200	60.6	57.5	57.0	56.5	55.9	55.3	54.7	54.0	53.4	51.0	45.0
2400	63.3	60.0	59.5	59.0	58.4	57.8	57.1	56.4	55.8	53.3	47.0
2600	65.7	62.3	61.7	61.2	60.6	59.9	59.2	58.5	57.8	55.2	48.6
2800	67.9	64.3	63.8	63.2	62.6	61.9	61.1	60.4	59.7	57.0	50.1
3000	69.9	66.2	65.7	65.1	64.4	63.7	62.9	62.2	61.4	58.6	51.5
3200	71.9	68.1	67.6	66.9	66.2	65.5	64.7	63.9	63.1	60.2	52.9
3400	73.9	69.9	69.4	68.7	68.0	67.2	66.4	65.6	64.8	61.8	54.2
3600	75.7	71.7	71.1	70.4	69.7	68.9	68.0	67.2	66.4	63.3	55.5
3800	77.5	73.4	72.7	72.0	71.3	70.5	69.6	68.8	67.9	64.8	56.8
4000	79.2	75.0	74.4	73.6	72.9	72.0	71.2	70.3	69.4	66.2	58.0
4200	80.9	76.6	75.9	75.2	74.4	73.6	72.7	71.8	70.9	67.6	59.2
4400	82.6	78.1	77.5	76.7	75.9	75.1	74.1	73.2	72.3	68.9	60.4
4600	84.2	79.6	79.0	78.2	77.4	76.5	75.6	74.6	73.7	70.3	61.5
CLIMB LIMIT WT (1000 KG)	66.9	66.5	66.5	66.4	65.8	65.2	64.5	63.8	63.0	60.2	50.0

With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1400 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 300 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 900 kg and climb limit weight by 1650 kg.

Takeoff Obstacle Limit Weight

Flaps 5

Sea Level, 30°C & Below, Zero Wind

Based on engine bleed for packs on and anti-ice off

Reference Obstacle Limit Weight (1000 KG)

OBSTACLE HEIGHT (M)	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	77.4	84.1									
20	71.6	77.7	82.6								
40	66.3	72.1	76.8	80.6	83.6						
60	62.3	67.8	72.4	76.2	79.3	81.9	84.0				
80	58.9	64.3	68.8	72.6	75.7	78.4	80.7	82.6	84.3		
100	56.0	61.2	65.7	69.4	72.7	75.4	77.7	79.8	81.5	83.0	84.4
120	53.4	58.6	63.0	66.7	69.9	72.7	75.1	77.2	79.0	80.6	82.1
140	51.2	56.2	60.5	64.2	67.5	70.3	72.7	74.9	76.8	78.4	79.9
160	49.1	54.1	58.4	62.0	65.2	68.1	70.6	72.8	74.7	76.4	77.9
180	47.1	52.2	56.4	60.0	63.2	66.0	68.5	70.8	72.7	74.5	76.1
200	45.4	50.3	54.5	58.2	61.3	64.1	66.7	68.9	70.9	72.7	74.3
220	43.7	48.7	52.8	56.4	59.6	62.4	64.9	67.2	69.2	71.0	72.7
240	42.3	47.1	51.3	54.8	58.0	60.8	63.3	65.5	67.6	69.4	71.1
260		45.6	49.8	53.3	56.5	59.3	61.8	64.0	66.1	67.9	69.6
280		44.3	48.3	51.9	55.0	57.8	60.3	62.6	64.6	66.5	68.2
300		43.0	47.0	50.6	53.7	56.5	59.0	61.2	63.3	65.1	66.9

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.

OAT Adjustments

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)					
	40	50	60	70	80	90
30 & BELOW	0	0	0	0	0	0
32	-0.6	-0.7	-0.9	-1.1	-1.2	-1.4
34	-1.2	-1.5	-1.8	-2.1	-2.5	-2.8
36	-1.8	-2.2	-2.7	-3.2	-3.7	-4.2
38	-2.4	-3.0	-3.6	-4.3	-4.9	-5.6
40	-2.9	-3.7	-4.5	-5.3	-6.2	-7.0
42	-3.5	-4.5	-5.5	-6.4	-7.4	-8.3
44	-4.1	-5.2	-6.4	-7.5	-8.6	-9.7
46	-4.7	-6.0	-7.3	-8.6	-9.8	-11.1
48	-5.3	-6.7	-8.2	-9.6	-11.1	-12.5
50	-5.9	-7.5	-9.1	-10.7	-12.3	-13.9

Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)					
	40	50	60	70	80	90
S.L. & BELOW	0	0	0	0	0	0
1000	-1.5	-1.8	-2.2	-2.6	-3.0	-3.3
2000	-2.9	-3.7	-4.4	-5.2	-5.9	-6.7
3000	-4.2	-5.4	-6.5	-7.6	-8.7	-9.8
4000	-5.6	-7.0	-8.5	-10.0	-11.5	-13.0
5000	-6.8	-8.6	-10.5	-12.3	-14.1	-15.9
6000	-8.1	-10.3	-12.4	-14.5	-16.6	-18.8
7000	-9.3	-11.7	-14.1	-16.6	-19.0	-21.4
8000	-10.5	-13.2	-15.9	-18.6	-21.3	-24.0
9000	-11.6	-14.6	-17.6	-20.5	-23.5	-26.5
10000	-12.7	-15.9	-19.2	-22.5	-25.7	-29.0

Takeoff Obstacle Limit Weight
Flaps 5
Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)					
	40	50	60	70	80	90
15 TW	-9.4	-9.1	-8.9	-8.6	-8.4	-8.2
10 TW	-6.2	-6.1	-5.9	-5.8	-5.6	-5.4
5 TW	-3.1	-3.0	-3.0	-2.9	-2.8	-2.7
0	0	0	0	0	0	0
10 HW	1.1	1.1	1.0	0.9	0.8	0.7
20 HW	2.3	2.1	2.0	1.8	1.6	1.5
30 HW	3.6	3.3	3.0	2.7	2.5	2.2
40 HW	4.9	4.5	4.1	3.7	3.3	2.9

With engine bleed for packs off, increase weight by 600 kg.
With engine anti-ice on, decrease weight by 300 kg.
With engine and wing anti-ice on, decrease weight by 1700 kg (optional system).

Brake Energy Limits VMBE

Maximum Brake Energy Speed

OAT (°C)	REFERENCE VMBE (KIAS)						
	PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
54	197	189					
50	197	190	183				
46	198	191	184	177			
42	199	191	185	178	172		
38	200	192	186	179	173	167	
34	201	193	186	180	174	168	161
30	202	194	187	181	174	168	162
26	203	195	189	182	176	169	163
22	205	197	190	183	177	170	164
18	206	198	191	184	178	172	166
14	208	199	193	186	179	173	167
10	210	201	194	187	180	174	168
6	210	203	196	189	182	175	169
2	210	205	197	190	183	177	170
-2	210	206	199	192	185	178	172
-6	210	208	201	194	186	179	173
-10	210	210	203	195	188	181	174

Weight Adjusted VMBE

WEIGHT (1000 KG)	REFERENCE VMBE (KIAS)														
	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210
42	168	174	180	186	192	198	205	210	210	210	210	210	210	210	210
46	159	165	171	176	182	188	194	200	205	210	210	210	210	210	210
50	152	158	163	168	174	179	185	190	196	201	207	210	210	210	210
54	146	151	156	161	166	172	177	182	187	192	198	203	208	210	210
58	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210
62	135	140	145	149	154	159	164	169	173	178	183	188	193	197	202
66	131	135	140	144	149	154	158	163	167	172	177	181	186	190	195
70	127	131	136	140	145	149	153	158	162	167	171	175	180	184	189
74	124	128	132	136	141	145	149	153	158	162	166	170	174	179	183
78	120	125	129	133	137	141	145	149	153	157	161	166	170	174	178
82	118	122	126	130	134	137	141	145	149	153	157	161	165	169	173
86	117	120	124	128	132	135	139	143	146	150	154	157	161	165	169

Increase VMBE by 1 knot per 1% uphill runway slope. Decrease VMBE by 4 knots per 1% downhill runway slope.
Increase VMBE by 3 knots per 10 knots headwind. Decrease VMBE by 19 knots per 10 knots tailwind.
Decrease brake release weight by 700 kg for each knot V1 exceeds VMBE.
Determine normal V1, VR, V2 speeds for lower brake release weight.

Intentionally
Blank

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	32300	-10	34300*	34300*	33800	32200	30800
80	33600	-13	35800*	35800*	35100	33500	32100
75	35000	-16	37100*	37100*	36400	34900	33500
70	36400	-18	38400*	38400*	37900	36300	35000
65	38000	-18	39800*	39800*	39400	37800	36500
60	39600	-18	41000	41000	41000	39500	38200
55	41000	-18	41000	41000	41000	41000	40000
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	32300	-4	33000*	33000*	33000*	32200	30800
80	33600	-7	34700*	34700*	34700*	33500	32100
75	35000	-10	36200*	36200*	36200*	34900	33500
70	36400	-12	37600*	37600*	37600*	36300	35000
65	38000	-12	38900*	38900*	38900*	37800	36500
60	39600	-12	40400*	40400*	40400*	39500	38200
55	41000	-12	41000	41000	41000	41000	40000
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	32300	2	29400*	29400*	29400*	29400*	29400*
80	33600	-1	32200*	32200*	32200*	32200*	32100
75	35000	-4	34700*	34700*	34700*	34700*	33500
70	36400	-7	36200*	36200*	36200*	36200*	35000
65	38000	-7	37700*	37700*	37700*	37700*	36500
60	39600	-7	39100*	39100*	39100*	39100*	38200
55	41000	-7	40500*	40500*	40500*	40500*	40000
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

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
279	259	241	226	212	200	190	181	173	166	159
556	516	481	451	424	400	382	364	349	334	321
832	774	721	676	636	600	573	547	524	503	484
1108	1030	960	900	848	800	764	730	700	672	646
1383	1286	1200	1125	1059	1000	955	914	875	840	809
1657	1542	1439	1349	1271	1200	1146	1097	1051	1009	971
1931	1797	1677	1574	1483	1400	1338	1280	1227	1178	1134
2204	2052	1916	1798	1694	1600	1529	1464	1403	1347	1297
2477	2307	2154	2022	1905	1800	1721	1647	1579	1517	1460
2749	2561	2392	2246	2117	2000	1912	1830	1755	1686	1623
3021	2815	2630	2470	2328	2200	2104	2014	1932	1856	1787
3292	3069	2868	2694	2540	2400	2295	2198	2108	2025	1950
3563	3322	3105	2917	2751	2600	2487	2382	2284	2195	2114
3832	3574	3342	3140	2962	2800	2678	2565	2461	2365	2277
4101	3826	3579	3363	3173	3000	2870	2749	2637	2535	2441
4369	4077	3814	3586	3384	3200	3061	2933	2814	2704	2605
4636	4328	4050	3808	3594	3400	3253	3116	2990	2874	2769
4902	4578	4285	4030	3805	3600	3445	3300	3166	3044	2932
5168	4827	4520	4252	4015	3800	3636	3484	3343	3214	3096
5433	5076	4755	4474	4226	4000	3828	3668	3520	3384	3260
5697	5325	4989	4696	4436	4200	4019	3851	3696	3554	3424
5961	5573	5223	4917	4647	4400	4211	4035	3873	3724	3588
6224	5820	5457	5139	4857	4600	4403	4219	4050	3894	3751
6486	6068	5690	5360	5067	4800	4594	4403	4226	4064	3915
6747	6314	5923	5581	5277	5000	4786	4587	4403	4233	4079

Long Range Cruise Trip Fuel and Time

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	1.5	0:38	1.5	0:37	1.5	0:37	1.5	0:36	1.5	0:36
400	2.5	1:10	2.4	1:09	2.4	1:07	2.4	1:06	2.4	1:04
600	3.5	1:42	3.4	1:40	3.4	1:37	3.3	1:34	3.3	1:32
800	4.5	2:14	4.4	2:11	4.3	2:07	4.3	2:03	4.2	2:00
1000	5.5	2:45	5.4	2:41	5.3	2:36	5.2	2:32	5.1	2:28
1200	6.6	3:16	6.5	3:11	6.3	3:05	6.2	2:59	6.1	2:55
1400	7.7	3:47	7.5	3:41	7.3	3:34	7.2	3:27	7.0	3:22
1600	8.7	4:18	8.5	4:11	8.3	4:02	8.1	3:55	8.0	3:50
1800	9.8	4:49	9.6	4:40	9.3	4:31	9.1	4:23	8.9	4:17
2000	10.9	5:19	10.6	5:10	10.3	5:00	10.1	4:51	9.8	4:44
2200	12.0	5:49	11.7	5:38	11.4	5:27	11.1	5:18	10.9	5:11
2400	13.1	6:18	12.8	6:07	12.5	5:55	12.1	5:45	11.9	5:38
2600	14.3	6:48	13.9	6:35	13.5	6:23	13.1	6:13	12.9	6:05
2800	15.4	7:17	15.0	7:04	14.6	6:51	14.2	6:40	13.9	6:32
3000	16.5	7:47	16.1	7:32	15.6	7:18	15.2	7:07	14.9	6:58
3200	17.7	8:15	17.2	8:00	16.7	7:45	16.3	7:34	15.9	7:25
3400	18.9	8:43	18.4	8:27	17.8	8:12	17.3	8:01	17.0	7:52
3600	20.0	9:11	19.5	8:55	18.9	8:39	18.4	8:27	18.0	8:18
3800	21.2	9:39	20.6	9:22	20.0	9:06	19.5	8:54	19.1	8:45
4000	22.4	10:08	21.8	9:50	21.2	9:33	20.6	9:21	20.2	9:11
4200	23.6	10:35	23.0	10:16	22.3	10:00	21.7	9:47	21.3	9:38
4400	24.9	11:02	24.2	10:43	23.5	10:26	22.8	10:14	22.4	10:04
4600	26.1	11:29	25.4	11:10	24.6	10:53	24.0	10:40	23.6	10:31
4800	27.4	11:56	26.6	11:37	25.8	11:20	25.1	11:07	24.7	10:57
5000	28.6	12:24	27.8	12:04	27.0	11:46	26.3	11:33	25.9	11:24

Fuel Required Adjustments (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	0.3	0.4	0.5
4	-0.3	-0.2	0.0	0.2	0.5	0.7	1.0
6	-0.5	-0.2	0.0	0.3	0.7	1.1	1.7
8	-0.6	-0.3	0.0	0.5	1.0	1.6	2.4
10	-0.8	-0.4	0.0	0.6	1.3	2.1	3.2
12	-1.0	-0.5	0.0	0.7	1.6	2.6	4.0
14	-1.1	-0.6	0.0	0.9	1.9	3.1	4.9
16	-1.3	-0.7	0.0	1.0	2.2	3.8	5.9
18	-1.5	-0.8	0.0	1.2	2.6	4.4	7.0
20	-1.7	-0.9	0.0	1.4	3.0	5.1	8.1
22	-1.8	-1.0	0.0	1.6	3.4	5.8	9.3
24	-2.0	-1.0	0.0	1.8	3.8	6.6	10.6
26	-2.2	-1.1	0.0	2.0	4.3	7.4	11.9
28	-2.4	-1.2	0.0	2.2	4.8	8.3	13.3
30	-2.6	-1.3	0.0	2.4	5.3	9.2	14.8
32	-2.8	-1.4	0.0	2.7	5.8	10.1	16.4

Based on 280/.78 climb, Long Range Cruise and .78/280/250 descent.

Long Range Cruise Step Climb
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
1321	1241	1171	1108	1051	1000	954	911	873	837	804
1839	1730	1634	1548	1470	1400	1336	1278	1225	1176	1130
2354	2218	2096	1987	1889	1800	1719	1645	1577	1515	1457
2869	2704	2558	2426	2308	2200	2102	2012	1930	1854	1784
3383	3190	3019	2865	2726	2600	2485	2380	2283	2194	2112
3895	3676	3480	3304	3145	3000	2868	2747	2636	2534	2439
4407	4161	3940	3742	3563	3400	3251	3115	2990	2874	2768
4919	4645	4401	4180	3981	3800	3635	3483	3344	3215	3096
5430	5130	4861	4619	4399	4200	4018	3851	3697	3556	3424
5942	5614	5321	5057	4818	4600	4401	4219	4051	3896	3753
6453	6099	5781	5495	5236	5000	4785	4587	4405	4237	4081

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG)							TIME (HRS:MIN)
	LANDING WEIGHT (1000 KG)							
	40	45	50	55	60	65	70	
1000	4.5	4.8	5.1	5.4	5.7	6.2	6.5	2:26
1400	6.1	6.5	6.9	7.3	7.9	8.4	8.9	3:20
1800	7.8	8.3	8.8	9.4	10.1	10.8	11.3	4:14
2200	9.5	10.0	10.7	11.4	12.3	13.1	13.9	5:08
2600	11.2	11.9	12.6	13.6	14.6	15.6	16.5	6:01
3000	12.9	13.7	14.7	15.8	16.9	18.1	19.2	6:54
3400	14.7	15.7	16.8	18.0	19.4	20.7	22.0	7:46
3800	16.5	17.6	19.0	20.4	21.9	23.4	24.8	8:39
4200	18.4	19.7	21.2	22.7	24.4	26.2	27.8	9:31
4600	20.3	21.7	23.4	25.2	27.1	29.0	30.8	10:23
5000	22.2	23.9	25.7	27.7	29.8	31.9	33.9	11:16

Based on 280/.78 climb, Long Range Cruise 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

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
93	80	69	61	55	50	46	42	39	36	34
161	143	129	118	108	100	93	87	81	77	73
227	206	188	174	161	150	140	132	125	118	112
291	267	246	229	213	200	188	178	168	160	152
355	327	304	283	266	250	236	224	212	202	193
417	387	361	338	318	300	284	270	257	245	234
480	447	418	392	370	350	332	316	301	288	276
543	507	475	447	422	400	380	362	345	330	317
607	567	533	502	475	450	428	408	390	373	358
673	629	591	557	527	500	476	453	433	415	398

Trip Fuel and Time Required

AIR DIST (NM)		LANDING WEIGHT (1000 KG)							TIME (HRS:MIN)
		40	45	50	55	60	65	70	
50	FUEL (1000 KG)	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0:14
	ALT (FT)	12000	12000	11000	8000	8000	10000	8000	
100	FUEL (1000 KG)	0.8	0.9	0.9	1.0	1.0	1.1	1.1	0:23
	ALT (FT)	18000	17000	16000	15000	15000	15000	16000	
150	FUEL (1000 KG)	1.1	1.2	1.2	1.3	1.3	1.4	1.5	0:31
	ALT (FT)	25000	24000	24000	23000	23000	22000	21000	
200	FUEL (1000 KG)	1.3	1.4	1.5	1.6	1.6	1.7	1.8	0:38
	ALT (FT)	31000	29000	27000	26000	26000	25000	24000	
250	FUEL (1000 KG)	1.5	1.6	1.7	1.8	1.9	2.0	2.1	0:44
	ALT (FT)	39000	37000	35000	31000	31000	31000	29000	
300	FUEL (1000 KG)	1.7	1.8	2.0	2.1	2.2	2.3	2.4	0:51
	ALT (FT)	41000	41000	39000	37000	35000	35000	33000	
350	FUEL (1000 KG)	1.9	2.0	2.2	2.3	2.4	2.6	2.7	0:57
	ALT (FT)	41000	41000	39000	39000	37000	35000	35000	
400	FUEL (1000 KG)	2.1	2.2	2.4	2.5	2.7	2.8	3.0	1:03
	ALT (FT)	41000	41000	41000	39000	39000	37000	35000	
450	FUEL (1000 KG)	2.3	2.5	2.6	2.8	2.9	3.1	3.3	1:10
	ALT (FT)	41000	41000	41000	41000	39000	37000	35000	
500	FUEL (1000 KG)	2.5	2.7	2.8	3.0	3.2	3.4	3.5	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	3000	2950	2920	2900	2850	2860	2910		
80	2840	2790	2760	2740	2680	2680	2720		
75	2680	2630	2600	2570	2520	2500	2540	2600	
70	2520	2470	2440	2410	2360	2320	2360	2400	
65	2370	2320	2280	2240	2210	2150	2190	2220	
60	2210	2160	2120	2080	2050	1990	2010	2030	
55	2060	2000	1960	1920	1890	1840	1840	1860	1970
50	1910	1850	1800	1770	1730	1720	1700	1710	1790
45	1750	1700	1680	1640	1600	1570	1540	1540	1600
40	1640	1580	1520	1480	1450	1410	1400	1370	1420

This table includes 5% additional fuel for holding in a racetrack pattern.

Flight Crew Oxygen Requirements

Required Pressure (PSI) for 76 Cu. Ft. Cylinder

BOTTLE TEMPERATURE		NUMBER OF CREW USING OXYGEN		
°C	°F	2	3	4
50	122	735	1055	1360
45	113	725	1040	1340
40	104	715	1020	1320
35	95	700	1005	1300
30	86	690	990	1280
25	77	680	975	1255
20	68	670	960	1240
15	59	655	940	1215
10	50	645	925	1195
5	41	635	910	1175
0	32	620	890	1150
-5	23	610	875	1130
-10	14	600	860	1110

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

ENGINE INOP

MAX CONTINUOUS THRUST

Net Level Off Weight

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
30	44.3	42.9	41.4
28	47.9	46.3	44.7
26	51.7	49.9	48.3
24	56.0	54.1	52.2
22	61.0	58.8	56.7
20	66.3	63.9	61.4
18	71.2	68.5	65.6
16	76.0	73.3	70.3
14	80.4	77.7	75.1
12	85.1	82.1	78.9

Anti-Ice Adjustments

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)								
	PRESSURE ALTITUDE (1000 FT)								
	12	14	16	18	20	22	24	26	28
ENGINE ONLY	-2.0	-1.9	-1.8	-1.8	-1.6	-1.5	-1.4	-1.3	-1.2
ENGINE & WING	-7.8	-7.3	-6.8	-6.8	-6.6	-6.0	-5.4	-5.0	

Performance Dispatch — Chapter PD

Landing — Section 12

Landing Field Limit Weight - Dry Runway

Flaps 40

Based on anti-skid operative and automatic speedbrakes

Wind Corrected Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1000		860	900	1000	1070	1130	1200	1270
1200	940	1010	1080	1200	1270	1340	1420	1500
1400	1090	1170	1260	1400	1480	1550	1640	1720
1600	1230	1320	1430	1600	1680	1760	1850	1940
1800	1380	1480	1610	1800	1880	1970	2070	2170
2000	1530	1640	1790	2000	2090	2180	2280	2390
2200	1670	1790	1960	2200	2290	2390	2500	2610
2400	1820	1950	2140	2400	2500	2600	2720	2830
2600	1960	2100	2320	2600	2700	2810	2930	3060
2800	2110	2260	2490	2800	2910	3020	3150	3280
3000	2250	2420	2670	3000	3110	3230	3360	
3200	2400	2570	2850	3200	3320			
3400	2540	2730	3020	3400				
3600	2690	2880	3200					
3800	2830	3040	3380					
4000	2980	3200						
4200	3120	3350						
4400	3270							

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
1000	39.4					
1200	49.9	47.2	44.4	41.8	39.3	
1400	58.9	56.2	53.6	50.9	47.9	45.1
1600	68.3	64.5	61.2	58.4	55.7	53.0
1800	77.3	73.6	69.9	66.1	62.5	59.5
2000	84.6	81.6	78.0	74.1	70.4	66.6
2200		87.5	84.4	81.3	77.6	73.5
2400				86.5	83.4	80.0
2600						84.0
2800						86.4

Decrease field limit weight by 5000 kg when using manual speedbrakes.

Landing Field Limit Weight - Dry Runway

Flaps 40

Based on anti-skid inoperative and manual speedbrakes

Wind Corrected Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1800				1800	1960	2120	2260	2420
2000			1780	2000	2160	2320	2480	2640
2200		1700	1970	2200	2370	2530	2690	2860
2400	1630	1890	2160	2400	2570	2740	2910	3090
2600	1810	2070	2350	2600	2770	2950	3130	3310
2800	2000	2260	2540	2800	2970	3150	3340	3530
3000	2180	2450	2730	3000	3170	3360	3560	3750
3200	2360	2630	2920	3200	3380	3570	3770	3980
3400	2540	2820	3110	3400	3580	3770	3990	4200
3600	2720	3010	3300	3600	3780	3980	4200	4420
3800	2900	3190	3490	3800	3980	4190	4420	4650
4000	3080	3380	3680	4000	4180	4400	4640	4870
4200	3260	3570	3870	4200	4390	4600	4850	5090
4400	3440	3750	4060	4400	4590	4810	5070	5320
4600	3620	3940	4250	4600	4790	5020	5280	5540
4800	3800	4120	4440	4800	4990	5230	5500	5760
5000	3980	4310	4630	5000	5190	5430	5720	5990
5200	4160	4500	4820	5200	5400	5640	5930	
5400	4340	4680	5010	5400	5600	5850		
5600	4520	4870	5200	5600	5800			

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
2000	39.9					
2200	44.9	42.1	38.8			
2400	50.0	46.9	43.4	40.6		
2600	55.0	51.7	48.0	44.9	42.0	39.2
2800	60.1	56.5	52.5	49.3	46.1	43.1
3000	65.3	61.2	57.1	53.6	50.2	46.9
3200	71.5	66.7	61.6	57.9	54.3	50.8
3400	76.9	72.2	66.9	62.2	58.4	54.7
3600	82.3	77.3	72.0	67.5	62.4	58.5
3800	87.8	82.5	76.9	72.1	67.5	62.3
4000		87.7	81.8	76.8	71.9	67.2
4200			86.7	81.3	76.3	71.2
4400				85.9	80.5	75.3
4600					84.8	79.2
4800						83.2
5000						87.1

Landing Field Limit Weight - Wet Runway

Flaps 40

Based on anti-skid operative and automatic speedbrakes

Wind Corrected Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1000				1000	1070	1150	1220	1300
1200	960	1020	1080	1200	1280	1360	1440	1520
1400	1100	1180	1260	1400	1480	1570	1650	1740
1600	1250	1340	1440	1600	1690	1780	1870	1970
1800	1390	1490	1610	1800	1890	1990	2090	2190
2000	1540	1650	1790	2000	2100	2200	2300	2410
2200	1680	1800	1970	2200	2300	2410	2520	2630
2400	1830	1960	2140	2400	2500	2620	2730	2860
2600	1970	2120	2320	2600	2710	2830	2950	3080
2800	2120	2270	2500	2800	2910	3040	3170	3300
3000	2260	2430	2670	3000	3120	3250	3380	3530
3200	2410	2580	2850	3200	3320	3450	3600	3750
3400	2550	2740	3030	3400	3530	3660	3810	
3600	2700	2900	3200	3600	3730	3870		
3800	2840	3050	3380	3800				
4000	2990	3210	3560					
4200	3130	3360	3730					
4400	3280	3520						
4600	3420	3680						
4800	3570	3830						

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
1200	41.7	39.3				
1400	50.8	48.0	45.3	42.6	40.1	
1600	58.5	55.9	53.3	50.5	47.6	44.7
1800	66.5	62.9	59.9	57.2	54.5	51.7
2000	74.6	71.0	67.1	63.4	60.4	57.5
2200	81.8	78.4	74.5	70.8	67.2	63.1
2400	87.3	84.2	81.2	77.4	73.5	69.7
2600			86.1	83.0	79.7	75.5
2800				87.4	84.2	81.0
3000						84.1
3200						86.1

Decrease field limit weight by 5000 kg when using manual speedbrakes.

Landing Field Limit Weight - Wet Runway

Flaps 40

Based on anti-skid inoperative and manual speedbrakes

Wind Corrected Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1800					1980	2150	2310	2480
2000				2000	2190	2360	2520	2700
2200			1950	2200	2390	2570	2740	2920
2400			2140	2400	2590	2780	2960	3150
2600		2020	2330	2600	2790	2980	3170	3370
2800	1920	2210	2520	2800	2990	3190	3390	3590
3000	2100	2390	2710	3000	3200	3400	3600	3820
3200	2280	2580	2900	3200	3400	3600	3820	4040
3400	2460	2770	3090	3400	3600	3810	4040	4260
3600	2640	2950	3280	3600	3800	4020	4250	4490
3800	2820	3140	3470	3800	4000	4230	4470	4710
4000	3000	3330	3660	4000	4210	4430	4680	4930
4200	3180	3510	3850	4200	4410	4640	4900	5150
4400	3360	3700	4040	4400	4610	4850	5120	5380
4600	3540	3890	4230	4600	4810	5060	5330	5600
4800	3720	4070	4420	4800	5010	5260	5550	5820
5000	3900	4260	4610	5000	5220	5470	5760	6050
5200	4080	4450	4800	5200	5420	5680	5980	6270
5400	4260	4630	4990	5400	5620	5890	6200	6490
5600	4440	4820	5180	5600	5820	6090	6410	6720

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
2400	42.1	39.4				
2600	46.5	43.5	40.2			
2800	50.9	47.7	44.2	41.4	38.6	
3000	55.3	51.9	48.2	45.1	42.2	39.4
3200	59.6	56.1	52.1	48.9	45.8	42.7
3400	64.0	60.2	56.1	52.6	49.3	46.1
3600	69.6	64.5	60.0	56.4	52.9	49.5
3800	74.3	69.7	64.0	60.1	56.4	52.8
4000	79.0	74.2	69.0	63.8	59.9	56.2
4200	83.8	78.6	73.3	68.7	63.5	59.5
4400		83.1	77.6	72.7	68.1	62.8
4600		87.7	81.8	76.8	71.9	67.2
4800			86.1	80.7	75.7	70.7
5000				84.7	79.4	74.2
5200					83.1	77.7
5400					86.8	81.1
5600						84.5
5800						87.9

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		AIRPORT LANDING CLIMB LIMIT WEIGHT (1000 KG)						
		AIRPORT PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
54	129	69.1	64.9					
52	126	70.3	66.7					
50	122	71.5	68.3	63.0				
48	118	72.8	69.7	64.7				
46	115	74.2	70.9	66.2	61.0			
44	111	75.5	72.2	67.5	62.5			
42	108	76.8	73.4	68.7	63.9	58.6		
40	104	78.1	74.7	69.9	65.1	60.0		
38	100	79.3	76.0	71.1	66.3	61.3	55.8	
36	97	80.6	77.2	72.3	67.5	62.4	56.7	
34	93	81.5	78.6	73.6	68.7	63.5	57.7	53.0
32	90	81.9	80.0	74.8	69.8	64.5	58.8	54.1
30	86	81.9	81.0	75.9	70.7	65.5	59.8	55.1
28	82	82.0	81.4	76.8	71.4	66.3	60.7	56.0
26	79	82.1	81.5	77.5	72.1	66.9	61.6	56.8
24	75	82.2	81.5	77.7	72.7	67.4	62.3	57.4
22	72	82.3	81.6	77.8	73.1	67.9	62.8	57.9
20	68	82.3	81.6	77.8	73.2	68.4	63.2	58.4
18	64	82.4	81.7	77.9	73.3	68.7	63.6	58.8
16	61	82.5	81.8	77.9	73.3	68.8	64.0	59.1
14	57	82.5	81.8	78.0	73.3	68.8	64.3	59.5
12	54	82.6	81.9	78.0	73.4	68.9	64.4	59.9
10	50	82.7	81.9	78.0	73.4	68.9	64.4	60.1
-40	-40	83.3	82.5	78.6	73.9	69.3	64.8	60.8

With engine bleed for packs off, increase weight by 1300 kg.
With engine anti-ice on, decrease weight by 250 kg.
With engine and wing anti-ice on, decrease weight by 1450 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10 °C, decrease weight by 6850 kg.

ENGINE INOP

ADVISORY INFORMATION

Go-Around Climb Gradient

Flaps 15, Gear Up

Based on engine bleed for packs on and anti-ice off

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)					
	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
54	3.09					
50	3.77	2.70				
46	4.27	3.35	2.30			
42	4.78	3.82	2.90	1.84		
38	5.30	4.30	3.34	2.37	1.27	
34	5.83	4.80	3.81	2.80	1.65	0.73
30	6.38	5.27	4.20	3.17	2.07	1.15
26	6.41	5.63	4.49	3.45	2.42	1.48
22	6.44	5.65	4.71	3.64	2.66	1.71
18	6.46	5.67	4.72	3.82	2.82	1.87
14	6.49	5.68	4.74	3.83	2.96	2.01
10	6.51	5.70	4.75	3.84	2.97	2.15
6	6.53	5.71	4.76	3.85	2.98	2.16
2	6.55	5.73	4.78	3.86	2.99	2.17

Gradient Adjustment for Weight (%)

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)								
	0	1	2	3	4	5	6	7	8
80	-2.31	-2.61	-2.91	-3.19	-3.47	-3.73	-3.99	-4.25	-4.49
75	-1.89	-2.12	-2.36	-2.58	-2.81	-3.03	-3.24	-3.44	-3.65
70	-1.36	-1.53	-1.69	-1.85	-2.01	-2.17	-2.32	-2.47	-2.62
65	-0.73	-0.82	-0.91	-0.99	-1.08	-1.16	-1.24	-1.32	-1.40
60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55	0.83	0.94	1.04	1.15	1.25	1.36	1.46	1.56	1.66
50	1.78	2.02	2.27	2.51	2.75	2.98	3.21	3.44	3.66

Gradient Adjustment for Speed (%)

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)								
	0	1	2	3	4	5	6	7	8
VREF40	-0.24	-0.25	-0.26	-0.27	-0.27	-0.28	-0.28	-0.27	-0.27
VREF40+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF40+10	0.13	0.12	0.12	0.13	0.14	0.15	0.17	0.20	0.23
VREF40+15	0.27	0.25	0.25	0.25	0.26	0.28	0.31	0.34	0.38
VREF40+20	0.40	0.38	0.37	0.37	0.37	0.38	0.40	0.42	0.46
VREF40+25	0.54	0.51	0.49	0.47	0.46	0.45	0.45	0.45	0.46
VREF40+30	0.68	0.64	0.61	0.57	0.53	0.49	0.46	0.42	0.39

With engine bleed for packs off, increase gradient by 0.4%.
With engine anti-ice on, decrease gradient by 0.1%.
With engine and wing anti-ice on, decrease gradient by 0.3%.
When operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C decrease gradient by 1.0%.

Quick Turnaround Limit Weight - Category C Steel Brakes

Flaps 40

OAT		LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	0	2000	4000	6000	8000	10000
54	129	80.9					
50	122	81.4	78.5				
45	113	82.1	79.0	76.1			
40	104	82.8	79.7	76.7	73.8		
35	95	83.6	80.4	77.4	74.4	71.6	
30	86	84.3	81.1	78.0	75.1	72.2	69.3
25	77	85.1	81.8	78.7	75.7	72.8	69.9
20	68	85.9	82.6	79.3	76.4	73.4	70.5
15	59	86.1	83.4	80.0	77.1	74.1	71.1
10	50	86.1	84.1	80.8	77.8	74.8	71.8
5	41	86.1	84.9	81.6	78.5	75.5	72.4
0	32	86.1	85.8	82.4	79.2	76.2	73.1
-5	23	86.1	86.1	83.2	79.9	76.9	73.8
-10	14	86.1	86.1	84.0	80.7	77.7	74.5
-15	5	86.1	86.1	84.9	81.5	78.4	75.2
-20	-4	86.1	86.1	85.8	82.4	79.2	76.0
-30	-22	86.1	86.1	86.1	84.2	80.8	77.6
-40	-40	86.1	86.1	86.1	86.1	82.6	79.2
-50	-58	86.1	86.1	86.1	86.1	84.5	81.0
-54	-65	86.1	86.1	86.1	86.1	85.3	81.7

Increase weight by 700 kg per 1% uphill slope. Decrease weight by 1150 kg per 1% downhill slope. Increase weight by 1750 kg per 10 knots headwind. Decrease weight by 7550 kg per 10 knots tailwind. After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 67 minutes and check that wheel thermal plugs have not melted before executing a subsequent takeoff.

As an alternate procedure, ensure that each brake pressure plate surface temperature, without artificial cooling, is less than 218°C as follows: No sooner than 10 and no later than 15 minutes after parking, measure each brake pressure plate surface temperature at a minimum of two points per brake by an accurate method (using a Doric Microtemp 450 hand held thermometer or equivalent, hold temperature probe in place for 20 seconds or until reading stabilizes). If each measured temperature is less than 218°C, immediate dispatch is allowed; otherwise the required minimum ground wait period of 67 minutes applies.

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 67 minutes after landing, or until all the BTMS readings on the systems Display are below 3.5 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.

Quick Turnaround Limit Weight - Category N Carbon Brakes

Flaps 40

OAT		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	0	2000	4000	6000	8000	10000
54	129	74.9					
50	122	75.3	72.6				
45	113	76.0	73.2	70.4			
40	104	76.6	73.8	71.0	68.3		
35	95	77.3	74.4	71.6	68.9	66.1	
30	86	77.9	75.1	72.2	69.5	66.8	63.7
25	77	78.6	75.7	72.8	70.1	67.4	64.2
20	68	79.3	76.4	73.5	70.7	68.0	64.8
15	59	80.0	77.1	74.1	71.3	68.6	65.4
10	50	80.7	77.8	74.8	72.0	69.2	66.5
5	41	81.5	78.5	75.5	72.6	69.8	67.1
0	32	82.2	79.2	76.2	73.3	70.5	67.7
-5	23	83.0	79.9	76.9	74.0	71.2	68.4
-10	14	83.9	80.7	77.7	74.7	71.8	69.0
-15	5	84.7	81.5	78.5	75.5	72.6	69.7
-20	-4	85.6	82.3	79.2	76.2	73.3	70.4
-30	-22	86.1	84.1	80.9	77.9	74.8	71.8
-40	-40	86.1	86.0	82.7	79.5	76.5	73.4
-50	-58	86.1	86.1	84.6	81.3	78.2	75.1
-54	-65	86.1	86.1	85.4	82.0	78.9	75.8

Increase weight by 600 kg per 1% uphill slope. Decrease weight by 1150 kg per 1% downhill slope.
Increase weight by 1550 kg per 10 knots headwind. Decrease weight by 8150 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.

