PMDG

WARNING
DO NOT USE THIS MANUAL OR ANY OF THE RELATED MATERIALS IN ANY WAY IN THE OPERATION, USE OR MAINTENANCE OF ANY AIRCRAFT. THESE MATERIALS HAVE BEEN PREPARED AND ARE PROVIDED SOLELY TO GIVE GUIDANCE ON THE LAYOUT AND STRUCTURE OF A TYPICAL AIRCRAFT MANUAL. THESE MATERIALS HAVE NOT BEEN APPROVED BY ANY AVIATION ADMINISTRATION FOR USE ON ANY AIRCRAFT AND SHOULD NEVER BE SO USED UNDER ANY CIRCUMSTANCES. FAILURE TO FOLLOW THIS WARNING COULD LEAD TO SERIOUS INJURY OR DEATH.

737-600/-700/-800/-900

Flight Crew Operations Manual

The Boeing Company

Document Number D6-27370-TBC
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Revision Date: March 27, 2009

Copyright Information

March 27, 2009

Preface — Chapter 0
Chapter Table of Contents — Section 0

Volume 1

Volume 2

Preface — Chapter 0
Model Identification — Section 1

General

The airplanes listed in the table below are covered in the Flight Crew Operations Manual (FCOM). The table information is 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 airplanes.

Airplane number is supplied by the operator. Registry number is supplied by the national regulatory agency. Serial and tabulation number are supplied by Boeing.

Airplane Number	Registry Number	Serial Number	Tabulation Number
YX600	YX600	YX600	YX600
YX700	YX700	YX700	YX700
YX800	YX800	YX800	YX800
YX900	YX900	YX900	YX900
YX910	YX910	YX910	YX910

Intentionally
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General

This Flight Crew Operations Manual (FCOM) has been prepared by The Boeing Company. 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 and supplementary procedures, and dispatch performance data. Volume 2 contains systems information. The QRH contains all checklists necessary for normal and non–normal procedures as well as in–flight 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.

Any questions about the content or use of this manual can be directed to:

Manager, Flight Technical Data

737 Model

Boeing Commercial Airplane Groups

P. O. Box 3707, M/C 20–89

Seattle, Washington 98124–2207 USA

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 chapter contains performance information necessary for self dispatch.

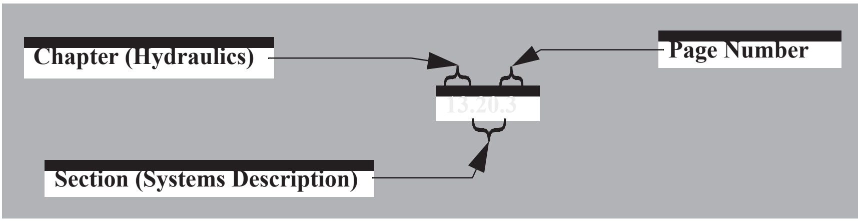
Volume 2 – Chapters 1 through 15 contain general airplane and systems information. These chapters are generally subdivided into sections covering controls and indicators and systems descriptions.

Quick Reference Handbook (QRH) – The QRH covers normal checklists, in–flight performance, non–normal checklists, and non–normal 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.

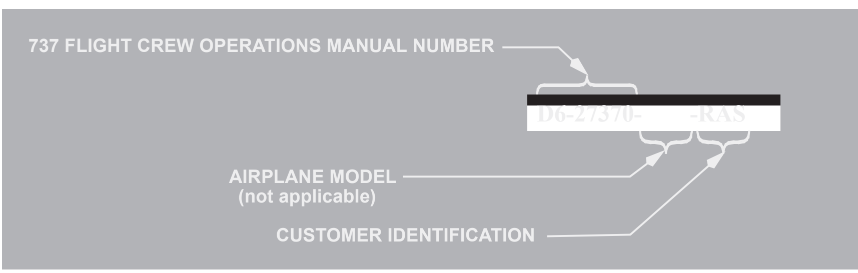
Example Page Number



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 airplane model and customer identification.

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

The material in this 737-600/700/800/900 Boeing Company FCOM is not customized to a specific airplane configuration. The user must ascertain that this material is applicable for the intended use.

Configuration [Option] Annotations

Throughout this document, technical data is provided for many of the configuration options available for 737-600/700/800/900 airplanes.

Options at Chapter / Section Level

Configuration specific information is shown (distinguished) by:

- options annotated by the chapter/section title; e.g.
  - EFIS/MAP - Controls and Indicators (Chapter 10.10)
  - PFD/ND - Displays (Chapter 10.11).

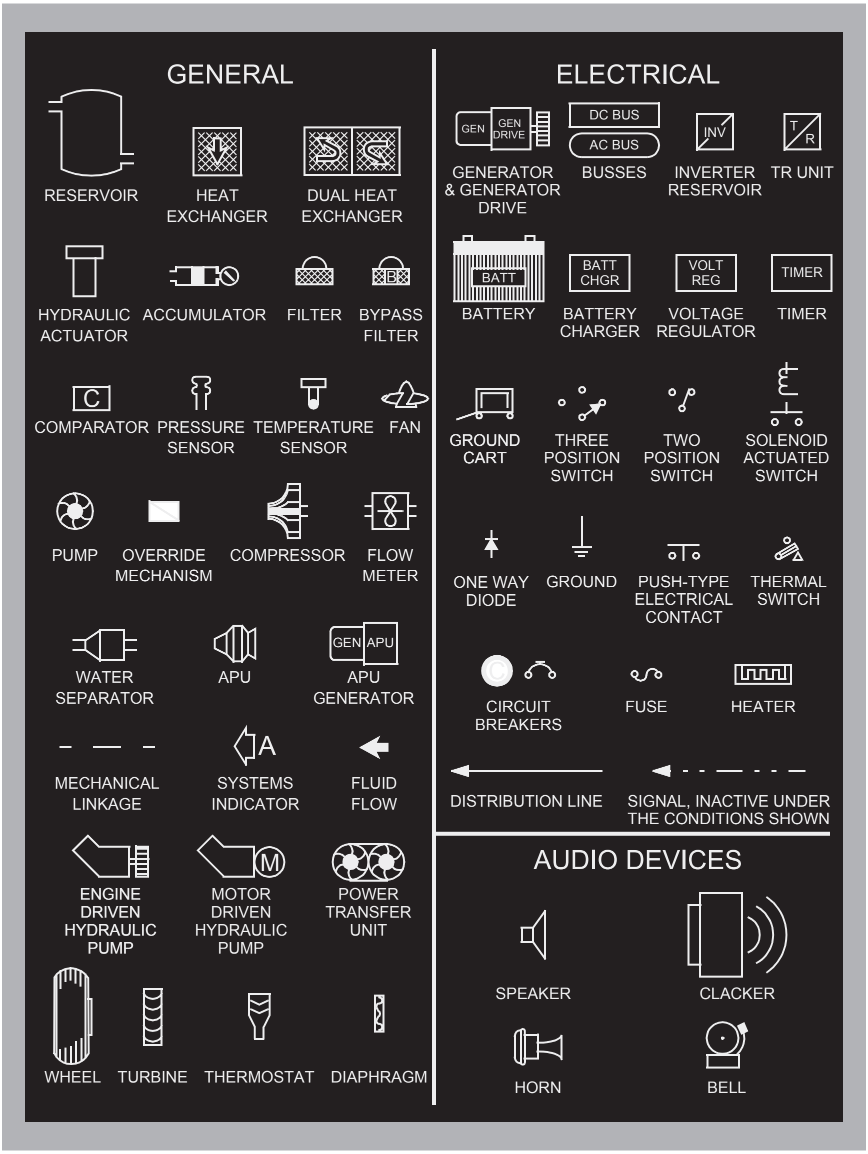
Options Within a Chapter / Section

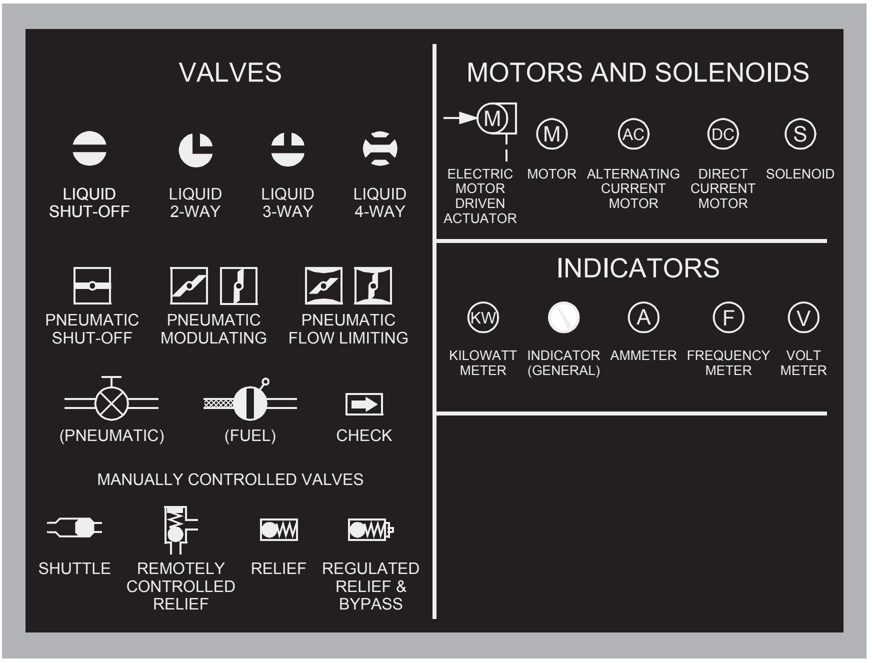
Configuration specific information is shown (distinguished) by:

- model sensitive options [737-xxx] using only the model designator; e.g.
  - [737-800]
  - Tail skid .... Check
- obvious single options [Option] where the configuration variable or nomenclature stands out in surrounding text, graphic or title; e.g.
  - [Option]
  - VOICE RECORDER switch .... As required
- specific options [Option - xxx, xxxx] where the configuration variable(s) are stated within the annotation (multiple variables, if applicable, are separated by commas); e.g.
  - [Option - VHF-3, ACARS, audio entertainment system]
  - Do not use VHF-3 for ATC communications with ACARS operational, or if audio entertainment system is in use.
- generic options [Option - Typical, xxx, xxxx] where multiple configuration options exist, but only a single option is shown (multiple variables, if applicable, are separated by commas); e.g.
  - [Option - Typical]
  - ‘one of numerous possible VHF control panel graphics might be shown here’
- part number options [Option - ‘Boeing or vendor part number’] where the option is part number specific (multiple variables, if applicable, are separated by commas); e.g.
  - [Option - Gables G7400-04, -06]
  - ‘a part number specific graphic might be shown here’.

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)
CHECK
MANUALLY CONTROLLED VALVES
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

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.

A	
AC	Alternating Current
ACARS	Aircraft Communications Addressing and Reporting System
ACP	Audio Control Panel
ACT	Active
ADF	Automatic Direction Finder
ADIRS	Air Data Inertial Reference System
ADIRU	Air Data Inertial Reference Unit
ADM	Air Data Module
AFDS	Autopilot Flight Director System
AED	Automatic External Defibrillator
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
A/P	Autopilot
APP	Approach
APU	Auxiliary Power Unit
ARINC	Aeronautical Radio, Incorporated
ARPT	Airport
A/T	Autothrottle
ATA	Actual Time of Arrival
ATC	Air Traffic Control
ATT	Attitude
AUTO	Automatic
AUX	Auxiliary
AVAIL	Available
B	
BAC	Back Course
BARO	Barometric
B/CRS	Back Course
BCS	Back Course
BRT	Bright

BTL DISCH	Bottle Discharge (fire extinguishers)
B/C	Back Course
C	
C	Captain Celsius Center
CANC/ RCL	Cancel/Recall
CAPT	Captain
CB	Circuit Breaker
CDS	Common Display System
CDU	Control Display Unit
CG	Center of Gravity
CHKL	Checklist
CLB	Climb
COMM	Communication
CON	Continuous
CONFIG	Configuration
CRS	Course
CRZ	Cruise
CTL	Control
D	
DC	Direct Current
DDG	Dispatch Deviations Guide
DEP ARR	Departure Arrival
DES	Descent
DEU	Display Electronic Unit
DISC	Disconnect
DME	Distance Measuring Equipment

DSP	Display Select Panel
DSPL	Display
E	
ECS	Environmental Control System
E/D	End of Descent
E/E	Electrical and Electronic
EEC	Electronic Engine Control
EFIS	Electronic Flight Instrument System
EGPWS	Enhanced Ground Proximity Warning System
EGT	Exhaust Gas Temperature
ELEC	Electrical
ELEV	Elevator
EMER	Emergency
ENG	Engine
EO	Engine Out
ETOPS	Extended Operations
EVAC	Evacuation
EXEC	Execute
EXT	Extend
F	
F	Fahrenheit
FAC	Final Approach Course
FCOM	Flight Crew Operations Manual
FCTL	Flight Control
F/D or FLT DIR	Flight Director

FMA	Flight Mode Annunciations
FMC	Flight Management Computer
FMS	Flight Management System
F/O	First Officer
FPA	Flight Path Angle
FPM	Feet Per Minute
FPV	Flight Path Vector
FREQ	Frequency
FT	Feet
FWD	Forward
G	
GA	Go–Around
GEN	Generator
GLS	GPS Landing System or GNSS Landing System
G/P	Glidepath
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
GS	Ground Speed
G/S	Glide Slope
H	
HDG	Heading
HDG REF	Heading Reference
HDG SEL	Heading Select
HF	High Frequency
HPA	Hectopascals
HUD	Head-Up Display
HYD	Hydraulic
I	
IAN	Integrated Approach Navigation
IAS	Indicated Airspeed
IDENT	Identification
IFE	In-Flight Entertainment System
IGN	Ignition
IN	Inches
IND LTS	Indicator Lights
ILS	Instrument Landing System
INBD	Inboard
INOP	Inoperative
INT or INTPH	Interphone
INTC CRS	Intercept Course
IRS	Inertial Reference System
ISFD	Integrated Standby Flight Display
ISLN	Isolation
K	
K	Knots
KGS	Kilograms
KIAS	Knots Indicated Airspeed
L	
L	Left
LBS	Pounds
LDA	Localizer type Directional Aid
LDG ALT	Landing Altitude

LIM	Limit
LNAV	Lateral Navigation
LOC	Localizer
LWR CTR	Lower Center
LWR DSPL	Lower Display
M	
M	Mach
MAG	Magnetic
MAN	Manual
MCP	Mode Control Panel
MDA	Minimum Descent Altitude
MEL	Minimum Equipment List
MFD	Multifunction Display
MHZ	Megahertz
MIC	Microphone
MIN	Minimum
MKR	Marker
MMO	Maximum Mach Operating Speed
MOD	Modify
MSG	Message
MTRS	Meters
MUH	Minimum Use Height
N	
NAV RAD	Navigation Radio
ND	Navigation Display
NM	Nautical Miles
NORM	Normal
NPS	Navigation Performance Scales