Performance Dispatch — Chapter PD

Gear Down — Section 13

GEAR DOWN

Takeoff Climb Limit Weight

Flaps 5

Based on engine bleed for packs on and anti-ice off

AIRPORT OAT		TAKEOFF CLIMB WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	0	2000	4000	6000	8000	10000
54	129	59.0	55.7	52.6	49.4	45.9	
52	126	60.3	55.7	52.5	49.4	45.9	
50	122	61.6	56.0	52.5	49.3	45.9	43.2
48	118	63.0	57.3	52.5	49.3	45.9	43.1
46	115	64.3	58.5	52.8	49.3	45.9	43.1
44	111	65.8	59.8	54.1	49.3	45.8	43.1
42	108	67.3	61.1	55.4	49.6	45.8	43.1
40	104	68.6	62.3	56.6	50.9	45.8	43.1
38	100	69.8	63.6	57.8	52.1	46.2	43.1
36	97	71.1	64.8	59.0	53.3	47.4	43.1
34	93	72.5	66.3	60.2	54.5	48.6	43.4
32	90	74.0	67.5	61.4	55.7	49.8	44.6
30	86	75.5	68.9	62.6	56.8	51.0	45.8
28	82	77.0	70.4	63.8	58.0	52.2	46.9
26	79	78.5	71.9	65.1	59.2	53.4	48.1
24	75	79.2	73.3	66.8	60.4	54.6	49.3
22	72	79.2	74.7	68.2	61.7	55.8	50.5
20	68	79.3	75.3	69.5	63.0	56.9	51.7
18	64	79.3	75.3	70.7	64.2	58.1	52.8
16	61	79.3	75.4	71.2	65.3	59.3	53.8
14	57	79.4	75.4	71.2	66.4	60.4	54.9
12	54	79.4	75.4	71.2	66.7	61.4	55.9
10	50	79.5	75.4	71.2	67.1	62.1	56.8

With engine bleeds for packs off, increase weight by 300 kg.
With engine anti-ice on, decrease weight by 2050 kg.
With engine and wing anti-ice on, decrease weight by 7500 kg (optional system).

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		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	0	2000	4000	6000	8000	10000
54	129	58.5					
52	126	60.0					
50	122	61.6	56.8				
48	118	62.7	58.3				
46	115	63.9	59.7	55.0			
44	111	65.0	60.7	56.3			
42	108	66.4	61.8	57.7	52.9		
40	104	67.5	62.9	58.7	54.1		
38	100	68.7	64.0	59.7	55.3	50.3	
36	97	69.9	65.0	60.8	56.3	51.2	
34	93	71.1	66.6	61.9	57.3	52.0	47.8
32	90	72.3	67.7	62.8	58.1	53.0	48.8
30	86	73.5	68.6	63.6	59.0	53.9	49.7
28	82	73.6	69.5	64.3	59.7	54.8	50.5
26	79	73.7	70.2	64.9	60.2	55.5	51.3
24	75	73.7	70.3	65.4	60.6	56.2	51.8
22	72	73.8	70.3	66.1	61.1	56.6	52.2
20	68	73.8	70.4	66.1	61.5	57.0	52.6
18	64	73.9	70.4	66.2	61.8	57.3	53.0
16	61	73.9	70.5	66.2	61.9	57.6	53.3
14	57	74.0	70.5	66.3	61.9	58.0	53.6
12	54	74.0	70.5	66.3	61.9	58.0	53.9
10	50	74.1	70.6	66.3	61.9	58.0	54.3
-40	-40	74.6	71.0	66.8	62.3	58.4	54.8

With engine bleed for packs off, increase weight by 1200 kg.
With engine anti-ice on, decrease weight by 250 kg.
With engine and wing anti-ice on, decrease weight by 1400 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 7000 kg.

GEAR DOWN

Takeoff Obstacle Limit Weight

Flaps 5

Sea Level, 30°C & Below, Zero Wind

Based on engine bleed for packs on and anti-ice off

Reference Obstacle Limit Weight (1000 KG)

OBSTACLE HEIGHT (M)	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
20	69.8	74.7									
40	64.2	69.1	72.8	75.6							
60	60.2	64.8	68.6	71.7	74.1						
80	56.8	61.5	65.2	68.3	70.9	73.0	74.7	76.2			
100	54.0	58.6	62.3	65.4	68.1	70.3	72.2	73.8	75.1	76.1	76.8
120	51.5	56.1	59.8	62.9	65.6	67.9	69.8	71.5	73.0	74.2	75.3
140	49.3	53.8	57.5	60.7	63.4	65.7	67.7	69.5	71.0	72.3	73.5
160	47.3	51.8	55.5	58.7	61.4	63.7	65.7	67.5	69.1	70.5	71.8
180	45.4	49.9	53.6	56.8	59.5	61.9	64.0	65.8	67.4	68.9	70.2
200	43.7	48.2	51.9	55.1	57.8	60.2	62.3	64.1	65.8	67.3	68.6
220	42.2	46.6	50.3	53.5	56.2	58.6	60.7	62.6	64.3	65.8	67.2
240		45.1	48.8	52.0	54.7	57.2	59.3	61.2	62.9	64.4	65.8
260		43.7	47.4	50.6	53.4	55.8	57.9	59.8	61.5	63.1	64.5
280		42.4	46.1	49.3	52.0	54.5	56.6	58.5	60.3	61.8	63.3
300		41.2	44.9	48.0	50.8	53.2	55.4	57.3	59.1	60.7	62.1

Obstacle height must be calculated from lowest point of the runway to conservatively account for runway slope.

OAT Adjustments

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)							
	40	45	50	55	60	65	70	75
30 & BELOW	0	0	0	0	0	0	0	0
32	-0.5	-0.6	-0.7	-0.8	-0.9	-0.9	-1.0	-1.1
34	-1.0	-1.2	-1.4	-1.5	-1.7	-1.9	-2.1	-2.3
36	-1.5	-1.8	-2.0	-2.3	-2.6	-2.9	-3.1	-3.4
38	-2.0	-2.4	-2.7	-3.1	-3.4	-3.8	-4.2	-4.5
40	-2.5	-3.0	-3.4	-3.9	-4.3	-4.8	-5.2	-5.7
42	-3.1	-3.7	-4.2	-4.8	-5.3	-5.8	-6.4	-6.9
44	-3.8	-4.4	-5.0	-5.7	-6.3	-6.9	-7.5	-8.1
46	-4.5	-5.2	-5.9	-6.6	-7.3	-8.0	-8.7	-9.4
48	-5.1	-5.9	-6.7	-7.5	-8.3	-9.1	-9.8	-10.6
50	-5.8	-6.6	-7.5	-8.4	-9.2	-10.1	-11.0	-11.9

Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	40	45	50	55	60	65	70	75
S.L. & BELOW	0	0	0	0	0	0	0	0
1000	-1.5	-1.7	-1.9	-2.1	-2.3	-2.5	-2.6	-2.8
2000	-3.0	-3.4	-3.8	-4.2	-4.5	-4.9	-5.3	-5.7
3000	-4.2	-4.8	-5.4	-6.0	-6.6	-7.2	-7.8	-8.4
4000	-5.3	-6.2	-7.0	-7.8	-8.7	-9.5	-10.3	-11.1
5000	-6.5	-7.5	-8.5	-9.5	-10.4	-11.4	-12.4	-13.4
6000	-7.8	-8.9	-10.0	-11.1	-12.2	-13.4	-14.5	-15.6
7000	-9.1	-10.3	-11.6	-12.9	-14.1	-15.4	-16.6	-17.9
8000	-10.4	-11.8	-13.2	-14.6	-16.0	-17.4	-18.8	-20.2
9000	-11.4	-13.0	-14.6	-16.1	-17.6	-19.2	-20.8	-22.3
10000	-12.5	-14.2	-15.9	-17.6	-19.3	-21.0	-22.7	-24.4

GEAR DOWN

Takeoff Obstacle Limit Weight
Flaps 5
Sea Level, 30°C & Below, Zero Wind
Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	40	45	50	55	60	65	70	75
15TW	-5.0	-5.3	-5.7	-6.0	-6.3	-6.7	-7.0	-7.3
10TW	-3.3	-3.6	-3.8	-4.0	-4.2	-4.4	-4.7	-4.9
5TW	-1.7	-1.8	-1.9	-2.0	-2.1	-2.2	-2.3	-2.4
0	0	0	0	0	0	0	0	0
10HW	1.1	1.1	1.0	0.9	0.9	0.8	0.8	0.7
20HW	2.3	2.2	2.0	1.9	1.8	1.6	1.5	1.4
30HW	3.5	3.2	3.1	2.9	2.7	2.4	2.2	2.0
40HW	4.6	4.3	4.1	3.8	3.5	3.3	3.0	2.7

With engine bleed for packs off, increase weight by 200 kg.
With engine anti-ice on, decrease weight by 2050 kg.
With engine and wing anti-ice on, decrease weight by 7650 kg (optional system).

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	15600	12500	9400
80	18400	15500	12600
75	21100	18500	15700
70	23600	21400	18600
65	26100	24400	21800
60	28600	27100	25300
55	30800	29600	28100
50	32900	31900	30700
45	35100	34100	33000
40	37500	36500	35400

GEAR DOWN

Long Range Cruise Trip Fuel and Time

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
340	300	266	239	218	200	187	174	164	155	147
508	449	399	359	328	300	280	262	246	233	221
675	597	531	479	437	400	374	350	329	311	295
841	745	662	598	545	500	467	438	412	389	369
1006	892	794	717	654	600	561	526	495	468	444
1170	1038	925	835	763	700	655	614	578	546	518
1332	1183	1055	954	872	800	749	703	661	625	593
1494	1328	1185	1072	980	900	843	791	745	704	668
1655	1472	1315	1190	1089	1000	937	879	828	783	743
1814	1615	1444	1308	1197	1100	1031	968	911	862	818
1973	1758	1573	1426	1305	1200	1125	1056	995	941	894
2131	1900	1701	1543	1413	1300	1218	1145	1079	1020	969
2288	2041	1829	1660	1521	1400	1313	1233	1162	1100	1045
2444	2182	1957	1777	1629	1500	1407	1322	1246	1179	1121
2599	2323	2084	1894	1737	1600	1501	1411	1330	1259	1197
2754	2463	2212	2011	1845	1700	1595	1500	1414	1339	1273
2907	2602	2338	2127	1953	1800	1689	1589	1499	1419	1350
3060	2741	2465	2243	2060	1900	1784	1678	1583	1499	1426
3212	2879	2591	2359	2168	2000	1878	1767	1668	1580	1503

Reference Fuel and Time Required

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	2.6	0:53	2.5	0:51	2.3	0:49	2.2	0:48	2.2	0:47
300	3.8	1:18	3.6	1:14	3.3	1:10	3.2	1:08	3.1	1:05
400	5.0	1:42	4.7	1:37	4.4	1:31	4.2	1:27	4.0	1:24
500	6.3	2:06	5.9	2:00	5.4	1:52	5.1	1:47	5.0	1:43
600	7.6	2:30	7.1	2:22	6.5	2:13	6.1	2:06	5.9	2:01
700	8.9	2:53	8.3	2:44	7.5	2:33	7.1	2:25	6.9	2:19
800	10.2	3:16	9.5	3:06	8.6	2:53	8.1	2:44	7.8	2:37
900	11.5	3:39	10.7	3:28	9.7	3:13	9.2	3:03	8.8	2:56
1000	12.8	4:02	11.9	3:50	10.8	3:33	10.2	3:23	9.7	3:14
1100	14.2	4:24	13.2	4:11	11.9	3:53	11.2	3:41	10.8	3:31
1200	15.5	4:46	14.5	4:32	13.1	4:12	12.3	3:59	11.8	3:49
1300	16.9	5:08	15.8	4:53	14.2	4:31	13.4	4:18	12.8	4:07
1400	18.3	5:30	17.0	5:14	15.4	4:51	14.4	4:36	13.8	4:25
1500	19.6	5:52	18.3	5:35	16.5	5:10	15.5	4:55	14.9	4:42
1600	21.1	6:13	19.7	5:55	17.7	5:29	16.6	5:13		
1700	22.5	6:34	21.0	6:15	18.9	5:48	17.8	5:31		
1800	24.0	6:55	22.4	6:35	20.1	6:06	18.9	5:48		
1900	25.4	7:16	23.7	6:55	21.3	6:25	20.0	6:06		
2000	26.9	7:37	25.1	7:16	22.5	6:44	21.1	6:24		

GEAR DOWN

Long Range Cruise Trip Fuel and Time

Fuel Required Adjustments (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	0.3	0.4	0.5
4	-0.4	-0.2	0.0	0.2	0.5	0.7	1.0
6	-0.6	-0.3	0.0	0.4	0.7	1.1	1.4
8	-0.8	-0.4	0.0	0.5	0.9	1.4	1.8
10	-1.0	-0.5	0.0	0.6	1.1	1.7	2.3
12	-1.1	-0.6	0.0	0.7	1.4	2.0	2.7
14	-1.3	-0.7	0.0	0.8	1.6	2.4	3.2
16	-1.5	-0.8	0.0	0.9	1.8	2.7	3.6
18	-1.7	-0.9	0.0	1.0	2.0	3.0	4.0
20	-1.9	-0.9	0.0	1.1	2.2	3.3	4.5
22	-2.1	-1.0	0.0	1.2	2.4	3.7	4.9
24	-2.3	-1.1	0.0	1.3	2.6	4.0	5.3
26	-2.4	-1.2	0.0	1.4	2.9	4.3	5.8
28	-2.6	-1.3	0.0	1.5	3.1	4.6	6.2

Based on VREF40 + 70 climb, Long Range Cruise and VREF40 + 70 descent.

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	4480	4450	4430	4460	4510			
80	4230	4200	4170	4190	4210			
75	3980	3950	3920	3920	3930			
70	3740	3700	3670	3660	3660	3720		
65	3530	3480	3450	3420	3410	3440		
60	3300	3240	3210	3170	3150	3160	3320	
55	3070	3020	2970	2940	2900	2900	2980	
50	2840	2790	2740	2700	2660	2650	2690	
45	2620	2570	2520	2480	2420	2400	2440	2530
40	2390	2350	2300	2260	2200	2160	2190	2220

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)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
22	42.9	41.7	
20	46.4	45.1	43.8
18	50.0	48.4	46.7
16	53.6	51.7	49.8
14	56.8	55.1	53.3
12	60.5	58.5	56.2
10	64.1	61.9	59.1
8	68.1	65.6	62.6
6	72.1	69.2	66.0
4	75.9	72.7	69.2
2	79.5	76.1	72.6
0	82.9	79.3	75.9

Anti-Ice Adjustments

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)				
	PRESSURE ALTITUDE (1000 FT)				
	2	6	10	14	18
ENGINE ONLY	-1.7	-1.3	-1.5	-1.5	-1.3
ENGINE AND WING	-6.6	-5.9	-5.6	-5.1	-4.9

Intentionally
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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 takeoff 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 the 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 will be the least of the Field, Climb, Obstacle, Brake Energy and Tire Speed Limit Weights as determined from the tables shown.

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.

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 appropriate table with the available field length and runway slope to determine the slope corrected field length. Next enter the appropriate table 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 conditions and show both Field and Climb Limit Weights. Enter the appropriate table 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. 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

The Reference Obstacle Limit Weight table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the adjustment tables to adjust the reference Obstacle Limit Weight for the effects of OAT, pressure altitude and wind as indicated. In the case of multiple obstacles, enter the tables successively with each obstacle and determine the most limiting 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 225 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.

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.

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 this table considers 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. Flying above these altitudes with sustained banks in excess of approximately 15° 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

Long Range Cruise Trip Fuel and Time tables are provided to determine trip time and fuel required to destination.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time table 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 with the Reference Fuel and the planned landing weight to obtain the adjustment to the fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

The Long Range Cruise Step Climb Trip Fuel and Time tables are provided to determine trip time and fuel 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 and determine air distance as discussed above. Then enter the Trip Fuel and Time Required table 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. Obtain air distance from the table using the ground distance and wind component to the alternate. Enter the Trip Fuel and Time Required table with air distance and read trip fuel required for the expected landing weight, together with time to alternate at right. For distances greater than shown or other altitudes, use the Long Range Cruise Trip Fuel and Time tables.

Holding Planning

This table provides 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 flaps up 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 Oxygen Requirements

This airplane is equipped with a chemical passenger oxygen system. 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 with the minimum dispatch oxygen cylinder pressure.

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.

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 a single landing flap.

Maximum landing weight is the lowest of the field length limit weight, climb limit weight, or maximum certified landing weight.

Landing Field Limit Weight

For the expected runway condition and anti-skid system configuration, obtain wind corrected field length by entering the Wind Corrected Field Length table with field length available and wind component along the runway. Now enter the Field Limit Weight table with wind corrected field length and pressure altitude to read field limit weight.

Landing Climb Limit Weight

Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required.

Go-Around Climb Gradient

Enter the Reference Go-Around Gradient table with airport OAT and pressure altitude to determine the reference go-around gradient. Then adjust the reference gradient for airplane weight and speed using the tables provided 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 the appropriate table (Steel or Carbon Brakes) 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. For Steel Brakes, the alternate procedures on the charts can be used to ensure the brake temperature is within limits. These procedures cannot be used for carbon brakes.

Gear Down

This section provides flight planning data for revenue operation with gear down. Unless otherwise noted, the gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

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 FMCS 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.

Takeoff/Landing Climb Limit Weight

Enter the appropriate table with airport OAT and pressure altitude to determine Takeoff/Landing Climb Limit Weight with gear down. Correct the weight obtained for engine bleed configuration as required.

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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 Errata (NOE) 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.

Line Number	Registry Number	Serial Number	Tabulation Number
4081	A6-FDZ	40253	YR017
4096	A6-FEA	40254	YR018
4216	A6-FEB	40255	YR019
4243	A6-FEC	40256	YR020
4277	A6-FED	40257	YR021
4433	A6-FEE	40258	YR022
4467	N-402FP	40259	YR023
4534	A6-FEG	40281	YR024
4648	A6-FEH	40260	YR025

Line Number	Registry Number	Serial Number	Tabulation Number
4671	A6-FEI	40261	YR026
4699	A6-FEJ	40262	YR027
4738	A6-FEK	40282	YR028
4781	A6-FEL	40263	YR029
4979	A6-FEN	40265	YR030
4988	A6-FEM	40264	YR031
5004	A6-FEO	40266	YR032
5083	A6-FEP	40269	YR033
5117	A6-FEQ	40267	YR034
5163	A6-FER	40268	YR035
5187	A6-FES	40270	YR036
5241	A6-FET	40271	YR037
5285	A6-FEU	40273	YR038
5323	A6-FEV	40275	YR039
5364	A6-FEW	40276	YR040
5397	A6-FEX	40278	YR041
5465	A6-FEY	40274	YR042
5553	A6-FEZ	40272	YR044
5887	A6-FGA	60954	YR045
5950	A6-FGB	60955	YR046
6004	A6-FGC	60956	YR047
6042	A6-FGD	60957	YR048
6069	A6-FGE	60958	YR049
6116	A6-FGF	60959	YR050
6175	A6-FGG	60960	YV391

Line Number	Registry Number	Serial Number	Tabulation Number
6201	A6-FGH	60961	YV392
6277	A6-FGI	60962	YV393
6351	A6-FGJ	60963	YV394

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Takeoff Speeds - Dry Runway
V1, VR, V2 for Max Takeoff Thrust

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	165	168	173	158	161	167	155	158	163	152	154	160	149	151	158
80	155	158	166	148	151	159	146	148	156	143	145	153	140	142	150
70	145	147	157	139	141	151	136	138	148	133	135	145	131	132	143
60	133	134	148	127	129	142	124	126	139	122	123	136	119	121	134
50	119	120	136	114	115	131	112	113	129	109	110	126	107	108	124
40	104	105	125	100	100	120	98	98	118	96	96	115	94	94	113

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	6	7						5	6						-4	-4					
60	140	5	5	6	7				4	5	6	7				-3	-3	-4	-4			
50	122	3	4	5	6	7	8	9	2	3	4	5	6	8	9	-2	-2	-3	-4	-4	-5	-6
40	104	1	2	3	4	5	6	8	1	2	3	4	5	6	8	-1	-1	-2	-3	-4	-4	-5
30	86	0	0	2	3	4	5	7	0	0	2	3	4	5	7	0	0	-1	-2	-3	-4	-4
20	68	0	0	1	2	3	5	6	0	0	1	2	3	5	6	0	0	-1	-1	-2	-3	-4
-60	-76	0	0	1	2	3	5	6	0	0	1	2	3	4	5	0	0	-1	-1	-2	-3	-3

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
90	-4	-2	0	1	2	-3	-2	-1	0	0	0	1	1
80	-3	-2	0	1	2	-2	-2	-1	0	0	1	1	1
70	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	1
60	-1	-1	0	1	1	-2	-1	-1	0	0	1	1	1
50	-1	-1	0	0	0	-2	-1	-1	0	0	0	0	0
40	-1	-1	0	-1	-1	-2	-1	-1	0	0	0	0	0

***V1 not to exceed VR.**

V1(MCG)
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	97	94					
60	140	97	94	92	91			
50	122	99	97	93	91	89	86	83
40	104	103	101	98	94	90	86	83
30	86	106	105	101	97	94	89	85
20	68	106	106	102	99	95	91	87
-60	-76	108	107	104	100	97	93	89

Takeoff Speeds - Wet Runway

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS1			FLAPS5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
90	159	169	173	152	161	167	150	158	163	146	154	160	144	151	158
80	147	158	166	141	151	159	138	148	156	135	145	153	133	142	150
70	136	147	157	130	141	151	127	138	148	124	135	145	122	132	143
60	123	134	148	117	129	142	115	126	139	112	123	136	110	121	134
50	108	120	136	103	115	131	102	113	129	99	110	126	97	108	124
40	93	105	125	88	100	120	86	98	118	84	96	115	83	94	113

Check V1(MCG).

V1, VR, V2 Adjustment*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	9	10						5	6						-4	-4					
60	140	7	7	9	10				4	5	6	7				-3	-3	-4	-4			
50	122	4	5	6	7	9	11	12	2	3	4	5	6	8	9	-2	-2	-3	-4	-4	-5	-6
40	104	2	2	4	5	7	9	10	1	2	3	4	5	6	8	-1	-1	-2	-3	-3	-4	-5
30	86	0	0	2	4	5	7	9	0	0	2	3	4	5	7	0	0	-1	-2	-3	-3	-4
20	68	0	0	1	3	4	6	8	0	0	1	2	3	5	6	0	0	-1	-1	-2	-3	-4
-60	-76	0	0	1	3	4	6	7	0	0	1	2	3	4	5	0	0	-1	-1	-2	-3	-3

Slope and Wind V1 Adjustment*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
90	-4	-2	0	3	6	-4	-2	-1	0	1	2	3	3
80	-4	-2	0	3	5	-4	-2	-1	0	1	2	2	3
70	-4	-2	0	2	4	-4	-3	-1	0	1	1	2	3
60	-3	-2	0	1	3	-4	-3	-1	0	1	2	2	3
50	-3	-1	0	1	2	-5	-3	-2	0	1	2	3	4
40	-2	-1	0	1	2	-5	-4	-2	0	1	2	3	5

V1(MCG)
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	97	94					
60	140	97	94	93	92			
50	122	100	97	93	92	90	88	85
40	104	104	102	98	94	91	88	85
30	86	106	105	101	97	94	90	87
20	68	106	106	103	99	95	91	88
-60	-76	108	107	105	102	98	95	91

Stab Trim Setting
Max Takeoff Thrust
Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)									
	6	9	11	16	23	26	30	32	33	36
80	8 1/2	8	7 1/2	6 3/4	5 1/2	5	4 1/4	4	3 3/4	3 1/4
70	7 3/4	7 1/4	7	6 1/4	5	4 1/2	4	3 1/2	3 1/2	3
60	7	6 1/2	6 1/4	5 1/2	4 1/2	4	3 1/2	3 1/4	3	2 3/4
50	6 1/4	5 3/4	5 1/2	5	4	3 1/2	3	2 3/4	2 3/4	2 3/4
40	5 3/4	5 1/2	5 1/4	4 1/2	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4
35	5 3/4	5 1/2	5 1/4	4 1/2	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)									
	6	9	11	16	23	26	30	32	33	36
80	8 1/2	8 1/2	7 3/4	6	4 1/2	4	3 1/4	3	2 3/4	2 3/4
70	8 1/2	7 3/4	7	5 1/4	4	3 1/2	2 3/4	2 3/4	2 3/4	2 3/4
60	7 3/4	6 3/4	6 1/4	4 3/4	3 1/2	3	2 3/4	2 3/4	2 3/4	2 3/4
50	6 1/4	5 1/2	5	4	3	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
40	5	4 3/4	4 1/2	3 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
35	5	4 3/4	4 1/2	3 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4

VREF

WEIGHT (1000 KG)	FLAPS		
	40	30	15
85	159	167	174
80	154	162	169
75	148	156	163
70	143	151	157
65	139	147	153
60	133	141	147
55	127	134	140
50	121	128	133
45	114	121	126
40	107	114	119

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
Weight Adjustments (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	S.L.	5000	10000	S.L.	5000	10000
95	-10.9	-12.9	-14.9	-13.6	-15.6	-17.6	-19.1	-21.1	-23.1
90	-10.1	-12.1	-14.1	-12.4	-14.4	-16.4	-17.2	-19.2	-21.2
85	-9.2	-11.2	-13.2	-11.2	-13.2	-15.2	-15.3	-17.3	-19.3
80	-8.4	-10.4	-12.4	-10.0	-12.0	-14.0	-13.4	-15.4	-17.4
75	-7.5	-9.5	-11.5	-8.8	-10.8	-12.8	-11.6	-13.6	-15.6
70	-6.7	-8.7	-10.7	-7.7	-9.7	-11.7	-10.0	-12.0	-14.0
65	-5.8	-7.8	-9.8	-6.6	-8.6	-10.6	-8.4	-10.4	-12.4
60	-4.9	-6.9	-8.9	-5.6	-7.6	-9.6	-7.0	-9.0	-11.0
55	-4.1	-6.1	-8.1	-4.6	-6.6	-8.6	-5.6	-7.6	-9.6
50	-3.2	-5.2	-7.2	-3.6	-5.6	-7.6	-4.4	-6.4	-8.4
45	-2.4	-4.4	-6.4	-2.6	-4.6	-6.6	-3.3	-5.3	-7.3
40	-1.5	-3.5	-5.5	-1.7	-3.7	-5.7	-2.2	-4.2	-6.2

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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	S.L.	5000	10000	S.L.	5000	10000
1200							33.3		
1400	41.7			45.0	31.8		50.8	37.6	
1600	60.3	46.2	32.9	63.7	49.6	36.2	69.5	55.4	42.0
1800	81.0	65.2	50.8	84.4	68.7	54.2	89.7	74.4	60.0
2000	103.0	86.5	70.3		89.8	73.8		94.8	79.5
2200			92.0			95.2			99.9

1. Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -30 m/+30 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slush/standing water limited weight is lesser of weights from 1 and 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	S.L.	5000	10000	S.L.	5000	10000
90	-18	-11	-3	-12	-4	0	0	0	0
85	-19	-12	-4	-13	-6	0	0	0	0
80	-20	-13	-5	-15	-8	0	-3	0	0
75	-21	-14	-6	-17	-9	-2	-6	0	0
70	-22	-15	-7	-18	-11	-3	-9	-1	0
65	-23	-16	-8	-20	-12	-5	-12	-4	0
60	-24	-17	-9	-21	-14	-6	-14	-7	0
55	-25	-18	-10	-23	-15	-8	-17	-9	-2
50	-26	-19	-11	-24	-17	-9	-19	-12	-4
45	-27	-19	-12	-25	-18	-10	-22	-14	-7
40	-28	-20	-13	-27	-19	-12	-24	-17	-9

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 V1 Adjustment table 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
Weight Adjustments (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	S.L.	5000	10000	S.L.	5000	10000
95	-14.4	-16.7	-18.9	-17.0	-19.2	-21.5	-22.4	-24.6	-26.9
90	-13.4	-15.7	-17.9	-15.7	-17.9	-20.2	-20.4	-22.7	-24.9
85	-12.4	-14.7	-16.9	-14.4	-16.6	-18.9	-18.4	-20.7	-22.9
80	-11.4	-13.7	-15.9	-13.0	-15.3	-17.5	-16.5	-18.7	-21.0
75	-10.4	-12.7	-14.9	-11.7	-14.0	-16.2	-14.5	-16.8	-19.0
70	-9.4	-11.7	-13.9	-10.5	-12.7	-15.0	-12.7	-15.0	-17.2
65	-8.4	-10.7	-12.9	-9.3	-11.5	-13.8	-11.1	-13.3	-15.6
60	-7.4	-9.7	-11.9	-8.1	-10.3	-12.6	-9.5	-11.7	-14.0
55	-6.4	-8.7	-10.9	-6.9	-9.2	-11.4	-8.0	-10.3	-12.5
50	-5.4	-7.7	-9.9	-5.8	-8.1	-10.3	-6.7	-9.0	-11.2
45	-4.5	-6.7	-9.0	-4.8	-7.0	-9.3	-5.5	-7.8	-10.0
40	-3.5	-5.7	-8.0	-3.7	-6.0	-8.2	-4.4	-6.7	-8.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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	S.L.	5000	10000	S.L.	5000	10000
1800							43.7		
2000				45.1			67.1	46.5	
2200	57.9	32.5		73.5	48.4		92.7	70.2	49.3
2400	91.8	61.8	36.0		77.4	51.8		96.0	73.3
2600		96.3	65.8			81.4			99.3
2800			100.7						

1. **Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -40 m/+40 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 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	S.L.	5000	10000	S.L.	5000	10000
90	-28	-18	-8	-18	-8	0	0	0	0
85	-29	-19	-9	-21	-11	-1	-1	0	0
80	-31	-21	-11	-23	-13	-3	-6	0	0
75	-32	-22	-12	-26	-16	-6	-10	0	0
70	-34	-24	-14	-28	-18	-8	-15	-5	0
65	-35	-25	-15	-31	-21	-11	-19	-9	0
60	-37	-27	-17	-33	-23	-13	-23	-13	-3
55	-39	-29	-19	-36	-26	-16	-28	-18	-8
50	-41	-31	-21	-38	-28	-18	-32	-22	-12
45	-42	-32	-22	-40	-30	-20	-36	-26	-16
40	-44	-34	-24	-43	-33	-23	-40	-30	-20

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 V1 Adjustment table 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

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	S.L.	5000	10000	S.L.	5000	10000
95	0.0	0.0	0.0	-5.3	-5.3	-5.3	-10.3	-10.3	-10.3
90	0.0	0.0	0.0	-5.3	-5.3	-5.3	-9.9	-9.9	-9.9
85	-0.1	-0.1	-0.1	-5.3	-5.3	-5.3	-9.5	-9.5	-9.5
80	-0.4	-0.4	-0.4	-5.2	-5.2	-5.2	-9.1	-9.1	-9.1
75	-0.6	-0.6	-0.6	-5.1	-5.1	-5.1	-8.6	-8.6	-8.6
70	-0.7	-0.7	-0.7	-4.8	-4.8	-4.8	-8.0	-8.0	-8.0
65	-0.7	-0.7	-0.7	-4.5	-4.5	-4.5	-7.4	-7.4	-7.4
60	-0.6	-0.6	-0.6	-4.0	-4.0	-4.0	-6.6	-6.6	-6.6
55	-0.4	-0.4	-0.4	-3.5	-3.5	-3.5	-5.8	-5.8	-5.8
50	-0.1	-0.1	-0.1	-2.9	-2.9	-2.9	-4.9	-4.9	-4.9
45	0.0	0.0	0.0	-2.2	-2.2	-2.2	-4.0	-4.0	-4.0
40	0.0	0.0	0.0	-1.4	-1.4	-1.4	-3.0	-3.0	-3.0

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1000	39.1								
1200	70.5	54.8	39.1						
1400	101.8	86.2	70.5	46.7	31.4				
1600			101.8	69.0	52.1	36.5	31.2		
1800				93.9	75.0	57.5	43.7		
2000					100.3	81.2	57.1	40.6	
2200							72.1	53.6	37.5
2400							89.2	68.1	50.2
2600								84.8	64.3
2800								102.3	80.4
3000									98.0

1. Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust "Good" field length available by -20 m/+20 m for every 5°C above/below 4°C.
Adjust "Medium" field length available by -20 m/+20 m for every 5°C above/below 4°C.
Adjust "Poor" field length available by -35 m/+35 m for every 5°C above/below 4°C.
3. Find V1(MCG) limit weight for adjusted field length and pressure altitude.
4. Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION

Slippery Runway Takeoff
Maximum Reverse Thrust
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	S.L.	5000	10000	S.L.	5000	10000
90	-7	-2	0	-17	-12	-7	-29	-24	-19
85	-8	-3	0	-18	-13	-8	-30	-25	-20
80	-8	-3	0	-19	-14	-9	-32	-27	-22
75	-9	-4	0	-20	-15	-10	-34	-29	-24
70	-10	-5	0	-22	-17	-12	-35	-30	-25
65	-11	-6	-1	-23	-18	-13	-37	-32	-27
60	-12	-7	-2	-24	-19	-14	-39	-34	-29
55	-13	-8	-3	-26	-21	-16	-40	-35	-30
50	-14	-9	-4	-27	-22	-17	-42	-37	-32
45	-15	-10	-5	-29	-24	-19	-43	-38	-33
40	-17	-12	-7	-30	-25	-20	-45	-40	-35

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 V1 Adjustment table 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
Weight Adjustments (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	S.L.	5000	10000	S.L.	5000	10000
95	-0.8	-0.8	-0.8	-8.3	-8.3	-8.3	-14.5	-14.5	-14.5
90	-1.2	-1.2	-1.2	-8.2	-8.2	-8.2	-14.0	-14.0	-14.0
85	-1.6	-1.6	-1.6	-8.1	-8.1	-8.1	-13.4	-13.4	-13.4
80	-1.9	-1.9	-1.9	-8.0	-8.0	-8.0	-12.8	-12.8	-12.8
75	-2.2	-2.2	-2.2	-7.8	-7.8	-7.8	-12.1	-12.1	-12.1
70	-2.3	-2.3	-2.3	-7.5	-7.5	-7.5	-11.3	-11.3	-11.3
65	-2.3	-2.3	-2.3	-7.1	-7.1	-7.1	-10.5	-10.5	-10.5
60	-2.2	-2.2	-2.2	-6.6	-6.6	-6.6	-9.5	-9.5	-9.5
55	-2.0	-2.0	-2.0	-6.0	-6.0	-6.0	-8.5	-8.5	-8.5
50	-1.7	-1.7	-1.7	-5.2	-5.2	-5.2	-7.4	-7.4	-7.4
45	-1.3	-1.3	-1.3	-4.4	-4.4	-4.4	-6.2	-6.2	-6.2
40	-0.8	-0.8	-0.8	-3.5	-3.5	-3.5	-4.9	-4.9	-4.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1200	38.2								
1400	84.8	64.3	38.2						
1600		103.9	84.8						
1800				30.0					
2000				72.5	40.5				
2200					83.5	51.0			
2400						94.5			
3000							49.2		
3200							80.3	42.9	
3400								71.3	36.9
3600									63.2
3800									100.1

1. **Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust “Good” field length available by -20 m/+20 m for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -20 m/+20 m for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -45 m/+45 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff
No Reverse Thrust
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	S.L.	5000	10000	S.L.	5000	10000
90	-9	-4	0	-23	-18	-13	-43	-38	-33
85	-10	-5	0	-25	-20	-15	-46	-41	-36
80	-11	-6	-1	-27	-22	-17	-49	-44	-39
75	-13	-8	-3	-29	-24	-19	-52	-47	-42
70	-14	-9	-4	-31	-26	-21	-56	-51	-46
65	-15	-10	-5	-34	-29	-24	-59	-54	-49
60	-17	-12	-7	-36	-31	-26	-62	-57	-52
55	-19	-14	-9	-39	-34	-29	-66	-61	-56
50	-21	-16	-11	-43	-38	-33	-70	-65	-60
45	-23	-18	-13	-46	-41	-36	-73	-68	-63
40	-25	-20	-15	-50	-45	-40	-77	-72	-67

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 V1 Adjustment table 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

Based on engine bleed for packs on, engine and wing anti-ice on or off

OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
60	95.7	96.4	96.9	97.2	97.6	97.7	97.7	97.7	97.3	96.8	96.4	97.1	97.8
55	96.8	97.2	97.4	97.7	98.0	98.3	98.5	98.5	98.2	97.8	97.3	97.2	97.2
50	98.1	98.5	98.7	98.6	98.5	98.9	99.2	99.2	99.1	98.8	98.4	98.4	98.3
45	98.9	99.5	100.1	99.9	99.7	99.8	100.0	100.0	99.9	99.8	99.5	99.5	99.5
40	99.5	100.2	100.8	100.8	100.7	100.7	100.7	100.6	100.7	100.7	100.6	100.5	100.5
35	99.8	100.9	101.9	101.9	101.7	101.7	101.6	101.6	101.6	101.6	101.6	101.6	101.5
30	99.3	100.9	102.6	102.5	102.6	102.4	102.4	102.4	102.3	102.3	102.3	102.2	102.5
25	98.6	100.2	102.0	102.7	102.7	102.6	102.6	102.6	102.5	102.5	102.5	102.5	102.5
20	97.9	99.5	101.4	102.7	102.7	102.6	102.6	102.6	102.6	102.6	102.5	102.5	102.5
15	97.2	98.8	100.8	102.7	102.7	102.6	102.6	102.6	102.6	102.5	102.5	102.5	102.5
10	96.4	98.0	100.1	102.2	102.5	102.6	102.6	102.6	102.6	102.6	102.5	102.5	102.5
5	95.6	97.3	99.3	101.5	101.7	102.0	102.3	102.5	102.6	102.5	102.5	102.5	102.5
0	94.8	96.5	98.6	100.7	101.0	101.2	101.5	101.8	102.1	102.4	102.5	102.5	102.5
-5	94.0	95.7	97.8	99.9	100.2	100.4	100.7	101.0	101.3	101.6	101.9	102.2	102.5
-10	93.2	94.9	97.1	99.2	99.4	99.7	99.9	100.2	100.5	100.8	101.1	101.4	101.7
-15	92.4	94.1	96.3	98.4	98.6	98.9	99.1	99.4	99.7	100.0	100.3	100.6	100.8
-20	91.5	93.3	95.5	97.6	97.8	98.1	98.3	98.6	98.9	99.2	99.4	99.7	100.0
-25	90.7	92.5	94.7	96.8	97.0	97.3	97.5	97.8	98.1	98.3	98.6	98.9	99.2
-30	89.9	91.6	93.9	95.9	96.2	96.4	96.7	96.9	97.2	97.5	97.8	98.1	98.4
-35	89.0	90.8	93.1	95.1	95.4	95.6	95.8	96.1	96.4	96.7	96.9	97.2	97.5
-40	88.1	89.9	92.3	94.3	94.5	94.8	95.0	95.3	95.5	95.8	96.1	96.4	96.6
-45	87.3	89.1	91.4	93.4	93.7	93.9	94.1	94.4	94.7	95.0	95.2	95.5	95.8
-50	86.4	88.2	90.6	92.6	92.8	93.0	93.3	93.5	93.8	94.1	94.3	94.6	94.9

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.7	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Assumed Temperature Reduced Thrust

Maximum Assumed Temperature (Table 1 of 3)

Based on 25% Takeoff Thrust Reduction

OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
55	73	71	69	77								
50	73	71	69	71	65	63						
45	73	71	69	71	65	63	61	59	57			
40	73	71	69	71	65	63	61	59	57	55		
35	71	70	69	71	65	63	61	59	57	55	53	
30	69	66	68	70	65	63	61	59	57	55	53	51
25	69	66	67	68	65	63	61	59	57	55	53	51
20	68	66	65	67	65	63	61	59	57	55	53	51
15	68	65	64	65	65	63	61	59	57	55	53	51
10	68	65	63	64	64	63	61	59	57	55	53	51
5	68	65	63	64	63	62	61	59	57	55	53	51
0	68	65	63	64	63	62	61	59	57	55	53	51
-5 & BELOW	68	65	63	64	63	62	61	59	57	55	53	51

Takeoff %N1 (Table 2 of 3)

Based on engine bleed for packs on, engine and wing anti-ice on or off

ASSUMED TEMP (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
75	94.8	95.2	96.3	97.1	97.4	97.6	98.2	98.4	98.4	98.5	99.2	99.9
70	95.3	95.8	96.3	96.7	96.7	96.9	97.5	97.7	97.7	97.8	98.5	99.2
65	95.9	96.3	96.8	97.1	97.1	96.9	96.8	97.0	97.1	97.1	97.8	98.5
60	96.4	96.9	97.2	97.6	97.7	97.7	97.7	97.3	96.8	96.4	97.1	97.8
55	97.2	97.4	97.7	98.0	98.3	98.5	98.5	98.2	97.8	97.3	97.2	97.2
50	98.5	98.7	98.6	98.5	98.9	99.2	99.2	99.1	98.8	98.4	98.4	98.3
45	99.5	100.1	99.9	99.7	99.8	100.0	100.0	99.9	99.8	99.5	99.5	99.5
40	100.2	100.8	100.8	100.7	100.7	100.7	100.6	100.7	100.7	100.6	100.5	100.5
35	100.9	101.9	101.9	101.7	101.7	101.6	101.6	101.6	101.6	101.6	101.6	101.5
30	100.9	102.6	102.5	102.6	102.4	102.4	102.4	102.3	102.3	102.3	102.2	102.5
25	100.2	102.0	102.7	102.7	102.6	102.6	102.6	102.5	102.5	102.5	102.5	102.5
20	99.5	101.4	102.7	102.7	102.6	102.6	102.6	102.6	102.6	102.5	102.5	102.5
15	98.8	100.8	102.7	102.7	102.6	102.6	102.6	102.6	102.5	102.5	102.5	102.5
10	98.0	100.1	102.2	102.5	102.6	102.6	102.6	102.6	102.6	102.5	102.5	102.5
5	97.3	99.3	101.5	101.7	102.0	102.3	102.5	102.6	102.5	102.5	102.5	102.5
0	96.5	98.6	100.7	101.0	101.2	101.5	101.8	102.1	102.4	102.5	102.5	102.5
-5	95.7	97.8	99.9	100.2	100.4	100.7	101.0	101.3	101.6	101.9	102.2	102.5
MINIMUM ASSUMED TEMP (°C)	17	15	13	11	9	7	5	3	1	-1	-3	-5

With engine bleed for packs off, increase %N1 by 1.0.