N1	Low Pressure Rotor Speed
N2	High Pressure Rotor Speed
O	
OAT	Outside Air Temperature
OFST	Offset
OHU	Overhead Unit
OUTBD DSPL	Outboard Display
OVHD	Overhead
OVHT	Overheat
OVRD	Override
OXY or O2	Oxygen
P	
PA	Passenger Address
PASS	Passenger
PERF INIT	Performance Initialization
PF	Pilot Flying
PFC	Primary Flight Computers
PFD	Primary Flight Display
PM	Pilot Monitoring
PNF	Pilot Not Flying
PNL	Panel
POS	Position
PREV	Previous
P-RNAV	Precision Area Navigation
PROX	Proximity
POS INIT	Position Initialization

PRI	Primary
PSI	Pounds Per Square Inch
PTH	Path
PTT	Push To Talk
PWR	Power
PWS	Predictive Windshear System
R	
R	Right
RA	Radio Altitude Resolution Advisory
RDMI	Radio Distance Magnetic Indicator
REC	Recorder
RECIRC	Recirculation
REF	Reference
RET	Retract
RF	Refill
RNP	Required Navigation Performance
RPM	Revolutions Per Minute
RST	Reset
RTE	Route
RTO	Rejected Takeoff
RTP	Radio Tuning Panel
RUD	Rudder
RVSM	Reduced Vertical Separation Minimum
S	
SAT	Static Air Temperature
S/C	Step Climb
SDF	Simplified Directional Facility
SELCAL	Selective Calling
SEL	Select
SPD	Speed
STA	Station
STAB	Stabilizer
STAT	Status
STBY	Standby
STD	Standard
SYS	System
T	
T or TRU	True
T or TK or TRK	Track
TA	Traffic Advisory
TAS	True Airspeed
TAT	Total Air Temperature
T/C	Top of Climb
TCAS	Traffic Alert and Collision Avoidance System
TDZE	Touch Down Zone Elevation
T/D	Top of Descent
TEMP	Temperature
TERR	Terrain
TFC	Traffic
TFR	Transfer
THR HOLD	Throttle Hold
TO	Takeoff

TO/GA	Takeoff/Go–Around
TRU	Transformer Rectifier Unit
U	
UNLKD	Unlocked
USB	Upper Side Band
UPR DSPL	Upper Display
UTC	Coordinated Universal Time
UTIL	Utility
V	
VA	Design Maneuvering Speed
VANP	Vertical Actual Navigation Performance
VERT	Vertical
VHF	Very High Frequency
VMO	Maximum Operating Speed
VNAV	Vertical Navigation
VOR	VHF Omnidirectional Range
VR	Rotation Speed
VREF	Reference Speed
VRNP	Vertical Required Navigation Performance
VSD	Vertical Situation Display
VSI	Vertical Speed Indicator
V/S	Vertical Speed
VTK	Vertical Track
V1	Takeoff Decision Speed
V2	Takeoff Safety Speed
W	
WPT	Waypoint
WXR	Weather Radar
X	
XPDR or XPNDR	Transponder
XTK	Cross Track

Revision Transmittal Letter

To: All holders of The Boeing Company 737 Flight Crew Operations Manual (FCOM), Boeing Document Number D6-27370-TBC.

Subject: Flight Crew Operations Manual Revision.

This revision reflects the most current information available to The Boeing Company 45 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.

Boeing has added the following Chapters to the Quick Reference Handbook (QRH):

- CI.ModID QRH Model Identification
- CI.RR QRH Revision Record
- CI.LEP QRH List of Effective Pages

This change will support future publication enhancements as well as provide FCOM (V1V2/QRH) users with more precise page and revision accountability.

Refer to the above-listed Chapters for detailed descriptions and user instructions.

Revision Record

No.	Revision Date	Date Filed	No.	Revision Date	Date Filed
1	March 5, 1998		2	July 31, 1998	
3	January 29, 1999		4	July 30, 1999	
5	January 28, 2000		6	August 30, 2000	
7	June 6, 2001		8	October 15, 2001	
9	March 15, 2002		10	September 30, 2002	
11	March 31, 2003		12	September 26, 2003	
13	March 29, 2004		14	September 27, 2004	
15	March 28, 2005		16	September 29, 2005	
17	March 31, 2006		18	September 28, 2006	
19	March 15, 2007		20	September 24, 2007	
21	January 25, 2008		22	May 15, 2008	

No.	Revision Date	Date Filed	No.	Revision Date	Date Filed
23	September 18, 2008		24	March 27, 2009	

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 made available to the customer and is effective upon receipt.

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 Systems Handbook 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.

Chapter 0 - Preface

Section 4 - Revision Record

0.4.2 - Provided clarification on revision effectivity.

Chapter L - Limitations

Section 10 - Operating Limitations

Fuel System

L.10.11 - Removed reference to prohibited fuels. A crew may assume that a fuel that is not prohibited, is allowed, which is not the case. The FCOM is not intended as a servicing manual. An airline should use the appropriate servicing documents to determine fueling, not the FCOM.

Chapter NP - Normal Procedures

Section 11 - Introduction

Areas of Responsibility - Captain as Pilot Flying or Taxiing

NP.11.6 - Corrected shading for cross-model commonality.

Areas of Responsibility - First Officer as Pilot Flying or Taxiing

NP.11.7 - Corrected shading for cross-model commonality.

Section 21 - Amplified Procedures

CDU Preflight Procedure - Captain and First Officer

NP.21.5 - Added VNAV armed on the ground feature.

Exterior Inspection

NP.21.8 - Added Nitrogen Generation System information.

Preflight Procedure – First Officer

NP.21.21 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Before Start Procedure

NP.21.29 - Added VNAV armed on the ground feature.

NP.21.29 - Added cabin altitude warning indications and memory item procedures briefing to the takeoff briefing as mandated by AD 2008-23-07.

Takeoff Procedure

NP.21.39 - Removed requirement to select N1 for airplanes equipped with automatic takeoff thrust reduction option.

NP.21.40,43,45 - Added reference to V1 aural callout.

NP.21.41 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

NP.21.42 - Added VNAV armed on the ground feature.

NP.21.43,46 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Climb and Cruise Procedure [AD 2002-19-52 and AD 2002-24-51]

NP.21.47 - Removed ETOPS specific information and referred the flight crew to SP1.

Climb and Cruise Procedure [Alternate Method of Compliance (AMOC) to AD 2002-24-51]

NP.21.48 - Removed ETOPS specific information and referred the flight crew to SP1.

Climb and Cruise Procedure [Alternate Method of Compliance (AMOC) to AD 2001-08-24 and AD 2002-24-51 for Airplanes with Master Caution System Logic Change and Automatic Shutoff]

NP.21.50 - Removed ETOPS specific information and referred the flight crew to SP1.

Descent Procedure [AD 2002-19-52 and AD 2002-24-51]

NP.21.51 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Descent Procedure [Alternate Method of Compliance (AMOC) to AD 2002-24-51]

NP.21.53 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Descent Procedure [Alternate Method of Compliance (AMOC) to AD 2001-08-24 and AD 2002-24-51 for Airplanes with Master Caution System Logic Change and Automatic Shutoff]

NP.21.55 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Descent Procedure - Airplanes with Fail Operational Autoland Capability [AD 2002-19-52 and AD 2002-24-51]

NP.21.56 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Descent Procedure - Airplanes with Fail Operational Autoland Capability [Alternate Method of Compliance (AMOC) to AD 2002-24-51]

NP.21.58 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Descent Procedure - Airplanes with Fail Operational Autoland Capability [Alternate Method of Compliance (AMOC) to AD 2001-08-24 and AD 2002-24-51 for Airplanes with Master Caution System Logic Change and Automatic Shutoff]

NP.21.60 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Descent Procedure - Airplanes with IAN Capability [AD 2002-19-52 and AD 2002-24-51]

NP.21.61 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Descent Procedure - Airplanes with IAN Capability [Alternate Method of Compliance (AMOC) to AD 2002-24-51]

NP.21.63 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Descent Procedure - Airplanes with IAN Capability [Alternate Method of Compliance (AMOC) to AD 2001-08-24 and AD 2002-24-51 for Airplanes with Master Caution System Logic Change and Automatic Shutoff]

NP.21.65 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Landing Roll Procedure

NP.21.79 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Landing Roll Procedure - Airplanes with Fail Operational Autoland Capability

NP.21.80 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

After Landing Procedure

NP.21.81-82 - Revised to create a generic step to cover all configurations.

NP.21.81-82 - Standardized autobrake nomenclature and capitalization to match panels and for cross-model standardization.

Shutdown Procedure

NP.21.84 - Added step to set the transponder to STBY.

Chapter SP - Supplementary Procedures

Section 1 - Airplane General, Emer. Equip., Doors, Windows

ETOPS

SP.1.7 - Created a new ETOPS supplementary procedure to provide the additional step(s) required for ETOPS.

Section 2 - Air Systems

Ground Conditioned Air Use

SP.2.2 - Made procedure more generic by reference to "cart." Not all sources of ground conditioned air are carts. Standardized text.

Landing

SP.2.7 - Format change for standardization.

Section 4 - Automatic Flight

Instrument Approach - RNAV (RNP) SAAAR/AR

SP.4.6 - Added procedures for Instrument Approach - RNAV (RNP) SAAAR/AR.

Section 7 - Engines, APU

Battery Start

SP.7.3 - Moved steps to after the start of the first engine. Indications are not available without AC power.

SP.7.3 - Added steps to verify lights are extinguished for consistency with Normal Procedures.

Section 10 - Flight Instruments, Displays

Altimeter Difference

SP.10.2 - Changed format for clarity.

Section 11 - Flight Management, Navigation

Step Climb or Descent from Cruise

SP.11.18 - Added step to set the FLT ALT indicator to the new level-off altitude for a step climb or descent.

Section 16 - Adverse Weather

Exterior Inspection

SP.16.2 - Changed for 737 cross-model commonality.

SP.16.3 - Expanded discussion regarding snow and ice on the fan blades to differentiate between maintenance responsibility and flight crew actions.

Takeoff Procedure

SP.16.9 - Expanded the static engine run-up for takeoff procedure to include a time of approximately 30 seconds for the run-up.

Chapter PD - Performance Dispatch

Section 11 - Enroute

Net Level Off Weight

PD.11.8 - Revised titles per ETOPS data.

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

PD.11.9-10 - Revised titles per ETOPS data.

Section 21 - Enroute

Net Level Off Weight

PD.21.8 - Revised titles per ETOPS data.

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

PD.21.9-10 - Revised titles per ETOPS data.

Section 31 - Enroute

Net Level Off Weight

PD.31.8 - Revised titles per ETOPS data.

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

PD.31.9-10 - Revised titles per ETOPS data.

Section 41 - Enroute

Decompression Critical Fuel Reserves - LRC Cruise

PD.41.8 - Revised titles per ETOPS data.

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

PD.41.9-10 - Revised titles per ETOPS data.

Section 51 - Enroute

Decompression Critical Fuel Reserves - LRC Cruise

PD.51.8 - Revised titles per ETOPS data.

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

PD.51.9-10 - Revised titles per ETOPS data.

Section 52 - Landing

Go-Around Climb Gradient

PD.52.6 - Revised word "weight" with "gradient" in notes.

Chapter PI - Performance Inflight

Section 10 - General

Maximum Allowable Clearway

PI.10.2 - No data change. Consolidated data from other files per improvements to publication system, new page dates and / or revision bars will appear on the following pages of the General section.

Section 14 - Gear Down

Gear Down

PI.14.1 - Added Gear Down and Gear Down, Engine Inop Sections to the Performance Inflight QRH volume.

Section 20 - General

Maximum Allowable Clearway

PI.20.4 - No data change. Consolidated data from other files per improvements to publication system, new page dates and / or revision bars will appear on the following pages of the General section.

PI.20.5 - Revised maximum allowable clearway.

Slush/Standing Water Takeoff

PI.20.8 - Consolidated duplicate tables in publishing system. No data change.

PI.20.8-11 - Consolidated duplicate tables in publishing system. No data change.

PI.20.8,10 - Extended coverage to 10000 ft.

Slippery Runway Takeoff

PI.20.12 - Extended coverage to 10000 ft.

PI.20.12-15 - Consolidated duplicate tables in publishing system. No data change.

Maximum Allowable Clearway (22K Derate)

PI.20.20 - No data change. Consolidated data from other files per improvements to publication system, new page dates and / or revision bars will appear on the following pages of the General section.

PI.20.20 - Revised maximum allowable clearway.

Slush/Standing Water Takeoff (22K Derate)

PI.20.21-23 - Consolidated duplicate tables in publishing system. No data change.

PI.20.21,23-24 - Extended coverage to 10000 ft.

Slippery Runway Takeoff (22K Derate)

PI.20.25,27 - Consolidated duplicate tables in publishing system. No data change.

PI.20.25-27 - Extended coverage to 10000 ft.

PI.20.28 - Added no reverse thrust data.

Maximum Allowable Clearway (20K Derate)

PI.20.33 - Revised maximum allowable clearway.

Slush/Standing Water Takeoff (20K Derate)

PI.20.34-36 - Extended coverage to 10000 ft.

PI.20.36-37 - Added no reverse thrust data.

Slippery Runway Takeoff (20K Derate)

PI.20.38-39 - Extended coverage to 10000 ft.

PI.20.40-41 - Added no reverse thrust data.

Section 30 - General

Maximum Allowable Clearway

PI.30.3 - No data change. Consolidated data from other files per improvements to publication system, new page dates and / or revision bars will appear on the following pages of the General section.

Takeoff Speeds - Dry Runway (24K Derate)

PI.30.15 - Revised data up to 10000 ft pressure altitude.

PI.30.15 - Consolidate duplicate tables in publication system. No change to data.

Takeoff Speeds - Wet Runway (24K Derate)

PI.30.16 - Consolidate duplicate tables in publication system. No change to data.

Maximum Allowable Clearway (24K Derate)

PI.30.17 - No data change. Consolidated data from other files per improvements to publication system, new page dates and / or revision bars will appear on the following pages of the General section.

Takeoff Speeds - Dry Runway (22K Derate)

PI.30.28 - Extended coverage up to 10000 ft.

Maximum Allowable Clearway (22K Derate)

PI.30.30 - No data change. Consolidated data from other files per improvements to publication system, new page dates and / or revision bars will appear on the following pages of the General section.

Slush/Standing Water Takeoff (22K Derate)

PI.30.31 - Added contaminated runway takeoff data without reverse thrust credit.

Section 32 - Advisory Information

Non-Normal Configuration Landing Distance

PI.32.5 - Corrected typo.

Section 40 - General

Maximum Allowable Clearway

PI.40.3 - No data change. Consolidated data from other files per improvements to publication system, new page dates and / or revision bars will appear on the following pages of the General section.

Maximum Allowable Clearway (24K Derate)

PI.40.19 - No data change. Consolidated data from other files per improvements to publication system, new page dates and / or revision bars will appear on the following pages of the General section.

Maximum Allowable Clearway (22K Derate)

PI.40.33 - No data change. Consolidated data from other files per improvements to publication system, new page dates and / or revision bars will appear on the following pages of the General section.

Section 50 - General

Maximum Allowable Clearway

PI.50.4 - No data change. Consolidated data from other files per improvements to publication system, new page dates and / or revision bars will appear on the following pages of the General section.

Slippery Runway Takeoff

PI.50.13 - Added No Reverse Thrust Data.

Maximum Allowable Clearway (24K Derate)

PI.50.20 - No data change. Consolidated data from other files per improvements to publication system, new page dates and / or revision bars will appear on the following pages of the General section.

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

Section 20 - Instrument Panels

Auxiliary Panels

1.20.19 - Revised the depiction of the Auxiliary Panels to show the EFB.

Section 40 - Systems Description

Fire Extinguisher Usage

1.40.19 - Expanded the Fire Extinguisher Usage text to show the different fire codes in use in the US and in Europe/Australia.

Doors and Windows

1.40.27 - For cross-model standardization, added a CAUTION which discusses airplane door wind limitations.

Chapter 3 - Anti-Ice, Rain

Section 20 - System Description

Flight Deck Window Heat Schematic

3.20.4 - Updated Amber OFF Light

Chapter 5 - Communications

Section 10 - Controls and Indicators

Radio Tuning Panel

5.10.2 - Added text to reflect 3 digits right of decimal point for 8.33 spacing.

Chapter 7 - Engines, APU

Section 20 - Engine System Description

Thrust Reverser

7.20.16 - Changed time from 16 seconds to 18 seconds.

Chapter 9 - Flight Controls

Section 10 - Controls and Indicators

Flight Control Surface Position Indicator

9.10.15 - Revised text to indicate that SYS data will only display on a MFD selectable DU.

Chapter 10 - Flight Instruments, Displays

Section 10 - EFIS/Map – Controls and Indicators

Mach/Airspeed Indicator Failure Flags

10.10.14 - Revised to remove "All".

Attitude Indicator – GLS Source Annunciation Indication

10.10.19 - Revised GLS text to combine channel and approach course disagree indications.

Attitude Indicator Failure Flags

10.10.20 - Revised failure to remove display.

10.10.20 - Revised text to eliminate the display.

10.10.20 - Revised text to remove display.

Failure Flags – Expanded MAP, Center MAP, Expanded APP, Expanded VOR Modes

10.10.53 - Revised text to clarify heading failure.

Failure Flags – Center APP and Center VOR Modes

10.10.56 - Revised text to clarify heading failure.

Section 11 - PFD/ND – Displays

PFD Navigation Performance Scales (NPS) Indications

10.11.14 - Added Scale ID Annunciation for ILS with FMC Glidepath Approach.

PFD Instrument Landing System Indications

10.11.16 - Revised ILS text to add information on ILS "disagree" indications.

10.11.16 - Revised text for comparison of GLS channels and approach courses.

10.11.17 - Revised text to add audible pulse rates.

PFD Failure Flags

10.11.28 - Revised to eliminate display failure as sole source of system failure.

10.11.29 - Revised description to V1 and VR; was V1 or VR.

10.11.29 - Revised to remove "All".

10.11.29 - Revised text to remove display failure.

10.11.29 - Revised text to clarify heading failure.

10.11.29 - Revised text to remove display.

10.11.30 - Revised failure to eliminate display.

Navigation Advisory Messages

10.11.48 - Added additional information to clear Excess Data Annunciation (amber) from the primary ND.

ND Failure Flags – Center APP and Center VOR Modes

10.11.56-57 - Revised text to remove display.

10.11.57 - Revised to remove display as sole source of malfunction.

Section 20 - EFIS/Map System Description

Flight Recorder (DFDR)

10.20.16 - Revised parameter groups based on Federal rules for two engine aircraft.

Section 21 - PFD/ND System Description

Air Data Inertial Reference System (ADIRS)

10.21.13 - Added SMYD definition to AOA backup source.

Flight Recorder (DFDR)

10.21.16 - Revised wording to comply with Federal rules for flight data recorder parameters for two engine aircraft.

Section 30 - Electronic Flight Instrument System (EFIS)

Introduction

10.30.1 - Revised text to eliminate display failure.

Section 31 - Primary Flight Display (PFD)

Introduction

10.31.1 - Revised text to eliminate display failure.

Section 65 - Electronic Flight Bag (EFB)

System Description

10.65.2 - Revised EFB text description.

Chapter 11 - Flight Management, Navigation

Section 31 - Flight Management System Operation

Navigation Performance

11.31.11 - Deleted text to reflect operation of FMC's with above U10.6.

11.31.11 - Deleted FMC Update U10.5 or later.

Waypoints

11.31.17 - Revised FMC Update U10.5A or earlier.

Speed/Altitude Restrictions

11.31.21 - Deleted text to match customer options.

11.31.21 - Revised information for U10.7 and later.

MCP Speed Intervention

11.31.27 - Revised for FMC Update U10.6 and later.

Descent

11.31.28 - Deleted text for customer options.

11.31.28 - Revised to add Geometric Path Descent.

11.31.29 - Revised FMC for Update U10.6 and latter.

11.31.31 - Revised for FMC Update U10.3 and latter.

11.31.32 - Revised to reflect software with Geometric Path Descent.

11.31.34 - Revised FMC Update U10.3 and latter with Geometric Descent Path.

Section 40 - FMC Preflight

Identification Page

11.40.7 - Revised FMC Update.

11.40.7 - Added FMC Update U10.8

Takeoff Reference Page 2/2

11.40.57 - Added description reflecting FMC U10.7 and on operation with aspirated TAT.

11.40.58 - Added aspirated TAT option.

11.40.60-63 - Added description reflecting FMC U10.7 operation.

11.40.62 - Added automatic takeoff thrust reduction option.

11.40.62 - Added FMC Update U10.3 or later.

11.40.63 - Added automatic takeoff thrust reduction option.

11.40.63 - Added FMC Update U10.3 or later.

Section 41 - FMC Takeoff and Climb

Takeoff Phase

11.41.1 - Changed wording to reflect armed vice engaged on the ground.

VNAV Armed for Takeoff

11.41.2 - Added to reflect FMC U10.8 upgrade.

11.41.2 - Revised to reflect FMC software operations.

Climb Phase

11.41.3 - Deactivated VNAV with operation for FMCs with U10.6 and earlier.

Climb Page

11.41.5 - Deleted FANS MCDU.

11.41.5 - Added illustration for airplanes with U10.7 and on.

Section 42 - FMC Cruise

Select Desired Waypoint Page

11.42.14 - Deleted FMC update U10.5 or earlier.

11.42.14 - Revised graphic to reflect FMC software change.

Navigation Options (NAV OPTIONS)

11.42.55 - Revised graphic to reflect FMC software change.

11.42.55 - Revised DME/VOR/GPS UPDATE options.

11.42.56 - Added Default DME Off option.

Fix Information Page

11.42.56 - Added FMC Update U10.6 or later with additional fix pages option.

Section 43 - FMC Descent and Approach

Descent Page (During Cruise)

11.43.4 - Added FANS MCDU with FMC Update U10.6 or later and Common VNAV option.

11.43.4 - Revised to reflect FMC Update U10.6 and latter only.

RTA Descent Page

11.43.11 - Added FANS MCDU with FMC Update U10.6 or later and Common VNAV option.

Arrivals Page – IFR Approaches

11.43.21 - Replaced graphic to reflect FMC U10.6 and later update.

Section 60 - FMC Messages

FMC Alerting Messages

11.60.6 - Added FMC U10.8.

Chapter 13 - Hydraulics

Section 10 - Controls and Indicators

Hydraulic Indications

13.10.3 - Revised text to indicate that SYS data will only display on a MFD selectable DU.

Section 20 - System Description

Power Transfer Unit

13.20.4 - Deleted PTU logic for airplanes with Short Field Performance enhancement.

Chapter 14 - Landing Gear

Section 10 - Controls and Indicators

Autobrake and Antiskid Controls

14.10.4 - Standardized autobrake nomenclature and capitalization to match panel nomenclature and for cross model standardization.

Brake Temperature Indicator

14.10.7 - Revised text to indicate that SYS data will only display on a MFD selectable DU.

Nose Wheel Steering Wheel

14.10.8 - Added note to reference Chapter 1.

Section 20 - System Description

Air/Ground System Logic Table

14.20.8 - Standardized autobrake nomenclature and capitalization to match panel nomenclature and for cross model standardization.

Chapter 15 - Warning Systems

Section 20 - System Description

Predictive Windshear Alerts

15.20.16 - Description revised for clarity, no content change.

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General

The Boeing Company issues Flight Crew Operations Manual (FCOM) bulletins as required. Bulletins transmit temporary information which must be issued before the next formal revision to the FCOM or information of interest to all operators.

Bulletins are 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. Each bulletin specifically identifies the airplane effectivity. When appropriate, the next formal FCOM revision will include an updated bulletin record page.

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 FCOM. The bulletin is active and should be retained in the manual.
- Incorporated (INC) - the bulletin operating information has been incorporated into the FCOM. The bulletin is active and should be retained in the manual.
- Cancelled (CANC) - the bulletin is no longer in active and should be removed from the FCOM. Previously cancelled bulletins are no longer listed in the Bulletin Record.

The record below should be accomplished by the person revising the material.

Number	Subject	Date	Status
TBC-3R1	Standby Power Test	Nov 8, 1999	INC
TBC-5R1	Window Overheat	Nov 15, 2000	IE
TBC-6	Possible Autopilot Low Frequency Pitch Oscillation During Flap Extension While in a Turn	Jan 29, 1999	IE
TBC-7	Engine Overheat/Fire and APU Fire Detection	Jan 29, 1999	IE
TBC-8R1	Uncommanded Engine Acceleration Due to an Engine Fuel Control Fault	Dec 17, 1999	IE

Number	Subject	Date	Status
TBC-9R1	APU DC Fuel Pump Operational Anomaly	Jun 30, 2004	IE
TBC-11R1	Collins ILS/GPS Multi-Mode Receiver (MMR) Failure	Mar 26, 1999	IE
TBC-12R1	Inadvertent RTO Autobraking During Landing	Sep 6, 1999	IE
TBC-13R1	Nuisance PWS Fail Annunciation	Apr 23, 1999	IE
TBC-14R1	AFDS Performance Degradation with Radio Altimeter Failure	Jun 30, 2004	IE
TBC-17R1	Control Wheel Microphone/Interphone Switch Anomaly	Nov 6, 2000	IE
TBC-18R2	Nuisance Zone Temp Light Illuminations on 737-800 Airplanes	Nov 1, 2001	IE
TBC-19	737-600/-700/-800 Elevator Tab Operational Limitations	Jun 10, 1999	IE
TBC-20R1	VHF Radio Use for ATC Ground Operations	Jun 30, 2004	IE
TBC-21R1	GPWS Minimums Voice Callout Anomaly	Jun 30, 2004	IE
TBC-22R1	TCAS Display Anomaly	Jun 30, 2004	IE
TBC-23R1	Look-Ahead Terrain Alerting Display Anomalies	Jun 30, 2004	IE
TBC-24	GPWS 2500 Foot Voice Callout Anomaly	May 17, 2000	IE
TBC-27R1	PSEU Fault Indications	Jun 30, 2004	IE
TBC-29R2	Emergency Airworthiness Directive 2002-08-52	Jul 19, 2002	IE
TBC-30R1	Inflight Start EGT Display	Jun 30, 2004	IE
TBC-33R1	Airworthiness Directive 2002-08-20, AMOC Letter 120S-02-907	Nov 1, 2002	IE
TBC-34	FMC MAP Display Blanking with FMC Update U10.3, U10.4 and U10.4A software	Aug 2, 2002	IE
TBC-35R1	Integrated Standby Flight Display (ISFD) Alignment Anomaly	Jul 14, 2004	IE
TBC-37	AD-2002-19-51, Flight Control Modules	Sep 16, 2002	IE

Number	Subject	Date	Status
TBC-38R1	Flight Director and Autopilot Mode Entry Failures	Nov 1, 2004	IE
TBC-39R1	Autopilot Altitude Acquire/Altitude Capture Anomaly	Nov 1, 2004	IE
TBC-41R1	Target Speed Anomaly with Flaps Extended and VNAV Engaged	Nov 1, 2004	IE
TBC-42R2	FMC Navigation Anomaly	Nov 1, 2004	IE
TBC-44R1	Flight Director Anomaly	Oct 21, 2005	IE
TBC-45	Predictive Windshear System Anomaly	Jan 19, 2004	IE
TBC-46R1	FMC Arc Leg Sequencing Anomaly	Nov 1, 2004	IE
TBC-47	Lack of “GLIDESLOPE” Alert During Approach	May 24, 2004	IE
TBC-48R1	Center Tank Fuel System Changes	Apr 3, 2007	IE
TBC-50R1	Nuisance Stall Warning Stick Shaker Events	Apr 15, 2005	IE
TBC-52R1	Master Caution System Anomaly	Jul 25, 2008	IE
TBC-53	Unwanted “Glideslope” Advisory During Approaches Using IAN Capability	Apr 15, 2005	IE
TBC-54R1	FMC Update 549849-015 U10.6 Prediction Errors	Apr 11, 2006	IE
TBC-59	Flight Deck Display Unit Blanking Anomaly	Apr 1, 2006	IE
TBC-61	Head-Up Display (HUD) Software Anomaly	Aug 4, 2006	IE
TBC-62	FMC Update U10.6 Erroneous Holding Pattern	Oct 16, 2006	IE
TBC-63	NO LAND 3 Annunciation After Landing	Nov 13, 2006	IE
TBC-64R1	FMC Failure	Jan 17, 2007	IE
TBC-65	Incorrect Implementation Of TO/GA To LNAV Feature With CDS Blockpoint 06 (BP06) and FMC Update U10.5 Or U10.5A Installed	Feb 12, 2007	IE

Number	Subject	Date	Status
TBC-66	Instrument Procedure, Transition Altitude and FMC Loss of Flight Information (FMC Update U10.6)	Mar 16, 2007	IE
TBC-67	Spoiler Retraction Failure on Airplanes with the Short Field Performance Package	Mar 05, 2007	IE
TBC-68	Unintentional Initiation of the FMC Engine Out Mode (FMC Update U10.7)	Apr 16, 2007	IE
TBC-70	Arming VNAV on the Ground (FMC Update U10.7)	Jun 11, 2007	IE
TBC-71R3	APU Electrical Bus Disconnect	Nov 16, 2007	IE
TBC-73	FMC Lockup with Selection of a Standard Instrument Departure (SID) on Missed Approach (FMC Update U10.0 and later)	Jan 28, 2008	IE
TBC-74	Hand Microphone Use With Flight Deck PC Power Outlets	Sep 22, 2008	IE
TBC-75	Cabin Altitude Warning Indications and Procedures Briefing	Nov 25, 2008	IE

Limitations — Chapter L
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Operating Limitations — Section 10

General

This chapter contains Airplane Flight Manual (AFM) limitations and Boeing recommended operating limitations. Limitations that are obvious, shown on displays or placards, or incorporated within an operating procedure are not contained in this chapter.