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
110	15.2													
100	14.5	11.1												
90	14.2	11.9												
80	12.8	11.2	8.0											
70	10.7	10.9	8.8	7.8	6.5									
60	9.3	9.4	8.1	8.0	7.2	6.3	5.0							
50	7.8	7.5	7.6	7.4	7.2	7.1	6.2	4.9	3.7					
40	6.3	6.0	6.1	6.1	6.0	5.9	5.8	5.7	4.8	4.4	5.4			
30	4.8	4.6	4.4	4.5	4.6	4.6	4.5	4.4	4.3	4.2	4.1	4.1	4.0	
20		3.1	3.0	2.9	2.9	3.0	3.0	3.0	3.0	2.9	2.8	2.8	2.7	2.7
10		1.6	1.5	1.5	1.5	1.4	1.4	1.5	1.5	1.5	1.5	1.4	1.4	1.4
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.**

Takeoff Speeds - Dry Runway (26K Derate)

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	167	169	173	160	162	166	158	158	163						
80	157	159	165	150	152	159	148	149	155	145	146	152	142	143	150
70	146	148	157	140	142	150	138	139	147	134	136	144	132	133	142
60	134	135	147	128	129	141	126	127	138	123	124	135	121	122	133
50	120	121	136	115	116	131	113	113	128	110	111	125	108	109	124
40	105	105	124	101	101	119	99	99	117	96	97	114	95	95	113

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	5	6						4	5						-3	-4					
60	140	4	4	5	7				3	4	5	6				-2	-3	-3	-4			
50	122	2	3	4	5	6	7	9	2	3	4	5	6	7	8	-2	-2	-3	-3	-4	-5	-6
40	104	1	1	2	3	5	6	7	1	1	3	4	5	6	7	-1	-1	-2	-2	-3	-4	-5
30	86	0	0	1	2	4	5	6	0	0	1	2	4	5	6	0	0	-1	-2	-2	-3	-4
20	68	0	0	1	2	3	4	5	0	0	1	2	3	4	5	0	0	-1	-1	-2	-3	-3
-60	-76	0	0	1	2	3	4	5	0	0	1	2	3	4	5	0	0	-1	-1	-2	-2	-3

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
90	-4	-3	0	1	1	-2	-2	-1	0	0	0	0	1
80	-3	-2	0	1	1	-2	-1	-1	0	0	0	1	1
70	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	1
60	-1	-1	0	1	1	-2	-1	0	0	0	1	1	1
50	-1	0	0	0	0	-2	-1	0	0	0	0	0	0
40	0	0	0	0	0	-2	-1	0	0	0	0	0	0

***V1 not to exceed VR.**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	95	93					
60	140	95	93	92	90			
50	122	97	95	92	90	88	86	83
40	104	101	99	96	93	89	86	83
30	86	104	103	100	96	92	88	85
20	68	104	104	101	98	94	90	87
-60	-76	106	105	102	99	95	92	89

Takeoff Speeds - Wet Runway (26K Derate)

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	162	169	173	154	162	166	154	158	163						
80	150	159	165	143	152	159	141	149	155	138	146	152	135	143	150
70	138	148	157	132	142	150	130	139	147	126	136	144	124	133	142
60	125	135	147	119	129	141	117	127	138	114	124	135	112	122	133
50	110	121	136	105	116	131	103	113	128	101	111	125	99	109	124
40	94	105	124	90	101	119	88	99	117	86	97	114	84	95	113

Check V1(MCG).

V1, VR, V2 Adjustment*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	7	9						4	5						-3	-4					
60	140	5	6	8	9				3	4	5	6				-2	-3	-3	-4			
50	122	3	4	5	6	8	10	12	2	3	4	5	6	7	8	-2	-2	-3	-3	-4	-5	-6
40	104	1	2	3	4	6	8	10	1	1	3	4	5	6	7	-1	-1	-2	-2	-3	-4	-5
30	86	0	0	1	3	4	6	8	0	0	1	2	4	5	6	0	0	-1	-2	-2	-3	-4
20	68	0	0	1	2	4	5	7	0	0	1	2	3	4	5	0	0	-1	-1	-2	-2	-3
-60	-76	0	0	1	2	4	5	7	0	0	1	2	3	4	5	0	0	-1	-1	-2	-2	-3

Slope and Wind V1 Adjustment*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
90	-5	-3	0	3	6	-3	-2	-1	0	1	1	2	3
80	-5	-2	0	3	5	-4	-2	-1	0	1	1	2	3
70	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
60	-3	-2	0	2	3	-4	-3	-1	0	1	2	2	3
50	-2	-1	0	1	3	-5	-3	-1	0	1	2	3	4
40	-2	-1	0	1	2	-5	-3	-2	0	1	2	3	4

***V1 not to exceed VR.**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	95	93					
60	140	95	93	92	90			
50	122	97	95	92	90	88	86	83
40	104	101	99	96	93	89	86	83
30	86	104	103	100	96	92	88	85
20	68	104	104	101	98	94	90	87
-60	-76	106	105	102	99	95	92	89

Stab Trim Setting (26K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)									
	6	9	11	16	23	26	30	32	33	36
80	8 1/2	8	7 3/4	7	5 3/4	5 1/4	4 1/2	4 1/4	4	3 1/2
70	8	7 1/2	7 1/4	6 1/2	5 1/4	4 3/4	4 1/4	3 3/4	3 3/4	3 1/4
60	7 1/4	6 3/4	6 1/2	5 3/4	4 3/4	4 1/4	3 3/4	3 1/2	3 1/4	2 3/4
50	6 1/2	6 1/4	6	5 1/4	4 1/4	3 3/4	3 1/4	3	2 3/4	2 3/4
40	6 1/4	5 3/4	5 1/2	4 3/4	4	3 1/2	3	2 3/4	2 3/4	2 3/4
35	6 1/4	5 3/4	5 1/2	4 3/4	4	3 1/2	3	2 3/4	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)									
	6	9	11	16	23	26	30	32	33	36
80	8 1/2	8 1/2	8	6 1/4	4 3/4	4 1/4	3 1/2	3	2 3/4	2 3/4
70	8 1/2	7 3/4	7 1/4	5 3/4	4 1/2	3 3/4	3	2 3/4	2 3/4	2 3/4
60	7 3/4	7	6 1/2	5 1/4	4	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4
50	6 1/4	5 3/4	5 1/4	4 1/4	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
40	5 1/4	4 3/4	4 1/2	3 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
35	5 1/4	4 3/4	4 1/2	3 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (26K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

26K DERATE 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	S.L.	5000	10000	S.L.	5000	10000
95	-11.1	-12.9	-14.6	-14.0	-15.7	-17.5	-20.0	-23.2	-26.5
90	-10.3	-12.0	-13.8	-12.8	-14.5	-16.3	-18.0	-21.3	-24.5
85	-9.4	-11.1	-12.9	-11.5	-13.3	-15.0	-16.1	-19.3	-22.6
80	-8.5	-10.3	-12.0	-10.3	-12.1	-13.8	-14.1	-17.4	-20.6
75	-7.7	-9.4	-11.2	-9.1	-10.9	-12.6	-12.2	-15.5	-18.7
70	-6.8	-8.6	-10.3	-8.0	-9.7	-11.5	-10.5	-13.7	-17.0
65	-6.0	-7.7	-9.5	-6.9	-8.6	-10.4	-8.8	-12.1	-15.3
60	-5.1	-6.8	-8.6	-5.8	-7.5	-9.3	-7.3	-10.6	-13.8
55	-4.2	-6.0	-7.7	-4.7	-6.5	-8.2	-5.9	-9.1	-12.4
50	-3.3	-5.1	-6.8	-3.7	-5.5	-7.2	-4.6	-7.9	-11.1
45	-2.5	-4.2	-6.0	-2.8	-4.5	-6.3	-3.5	-6.7	-10.0
40	-1.6	-3.3	-5.1	-1.8	-3.6	-5.3	-2.4	-5.6	-8.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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	S.L.	5000	10000	S.L.	5000	10000
1200				30.8			36.3		
1400	45.9			49.1	33.1		54.5	38.6	
1600	65.5	48.3	32.2	68.8	51.4	35.3	74.0	56.9	40.8
1800	87.4	68.2	50.6	90.4	71.4	53.8	94.7	76.5	59.2
2000		90.2	70.8		93.2	74.0		97.3	79.1
2200			93.0			95.9			99.9

1. **Enter Weight Adjustment table with slush/standing water depth and 26K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -25 m/+25 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff (26K Derate)
Maximum Reverse Thrust
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	S.L.	5000	10000	S.L.	5000	10000
90	-16	-11	-6	-9	-4	0	0	0	0
85	-17	-12	-7	-11	-6	-1	0	0	0
80	-18	-13	-8	-13	-8	-3	-1	0	0
75	-20	-15	-10	-15	-10	-5	-4	0	0
70	-21	-16	-11	-17	-12	-7	-6	-1	0
65	-22	-17	-12	-18	-13	-8	-9	-4	0
60	-23	-18	-13	-20	-15	-10	-12	-7	-2
55	-24	-19	-14	-21	-16	-11	-15	-10	-5
50	-25	-20	-15	-23	-18	-13	-18	-13	-8
45	-26	-21	-16	-24	-19	-14	-21	-16	-11
40	-27	-22	-17	-26	-21	-16	-23	-18	-13

1. **Obtain V1, VR and V2 for the actual weight using the 26K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table 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 (26K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

26K DERATE 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	S.L.	5000	10000	S.L.	5000	10000
95	-14.7	-16.2	-17.7	-17.6	-19.1	-20.6	-23.5	-27.0	-30.5
90	-13.7	-15.2	-16.7	-16.2	-17.7	-19.2	-21.3	-24.8	-28.3
85	-12.6	-14.1	-15.6	-14.8	-16.3	-17.8	-19.2	-22.7	-26.2
80	-11.6	-13.1	-14.6	-13.4	-14.9	-16.4	-17.1	-20.6	-24.1
75	-10.5	-12.0	-13.5	-12.0	-13.5	-15.0	-15.1	-18.6	-22.1
70	-9.5	-11.0	-12.5	-10.7	-12.2	-13.7	-13.2	-16.7	-20.2
65	-8.5	-10.0	-11.5	-9.4	-10.9	-12.4	-11.4	-14.9	-18.4
60	-7.5	-9.0	-10.5	-8.2	-9.7	-11.2	-9.8	-13.3	-16.8
55	-6.5	-8.0	-9.5	-7.1	-8.6	-10.1	-8.2	-11.7	-15.2
50	-5.6	-7.1	-8.6	-6.0	-7.5	-9.0	-6.9	-10.4	-13.9
45	-4.6	-6.1	-7.6	-4.9	-6.4	-7.9	-5.6	-9.1	-12.6
40	-3.7	-5.2	-6.7	-4.0	-5.5	-7.0	-4.5	-8.0	-11.5

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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	S.L.	5000	10000	S.L.	5000	10000
1800							51.5	34.0	
2000	42.0			57.3	35.5		76.5	57.6	39.8
2200	74.9	49.6		87.1	64.6	42.7	103.1	83.1	63.7
2400		84.3	57.6		94.6	72.1			89.8
2600			94.0			102.2			

1. **Enter Weight Adjustment table with slush/standing water depth and 26K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -35 m/+35 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 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	S.L.	5000	10000	S.L.	5000	10000
90	-24	-14	-4	-14	-4	0	0	0	0
85	-26	-16	-6	-17	-7	0	0	0	0
80	-28	-18	-8	-20	-10	0	-2	0	0
75	-30	-20	-10	-23	-13	-3	-6	0	0
70	-32	-22	-12	-26	-16	-6	-11	-1	0
65	-33	-23	-13	-28	-18	-8	-15	-5	0
60	-35	-25	-15	-31	-21	-11	-20	-10	0
55	-37	-27	-17	-34	-24	-14	-24	-14	-4
50	-39	-29	-19	-36	-26	-16	-29	-19	-9
45	-41	-31	-21	-39	-29	-19	-34	-24	-14
40	-43	-33	-23	-41	-31	-21	-38	-28	-18

1. **Obtain V1, VR and V2 for the actual weight using the 26K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table 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 (26K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

26K DERATE 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	S.L.	5000	10000	S.L.	5000	10000
95	0.0	0.0	0.0	-5.3	-5.3	-5.3	-10.2	-10.2	-10.2
90	-0.1	-0.1	-0.1	-5.3	-5.3	-5.3	-9.8	-9.8	-9.8
85	-0.3	-0.3	-0.3	-5.2	-5.2	-5.2	-9.4	-9.4	-9.4
80	-0.5	-0.5	-0.5	-5.2	-5.2	-5.2	-9.0	-9.0	-9.0
75	-0.7	-0.7	-0.7	-5.0	-5.0	-5.0	-8.5	-8.5	-8.5
70	-0.8	-0.8	-0.8	-4.8	-4.8	-4.8	-8.0	-8.0	-8.0
65	-0.7	-0.7	-0.7	-4.5	-4.5	-4.5	-7.4	-7.4	-7.4
60	-0.6	-0.6	-0.6	-4.1	-4.1	-4.1	-6.7	-6.7	-6.7
55	-0.4	-0.4	-0.4	-3.6	-3.6	-3.6	-5.9	-5.9	-5.9
50	-0.2	-0.2	-0.2	-3.0	-3.0	-3.0	-5.1	-5.1	-5.1
45	0.0	0.0	0.0	-2.3	-2.3	-2.3	-4.1	-4.1	-4.1
40	0.0	0.0	0.0	-1.5	-1.5	-1.5	-3.1	-3.1	-3.1

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1000	43.2								
1200	74.7	59.0	43.2						
1400		90.3	74.7	50.6	34.8				
1600				73.6	56.1	39.9	33.7		
1800				99.1	79.9	61.7	46.6	32.1	
2000						86.3	60.6	44.9	30.5
2200							76.5	58.8	43.3
2400							94.3	74.4	57.0
2600								92.0	72.3
2800									89.8

1. **Enter Weight Adjustment table with reported braking action and 26K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -15 m/+15 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -15 m/+15 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -35 m/+35 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff (26K Derate)
Maximum Reverse Thrust
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	S.L.	5000	10000	S.L.	5000	10000
90	-6	-1	0	-15	-10	-5	-25	-20	-15
85	-7	-2	0	-16	-11	-6	-27	-22	-17
80	-8	-3	0	-18	-13	-8	-30	-25	-20
75	-8	-3	0	-19	-14	-9	-32	-27	-22
70	-9	-4	0	-20	-15	-10	-34	-29	-24
65	-10	-5	0	-22	-17	-12	-35	-30	-25
60	-11	-6	-1	-23	-18	-13	-37	-32	-27
55	-12	-7	-2	-25	-20	-15	-39	-34	-29
50	-13	-8	-3	-26	-21	-16	-40	-35	-30
45	-15	-10	-5	-28	-23	-18	-42	-37	-32
40	-16	-11	-6	-29	-24	-19	-43	-38	-33

1. **Obtain V1, VR and V2 for the actual weight using the 26K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table 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 (26K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

26K DERATE 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	S.L.	5000	10000	S.L.	5000	10000
95	-1.0	-1.0	-1.0	-8.1	-8.1	-8.1	-14.5	-14.5	-14.5
90	-1.3	-1.3	-1.3	-8.0	-8.0	-8.0	-13.9	-13.9	-13.9
85	-1.6	-1.6	-1.6	-7.9	-7.9	-7.9	-13.3	-13.3	-13.3
80	-1.9	-1.9	-1.9	-7.8	-7.8	-7.8	-12.7	-12.7	-12.7
75	-2.1	-2.1	-2.1	-7.7	-7.7	-7.7	-12.0	-12.0	-12.0
70	-2.2	-2.2	-2.2	-7.4	-7.4	-7.4	-11.3	-11.3	-11.3
65	-2.3	-2.3	-2.3	-7.0	-7.0	-7.0	-10.4	-10.4	-10.4
60	-2.2	-2.2	-2.2	-6.5	-6.5	-6.5	-9.5	-9.5	-9.5
55	-2.0	-2.0	-2.0	-6.0	-6.0	-6.0	-8.5	-8.5	-8.5
50	-1.7	-1.7	-1.7	-5.3	-5.3	-5.3	-7.4	-7.4	-7.4
45	-1.4	-1.4	-1.4	-4.5	-4.5	-4.5	-6.2	-6.2	-6.2
40	-0.9	-0.9	-0.9	-3.6	-3.6	-3.6	-4.9	-4.9	-4.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1200	47.5								
1400	89.6	70.6	47.5						
1600		108.1	89.6						
1800				41.4					
2000				83.4	51.9				
2200					93.9	62.5			
2400						104.4			
2800							30.3		
3000							62.1		
3200							95.7	54.0	
3400								87.2	46.0
3600									78.7

1. **Enter Weight Adjustment table with reported braking action and 26K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -20 m/+20 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -20 m/+20 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -40 m/+40 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff (26K Derate)
No Reverse Thrust
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	S.L.	5000	10000	S.L.	5000	10000
90	-8	-3	0	-20	-15	-10	-39	-34	-29
85	-9	-4	0	-22	-17	-12	-42	-37	-32
80	-10	-5	0	-24	-19	-14	-46	-41	-36
75	-12	-7	-2	-27	-22	-17	-49	-44	-39
70	-13	-8	-3	-29	-24	-19	-53	-48	-43
65	-14	-9	-4	-32	-27	-22	-56	-51	-46
60	-16	-11	-6	-35	-30	-25	-60	-55	-50
55	-18	-13	-8	-38	-33	-28	-63	-58	-53
50	-20	-15	-10	-41	-36	-31	-67	-62	-57
45	-22	-17	-12	-44	-39	-34	-71	-66	-61
40	-24	-19	-14	-48	-43	-38	-74	-69	-64

1. **Obtain V1, VR and V2 for the actual weight using the 26K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table 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 - (26K Derate)

Based on engine bleeds for packs on, engine and wing anti-ice on or off

OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
60	94.8	95.4	95.8	95.9	96.0	96.1	96.2	96.3	96.2	95.9	95.8	95.7	95.7
55	95.4	96.0	96.5	96.6	96.7	96.8	96.9	97.1	96.9	96.6	96.3	95.7	95.0
50	96.0	96.6	97.1	97.3	97.4	97.6	97.7	97.8	97.7	97.4	97.1	96.6	96.1
45	96.8	97.4	97.8	98.0	98.1	98.3	98.4	98.5	98.4	98.1	97.8	97.5	97.1
40	97.4	98.1	98.6	98.7	98.8	98.9	99.0	99.2	99.1	98.8	98.5	98.4	98.1
35	98.0	98.7	99.4	99.5	99.6	99.7	99.8	99.9	99.8	99.5	99.2	99.1	99.0
30	97.6	98.8	100.3	100.3	100.4	100.4	100.5	100.5	100.4	100.3	100.0	99.9	99.9
25	96.8	98.1	99.5	100.1	100.7	100.8	100.7	100.7	100.7	100.7	100.6	100.6	100.7
20	96.0	97.3	98.8	99.3	99.9	100.2	100.5	100.8	100.8	100.9	100.8	100.8	100.8
15	95.2	96.5	98.0	98.6	99.2	99.5	99.8	100.1	100.5	100.9	101.1	101.1	101.1
10	94.5	95.8	97.2	97.8	98.4	98.7	99.0	99.4	99.7	100.1	100.5	101.0	101.5
5	93.7	95.0	96.4	97.0	97.6	98.0	98.3	98.6	99.0	99.4	99.8	100.3	100.7
0	92.9	94.2	95.6	96.3	96.9	97.2	97.5	97.9	98.2	98.6	99.0	99.5	100.0
-5	92.0	93.4	94.8	95.5	96.1	96.4	96.7	97.1	97.5	97.9	98.3	98.7	99.2
-10	91.2	92.6	94.0	94.7	95.3	95.6	96.0	96.3	96.7	97.1	97.5	98.0	98.4
-15	90.4	91.7	93.2	93.9	94.5	94.8	95.2	95.6	95.9	96.3	96.7	97.2	97.6
-20	89.6	90.9	92.4	93.0	93.7	94.0	94.4	94.8	95.2	95.6	95.9	96.4	96.8
-25	88.7	90.1	91.6	92.2	92.9	93.2	93.6	94.0	94.4	94.8	95.2	95.6	96.0
-30	87.9	89.2	90.7	91.4	92.0	92.4	92.8	93.2	93.6	94.0	94.3	94.8	95.2
-35	87.0	88.4	89.9	90.5	91.2	91.6	91.9	92.4	92.8	93.1	93.5	94.0	94.4
-40	86.1	87.5	89.0	89.7	90.3	90.7	91.1	91.5	91.9	92.3	92.7	93.1	93.6
-45	85.3	86.6	88.2	88.8	89.5	89.9	90.3	90.7	91.1	91.5	91.9	92.3	92.7
-50	84.4	85.7	87.3	87.9	88.6	89.0	89.4	89.9	90.3	90.6	91.0	91.5	91.9

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	1.0

Assumed Temperature Reduced Thrust - (26K Derate)
Maximum Assumed Temperature (Table 1 of 3)
Based on 25% Takeoff Thrust Reduction

OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
55	73	71	69	67								
50	73	71	69	67	65	63						
45	73	71	69	67	65	63	61	59	57			
40	73	71	69	67	65	63	61	59	57	55		
35	71	71	69	67	65	63	61	59	57	55	53	
30	69	67	67	67	65	63	61	59	57	55	53	51
25	69	67	66	64	65	63	61	59	57	55	53	51
20	69	67	66	64	64	63	61	59	57	55	53	51
15	69	67	66	64	64	63	61	59	57	55	53	51
10 & BELOW	69	67	66	64	64	63	61	59	57	55	53	51

Takeoff %N1 (Table 2 of 3)
Based on engine bleed for packs on, engine and wing anti-ice on or off

ASSUMED TEMP (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
75	93.4	93.7	94.2	94.7	95.4	96.1	96.9	97.3	97.6	97.8	97.8	97.7
70	94.1	94.4	94.4	94.4	94.7	95.4	96.2	96.6	96.9	97.1	97.1	97.1
65	94.8	95.1	95.2	95.2	95.3	95.4	95.5	96.0	96.2	96.5	96.4	96.4
60	95.4	95.8	95.9	96.0	96.1	96.2	96.3	96.2	95.9	95.8	95.7	95.7
55	96.0	96.5	96.6	96.7	96.8	96.9	97.1	96.9	96.6	96.3	95.7	95.0
50	96.6	97.1	97.3	97.4	97.6	97.7	97.8	97.7	97.4	97.1	96.6	96.1
45	97.4	97.8	98.0	98.1	98.3	98.4	98.5	98.4	98.1	97.8	97.5	97.1
40	98.1	98.6	98.7	98.8	98.9	99.0	99.2	99.1	98.8	98.5	98.4	98.1
35	98.7	99.4	99.5	99.6	99.7	99.8	99.9	99.8	99.5	99.2	99.1	99.0
30	98.8	100.3	100.3	100.4	100.4	100.5	100.5	100.4	100.3	100.0	99.9	99.9
25	98.1	99.5	100.1	100.7	100.8	100.7	100.7	100.7	100.7	100.6	100.6	100.7
20	97.3	98.8	99.3	99.9	100.2	100.5	100.8	100.8	100.9	100.8	100.8	100.8
15	96.5	98.0	98.6	99.2	99.5	99.8	100.1	100.5	100.9	101.1	101.1	101.1
10	95.8	97.2	97.8	98.4	98.7	99.0	99.4	99.7	100.1	100.5	101.0	101.5
MINIMUM ASSUMED TEMP (°C)	32	30	28	26	24	22	20	18	16	15	12	10

With engine bleed for packs off, increase %N1 by 1.0.

Assumed Temperature Reduced Thrust - (26K Derate)
%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
110	14.9													
100	14.9	10.9												
90	14.0	11.7												
80	12.9	11.6	7.8											
70	11.2	10.7	8.6	7.8	6.3									
60	9.2	9.5	8.5	8.4	7.1	6.3	4.9							
50	7.8	7.8	7.5	7.1	6.9	7.0	5.6	4.9	3.4					
40		6.0	6.2	6.1	5.9	5.8	5.7	5.6	4.7	4.4	5.3			
30		4.6	4.6	4.6	4.6	4.5	4.4	4.3	4.3	4.2	4.1	4.0	3.9	
20			2.9	3.0	3.0	3.0	3.0	3.0	2.9	2.9	2.8	2.8	2.7	2.6
10			1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4
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.**

Takeoff Speeds - Dry Runway (24K Derate)

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	171	171	174												
80	159	160	164	153	154	158	150	150	154						
70	148	149	156	142	143	149	140	140	146	136	137	143	134	134	141
60	136	137	146	130	131	140	128	128	137	125	125	134	122	123	132
50	122	122	135	117	117	130	114	115	127	112	112	124	110	110	123
40	107	107	123	102	102	118	100	100	116	97	98	113	96	96	112

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	5	5						5	5						-3	-4					
60	140	4	4	5	6				3	4	5	6				-2	-3	-3	-4			
50	122	2	3	4	5	6	7	8	2	3	4	5	6	7	8	-2	-2	-3	-3	-4	-5	-5
40	104	1	2	3	4	5	6	7	1	2	3	4	5	6	7	-1	-1	-2	-2	-3	-4	-4
30	86	0	0	1	2	4	5	6	0	0	1	3	4	5	6	0	0	-1	-1	-2	-3	-4
20	68	0	0	1	1	2	4	5	0	0	1	1	2	4	5	0	0	0	-1	-1	-2	-3
-60	-76	0	0	1	1	2	3	4	0	0	1	1	2	3	4	0	0	0	-1	-1	-1	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
90	-4	-2	0	1	1	-2	-1	-1	0	0	0	0	1
80	-3	-2	0	1	1	-1	-1	-1	0	0	0	1	1
70	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
60	-1	-1	0	0	1	-1	-1	0	0	0	0	0	1
50	-1	0	0	0	0	-1	-1	0	0	0	0	0	0
40	0	0	0	0	0	-1	0	0	0	0	0	0	0

***V1 not to exceed VR.**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	90	88					
60	140	90	88	87	85			
50	122	92	90	87	85	83	81	79
40	104	97	95	91	88	84	81	79
30	86	100	99	95	92	88	85	81
20	68	100	99	97	95	92	88	85
-60	-76	101	101	98	96	94	91	89

Takeoff Speeds - Wet Runway (24K Derate)

V1, VR, V2

WEIGHT (1000 KG)	FLAPS1			FLAPS5			FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
90	166	171	174												
80	154	161	164	146	154	158	145	150	154						
70	141	149	156	135	143	149	133	140	146	129	137	143	127	134	141
60	128	137	146	122	131	140	120	128	137	117	125	134	115	123	132
50	113	122	135	108	117	130	106	115	127	103	112	124	101	110	123
40	97	107	123	92	102	118	91	100	116	89	98	113	87	96	112

Check V1(MCG).

V1, VR, V2 Adjustment*

TEMP		V1							VR							V2						
		PRESS ALT (1000 FT)							PRESS ALT (1000 FT)							PRESS ALT (1000 FT)						
°C	°F	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10	-2	0	2	4	6	8	10
70	158	8	9						5	5						-3	-4					
60	140	6	7	8	10				3	4	5	6				-2	-3	-3	-4			
50	122	4	4	6	7	9	10	12	2	3	4	5	6	7	8	-2	-2	-3	-3	-4	-5	-5
40	104	1	2	4	5	7	8	10	1	2	3	4	5	6	7	-1	-1	-2	-2	-3	-4	-4
30	86	0	0	1	3	5	6	8	0	0	1	3	4	5	6	0	0	-1	-1	-2	-3	-4
20	68	0	0	1	1	3	4	6	0	0	1	1	2	4	5	0	0	0	-1	-1	-2	-3
-60	-76	0	0	1	1	2	3	4	0	0	1	1	2	3	4	0	0	0	-1	-1	-1	-2

Slope and Wind V1 Adjustment*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
90	-6	-3	0	3	6	-3	-2	-1	0	1	1	2	2
80	-5	-3	0	3	5	-3	-2	-1	0	0	1	2	2
70	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
60	-3	-2	0	2	3	-4	-2	-1	0	1	1	2	3
50	-2	-1	0	1	3	-4	-3	-1	0	1	2	2	3
40	-2	-1	0	1	2	-5	-3	-1	0	1	2	3	4

***V1 not to exceed VR.**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	90	88					
60	140	90	88	87	85			
50	122	92	90	87	85	83	81	79
40	104	97	95	91	88	84	81	79
30	86	100	99	95	92	88	85	81
20	68	100	99	97	95	92	88	85
-60	-76	101	101	98	96	94	91	89

Stab Trim Setting (24K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)									
	6	9	11	16	23	26	30	32	33	36
80	8 1/2	8 1/4	8	7 1/4	6	5 1/2	4 3/4	4 1/2	4 1/4	3 3/4
70	8 1/4	7 3/4	7 1/2	6 3/4	5 1/2	5	4 1/2	4	4	3 1/2
60	7 1/2	7	6 3/4	6	5	4 1/2	4	3 3/4	3 1/2	3
50	7	6 1/2	6 1/4	5 1/2	4 1/2	4	3 1/2	3 1/4	3	2 3/4
40	6 1/2	6	5 3/4	5	4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4
35	6 1/2	6	5 3/4	5	4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)									
	6	9	11	16	23	26	30	32	33	36
80	8 1/2	8 1/2	8	6 1/2	5 1/4	4 1/2	3 3/4	3 1/4	3	2 3/4
70	8 1/2	7 3/4	7 1/4	6	4 1/2	4	3 1/4	2 3/4	2 3/4	2 3/4
60	7 3/4	7	6 1/2	5 1/2	4	3 1/2	2 3/4	2 3/4	2 3/4	2 3/4
50	6 1/2	6	5 1/2	4 3/4	3 1/2	3	2 3/4	2 3/4	2 3/4	2 3/4
40	5 3/4	5 1/4	5	4 1/4	3	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
35	5 3/4	5 1/4	5	4 1/4	3	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (24K Derate)
Maximum Reverse Thrust
Weight Adjustments (1000 KG)

24K DERATE 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	S.L.	5000	10000	S.L.	5000	10000
95	-11.0	-12.2	-13.5	-14.1	-15.3	-16.6	-20.7	-23.4	-26.2
90	-10.2	-11.5	-12.7	-12.9	-14.2	-15.4	-18.8	-21.5	-24.3
85	-9.4	-10.7	-11.9	-11.8	-13.0	-14.3	-16.8	-19.6	-22.3
80	-8.6	-9.9	-11.1	-10.6	-11.9	-13.1	-14.9	-17.6	-20.4
75	-7.8	-9.1	-10.3	-9.5	-10.7	-12.0	-13.0	-15.7	-18.5
70	-7.0	-8.3	-9.5	-8.3	-9.6	-10.8	-11.2	-13.9	-16.7
65	-6.2	-7.4	-8.7	-7.2	-8.5	-9.7	-9.5	-12.2	-15.0
60	-5.3	-6.6	-7.8	-6.1	-7.4	-8.6	-7.9	-10.6	-13.4
55	-4.4	-5.7	-6.9	-5.1	-6.3	-7.6	-6.4	-9.1	-11.9
50	-3.6	-4.8	-6.1	-4.0	-5.3	-6.5	-5.0	-7.7	-10.5
45	-2.6	-3.9	-5.1	-3.0	-4.2	-5.5	-3.7	-6.4	-9.2
40	-1.7	-3.0	-4.2	-1.9	-3.2	-4.4	-2.5	-5.2	-8.0

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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	S.L.	5000	10000	S.L.	5000	10000
1200	34.3			37.1			42.1		
1400	54.2	36.7		57.0	39.5		61.6	44.5	
1600	76.0	56.8	39.1	78.7	59.6	42.0	82.7	64.2	46.9
1800	99.8	78.9	59.4	101.7	81.5	62.2	104.6	85.4	66.7
2000		102.8	81.9		104.6	84.4			88.2

1. **Enter Weight Adjustment table with slush/standing water depth and 24K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -25 m/+25 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff (24K Derate)
Maximum Reverse Thrust
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	S.L.	5000	10000	S.L.	5000	10000
90	-12	-7	-2	-5	0	0	0	0	0
85	-14	-9	-4	-8	-3	0	0	0	0
80	-16	-11	-6	-10	-5	0	0	0	0
75	-17	-12	-7	-12	-7	-2	0	0	0
70	-19	-14	-9	-14	-9	-4	-2	0	0
65	-20	-15	-10	-16	-11	-6	-6	-1	0
60	-21	-16	-11	-18	-13	-8	-9	-4	0
55	-22	-17	-12	-19	-14	-9	-13	-8	-3
50	-23	-18	-13	-21	-16	-11	-16	-11	-6
45	-24	-19	-14	-22	-17	-12	-18	-13	-8
40	-25	-20	-15	-24	-19	-14	-21	-16	-11

1. **Obtain V1, VR and V2 for the actual weight using the 24K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table 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 (24K Derate)
No Reverse Thrust
Weight Adjustments (1000 KG)

24K DERATE 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	S.L.	5000	10000	S.L.	5000	10000
95	-14.5	-16.0	-17.5	-17.7	-19.2	-20.7	-24.3	-27.8	-31.3
90	-13.5	-15.0	-16.5	-16.4	-17.9	-19.4	-22.2	-25.7	-29.2
85	-12.6	-14.1	-15.6	-15.0	-16.5	-18.0	-20.0	-23.5	-27.0
80	-11.6	-13.1	-14.6	-13.6	-15.1	-16.6	-17.9	-21.4	-24.9
75	-10.6	-12.1	-13.6	-12.3	-13.8	-15.3	-15.8	-19.3	-22.8
70	-9.7	-11.2	-12.7	-11.0	-12.5	-14.0	-13.8	-17.3	-20.8
65	-8.7	-10.2	-11.7	-9.7	-11.2	-12.7	-12.0	-15.5	-19.0
60	-7.7	-9.2	-10.7	-8.5	-10.0	-11.5	-10.3	-13.8	-17.3
55	-6.7	-8.2	-9.7	-7.3	-8.8	-10.3	-8.7	-12.2	-15.7
50	-5.8	-7.3	-8.8	-6.2	-7.7	-9.2	-7.2	-10.7	-14.2
45	-4.8	-6.3	-7.8	-5.1	-6.6	-8.1	-5.9	-9.4	-12.9
40	-3.8	-5.3	-6.8	-4.1	-5.6	-7.1	-4.7	-8.2	-11.7