Airplane General

Operational Limitations

Runway slope	+/– 2%
Maximum Takeoff and Landing Tailwind Component	[Option - 15 kt tailwind] 15 knots [Option - 10 kt tailwind] 10 knots
Maximum speeds	Observe gear and flap placards
Maximum Operating Altitude	41,000 ft
Maximum Takeoff and Landing Altitude	[Option - Typical] 8,400 ft [Option - High altitude landing system] 12,000 ft

[Option - Without polar navigation]

Maximum flight operating latitude – 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.

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

[Option - Photoluminescent Floor Emergency Lighting]

Photoluminescent Floor Emergency Lighting must be charged in accordance with approved procedures. Refer to chapter one section 40 for charging tables.

[Option - Flight deck security door]

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

Non–AFM Operational Information

Note: The following items are not AFM limitations, but are provided for flight crew information.

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

[Option - Winglets]

The maximum demonstrated takeoff and landing crosswind is 33 knots.

[Option - No winglets]

The maximum demonstrated takeoff and landing crosswind is 36 knots.

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

[Option - Typical 737-600]

Weights	Pounds / Kilograms
Maximum Taxi Weight	127,500 / 57,832
Maximum Takeoff Weight	127,000 / 57,606
Maximum Landing Weight	120,500 / 54,657
Maximum Zero Fuel Weight	114,000 / 51,709

[Option - Typical 737-700]

Weights	Pounds / Kilograms
Maximum Taxi Weight	133,500 / 60,554
Maximum Takeoff Weight	133,000 / 60,327
Maximum Landing Weight	128,000 / 58,059
Maximum Zero Fuel Weight	120,500 / 54,657

[Option - Typical 737-700 with CFM56-7B26 Thrust]

Note: Minimum Takeoff Weight – 125,000 lbs. / 56,699 kgs.
Lower minimum takeoff weights that account for the actual pressure altitude and outside air temperature may be obtained by using the Minimum Takeoff Weight table in the Takeoff section of the Performance Dispatch (PD) chapter.

[Option - Typical 737-800]

Weights	Pounds / Kilograms
Maximum Taxi Weight	156,000 / 70,760
Maximum Takeoff Weight	155,500 / 70,533
Maximum Landing Weight	144,000 / 65,317
Maximum Zero Fuel Weight	136,000 / 61,688

[Option - Typical 737-900]

Weights	Pounds / Kilograms
Maximum Taxi Weight	174,700 / 79,242
Maximum Takeoff Weight	174,200 / 79,015
Maximum Landing Weight Maximum Landing Weight (Flaps 15 *)	146,300 / 66,360 144,200 / 65,407
Maximum Zero Fuel Weight	138,300 / 62,731

* This maximum weight applies when landing with Flaps 15 under normal conditions. It does not apply when Flaps 15 is required during a Non-Normal Checklist.

Air Systems

Pressurization

[Option - Normal Cabin Altitude]

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

Non–AFM Operational Information

Note: The following items are not AFM limitations, but are provided for flight crew information.

With 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 takes 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 open overboard exhaust valve (OEV).

Anti–Ice, Rain

Engine TAI must be on when icing conditions exist or are anticipated, except during climb and cruise below -40°C SAT.

[Option - 737-600/-700/-800 without stiffened elevator tabs]
(PRR 38506 or Service Bulletin 737-55A1080)

After any ground deicing/anti-icing of the horizontal stabilizer using Type II or Type IV fluids, airspeed must be limited to 270 KIAS until the crew has been informed that applicable maintenance procedures have been accomplished that would allow exceedance of 270 KIAS. Once the applicable maintenance procedures have been accomplished, exceeding 270 KIAS is permissible only until the next application of Type II or Type IV deicing/anti-icing fluids.

Autopilot/Flight Director System

Use of aileron trim with the autopilot engaged is prohibited.

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

[Option - FAA rules]

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

[Option - High altitude landing system]

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

[Option - JAA rules]

The autopilot must be disengaged before the airplane descends more than 50 feet below the minimum descent altitude (MDA) unless it is coupled to an ILS glide slope and localizer or in the go-around mode.

[Option - Typical, 737-800, JAA rules]

The Minimum Use Height (MUH) for single channel autopilot operation is defined as 158 feet AGL.

[Option - Typical, FAA rules, 15 kt tailwind]

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

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

[Option - Typical, JAA rules, Cat II or Cat III]

Maximum allowable wind speeds, when conducting a dual channel Cat II or Cat III landing predicated on autoland operations, are:

- Headwind 25 knots
- Crosswind 20 knots

[option - CatIIIb]

- Crosswind 25 knots
- Tailwind 10 knots.
- Tailwind:

[Option - Typical 737-900, 10 kt tailwind]

Field Elevation	Flaps 30	Flaps 40
2000 feet or less	10 knots	10 knots
2001 to 4000 feet	10 knots	10 knots
4001 to 6000 feet	5 knots	10 knots
Greater than 6000 feet	0 knots	10 knots

[Option - Typical 737-900, 15 kt tailwind]

Field Elevation	Flaps 30	Flaps 40
2000 feet or less	15 knots	15 knots
2001 to 4000 feet	10 knots	15 knots
4001 to 6000 feet	5 knots	15 knots
Greater than 6000 feet	0 knots	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.

[Option - CatIIIb]

Autoland capability may only be used with flaps 30 with one engine operative and only for DH at or above 50 feet.

[Option - Landing altitudes above 8,400 ft]

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

[Option - Integrated Approach Navigation (IAN)]

Do not use Integrated Approach Navigation (IAN) Final Approach Course (FAC) or Glide Path (G/P) guidance when any altitude constraint specified by the approach procedure for a final approach fix, or for waypoints between a final approach fix and a runway, has been modified by the flight crew.

HUD System

[Option - Head-Up Display]

[Option - With HGS 2350 and polar navigation]

Do not use HUD System at latitudes greater than 85 degrees latitude or when the Heading Reference Switch is in the TRUE position.

Non–AFM Operational Information

[Option - With HGS 4000 Phase I]

Note: The following items are not AFM limitations, but are provided for flight crew information.

AIII mode approach and landings are not approved for airplanes with Flight Dynamics Model 4000 Phase I HGS installed.

Communications

[Option - With VHF-3 and ACARS without Voice Mode Protection]

Do not use VHF–3 (if installed for voice communication) for ATC communications with ACARS operational.

Aircraft Communications Addressing and Reporting System

[Option - ACARS]

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

Non–AFM Operational Information

Note: The following items are not AFM limitations, but are provided for flight crew information.

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

Electrical

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

Engines and APU

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.

Reverse Thrust

Intentional selection of reverse thrust in flight is prohibited.

APU

[Option - Typical JAA]

APU bleed + electrical load: max alt 10,000 ft.

[Option - Typical FAA]

Inflight - APU bleed + electrical load: max alt 10,000 ft.

[Option - Typical FAA]

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

Note: The following items are not AFM limitations, but are provided for flight crew 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.

Flight Controls

Max flap extension altitude is 20,000 ft.

Holding in icing conditions with flaps extended is prohibited.

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

[Option - 737-600/-700/-800 without stiffened elevator tabs]
(PRR 38506 or Service Bulletin 737-55A1080)

Do not operate the airplane at speeds in excess of 300 KIAS with speedbrakes extended.

WARNING: Use of speedbrakes at speeds in excess of 320 KIAS could result in a severe vibration, which, in turn, could cause extreme damage to the horizontal stabilizer.

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

Note: The following items are not AFM limitations, but are provided for flight crew information.

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

Air Data Inertial Reference Unit (ADIRU)

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

[Option - Altimeters with QFE]

QFE Selection

The use of VNAV or LNAV with the altimeters referenced to QFE is prohibited.

[Option - Vertical Situation Display]

The use of the vertical situation display (VSD) with the altimeters referenced to QFE is prohibited.

[Option - With PFD/ND]

QFE operations are prohibited if the option for QFE altitude reference selection is not installed in the Flight Management System (FMS).

A QFE altitude reference for the PFDs must be selected in the FMS whenever QFE is used instead of QNH.

[Option - With Look-Ahead terrain alerting and without GPS]

The use of Look- Ahead terrain alerting and terrain display functions with the altimeters referenced to QFE is prohibited.

[Option - With Look-Ahead terrain alerting with GPS and with old GPWS computers]

The use of Look-Ahead terrain alerting and terrain display functions with the altimeters referenced to QFE is prohibited.

Look-Ahead Terrain Alerting (GPWS)

[Option - With Enhanced 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 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

Note: The following items are not AFM limitations, but are provided for flight crew information.

[Option - Integrated Approach Navigation]

The use of Integrated Approach Navigation (IAN) with the altimeters referenced to QFE is prohibited.

Do not operate the weather radar in a hangar or within 50 feet of any personnel or a fuel spill.

Note: The hangar and personnel restrictions do not apply to the weather radar test mode.

Fuel System

Maximum tank fuel temperature: 49°C.

Minimum inflight tank fuel temperature: 3°C above the freezing point of the fuel being used or -43°C, whichever is higher.

Fuel Balance

Lateral imbalance between main tanks 1 and 2 must be scheduled to be zero. Random fuel imbalance must not exceed 1000 lbs / 453 kgs for taxi, takeoff, flight or landing.

Fuel Loading

Main tanks 1 and 2 must be full if center tank contains more than 1000 lbs / 453 kgs.

Landing Gear

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

[Option - JAA rules]

Towing operations without the use of a tow bar is restricted to tow vehicles that are designed and operated to preclude damage to the airplane steering system or which provide a reliable and unmistakable warning when damage to the steering system may have occurred.

Non–AFM Operational Information

Note: The following items are not AFM limitations, but are provided for flight crew information.

Do not apply brakes until after touchdown.

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Normal Procedures — Chapter NP
Table of Contents — Section 0

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General

This chapter gives:

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

Normal Procedures Philosophy and Assumptions

Normal procedures verify for each phase of flight that:

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

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

Normal procedures are used by a trained flight crew and assume:

- all systems operate normally
- the full use of all automated features (LNAV, VNAV, autoland, autopilot, and autothrottle).

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 Procedures Guide (DDPG) 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 DDPG or the operator equivalent

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

- check the DDPG 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:

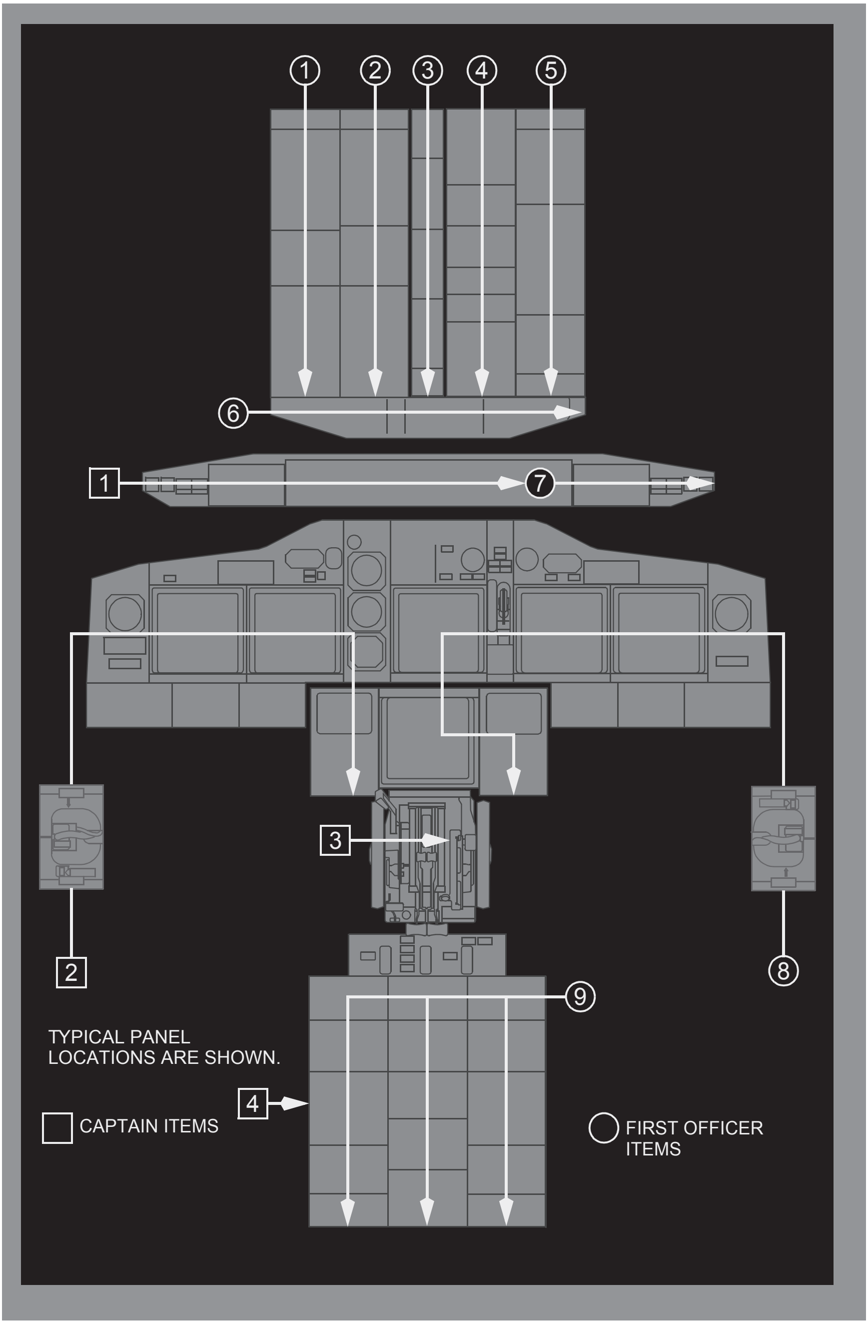
- autopilot
- flight director
- autothrottle

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

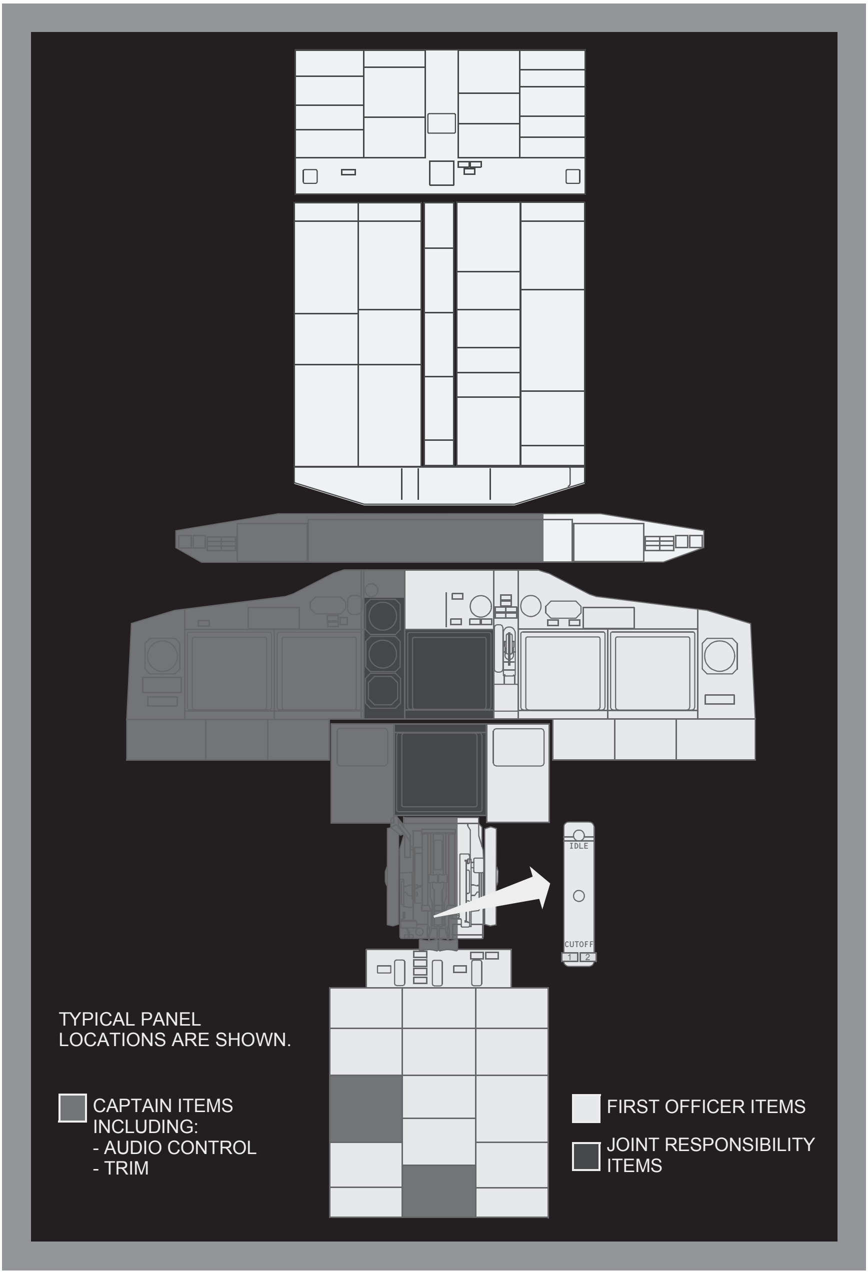
- course
- vertical path
- thrust
- speed

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

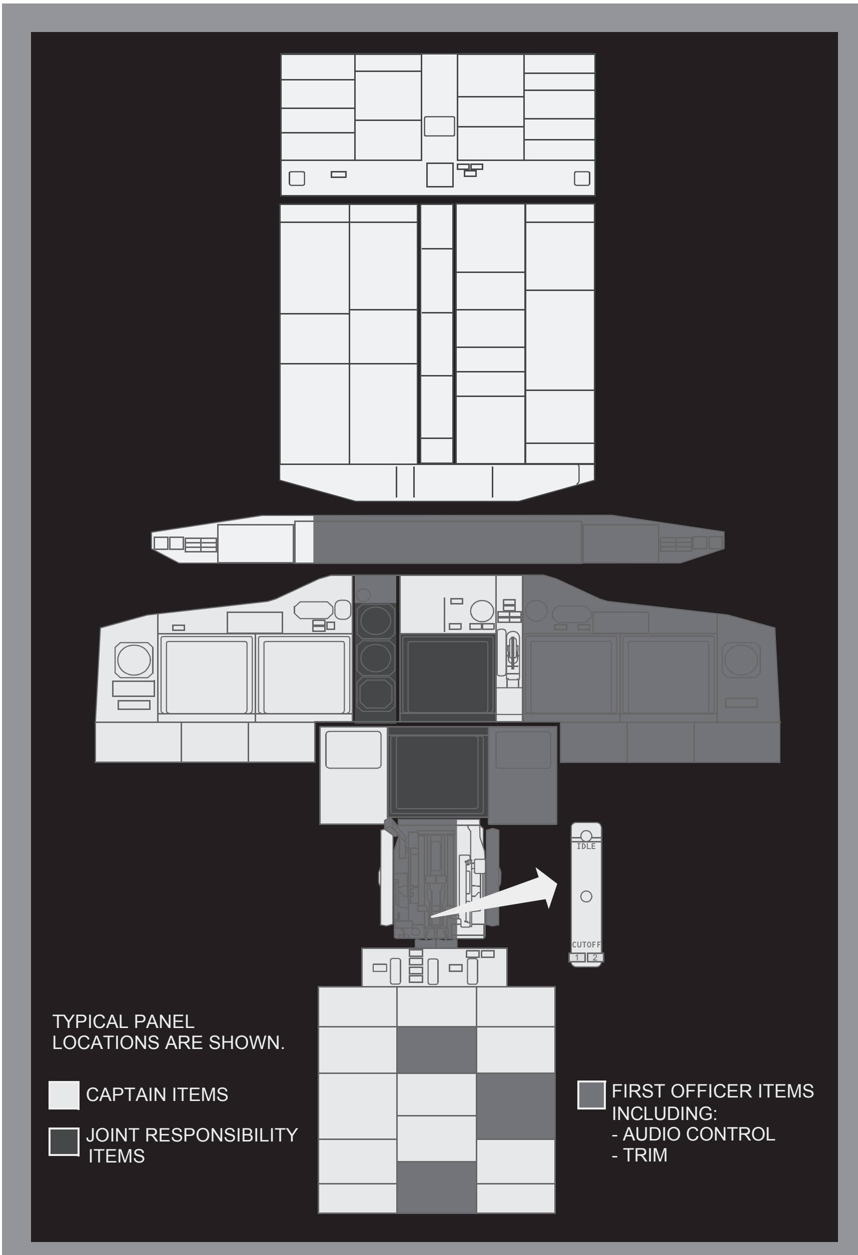
Preflight and Postflight Scan Flow



Areas of Responsibility - Captain as Pilot Flying or Taxiing



Areas of Responsibility - First Officer as Pilot Flying or Taxiing



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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.

[Option]
VOICE RECORDER switch ....As needed

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.

Maintenance documents .... Check

[Option]
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

PSEU light .... Verify extinguished

GPS light .... Verify extinguished

[Option - GLS]
ILS light ....Verify extinguished

[Option - GLS]
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.

Verify pressure meets dispatch requirements.

Landing gear indicator lights ....Verify illuminated

Flight recorder switch ....Guard closed

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 brake wear indicators will be checked during the exterior inspection.

CDU Preflight Procedure - Captain and First Officer

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

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

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

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

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

Initial Data ....Set

IDENT page:

Verify that the MODEL is correct.

Verify that the ENG RATING is correct.

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

POS INIT page:

Verify that the time is correct.

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

Navigation Data ....Set

ROUTE page:

Enter the ORIGIN.

Enter the route.

Enter the FLIGHT NUMBER.

Activate and execute the route.

DEPARTURES page:

Select the runway and departure routing.

Execute the runway and departure routing.

LEGS page:

Verify or enter the correct RNP for the departure.

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:

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

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:

[Option - Aspirated TAT]

Verify that TO shows.

[Option - Non-aspirated TAT]

Verify that dashes are shown.

[Option - FMC U 10.1 and later]
N1 LIMIT page:

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

Select a full or a derated climb thrust as needed.

[Option - FMC U 10.1 and later]
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.

[Option - FMC U10.8 and later, FCC Collins P4 and later or FCC Honeywell 710 and later, and CDS BP06 and later]

Verify or enter an acceleration height.

[Option - FMC U10.8 and later, FCC Collins P4 and later or FCC Honeywell 710 and later, and CDS BP06 and later]

Verify or enter an engine out acceleration height.

[Option – With automatic thrust reduction after takeoff]

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.

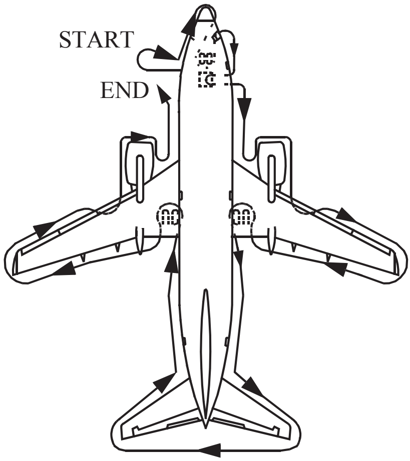
Items at each location may be checked in any sequence.

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 exterior 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.

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

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

Access panels .... 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

[Option]
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 .... Open

Tail

Vertical stabilizer and rudder .... Check

Elevator feel probes .... Check

[737-800/900]
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 .... Latched

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.

[Option - RSEP airplanes]

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

[Option]

FMC transfer 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

[Option]

CAB/UTIL power switch – ON

[Option]

IFE/PASS SEAT power switch – ON

STANDBY POWER switch – Guard closed

Verify that the STANDBY PWR OFF light is extinguished.

Verify that the BAT DISCHARGE light is extinguished.

Verify that the TR UNIT light is extinguished.

Verify that the ELEC light is extinguished.

Generator drive DISCONNECT switches – Guards closed

Verify that the DRIVE lights are illuminated.

BUS TRANSFER switch – Guard closed

Verify that the TRANSFER BUS OFF lights are extinguished.

Verify that the SOURCE OFF lights are extinguished.

Verify that the GEN OFF BUS lights are illuminated.

Overheat and fire protection panel .... Check

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

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

Alert ground personnel before the following test is accomplished:

OVERHEAT DETECTOR switches – NORMAL

TEST switch – Hold to FAULT/INOP

Verify that the MASTER CAUTION lights are illuminated.

Verify that the OVHT/DET annunciator is illuminated.

Verify that the FAULT light is illuminated.

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

Verify that the APU DET INOP light is illuminated.

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

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

TEST switch – Hold to OVHT/FIRE

Verify that the fire warning bell sounds.

Verify that the master FIRE WARN lights are illuminated.

Verify that the MASTER CAUTION lights are illuminated.

Verify that the OVHT/DET annunciator is illuminated.

Master FIRE WARN light – Push

Verify that the master FIRE WARN lights are extinguished.

Verify that the fire warning bell cancels.

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

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

Verify that the WHEEL WELL 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, position an AC operated fuel pump ON. 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 453kgs/1000 lbs.

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

[Option - Without DC Operated APU Fuel Pump]

Note: Whenever the APU is operating and AC electrical power is on the airplane busses, operate at least one fuel boost pump to supply fuel under pressure to the APU to extend the service life of the APU fuel control unit.

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.

[Option]
Lavatory SMOKE light .... Verify extinguished

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.

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

[Option]
Verify that the OFF lights are extinguished (except at high ambient temperatures.)

PROBE HEAT switches .... OFF

Verify that all lights are illuminated.

WING ANTI–ICE switch .... OFF

Verify that the VALVE OPEN lights are extinguished.

[Option]

Verify that the ICE DETECTOR light is 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.

[Option]
High altitude landing switch .... As needed

Verify that the INOP light is extinguished

Air conditioning panel .... Set

AIR TEMPERATURE source selector – As needed

[737-800/900]

TRIM AIR switch – ON

[737-600/700]

Verify that the DUCT OVERHEAT lights are extinguished.

[737-800/900]

Verify that the ZONE TEMP lights are extinguished.

Temperature selectors – As needed

Verify that the RAM DOOR FULL OPEN lights are illuminated.

[737-600/700]

RECIRCULATION FAN switch – AUTO

[737-800/900]

RECIRCULATION 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.

[737-600/700]
Verify that the PACK TRIP OFF lights are extinguished.

[737-800/900]
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

LANDING light switches – RETRACT and 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.

[Without automatic ignition]
ENGINE START switches .... OFF

[Automatic ignition]
ENGINE START switches ....AUTO

Lighting panel .... Set

[Option]

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

[Option]
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

Oxygen .... Test and set

[Chemical passenger oxygen]
Crew oxygen pressure – Check

Verify that the pressure is sufficient for dispatch.

Oxygen mask – Stowed and doors closed

RESET/TEST switch – Push and hold

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

EMERGENCY/Test selector – Push and hold

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

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

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

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

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

Normal/100% switch – 100%

[Option - Electronic Flight Bag]
ELECTRONIC FLIGHT BAG .... Set

Clock .... Set

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
- expected RMI flags

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.

[Option]
BRAKE TEMP light .... Verify extinguished

GROUND PROXIMITY panel .... Check

FLAP INHIBIT switch – Guard closed

GEAR INHIBIT switch – Guard closed

TERRAIN INHIBIT switch – Guard closed

Verify that the 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.

[Option]
Verify that the hydraulic quantity indications do not show RF.

[Option - Fail Operational airplanes]
MFD Cancel/Recall switch – Push

Verify that the autoland status advisory messages are not shown.

CARGO FIRE panel .... Check

This check is needed once per flight day or following a flight crew change.

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 FWD and AFT lights stay illuminated.

Verify that the DETECTOR FAULT light stays extinguished.

Verify that the green EXTINGUISHER test lights stay illuminated.

Verify that the DISCH light stays illuminated.

[Option]
HUD system .... As needed

[Option]
Radio tuning panel .... Set

WARNING: Do not key HF radio while airplane is being fueled. Injury to personnel or fire may result.

Verify that the OFF light is extinguished.

[Option]
VHF communications radios .... Set

VHF NAVIGATION radios .... Set for departure

Audio control panel .... Set

ADF radios .... Set

WEATHER RADAR 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

Adjust the seat for optimum eye reference.

Verify a positive horizontal (fore and aft) seat lock.

Rudder pedals .... Adjust

Adjust the rudder pedals to allow full rudder pedal and brake pedal movement.

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

[Option]
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

Oxygen .... Test and set

[Chemical passenger oxygen]
Crew oxygen pressure – Check

Verify that the pressure is sufficient for dispatch.

Oxygen mask – Stowed and doors closed

RESET/TEST switch – Push and hold

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

EMERGENCY/Test selector – Push and hold

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

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

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

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

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

Normal/100% switch – 100%

[Option - Electronic Flight Bag]
ELECTRONIC FLIGHT BAG .... Set

Clock .... Set

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
- expected RMI flags

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.

[Option]
Standby instruments ....Check

Standby horizon – Set

Gyro caging control – Pull, then release

Approach mode selector – As needed

Verify that the flight instrument indications are correct.

Verify that no flags are shown.

Standby altimeter – Set

Verify that the flight instrument indications are correct.

Verify that no flags are shown.

[Option]
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.

[Option]
Standby RMI ....Set

Select either VOR or ADF.

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.

[Option]

Verify that the FLAP LOAD RELIEF light is extinguished.

Parking brake ....Set

Verify that the parking brake warning light is illuminated

Note: Do not assume that the parking brake will prevent airplane movement. Accumulator pressure can be insufficient.

Engine start levers .... CUTOFF

STABILIZER TRIM cutout switches .... NORMAL

[Option]
HUD system .... As needed

[Option]
Radio tuning panel .... Set

WARNING: Do not key the HF radio when the airplane is being refueled. Injury to personnel or fire can occur.

Verify that the OFF light is extinguished.

[Option]
VHF communications radios .... Set

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

Adjust the seat for optimum eye reference.

Verify a positive horizontal (fore and aft) seat lock.

Rudder pedals .... Adjust

Adjust the rudder pedals to allow full rudder pedal and brake pedal movement.