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	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	S.L.	5000	10000	S.L.	5000	10000
1600							41.0		
1800	33.1			48.8			66.8	41.0	
2000	69.6	33.1		80.3	48.8		94.3	66.8	41.0
2200	104.7	69.6	33.1		80.3	48.8		94.3	66.8
2400		104.7	69.6			80.3			94.3
2600			104.7						

1. **Enter Weight Adjustment table with slush/standing water depth and 24K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -35 m/+35 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff (24K Derate)

No Reverse Thrust

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	S.L.	5000	10000	S.L.	5000	10000
90	-19	-12	-4	-8	-1	0	0	0	0
85	-21	-14	-6	-12	-4	0	0	0	0
80	-24	-16	-9	-15	-7	0	0	0	0
75	-26	-18	-11	-18	-11	-3	0	0	0
70	-28	-20	-13	-21	-14	-6	-3	0	0
65	-30	-23	-15	-24	-17	-9	-9	-2	0
60	-32	-25	-17	-27	-20	-12	-15	-7	0
55	-34	-27	-19	-30	-23	-15	-20	-13	-5
50	-36	-29	-21	-33	-25	-18	-25	-18	-10
45	-38	-30	-23	-36	-28	-21	-30	-22	-15
40	-40	-32	-25	-38	-31	-23	-34	-27	-19

1. **Obtain V1, VR and V2 for the actual weight using the 24K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table 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 (24K Derate)
Maximum Reverse Thrust
Weight Adjustment (1000 KG)

24K DERATE 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	S.L.	5000	10000	S.L.	5000	10000
95	-0.1	-0.1	-0.1	-5.1	-5.1	-5.1	-9.7	-9.7	-9.7
90	-0.2	-0.2	-0.2	-5.0	-5.0	-5.0	-9.4	-9.4	-9.4
85	-0.4	-0.4	-0.4	-5.0	-5.0	-5.0	-9.0	-9.0	-9.0
80	-0.6	-0.6	-0.6	-5.0	-5.0	-5.0	-8.7	-8.7	-8.7
75	-0.7	-0.7	-0.7	-4.9	-4.9	-4.9	-8.4	-8.4	-8.4
70	-0.8	-0.8	-0.8	-4.7	-4.7	-4.7	-7.9	-7.9	-7.9
65	-0.7	-0.7	-0.7	-4.5	-4.5	-4.5	-7.4	-7.4	-7.4
60	-0.7	-0.7	-0.7	-4.1	-4.1	-4.1	-6.8	-6.8	-6.8
55	-0.5	-0.5	-0.5	-3.6	-3.6	-3.6	-6.0	-6.0	-6.0
50	-0.2	-0.2	-0.2	-3.1	-3.1	-3.1	-5.2	-5.2	-5.2
45	0.0	0.0	0.0	-2.5	-2.5	-2.5	-4.3	-4.3	-4.3
40	0.0	0.0	0.0	-1.7	-1.7	-1.7	-3.3	-3.3	-3.3

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1000	50.5	30.4							
1200	82.1	62.4	42.4	35.6					
1400		93.9	74.3	57.8	38.3				
1600				82.7	60.8	41.0	38.3		
1800					86.0	63.8	52.2	35.0	
2000						89.3	67.7	48.6	31.6
2200							85.4	63.6	45.1
2400							104.1	80.8	59.7
2600								99.4	76.2
2800									94.8

1. **Enter Weight Adjustment table with reported braking action and 24K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust “Good” field length available by -20 m/+20 m for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -20 m/+20 m for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -30 m/+30 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff (24K Derate)
Maximum Reverse Thrust
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	S.L.	5000	10000	S.L.	5000	10000
90	-5	-2	0	-12	-9	-7	-21	-19	-16
85	-6	-3	-1	-13	-11	-8	-23	-21	-18
80	-7	-4	-2	-15	-13	-10	-26	-23	-21
75	-8	-5	-3	-17	-14	-12	-28	-26	-23
70	-9	-6	-4	-19	-16	-14	-30	-28	-25
65	-10	-7	-5	-20	-18	-15	-33	-30	-28
60	-11	-8	-6	-22	-19	-17	-35	-32	-30
55	-12	-9	-7	-23	-21	-18	-36	-34	-31
50	-13	-10	-8	-25	-22	-20	-38	-36	-33
45	-14	-11	-9	-26	-23	-21	-40	-37	-35
40	-15	-12	-10	-27	-25	-22	-41	-39	-36

1. **Obtain V1, VR and V2 for the actual weight using the 24K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table 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 (24K Derate)
No Reverse Thrust
Weight Adjustments (1000 KG)

24K DERATE 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	S.L.	5000	10000	S.L.	5000	10000
95	-1.0	-1.0	-1.0	-7.6	-7.6	-7.6	-13.7	-13.7	-13.7
90	-1.2	-1.2	-1.2	-7.6	-7.6	-7.6	-13.3	-13.3	-13.3
85	-1.5	-1.5	-1.5	-7.5	-7.5	-7.5	-12.8	-12.8	-12.8
80	-1.8	-1.8	-1.8	-7.5	-7.5	-7.5	-12.4	-12.4	-12.4
75	-2.0	-2.0	-2.0	-7.4	-7.4	-7.4	-11.8	-11.8	-11.8
70	-2.1	-2.1	-2.1	-7.2	-7.2	-7.2	-11.2	-11.2	-11.2
65	-2.1	-2.1	-2.1	-6.9	-6.9	-6.9	-10.5	-10.5	-10.5
60	-2.1	-2.1	-2.1	-6.5	-6.5	-6.5	-9.7	-9.7	-9.7
55	-2.0	-2.0	-2.0	-6.0	-6.0	-6.0	-8.8	-8.8	-8.8
50	-1.7	-1.7	-1.7	-5.4	-5.4	-5.4	-7.8	-7.8	-7.8
45	-1.4	-1.4	-1.4	-4.7	-4.7	-4.7	-6.7	-6.7	-6.7
40	-1.0	-1.0	-1.0	-3.9	-3.9	-3.9	-5.5	-5.5	-5.5

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
1200	62.6	30.7							
1400	100.8	77.8	51.0						
1600			91.6						
1800				63.9					
2000				103.7	69.2				
2200					108.6	74.4			
2400						113.5			
2800							58.5		
3000							90.7		
3200								62.8	
3400								94.5	31.0
3600									67.0
3800									98.4

1. **Enter Weight Adjustment table with reported braking action and 24K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -20 m/+20 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -20 m/+20 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -40 m/+40 m for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for adjusted field length and pressure altitude.**
4. **Max allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff (24K Derate)
No Reverse Thrust
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	S.L.	5000	10000	S.L.	5000	10000
90	-6	-1	0	-16	-11	-6	-32	-27	-22
85	-7	-2	0	-19	-14	-9	-36	-31	-26
80	-9	-4	0	-21	-16	-11	-40	-35	-30
75	-10	-5	0	-23	-18	-13	-44	-39	-34
70	-11	-6	-1	-26	-21	-16	-47	-42	-37
65	-13	-8	-3	-29	-24	-19	-51	-46	-41
60	-15	-10	-5	-31	-26	-21	-55	-50	-45
55	-16	-11	-6	-34	-29	-24	-59	-54	-49
50	-18	-13	-8	-37	-32	-27	-63	-58	-53
45	-20	-15	-10	-41	-36	-31	-66	-61	-56
40	-22	-17	-12	-44	-39	-34	-70	-65	-60

1. **Obtain V1, VR and V2 for the actual weight using the 24K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table 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 - (24K Derate)

Based on engine bleeds for packs on, engine and wing anti-ice on or off

OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
60	90.3	90.8	91.2	91.2	91.1	91.1	91.0	91.1	91.2	91.0	91.2	91.3	91.4
55	91.0	91.6	92.0	92.0	92.0	91.9	91.9	91.9	92.0	91.9	91.7	91.3	90.8
50	91.8	92.4	92.8	92.8	92.8	92.7	92.7	92.7	92.7	92.6	92.6	92.2	91.8
45	92.6	93.2	93.6	93.6	93.6	93.6	93.5	93.5	93.5	93.4	93.3	93.1	92.8
40	93.4	94.0	94.4	94.4	94.4	94.3	94.3	94.2	94.2	94.1	94.1	94.0	93.8
35	94.2	94.8	95.2	95.2	95.2	95.1	95.1	95.0	95.0	94.9	94.8	94.8	94.7
30	93.8	95.0	96.1	96.0	96.0	96.0	95.9	95.8	95.8	95.7	95.7	95.6	95.6
25	93.1	94.3	95.4	95.9	96.4	96.7	96.7	96.6	96.6	96.5	96.4	96.4	96.3
20	92.3	93.5	94.6	95.1	95.7	96.3	96.9	97.6	97.5	97.5	97.4	97.3	97.2
15	91.6	92.7	93.8	94.3	94.9	95.5	96.1	96.8	97.5	98.2	98.6	98.6	98.5
10	90.8	92.0	93.0	93.6	94.1	94.7	95.3	96.0	96.7	97.5	98.2	99.1	100.0
5	90.0	91.2	92.2	92.8	93.3	93.9	94.5	95.2	95.9	96.7	97.4	98.4	99.3
0	89.2	90.4	91.4	92.0	92.5	93.1	93.7	94.4	95.1	95.9	96.7	97.6	98.5
-5	88.4	89.6	90.6	91.2	91.7	92.3	92.9	93.6	94.3	95.1	95.9	96.8	97.7
-10	87.6	88.8	89.8	90.4	90.9	91.5	92.1	92.8	93.5	94.3	95.1	96.1	97.0
-15	86.8	88.0	89.0	89.5	90.0	90.6	91.3	92.0	92.7	93.5	94.3	95.3	96.2
-20	86.0	87.1	88.2	88.7	89.2	89.8	90.5	91.2	91.9	92.6	93.5	94.5	95.4
-25	85.2	86.3	87.3	87.9	88.4	89.0	89.6	90.3	91.0	91.8	92.6	93.7	94.6
-30	84.4	85.5	86.5	87.0	87.5	88.1	88.8	89.5	90.2	91.0	91.8	92.9	93.8
-35	83.5	84.6	85.6	86.2	86.6	87.3	87.9	88.6	89.3	90.1	91.0	92.1	93.0
-40	82.7	83.8	84.8	85.3	85.8	86.4	87.0	87.8	88.5	89.3	90.1	91.2	92.2
-45	81.8	82.9	83.9	84.4	84.9	85.5	86.2	86.9	87.6	88.4	89.3	90.4	91.4
-50	81.0	82.0	83.0	83.5	84.0	84.6	85.3	86.0	86.7	87.5	88.4	89.5	90.5

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	1.0

Assumed Temperature Reduced Thrust (24K Derate)
Maximum Assumed Temperature (Table 1 of 3)
Based on 25% Takeoff Thrust Reduction

OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
55	73	71	69	67								
50	73	71	69	67	65	63						
45	73	71	69	67	65	63	61	59	57			
40	73	71	69	67	65	63	61	59	57	55		
35	67	67	67	67	65	63	61	59	57	55	53	
30	64	61	62	61	61	61	61	59	57	55	53	51
25	64	61	59	57	56	56	57	57	57	55	53	51
20	64	61	59	57	56	54	53	53	53	53	52	51
15	64	61	59	57	56	54	53	52	50	49	48	47
10 & BELOW	64	61	59	57	56	54	53	52	50	48	45	43

Takeoff %N1 (Table 2 of 3)
Based on engine bleed for packs on, engine and wing anti-ice on or off

ASSUMED TEMP (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
75	88.3	88.6	89.1	89.6	90.2	90.8	91.5	92.2	92.7	93.1	93.3	93.4
70	89.1	89.5	89.4	89.3	89.6	90.1	90.8	91.6	92.0	92.5	92.6	92.7
65	90.0	90.4	90.3	90.2	90.2	90.1	90.2	90.9	91.4	91.8	91.9	92.1
60	90.8	91.2	91.2	91.1	91.1	91.0	91.1	91.2	91.0	91.2	91.3	91.4
55	91.6	92.0	92.0	92.0	91.9	91.9	91.9	92.0	91.9	91.7	91.3	90.8
50	92.4	92.8	92.8	92.8	92.7	92.7	92.7	92.7	92.6	92.6	92.2	91.8
45	93.2	93.6	93.6	93.6	93.6	93.5	93.5	93.5	93.4	93.3	93.1	92.8
40	94.0	94.4	94.4	94.4	94.3	94.3	94.2	94.2	94.1	94.1	94.0	93.8
35	94.8	95.2	95.2	95.2	95.1	95.1	95.0	95.0	94.9	94.8	94.8	94.7
30	95.0	96.1	96.0	96.0	96.0	95.9	95.8	95.8	95.7	95.7	95.6	95.6
25	94.3	95.4	95.9	96.4	96.7	96.7	96.6	96.6	96.5	96.4	96.4	96.3
20	93.5	94.6	95.1	95.7	96.3	96.9	97.6	97.5	97.5	97.4	97.3	97.2
15	92.7	93.8	94.3	94.9	95.5	96.1	96.8	97.5	98.2	98.6	98.6	98.5
10	92.0	93.0	93.6	94.1	94.7	95.3	96.0	96.7	97.5	98.2	99.1	100.0
MINIMUM ASSUMED TEMP (°C)	32	30	28	26	24	22	20	18	16	15	12	10

With engine bleed for packs off, increase %N1 by 1.0

Assumed Temperature Reduced Thrust (24K Derate)

%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
110	12.1													
100	11.3	8.5												
90	11.7	8.9												
80	12.5	8.0	5.5											
70	11.3	8.4	5.9	5.6	4.0									
60	9.7	9.2	4.8	4.7	4.4	4.2	2.6							
50	7.8	7.9	5.3	3.5	3.3	3.6	3.0	2.7	1.2					
40		6.4	6.0	5.5	3.7	3.2	3.7	3.0	2.8	3.0	3.7			
30		4.6	4.6	4.6	4.5	4.3	4.2	4.0	4.1	4.0	3.9	3.8	3.7	
20			3.1	3.1	3.1	3.0	2.9	2.9	2.8	2.7	2.7	2.6	2.6	2.5
10			1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3
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 or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (FT)/SPEED (KIAS/MACH)									
	0	5000	10000	15000	20000	25000	30000	35000	37000	41000
	280	280	280	280	280	280	280	.78	.78	.78
60	90.2	90.5	90.4	90.6	90.4	92.1	93.8	95.1	95.2	93.5
55	91.0	91.2	91.3	91.4	90.8	91.5	93.1	94.4	94.5	92.8
50	91.7	92.0	92.1	92.2	91.7	91.5	92.4	93.7	93.8	92.1
45	92.4	92.6	92.8	93.0	92.6	92.4	92.4	93.0	93.1	91.4
40	93.1	93.3	93.6	93.8	93.4	93.2	93.2	92.3	92.4	90.7
35	93.6	94.0	94.3	94.5	94.3	94.0	94.0	93.0	92.4	90.8
30	92.9	94.8	95.0	95.2	95.1	94.8	94.7	93.9	93.3	91.8
25	92.2	94.8	95.7	95.9	95.9	95.5	95.4	94.7	94.1	92.8
20	91.4	94.0	96.5	96.7	96.6	96.2	96.1	95.4	94.9	93.7
15	90.6	93.2	95.9	97.5	97.4	96.9	96.7	96.2	95.7	94.6
10	89.9	92.5	95.1	97.8	98.3	97.7	97.4	96.9	96.5	95.6
5	89.1	91.7	94.3	97.0	99.2	98.6	98.1	97.7	97.3	96.5
0	88.3	90.9	93.5	96.2	98.6	99.6	99.1	98.5	98.2	97.5
-5	87.6	90.1	92.7	95.4	97.8	99.6	100.0	99.2	99.0	98.4
-10	86.8	89.3	91.9	94.6	97.1	98.8	100.3	100.2	99.8	99.4
-15	86.0	88.5	91.0	93.8	96.3	98.0	99.6	101.1	100.8	100.4
-20	85.2	87.6	90.2	93.0	95.5	97.2	98.7	100.8	101.3	101.0
-25	84.3	86.8	89.4	92.2	94.7	96.4	97.9	100.0	100.5	100.1
-30	83.5	86.0	88.5	91.3	93.9	95.6	97.1	99.1	99.6	99.3
-35	82.7	85.1	87.7	90.5	93.1	94.8	96.3	98.3	98.8	98.4
-40	81.8	84.3	86.8	89.6	92.3	93.9	95.4	97.4	97.9	97.6

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	0	10	20	30	35	41
ENGINE ANTI-ICE	-0.6	-0.8	-0.9	-0.9	-0.8	-0.8
ENGINE & WING ANTI-ICE*	-1.8	-2.1	-2.5	-2.7	-3.0	-3.0

***Dual bleed sources**

Go-around %N1

Based on engine bleed for packs on, engine and wing anti-ice on or off

AIRPORT OAT		TAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
57	134	60	95.0	96.2	96.8									
52	125	55	95.9	96.7	96.6	96.8	97.5							
47	116	50	96.6	97.6	97.8	97.8	97.7	97.5	98.2	98.8				
42	108	45	97.4	98.4	98.5	98.6	98.7	98.8	98.7	98.5	98.5	99.0		
37	99	40	98.0	99.1	99.2	99.3	99.4	99.5	99.6	99.5	99.1	98.9	98.8	99.1
32	90	35	98.1	99.9	100.0	100.1	100.1	100.3	100.3	100.2	99.9	99.6	99.6	99.5
27	81	30	97.3	99.8	100.4	100.7	100.7	100.7	100.7	100.7	100.6	100.4	100.4	100.3
22	72	25	96.6	99.1	99.7	100.2	100.6	100.9	100.9	100.9	100.9	100.9	100.9	100.8
17	63	20	95.8	98.3	98.9	99.5	99.8	100.2	100.5	100.9	101.0	101.1	101.0	101.0
12	54	15	95.0	97.5	98.1	98.7	99.1	99.4	99.8	100.1	100.5	100.9	101.3	101.2
7	45	10	94.2	96.8	97.4	98.0	98.3	98.7	99.0	99.4	99.8	100.2	100.5	100.9
2	36	5	93.4	96.0	96.6	97.2	97.6	97.9	98.3	98.7	99.0	99.4	99.8	100.2
-3	27	0	92.6	95.2	95.8	96.4	96.8	97.2	97.5	97.9	98.3	98.7	99.0	99.4
-8	18	-5	91.8	94.4	95.0	95.6	96.0	96.4	96.8	97.2	97.5	97.9	98.3	98.6
-13	9	-10	91.0	93.6	94.2	94.8	95.2	95.6	96.0	96.4	96.8	97.1	97.5	97.9
-17	1	-15	90.2	92.8	93.4	94.0	94.4	94.8	95.2	95.6	96.0	96.4	96.7	97.1
-22	-8	-20	89.3	92.0	92.6	93.2	93.6	94.0	94.4	94.8	95.2	95.6	95.9	96.3
-27	-17	-25	88.5	91.1	91.8	92.4	92.8	93.2	93.6	94.0	94.4	94.8	95.1	95.5
-32	-26	-30	87.6	90.3	90.9	91.6	92.0	92.4	92.8	93.3	93.6	94.0	94.3	94.7
-37	-35	-35	86.8	89.4	90.1	90.7	91.1	91.6	92.0	92.4	92.8	93.2	93.5	93.9
-42	-44	-40	85.9	88.6	89.2	89.9	90.3	90.7	91.2	91.6	92.0	92.4	92.7	93.0
-47	-53	-45	85.0	87.7	88.4	89.0	89.4	89.9	90.3	90.8	91.2	91.5	91.9	92.2
-52	-62	-50	84.1	86.8	87.5	88.2	88.6	89.0	89.5	90.0	90.3	90.7	91.0	91.4

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9
A/C HIGH	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1

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
40000	**PITCH ATT**	**4.0**	**4.0**	**4.0**		
	V/S (FT/MIN)	1700	1100	600		
30000	**PITCH ATT**	**4.0**	**4.0**	**3.5**	**4.0**	**4.0**
	V/S (FT/MIN)	2500	1900	1500	1100	800
20000	**PITCH ATT**	**7.0**	**6.5**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	4200	3300	2600	2100	1700
10000	**PITCH ATT**	**11.0**	**9.5**	**8.5**	**8.0**	**8.0**
	V/S (FT/MIN)	5600	4400	3600	3000	2500
SEA LEVEL	**PITCH ATT**	**14.5**	**12.5**	**11.0**	**10.0**	**9.5**
	V/S (FT/MIN)	6700	5300	4400	3700	3100

CRUISE (.76/280)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
40000	**PITCH ATT**	**2.0**	**2.5**	**3.5**		
	%N1	**82.9**	**85.4**	**88.9**		
35000	**PITCH ATT**	**1.0**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	**81.2**	**82.6**	**84.4**	**86.8**	**90.4**
30000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	**80.7**	**81.5**	**82.7**	**84.2**	**86.1**
25000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	**77.2**	**77.9**	**79.0**	**80.5**	**82.3**
20000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.5**
	%N1	**73.6**	**74.2**	**75.3**	**76.6**	**78.2**
15000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**3.0**	**3.5**
	%N1	**69.8**	**70.6**	**71.6**	**72.9**	**74.4**

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
40000	**PITCH ATT**	**-1.5**	**-0.5**	**0.5**	**1.0**	**1.5**
	V/S (FT/MIN)	-2700	-2400	-2300	-2500	-2700
30000	**PITCH ATT**	**-3.5**	**-2.0**	**-1.0**	**-0.5**	**0.5**
	V/S (FT/MIN)	-3100	-2600	-2300	-2100	-2000
20000	**PITCH ATT**	**-3.5**	**-2.0**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN)	-2800	-2300	-2000	-1900	-1700
10000	**PITCH ATT**	**-3.5**	**-2.0**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN)	-2500	-2100	-1800	-1700	-1500
SEA LEVEL	**PITCH ATT**	**-3.5**	**-2.5**	**-1.0**	**-0.5**	**0.5**
	V/S (FT/MIN)	-2300	-1900	-1700	-1500	-1400

HOLDING (VREF40 + 70)
Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
15000	**PITCH ATT**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	**56**	**62**	**66**	**70**	**73**
	KIAS	177	193	212	229	246
10000	**PITCH ATT**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	**52**	**58**	**62**	**66**	**69**
	KIAS	177	192	211	228	244
5000	**PITCH ATT**	**5.0**	**5.5**	**5.0**	**5.0**	**5.0**
	%N1	**49**	**54**	**58**	**62**	**66**
	KIAS	177	191	210	227	243

Flight With Unreliable Airspeed/ Turbulent Air Penetration
Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)
%N1 for Level Flight
Airport Altitude = -2000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS UP (GEAR UP) VREF40+70	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**47.5**	**52.2**	**56.3**	**60.0**	**63.6**
	KIAS	177	191	203	213	223
FLAPS 1 (GEAR UP) VREF40+50	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**49.6**	**54.3**	**58.5**	**62.3**	**65.8**
	KIAS	157	171	183	193	203
FLAPS 5 (GEAR UP) VREF40+30	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
	%N1	**49.3**	**54.4**	**58.9**	**63.1**	**66.7**
	KIAS	137	151	163	173	183
FLAPS 10 (GEAR UP) VREF40+30	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
	%N1	**50.4**	**55.6**	**60.2**	**64.4**	**68.0**
	KIAS	137	151	163	173	183
FLAPS 15 (GEAR UP) VREF40+20	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**5.5**	**6.0**
	%N1	**50.9**	**56.3**	**61.1**	**65.3**	**69.0**
	KIAS	127	141	153	163	173
FLAPS 25 (GEAR UP) VREF40+10	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.5**
	%N1	**52.1**	**57.6**	**62.5**	**66.8**	**70.6**
	KIAS	117	131	143	153	163
FLAPS 15 (GEAR DOWN) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
	%N1	**55.5**	**61.2**	**66.1**	**70.2**	**74.1**
	KIAS	127	141	153	163	173

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)
%N1 for Level Flight
Airport Altitude = -1000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS UP (GEAR UP) VREF40+70	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.5**
	%N1	**48.2**	**52.9**	**57.0**	**60.8**	**64.4**
	KIAS	177	191	203	213	223
FLAPS 1 (GEAR UP) VREF40+50	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**50.2**	**55.1**	**59.3**	**63.1**	**66.5**
	KIAS	157	171	183	193	203
FLAPS 5 (GEAR UP) VREF40+30	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
	%N1	**49.9**	**55.2**	**59.7**	**63.9**	**67.5**
	KIAS	137	151	163	173	183
FLAPS 10 (GEAR UP) VREF40+30	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
	%N1	**51.1**	**56.3**	**61.0**	**65.2**	**68.8**
	KIAS	137	151	163	173	183
FLAPS 15 (GEAR UP) VREF40+20	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**5.5**	**6.0**
	%N1	**51.6**	**57.0**	**61.9**	**66.1**	**69.8**
	KIAS	127	141	153	163	173
FLAPS 25 (GEAR UP) VREF40+10	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.5**
	%N1	**52.8**	**58.4**	**63.3**	**67.6**	**71.5**
	KIAS	117	131	143	153	163
FLAPS 15 (GEAR DOWN) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
	%N1	**56.2**	**62.0**	**66.9**	**71.0**	**74.9**
	KIAS	127	141	153	163	173

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)

%N1 for Level Flight

Airport Altitude = SEA LEVEL

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS UP (GEAR UP) VREF40+70	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.5**
	%N1	**48.9**	**53.5**	**57.7**	**61.6**	**65.2**
	KIAS	177	191	203	213	223
FLAPS 1 (GEAR UP) VREF40+50	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**50.9**	**55.8**	**60.0**	**63.9**	**67.3**
	KIAS	157	171	183	193	203
FLAPS 5 (GEAR UP) VREF40+30	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
	%N1	**50.6**	**55.9**	**60.5**	**64.7**	**68.3**
	KIAS	137	151	163	173	183
FLAPS 10 (GEAR UP) VREF40+30	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
	%N1	**51.8**	**57.1**	**61.9**	**66.0**	**69.6**
	KIAS	137	151	163	173	183
FLAPS 15 (GEAR UP) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**6.0**
	%N1	**52.3**	**57.8**	**62.7**	**66.9**	**70.6**
	KIAS	127	141	153	163	173
FLAPS 25 (GEAR UP) VREF40+10	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.5**
	%N1	**53.5**	**59.2**	**64.2**	**68.4**	**72.4**
	KIAS	117	131	143	153	163
FLAPS 15 (GEAR DOWN) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
	%N1	**57.0**	**62.8**	**67.7**	**71.9**	**75.8**
	KIAS	127	141	153	163	173

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)

%N1 for Level Flight

Airport Altitude = 1000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS UP	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.5**
(GEAR UP)	**%N1**	**49.7**	**54.3**	**58.4**	**62.4**	**66.0**
VREF40+70	KIAS	177	191	203	213	223
FLAPS 1	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
(GEAR UP)	**%N1**	**51.6**	**56.5**	**60.8**	**64.7**	**68.0**
VREF40+50	KIAS	157	171	183	193	203
FLAPS 5	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
(GEAR UP)	**%N1**	**51.4**	**56.6**	**61.3**	**65.5**	**69.1**
VREF40+30	KIAS	137	151	163	173	183
FLAPS 10	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
(GEAR UP)	**%N1**	**52.6**	**57.9**	**62.7**	**66.8**	**70.4**
VREF40+30	KIAS	137	151	163	173	183
FLAPS 15	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**6.0**
(GEAR UP)	**%N1**	**53.0**	**58.6**	**63.5**	**67.7**	**71.5**
VREF40+20	KIAS	127	141	153	163	173
FLAPS 25	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.5**
(GEAR UP)	**%N1**	**54.3**	**60.0**	**65.0**	**69.2**	**73.2**
VREF40+10	KIAS	117	131	143	153	163
FLAPS 15	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
(GEAR DOWN)	**%N1**	**57.7**	**63.6**	**68.5**	**72.8**	**76.6**
VREF40+20	KIAS	127	141	153	163	173

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)
%N1 for Level Flight
Airport Altitude = 2000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS UP (GEAR UP) VREF40+70	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.5**
	%N1	**50.4**	**55.0**	**59.2**	**63.3**	**66.7**
	KIAS	177	191	203	213	223
FLAPS 1 (GEAR UP) VREF40+50	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**52.3**	**57.3**	**61.7**	**65.4**	**68.8**
	KIAS	157	171	183	193	203
FLAPS 5 (GEAR UP) VREF40+30	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
	%N1	**52.1**	**57.4**	**62.2**	**66.3**	**69.9**
	KIAS	137	151	163	173	183
FLAPS 10 (GEAR UP) VREF40+30	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
	%N1	**53.3**	**58.6**	**63.5**	**67.6**	**71.3**
	KIAS	137	151	163	173	183
FLAPS 15 (GEAR UP) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**6.0**
	%N1	**53.7**	**59.4**	**64.3**	**68.5**	**72.4**
	KIAS	127	141	153	163	173
FLAPS 25 (GEAR UP) VREF40+10	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.5**
	%N1	**55.0**	**60.8**	**65.8**	**70.1**	**74.1**
	KIAS	117	131	143	153	163
FLAPS 15 (GEAR DOWN) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
	%N1	**58.5**	**64.4**	**69.3**	**73.6**	**77.4**
	KIAS	127	141	153	163	173

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)
%N1 for Level Flight
Airport Altitude = 3000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS UP (GEAR UP) VREF40+70	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.5**
	%N1	**51.0**	**55.8**	**60.0**	**64.1**	**67.4**
	KIAS	177	191	203	213	223
FLAPS 1 (GEAR UP) VREF40+50	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**53.1**	**58.0**	**62.5**	**66.2**	**69.6**
	KIAS	157	171	183	193	203
FLAPS 5 (GEAR UP) VREF40+30	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
	%N1	**52.9**	**58.2**	**63.0**	**67.1**	**70.7**
	KIAS	137	151	163	173	183
FLAPS 10 (GEAR UP) VREF40+30	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
	%N1	**54.0**	**59.5**	**64.3**	**68.4**	**72.1**
	KIAS	137	151	163	173	183
FLAPS 15 (GEAR UP) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**6.0**
	%N1	**54.5**	**60.2**	**65.2**	**69.4**	**73.3**
	KIAS	127	141	153	163	173
FLAPS 25 (GEAR UP) VREF40+10	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.5**
	%N1	**55.8**	**61.6**	**66.5**	**71.0**	**74.9**
	KIAS	117	131	143	153	163
FLAPS 15 (GEAR DOWN) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
	%N1	**59.3**	**65.2**	**70.2**	**74.5**	**78.2**
	KIAS	127	141	153	163	173

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)

%N1 for Level Flight

Airport Altitude = 4000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS UP	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.5**
(GEAR UP)	**%N1**	**51.7**	**56.4**	**60.8**	**64.9**	**68.2**
VREF40+70	KIAS	177	191	203	213	223
FLAPS 1	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
(GEAR UP)	**%N1**	**53.9**	**58.8**	**63.3**	**66.9**	**70.5**
VREF40+50	KIAS	157	171	183	193	203
FLAPS 5	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
(GEAR UP)	**%N1**	**53.6**	**59.0**	**63.8**	**67.9**	**71.6**
VREF40+30	KIAS	137	151	163	173	183
FLAPS 10	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
(GEAR UP)	**%N1**	**54.7**	**60.3**	**65.1**	**69.2**	**73.0**
VREF40+30	KIAS	137	151	163	173	183
FLAPS 15	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**6.0**
(GEAR UP)	**%N1**	**55.2**	**61.1**	**66.0**	**70.2**	**74.1**
VREF40+20	KIAS	127	141	153	163	173
FLAPS 25	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.5**
(GEAR UP)	**%N1**	**56.5**	**62.4**	**67.4**	**71.9**	**75.7**
VREF40+10	KIAS	117	131	143	153	163
FLAPS 15	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
(GEAR DOWN)	**%N1**	**60.1**	**66.0**	**71.1**	**75.3**	**79.1**
VREF40+20	KIAS	127	141	153	163	173

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)

%N1 for Level Flight

Airport Altitude = 5000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS UP (GEAR UP) VREF40+70	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.5**
	%N1	**52.4**	**57.2**	**61.6**	**65.6**	**69.0**
	KIAS	177	191	203	213	224
FLAPS 1 (GEAR UP) VREF40+50	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**54.6**	**59.6**	**64.1**	**67.7**	**71.4**
	KIAS	157	171	183	193	204
FLAPS 5 (GEAR UP) VREF40+30	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
	%N1	**54.3**	**59.8**	**64.6**	**68.7**	**72.5**
	KIAS	137	151	163	173	184
FLAPS 10 (GEAR UP) VREF40+30	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
	%N1	**55.5**	**61.1**	**65.9**	**70.0**	**73.8**
	KIAS	137	151	163	173	184
FLAPS 15 (GEAR UP) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**6.0**
	%N1	**56.0**	**61.9**	**66.7**	**71.1**	**74.9**
	KIAS	127	141	153	163	174
FLAPS 25 (GEAR UP) VREF40+10	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.5**
	%N1	**57.3**	**63.3**	**68.2**	**72.7**	**76.5**
	KIAS	117	131	143	153	164
FLAPS 15 (GEAR DOWN) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
	%N1	**61.0**	**66.8**	**71.9**	**76.1**	**80.0**
	KIAS	127	141	153	163	174

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)

%N1 for Level Flight

Airport Altitude = 6000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS UP	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.5**
(GEAR UP)	**%N1**	**53.1**	**57.9**	**62.5**	**66.3**	**69.8**
VREF40+70	KIAS	177	191	203	213	224
FLAPS 1	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
(GEAR UP)	**%N1**	**55.3**	**60.4**	**64.8**	**68.5**	**72.2**
VREF40+50	KIAS	157	171	183	193	204
FLAPS 5	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
(GEAR UP)	**%N1**	**55.1**	**60.7**	**65.4**	**69.5**	**73.3**
VREF40+30	KIAS	137	151	163	173	184
FLAPS 10	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
(GEAR UP)	**%N1**	**56.2**	**62.0**	**66.7**	**70.9**	**74.6**
VREF40+30	KIAS	137	151	163	173	184
FLAPS 15	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**6.0**
(GEAR UP)	**%N1**	**56.7**	**62.7**	**67.6**	**72.0**	**75.7**
VREF40+20	KIAS	127	141	153	163	174
FLAPS 25	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.5**
(GEAR UP)	**%N1**	**58.1**	**64.1**	**69.0**	**73.6**	**77.3**
VREF40+10	KIAS	117	131	143	153	164
FLAPS 15	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
(GEAR DOWN)	**%N1**	**61.8**	**67.6**	**72.8**	**77.0**	**80.9**
VREF40+20	KIAS	127	141	153	163	174

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)

%N1 for Level Flight

Airport Altitude = 7000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS UP (GEAR UP) VREF40+70	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.5**
	%N1	**53.8**	**58.7**	**63.3**	**67.1**	**70.6**
	KIAS	177	191	203	213	224
FLAPS 1 (GEAR UP) VREF40+50	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**56.1**	**61.3**	**65.6**	**69.4**	**73.1**
	KIAS	157	171	183	193	204
FLAPS 5 (GEAR UP) VREF40+30	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
	%N1	**55.8**	**61.5**	**66.2**	**70.4**	**74.1**
	KIAS	137	151	163	173	184
FLAPS 10 (GEAR UP) VREF40+30	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
	%N1	**57.0**	**62.8**	**67.5**	**71.8**	**75.4**
	KIAS	137	151	163	173	184
FLAPS 15 (GEAR UP) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**6.0**
	%N1	**57.6**	**63.5**	**68.4**	**72.8**	**76.5**
	KIAS	127	141	153	163	174
FLAPS 25 (GEAR UP) VREF40+10	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.5**
	%N1	**58.9**	**64.9**	**69.9**	**74.4**	**78.2**
	KIAS	117	131	143	153	164
FLAPS 15 (GEAR DOWN) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
	%N1	**62.6**	**68.5**	**73.7**	**77.8**	**81.8**
	KIAS	127	141	153	163	174

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)
%N1 for Level Flight
Airport Altitude = 8000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS UP	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.0**
(GEAR UP)	**%N1**	**54.5**	**59.5**	**64.1**	**67.8**	**71.4**
VREF40+70	KIAS	177	191	203	214	225
FLAPS 1	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
(GEAR UP)	**%N1**	**56.8**	**62.1**	**66.4**	**70.3**	**73.9**
VREF40+50	KIAS	157	171	183	194	205
FLAPS 5	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
(GEAR UP)	**%N1**	**56.6**	**62.4**	**67.0**	**71.2**	**74.9**
VREF40+30	KIAS	137	151	163	174	185
FLAPS 10	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
(GEAR UP)	**%N1**	**57.8**	**63.6**	**68.3**	**72.6**	**76.2**
VREF40+30	KIAS	137	151	163	174	185
FLAPS 15	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**6.0**
(GEAR UP)	**%N1**	**58.4**	**64.3**	**69.3**	**73.7**	**77.3**
VREF40+20	KIAS	127	141	153	164	175
FLAPS 25	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.5**
(GEAR UP)	**%N1**	**59.8**	**65.7**	**70.8**	**75.2**	**79.1**
VREF40+10	KIAS	117	131	143	154	165
FLAPS 15	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
(GEAR DOWN)	**%N1**	**63.5**	**69.4**	**74.5**	**78.7**	**82.7**
VREF40+20	KIAS	127	141	153	164	175

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)