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

[Option - EFIS/MAP]
Verify that the speed bugs are at V1, VR, V2 + 15, and flaps up maneuvering speed.

MCP .... Set C

AUTOTHROTTLE ARM switch – ARM

IAS/MACH selector – Set V2

Arm LNAV as needed

[Option - FMC U10.8 and later, FCC Collins P4 and later or FCC Honeywell 710 and later, and CDS BP06 and later]
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:

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 1,000 pounds/460 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.

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

[Option]
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.

Engine start lever ....IDLE C

Monitor fuel flow and EGT indications. C, F/O

[Automatic ignition]
At 56% N2, verify that the ENGINE START switch moves to AUTO. If not, move the ENGINE START switch to AUTO. F/O

[Without automatic ignition]
At 56% N2, verify that the ENGINE START switch moves to OFF. If not, move the ENGINE START switch to OFF. F/O

[Automatic ignition]
Verify that the START VALVE OPEN alert extinguishes when the ENGINE START switch moves to AUTO. F/O

[Without automatic ignition]
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.

Starter duty cycle:
- Do not exceed 2 minutes during each start attempt
- A minimum of 10 seconds is needed between start attempts

Normal engine start considerations:
- do not move an engine start lever to idle 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.

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 10 seconds after the engine start lever is moved to IDLE
- the EGT quickly nears or exceeds the start limit

Before Taxi Procedure

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
[Without automatic ignition] 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

[Option]
Blank the lower display unit. F/O

Transponder ....As needed F/O

At airports where ground tracking is not available, select STBY. At airports equipped to track airplanes on the ground, select an active transponder setting, but not a TCAS mode.

Recall .... Check C, F/O

Verify that all system annunciator panel lights illuminate and then extinguish.

[Option - Electronic Flight Bag]
EFB AIRPORT MAP application.................................Select C, F/O

Select map as desired.

CAUTION: Do not use the Airport Map application as a primary navigation reference. The Airport Map application is designed to aid flight crew positional awareness only.

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 [AD 2002-19-52 and AD 2002-24-51]

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
	Check the center tank fuel quantity. Both center tank fuel pump switches must be OFF for takeoff if center tank fuel is less than 5000 pounds/2300 kilograms. Do not accomplish the CONFIG non-normal checklist with less than 5000 pounds/2300 kilograms in the center tank prior to takeoff.
	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. [Option - with EGPWS] Set the terrain display as needed.	
Call "BEFORE TAKEOFF CHECKLIST."	Do the BEFORE TAKEOFF checklist.

Before Takeoff Procedure [Alternate Method of Compliance (AMOC) to AD 2002-24-51]

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
	Check the center tank fuel quantity. Both center tank fuel pump switches must be OFF for takeoff if center tank fuel is less than 5000 pounds/2300 kilograms. Do not accomplish the CONFIG non-normal checklist with less than 5000 pounds/2300 kilograms in the center tank prior to takeoff.
	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. [Option - with EGPWS] Set the terrain display as needed.	
Call “BEFORE TAKEOFF CHECKLIST.”	Do the BEFORE TAKEOFF checklist.

Before Takeoff Procedure [Alternate Method of Compliance (AMOC) to AD 2001-08-24 and AD 2002-24-51 for Airplanes with Master Caution System Logic Change and Automatic Shutoff]

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. [Option - with EGPWS] Set the terrain display as needed.	
Call "BEFORE TAKEOFF CHECKLIST."	Do the BEFORE TAKEOFF checklist.

Takeoff Procedure

[Option - With auto T/O thrust reduction and with FMC U10.7 and earlier]

Pilot Flying	Pilot Monitoring
	[Option - Runway position update (Runway Remaining) with TO/GA activation] Enter the RWY REMAIN on the CDU TAKEOFF REF page. [Option - Runway position update with the CDU only] Update the FMC position to the runway threshold on the CDU TAKEOFF REF page.
	When entering the departure runway, set the STROBE light switch to ON. Use other lights as needed.
Verify that the brakes are released. Align the airplane with the runway.	When cleared for takeoff, set the FIXED LANDING light switches to ON. Set the transponder mode selector to TA/RA.
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 by 60 knots, manually advance the thrust levers.
After takeoff thrust is set, the captain's hand must be on the thrust levers until V1.	

Pilot Flying	Pilot Monitoring
Monitor airspeed. Maintain light forward pressure on the control column.	Monitor airspeed and call out any abnormal indications.
Verify 80 knots and call “CHECK.”	Call “80 KNOTS.”
Verify V1 speed.	Verify the automatic V1 callout or call “V1.”
At VR, rotate toward 15° pitch attitude. After liftoff, follow F/D commands.	At VR, call “ROTATE.” Monitor airspeed and vertical speed.
Establish a positive rate of climb.	
	Verify a positive rate of climb on the altimeter and call “POSITIVE RATE.”
Verify a positive rate of climb on the altimeter and call “GEAR UP.”	
	Set the landing gear lever to UP.
Above 400 feet radio altitude, call for a roll mode as needed.	Select or verify the roll mode.
At thrust reduction height, verify that climb thrust is set.	
At acceleration height, call “SET FLAPS UP SPEED.”	
	Set the flaps up maneuvering speed.
Verify acceleration. Call “FLAPS ___” according to the flap retraction schedule.	
	Set the FLAP lever as directed. Monitor flaps and slats retraction.
After flaps and slats retraction is complete, call “VNAV.”	
	Push the VNAV switch.
Engage the autopilot when above the minimum altitude for autopilot engagement.	

Pilot Flying	Pilot Monitoring
	After flap retraction is complete: • Set or verify engine bleeds and air conditioning packs are operating [Without automatic ignition] • 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 Procedure

[Option - With auto T/O thrust reduction and with FMC U10.8 and later, FCC Collins P4 and later or FCC Honeywell 710 and later and CDS BP06 and later]

Pilot Flying	Pilot Monitoring
	[Option - Runway position update (Takeoff Shift) with TO/GA activation] Enter the runway offset on the CDU TAKEOFF REF page.
	When entering the departure runway, set the STROBE light switch to ON. Use other lights as needed.
Verify that the brakes are released. Align the airplane with the runway.	When cleared for takeoff, set the FIXED LANDING light switches to ON. Set the transponder mode selector to TA/RA.
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 by 60 knots, manually advance the thrust levers.
After takeoff thrust is set, the captain’s hand must be on the thrust levers until V1.	
Monitor airspeed. Maintain light forward pressure on the control column.	Monitor airspeed and call out any abnormal indications.
Verify 80 knots and call “CHECK.”	Call “80 KNOTS.”

Pilot Flying	Pilot Monitoring
Verify V1 speed.	Verify the automatic V1 callout or call "V1."
At VR, rotate toward 15° pitch attitude. After liftoff, follow F/D commands.	At VR, call "ROTATE." Monitor airspeed and vertical speed.
Establish a positive rate of climb.	
	Verify a positive rate of climb on the altimeter and call "POSITIVE RATE."
Verify a positive rate of climb on the altimeter and call "GEAR UP."	
	Set the landing gear lever to UP.
Above 400 feet radio altitude, call for a roll mode as needed.	Select or verify the roll mode. Verify VNAV engaged.
At thrust reduction height, verify that climb thrust is set.	
Verify acceleration at the acceleration height. Call "FLAPS ___" according to the flap retraction schedule.	
	Set the FLAP lever as directed.
Engage the autopilot when above the minimum altitude for autopilot engagement.	
	After flap retraction is complete: • Set or verify engine bleeds and air conditioning packs are operating • 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 Procedure

[Option - Without auto T/O thrust reduction and with FMC U10.7 and earlier]

Pilot Flying	Pilot Monitoring
	[Option - Runway position update (Runway Remaining) with TO/GA activation] Enter the RWY REMAIN on the CDU TAKEOFF REF page. [Option - Runway position update with the CDU only] Update the FMC position to the runway threshold on the CDU TAKEOFF REF page.
	When entering the departure runway, set the STROBE light switch to ON. Use other lights as needed.
Verify that the brakes are released. Align the airplane with the runway.	When cleared for takeoff, set the FIXED LANDING light switches to ON. Set the transponder mode selector to TA/RA.
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 by 60 knots, manually advance the thrust levers.
After takeoff thrust is set, the captain's hand must be on the thrust levers until V1.	

Pilot Flying	Pilot Monitoring
Monitor airspeed. Maintain light forward pressure on the control column.	Monitor airspeed and call out any abnormal indications.
Verify 80 knots and call “CHECK.”	Call “80 KNOTS.”
Verify V1 speed.	Verify the automatic V1 callout or call “V1.”
At VR, rotate toward 15° pitch attitude. After liftoff, follow F/D commands.	At VR, call “ROTATE.” Monitor airspeed and vertical speed.
Establish a positive rate of climb.	
	Verify a positive rate of climb on the altimeter and call “POSITIVE RATE.”
Verify a positive rate of climb on the altimeter and call “GEAR UP.”	
	Set the landing gear lever to UP.
Above 400 feet radio altitude, call for a roll mode as needed.	Select or verify the roll mode.
At thrust reduction height, call “SET CLIMB THRUST.”	
	Push the N1 switch.
Verify that climb thrust is set.	
At acceleration height, call “SET FLAPS UP SPEED.”	
	Set the flaps up maneuvering speed.
Verify acceleration. Call “FLAPS ___” according to the flap retraction schedule.	
	Set the FLAP lever as directed. Monitor flaps and slats retraction.
After flaps and slats retraction is complete, call “VNAV.”	
	Push the VNAV switch.
Engage the autopilot when above the minimum altitude for autopilot engagement.	

Pilot Flying	Pilot Monitoring
	After flap retraction is complete: • Set or verify engine bleeds and air conditioning packs are operating [Without automatic ignition] • 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 [AD 2002-19-52 and AD 2002-24-51]

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

Pilot Flying	Pilot Monitoring
	If the center tank fuel pump switches were OFF for takeoff and the center tank contains more than 1000 pounds/500 kilograms, set both center tank fuel pump switches ON above 10,000 feet or after the pitch attitude has been reduced to begin acceleration to a climb speed of 250 knots or greater.
	During climb, set both center tank fuel pump switches OFF when center tank fuel quantity reaches approximately 1000 pounds/500 kilograms.
	At or above 10,000 feet MSL, set the LANDING light switches to OFF.
	Set the passenger signs as needed.
At transition altitude, set and crosscheck the altimeters to standard.	
	When established in a level attitude at cruise, if the center tank contains more than 1000 pounds/500 kilograms and the center tank fuel pump switches are OFF, set the center tank fuel pump switches ON again. Set both center tank fuel pump switches OFF when center tank fuel quantity reaches approximately 1000 pounds/500 kilograms.
	During an ETOPS flight, additional steps must be done. See the ETOPS supplementary procedure in SP.1.
	Before the top of descent, modify the active route as needed for the arrival and approach. Verify or enter the correct RNP for arrival.

Climb and Cruise Procedure [Alternate Method of Compliance (AMOC) to AD 2002-24-51]

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

Pilot Flying	Pilot Monitoring
	If the center tank fuel pump switches were OFF for takeoff and the center tank contains more than 2000 pounds/950 kilograms, set both center tank fuel pump switches ON above 10,000 feet or after the pitch attitude has been reduced to begin acceleration to a climb speed of 250 knots or greater.
	At or above 10,000 feet MSL, set the LANDING light switches to OFF.
	Set the passenger signs as needed.
At transition altitude, set and crosscheck the altimeters to standard.	
	During climb or cruise, set one center tank fuel pump switch OFF when center tank fuel quantity reaches approximately 2000 pounds/950 kilograms. Open the crossfeed valve to minimize fuel imbalance. Set the remaining center tank fuel pump switch OFF without delay and close the crossfeed valve when the Master Caution and FUEL system annunciator illuminate.
	During an ETOPS flight, additional steps must be done. See the ETOPS supplementary procedure in SP.1.
	Before the top of descent, modify the active route as needed for the arrival and approach. Verify or enter the correct RNP for arrival.

Climb and Cruise Procedure [Alternate Method of Compliance (AMOC) to AD 2001-08-24 and AD 2002-24-51 for Airplanes with Master Caution System Logic Change and Automatic Shutoff]

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

Pilot Flying	Pilot Monitoring
	At or above 10,000 feet MSL, set the LANDING light switches to OFF.
	Set the passenger signs as needed.
At 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.
	Before the top of descent, modify the active route as needed for the arrival and approach. Verify or enter the correct RNP for arrival.

Descent Procedure [AD 2002-19-52 and AD 2002-24-51]

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
	Set both center tank fuel pump switches OFF when center tank fuel quantity reaches approximately 3000 pounds/1400 kilograms. Do not accomplish the CONFIG non-normal checklist.
	Verify that pressurization is set to landing altitude.
Review the system annunciator lights.	Recall and review the system annunciator lights.
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.

Descent Procedure [Alternate Method of Compliance (AMOC) to AD 2002-24-51]

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
	Set one center tank fuel pump switch OFF when center tank fuel quantity reaches approximately 3000 pounds/1400 kilograms. Open the crossfeed valve to minimize fuel imbalance. Turn the remaining center tank fuel pump switch OFF without delay and close the crossfeed valve when the Master Caution and FUEL system annunciator illuminate.
	If established in level flight for an extended period of time prior to approach and landing with more than 2000 pounds/950 kilograms in the center tank and the center tank fuel pump switches OFF, one center tank fuel pump switch may be turned ON again. Open the crossfeed valve to minimize fuel imbalance. Turn the remaining center tank fuel pump switch OFF without delay and close the crossfeed valve when the Master Caution and FUEL system annunciator illuminate.
	Verify that pressurization is set to landing altitude.
Review the system annunciator lights.	Recall and review the system annunciator lights.
Verify VREF on the APPROACH REF page.	Enter VREF on the APPROACH REF page.
Set the RADIO/BARO minimums as needed for the approach.	

Pilot Flying	Pilot Monitoring
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.

Descent Procedure [Alternate Method of Compliance (AMOC) to AD 2001-08-24 and AD 2002-24-51 for Airplanes with Master Caution System Logic Change and Automatic Shutoff]

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
	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) 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.
Review the system annunciator lights.	Recall and review the system annunciator lights.
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.

Descent Procedure - Airplanes with Fail Operational Autoland Capability [AD 2002-19-52 and AD 2002-24-51]

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
	Set both center tank fuel pump switches OFF when center tank fuel quantity reaches approximately 3000 pounds/1400 kilograms. Do not accomplish the CONFIG non-normal checklist.
	Verify that pressurization is set to landing altitude.
Review the system annunciator lights.	Recall and review the system annunciator lights.
	Verify that the autoland advisory messages are not shown.
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.

Descent Procedure - Airplanes with Fail Operational Autoland Capability [Alternate Method of Compliance (AMOC) to AD 2002-24-51]

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
	Set one center tank fuel pump switch OFF when center tank fuel quantity reaches approximately 3000 pounds/1400 kilograms. Open the crossfeed valve to minimize fuel imbalance. Turn the remaining center tank fuel pump switch OFF without delay and close the crossfeed valve when the Master Caution and FUEL system annunciator illuminate.
	If established in level flight for an extended period of time prior to approach and landing with more than 2000 pounds/950 kilograms in the center tank and the center tank fuel pump switches OFF, one center tank fuel pump switch may be turned ON again. Open the crossfeed valve to minimize fuel imbalance. Turn the remaining center tank fuel pump switch OFF without delay and close the crossfeed valve when the Master Caution and FUEL system annunciator illuminate.
	Verify that pressurization is set to landing altitude.
Review the system annunciator lights.	Recall and review the system annunciator lights.
	Verify that the autoland advisory messages are not shown.
Verify VREF on the APPROACH REF page.	Enter VREF on the APPROACH REF page.

Pilot Flying	Pilot Monitoring
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.

Descent Procedure - Airplanes with Fail Operational Autoland Capability [Alternate Method of Compliance (AMOC) to AD 2001-08-24 and AD 2002-24-51 for Airplanes with Master Caution System Logic Change and Automatic Shutoff]

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
	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) 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.
Review the system annunciator lights.	Recall and review the system annunciator lights.
	Verify that the autoland advisory messages are not shown.
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.

Descent Procedure - Airplanes with IAN Capability [AD 2002-19-52 and AD 2002-24-51]

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
	Set both center tank fuel pump switches OFF when center tank fuel quantity reaches approximately 3000 pounds/1400 kilograms. Do not accomplish the CONFIG non-normal checklist.
	Verify that pressurization is set to landing altitude.
Review the system annunciator lights.	Recall and review the system annunciator lights.
Verify VREF on the APPROACH REF page.	Enter VREF on the APPROACH REF page.
Set the RADIO/BARO minimums as needed for the approach.	
Select FMC approach procedure.	
Verify/set RNP as appropriate for procedure.	
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.

Descent Procedure - Airplanes with IAN Capability [Alternate Method of Compliance (AMOC) to AD 2002-24-51]

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
	Set one center tank fuel pump switch OFF when center tank fuel quantity reaches approximately 3000 pounds/1400 kilograms. Open the crossfeed valve to minimize fuel imbalance. Turn the remaining center tank fuel pump switch OFF without delay and close the crossfeed valve when the Master Caution and FUEL system annunciator illuminate.
	If established in level flight for an extended period of time prior to approach and landing with more than 2000 pounds/950 kilograms in the center tank and the center tank fuel pump switches OFF, one center tank fuel pump switch may be turned ON again. Open the crossfeed valve to minimize fuel imbalance. Turn the remaining center tank fuel pump switch OFF without delay and close the crossfeed valve when the Master Caution and FUEL system annunciator illuminate.
	Verify that pressurization is set to landing altitude.
Review the system annunciator lights.	Recall and review the system annunciator lights.
Verify VREF on the APPROACH REF page.	Enter VREF on the APPROACH REF page.
Set the RADIO/BARO minimums as needed for the approach.	
Select FMC approach procedure.	
Verify/set RNP as appropriate for procedure.	

Pilot Flying	Pilot Monitoring
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.

Descent Procedure - Airplanes with IAN Capability [Alternate Method of Compliance (AMOC) to AD 2001-08-24 and AD 2002-24-51 for Airplanes with Master Caution System Logic Change and Automatic Shutoff]

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
	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) 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.
Review the system annunciator lights.	Recall and review the system annunciator lights.
Verify VREF on the APPROACH REF page.	Enter VREF on the APPROACH REF page.
Set the RADIO/BARO minimums as needed for the approach.	
Select FMC approach procedure.	
Verify/set RNP as appropriate for procedure.	

Pilot Flying	Pilot Monitoring
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

[Option - GLS]

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.

[FAA]
If a flaps 15 landing is needed because of performance:

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

Pilot Flying	Pilot Monitoring
	Set the passenger signs as needed.
	At or above 10,000 feet MSL, set the FIXED LANDING light switches to ON.
At transition level, set and crosscheck the altimeters.	
Update the arrival and approach procedures as needed. Update the RNP as needed.	
Update the approach briefing as needed.	
Call “APPROACH CHECKLIST.”	Do the APPROACH checklist.

Approach Procedure - Airplanes with IAN Capability

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

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 or add waypoints to the selected FMC procedure.

Note: Approaches other than ILS or GLS are not authorized using QFE.

For a GLS approach, select the appropriate GLS channel. For an ILS, LOC, BCRS, SDF or LDA approach, select the appropriate localizer frequency. For all other approaches, select a VOR frequency in both VHF control panels.

For a BCRS approach, enter the front course in the Mode Control Panel COURSE window. Do not select VOR/LOC.

Pilot Flying	Pilot Monitoring
	Set the passenger signs as needed.
	At or above 10,000 feet MSL, set the FIXED LANDING light switches to ON.
At transition level, set and crosscheck the altimeters.	
Update the arrival and approach procedures as needed. Update the RNP 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 - ILS

[Option - Glideslope inhibited before Localizer capture]

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. Engage the other autopilot.	
Use HDG SEL to intercept the final approach course as needed.	
Verify that the localizer is captured.	
	Call "GLIDE SLOPE ALIVE."
At glide slope 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. [Without automatic ignition] Set the engine start switches to CONT.

Pilot Flying	Pilot Monitoring
Set the speed brake lever to ARM. Verify that the SPEED BRAKE ARMED light is illuminated.	
At glide slope 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 or OM, verify the crossing altitude.	
Monitor the approach. [Without Fail Operational Autoland capability] Verify the AFDS status at 500 feet radio altitude. [Fail Operational Autoland capability] Verify the autoland status at 500 feet radio altitude.	

Landing Procedure - ILS

[Option - No Glideslope inhibit before Localizer capture]

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. Engage the other autopilot.	
WARNING: When using LNAV to intercept the final approach course, LNAV might parallel the localizer without capturing it. The airplane can then descend on the glide slope with the localizer not captured.	
Use HDG SEL to intercept the final approach course as needed.	
Verify that the localizer is captured.	
	Call “GLIDE SLOPE ALIVE.”
At glide slope 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. [Without automatic ignition] Set the engine start switches to CONT.
Set the speed brake lever to ARM. Verify that the SPEED BRAKE ARMED light is illuminated.	
At glide slope 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.

Pilot Flying	Pilot Monitoring
At the final approach fix or OM, verify the crossing altitude.	
Monitor the approach. [Without Fail Operational Autoland capability] Verify the AFDS status at 500 feet radio altitude. [Airplanes with Fail Operational Autoland capability] Verify the autoland status at 500 feet radio altitude.	

Landing Procedure - ILS - Airplanes with IAN Capability

[Option - Glideslope inhibited before Localizer capture]

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></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>Use 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.</td></tr>
<tr><td></td><td>Call “GLIDE SLOPE/GLIDE PATH ALIVE.”</td></tr>
<tr><td>At glide slope/glide path alive, 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.</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 slope/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 or OM, verify the crossing altitude.</td></tr>
<tr><td colspan="2">Monitor the approach.</td></tr>
</table>

Landing Procedure - Instrument Approach using VNAV

[With VNAV ALT enabled]

Use the autopilot during the approach to give:

- autopilot alerts and mode fail indications
- more accurate course and glide path tracking
- lower RNP limits.

This procedure is not authorized using QFE.

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></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></td><td>Verify that the VNAV glide path angle is shown on the final approach segment of the LEGS page.</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 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>
<tr><td colspan="2">Verify that LNAV is engaged or that VOR/LOC is captured.</td></tr>
<tr><td>Approximately 2 NM before the final approach fix and after ALT HOLD or VNAV PTH or VNAV ALT is annunciated:
• verify that the autopilot is engaged
• set DA(H) or MDA(H) on the MCP
• select or verify speed intervention
• select or verify VNAV.</td><td>Call “APPROACHING GLIDE PATH.”</td></tr>
</table>

Pilot Flying	Pilot Monitoring
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. [Without automatic ignition] 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.
When at least 300 feet below the missed approach altitude, set the missed approach altitude on the MCP.	
At the final approach fix, verify the crossing altitude and crosscheck the altimeters.	
Monitor the approach.	
If suitable visual reference is established at DA(H), MDA(H) or the missed approach point, disengage the autopilot and autothrottle. Maintain the glide path to landing.	

Landing Procedure - Instrument Approach using VNAV

[Without VNAV ALT enabled]

Use the autopilot during the approach to give:

- autopilot alerts and mode fail indications
- more accurate course and glide path tracking
- lower RNP limits.

This procedure is not authorized using QFE.

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></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></td><td>Verify that the VNAV glide path angle is shown on the final approach segment of the LEGS page.</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 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>
<tr><td colspan="2">Verify that LNAV is engaged or that VOR/LOC is captured.</td></tr>
<tr><td>Approximately 2 NM before the final approach fix and after ALT HOLD or VNAV PTH is annunciated:
• verify that the autopilot is engaged
• set DA(H) or MDA(H) on the MCP
• select or verify speed intervention
• select or verify VNAV.</td><td>Call “APPROACHING GLIDE PATH.”</td></tr>
</table>

Pilot Flying	Pilot Monitoring
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. [Without automatic ignition] 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.
When at least 300 feet below the missed approach altitude, set the missed approach altitude on the MCP.	
At the final approach fix, verify the crossing altitude and crosscheck the altimeters.	
Monitor the approach.	
If suitable visual reference is established at DA(H), MDA(H) or the missed approach point, disengage the autopilot and autothrottle. Maintain the glide path to landing.	

Go–Around and Missed Approach Procedure

Pilot Flying	Pilot Monitoring
At the same time: • push the TO/GA switch • call “FLAPS 15.”	Position the FLAP lever to 15 and monitor flap retraction
Verify: • the rotation to go–around attitude • that the thrust increases.	
	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 below the top of the amber band, limit bank angle to 15°.	
Above 400 feet, verify LNAV or select HDG SEL as appropriate. Above 400 feet, select appropriate roll mode and verify proper mode annunciation.	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 flap retraction to the planned flap setting, select LVL CHG. VNAV may be selected if the flaps are up.	
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. [Without automatic ignition] Set the engine start switches as needed.
Call “AFTER TAKEOFF CHECKLIST.”	Do the AFTER TAKEOFF checklist.

Landing Roll Procedure

[Option - Electronic Flight Bag]

Pilot Flying	Pilot Monitoring
Disengage the autopilot. Control the airplane manually.	
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.	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." Monitor the rollout progress.
Verify correct autobrake operation.	
WARNING: After the reverse thrust levers are moved, a full stop landing must be made. If an engine stays in reverse, safe flight is not possible.	
Without delay, move the reverse thrust levers to the interlocks and hold light pressure until the interlocks release. Then apply reverse thrust as needed.	
By 60 knots, start movement of the reverse thrust levers to be at the reverse idle detent before taxi speed.	Call "60 KNOTS."
After the engines are at reverse idle, move the reverse thrust levers full down.	
Before taxi speed, disarm the autobrake. Use manual braking as needed.	
CAUTION: Do not use the Airport Map application as a primary navigation reference. The Airport Map application is designed to aid flight crew positional awareness only.	

Landing Roll Procedure - Airplanes with Fail Operational Autoland Capability

[Option - Electronic Flight Bag]

Pilot Flying	Pilot Monitoring
Verify that the thrust levers are closed. Verify that the SPEED BRAKE lever is UP.	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.”
Monitor the rollout progress.	
Verify correct autobrake operation.	
WARNING: After the reverse thrust levers are moved, a full stop landing must be made. If an engine stays in reverse, safe flight is not possible.	
Without delay, move the reverse thrust levers to the interlocks and hold light pressure until the interlocks release. Then apply reverse thrust as needed.	
By 60 knots, start movement of the reverse thrust levers to be at the reverse idle detent before taxi speed.	Call “60 KNOTS.”
After the engines are at reverse idle, move the reverse thrust levers full down.	
Before taxi speed, disarm the autobrake. Use manual braking as needed.	
Before turning off the runway, disconnect the autopilot.	
CAUTION: Do not use the Airport Map application as a primary navigation reference. The Airport Map application is designed to aid flight crew positional awareness only.	

After Landing Procedure

[Without automatic ignition]

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 OFF.
	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 mode selector as needed. At airports where ground tracking is not available, select STBY. At airports equipped to track airplanes on the ground, select an active transponder setting, but not a TCAS mode.

After Landing Procedure

[With automatic ignition]

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 OFF.
	Set the exterior lights as needed.
Set the weather radar to OFF.	
	Set the AUTO BRAKE select switch to OFF.
	Set the flap lever to UP.
	Set the transponder mode selector as needed. At airports where ground tracking is not available, select STBY. At airports equipped to track airplanes on the ground, select an active transponder setting, but not a TCAS mode.

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.

Engine start levers .... CUTOFF C

If possible, after high thrust operation, including reverse thrust, run the engines at or near idle for three minutes before shutdown to cool the engine hot sections. Time at or near idle, such as taxiing before shutdown, is applicable to this three minute period. If needed, the engines may be shut down with a one minute cooling period. Routine cool down times of less than three minutes before shutdown are not recommended.

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 may 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

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

[Option]
CAB/UTIL power switch ....As needed — F/O

[Option]
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

[737-600/700]
RECIRCULATION FAN switch .... As needed F/O

[737-800/900]
RECIRCULATION FAN switches .... As needed F/O

Air conditioning PACK switches .... AUTO F/O

ISOLATION VALVE switch .... OPEN F/O

Engine BLEED air switches.. ON F/O

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

Exterior lights switches .... As needed F/O

FLIGHT DIRECTOR switches ....OFF C, F/O

Transponder mode selector ....STBY F/O

[Option - Electronic Flight Bag]
EFB CLOSE FLIGHT .... Select C, F/O

After the wheel chocks are in place:

Parking brake – Release C or F/O

APU switch .... As needed F/O

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
[Option - Electronic Flight Bag]		
EFB POWER switch	Push	C, F/O
Call “SECURE CHECKLIST.”		C

Do the SECURE checklist. F/O

Supplementary Procedures — Chapter SP
Table of Contents — Section 0

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.

Intentionally
Blank

Interior Inspection

Emergency exit lights .... Check

Passenger signs .... Check

Service and entry doors .... Check

Escape slides .... Check pressure

Emergency exits .... Check

Wing upper surfaces .... Check

Lavatory fire extinguishers .... Check

Emergency equipment .... Check

Check availability and condition of emergency equipment, as required.

Flight Deck Door Access System Test

Flight deck access system switch .... NORM

Flight deck door .... Open

Flight deck door lock selector .... AUTO

Emergency access code .... Enter

ENT key .... Push

Verify alert sounds.

Verify AUTO UNLK light illuminates.

Flight deck door lock selector .... DENY

Verify AUTO UNLK light extinguishes.

Flight deck door lock selector .... UNLKD

Flight deck access system switch .... OFF

Verify LOCK FAIL light illuminates.

Flight deck access system switch .... NORM

Guard - Down

Verify LOCK FAIL light extinguishes.

Water System Draining

Lavatory water supply selector valves .... SUPPLY/DRAIN

Galley water supply shutoff valves .... SUPPLY ON

The shutoff valve is found adjacent to each wet galley sink.