%N1 for Level Flight

Airport Altitude = 9000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS UP (GEAR UP) VREF40+70	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**55.3**	**60.4**	**64.9**	**68.6**	**72.2**
	KIAS	177	191	204	214	225
FLAPS 1 (GEAR UP) VREF40+50	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**57.6**	**62.9**	**67.2**	**71.1**	**74.7**
	KIAS	157	171	184	194	205
FLAPS 5 (GEAR UP) VREF40+30	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.5**	**6.5**
	%N1	**57.4**	**63.1**	**67.8**	**72.1**	**75.7**
	KIAS	137	151	164	174	185
FLAPS 10 (GEAR UP) VREF40+30	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
	%N1	**58.7**	**64.4**	**69.2**	**73.4**	**77.1**
	KIAS	137	151	164	174	185
FLAPS 15 (GEAR UP) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**5.5**
	%N1	**59.2**	**65.1**	**70.2**	**74.5**	**78.2**
	KIAS	127	141	154	164	175
FLAPS 25 (GEAR UP) VREF40+10	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.5**
	%N1	**60.6**	**66.5**	**71.7**	**76.1**	**80.0**
	KIAS	117	131	144	154	165
FLAPS 15 (GEAR DOWN) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
	%N1	**64.3**	**70.3**	**75.3**	**79.6**	**83.6**
	KIAS	127	141	154	164	175

Flight With Unreliable Airspeed/ Turbulent Air Penetration
Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)
%N1 for Level Flight
Airport Altitude = 10000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS UP	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.0**
(GEAR UP)	**%N1**	**56.0**	**61.2**	**65.6**	**69.4**	**73.0**
VREF40+70	KIAS	177	191	204	214	225
FLAPS 1	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
(GEAR UP)	**%N1**	**58.4**	**63.7**	**68.0**	**72.0**	**75.5**
VREF40+50	KIAS	157	171	184	194	205
FLAPS 5	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.0**	**6.5**
(GEAR UP)	**%N1**	**58.2**	**64.0**	**68.7**	**72.9**	**76.6**
VREF40+30	KIAS	137	151	164	174	185
FLAPS 10	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.0**	**5.5**
(GEAR UP)	**%N1**	**59.5**	**65.3**	**70.1**	**74.3**	**78.0**
VREF40+30	KIAS	137	151	164	174	185
FLAPS 15	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**5.5**	**5.5**
(GEAR UP)	**%N1**	**60.1**	**65.9**	**71.1**	**75.3**	**79.1**
VREF40+20	KIAS	127	141	154	164	175
FLAPS 25	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.0**
(GEAR UP)	**%N1**	**61.4**	**67.4**	**72.6**	**76.9**	**80.8**
VREF40+10	KIAS	117	131	144	154	165
FLAPS 15	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
(GEAR DOWN)	**%N1**	**65.0**	**71.2**	**76.2**	**80.6**	**84.5**
VREF40+20	KIAS	127	141	154	164	175

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)
%N1 for Level Flight
Airport Altitude = 11000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS UP (GEAR UP) VREF40+70	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**56.8**	**62.2**	**66.3**	**70.3**	**73.8**
	KIAS	177	191	204	215	226
FLAPS 1 (GEAR UP) VREF40+50	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**59.4**	**64.5**	**69.0**	**73.0**	**76.3**
	KIAS	157	171	184	195	206
FLAPS 5 (GEAR UP) VREF40+30	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.0**	**6.5**
	%N1	**59.4**	**64.9**	**69.7**	**73.8**	**77.5**
	KIAS	137	151	164	175	186
FLAPS 10 (GEAR UP) VREF40+30	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.0**	**5.5**
	%N1	**60.7**	**66.2**	**71.1**	**75.1**	**79.0**
	KIAS	137	151	164	175	186
FLAPS 15 (GEAR UP) VREF40+20	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**5.5**	**5.5**
	%N1	**61.2**	**67.0**	**72.1**	**76.2**	**80.1**
	KIAS	127	141	154	165	176
FLAPS 25 (GEAR UP) VREF40+10	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.5**	**6.0**
	%N1	**62.6**	**68.5**	**73.6**	**78.0**	**81.8**
	KIAS	117	131	144	155	166
FLAPS 15 (GEAR DOWN) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
	%N1	**66.1**	**72.2**	**77.2**	**81.6**	**85.5**
	KIAS	127	141	154	165	176

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)

%N1 for Level Flight

Airport Altitude = 12000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS UP	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.0**
(GEAR UP)	**%N1**	**57.6**	**63.0**	**67.1**	**71.2**	**74.6**
VREF40+70	KIAS	178	191	204	215	226
FLAPS 1	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
(GEAR UP)	**%N1**	**60.4**	**65.3**	**69.9**	**73.7**	**77.2**
VREF40+50	KIAS	158	171	184	195	206
FLAPS 5	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.0**	**6.5**
(GEAR UP)	**%N1**	**60.4**	**65.8**	**70.6**	**74.7**	**78.5**
VREF40+30	KIAS	138	151	164	175	186
FLAPS 10	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.0**	**5.5**
(GEAR UP)	**%N1**	**61.7**	**67.1**	**72.0**	**76.0**	**79.9**
VREF40+30	KIAS	138	151	164	175	186
FLAPS 15	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**5.5**	**5.5**
(GEAR UP)	**%N1**	**62.2**	**68.0**	**73.0**	**77.2**	**81.1**
VREF40+20	KIAS	128	141	154	165	176
FLAPS 25	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.0**	**6.0**
(GEAR UP)	**%N1**	**63.6**	**69.7**	**74.5**	**78.9**	**82.8**
VREF40+10	KIAS	118	131	144	155	166
FLAPS 15	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**5.5**
(GEAR DOWN)	**%N1**	**67.3**	**73.2**	**78.3**	**82.6**	**86.6**
VREF40+20	KIAS	128	141	154	165	176

Flight With Unreliable Airspeed/ Turbulent Air Penetration
Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)
%N1 for Level Flight
Airport Altitude = 13000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS UP (GEAR UP) VREF40+70	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**58.5**	**63.7**	**67.9**	**72.0**	**75.4**
	KIAS	178	192	205	215	227
FLAPS 1 (GEAR UP) VREF40+50	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**61.3**	**66.2**	**70.8**	**74.5**	**78.1**
	KIAS	158	172	185	195	207
FLAPS 5 (GEAR UP) VREF40+30	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.0**	**6.0**
	%N1	**61.4**	**66.7**	**71.6**	**75.6**	**79.4**
	KIAS	138	152	165	175	187
FLAPS 10 (GEAR UP) VREF40+30	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.0**	**5.0**
	%N1	**62.6**	**68.1**	**72.9**	**77.0**	**80.8**
	KIAS	138	152	165	175	187
FLAPS 15 (GEAR UP) VREF40+20	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**5.5**	**5.5**
	%N1	**63.2**	**69.1**	**73.9**	**78.2**	**82.0**
	KIAS	128	142	155	165	177
FLAPS 25 (GEAR UP) VREF40+10	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.0**	**6.0**
	%N1	**64.7**	**70.7**	**75.4**	**79.9**	**83.7**
	KIAS	118	132	145	155	167
FLAPS 15 (GEAR DOWN) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**5.5**
	%N1	**68.4**	**74.2**	**79.3**	**83.6**	**87.6**
	KIAS	128	142	155	165	177

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)
%N1 for Level Flight
Airport Altitude = 14000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS UP (GEAR UP) VREF40+70	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**59.4**	**64.4**	**68.7**	**72.8**	**76.3**
	KIAS	178	192	205	215	227
FLAPS 1 (GEAR UP) VREF40+50	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**62.2**	**67.1**	**71.6**	**75.3**	**79.0**
	KIAS	158	172	185	195	207
FLAPS 5 (GEAR UP) VREF40+30	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.0**	**6.0**
	%N1	**62.3**	**67.7**	**72.4**	**76.5**	**80.3**
	KIAS	138	152	165	175	187
FLAPS 10 (GEAR UP) VREF40+30	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.0**	**5.5**
	%N1	**63.5**	**69.1**	**73.7**	**77.9**	**81.7**
	KIAS	138	152	165	175	187
FLAPS 15 (GEAR UP) VREF40+20	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**5.5**	**5.5**
	%N1	**64.1**	**70.1**	**74.8**	**79.1**	**82.9**
	KIAS	128	142	155	165	177
FLAPS 25 (GEAR UP) VREF40+10	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.0**	**6.0**
	%N1	**65.8**	**71.7**	**76.5**	**80.9**	**84.7**
	KIAS	118	132	145	155	167
FLAPS 15 (GEAR DOWN) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**5.5**
	%N1	**69.5**	**75.1**	**80.2**	**84.5**	**88.6**
	KIAS	128	142	155	165	177

Flight With Unreliable Airspeed/ Turbulent Air Penetration
Altitude and/or vertical speed indications may also be unreliable.

TERMINAL AREA (5000 FT)
%N1 for Level Flight
Airport Altitude = 14500 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS UP (GEAR UP) VREF40+70	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**59.8**	**64.8**	**69.2**	**73.2**	**76.7**
	KIAS	178	192	205	216	227
FLAPS 1 (GEAR UP) VREF40+50	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**6.0**	**6.0**
	%N1	**62.6**	**67.5**	**72.1**	**75.8**	**79.4**
	KIAS	158	172	185	196	207
FLAPS 5 (GEAR UP) VREF40+30	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.0**	**6.0**
	%N1	**62.7**	**68.2**	**72.9**	**76.9**	**80.7**
	KIAS	138	152	165	176	187
FLAPS 10 (GEAR UP) VREF40+30	**PITCH ATT**	**4.5**	**4.5**	**5.0**	**5.0**	**5.0**
	%N1	**63.9**	**69.6**	**74.2**	**78.4**	**82.1**
	KIAS	138	152	165	176	187
FLAPS 15 (GEAR UP) VREF40+20	**PITCH ATT**	**5.0**	**5.0**	**5.5**	**5.5**	**5.5**
	%N1	**64.6**	**70.6**	**75.2**	**79.6**	**83.4**
	KIAS	128	142	155	166	177
FLAPS 25 (GEAR UP) VREF40+10	**PITCH ATT**	**6.0**	**6.0**	**6.0**	**6.0**	**6.0**
	%N1	**66.3**	**72.1**	**77.0**	**81.4**	**85.2**
	KIAS	118	132	145	156	167
FLAPS 15 (GEAR DOWN) VREF40+20	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**5.5**
	%N1	**70.1**	**75.6**	**80.7**	**85.0**	**89.2**
	KIAS	128	142	155	166	177

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

FINAL APPROACH (1500 FT)

Gear Down, %N1 for 3° Glideslope

Airport Altitude = -2000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**38.9**	**43.0**	**46.7**	**49.9**	**52.8**
	KIAS	128	143	156	167	178
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.0**	**1.5**	**1.5**
	%N1	**46.1**	**50.8**	**55.1**	**58.6**	**62.0**
	KIAS	124	138	150	161	171
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	**50.5**	**55.9**	**60.6**	**64.4**	**67.9**
	KIAS	117	130	143	153	163

Flap placard speed exceeded in shaded area.

Airport Altitude = -1000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**39.5**	**43.6**	**47.3**	**50.5**	**53.5**
	KIAS	128	143	156	167	178
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.0**	**1.5**	**1.5**
	%N1	**46.7**	**51.5**	**55.8**	**59.3**	**62.8**
	KIAS	124	138	150	161	171
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	**51.2**	**56.6**	**61.3**	**65.2**	**68.7**
	KIAS	117	130	143	153	163

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, %N1 for 3° Glideslope

Airport Altitude = SEA LEVEL

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**40.2**	**44.1**	**48.0**	**51.1**	**54.2**
	KIAS	128	143	156	167	178
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.0**	**1.5**	**1.5**
	%N1	**47.3**	**52.2**	**56.5**	**60.1**	**63.6**
	KIAS	124	138	150	161	171
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	**51.9**	**57.3**	**62.1**	**66.1**	**69.5**
	KIAS	117	131	143	153	163

Flap placard speed exceeded in shaded area.

Airport Altitude = 1000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**40.7**	**44.7**	**48.7**	**51.8**	**54.9**
	KIAS	128	143	156	167	178
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.0**	**1.5**	**1.5**
	%N1	**47.9**	**52.9**	**57.2**	**60.9**	**64.4**
	KIAS	124	138	150	161	171
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	**52.6**	**58.1**	**62.9**	**66.8**	**70.3**
	KIAS	117	131	143	153	163

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, %N1 for 3° Glideslope

Airport Altitude = 2000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**41.2**	**45.4**	**49.3**	**52.5**	**55.6**
	KIAS	128	143	156	167	178
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.0**	**1.5**	**1.5**
	%N1	**48.6**	**53.6**	**58.0**	**61.7**	**65.1**
	KIAS	124	138	150	161	171
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	**53.3**	**58.9**	**63.7**	**67.5**	**71.1**
	KIAS	117	131	143	153	163

Flap placard speed exceeded in shaded area.

Airport Altitude = 3000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**41.7**	**46.0**	**49.9**	**53.2**	**56.3**
	KIAS	128	143	156	167	178
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.0**	**1.5**	**1.5**
	%N1	**49.2**	**54.3**	**58.7**	**62.5**	**65.9**
	KIAS	124	138	150	161	171
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	**54.1**	**59.6**	**64.5**	**68.3**	**72.0**
	KIAS	117	131	143	153	163

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, %N1 for 3° Glideslope

Airport Altitude = 4000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**42.2**	**46.7**	**50.5**	**53.9**	**57.0**
	KIAS	128	143	157	167	178
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.0**	**1.5**	**1.5**
	%N1	**49.9**	**55.0**	**59.5**	**63.3**	**66.7**
	KIAS	124	138	150	161	171
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	**54.8**	**60.4**	**65.4**	**69.1**	**72.8**
	KIAS	117	131	143	153	163

Flap placard speed exceeded in shaded area.

Airport Altitude = 5000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**42.8**	**47.3**	**51.2**	**54.6**	**57.7**
	KIAS	129	143	157	167	178
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.0**	**1.5**	**1.5**
	%N1	**50.6**	**55.7**	**60.3**	**64.0**	**67.5**
	KIAS	124	138	151	161	171
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	**55.6**	**61.2**	**66.1**	**69.9**	**73.6**
	KIAS	117	131	143	153	163

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, %N1 for 3° Glideslope

Airport Altitude = 6000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**43.4**	**48.0**	**51.9**	**55.3**	**58.4**
	KIAS	129	143	157	167	178
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.0**	**1.5**	**1.5**
	%N1	**51.3**	**56.4**	**61.1**	**64.8**	**68.2**
	KIAS	124	138	151	161	171
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	**56.3**	**62.0**	**66.8**	**70.8**	**74.5**
	KIAS	117	131	143	153	163

Flap placard speed exceeded in shaded area.

Airport Altitude = 7000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**44.0**	**48.6**	**52.6**	**56.0**	**59.1**
	KIAS	129	143	157	167	178
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.0**	**1.5**	**1.5**
	%N1	**52.0**	**57.2**	**61.9**	**65.6**	**69.0**
	KIAS	124	138	151	161	171
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	**57.0**	**62.8**	**67.6**	**71.6**	**75.3**
	KIAS	117	131	143	153	163

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, %N1 for 3° Glideslope

Airport Altitude = 8000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**44.6**	**49.2**	**53.3**	**56.7**	**59.8**
	KIAS	129	143	157	167	178
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.0**	**1.5**	**1.5**
	%N1	**52.7**	**58.0**	**62.7**	**66.4**	**69.8**
	KIAS	124	138	151	161	171
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	**57.8**	**63.6**	**68.4**	**72.5**	**76.1**
	KIAS	117	131	143	153	163

Flap placard speed exceeded in shaded area.

Airport Altitude = 9000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**45.3**	**49.9**	**54.1**	**57.4**	**60.6**
	KIAS	129	143	157	168	179
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.5**	**1.5**	**1.5**
	%N1	**53.4**	**58.8**	**63.4**	**67.1**	**70.6**
	KIAS	124	138	151	161	172
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.5**	**0.5**	**0.5**	**0.5**
	%N1	**58.6**	**64.4**	**69.3**	**73.3**	**76.9**
	KIAS	117	131	143	153	163

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, %N1 for 3° Glideslope

Airport Altitude = 10000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**45.9**	**50.6**	**54.7**	**58.1**	**61.4**
	KIAS	129	143	157	168	179
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.5**	**1.5**	**1.5**
	%N1	**54.2**	**59.6**	**64.2**	**67.9**	**71.4**
	KIAS	124	138	151	161	172
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.5**	**0.5**	**0.5**	**0.5**
	%N1	**59.4**	**65.2**	**70.1**	**74.1**	**77.8**
	KIAS	117	131	143	153	164

Flap placard speed exceeded in shaded area.

Airport Altitude = 11000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**46.7**	**51.3**	**55.5**	**58.8**	**62.2**
	KIAS	129	143	157	168	179
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.5**	**1.5**	**1.5**
	%N1	**54.9**	**60.4**	**65.1**	**68.7**	**72.3**
	KIAS	124	138	151	161	172
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.5**	**0.5**	**0.5**	**0.5**
	%N1	**60.2**	**66.0**	**71.0**	**74.9**	**78.7**
	KIAS	117	131	143	153	164

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, %N1 for 3° Glideslope

Airport Altitude = 12000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**47.3**	**52.0**	**56.2**	**59.6**	**62.9**
	KIAS	129	143	157	168	179
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.5**	**1.5**	**1.5**
	%N1	**55.6**	**61.2**	**65.8**	**69.5**	**73.0**
	KIAS	124	138	151	161	172
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.5**	**0.5**	**0.5**	**0.5**
	%N1	**61.0**	**66.8**	**71.8**	**75.7**	**79.6**
	KIAS	117	131	143	153	164

Flap placard speed exceeded in shaded area.

Airport Altitude = 13000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**47.9**	**52.8**	**56.8**	**60.4**	**63.6**
	KIAS	129	143	157	168	179
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.5**	**1.5**	**1.5**
	%N1	**56.4**	**62.0**	**66.6**	**70.4**	**73.8**
	KIAS	124	138	151	161	172
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.5**	**0.5**	**0.5**	**0.5**
	%N1	**61.9**	**67.6**	**72.7**	**76.6**	**80.5**
	KIAS	117	131	143	154	165

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, %N1 for 3° Glideslope

Airport Altitude = 14000 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**48.7**	**53.5**	**57.6**	**61.3**	**64.4**
	KIAS	129	143	157	168	180
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.5**	**1.5**	**1.5**
	%N1	**57.4**	**62.9**	**67.5**	**71.3**	**74.6**
	KIAS	124	138	151	161	172
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N1	**62.9**	**68.6**	**73.6**	**77.6**	**81.4**
	KIAS	117	131	144	154	165

Flap placard speed exceeded in shaded area.

Airport Altitude = 14500 FT

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.5**	**2.5**	**2.5**	**2.5**
	%N1	**49.1**	**53.9**	**58.0**	**61.7**	**64.7**
	KIAS	129	144	157	168	180
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**1.0**	**1.0**	**1.5**	**1.5**	**1.5**
	%N1	**58.0**	**63.4**	**68.0**	**71.7**	**75.0**
	KIAS	124	138	151	161	172
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**0.0**	**0.0**	**0.0**	**0.5**	**0.5**
	%N1	**63.4**	**69.2**	**74.1**	**78.1**	**81.9**
	KIAS	117	131	144	154	165

Flap placard speed exceeded in shaded area.

Flight With Unreliable Airspeed/ Turbulent Air Penetration

Altitude and/or vertical speed indications may also be unreliable.

GO-AROUND

Flaps 15, Gear Up, Set Go-Around Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
14500	**PITCH ATT**	**17.5**	**14.0**	**11.5**	**10.5**	**9.0**
	V/S (FT/MIN)	3500	2700	2200	1700	1400
	KIAS	127	141	154	164	175
10000	**PITCH ATT**	**20.0**	**16.0**	**13.5**	**12.0**	**10.5**
	V/S (FT/MIN)	4000	3200	2600	2100	1700
	KIAS	127	141	153	163	174
5000	**PITCH ATT**	**24.0**	**19.0**	**16.0**	**14.0**	**12.5**
	V/S (FT/MIN)	4600	3800	3100	2600	2200
	KIAS	127	141	153	163	173
SEA LEVEL	**PITCH ATT**	**28.0**	**22.0**	**18.5**	**16.0**	**14.0**
	V/S (FT/MIN)	5200	4300	3600	3000	2600
	KIAS	127	141	153	163	173
-2000	**PITCH ATT**	**28.0**	**22.5**	**18.5**	**16.0**	**14.5**
	V/S (FT/MIN)	5100	4200	3500	3000	2500
	KIAS	127	140	153	163	173

Intentionally
Blank

Performance Inflight — Chapter PI
All Engine — 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	32300	-10	34300*	34300*	33800	32200	30800
80	33600	-13	35800*	35800*	35100	33500	32100
75	35000	-16	37100*	37100*	36400	34900	33500
70	36400	-18	38400*	38400*	37900	36300	35000
65	38000	-18	39800*	39800*	39400	37800	36500
60	39600	-18	41000	41000	41000	39500	38200
55	41000	-18	41000	41000	41000	41000	40000
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	32300	-4	33000*	33000*	33000*	32200	30800
80	33600	-7	34700*	34700*	34700*	33500	32100
75	35000	-10	36200*	36200*	36200*	34900	33500
70	36400	-12	37600*	37600*	37600*	36300	35000
65	38000	-12	38900*	38900*	38900*	37800	36500
60	39600	-12	40400*	40400*	40400*	39500	38200
55	41000	-12	41000	41000	41000	41000	40000
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	32300	2	29400*	29400*	29400*	29400*	29400*
80	33600	-1	32200*	32200*	32200*	32200*	32100
75	35000	-4	34700*	34700*	34700*	34700*	33500
70	36400	-7	36200*	36200*	36200*	36200*	35000
65	38000	-7	37700*	37700*	37700*	37700*	36500
60	39600	-7	39100*	39100*	39100*	39100*	38200
55	41000	-7	40500*	40500*	40500*	40500*	40000
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	85.0	86.4	87.6	88.8	90.3				
	MACH	.735	.759	.776	.788	.792				
	KIAS	308	306	300	292	281				
	FF/ENG	1539	1536	1527	1510	1500				
80	%N1	83.7	85.1	86.4	87.6	88.8	91.1			
	MACH	.715	.743	.765	.780	.790	.790			
	KIAS	299	299	296	289	281	268			
	FF/ENG	1447	1451	1446	1432	1414	1426			
75	%N1	82.1	83.7	85.0	86.4	87.6	88.9	92.6		
	MACH	.692	.723	.750	.770	.784	.792	.788		
	KIAS	289	290	289	285	278	269	255		
	FF/ENG	1348	1362	1363	1353	1338	1321	1366		
70	%N1	80.3	82.0	83.6	85.0	86.3	87.5	89.5		
	MACH	.668	.699	.730	.755	.774	.787	.792		
	KIAS	278	280	281	279	274	267	257		
	FF/ENG	1250	1264	1275	1272	1259	1244	1244		
65	%N1	78.6	80.2	81.8	83.4	84.8	86.1	87.7	90.6	
	MACH	.645	.673	.705	.735	.760	.777	.789	.791	
	KIAS	268	269	271	271	269	263	256	245	
	FF/ENG	1155	1166	1180	1186	1180	1166	1162	1179	
60	%N1	77.0	78.3	79.9	81.6	83.1	84.5	86.2	88.2	91.6
	MACH	.627	.647	.676	.709	.739	.763	.779	.790	.790
	KIAS	260	258	259	261	261	258	252	245	233
	FF/ENG	1076	1070	1082	1093	1096	1088	1086	1085	1111
55	%N1	75.4	76.5	77.8	79.4	81.2	82.7	84.5	86.6	88.7
	MACH	.611	.627	.647	.677	.711	.741	.765	.781	.791
	KIAS	253	249	247	248	250	250	247	241	234
	FF/ENG	1007	990	985	995	1003	1005	1006	1008	1008
50	%N1	73.7	74.8	75.9	77.2	78.9	80.6	82.5	84.8	86.8
	MACH	.595	.610	.626	.646	.676	.710	.741	.765	.781
	KIAS	246	242	238	236	237	239	239	236	230
	FF/ENG	944	921	906	899	906	914	921	928	930
45	%N1	71.5	72.9	74.0	75.2	76.4	78.1	80.2	82.6	84.8
	MACH	.569	.591	.607	.624	.643	.673	.707	.739	.763
	KIAS	235	234	231	227	224	225	227	227	224
	FF/ENG	868	857	838	823	825	828	839	852	859
40	%N1	68.8	70.5	71.9	73.1	74.2	75.4	77.3	79.9	82.3
	MACH	.538	.561	.584	.602	.619	.637	.665	.699	.732
	KIAS	222	222	222	219	215	212	212	214	214
	FF/ENG	801	796	787	769	751	739	742	757	771

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitudes
Ground to Air Miles Conversions

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	165	158
444	406	373	345	321	300	285	272	259	248	238
594	543	498	461	429	400	380	362	346	331	318
744	680	623	576	536	500	476	453	432	414	397
894	817	749	692	643	600	571	544	519	496	476
1045	954	874	808	751	700	666	634	605	579	556
1197	1092	1000	924	858	800	761	725	692	662	635
1349	1230	1126	1039	966	900	856	816	778	745	714
1502	1369	1252	1155	1073	1000	951	906	865	827	793
1655	1508	1379	1272	1181	1100	1046	996	951	909	872
1809	1647	1505	1388	1288	1200	1141	1086	1037	992	951
1963	1787	1632	1505	1396	1300	1236	1177	1123	1074	1030
2118	1927	1760	1621	1504	1400	1331	1268	1210	1157	1109
2274	2068	1888	1738	1612	1500	1426	1358	1296	1239	1188
2430	2209	2015	1856	1720	1600	1521	1448	1381	1321	1267
2587	2350	2143	1972	1828	1700	1616	1538	1467	1403	1346
2744	2492	2271	2090	1936	1800	1711	1628	1553	1486	1425
2902	2634	2400	2207	2044	1900	1805	1719	1639	1568	1504
3060	2777	2529	2325	2153	2000	1900	1809	1725	1650	1582

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	1.4	0:42	1.3	0:40	1.1	0:38	0.9	0:37	0.9	0:36
300	2.2	1:02	2.0	0:59	1.7	0:54	1.5	0:53	1.4	0:51
400	3.0	1:22	2.7	1:17	2.3	1:11	2.1	1:09	1.9	1:07
500	3.7	1:42	3.4	1:36	3.0	1:28	2.7	1:25	2.5	1:22
600	4.5	2:02	4.1	1:55	3.6	1:45	3.2	1:42	3.0	1:38
700	5.2	2:22	4.8	2:14	4.2	2:02	3.8	1:58	3.5	1:54
800	6.0	2:43	5.5	2:33	4.8	2:19	4.4	2:14	4.1	2:09
900	6.7	3:03	6.2	2:52	5.5	2:37	4.9	2:31	4.6	2:25
1000	7.5	3:24	6.9	3:11	6.1	2:54	5.5	2:47	5.1	2:41
1100	8.2	3:45	7.6	3:31	6.7	3:11	6.1	3:04	5.7	2:57
1200	8.9	4:06	8.2	3:50	7.3	3:29	6.6	3:20	6.2	3:12
1300	9.7	4:27	8.9	4:10	7.9	3:47	7.2	3:37	6.7	3:28
1400	10.4	4:48	9.6	4:30	8.5	4:04	7.7	3:53	7.2	3:44
1500	11.1	5:10	10.3	4:50	9.1	4:22	8.3	4:10	7.7	4:01
1600	11.8	5:31	10.9	5:10	9.7	4:40	8.8	4:27	8.2	4:17
1700	12.5	5:53	11.6	5:30	10.3	4:58	9.4	4:43	8.7	4:33
1800	13.2	6:15	12.2	5:50	10.9	5:16	9.9	5:00	9.2	4:49
1900	13.9	6:37	12.9	6:11	11.5	5:34	10.4	5:17	9.7	5:05
2000	14.6	6:59	13.6	6:31	12.1	5:53	11.0	5:34	10.2	5:22

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Fuel Required Adjustments (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	0.1	0.1
2	-0.2	-0.1	0.0	0.1	0.3
3	-0.4	-0.2	0.0	0.2	0.5
4	-0.5	-0.2	0.0	0.3	0.6
5	-0.6	-0.3	0.0	0.4	0.8
6	-0.7	-0.4	0.0	0.5	1.0
7	-0.9	-0.4	0.0	0.6	1.2
8	-1.0	-0.5	0.0	0.7	1.4
9	-1.1	-0.6	0.0	0.8	1.6
10	-1.2	-0.6	0.0	0.9	1.8
11	-1.3	-0.7	0.0	1.0	1.9
12	-1.5	-0.8	0.0	1.1	2.1
13	-1.6	-0.9	0.0	1.2	2.3
14	-1.7	-0.9	0.0	1.3	2.5
15	-1.8	-1.0	0.0	1.4	2.7

Long Range Cruise Enroute Fuel and Time - High Altitudes

Ground to Air Miles Conversions

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
540	505	474	446	422	400	382	366	351	337	324
808	757	710	669	633	600	574	549	527	506	488
1078	1009	947	892	844	800	765	733	703	676	651
1348	1262	1184	1116	1055	1000	956	916	879	845	814
1619	1515	1421	1339	1266	1200	1148	1099	1055	1014	977
1890	1768	1658	1562	1477	1400	1339	1283	1231	1183	1140
2162	2023	1897	1786	1689	1600	1531	1466	1406	1352	1302
2435	2277	2135	2011	1900	1800	1722	1649	1582	1521	1465
2708	2532	2374	2235	2112	2000	1913	1832	1757	1689	1627
2982	2788	2612	2459	2324	2200	2104	2015	1933	1858	1789
3256	3044	2851	2684	2535	2400	2295	2198	2109	2026	1951
3532	3300	3091	2909	2747	2600	2486	2381	2283	2194	2113
3808	3557	3331	3133	2959	2800	2677	2563	2458	2362	2274
4085	3815	3571	3359	3171	3000	2868	2746	2633	2529	2435
4362	4072	3811	3584	3383	3200	3059	2928	2807	2697	2596
4639	4330	4051	3809	3595	3400	3250	3111	2982	2864	2757
4917	4588	4292	4035	3807	3600	3441	3293	3156	3031	2917
5196	4847	4533	4260	4019	3800	3631	3474	3330	3197	3077
5476	5107	4775	4487	4231	4000	3821	3656	3503	3364	3237
5757	5368	5017	4713	4444	4200	4012	3837	3677	3530	3396
6040	5629	5260	4939	4656	4400	4202	4019	3850	3695	3556
6322	5891	5503	5166	4869	4600	4392	4200	4023	3861	3714
6606	6153	5746	5393	5082	4800	4583	4381	4196	4026	3873
6892	6417	5990	5621	5295	5000	4773	4562	4368	4191	4031

Long Range Cruise Enroute Fuel and Time - High Altitudes

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	1.9	1:06	1.8	1:04	1.8	1:02	1.7	1:01	1.7	1:01
600	3.0	1:37	2.9	1:34	2.8	1:31	2.7	1:29	2.6	1:28
800	4.0	2:07	3.9	2:03	3.8	1:59	3.6	1:57	3.5	1:55
1000	5.1	2:38	4.9	2:33	4.7	2:28	4.6	2:24	4.5	2:22
1200	6.1	3:10	5.9	3:03	5.7	2:57	5.5	2:53	5.4	2:49
1400	7.1	3:41	6.9	3:34	6.7	3:26	6.5	3:21	6.3	3:17
1600	8.1	4:13	7.9	4:05	7.6	3:56	7.4	3:49	7.2	3:44
1800	9.1	4:45	8.8	4:36	8.6	4:26	8.3	4:18	8.1	4:12
2000	10.1	5:17	9.8	5:07	9.5	4:56	9.2	4:47	9.0	4:40
2200	11.1	5:50	10.8	5:39	10.4	5:26	10.1	5:16	9.9	5:08
2400	12.0	6:22	11.7	6:11	11.4	5:57	11.0	5:45	10.8	5:36
2600	13.0	6:55	12.6	6:43	12.3	6:28	11.9	6:15	11.6	6:04
2800	13.9	7:28	13.6	7:15	13.2	6:59	12.8	6:45	12.5	6:33
3000	14.9	8:01	14.5	7:47	14.1	7:31	13.7	7:15	13.3	7:02
3200	15.8	8:35	15.4	8:20	14.9	8:03	14.5	7:46	14.1	7:31
3400	16.8	9:09	16.3	8:53	15.8	8:35	15.4	8:16	15.0	8:00
3600	17.7	9:42	17.2	9:26	16.7	9:07	16.2	8:48	15.8	8:30
3800	18.6	10:17	18.1	10:00	17.6	9:40	17.1	9:19	16.6	9:00
4000	19.5	10:51	19.0	10:33	18.4	10:12	17.9	9:51	17.4	9:30
4200	20.4	11:25	19.8	11:07	19.3	10:45	18.7	10:23	18.2	10:01
4400	21.3	12:00	20.7	11:41	20.1	11:19	19.5	10:55	19.0	10:31
4600	22.2	12:36	21.6	12:15	21.0	11:52	20.4	11:28	19.8	11:03
4800	23.1	13:11	22.4	12:49	21.8	12:26	21.2	12:01	20.6	11:34
5000	24.0	13:47	23.3	13:24	22.6	12:59	22.0	12:33	21.4	12:06

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	40	50	60	70	80
2	-0.3	-0.2	0.0	0.2	0.7
4	-0.5	-0.3	0.0	0.4	1.3
6	-0.8	-0.5	0.0	0.6	1.8
8	-1.1	-0.6	0.0	0.9	2.3
10	-1.4	-0.8	0.0	1.1	2.7
12	-1.7	-0.9	0.0	1.3	3.2
14	-2.0	-1.0	0.0	1.5	3.6
16	-2.4	-1.2	0.0	1.7	4.0
18	-2.7	-1.4	0.0	1.9	4.4
20	-3.0	-1.5	0.0	2.0	4.8
22	-3.4	-1.7	0.0	2.2	5.1
24	-3.8	-1.8	0.0	2.4	5.4
26	-4.1	-2.0	0.0	2.6	5.7
28	-4.5	-2.2	0.0	2.7	6.0
30	-4.9	-2.4	0.0	2.9	6.3

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					30	7	0	4	16	33
39				22	4	0	4	15	30	45
37		37	14	2	0	5	15	28	43	56
35	23	7	0	0	6	16	28	41	54	64
33	2	0	2	8	18	29	41	53	62	68
31	0	4	11	21	31	42	52	61	67	70
29	7	15	24	34	43	53	61	67	70	70
27	19	27	36	45	54	61	66	70	70	68
25	31	40	48	55	62	67	70	70	69	64

The above wind factor tables are 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

.78/280/250

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM) LANDING WEIGHT (1000 KG)			
			40	50	60	70
41000	27	340	102	119	133	142
39000	26	340	97	114	127	136
37000	25	330	92	108	121	130
35000	24	330	88	103	116	125
33000	24	320	84	99	111	120
31000	23	320	80	94	105	113
29000	22	310	75	88	98	106
27000	21	300	70	82	92	99
25000	20	300	66	77	86	92
23000	19	290	61	71	79	85
21000	18	280	57	66	73	78
19000	17	270	52	61	67	72
17000	15	250	48	55	61	65
15000	14	240	44	50	55	58
10000	11	200	30	34	37	39
5000	7	150	18	19	20	21
1500	4	110	9	9	9	9

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	64.3	67.0	70.7	74.7	78.9	83.0	87.0		
	KIAS	250	251	252	253	255	257	260		
	FF/ENG	1500	1470	1460	1450	1430	1430	1460		
80	%N1	62.6	65.5	69.1	73.2	77.3	81.6	85.5		
	KIAS	242	243	244	245	247	249	252		
	FF/ENG	1420	1390	1380	1370	1340	1340	1360		
75	%N1	60.9	63.9	67.5	71.6	75.6	80.0	83.9	88.2	
	KIAS	235	236	236	238	239	241	243	247	
	FF/ENG	1340	1310	1300	1290	1260	1250	1270	1300	
70	%N1	59.2	62.0	65.9	69.8	73.9	78.3	82.3	86.5	
	KIAS	227	227	228	229	231	232	235	238	
	FF/ENG	1260	1240	1220	1200	1180	1160	1180	1200	
65	%N1	57.4	60.0	64.2	67.8	72.1	76.4	80.5	84.7	
	KIAS	219	219	220	221	222	224	226	228	
	FF/ENG	1180	1160	1140	1120	1100	1080	1090	1110	
60	%N1	55.6	58.1	62.1	65.9	70.1	74.3	78.6	82.7	
	KIAS	210	210	211	212	213	214	216	219	
	FF/ENG	1110	1080	1060	1040	1020	990	1010	1020	
55	%N1	53.6	56.1	59.8	64.0	67.9	72.2	76.5	80.7	87.9
	KIAS	200	201	202	203	204	205	207	209	212
	FF/ENG	1030	1000	980	960	940	920	920	930	980
50	%N1	51.4	53.9	57.5	61.7	65.5	69.9	74.0	78.4	85.5
	KIAS	191	191	192	193	194	195	196	198	201
	FF/ENG	950	920	900	880	860	860	850	850	890
45	%N1	49.1	51.5	55.1	58.9	63.1	67.2	71.4	75.9	82.9
	KIAS	184	184	184	184	184	185	186	187	190
	FF/ENG	880	850	840	820	800	780	770	770	800
40	%N1	46.5	48.9	52.4	56.0	60.3	64.2	68.6	73.0	80.1
	KIAS	177	177	177	177	177	177	177	177	178
	FF/ENG	820	790	760	740	720	710	700	690	710

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
Blank

Performance Inflight — Chapter PI
Advisory Information — Section 12

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 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 Greater than 3 mm (0.12 inches) of : Dry Snow or Wet Snow 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

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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 VREF15	ONE REV	NO REV
Dry Runway									
MAX MANUAL	1295	85/-70	25/35	-40/140	10/-10	25/-25	40	25	45
AUTOBRAKE MAX	1635	80/-80	35/45	-50/180	0/0	35/-35	70	0	5
AUTOBRAKE 3	2265	120/-130	60/75	-85/295	0/0	60/-60	115	0	0
AUTOBRAKE 2	2820	175/-185	80/110	-120/405	35/-50	80/-80	110	90	90
AUTOBRAKE 1	3085	205/-220	100/125	-140/470	80/-90	85/-85	105	255	385
Good Reported Braking Action									
MAX MANUAL	1705	85/-90	40/50	-70/230	35/-30	40/-40	50	75	165
AUTOBRAKE MAX	1820	90/-100	45/60	-70/240	35/-30	40/-40	65	85	190
AUTOBRAKE 3	2270	120/-130	60/75	-85/300	5/-5	60/-60	115	5	10
AUTOBRAKE 2	2820	175/-185	80/110	-120/405	35/-50	80/-80	110	90	90
AUTOBRAKE 1	3085	205/-220	100/125	-140/470	80/-90	85/-85	105	255	385
Good To Medium Reported Braking Action									
MAX MANUAL	2000	110/-115	55/70	-90/310	65/-50	50/-50	60	145	345
AUTOBRAKE MAX	2080	120/-120	60/75	-90/315	60/-50	50/-50	70	150	360
AUTOBRAKE 3	2375	130/-140	65/85	-100/350	35/-25	60/-65	115	80	220
AUTOBRAKE 2	2850	175/-185	85/110	-125/430	55/-60	80/-80	110	110	180
AUTOBRAKE 1	3090	205/-220	100/125	-140/485	90/-95	85/-85	105	260	415
Medium Reported Braking Action									
MAX MANUAL	2295	140/-140	70/85	-110/385	90/-75	60/-60	70	220	525
AUTOBRAKE MAX	2345	145/-145	70/90	-110/390	85/-70	60/-65	80	220	530
AUTOBRAKE 3	2480	145/-150	70/90	-115/405	70/-45	65/-70	115	150	430
AUTOBRAKE 2	2880	180/-190	85/110	-130/455	75/-70	80/-80	110	130	265
AUTOBRAKE 1	3095	205/-220	100/125	-145/495	105/-100	85/-85	105	270	450

ADVISORY INFORMATION

Normal Configuration Landing Distance
Flaps 15

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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 VREF15	ONE REV	NO REV
Medium To Poor Reported Braking Action									
MAX MANUAL	2635	170/-170	85/110	-135/500	165/-115	70/-70	80	350	895
AUTOBRAKE MAX	2655	175/-175	85/110	-135/505	160/-110	70/-75	85	350	900
AUTOBRAKE 3	2745	175/-175	85/110	-140/510	145/-95	70/-80	110	315	855
AUTOBRAKE 2	3035	195/-205	95/125	-150/545	145/-105	85/-85	110	265	685
AUTOBRAKE 1	3210	215/-225	105/140	-160/575	165/-130	90/-90	105	365	795
Poor Reported Braking Action									
MAX MANUAL	2970	200/-200	100/130	-160/615	235/-155	80/-85	85	475	1270
AUTOBRAKE MAX	2970	200/-200	100/130	-160/615	235/-150	80/-85	90	475	1270
AUTOBRAKE 3	3005	200/-200	100/130	-165/615	225/-145	80/-85	105	485	1280
AUTOBRAKE 2	3195	215/-220	105/145	-175/640	220/-145	85/-90	110	405	1105
AUTOBRAKE 1	3325	225/-230	110/150	-180/655	225/-160	90/-100	105	460	1140

Reference distance is based on sea level, standard day, no wind or slope, VREF15, two-engine detent No. 2 reverse thrust, and auto speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 70 m.
For autobrake and manual speedbrakes, increase reference landing distance by 60 m.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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
Dry Runway									
MAX MANUAL	1250	70/-65	25/30	-40/140	10/-10	25/-25	40	15	40
AUTOBRAKE MAX	1555	70/-75	30/40	-50/165	0/0	35/-35	65	0	5
AUTOBRAKE 3	2130	115/-120	50/70	-85/280	0/-5	50/-50	100	0	0
AUTOBRAKE 2	2615	160/-165	75/100	-115/385	35/-45	70/-70	100	90	90
AUTOBRAKE 1	2850	185/-195	85/115	-130/455	75/-80	80/-80	90	215	345
Good Reported Braking Action									
MAX MANUAL	1640	80/-85	40/50	-65/225	35/-30	35/-35	50	70	150
AUTOBRAKE MAX	1755	85/-90	40/50	-70/235	35/-30	40/-40	65	75	165
AUTOBRAKE 3	2135	115/-120	50/70	-85/290	5/-10	50/-50	100	5	10
AUTOBRAKE 2	2615	160/-165	75/100	-115/385	35/-45	70/-70	100	90	90
AUTOBRAKE 1	2850	185/-195	85/115	-130/455	75/-80	80/-80	90	215	345
Good To Medium Reported Braking Action									
MAX MANUAL	1910	105/-110	50/65	-85/300	65/-50	45/-45	60	130	300
AUTOBRAKE MAX	1995	110/-115	50/70	-85/310	60/-50	50/-50	70	130	315
AUTOBRAKE 3	2240	125/-130	60/80	-100/340	35/-30	60/-60	100	70	195
AUTOBRAKE 2	2645	160/-170	75/100	-120/410	55/-60	70/-70	100	110	170
AUTOBRAKE 1	2860	185/-195	85/115	-135/465	90/-85	80/-80	90	220	375
Medium Reported Braking Action									
MAX MANUAL	2175	125/-130	65/80	-105/375	90/-70	50/-60	70	190	450
AUTOBRAKE MAX	2235	130/-140	65/85	-105/380	85/-70	60/-60	80	190	460
AUTOBRAKE 3	2345	130/-140	65/85	-110/390	65/-50	65/-65	100	130	380
AUTOBRAKE 2	2675	160/-175	75/105	-125/435	75/-70	75/-75	100	130	245
AUTOBRAKE 1	2865	185/-195	85/115	-140/470	105/-85	80/-80	90	225	405

ADVISORY INFORMATION

Normal Configuration Landing Distance
Flaps 30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	2480	155/-160	75/100	-130/485	155/-105	65/-70	75	300	755
AUTOBRAKE MAX	2515	160/-160	80/105	-130/490	150/-105	65/-70	85	295	760
AUTOBRAKE 3	2585	160/-160	80/105	-135/495	140/-95	70/-70	95	275	725
AUTOBRAKE 2	2825	180/-185	85/115	-145/525	140/-105	80/-80	100	245	590
AUTOBRAKE 1	2975	195/-200	90/125	-150/550	160/-120	85/-85	90	310	685

Poor Reported Braking Action

MAX MANUAL	2780	185/-185	85/120	-155/600	220/-145	75/-80	80	410	1060
AUTOBRAKE MAX	2790	185/-185	90/120	-155/600	220/-140	75/-80	90	405	1060
AUTOBRAKE 3	2825	185/-185	90/120	-160/600	215/-140	75/-80	90	415	1070
AUTOBRAKE 2	2975	195/-195	90/125	-165/615	205/-140	80/-85	100	360	930
AUTOBRAKE 1	3085	200/-205	100/130	-165/635	220/-150	85/-90	90	390	970

Reference distance is based on sea level, standard day, no wind or slope, VREF30, two-engine detent No. 2 reverse thrust, and auto speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 70 m.
For autobrake and manual speedbrakes, increase reference landing distance by 60 m.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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 VREF40	ONE REV	NO REV

Dry Runway

MAX MANUAL	1200	60/-60	25/30	-40/130	10/-10	25/-25	40	15	35
AUTOBRAKE MAX	1465	65/-70	30/35	-45/160	0/0	30/-30	65	0	0
AUTOBRAKE 3	1975	105/-115	45/65	-80/270	0/-5	45/-45	100	0	0
AUTOBRAKE 2	2450	145/-155	70/85	-110/375	30/-40	65/-65	105	45	45
AUTOBRAKE 1	2690	175/-180	80/105	-125/435	65/-75	75/-75	100	165	260

Good Reported Braking Action

MAX MANUAL	1580	75/-80	35/45	-65/225	35/-30	35/-35	50	65	140
AUTOBRAKE MAX	1680	80/-85	40/50	-70/230	30/-30	35/-35	65	70	150
AUTOBRAKE 3	1980	105/-115	45/65	-80/275	10/-5	45/-50	105	5	10
AUTOBRAKE 2	2450	145/-155	70/85	-110/375	30/-40	65/-65	105	45	45
AUTOBRAKE 1	2690	175/-180	80/105	-125/435	65/-75	75/-75	100	165	260

Good To Medium Reported Braking Action

MAX MANUAL	1830	100/-100	45/60	-85/295	60/-50	45/-45	60	120	270
AUTOBRAKE MAX	1905	105/-105	50/65	-85/300	55/-45	45/-45	70	120	280
AUTOBRAKE 3	2090	115/-125	50/70	-90/330	40/-30	50/-55	100	70	195
AUTOBRAKE 2	2485	145/-160	70/90	-115/400	50/-50	65/-65	105	70	125
AUTOBRAKE 1	2695	175/-180	80/105	-130/450	80/-80	75/-75	100	175	290

Medium Reported Braking Action

MAX MANUAL	2085	120/-120	60/75	-105/370	85/-70	50/-50	70	175	405
AUTOBRAKE MAX	2125	125/-125	60/80	-105/375	80/-65	50/-50	80	175	410
AUTOBRAKE 3	2200	125/-130	60/80	-105/380	70/-50	60/-60	100	130	375
AUTOBRAKE 2	2515	150/-160	70/90	-120/425	70/-65	70/-70	105	90	200
AUTOBRAKE 1	2700	175/-180	80/110	-130/460	90/-80	75/-75	100	185	315

ADVISORY INFORMATION

Normal Configuration Landing Distance
Flaps 40

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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 VREF40	ONE REV	NO REV

Medium To Poor Reported Braking Action

MAX MANUAL	2370	145/-145	70/95	-130/475	150/-105	60/-65	75	275	680
AUTOBRAKE MAX	2395	150/-150	70/100	-130/480	150/-100	60/-65	85	275	680
AUTOBRAKE 3	2445	150/-155	70/100	-130/485	140/-95	65/-65	95	255	670
AUTOBRAKE 2	2670	165/-175	80/105	-140/515	135/-100	70/-75	100	205	520
AUTOBRAKE 1	2810	180/-185	85/120	-150/540	150/-110	80/-80	95	265	585

Poor Reported Braking Action

MAX MANUAL	2660	175/-175	80/115	-155/585	220/-140	70/-75	80	375	955
AUTOBRAKE MAX	2665	175/-175	85/115	-155/585	220/-140	70/-75	85	375	955
AUTOBRAKE 3	2690	180/-180	85/115	-155/585	215/-140	70/-75	90	380	965
AUTOBRAKE 2	2820	185/-185	85/120	-160/605	200/-130	75/-80	100	315	840
AUTOBRAKE 1	2925	190/-195	90/125	-165/620	205/-145	80/-85	90	350	855

Reference distance is based on sea level, standard day, no wind or slope, VREF40, two-engine detent No. 2 reverse thrust, and auto speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 65 m.
For autobrake and manual speedbrakes, increase reference landing distance by 50 m.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1185	85/-60	25/30	-35/125	10/-10	25/-25	N/A	25	50
AUTOBRAKE MAX	1540	70/-75	35/45	-50/160	0/0	35/-35	N/A	0	5
AUTOBRAKE 2	2600	160/-170	80/105	-110/360	50/-55	75/-75	N/A	160	185

Good Reported Braking Action

MAX MANUAL	1560	80/-80	40/50	-60/205	30/-30	35/-35	N/A	75	175
AUTOBRAKE MAX	1680	85/-90	40/55	-60/215	30/-20	40/-40	N/A	85	195
AUTOBRAKE 2	2600	160/-170	80/105	-110/360	50/-55	75/-75	N/A	160	185

Good To Medium Reported Braking Action

MAX MANUAL	1825	105/-105	50/65	-80/275	55/-50	45/-45	N/A	145	350
AUTOBRAKE MAX	1915	105/-110	55/70	-80/280	55/-40	50/-50	N/A	155	365
AUTOBRAKE 2	2625	165/-175	80/105	-115/385	65/-65	75/-75	N/A	180	265

Medium Reported Braking Action

MAX MANUAL	2085	125/-125	60/80	-95/340	80/-65	55/-55	N/A	215	520
AUTOBRAKE MAX	2145	125/-130	65/85	-95/345	75/-60	55/-55	N/A	220	535
AUTOBRAKE 3	2335	130/-140	65/90	-100/365	55/-50	65/-65	N/A	125	385

Medium To Poor Reported Braking Action

MAX MANUAL	2375	150/-150	75/100	-120/440	140/-100	65/-70	N/A	335	875
AUTOBRAKE MAX	2415	155/-155	80/105	-120/440	135/-95	65/-70	N/A	335	880
AUTOBRAKE 3	2540	155/-160	80/110	-125/455	120/-85	70/-75	N/A	280	800

Poor Reported Braking Action

MAX MANUAL	2665	175/-175	90/120	-145/535	195/-130	75/-80	N/A	455	1230
AUTOBRAKE MAX	2680	180/-180	90/125	-145/535	195/-125	75/-80	N/A	450	1225
AUTOBRAKE 3	2740	175/-180	90/125	-145/540	185/-120	75/-80	N/A	430	1215

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	1145	65/-55	20/30	-35/125	10/-10	20/-20	N/A	20	45
AUTOBRAKE MAX	1465	65/-70	30/40	-45/155	0/0	30/-30	N/A	0	5
AUTOBRAKE 2	2415	145/-155	70/95	-105/345	45/-50	65/-65	N/A	135	185
Good Reported Braking Action									
MAX MANUAL	1505	75/-75	35/50	-60/200	30/-25	35/-35	N/A	70	155
AUTOBRAKE MAX	1615	80/-85	40/50	-60/210	30/-20	35/-35	N/A	80	175
AUTOBRAKE 2	2415	145/-155	70/95	-105/345	45/-50	65/-65	N/A	135	185
Good To Medium Reported Braking Action									
MAX MANUAL	1745	95/-95	45/65	-75/265	55/-45	45/-45	N/A	130	305
AUTOBRAKE MAX	1830	100/-105	50/65	-80/275	55/-40	45/-45	N/A	135	320
AUTOBRAKE 2	2440	150/-155	75/95	-110/370	60/-60	65/-70	N/A	155	255
Medium Reported Braking Action									
MAX MANUAL	1980	115/-115	55/75	-90/330	80/-60	50/-50	N/A	185	450
AUTOBRAKE MAX	2045	120/-120	60/80	-95/335	75/-60	50/-55	N/A	190	465
AUTOBRAKE 3	2190	120/-125	60/80	-100/350	60/-50	60/-60	N/A	115	340
Medium To Poor Reported Braking Action									
MAX MANUAL	2245	140/-140	70/95	-115/425	135/-95	60/-60	N/A	290	740
AUTOBRAKE MAX	2290	145/-145	75/95	-120/430	130/-90	60/-65	N/A	290	745
AUTOBRAKE 3	2380	145/-145	70/95	-120/440	120/-85	65/-70	N/A	240	675
Poor Reported Braking Action									
MAX MANUAL	2510	160/-160	80/110	-140/520	185/-125	65/-70	N/A	390	1025
AUTOBRAKE MAX	2535	165/-165	85/110	-140/525	180/-120	70/-75	N/A	390	1025
AUTOBRAKE 3	2570	165/-165	80/110	-140/525	180/-115	70/-75	N/A	365	1010

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1105	55/-50	20/30	-35/120	10/-10	20/-20	N/A	20	40
AUTOBRAKE MAX	1375	60/-65	30/35	-45/150	0/0	30/-30	N/A	0	0
AUTOBRAKE 2	2280	135/-145	65/85	-100/335	40/-45	60/-60	N/A	105	125

Good Reported Braking Action

MAX MANUAL	1455	70/-75	35/45	-55/200	30/-25	35/-35	N/A	65	145
AUTOBRAKE MAX	1550	75/-80	35/50	-60/210	30/-25	35/-35	N/A	70	160
AUTOBRAKE 2	2280	135/-145	65/85	-100/335	40/-45	60/-60	N/A	105	125

Good To Medium Reported Braking Action

MAX MANUAL	1680	90/-95	45/60	-75/265	55/-45	45/-45	N/A	120	280
AUTOBRAKE MAX	1755	95/-100	45/65	-75/270	55/-45	45/-45	N/A	125	290
AUTOBRAKE 2	2305	135/-145	70/90	-105/360	55/-55	65/-65	N/A	125	195

Medium Reported Braking Action

MAX MANUAL	1905	110/-110	55/70	-90/325	75/-60	50/-50	N/A	170	410
AUTOBRAKE MAX	1960	110/-115	55/75	-90/330	75/-60	50/-50	N/A	175	420
AUTOBRAKE 3	2060	110/-120	55/75	-95/345	60/-45	55/-55	N/A	115	335

Medium To Poor Reported Braking Action

MAX MANUAL	2155	135/-135	65/90	-115/420	130/-90	60/-60	N/A	265	670
AUTOBRAKE MAX	2195	135/-135	70/90	-115/425	130/-90	60/-60	N/A	265	675
AUTOBRAKE 3	2255	135/-140	65/90	-115/435	120/-80	60/-65	N/A	235	635

Poor Reported Braking Action

MAX MANUAL	2405	155/-155	75/105	-135/515	185/-120	65/-70	N/A	355	925
AUTOBRAKE MAX	2425	155/-155	80/105	-135/515	185/-115	65/-70	N/A	355	925
AUTOBRAKE 3	2450	155/-155	75/105	-135/520	180/-115	65/-70	N/A	355	935

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1470	190/-80	50/105	-45/200	20/-15	35/-35	45	40	85
AUTOBRAKE MAX	1965	90/-85	45/75	-60/190	5/0	50/-50	75	5	15
AUTOBRAKE 2	3585	195/-225	115/150	-130/435	60/-75	105/-105	115	215	225
Good Reported Braking Action									
MAX MANUAL	1950	90/-100	50/70	-70/235	40/-35	50/-50	50	110	255
AUTOBRAKE MAX	2135	90/-100	55/75	-75/245	30/-25	55/-55	75	95	250
AUTOBRAKE 2	3585	195/-225	115/150	-130/435	60/-75	105/-105	115	215	225
Good To Medium Reported Braking Action									
MAX MANUAL	2335	125/-130	70/95	-90/315	75/-65	65/-65	60	215	525
AUTOBRAKE MAX	2455	125/-130	75/95	-95/320	70/-55	65/-70	80	210	530
AUTOBRAKE 2	3615	200/-225	115/155	-135/460	80/-85	110/-110	115	240	340
Medium Reported Braking Action									
MAX MANUAL	2720	155/-160	85/115	-110/390	110/-90	75/-75	70	320	795
AUTOBRAKE MAX	2775	155/-160	90/115	-115/395	105/-85	75/-80	80	325	805
AUTOBRAKE 3	3080	150/-165	90/120	-120/420	65/-45	90/-90	125	185	570
Medium To Poor Reported Braking Action									
MAX MANUAL	3155	195/-200	110/145	-140/505	190/-135	90/-95	80	520	1395
AUTOBRAKE MAX	3180	195/-200	110/145	-145/505	190/-130	90/-95	90	520	1390
AUTOBRAKE 3	3370	190/-195	110/150	-145/525	155/-100	100/-105	125	430	1265
Poor Reported Braking Action									
MAX MANUAL	3590	230/-235	130/175	-170/620	270/-180	105/-110	90	715	1990
AUTOBRAKE MAX	3580	230/-235	130/175	-170/615	270/-175	105/-110	95	710	1975
AUTOBRAKE 3	3660	225/-225	130/175	-170/625	245/-155	110/-115	120	675	1955

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	1860	100/-105	50/65	-80/280	50/-45	45/-45	60	125	295
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								
Good Reported Braking Action									
MAX MANUAL	2070	120/-120	55/75	-95/340	75/-60	50/-50	65	185	460
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								
Good To Medium Reported Braking Action									
MAX MANUAL	2345	145/-145	70/95	-120/440	135/-95	60/-65	70	300	795
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								
Medium Reported Braking Action									
MAX MANUAL	2615	170/-170	85/115	-140/535	190/-125	70/-75	75	410	1125
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								
Medium To Poor Reported Braking Action									
MAX MANUAL	3035	210/-210	105/145	-190/760	395/-210	80/-95	85	710	2305
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								
Poor Reported Braking Action									
MAX MANUAL	3455	250/-245	120/175	-235/985	600/-290	90/-110	90	1005	3480
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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 30)
VREF30

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	1785	95/-100	45/60	-75/275	50/-40	40/-40	55	110	260
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	1975	110/-115	55/70	-90/335	75/-60	45/-50	65	165	395
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2225	135/-135	65/90	-115/430	130/-90	55/-60	70	260	670
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	2470	155/-155	75/105	-135/520	180/-120	65/-70	75	355	940
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	2855	190/-190	95/135	-185/740	370/-195	75/-90	80	610	1895
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	3235	225/-225	110/160	-230/960	560/-270	85/-105	85	860	2845
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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 40)

VREF40

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	1715	90/-95	40/55	-75/270	50/-40	40/-40	60	100	235
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	1900	105/-110	50/65	-90/330	75/-60	45/-45	65	150	360
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2135	130/-130	60/85	-115/420	130/-90	55/-55	70	240	605
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	2370	150/-150	70/100	-135/510	180/-115	60/-65	75	325	850
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	2740	185/-185	90/125	-180/730	365/-190	70/-85	80	560	1720
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	3105	215/-215	105/150	-225/945	550/-265	80/-100	85	795	2590
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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	1120	75/-60	20/30	-35/120	10/-10	20/-20	35	20	45
AUTOBRAKE MAX	1420	70/-70	30/40	-45/155	0/0	30/-30	60	0	5
AUTOBRAKE 2	2420	150/-160	70/95	-105/350	35/-45	65/-65	90	105	105

Good Reported Braking Action

MAX MANUAL	1470	75/-75	35/45	-55/200	30/-25	35/-35	45	70	160
AUTOBRAKE MAX	1570	80/-85	40/50	-60/210	30/-20	35/-35	55	80	175
AUTOBRAKE 2	2420	150/-160	70/95	-105/350	35/-45	65/-65	90	105	105

Good To Medium Reported Braking Action

MAX MANUAL	1720	100/-100	45/60	-75/265	55/-45	45/-45	55	135	325
AUTOBRAKE MAX	1790	100/-105	50/65	-80/275	55/-40	45/-45	65	140	335
AUTOBRAKE 2	2445	155/-165	75/95	-110/370	55/-55	70/-70	90	125	180

Medium Reported Braking Action

MAX MANUAL	1965	120/-120	55/75	-90/330	80/-65	50/-50	60	195	485
AUTOBRAKE MAX	2010	120/-125	60/80	-95/335	75/-60	50/-55	70	200	490
AUTOBRAKE 3	2140	125/-130	60/80	-95/350	55/-40	55/-60	100	125	390

Medium To Poor Reported Braking Action

MAX MANUAL	2245	145/-145	70/95	-115/430	140/-95	60/-65	70	310	825
AUTOBRAKE MAX	2270	145/-150	75/100	-120/430	135/-95	60/-65	75	315	825
AUTOBRAKE 3	2350	150/-150	75/100	-120/440	120/-80	65/-70	95	275	780

Poor Reported Braking Action

MAX MANUAL	2525	170/-170	85/115	-140/525	195/-125	70/-75	75	425	1165
AUTOBRAKE MAX	2525	170/-170	85/115	-140/525	195/-125	70/-75	75	425	1160
AUTOBRAKE 3	2555	170/-170	85/115	-140/530	185/-115	70/-75	90	425	1165

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1230	80/-65	25/35	-40/130	15/-10	25/-25	35	25	55
AUTOBRAKE MAX	1600	75/-75	35/45	-50/165	0/0	35/-35	65	0	5
AUTOBRAKE 2	2725	170/-180	85/110	-110/370	50/-60	75/-75	90	175	210
Good Reported Braking Action									
MAX MANUAL	1630	80/-85	40/55	-60/210	35/-30	40/-40	45	85	195
AUTOBRAKE MAX	1755	85/-90	45/60	-65/220	30/-20	40/-40	65	95	215
AUTOBRAKE 2	2725	170/-180	85/110	-110/370	50/-60	75/-75	90	175	210
Good To Medium Reported Braking Action									
MAX MANUAL	1905	105/-110	55/75	-80/280	60/-50	50/-50	55	160	385
AUTOBRAKE MAX	2000	110/-115	60/75	-85/290	55/-45	50/-50	70	170	405
AUTOBRAKE 2	2750	170/-180	85/115	-115/395	70/-70	80/-80	90	195	295
Medium Reported Braking Action									
MAX MANUAL	2180	130/-130	65/90	-100/350	85/-70	55/-60	60	235	575
AUTOBRAKE MAX	2245	135/-135	70/90	-100/355	80/-65	60/-60	70	240	590
AUTOBRAKE 3	2445	135/-145	70/95	-105/370	60/-50	65/-70	95	140	430
Medium To Poor Reported Braking Action									
MAX MANUAL	2485	160/-160	80/110	-125/450	145/-105	65/-70	70	365	960
AUTOBRAKE MAX	2525	160/-160	85/110	-125/455	145/-100	70/-75	80	365	965
AUTOBRAKE 3	2655	160/-165	85/115	-130/465	125/-90	75/-80	95	305	880
Poor Reported Braking Action									
MAX MANUAL	2785	185/-185	95/130	-145/545	205/-140	75/-80	75	490	1340
AUTOBRAKE MAX	2805	185/-185	95/130	-145/550	205/-130	80/-85	85	490	1340
AUTOBRAKE 3	2865	185/-185	95/130	-150/555	190/-125	80/-85	90	465	1325

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 15)
VREF15

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	1235	70/-60	25/35	-40/130	15/-15	25/-25	45	30	50
AUTOBRAKE MAX	1425	65/-70	30/40	-45/150	5/0	30/-30	60	0	5
AUTOBRAKE 2	2545	150/-165	70/90	-105/360	0/-10	70/-70	140	0	0
Good Reported Braking Action									
MAX MANUAL	1720	90/-95	45/60	-65/230	45/-40	40/-40	70	120	245
AUTOBRAKE MAX	1755	95/-100	45/60	-70/230	40/-35	40/-45	75	125	255
AUTOBRAKE 2	2545	150/-165	70/90	-105/360	5/-10	70/-70	140	0	0
Good To Medium Reported Braking Action									
MAX MANUAL	2020	120/-125	60/80	-85/305	80/-65	50/-55	80	225	510
AUTOBRAKE MAX	2035	125/-125	60/80	-90/305	80/-65	50/-55	85	225	515
AUTOBRAKE 2	2585	155/-170	75/95	-115/385	30/-25	75/-75	140	50	250
Medium Reported Braking Action									
MAX MANUAL	2315	145/-150	70/95	-105/375	110/-90	60/-65	90	325	775
AUTOBRAKE MAX	2315	150/-150	70/100	-105/375	115/-90	60/-65	90	325	775
AUTOBRAKE 3	2315	150/-150	70/100	-105/375	115/-80	60/-65	90	325	775
Medium To Poor Reported Braking Action									
MAX MANUAL	2645	180/-180	90/120	-135/480	185/-130	70/-80	100	500	1340
AUTOBRAKE MAX	2645	185/-180	90/125	-135/480	190/-135	75/-80	100	500	1345
AUTOBRAKE 3	2645	185/-180	90/125	-135/480	190/-130	75/-80	100	500	1345
Poor Reported Braking Action									
MAX MANUAL	2970	210/-210	105/145	-160/580	255/-170	80/-90	105	675	1905
AUTOBRAKE MAX	2970	215/-210	105/145	-160/580	260/-175	85/-90	105	675	1910
AUTOBRAKE 3	2970	215/-210	105/145	-160/580	260/-175	85/-90	105	675	1910

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	1185	65/-55	25/30	-40/125	15/-15	25/-25	45	25	45
AUTOBRAKE MAX	1350	60/-65	25/35	-45/145	0/0	30/-30	55	0	5
AUTOBRAKE 2	2380	140/-150	65/85	-105/345	0/-10	65/-65	130	0	0

Good Reported Braking Action

MAX MANUAL	1640	85/-90	40/55	-65/220	45/-40	40/-40	65	105	210
AUTOBRAKE MAX	1665	90/-95	40/55	-65/225	40/-35	40/-40	70	105	215
AUTOBRAKE 2	2380	140/-150	65/85	-105/345	0/-10	65/-65	130	0	0

Good To Medium Reported Braking Action

MAX MANUAL	1915	110/-115	55/75	-85/290	75/-65	50/-50	75	190	430
AUTOBRAKE MAX	1920	115/-115	55/75	-85/295	75/-60	50/-50	80	190	430
AUTOBRAKE 2	2415	140/-155	70/90	-110/370	25/-25	65/-70	130	45	200

Medium Reported Braking Action

MAX MANUAL	2185	135/-135	65/90	-100/360	105/-85	55/-60	85	275	645
AUTOBRAKE MAX	2175	135/-135	65/90	-100/360	110/-85	55/-60	85	275	640
AUTOBRAKE 3	2180	135/-135	65/90	-100/360	105/-75	55/-60	90	275	645

Medium To Poor Reported Braking Action

MAX MANUAL	2480	165/-165	80/110	-125/465	175/-120	65/-70	90	420	1090
AUTOBRAKE MAX	2475	165/-165	80/110	-125/465	180/-125	65/-70	90	420	1085
AUTOBRAKE 3	2480	165/-165	80/110	-125/465	175/-120	65/-70	95	420	1090

Poor Reported Braking Action

MAX MANUAL	2775	190/-190	95/130	-150/565	240/-155	75/-80	95	565	1530
AUTOBRAKE MAX	2775	195/-190	95/130	-150/565	245/-160	75/-80	95	565	1530
AUTOBRAKE 3	2775	195/-190	95/130	-150/565	245/-160	75/-80	95	565	1530

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	1140	60/-50	20/30	-35/125	15/-15	20/-20	45	25	35
AUTOBRAKE MAX	1270	55/-60	25/30	-40/140	0/0	25/-25	55	5	10
AUTOBRAKE 2	2185	125/-140	60/75	-95/330	0/-5	60/-60	125	0	0
Good Reported Braking Action									
MAX MANUAL	1570	80/-85	40/50	-65/220	45/-35	35/-35	70	95	190
AUTOBRAKE MAX	1570	80/-90	40/50	-65/220	35/-30	35/-35	70	95	185
AUTOBRAKE 2	2185	125/-140	60/75	-95/330	0/-5	60/-60	125	0	0
Good To Medium Reported Braking Action									
MAX MANUAL	1820	105/-110	50/70	-85/290	75/-60	45/-45	80	170	375
AUTOBRAKE MAX	1815	105/-110	50/70	-85/290	70/-55	45/-45	80	170	370
AUTOBRAKE 2	2220	130/-140	60/80	-100/355	30/-15	60/-65	125	45	190
Medium Reported Braking Action									
MAX MANUAL	2070	125/-130	60/85	-100/355	100/-80	55/-55	85	245	560
AUTOBRAKE MAX	2055	125/-130	60/85	-100/355	105/-80	55/-55	85	240	555
AUTOBRAKE 3	2060	125/-130	60/85	-100/355	105/-75	55/-55	90	240	555
Medium To Poor Reported Braking Action									
MAX MANUAL	2345	155/-155	75/105	-125/455	165/-115	65/-65	90	370	935
AUTOBRAKE MAX	2335	155/-155	75/105	-125/455	170/-120	65/-65	90	370	930
AUTOBRAKE 3	2340	155/-155	75/105	-125/455	170/-115	65/-65	95	370	930
Poor Reported Braking Action									
MAX MANUAL	2620	180/-180	85/120	-150/550	230/-150	70/-75	95	495	1305
AUTOBRAKE MAX	2615	180/-180	90/120	-145/550	235/-155	70/-75	95	495	1305
AUTOBRAKE 3	2615	180/-180	90/120	-145/550	235/-155	70/-75	95	495	1305

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	1685	80/-85	40/50	-60/195	35/-30	40/-40	75	-5	60
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	2390	135/-140	65/90	-100/335	100/-80	60/-60	105	90	425
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	2760	170/-175	85/115	-125/430	160/-120	75/-75	115	225	905
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	3130	200/-205	100/135	-145/520	215/-160	85/-85	125	355	1385
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	3495	240/-240	120/165	-180/650	345/-215	95/-100	130	580	2370
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	3860	275/-270	140/195	-210/780	475/-270	105/-115	135	805	3355
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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1245	55/-60	25/35	-40/145	15/-15	25/-25	40	35	55
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	1715	95/-95	45/60	-70/245	45/-40	40/-40	55	120	250
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good To Medium Reported Braking Action

MAX MANUAL	1995	120/-120	60/80	-90/325	80/-65	50/-50	65	215	490
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	2275	145/-145	70/95	-110/400	115/-90	60/-60	75	305	730
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Medium To Poor Reported Braking Action

MAX MANUAL	2575	175/-175	85/120	-140/515	200/-130	70/-75	80	460	1215
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	2875	200/-200	100/140	-165/625	285/-170	80/-85	85	610	1695
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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1685	80/-85	40/50	-60/195	35/-30	40/-40	75	-5	60
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								
Good Reported Braking Action									
MAX MANUAL	2390	135/-140	65/90	-100/335	100/-80	60/-60	105	90	425
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								
Good To Medium Reported Braking Action									
MAX MANUAL	2760	170/-175	85/115	-125/430	160/-120	75/-75	115	225	905
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								
Medium Reported Braking Action									
MAX MANUAL	3130	200/-205	100/135	-145/520	215/-160	85/-85	125	355	1385
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								
Medium To Poor Reported Braking Action									
MAX MANUAL	3495	240/-240	120/165	-180/650	345/-215	95/-100	130	580	2370
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								
Poor Reported Braking Action									
MAX MANUAL	3860	275/-270	140/195	-210/780	475/-270	105/-115	135	805	3355
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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1130	80/-60	20/30	-35/125	10/-10	20/-20	35	0	20
AUTOBRAKE MAX	1420	70/-70	30/40	-45/155	0/0	30/-30	60	0	0
AUTOBRAKE 2	2520	150/-160	70/90	-105/355	10/-30	70/-70	115	0	5
Good Reported Braking Action									
MAX MANUAL	1520	75/-80	35/50	-60/210	35/-30	35/-35	50	0	85
AUTOBRAKE MAX	1635	85/-90	40/50	-65/220	35/-25	40/-40	60	0	95
AUTOBRAKE 2	2520	150/-160	70/90	-105/355	10/-30	70/-70	115	0	5
Good To Medium Reported Braking Action									
MAX MANUAL	1820	100/-105	50/65	-80/285	70/-55	45/-45	60	0	180
AUTOBRAKE MAX	1905	110/-115	50/65	-85/295	65/-50	50/-50	70	0	185
AUTOBRAKE 2	2555	155/-165	75/95	-115/385	35/-40	75/-75	115	0	55
Medium Reported Braking Action									
MAX MANUAL	2115	125/-130	60/80	-100/360	100/-80	55/-55	70	0	270
AUTOBRAKE MAX	2175	130/-135	60/80	-100/365	95/-75	60/-60	80	0	275
AUTOBRAKE 3	2235	135/-140	65/85	-105/370	80/-60	60/-60	95	0	245
Medium To Poor Reported Braking Action									
MAX MANUAL	2485	160/-165	75/100	-130/475	185/-125	70/-70	80	0	475
AUTOBRAKE MAX	2515	165/-165	75/105	-130/480	185/-120	70/-75	90	0	480
AUTOBRAKE 3	2565	165/-170	80/105	-135/480	175/-115	70/-75	95	0	465
Poor Reported Braking Action									
MAX MANUAL	2850	190/-195	90/120	-160/590	270/-170	80/-85	85	0	675
AUTOBRAKE MAX	2855	195/-195	90/125	-160/590	270/-165	80/-85	95	0	680
AUTOBRAKE 3	2890	195/-200	95/125	-160/590	265/-170	80/-85	90	0	685

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1090	60/-55	20/25	-35/120	10/-10	20/-20	35	0	20
AUTOBRAKE MAX	1350	60/-65	25/35	-45/145	0/0	30/-30	55	0	0
AUTOBRAKE 2	2335	140/-145	65/85	-100/340	15/-35	65/-65	100	0	10
Good Reported Braking Action									
MAX MANUAL	1460	75/-75	35/45	-60/205	35/-30	35/-35	50	0	75
AUTOBRAKE MAX	1570	80/-85	35/50	-60/215	30/-25	35/-35	60	0	85
AUTOBRAKE 2	2335	140/-145	65/85	-100/340	15/-35	65/-65	100	0	10
Good To Medium Reported Braking Action									
MAX MANUAL	1730	95/-100	45/60	-80/280	65/-55	45/-45	60	0	155
AUTOBRAKE MAX	1815	100/-105	45/65	-80/285	60/-50	45/-45	70	0	160
AUTOBRAKE 2	2370	145/-150	65/90	-105/370	40/-45	65/-65	100	0	55
Medium Reported Braking Action									
MAX MANUAL	2000	115/-120	55/75	-95/350	95/-75	50/-55	65	0	230
AUTOBRAKE MAX	2055	120/-125	55/75	-100/355	90/-70	55/-55	75	0	235
AUTOBRAKE 3	2105	120/-130	60/75	-100/360	80/-65	55/-55	85	0	210
Medium To Poor Reported Braking Action									
MAX MANUAL	2325	145/-150	70/95	-125/460	170/-115	65/-65	75	0	395
AUTOBRAKE MAX	2355	150/-155	70/95	-125/460	170/-110	65/-70	85	0	395
AUTOBRAKE 3	2395	150/-155	75/95	-130/465	165/-115	65/-70	85	0	390
Poor Reported Braking Action									
MAX MANUAL	2650	175/-175	85/110	-150/565	245/-155	75/-75	80	0	555
AUTOBRAKE MAX	2655	175/-180	85/110	-150/565	245/-150	75/-80	90	0	555
AUTOBRAKE 3	2685	175/-180	85/110	-155/570	245/-160	75/-80	80	0	565

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	1120	75/-60	20/30	-35/120	10/-10	20/-20	35	20	45
AUTOBRAKE MAX	1420	70/-70	30/40	-45/155	0/0	30/-30	60	0	5
AUTOBRAKE 2	2420	150/-160	70/95	-105/350	35/-45	65/-65	90	105	105
Good Reported Braking Action									
MAX MANUAL	1470	75/-75	35/45	-55/200	30/-25	35/-35	45	70	160
AUTOBRAKE MAX	1570	80/-85	40/50	-60/210	30/-20	35/-35	55	80	175
AUTOBRAKE 2	2420	150/-160	70/95	-105/350	35/-45	65/-65	90	105	105
Good To Medium Reported Braking Action									
MAX MANUAL	1720	100/-100	45/60	-75/265	55/-45	45/-45	55	135	325
AUTOBRAKE MAX	1790	100/-105	50/65	-80/275	55/-40	45/-45	65	140	335
AUTOBRAKE 2	2445	155/-165	75/95	-110/370	55/-55	70/-70	90	125	180
Medium Reported Braking Action									
MAX MANUAL	1965	120/-120	55/75	-90/330	80/-65	50/-50	60	195	485
AUTOBRAKE MAX	2010	120/-125	60/80	-95/335	75/-60	50/-55	70	200	490
AUTOBRAKE 3	2140	125/-130	60/80	-95/350	55/-40	55/-60	100	125	390
Medium To Poor Reported Braking Action									
MAX MANUAL	2245	145/-145	70/95	-115/430	140/-95	60/-65	70	310	825
AUTOBRAKE MAX	2270	145/-150	75/100	-120/430	135/-95	60/-65	75	315	825
AUTOBRAKE 3	2350	150/-150	75/100	-120/440	120/-80	65/-70	95	275	780
Poor Reported Braking Action									
MAX MANUAL	2525	170/-170	85/115	-140/525	195/-125	70/-75	75	425	1165
AUTOBRAKE MAX	2525	170/-170	85/115	-140/525	195/-125	70/-75	75	425	1160
AUTOBRAKE 3	2555	170/-170	85/115	-140/530	185/-115	70/-75	90	425	1165

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1225	95/-60	25/40	-40/130	15/-10	25/-25	40	25	55
AUTOBRAKE MAX	1625	70/-75	35/45	-50/170	0/0	35/-35	65	0	5
AUTOBRAKE 2	2765	160/-175	85/110	-110/375	55/-60	80/-80	90	180	220
Good Reported Braking Action									
MAX MANUAL	1600	75/-80	40/55	-60/210	30/-30	35/-40	45	80	175
AUTOBRAKE MAX	1760	80/-85	45/55	-65/220	25/-20	40/-40	65	70	175
AUTOBRAKE 2	2765	160/-175	85/110	-110/375	55/-60	80/-80	90	180	220
Good To Medium Reported Braking Action									
MAX MANUAL	1885	100/-105	55/70	-80/280	60/-50	45/-50	55	150	355
AUTOBRAKE MAX	2000	105/-110	55/75	-85/285	55/-45	50/-50	70	150	365
AUTOBRAKE 2	2790	165/-180	85/115	-115/400	70/-70	80/-80	90	200	295
Medium Reported Braking Action									
MAX MANUAL	2165	120/-125	65/85	-95/345	85/-65	55/-60	60	220	535
AUTOBRAKE MAX	2240	125/-130	65/90	-100/350	80/-65	60/-60	70	225	550
AUTOBRAKE 3	2475	125/-135	70/95	-105/375	55/-50	70/-70	95	125	375
Medium To Poor Reported Braking Action									
MAX MANUAL	2485	150/-155	80/110	-120/445	145/-100	70/-75	70	350	915
AUTOBRAKE MAX	2530	155/-155	80/110	-125/450	140/-100	70/-75	75	350	920
AUTOBRAKE 3	2685	150/-160	85/115	-130/465	125/-90	75/-80	95	280	820
Poor Reported Braking Action									
MAX MANUAL	2800	180/-180	95/130	-145/545	205/-135	80/-85	75	480	1290
AUTOBRAKE MAX	2820	180/-180	95/130	-145/550	200/-130	80/-85	80	475	1290
AUTOBRAKE 3	2890	175/-180	95/130	-150/555	190/-125	80/-85	95	435	1260

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	1120	75/-60	20/30	-35/120	10/-10	20/-20	35	20	45
AUTOBRAKE MAX	1420	70/-70	30/40	-45/155	0/0	30/-30	60	0	5
AUTOBRAKE 2	2420	150/-160	70/95	-105/350	35/-45	65/-65	90	105	105

Good Reported Braking Action

MAX MANUAL	1470	75/-75	35/45	-55/200	30/-25	35/-35	45	70	160
AUTOBRAKE MAX	1570	80/-85	40/50	-60/210	30/-20	35/-35	55	80	175
AUTOBRAKE 2	2420	150/-160	70/95	-105/350	35/-45	65/-65	90	105	105

Good To Medium Reported Braking Action

MAX MANUAL	1720	100/-100	45/60	-75/265	55/-45	45/-45	55	135	325
AUTOBRAKE MAX	1790	100/-105	50/65	-80/275	55/-40	45/-45	65	140	335
AUTOBRAKE 2	2445	155/-165	75/95	-110/370	55/-55	70/-70	90	125	180

Medium Reported Braking Action

MAX MANUAL	1965	120/-120	55/75	-90/330	80/-65	50/-50	60	195	485
AUTOBRAKE MAX	2010	120/-125	60/80	-95/335	75/-60	50/-55	70	200	490
AUTOBRAKE 3	2140	125/-130	60/80	-95/350	55/-40	55/-60	100	125	390

Medium To Poor Reported Braking Action

MAX MANUAL	2245	145/-145	70/95	-115/430	140/-95	60/-65	70	310	825
AUTOBRAKE MAX	2270	145/-150	75/100	-120/430	135/-95	60/-65	75	315	825
AUTOBRAKE 3	2350	150/-150	75/100	-120/440	120/-80	65/-70	95	275	780

Poor Reported Braking Action

MAX MANUAL	2525	170/-170	85/115	-140/525	195/-125	70/-75	75	425	1165
AUTOBRAKE MAX	2525	170/-170	85/115	-140/525	195/-125	70/-75	75	425	1160
AUTOBRAKE 3	2555	170/-170	85/115	-140/530	185/-115	70/-75	90	425	1165

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1080	60/-55	20/25	-35/120	10/-10	20/-20	35	20	35
AUTOBRAKE MAX	1350	60/-65	25/35	-45/145	0/0	30/-30	55	0	5
AUTOBRAKE 2	2250	140/-145	65/85	-100/335	35/-45	60/-60	85	95	100

Good Reported Braking Action

MAX MANUAL	1415	70/-70	35/45	-55/195	30/-25	30/-30	45	65	140
AUTOBRAKE MAX	1505	75/-80	35/45	-60/205	25/-20	35/-35	55	70	155
AUTOBRAKE 2	2250	140/-145	65/85	-100/335	35/-45	60/-60	85	95	100

Good To Medium Reported Braking Action

MAX MANUAL	1640	90/-90	45/60	-75/260	55/-45	40/-40	55	120	280
AUTOBRAKE MAX	1710	95/-100	45/60	-75/265	50/-40	45/-45	65	125	290
AUTOBRAKE 2	2275	140/-150	65/90	-105/355	50/-55	60/-65	85	115	170

Medium Reported Braking Action

MAX MANUAL	1865	110/-110	55/70	-90/325	75/-60	45/-50	60	170	415
AUTOBRAKE MAX	1910	115/-115	55/70	-90/325	70/-55	50/-50	70	175	425
AUTOBRAKE 3	2020	115/-120	55/75	-95/340	55/-45	50/-55	85	115	340

Medium To Poor Reported Braking Action

MAX MANUAL	2120	135/-135	65/90	-115/420	130/-90	55/-60	65	270	695
AUTOBRAKE MAX	2145	135/-135	65/90	-115/420	130/-85	60/-60	75	270	695
AUTOBRAKE 3	2215	140/-140	65/90	-115/430	115/-80	60/-65	85	240	660

Poor Reported Braking Action

MAX MANUAL	2370	155/-155	75/105	-135/510	180/-120	65/-70	70	365	970
AUTOBRAKE MAX	2380	155/-155	75/105	-135/510	185/-115	65/-70	80	365	965
AUTOBRAKE 3	2410	160/-160	75/105	-135/515	175/-115	65/-70	80	365	975

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1225	95/-60	25/40	-40/130	15/-10	25/-25	40	25	55
AUTOBRAKE MAX	1625	70/-75	35/45	-50/170	0/0	35/-35	65	0	5
AUTOBRAKE 2	2765	160/-175	85/110	-110/375	55/-60	80/-80	90	180	220
Good Reported Braking Action									
MAX MANUAL	1600	75/-80	40/55	-60/210	30/-30	35/-40	45	80	175
AUTOBRAKE MAX	1760	80/-85	45/55	-65/220	25/-20	40/-40	65	70	175
AUTOBRAKE 2	2765	160/-175	85/110	-110/375	55/-60	80/-80	90	180	220
Good To Medium Reported Braking Action									
MAX MANUAL	1885	100/-105	55/70	-80/280	60/-50	45/-50	55	150	355
AUTOBRAKE MAX	2000	105/-110	55/75	-85/285	55/-45	50/-50	70	150	365
AUTOBRAKE 2	2790	165/-180	85/115	-115/400	70/-70	80/-80	90	200	295
Medium Reported Braking Action									
MAX MANUAL	2165	120/-125	65/85	-95/345	85/-65	55/-60	60	220	535
AUTOBRAKE MAX	2240	125/-130	65/90	-100/350	80/-65	60/-60	70	225	550
AUTOBRAKE 3	2475	125/-135	70/95	-105/375	55/-50	70/-70	95	125	375
Medium To Poor Reported Braking Action									
MAX MANUAL	2485	150/-155	80/110	-120/445	145/-100	70/-75	70	350	915
AUTOBRAKE MAX	2530	155/-155	80/110	-125/450	140/-100	70/-75	75	350	920
AUTOBRAKE 3	2685	150/-160	85/115	-130/465	125/-90	75/-80	95	280	820
Poor Reported Braking Action									
MAX MANUAL	2800	180/-180	95/130	-145/545	205/-135	80/-85	75	480	1290
AUTOBRAKE MAX	2820	180/-180	95/130	-145/550	200/-130	80/-85	80	475	1290
AUTOBRAKE 3	2890	175/-180	95/130	-150/555	190/-125	80/-85	95	435	1260

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1120	75/-60	20/30	-35/120	10/-10	20/-20	35	20	45
AUTOBRAKE MAX	1420	70/-70	30/40	-45/155	0/0	30/-30	60	0	5
AUTOBRAKE 2	2420	150/-160	70/95	-105/350	35/-45	65/-65	90	105	105
Good Reported Braking Action									
MAX MANUAL	1470	75/-75	35/45	-55/200	30/-25	35/-35	45	70	160
AUTOBRAKE MAX	1570	80/-85	40/50	-60/210	30/-20	35/-35	55	80	175
AUTOBRAKE 2	2420	150/-160	70/95	-105/350	35/-45	65/-65	90	105	105
Good To Medium Reported Braking Action									
MAX MANUAL	1720	100/-100	45/60	-75/265	55/-45	45/-45	55	135	325
AUTOBRAKE MAX	1790	100/-105	50/65	-80/275	55/-40	45/-45	65	140	335
AUTOBRAKE 2	2445	155/-165	75/95	-110/370	55/-55	70/-70	90	125	180
Medium Reported Braking Action									
MAX MANUAL	1965	120/-120	55/75	-90/330	80/-65	50/-50	60	195	485
AUTOBRAKE MAX	2010	120/-125	60/80	-95/335	75/-60	50/-55	70	200	490
AUTOBRAKE 3	2140	125/-130	60/80	-95/350	55/-40	55/-60	100	125	390
Medium To Poor Reported Braking Action									
MAX MANUAL	2245	145/-145	70/95	-115/430	140/-95	60/-65	70	310	825
AUTOBRAKE MAX	2270	145/-150	75/100	-120/430	135/-95	60/-65	75	315	825
AUTOBRAKE 3	2350	150/-150	75/100	-120/440	120/-80	65/-70	95	275	780
Poor Reported Braking Action									
MAX MANUAL	2525	170/-170	85/115	-140/525	195/-125	70/-75	75	425	1165
AUTOBRAKE MAX	2525	170/-170	85/115	-140/525	195/-125	70/-75	75	425	1160
AUTOBRAKE 3	2555	170/-170	85/115	-140/530	185/-115	70/-75	90	425	1165

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 (M)								
	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	1080	60/-55	20/25	-35/120	10/-10	20/-20	35	20	35
AUTOBRAKE MAX	1350	60/-65	25/35	-45/145	0/0	30/-30	55	0	5
AUTOBRAKE 2	2250	140/-145	65/85	-100/335	35/-45	60/-60	85	95	100
Good Reported Braking Action									
MAX MANUAL	1415	70/-70	35/45	-55/195	30/-25	30/-30	45	65	140
AUTOBRAKE MAX	1505	75/-80	35/45	-60/205	25/-20	35/-35	55	70	155
AUTOBRAKE 2	2250	140/-145	65/85	-100/335	35/-45	60/-60	85	95	100
Good To Medium Reported Braking Action									
MAX MANUAL	1640	90/-90	45/60	-75/260	55/-45	40/-40	55	120	280
AUTOBRAKE MAX	1710	95/-100	45/60	-75/265	50/-40	45/-45	65	125	290
AUTOBRAKE 2	2275	140/-150	65/90	-105/355	50/-55	60/-65	85	115	170
Medium Reported Braking Action									
MAX MANUAL	1865	110/-110	55/70	-90/325	75/-60	45/-50	60	170	415
AUTOBRAKE MAX	1910	115/-115	55/70	-90/325	70/-55	50/-50	70	175	425
AUTOBRAKE 3	2020	115/-120	55/75	-95/340	55/-45	50/-55	85	115	340
Medium To Poor Reported Braking Action									
MAX MANUAL	2120	135/-135	65/90	-115/420	130/-90	55/-60	65	270	695
AUTOBRAKE MAX	2145	135/-135	65/90	-115/420	130/-85	60/-60	75	270	695
AUTOBRAKE 3	2215	140/-140	65/90	-115/430	115/-80	60/-65	85	240	660
Poor Reported Braking Action									
MAX MANUAL	2370	155/-155	75/105	-135/510	180/-120	65/-70	70	365	970
AUTOBRAKE MAX	2380	155/-155	75/105	-135/510	185/-115	65/-70	80	365	965
AUTOBRAKE 3	2410	160/-160	75/105	-135/515	175/-115	65/-70	80	365	975

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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

	LANDING DISTANCE AND ADJUSTMENTS (M)								
	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	1325	110/-70	30/70	-40/140	15/-15	30/-30	40	30	65
AUTOBRAKE MAX	1755	75/-75	40/50	-55/175	0/0	40/-40	70	0	10
AUTOBRAKE 2	3130	175/-195	100/125	-120/400	55/-65	90/-90	105	170	180
Good Reported Braking Action									
MAX MANUAL	1770	85/-90	45/60	-65/225	40/-35	45/-45	50	95	210
AUTOBRAKE MAX	1920	85/-95	50/65	-70/235	30/-20	45/-50	70	90	220
AUTOBRAKE 2	3130	175/-195	100/125	-120/400	55/-65	90/-90	105	170	180
Good To Medium Reported Braking Action									
MAX MANUAL	2105	110/-120	60/80	-85/300	70/-60	55/-60	60	185	435
AUTOBRAKE MAX	2205	115/-120	65/85	-90/305	65/-50	55/-60	75	180	445
AUTOBRAKE 2	3160	180/-200	100/130	-125/425	70/-75	90/-95	105	195	280
Medium Reported Braking Action									
MAX MANUAL	2435	135/-145	75/100	-105/370	100/-80	65/-70	65	270	655
AUTOBRAKE MAX	2485	140/-145	75/100	-105/375	95/-75	65/-70	75	270	665
AUTOBRAKE 3	2715	135/-150	80/105	-115/395	60/-45	75/-80	115	160	485
Medium To Poor Reported Braking Action									
MAX MANUAL	2810	170/-180	95/125	-135/480	170/-120	80/-85	75	430	1135
AUTOBRAKE MAX	2830	175/-180	95/125	-135/480	170/-115	80/-85	85	430	1135
AUTOBRAKE 3	2980	170/-180	95/130	-140/495	145/-95	85/-90	115	365	1040
Poor Reported Braking Action									
MAX MANUAL	3185	205/-210	110/150	-160/585	240/-160	90/-95	85	590	1610
AUTOBRAKE MAX	3175	205/-210	110/150	-160/585	240/-155	90/-95	90	585	1600
AUTOBRAKE 3	3240	200/-205	110/150	-160/590	225/-140	95/-100	110	565	1595

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.
Reference Distance includes an air distance allowance of 455 m from threshold to touchdown.
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 Per Brake (Millions of Foot Pounds)

		WIND CORRECTED 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
80	0	15.1	17.0	19.3	22.4	25.3	28.9	30.9	35.0	40.2	40.4	45.9	53.0	50.8	57.9	67.3	60.8	69.6	81.2
	10	15.6	17.6	20.0	23.1	26.1	29.8	31.9	36.2	41.5	41.8	47.5	54.8	52.5	59.9	69.5	62.8	71.9	83.9
	15	15.8	17.8	20.2	23.5	26.5	30.3	32.4	36.7	42.1	42.4	48.2	55.6	53.3	60.7	70.5	63.7	72.9	85.1
	20	16.0	18.1	20.5	23.8	26.9	30.7	32.8	37.2	42.7	42.9	48.8	56.3	54.0	61.5	71.4	64.6	73.9	86.2
	30	16.4	18.5	21.1	24.4	27.6	31.5	33.7	38.2	43.8	44.0	50.0	57.7	55.3	63.1	73.2	66.2	75.7	88.4
	40	16.6	18.7	21.3	24.7	27.9	31.9	34.1	38.7	44.4	44.7	50.9	58.8	56.3	64.3	74.8	67.5	77.4	90.5
	50	16.6	18.7	21.3	24.8	28.0	32.1	34.3	39.0	44.9	45.2	51.5	59.7	57.1	65.4	76.3	68.7	79.0	92.9
70	0	13.7	15.4	17.5	20.2	22.8	26.0	27.7	31.3	35.9	36.1	41.0	47.2	45.3	51.6	59.7	54.9	62.7	72.9
	10	14.2	15.9	18.1	20.8	23.5	26.8	28.6	32.4	37.1	37.3	42.3	48.7	46.8	53.3	61.6	56.7	64.8	75.4
	15	14.4	16.2	18.4	21.1	23.9	27.2	29.0	32.8	37.6	37.8	43.0	49.4	47.5	54.0	62.5	57.5	65.7	76.4
	20	14.6	16.4	18.6	21.4	24.2	27.6	29.4	33.3	38.1	38.4	43.5	50.1	48.1	54.8	63.4	58.3	66.5	77.4
	30	14.9	16.8	19.1	22.0	24.8	28.3	30.2	34.1	39.1	39.3	44.6	51.4	49.3	56.1	64.9	59.8	68.2	79.4
	40	15.1	17.0	19.3	22.2	25.1	28.6	30.5	34.6	39.6	39.9	45.3	52.2	50.1	57.1	66.2	60.9	69.6	81.2
	50	15.1	17.0	19.3	22.3	25.2	28.8	30.7	34.8	40.0	40.2	45.8	52.9	50.7	58.0	67.4	61.8	70.9	83.0
60	0	12.3	13.9	15.7	18.0	20.3	23.1	24.4	27.6	31.6	31.7	35.9	41.2	39.6	45.0	51.8	48.1	54.8	63.5
	10	12.7	14.3	16.3	18.5	20.9	23.8	25.2	28.5	32.6	32.7	37.1	42.6	40.9	46.5	53.6	49.7	56.6	65.6
	15	12.9	14.6	16.5	18.8	21.2	24.2	25.6	29.0	33.1	33.2	37.6	43.2	41.5	47.1	54.4	50.4	57.4	66.5
	20	13.1	14.8	16.7	19.1	21.5	24.5	26.0	29.4	33.5	33.6	38.1	43.8	42.0	47.8	55.1	51.1	58.2	67.4
	30	13.4	15.1	17.2	19.6	22.1	25.1	26.6	30.1	34.4	34.5	39.1	44.9	43.1	49.0	56.5	52.3	59.6	69.1
	40	13.6	15.3	17.3	19.8	22.3	25.4	26.9	30.5	34.9	35.0	39.7	45.6	43.8	49.8	57.5	53.2	60.7	70.5
	50	13.5	15.3	17.3	19.8	22.4	25.5	27.0	30.6	35.1	35.2	40.0	46.0	44.2	50.4	58.3	53.9	61.7	71.9
50	0	11.0	12.3	14.0	15.7	17.7	20.2	21.2	23.9	27.3	27.2	30.8	35.3	33.8	38.3	44.1	40.9	46.4	53.6
	10	11.3	12.7	14.4	16.3	18.3	20.8	21.9	24.7	28.2	28.1	31.8	36.5	34.9	39.6	45.5	42.2	48.0	55.4
	15	11.5	12.9	14.7	16.5	18.6	21.1	22.2	25.1	28.6	28.6	32.3	37.0	35.4	40.2	46.2	42.8	48.7	56.2
	20	11.6	13.1	14.9	16.7	18.9	21.4	22.5	25.4	29.0	28.9	32.8	37.5	35.9	40.7	46.8	43.4	49.3	56.9
	30	11.9	13.4	15.2	17.2	19.3	22.0	23.1	26.1	29.7	29.7	33.6	38.4	36.8	41.8	48.0	44.5	50.6	58.4
	40	12.1	13.6	15.4	17.3	19.5	22.2	23.4	26.4	30.1	30.1	34.0	39.0	37.4	42.4	48.8	45.2	51.4	59.4
	50	12.0	13.6	15.4	17.3	19.6	22.3	23.4	26.5	30.3	30.2	34.2	39.3	37.6	42.8	49.3	45.7	52.1	60.3
40	0	9.6	10.8	12.3	13.5	15.2	17.3	17.9	20.2	23.0	22.8	25.8	29.4	28.1	31.8	36.4	33.7	38.2	43.9
	10	10.0	11.2	12.7	14.0	15.8	17.9	18.5	20.9	23.8	23.6	26.6	30.4	29.0	32.8	37.6	34.8	39.5	45.4
	15	10.1	11.4	12.9	14.2	16.0	18.1	18.8	21.2	24.1	23.9	27.0	30.8	29.4	33.3	38.2	35.3	40.0	46.0
	20	10.2	11.5	13.1	14.4	16.2	18.4	19.1	21.5	24.5	24.2	27.4	31.3	29.8	33.8	38.7	35.8	40.6	46.6
	30	10.5	11.8	13.4	14.8	16.6	18.9	19.6	22.1	25.1	24.9	28.1	32.1	30.6	34.6	39.7	36.7	41.6	47.8
	40	10.6	11.9	13.5	14.9	16.8	19.1	19.8	22.3	25.4	25.2	28.4	32.5	31.0	35.1	40.2	37.2	42.2	48.6
	50	10.6	11.9	13.5	14.9	16.8	19.1	19.8	22.3	25.5	25.2	28.6	32.7	31.1	35.3	40.6	37.5	42.6	49.1

***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

Adjusted Brake Energy Per Brake (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	7.8	16.3	25.3	34.7	44.7	55.0	65.7	76.6	87.9
	MAX AUTO	7.5	15.4	23.6	32.4	41.8	51.8	62.5	74.1	86.5
	AUTOBRAKE 3	7.3	14.7	22.3	30.2	38.6	47.6	57.4	68.1	80.0
	AUTOBRAKE 2	7.0	13.8	20.5	27.4	34.8	42.7	51.5	61.3	72.4
	AUTOBRAKE 1	6.7	13.1	19.2	25.3	31.8	38.8	46.6	55.4	65.5

Two Engine Detent Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
RTO MAX MAN		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	7.0	14.6	22.8	31.4	40.5	49.9	59.7	69.8	80.0
	MAX AUTO	5.8	12.3	19.5	27.2	35.6	44.5	53.9	63.7	74.1
	AUTOBRAKE 3	4.3	9.2	14.7	20.7	27.2	34.4	42.0	50.2	59.0
	AUTOBRAKE 2	2.5	5.6	9.1	13.1	17.8	23.0	28.8	35.2	42.3
	AUTOBRAKE 1	1.8	3.8	6.1	8.8	11.9	15.5	19.6	24.4	29.8

Cooling Time (Minutes) - Category C Steel Brakes

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
	16 & BELOW	17	20	23	25	28	32	33 TO 48	49 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS								
	UP TO 2.4	2.6	3.1	3.5	3.9	4.4	4.9	5.0 TO 7.5	7.5 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	1	2	3	4	5	6	CAUTION	FUSE PLUG MELT ZONE
GROUND		10	20	30	40	50	60		

Cooling Time (Minutes) - Category N Carbon Brakes

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
	16 & BELOW	17	19	20.9	23.5	26.9	29.4	30 TO 41	41 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS								
	UP TO 2.5	2.6	3	3.3	3.8	4.5	4.9	5.0 TO 7.1	7.1 & ABOVE
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	1	4	5	6	7	7.6	CAUTION	FUSE PLUG MELT ZONE
GROUND		6.7	16.0	24.1	34.2	45.9	53.3		

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 per brake 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 to 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 monitor system (BTMS) indication on CDS systems page may be used 10 to 15 minutes after airplane has come to a complete stop or inflight with gear retracted to determine recommended cooling schedule.

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	96.8	96.6	96.3	96.1	95.9	95.4	95.0	94.7	93.9
15	97.4	97.2	96.9	96.8	96.6	96.2	95.7	95.5	94.8
10	98.0	97.8	97.5	97.4	97.4	96.9	96.5	96.3	95.7
5	98.3	98.6	98.3	98.1	98.1	97.7	97.3	97.1	96.6
0	97.5	98.7	99.2	99.0	98.9	98.5	98.2	98.0	97.5
-5	96.7	98.0	99.1	99.8	99.7	99.3	98.9	98.7	98.4
-10	96.0	97.2	98.4	99.6	100.5	100.2	99.8	99.6	99.4
-15	95.2	96.4	97.6	98.8	100.1	101.0	100.8	100.6	100.3
-20	94.4	95.6	96.8	98.0	99.3	100.5	101.1	100.8	100.6
-25	93.6	94.9	96.0	97.2	98.5	99.7	100.2	100.0	99.8
-30	92.8	94.1	95.2	96.4	97.7	98.8	99.4	99.2	99.0
-35	92.0	93.2	94.4	95.6	96.8	98.0	98.5	98.3	98.1
-40	91.2	92.4	93.5	94.7	96.0	97.1	97.6	97.4	97.2

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)								
	25	27	29	31	33	35	37	39	41
ENGINE ANTI-ICE	-1.2	-1.1	-1.0	-0.9	-0.8	-0.8	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE	-4.2	-4.4	-4.5	-4.7	-5.0	-4.8	-4.8	-4.8	-4.8

ENGINE INOP

Max Continuous %N1
37000 FT to 29000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.51	96.6	97.6	98.5	99.4	100.2	99.6	98.8	97.6	96.3	94.7	93.2	91.8
200	.63	96.0	96.9	97.8	98.7	99.6	100.4	100.1	99.3	98.4	97.5	96.3	95.2
240	.74	95.1	96.0	96.8	97.7	98.6	99.4	100.3	100.7	100.0	99.2	98.4	97.5
280	.86	94.3	95.2	96.1	97.0	97.8	98.7	99.5	100.4	101.2	100.9	100.0	99.1

35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.49	96.5	97.4	98.3	99.2	100.1	99.8	99.0	98.0	96.8	95.4	94.0	92.7
200	.60	96.1	97.0	97.9	98.8	99.7	100.6	100.5	99.6	98.6	97.6	96.5	95.4
240	.71	95.0	95.9	96.8	97.7	98.6	99.4	100.3	100.8	100.2	99.5	98.6	97.7
280	.82	93.8	94.6	95.5	96.4	97.3	98.1	98.9	99.8	100.6	100.3	99.5	98.8

33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.47	97.4	98.3	99.2	100.0	100.8	100.0	99.1	97.9	96.7	95.3	93.9	92.6
200	.58	97.0	97.9	98.8	99.7	100.6	101.4	100.6	99.6	98.6	97.5	96.3	95.1
240	.68	95.9	96.8	97.7	98.5	99.4	100.2	101.1	100.9	100.2	99.4	98.4	97.4
280	.79	94.3	95.1	96.0	96.8	97.7	98.5	99.3	100.2	100.5	99.7	98.9	98.1
320	.89	93.6	94.5	95.4	96.2	97.1	97.9	98.7	99.5	100.3	101.1	100.7	99.8

31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.45	97.3	98.2	99.1	100.0	100.9	101.1	100.2	99.2	98.0	96.6	95.2	93.9
200	.55	97.1	98.0	98.9	99.7	100.6	101.5	101.6	100.7	99.7	98.6	97.4	96.2
240	.66	95.6	96.5	97.4	98.3	99.1	100.0	100.8	101.3	100.5	99.8	98.8	97.8
280	.76	93.8	94.7	95.5	96.4	97.2	98.0	98.8	99.7	100.5	99.8	98.9	98.0
320	.85	92.4	93.2	94.1	94.9	95.7	96.5	97.4	98.2	98.9	99.7	99.9	99.1

29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.43	98.1	99.0	99.9	100.8	101.6	101.2	100.2	99.1	97.9	96.4	95.1	93.8
200	.53	97.5	98.4	99.3	100.2	101.0	101.9	101.3	100.4	99.3	98.2	96.9	95.8
240	.63	96.3	97.1	98.0	98.9	99.7	100.5	101.4	101.1	100.2	99.2	98.3	97.2
280	.73	94.2	95.0	95.9	96.7	97.5	98.3	99.1	99.9	100.1	99.1	98.2	97.5
320	.82	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.5	99.2	98.5	97.6
360	.91	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.5	99.2	100.0	100.1

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	29	31	33	35	37
ENGINE ANTI-ICE ON	-0.9	-0.9	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE ON	-4.1	-4.3	-4.5	-4.7	-4.7

ENGINE INOP

Max Continuous %N1
27000 FT to 20000 FT Pressure Altitudes

27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.41	98.0	98.8	99.7	100.6	101.4	102.2	101.2	100.2	99.0	97.8	96.4	95.1
200	.51	96.9	97.8	98.7	99.6	100.4	101.2	101.8	100.8	99.9	98.8	97.6	96.4
240	.60	95.6	96.5	97.4	98.2	99.1	99.9	100.7	101.3	100.4	99.4	98.5	97.5
280	.70	93.6	94.4	95.3	96.1	96.9	97.7	98.5	99.3	100.1	99.4	98.4	97.6
320	.79	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.2	98.0	98.7	98.6	97.8
360	.88	91.0	91.8	92.6	93.4	94.2	95.0	95.8	96.6	97.3	98.1	98.8	99.4
25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.39	98.8	99.7	100.5	101.4	102.2	102.4	101.4	100.3	99.1	97.7	96.5	95.2
200	.49	97.5	98.3	99.2	100.0	100.9	101.7	101.5	100.6	99.5	98.4	97.3	96.2
240	.58	95.7	96.5	97.4	98.2	99.0	99.9	100.7	100.5	99.5	98.6	97.6	96.7
280	.67	93.9	94.7	95.5	96.3	97.1	97.9	98.7	99.5	99.5	98.6	97.6	96.9
320	.76	91.7	92.6	93.4	94.2	95.0	95.8	96.5	97.3	98.0	98.6	97.8	97.2
360	.85	90.4	91.2	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.6	98.4	98.2
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.38	98.6	99.5	100.4	101.2	102.1	102.9	101.9	100.8	99.6	98.4	97.1	95.8
200	.48	97.5	98.4	99.2	100.1	100.9	101.8	102.2	101.1	100.1	99.0	97.8	96.7
240	.57	95.9	96.8	97.6	98.5	99.3	100.1	100.9	101.2	100.2	99.2	98.2	97.3
280	.66	94.2	95.1	95.9	96.7	97.5	98.3	99.1	99.9	100.4	99.4	98.3	97.5
320	.75	92.1	93.0	93.8	94.6	95.4	96.2	96.9	97.7	98.5	99.2	98.6	97.8
360	.83	90.6	91.4	92.2	93.1	93.9	94.7	95.5	96.2	97.0	97.8	98.5	98.6
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.37	99.1	100.0	100.9	101.7	102.5	102.8	101.8	100.7	99.5	98.2	97.0	95.8
200	.46	98.4	99.3	100.1	101.0	101.8	102.6	102.3	101.2	100.0	98.9	97.8	96.8
240	.55	97.2	98.1	98.9	99.7	100.5	101.3	102.1	101.6	100.5	99.4	98.5	97.5
280	.63	95.7	96.5	97.4	98.2	99.0	99.8	100.6	101.3	101.0	99.8	98.9	98.1
320	.72	93.9	94.7	95.5	96.3	97.1	97.9	98.6	99.4	100.1	100.2	99.3	98.6
360	.80	92.2	93.0	93.8	94.6	95.4	96.1	96.9	97.7	98.4	99.2	99.7	99.1
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.35	98.7	99.5	100.4	101.2	102.0	102.8	102.5	101.5	100.4	99.2	98.0	96.8
200	.44	98.3	99.2	100.0	100.9	101.7	102.5	103.3	102.3	101.1	100.0	98.9	97.8
240	.53	97.5	98.4	99.2	100.0	100.8	101.7	102.5	103.1	101.8	100.5	99.5	98.6
280	.61	96.2	97.0	97.8	98.7	99.5	100.3	101.1	101.8	102.5	101.3	100.1	99.3
320	.69	94.7	95.5	96.3	97.1	97.9	98.7	99.5	100.2	101.0	101.7	100.9	99.9
360	.77	93.0	93.8	94.6	95.4	96.2	97.0	97.7	98.5	99.2	100.0	100.7	100.4

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	20	22	24	25	27
ENGINE ANTI-ICE ON	-0.9	-0.9	-1.0	-1.0	-1.0
ENGINE & WING ANTI-ICE ON	-3.6	-3.8	-3.8	-3.9	-4.0

ENGINE INOP

Max Continuous %N1
18000 FT to 12000 FT Pressure Altitudes

18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.34	98.5	99.3	100.2	101.0	101.8	102.6	101.6	100.3	99.2	98.1	97.0	95.9
200	.42	98.7	99.6	100.4	101.2	102.0	102.8	103.1	101.7	100.4	99.3	98.3	97.3
240	.51	97.8	98.7	99.5	100.3	101.1	101.9	102.7	102.5	101.1	99.9	99.0	98.1
280	.59	96.3	97.1	97.9	98.7	99.5	100.3	101.0	101.8	101.6	100.5	99.6	98.8
320	.67	94.8	95.6	96.4	97.2	97.9	98.7	99.5	100.2	101.0	100.9	100.0	99.2
360	.75	93.0	93.8	94.6	95.3	96.1	96.9	97.6	98.4	99.1	99.9	100.2	99.6

16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.33	97.1	98.0	98.8	99.6	100.4	101.2	101.6	100.3	99.1	98.1	97.1	96.1
200	.41	98.0	98.8	99.6	100.4	101.2	102.0	102.8	102.5	101.3	100.2	99.3	98.3
240	.49	97.1	97.9	98.7	99.5	100.3	101.1	101.9	102.7	101.8	100.5	99.6	98.7
280	.57	95.6	96.4	97.2	98.0	98.8	99.6	100.3	101.1	101.8	100.9	99.8	99.0
320	.64	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.4	100.2	100.9	100.2	99.4
360	.72	92.1	92.9	93.7	94.5	95.3	96.1	96.9	97.7	98.4	99.2	99.9	99.6

14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
160	.31	96.6	97.4	98.2	99.0	99.8	100.6	100.4	99.1	98.0	97.1	96.2	95.3
200	.39	97.1	97.9	98.7	99.5	100.3	101.1	101.8	101.5	101.0	100.1	99.3	98.4
240	.47	96.6	97.4	98.2	99.0	99.8	100.6	101.3	101.8	101.1	100.3	99.5	98.7
280	.54	95.5	96.3	97.1	97.8	98.6	99.4	100.1	100.9	101.0	100.1	99.2	98.5
320	.62	94.1	94.9	95.7	96.5	97.2	98.0	98.7	99.5	100.2	100.3	99.5	98.8
360	.69	92.2	93.1	93.9	94.7	95.5	96.3	97.0	97.8	98.6	99.3	99.6	99.0

12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.30	96.3	97.0	97.8	98.6	99.4	100.1	99.3	98.1	97.1	96.3	95.4	94.5
200	.38	97.1	97.9	98.7	99.5	100.3	101.0	101.5	100.8	99.8	99.0	98.2	97.3
240	.45	96.5	97.3	98.0	98.8	99.6	100.3	101.1	101.0	100.1	99.4	98.6	97.9
280	.52	95.5	96.3	97.0	97.8	98.6	99.3	100.0	100.8	100.3	99.4	98.6	98.0
320	.60	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.4	100.2	99.7	98.9	98.2
360	.67	92.3	93.2	94.0	94.8	95.6	96.4	97.1	97.9	98.7	99.4	99.1	98.5

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	12	14	16	18
ENGINE ANTI-ICE ON	-0.9	-0.9	-0.9	-0.9
ENGINE & WING ANTI-ICE ON	-3.2	-3.4	-3.4	-3.5

ENGINE INOP

Max Continuous %N1
10000 FT to 1000 FT Pressure Altitudes

10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.29	95.2	96.0	96.8	97.6	98.3	99.1	99.8	98.6	97.4	96.6	95.8	94.9
200	.36	96.0	96.7	97.5	98.3	99.0	99.8	100.5	100.5	99.4	98.5	97.8	97.0
240	.43	95.6	96.4	97.2	97.9	98.7	99.4	100.2	100.9	100.1	99.2	98.4	97.7
280	.51	94.5	95.3	96.1	96.9	97.6	98.4	99.1	99.9	100.4	99.5	98.7	98.0
320	.58	93.0	93.9	94.7	95.5	96.2	97.0	97.8	98.6	99.3	99.7	99.0	98.2
360	.65	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.2	98.0	98.7	99.1	98.5

5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
160	.26	94.9	95.7	96.4	97.2	98.0	98.8	99.2	98.3	97.4	96.6	95.9	95.1
200	.33	94.7	95.5	96.3	97.1	97.8	98.6	99.4	98.9	98.0	97.3	96.6	95.8
240	.40	94.0	94.8	95.6	96.4	97.2	97.9	98.7	99.5	98.7	97.9	97.2	96.5
280	.46	93.3	94.1	94.9	95.7	96.5	97.3	98.1	98.8	98.9	98.2	97.5	96.8
320	.53	92.5	93.3	94.1	94.9	95.7	96.5	97.2	98.0	98.7	98.4	97.7	97.1
360	.59	91.5	92.3	93.1	93.9	94.7	95.5	96.2	97.0	97.8	98.5	98.0	97.3

3000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.26	94.8	95.6	96.4	97.2	98.0	98.7	98.8	97.9	97.1	96.4	95.6	94.8
200	.32	94.5	95.3	96.1	96.9	97.6	98.4	99.2	98.3	97.5	96.8	96.1	95.3
240	.38	94.1	94.9	95.6	96.4	97.2	98.0	98.7	98.8	98.0	97.2	96.6	95.9
280	.45	93.2	94.0	94.8	95.6	96.4	97.2	97.9	98.7	98.3	97.5	96.9	96.2
320	.51	92.5	93.3	94.1	94.9	95.7	96.4	97.2	98.0	98.5	97.8	97.1	96.5
360	.57	91.6	92.4	93.2	94.0	94.7	95.5	96.3	97.1	97.8	98.1	97.4	96.8

1000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.25	93.9	94.7	95.4	96.2	97.0	97.8	98.5	98.2	97.4	96.7	96.0	95.2
200	.31	93.5	94.3	95.1	95.9	96.7	97.4	98.2	98.5	97.8	97.0	96.3	95.6
240	.37	93.0	93.8	94.6	95.4	96.1	96.9	97.7	98.4	98.1	97.3	96.6	95.9
280	.43	92.3	93.2	93.9	94.7	95.5	96.3	97.1	97.8	98.3	97.6	96.9	96.2
320	.49	91.6	92.4	93.2	94.0	94.8	95.6	96.3	97.1	97.9	97.9	97.2	96.5
360	.55	90.7	91.5	92.3	93.1	93.9	94.7	95.4	96.2	96.9	97.7	97.3	96.6

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	1	3	5	10
ENGINE ANTI-ICE ON	-0.6	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE ON	-2.9	-3.0	-2.7	-3.2

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
85	82	271	18500	17300	15900
80	77	263	20200	19000	17700
75	72	255	21600	20600	19400
70	67	247	23100	22200	21100
65	62	238	24700	23800	22800
60	57	229	26800	25800	24700
55	53	219	29100	28100	27000
50	48	209	31200	30400	29400
45	43	199	33300	32600	31700
40	38	187	35600	34900	34000

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

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
138	128	120	112	106	100	95	90	86	82	78
275	256	239	225	212	200	190	180	172	164	157
413	384	359	337	317	300	284	270	258	246	235
551	512	479	449	423	400	379	360	344	328	314
689	640	598	562	529	500	474	451	429	410	392
826	768	718	674	635	600	569	541	515	492	471
964	896	838	786	741	700	664	631	601	574	549
1102	1025	957	898	846	800	758	721	687	656	628
1240	1153	1077	1011	952	900	853	811	773	738	706
1377	1281	1197	1123	1058	1000	948	901	859	820	785
1515	1409	1317	1235	1164	1100	1043	991	945	902	863
1653	1537	1436	1348	1270	1200	1138	1081	1030	984	942
1792	1666	1556	1460	1375	1300	1232	1171	1116	1066	1020
1930	1794	1676	1573	1481	1400	1327	1261	1202	1148	1098
2068	1922	1796	1685	1587	1500	1422	1351	1288	1230	1177
2207	2051	1916	1798	1693	1600	1517	1441	1373	1312	1255
2345	2180	2036	1910	1799	1700	1611	1531	1459	1393	1333
2484	2309	2156	2023	1905	1800	1706	1621	1545	1475	1411

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	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0:16
200	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.3	0:33
300	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	0:49
400	1.6	1.8	1.9	2.0	2.2	2.3	2.5	2.6	2.8	2.9	1:06
500	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.3	3.5	3.7	1:22
600	2.4	2.7	2.9	3.1	3.3	3.6	3.8	4.0	4.3	4.5	1:39
700	2.8	3.1	3.4	3.6	3.9	4.2	4.5	4.7	5.0	5.3	1:55
800	3.2	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6.1	2:11
900	3.6	4.0	4.3	4.7	5.0	5.4	5.7	6.1	6.4	6.8	2:28
1000	4.0	4.4	4.8	5.2	5.6	6.0	6.4	6.7	7.1	7.6	2:44
1100	4.4	4.8	5.3	5.7	6.1	6.6	7.0	7.4	7.9	8.3	3:01
1200	4.8	5.3	5.7	6.2	6.7	7.1	7.6	8.1	8.6	9.0	3:17
1300	5.2	5.7	6.2	6.7	7.2	7.7	8.2	8.7	9.2	9.8	3:34
1400	5.5	6.1	6.6	7.2	7.7	8.3	8.8	9.4	9.9	10.5	3:51
1500	5.9	6.5	7.1	7.7	8.3	8.9	9.4	10.0	10.6	11.2	4:07
1600	6.3	6.9	7.5	8.2	8.8	9.4	10.0	10.7	11.3	12.0	4:24
1700	6.6	7.3	8.0	8.6	9.3	10.0	10.6	11.3	12.0	12.7	4:41
1800	7.0	7.7	8.4	9.1	9.8	10.5	11.2	11.9	12.6	13.4	4:57

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	15200	12600	9900
80	17200	15300	12500
75	19200	17400	15000
70	20900	19700	17300
65	22500	21300	19800
60	24100	23000	21600
55	26300	24800	23500
50	29000	27700	25800
45	31400	30500	29200
40	33800	33000	31800

With engine anti-ice on, decrease altitude capability by 1200 ft.
With engine and wing anti-ice on, decrease altitude capability by 5500 ft.

ENGINE INOP

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT) 10	15	17	19	21	23	25	27	29	31
85	%N1	91.8	95.5	97.9							
	MACH	.561	.600	.616							
	KIAS	311	303	300							
	FF/ENG	3067	3033	3052							
80	%N1	90.1	94.0	95.9	98.5						
	MACH	.545	.590	.603	.621						
	KIAS	302	299	294	291						
	FF/ENG	2875	2870	2846	2886						
75	%N1	88.4	92.5	94.0	96.1						
	MACH	.528	.579	.593	.607						
	KIAS	293	293	288	284						
	FF/ENG	2684	2709	2674	2662						
70	%N1	86.5	90.7	92.3	94.0	96.2					
	MACH	.510	.562	.582	.595	.610					
	KIAS	282	284	283	278	274					
	FF/ENG	2494	2518	2520	2481	2487					
65	%N1	84.5	88.7	90.4	92.2	93.9	96.4				
	MACH	.491	.542	.563	.584	.596	.612				
	KIAS	271	274	274	273	268	265				
	FF/ENG	2306	2327	2330	2330	2295	2317				
60	%N1	82.3	86.5	88.3	90.0	91.9	93.7	96.4			
	MACH	.471	.521	.543	.564	.585	.597	.614			
	KIAS	261	263	263	263	263	258	254			
	FF/ENG	2124	2137	2139	2140	2143	2114	2146			
55	%N1	80.2	84.2	85.9	87.7	89.5	91.4	93.3	96.2		
	MACH	.453	.498	.520	.541	.563	.585	.597	.614		
	KIAS	250	251	252	252	253	252	247	244		
	FF/ENG	1954	1948	1950	1950	1953	1958	1938	1971		
50	%N1	77.8	81.6	83.4	85.2	87.0	88.7	90.7	92.7	95.7	
	MACH	.434	.475	.495	.516	.538	.561	.583	.596	.613	
	KIAS	240	239	239	240	241	241	241	236	233	
	FF/ENG	1791	1764	1762	1762	1764	1767	1777	1765	1793	
45	%N1	75.5	79.1	80.6	82.3	84.1	85.9	87.7	89.7	91.8	94.8
	MACH	.415	.452	.469	.489	.511	.533	.556	.578	.593	.610
	KIAS	229	227	227	227	228	229	229	229	225	222
	FF/ENG	1636	1594	1582	1575	1577	1580	1586	1600	1593	1613
40	%N1	73.0	76.2	77.8	79.4	81.0	82.8	84.6	86.4	88.3	90.7
	MACH	.395	.429	.445	.462	.480	.502	.525	.548	.571	.589
	KIAS	218	215	215	214	214	215	216	216	216	214
	FF/ENG	1485	1434	1416	1402	1392	1394	1400	1410	1421	1424

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

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
298	272	249	230	214	200	190	180	172	164	158
600	547	501	462	429	400	379	361	344	328	315
903	823	753	694	644	600	570	542	517	494	473
1209	1100	1005	926	859	800	759	721	687	657	630
1516	1379	1259	1159	1075	1000	949	902	859	820	786
1825	1659	1513	1393	1290	1200	1139	1082	1031	984	943
2137	1940	1768	1626	1506	1400	1328	1262	1202	1147	1099
2450	2222	2024	1860	1722	1600	1518	1442	1373	1311	1256
2766	2507	2281	2095	1938	1800	1707	1622	1544	1474	1412
3083	2792	2539	2331	2155	2000	1896	1801	1715	1637	1568

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	1.4	0:43	1.2	0:41	1.1	0:39	1.0	0:38	0.9	0:37
400	2.8	1:23	2.6	1:19	2.4	1:14	2.2	1:11	2.1	1:09
600	4.3	2:04	3.9	1:57	3.6	1:50	3.4	1:45	3.2	1:42
800	5.7	2:46	5.2	2:36	4.9	2:26	4.5	2:19	4.4	2:14
1000	7.1	3:28	6.6	3:15	6.1	3:03	5.7	2:53	5.5	2:47
1200	8.5	4:10	7.9	3:55	7.3	3:40	6.8	3:28	6.6	3:21
1400	9.8	4:53	9.1	4:36	8.5	4:18	8.0	4:02	7.7	3:54
1600	11.2	5:36	10.4	5:16	9.7	4:55	9.1	4:38	8.7	4:28
1800	12.5	6:20	11.7	5:58	10.9	5:34	10.2	5:13	9.8	5:02
2000	13.9	7:05	12.9	6:39	12.0	6:13	11.3	5:49	10.8	5:36

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)								
	40	45	50	55	60	65	70	75	80
1	-0.1	-0.1	-0.1	0.0	0.0	0.1	0.1	0.2	0.3
2	-0.3	-0.2	-0.1	-0.1	0.0	0.2	0.3	0.6	0.8
3	-0.4	-0.3	-0.2	-0.1	0.0	0.3	0.5	0.9	1.2
4	-0.6	-0.4	-0.3	-0.1	0.0	0.3	0.7	1.2	1.6
5	-0.7	-0.5	-0.4	-0.2	0.0	0.4	0.9	1.4	2.0
6	-0.8	-0.6	-0.4	-0.2	0.0	0.5	1.1	1.7	2.4
7	-1.0	-0.8	-0.5	-0.3	0.0	0.6	1.2	2.0	2.8
8	-1.1	-0.9	-0.6	-0.3	0.0	0.6	1.4	2.2	3.2
9	-1.3	-1.0	-0.7	-0.3	0.0	0.7	1.5	2.4	3.5
10	-1.4	-1.1	-0.7	-0.4	0.0	0.7	1.6	2.6	3.8
11	-1.6	-1.2	-0.8	-0.4	0.0	0.8	1.7	2.8	4.1
12	-1.7	-1.3	-0.9	-0.4	0.0	0.8	1.9	3.0	4.4
13	-1.9	-1.4	-0.9	-0.5	0.0	0.9	2.0	3.2	4.7
14	-2.0	-1.5	-1.0	-0.5	0.0	0.9	2.0	3.4	4.9

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	81.1	84.1	88.3	92.8				
	KIAS	250	251	252	253				
	FF/ENG	2740	2730	2750	2800				
80	%N1	79.5	82.4	86.5	91.0	98.3			
	KIAS	242	243	244	245	247			
	FF/ENG	2580	2570	2570	2610	2740			
75	%N1	77.8	80.5	84.7	89.1	95.0			
	KIAS	235	236	236	238	239			
	FF/ENG	2420	2400	2400	2420	2490			
70	%N1	76.0	78.6	82.8	87.1	92.1			
	KIAS	227	227	228	229	231			
	FF/ENG	2260	2240	2230	2250	2270			
65	%N1	74.0	76.7	80.8	85.0	89.7	97.7		
	KIAS	219	219	220	221	222	224		
	FF/ENG	2100	2090	2070	2070	2080	2230		
60	%N1	71.7	74.6	78.5	82.8	87.4	93.7		
	KIAS	210	210	211	212	213	214		
	FF/ENG	1950	1930	1910	1910	1910	1970		
55	%N1	69.4	72.3	76.3	80.5	84.9	90.0		
	KIAS	200	201	202	203	204	205		
	FF/ENG	1800	1770	1750	1740	1730	1760		
50	%N1	67.0	69.7	73.8	77.8	82.3	87.0	94.9	
	KIAS	191	191	192	193	194	195	196	
	FF/ENG	1650	1620	1600	1580	1570	1570	1680	
45	%N1	64.3	66.9	71.0	75.0	79.4	84.0	89.6	
	KIAS	184	184	184	184	184	185	186	
	FF/ENG	1500	1470	1440	1430	1400	1400	1450	
40	%N1	61.1	64.0	67.8	72.0	76.2	80.7	85.4	94.1
	KIAS	177	177	177	177	177	177	177	177
	FF/ENG	1350	1330	1300	1270	1250	1240	1260	1360

This table includes 5% additional fuel for holding in a racetrack pattern.

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
52	50	-10	-120			
50	80	20	-80	-200		
48	110	50	-50	-160		
46	140	70	-30	-130	-250	
44	170	100	0	-100	-220	
42	200	130	30	-80	-190	-320
40	220	160	50	-50	-160	-300
38	250	190	80	-20	-140	-280
36	270	220	110	0	-120	-250
34	270	250	140	20	-100	-230
32	270	270	160	40	-70	-210
30	280	270	180	60	-60	-190
20	290	280	200	90	-20	-130
10	300	290	210	100	-10	-120
0	310	300	210	100	-10	-120
-20	330	320	230	110	0	-120
-40	350	340	240	120	0	-120

Rate of climb capability shown is valid for 60000 kg, gear down at VREF15+5.
Decrease rate of climb 120 ft/min per 5000 kg greater than 60000 kg.
Increase rate of climb 160 ft/min per 5000 kg less than 60000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-250	-310	-420			
50	-220	-290	-390	-510		
48	-190	-260	-360	-480		
46	-170	-240	-340	-450	-570	
44	-140	-210	-320	-420	-540	
42	-110	-180	-290	-400	-510	-650
40	-90	-160	-260	-370	-490	-630
38	-60	-130	-240	-350	-470	-610
36	-40	-100	-210	-320	-450	-580
34	-40	-70	-180	-300	-430	-560
32	-40	-50	-160	-290	-410	-540
30	-40	-50	-150	-270	-390	-520
20	-30	-50	-130	-240	-350	-470
10	-20	-40	-130	-240	-360	-470
0	-20	-40	-130	-240	-360	-470
-20	-10	-30	-130	-250	-370	-490
-40	-10	-30	-130	-250	-380	-500

Rate of climb capability shown is valid for 60000 kg, gear down at VREF30+5.
Decrease rate of climb 120 ft/min per 5000 kg greater than 60000 kg.
Increase rate of climb 170 ft/min per 5000 kg less than 60000 kg.

ALTERNATE MODE EEC

Alternate Mode EEC Limit Weight

PERFORMANCE LIMIT	NORMAL MODE PERFORMANCE LIMIT WEIGHT (1000 KG)										
	46	50	54	58	62	66	70	74	78	82	86
FIELD	43.1	46.8	50.5	54.3	58.0	61.7	65.4	69.1	72.8	76.6	80.3
CLIMB	42.0	45.6	49.3	52.9	56.5	60.2	63.8	67.5	71.1	74.8	78.4
OBSTACLE	42.3	45.9	49.5	53.1	56.7	60.3	64.0	67.6	71.2	74.8	78.4
TIRE	46.0	50.0	54.0	58.0	62.0	65.7	69.7	73.6	77.6	81.6	85.6
BRAKE	46.0	50.0	54.0	58.0	62.0	65.6	69.5	73.3	77.1	80.9	84.7

Alternate Mode EEC Takeoff Speed Adjustment

TAKEOFF SPEEDS	TAKEOFF SPEED ADJUSTMENT (KTS)
DRY V1	+1
WET V1	+2
VR	+1
V2	0

Alternate Mode EEC Max Takeoff %N1

Based on engine bleeds for packs on, engine and wing anti-ice on or off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)												
°C	°F	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
60	140	93.5	94.2	94.7	95.0	95.4	95.5	95.5	95.5	95.1	94.6	94.2	94.9	95.6
55	131	94.6	95.0	95.2	95.5	95.8	96.1	96.3	96.3	96.0	95.6	95.1	95.0	95.0
50	122	95.9	96.3	96.5	96.4	96.3	96.7	97.0	97.0	96.9	96.6	96.2	96.2	96.1
45	113	96.7	97.3	97.9	97.7	97.5	97.6	97.8	97.8	97.7	97.6	97.3	97.3	97.3
40	104	97.3	98.0	98.6	98.6	98.5	98.5	98.5	98.4	98.5	98.5	98.4	98.3	98.3
35	95	97.6	98.7	99.7	99.7	99.5	99.5	99.4	99.4	99.4	99.4	99.4	99.4	99.3
30	86	97.1	98.7	100.4	100.3	100.4	100.2	100.2	100.2	100.1	100.1	100.1	100.0	100.3
25	77	96.4	98.0	99.8	100.5	100.5	100.4	100.4	100.4	100.3	100.3	100.3	100.3	100.3
20	68	95.7	97.3	99.2	100.5	100.5	100.4	100.4	100.4	100.4	100.4	100.3	100.3	100.3
15	59	95.0	96.6	98.6	100.5	100.5	100.4	100.4	100.4	100.4	100.3	100.3	100.3	100.3
10	50	94.2	95.8	97.9	100.0	100.3	100.4	100.4	100.4	100.4	100.4	100.3	100.3	100.3
5	41	93.4	95.1	97.1	99.3	99.5	99.8	100.1	100.3	100.4	100.3	100.3	100.3	100.3
0	32	92.6	94.3	96.4	98.5	98.8	99.0	99.3	99.6	99.9	100.2	100.3	100.3	100.3
-5	23	91.8	93.5	95.6	97.7	98.0	98.2	98.5	98.8	99.1	99.4	99.7	100.0	100.3
-10	14	91.0	92.7	94.9	97.0	97.2	97.5	97.7	98.0	98.3	98.6	98.9	99.2	99.5
-15	5	90.2	91.9	94.1	96.2	96.4	96.7	96.9	97.2	97.5	97.8	98.1	98.4	98.6
-20	-4	89.3	91.1	93.3	95.4	95.6	95.9	96.1	96.4	96.7	97.0	97.2	97.5	97.8
-25	-13	88.5	90.3	92.5	94.6	94.8	95.1	95.3	95.6	95.9	96.1	96.4	96.7	97.0
-30	-22	87.7	89.4	91.7	93.7	94.0	94.2	94.5	94.7	95.0	95.3	95.6	95.9	96.2
-35	-31	86.8	88.6	90.9	92.9	93.2	93.4	93.6	93.9	94.2	94.5	94.7	95.0	95.3
-40	-40	85.9	87.7	90.1	92.1	92.3	92.6	92.8	93.1	93.3	93.6	93.9	94.2	94.4
-45	-49	85.1	86.9	89.2	91.2	91.5	91.7	91.9	92.2	92.5	92.8	93.0	93.3	93.6
-50	-58	84.2	86.0	88.4	90.4	90.6	90.8	91.1	91.3	91.6	91.9	92.1	92.4	92.7

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.7	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Intentionally
Blank

Performance Inflight — Chapter PI
Gear Down — Section 15

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	15600	12500	9400
80	18400	15500	12600
75	21100	18500	15700
70	23600	21400	18600
65	26100	24400	21800
60	28600	27100	25300
55	30800	29600	28100
50	32900	31900	30700
45	35100	34100	33000
40	37500	36500	35400

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)								
		10	21	23	25	27	29	31	33	35
85	%N1	85.9								
	MACH	.482								
	KIAS	267								
	FF/ENG	2421								
80	%N1	84.2								
	MACH	.468								
	KIAS	259								
	FF/ENG	2271								
75	%N1	82.5	91.7							
	MACH	.454	.554							
	KIAS	251	248							
	FF/ENG	2123	2101							
70	%N1	80.6	89.8	91.7						
	MACH	.440	.541	.557						
	KIAS	243	242	240						
	FF/ENG	1977	1960	1950						
65	%N1	78.6	87.9	89.5	91.6	94.5				
	MACH	.425	.524	.543	.560	.578				
	KIAS	235	234	233	231	229				
	FF/ENG	1835	1812	1806	1805	1836				
60	%N1	76.5	85.6	87.4	89.1	91.3	94.5			
	MACH	.409	.504	.525	.544	.562	.580			
	KIAS	226	225	225	224	222	220			
	FF/ENG	1696	1661	1661	1658	1664	1696			
55	%N1	74.4	83.3	85.0	86.8	88.5	90.9	94.1		
	MACH	.393	.484	.504	.525	.545	.562	.581		
	KIAS	217	216	216	216	215	213	211		
	FF/ENG	1559	1515	1512	1515	1517	1523	1555		
50	%N1	71.9	80.7	82.5	84.2	86.0	87.8	90.2	93.5	
	MACH	.376	.463	.482	.502	.523	.544	.561	.580	
	KIAS	207	206	206	206	206	205	203	201	
	FF/ENG	1424	1371	1367	1368	1374	1377	1381	1411	
45	%N1	69.1	78.0	79.7	81.4	83.1	85.0	86.8	89.1	92.5
	MACH	.358	.441	.458	.477	.498	.520	.541	.559	.578
	KIAS	197	196	196	196	196	196	195	193	191
	FF/ENG	1294	1231	1224	1224	1230	1235	1237	1239	1265
40	%N1	66.2	74.9	76.6	78.3	80.0	81.8	83.6	85.5	87.7
	MACH	.340	.417	.434	.452	.471	.491	.513	.535	.554
	KIAS	187	185	185	185	185	185	185	185	183
	FF/ENG	1170	1098	1085	1083	1089	1092	1094	1096	1097

GEAR DOWN

Long Range Cruise Enroute Fuel and Time

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
324	290	260	236	217	200	188	178	168	160	153
654	583	523	474	435	400	377	357	338	321	307
989	880	787	713	653	600	566	535	507	483	461
1329	1181	1054	953	871	800	754	713	676	643	614
1674	1484	1322	1194	1090	1000	943	891	844	803	766
2024	1791	1593	1436	1310	1200	1131	1069	1013	962	918
2381	2103	1865	1680	1530	1400	1320	1247	1181	1122	1070
2743	2417	2140	1924	1751	1600	1508	1424	1348	1280	1221
3113	2737	2418	2171	1972	1800	1695	1600	1514	1438	1371

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	2.4	0:49	2.2	0:47	1.9	0:44	1.7	0:42	1.6	0:41
400	4.9	1:36	4.5	1:31	4.0	1:25	3.7	1:20	3.5	1:17
600	7.4	2:25	6.8	2:17	6.1	2:06	5.7	1:59	5.4	1:54
800	9.8	3:14	9.1	3:03	8.1	2:48	7.6	2:38	7.2	2:31
1000	12.1	4:04	11.3	3:50	10.1	3:30	9.5	3:18	9.0	3:08
1200	14.4	4:56	13.5	4:39	12.1	4:14	11.3	3:58	10.7	3:46
1400	16.7	5:49	15.6	5:28	14.0	4:58	13.1	4:40	12.4	4:24
1600	18.9	6:43	17.7	6:18	15.9	5:44	14.9	5:22	14.1	5:03
1800	21.1	7:38	19.7	7:10	17.7	6:30	16.6	6:05	15.7	5:43

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	40	50	60	70	80
2	-0.3	-0.2	0.0	0.3	0.7
4	-0.7	-0.3	0.0	0.6	1.3
6	-1.0	-0.5	0.0	0.9	2.0
8	-1.3	-0.7	0.0	1.2	2.6
10	-1.7	-0.8	0.0	1.4	3.2
12	-2.0	-1.0	0.0	1.6	3.7
14	-2.4	-1.2	0.0	1.8	4.2
16	-2.7	-1.3	0.0	2.0	4.6
18	-3.0	-1.5	0.0	2.2	5.0
20	-3.4	-1.7	0.0	2.4	5.3
22	-3.7	-1.8	0.0	2.5	5.6

GEAR DOWN

Descent

VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM)
41000	21	280	91
39000	20	270	86
37000	19	270	81
35000	19	260	77
33000	18	260	72
31000	17	250	68
29000	17	250	64
27000	16	240	60
25000	15	230	56
23000	14	230	52
21000	13	220	48
19000	13	210	44
17000	12	200	40
15000	11	190	36
10000	8	170	26
5000	6	140	16
1500	4	110	9

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	75.7	78.4	82.7	86.9	91.9			
	KIAS	229	229	229	229	229			
	FF/ENG	2240	2220	2220	2230	2250			
80	%N1	74.1	76.9	81.0	85.3	89.9			
	KIAS	224	224	224	224	224			
	FF/ENG	2110	2100	2090	2090	2100			
75	%N1	72.3	75.3	79.2	83.6	88.1			
	KIAS	218	218	218	218	218			
	FF/ENG	1990	1970	1960	1960	1960			
70	%N1	70.6	73.5	77.5	81.8	86.2	91.7		
	KIAS	213	213	213	213	213	213		
	FF/ENG	1870	1850	1840	1830	1830	1860		
65	%N1	68.8	71.7	75.8	80.0	84.4	89.1		
	KIAS	209	209	209	209	209	209		
	FF/ENG	1760	1740	1720	1710	1700	1720		
60	%N1	66.9	69.7	73.9	77.9	82.3	86.9	94.1	
	KIAS	203	203	203	203	203	203	203	
	FF/ENG	1650	1620	1600	1590	1580	1580	1660	
55	%N1	65.0	67.6	71.8	75.8	80.2	84.7	90.2	
	KIAS	197	197	197	197	197	197	197	
	FF/ENG	1530	1510	1490	1470	1450	1450	1490	
50	%N1	62.7	65.5	69.4	73.6	77.8	82.3	87.0	
	KIAS	191	191	191	191	191	191	191	
	FF/ENG	1420	1400	1370	1350	1330	1320	1350	
45	%N1	60.2	63.1	67.0	71.2	75.3	79.8	84.4	91.3
	KIAS	184	184	184	184	184	184	184	184
	FF/ENG	1310	1290	1260	1240	1210	1200	1220	1260
40	%N1	57.7	60.4	64.5	68.5	72.8	77.1	81.5	86.6
	KIAS	177	177	177	177	177	177	177	177
	FF/ENG	1200	1170	1150	1130	1100	1080	1090	1110

This table includes 5% additional fuel for holding in a racetrack pattern.

Intentionally
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Performance Inflight — Chapter PI
Gear Down, Engine Inop — Section 16

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
85	80	227	1700		
80	76	223	4000	2300	200
75	71	218	6300	4900	2800
70	66	213	8600	7300	5300
65	62	208	10900	9800	8000
60	57	202	13200	12300	10900
55	52	196	15600	14800	13900
50	47	190	18100	17300	16500
45	43	183	20600	19800	18900
40	38	176	23100	22300	21400

Includes APU fuel burn.

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
75	1500		
70	4500	2500	
65	7500	5900	3400
60	10600	9200	6900
55	13300	12300	10600
50	16200	15400	14500
45	19300	18300	17500
40	22200	21400	20500

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	23
70	%N1	94.8									
	MACH	.389									
	KIAS	235									
	FF/ENG	3774									
65	%N1	92.6	94.3	96.9							
	MACH	.376	.389	.402							
	KIAS	228	227	226							
	FF/ENG	3477	3485	3527							
60	%N1	90.2	91.9	93.7	96.3						
	MACH	.364	.375	.388	.402						
	KIAS	220	219	218	218						
	FF/ENG	3192	3191	3198	3240						
55	%N1	87.8	89.3	91.0	92.8	95.4					
	MACH	.351	.362	.374	.387	.400					
	KIAS	212	211	210	209	209					
	FF/ENG	2924	2909	2906	2913	2951					
50	%N1	85.3	86.7	88.2	89.9	91.7	94.2	98.2			
	MACH	.338	.348	.359	.371	.384	.398	.412			
	KIAS	204	203	202	201	200	199	198			
	FF/ENG	2672	2647	2630	2626	2633	2657	2737			
45	%N1	82.7	84.0	85.4	86.9	88.6	90.4	92.7	96.6		
	MACH	.325	.334	.344	.355	.367	.380	.393	.408		
	KIAS	196	195	193	192	191	190	189	189		
	FF/ENG	2432	2400	2374	2356	2351	2352	2359	2417		
40	%N1	79.8	81.1	82.5	83.9	85.4	87.0	88.8	90.8	94.1	98.4
	MACH	.311	.320	.329	.339	.349	.361	.374	.387	.402	.418
	KIAS	188	186	184	183	182	181	180	179	179	178
	FF/ENG	2206	2166	2133	2107	2088	2076	2069	2065	2101	2201

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

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
172	151	134	120	109	100	93	88	83	78	75
352	308	270	242	219	200	187	175	165	156	148
533	465	408	364	330	300	280	262	246	232	220
716	623	545	486	440	400	373	349	328	309	293
900	783	684	609	551	500	466	436	409	385	365
1086	943	823	733	661	600	559	523	490	462	438
1273	1105	964	856	772	700	652	610	572	538	510
1462	1267	1103	980	883	800	745	696	652	614	581
1653	1431	1245	1104	994	900	838	782	733	690	653
1845	1595	1386	1228	1105	1000	931	868	813	765	724

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	1.3	0:27	1.1	0:26	1.0	0:26
200	2.6	0:53	2.4	0:50	2.3	0:48
300	3.9	1:18	3.7	1:15	3.6	1:11
400	5.2	1:44	4.9	1:39	4.8	1:35
500	6.5	2:10	6.1	2:04	6.0	1:58
600	7.8	2:37	7.3	2:29	7.1	2:22
700	9.1	3:03	8.5	2:55	8.3	2:46
800	10.3	3:30	9.7	3:20	9.4	3:10
900	11.6	3:58	10.9	3:46	10.5	3:35
1000	12.8	4:25	12.0	4:12	11.6	3:59

Fuel Required Adjustments (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	0.1	0.3
2	-0.3	-0.2	0.0	0.3	0.6
3	-0.5	-0.3	0.0	0.5	1.0
4	-0.6	-0.3	0.0	0.7	1.3
5	-0.8	-0.4	0.0	0.9	1.7
6	-1.0	-0.5	0.0	1.0	2.0
7	-1.1	-0.6	0.0	1.2	2.4
8	-1.3	-0.7	0.0	1.4	2.7
9	-1.5	-0.7	0.0	1.6	3.1
10	-1.6	-0.8	0.0	1.8	3.5
11	-1.8	-0.9	0.0	1.9	3.8
12	-1.9	-1.0	0.0	2.1	4.2
13	-2.1	-1.1	0.0	2.3	4.5
14	-2.3	-1.1	0.0	2.5	4.9

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT) 1500	5000	10000	15000
80	%N1	93.2			
	KIAS	224			
	FF/ENG	4120			
75	%N1	91.2	94.5		
	KIAS	218	218		
	FF/ENG	3840	3890		
70	%N1	89.2	92.4		
	KIAS	213	213		
	FF/ENG	3580	3610		
65	%N1	87.3	90.3	95.7	
	KIAS	209	209	209	
	FF/ENG	3340	3360	3430	
60	%N1	85.1	88.1	92.7	
	KIAS	203	203	203	
	FF/ENG	3090	3090	3130	
55	%N1	82.8	85.7	90.2	97.0
	KIAS	197	197	197	197
	FF/ENG	2850	2840	2860	2990
50	%N1	80.2	83.2	87.6	92.6
	KIAS	191	191	191	191
	FF/ENG	2610	2600	2610	2650
45	%N1	77.7	80.5	84.9	89.5
	KIAS	184	184	184	184
	FF/ENG	2390	2370	2360	2380
40	%N1	75.0	77.7	82.0	86.4
	KIAS	177	177	177	177
	FF/ENG	2170	2140	2120	2130

This table includes 5% additional fuel for holding in a racetrack pattern.

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 speeds 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 for 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 the takeoff speeds, takeoff is permitted. When selected takeoff speeds cannot be verified, the options are to select a lower number 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.

Normal takeoff speeds, V1, VR, and V2 are read from either the dry or wet table by entering with takeoff flap setting and brake release weight. Use the tables provided to adjust takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind adjustments to V1 are obtained by entering the Slope and Wind V1 Adjustment table.

V1(MCG)

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.

To find V1(MCG) enter the V1(MCG) table with the airport pressure altitude and actual OAT. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If the adjusted VR is less than V1(MCG), set VR equal to V1(MCG), and determine a new V2 by adding the difference between the normal VR and V1(MCG) to the normal V2. 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 chapter Performance Dispatch.

Stab Trim

To find takeoff stabilizer trim setting, enter Stab 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.

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 or 30° of bank (15° of bank and 15° overshoot) to stick shaker is provided at the flap retraction speed. Full maneuver capability or 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 or 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 field/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 cold weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush or standing water depths greater than 13 mm (0.5 inches) are not recommended because of possible airplane damage as a result of spray 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 determination:

1. Enter the Weight Adjustment table with the dry field/obstacle limit weight to obtain the weight reduction for the slush/standing water depth and airport pressure altitude.
2. Adjust field length available for temperature by amount shown beneath V1(MCG) limit weight table.
3. Enter the V1(MCG) Limit Weight table 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.
4. The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 1 and 3.

Takeoff speed determination:

1. Determine takeoff speeds V1, VR and V2 for actual brake release weight using the Dry Runway Takeoff Speeds table for the appropriate flap setting and thrust rating.
2. If V1(MCG) limited, set V1=V1(MCG). If not limited by V1(MCG) considerations, enter the V1 Adjustment table 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).

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 used to calculate the “good” data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate the “poor” data reflects a runway covered with wet ice. Performance is based on 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.

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 8400 kg and the V1 associated with the reduced weight by the amount shown in the table below.

ANTI-SKID INOPERATIVE V1 ADJUSTMENTS	
FIELD LENGTH (M)	V1 ADJUSTMENT (KIAS)
2000	-19
2500	-16
3000	-13
3500	-11
4000	-10

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 adjusted for wind and slope exceeds approximately 1800 m.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

Thrust Reverser Inoperative

When dispatching on a wet runway with both thrust reversers operative, an operative anti-skid system, and all brakes operating, regulations allow deceleration credit for one thrust reverser in the engine failure case and two thrust reversers in the all engine stop case.

When dispatching on a wet runway with one thrust reverser inoperative, the runway/obstacle limited weight and V1 must be reduced to account for the effect on accelerate-stop performance. A simplified method, which conservatively accounts for this, is to reduce the normal wet runway/obstacle limited weight by 850 kg and the V1 associated with the reduced weight by 2 knots.

If the resulting V1 is less than minimum V1, takeoff is permitted with V1 set equal to V1(MCG) provided the accelerate-stop distance available adjusted for wind and slope exceeds approximately 1200 m.

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, normal engine bleed for packs on or off and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

Go-around %N1

To find Max Go-around %N1 based on normal engine bleed for packs on (AUTO) and anti-ice on or off, enter the Go-around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. For packs OFF or HIGH operation, apply the %N1 adjustment shown below the table.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Pitch attitude and average %N1 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.

Pitch attitude is shown in bold type for emphasis since 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. This table considers 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. Flying above these altitudes with sustained banks in excess of approximately 15° 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

These tables provide 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 .79M approximates the Long Range Cruise Mach schedule.

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 and high altitudes.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table to convert ground distance and enroute wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time table 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 with the Reference Fuel and the actual weight at checkpoint to obtain fuel required to destination.

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 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

Time, fuel, and distance for descent are shown for a .78/280/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance, time and fuel. 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 of 1500 ft from threshold to touchdown. 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 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. A correction for use of manual speedbrakes is provided in the table notes.

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. Since it cannot be determined quickly when this becomes a factor, 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 of 1500 ft from threshold to touchdown. 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.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding the 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 Recommended Brake Cooling Schedule table 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. Notes providing adjustments for wind are included below the table.

To determine the energy per brake absorbed during landing, enter the appropriate Adjusted Brake Energy Per Brake table (No Reverse Thrust or 2 Engine Reverse) 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 appropriate (steel or carbon brakes) final table 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 .79M 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.

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 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 with the desired ground distance and adjust for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table 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 Enroute 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 Long Range Cruise 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. Enter with Air Distance as determined from the Ground to Air Miles Conversion table and read Fuel and Time required at the cruise pressure altitude. Adjust the fuel obtained for deviation from the reference weight at checkpoint as required by entering the off reference fuel adjustments table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel required and time for the actual weight.

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 derate and/or assumed temperature reduced thrust is not permitted with the EEC in alternate mode.

Limit Weight

A simplified method which conservatively accounts for the effects of EEC in alternate mode is to reduce the normal mode (ON EEC switch illuminated) performance limited weights. The Limit Weight table provides takeoff field, climb, obstacle, tire speed and brake energy limit weights. To determine limit weights for operations with the EEC in the alternate mode, enter the table with 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. Analysis from the Airplane Flight Manual - Digital Performance Information may yield less restrictive limit weights.

Takeoff Speed Adjustment

Takeoff speeds for the reduced weight should be increased by the amount shown in the Takeoff Speeds Adjustment table. The adjusted V1 should not exceed the adjusted VR.

Note: The FMC does not incorporate alternate mode EEC performance in its takeoff speeds calculations.

Max Takeoff %N1

The alternate mode EEC thrust schedule provides equal or greater thrust than the normal mode thrust for the same thrust lever position. Thrust limit protection is not provided in alternate mode EEC and maximum rated thrust may be reached at thrust lever position less than full forward. As a result, thrust overboost may occur if the target alternate mode EEC Max Takeoff %N1 settings are not observed.

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. For packs off apply the %N1 adjustment provided below the table. No %N1 adjustment is required for engine or wing anti-ice.

Gear Down

This section contains performance for airplane operation with the landing gear extended. The data is based on engine bleeds for normal air conditioning.

Note: The Flight Management Computer System (FMCS) does not contain special provisions for operation with landing gear extended. As a result, the FMCS may generate inappropriate 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 (ETA) is available if current speed or Mach is entered into the VNAV cruise page.

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.