Drain line .... Connect to drain ports

There are two drain port locations:

- below the main passenger entry door
- aft of the water service panel

Water service panel ....Open

Tank drain valve handle ....OPEN

Drains potable water tank and water system aft of the wings.

Forward lavatory drain valve ....OPEN

Drain valve is found below the sink in the forward lavatory only.

Drain valves for coffee maker and
water boiler (if installed) ....OPEN

All galley and lavatory water faucets ....Open

Close faucets when water flow stops.

Accomplish the following items after verifying the potable water system is empty:

Drain valves for coffee maker and
water boiler (if installed) ....CLOSED

Forward lavatory drain valve ....CLOSED

Tank drain valve handle ....CLOSED

Water service panel .... Close

Drain line .... Disconnect from drain ports

If the potable water tank will not be refilled immediately after the system is emptied, open the following circuit breakers and attach DO–NOT–CLOSE tags:

P18–3 circuit breaker panel

- LAVATORY WATER HEATER A
- LAVATORY WATER HEATER D
- LAVATORY WATER HEATER E

Power distribution panel number 1

- POT WATER COMPRESSOR
- WATER QTY IND

Forward Airstair Operation

[Option]

WARNING: Use care not to fall from the airstair platform when operating the forward entry door. The small platform area and bad weather can make the door difficult to operate.

CAUTION: Operation of airstair in winds exceeding 40 knots is not recommended.

CAUTION: Do not move airplane with stair extended.

Interior Control

WARNING: Open entry door to cocked position to allow clear visibility of area outside airplane to prevent injury to personnel. Do not open door beyond cocked position while operating airstair.

To extend:

Forward entry door .... Open to cocked position

When operating the airstair from the interior control panel, the forward entry door must be open to the cocked position. Safety circuits prevent airstair operation if the entry door is closed.

Control switch .... EXTEND

Note: For interior standby operation, the battery switch must be ON.

Hold until extension is complete.

The STAIRS OPER light illuminates during extension until the airstair is fully extended.

Note: The STAIRS OPER light will not illuminate with loss of AC power.

Control switch .... Release

Handrail extensions .... Engage

Release latch and pull inboard and up, extend and engage on the supports at the sides of the forward entry doorway.

To Retract:

Handrail extensions .... Disengage

Disengage from door supports, depress latch at base of forward extension to permit retraction within upper segment of handrail. Slide right and left extensions down along upper rails. Stowing in appropriate stowage points provides circuit continuity for energizing retract relay.

CAUTION: Use of the standby control switch bypasses all safety circuits. Airstair handrail extensions must be stowed or substantial damage could result.

Control switch .... RETRACT

Hold until retraction is complete.

The STAIRS OPER light illuminates during retraction until the airstair door is fully closed.

Note: The STAIRS OPER light will not illuminate with loss of AC power.

Control switch .... Release

Exterior Control

To Extend:

Normal mode:

AIRSTAIRS switch .... EXTEND

Standby mode:

POWER switch .... Hold in STANDBY

AIRSTAIRS switch .... EXTEND

Forward entry door .... Open to cocked position

WARNING: Extend and connect the airstair aft handrail to protect against falling and prevent injuries to personnel.

Aft handrail extension .... Engage

Release latch and pull inboard and up, extend and engage on the support at the side of the forward entry door.

WARNING: Step down the airstair as the forward entry door moves to the open position to prevent injuries to personnel.

Forward entry door .... Fully open

Forward handrail extension .... Engage

Release latch and pull inboard and up, extend and engage on the support at the side of the forward entry door.

To Retract:

WARNING: Do not disengage the airstair aft handrail at this time. Injuries to personnel can occur during forward entry door operations if the aft handrail is disengaged.

Forward handrail extension .... Disengage

Disengage from door support, depress latch at base of forward extension to permit retraction within upper segment of handrail. Slide right and left extensions down along upper rails. Stowing in appropriate stowage points provides circuit continuity for energizing retract relay.

WARNING: Step down the airstair as the forward entry door moves to the cocked position to prevent injuries to personnel.

Forward entry door .... Close to cocked position

Aft handrail extension .... Disengage

Disengage from door support, depress latch at base of forward extension to permit retraction within upper segment of handrail. Slide right and left extensions down along upper rails. Stowing in appropriate stowage points provides circuit continuity for energizing retract relay.

Forward entry door .... Fully close

CAUTION: Use of the standby control switch bypasses all safety circuits. Airstair handrail extension must be stowed or substantial damage could result.

Normal mode:

AIRSTAIRS switch .... RETRACT

Standby mode:

POWER switch .... Hold in STANDBY

AIRSTAIRS switch .... RETRACT

Oxygen Mask Microphone Test

[With Mask/Boom switch]

MASK/BOOM switch .... MASK

FLT INT switch .... Push

SPKR switch .... On

RESET/TEST switch .... Push and hold

EMERGENCY/Test selector .... Push and hold

Push-to-Talk switch .... INT

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

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

Push-to-Talk switch .... Release

EMERGENCY/Test selector .... Release

RESET/TEST switch .... Release

SPKR switch .... As needed

MASK/BOOM switch .... BOOM

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

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

[737-600/700]
RECIRC FAN switch ....AUTO

[737-800/900]
RECIRC FAN switches ....AUTO

[737-800/900]
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

Prevents pack operation if bleed air is supplied to the airplane.

After disconnecting ground conditioned air:

PACK switches .... As required

Isolated Pack Operation during Engine Start

To improve cabin air quality between starting the first and second engine:

CAUTION: Moving engine BLEED air switches while a starter is engaged can damage the starter.

Engine No. 2 .... Start

After engine No. 2 stabilized:

ISOLATION VALVE switch .... CLOSE

Right PACK switch .... AUTO

Duct pressure .... Stabilized

Engine No. 1 .... Start

After engine No. 1 stabilized:

ISOLATION VALVE switch .... AUTO

Pressurization System Manual Mode Test

PACK switches .... OFF

Pressurization mode selector .... MAN

AUTO FAIL and ALTN lights – extinguished.

MANUAL light – illuminated.

Outflow valve switch .... CLOSE

Verify outflow valve position indicator moves toward CLOSE.

Outflow valve switch .... OPEN

Verify outflow valve position indicator moves toward OPEN.

Pressurization mode selector ....AUTO

Verify outflow valve position indicator moves toward OPEN.

MANUAL light – extinguished.

Manual Mode Operation

CAUTION: Switch actuation to the manual mode causes an immediate response by the outflow valve. Full range of motion of the outflow valve can take up to 20 seconds.

Pressurization mode selector .... MAN

MANUAL light – illuminated

CABIN/FLIGHT ALTITUDE placard .... Check

Determine the desired cabin altitude.

If a higher cabin altitude is desired:

Outflow valve switch (momentarily) .... OPEN

Verify the outflow valve position indicator moves right, cabin altitude climbs at the desired rate, and differential pressure decreases. Repeat as necessary.

If a lower cabin altitude is desired:

Outflow valve switch (momentarily) .... CLOSE

Verify the outflow valve position indicator moves left, cabin altitude descends at the desired rate, and differential pressure increases. Repeat as necessary.

During Descent

Thrust lever changes should be made as slowly as possible to prevent excessive pressure bumps.

Outflow valve switch (momentarily) .... CLOSE

During descent, intermittently position the outflow valve switch toward CLOSE, observing cabin altitude decrease as the airplane descends.

Before entering the landing pattern, slowly position the outflow valve to full open to depressurize the airplane. Verify differential pressure is zero.

Pressurization Control Operation – Landing at Alternate Airport

At top of descent:

LAND ALT Indicator .... Reset

Reset to new destination field elevation.

Automatic Pressurization Control – Departure Airport Elevation Above 8400 Feet

[Option - High Altitude Landing option (maximum Takeoff and Landing Altitude above 8400 feet) with High Altitude Landing switch]

If departure airport elevation is above 10,000 feet:

Oxygen masks and regulators .... ON, Normal

Supplemental oxygen must be used from departure until the cabin altitude is below 10,000 feet.

After electrical power is applied to the airplane:

HIGH ALT LDG switch ....Off

Monitor CABIN ALT and CABIN rate of CLIMB indicators during climbout to ensure cabin altitude is descending below 8500 feet, at which time the cabin altitude warning system is reset to 10,000 feet.

If landing altitude is at or below 6000 feet:

LAND ALT indicator ....Destination field elevation

If landing altitude is above 6000 feet:

Do the Automatic Pressurization Control - Landing Airport Elevation Above 6000 Feet supplementary procedure.

Automatic Pressurization Control – Departure Airport Elevation Above 8400 Feet

[Option - High Altitude Landing option without High Altitude Landing switch]

Note: This procedure is not authorized if the CABIN ALTITUDE lights are installed and operative.

Oxygen masks and regulators ....ON, Normal

Supplemental oxygen must be used from departure until the cabin altitude is below 8000 feet.

After electrical power is applied to the airplane:

ALT HORN CUTOUT switch ....Push

Monitor CABIN ALT and CABIN rate of CLIMB indicators during climbout to ensure cabin altitude is descending below 8500 feet. No cabin altitude warning is provided until the cabin altitude warning system is reset to 10,000 feet after the cabin altitude descends below 8500 feet.

If landing altitude is at or below 6000 feet:

LAND ALT indicator .... Destination field elevation

If landing altitude is above 6000 feet:

Do the Automatic Pressurization Control - Landing Airport Elevation Above 6000 Feet supplementary procedure.

Automatic Pressurization Control – Landing Airport Elevation Above 6000 Feet

[Option - High Altitude Landing option (maximum Takeoff and Landing Altitude above 8400 feet) with High Altitude Landing switch]

Do the normal Preflight Procedure - First Officer except as modified below.

Prior to takeoff:

LAND ALT indicator .... 6000 feet

At initial descent or approximately 20 minutes prior to landing:

If landing elevation is above 8400 feet:

HIGH ALT LDG switch .... ON

If landing elevation is above 10,000 feet:

Oxygen masks and regulators .... ON, Normal

Supplemental oxygen must be used anytime the cabin altitude is above 10,000 feet.

LAND ALT indicator ....Destination field elevation

Automatic Pressurization Control – Landing Airport Elevation Above 6000 Feet

[Option - High Altitude Landing option without High Altitude Landing switch]

Note: This procedure is not authorized at airports with a landing field elevation above 8400 feet if the CABIN ALTITUDE lights are installed and operative.

Do the normal Preflight Procedure - First Officer except as modified below:

Prior to takeoff:

LAND ALT indicator .... 6000 feet

At initial descent or approximately 20 minutes prior to landing:

LAND ALT indicator ....Destination field elevation

If landing elevation is above 9000 feet:

Note: The intermittent cabin altitude/configuration warning horn will sound and the CABIN ALTITUDE lights (if installed and operative) will illuminate at a cabin altitude of approximately 10,000 feet.

Oxygen masks and regulators ....ON, Normal

Supplemental oxygen must be used anytime the cabin altitude is above 10,000 feet.

ALT HORN CUTOUT switch ....Push

Unpressurized Takeoff and Landing

When making a no engine bleed takeoff or landing with the APU inoperative:

Takeoff

PACK switches ....AUTO

ISOLATION VALVE switch ....CLOSE

Engine BLEED air switches ....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 take–off.

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

[737-800/-900]
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

Intentionally
Blank

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

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.

[Option: 737-800 without Blended Winglets]

Takeoff with light coatings of cold-soaked fuel frost, up to 1/8 inch (3 mm) in thickness on lower wing surfaces is allowable; however, all leading edge devices, all control surfaces, tab surfaces and control balance cavities must be free of snow, frost or ice. If the frost on the lower surface is greater than 1/8 inch (3 mm) in thickness, all ice or frost on the wings must be removed using appropriate deicing/anti-icing procedures.

[Option: 737-800 with Blended Winglets]

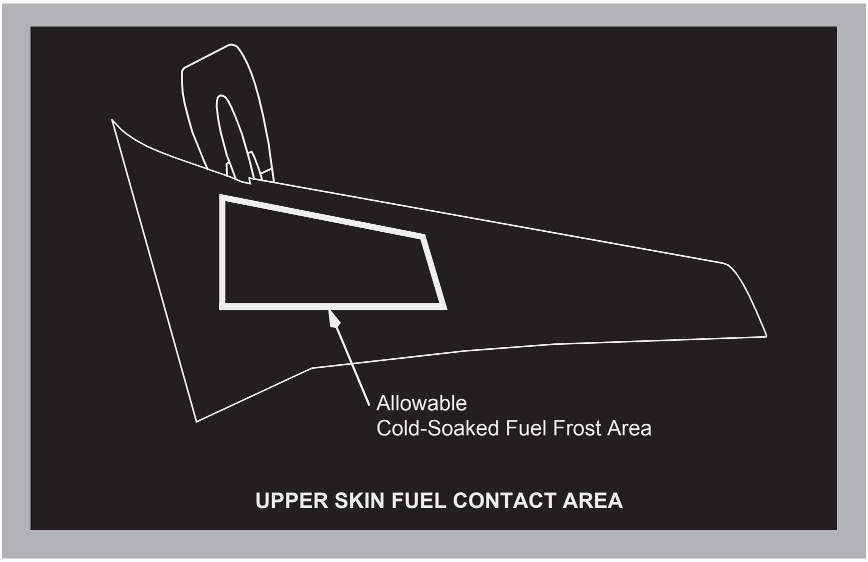
Takeoff with light coatings of cold-soaked fuel frost, up to 1/8 inch (3 mm) in thickness on lower wing surfaces is allowable; however, all leading edge devices, all control surfaces, tab surfaces, winglet surfaces and control balance cavities must be free of snow, frost or ice. If the frost on the lower surface is greater than 1/8 inch (3 mm) in thickness, all ice or frost on the wings must be removed using appropriate deicing/anti-icing procedures.

Takeoff with light coatings of cold-soaked fuel frost on upper wing surfaces is allowable, provided the following conditions are met:

- the frost on the upper surface is less than 1/16 inch (1.5 mm) in thickness
- the extent of the frost is similar on both wings
- the frost is on or between the black lines defining the allowable cold-soaked fuel frost area (see figure) with no ice or frost on the leading edges or control surfaces
- the ambient air temperature is above freezing (0°C, 32°F)
- there is no precipitation or visible moisture (rain, snow, drizzle or fog with less than 1 mile visibility, etc.)

If all the above criteria are not met, all ice or frost on the wings must be removed using appropriate deicing/anti-icing procedures.

Note: If the frost on the lower surface is less than 1/16 inch (1.5 mm) in thickness, the frost on the upper surface will be less than 1/16 inch (1.5 mm) in thickness.



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.

[Option: 737-800 without Blended Winglets]

Takeoff with light coatings of cold-soaked fuel frost, up to 1/8 inch (3 mm) in thickness on lower wing surfaces is allowable; however, all leading edge devices, all control surfaces, tab surfaces and control balance cavities must be free of snow, frost or ice. If the frost on the lower surface is greater than 1/8 inch (3 mm) in thickness, all ice or frost on the wings must be removed using appropriate deicing/anti-icing procedures.

[Option: 737-800 with Blended Winglets]

Takeoff with light coatings of cold-soaked fuel frost, up to 1/8 inch (3 mm) in thickness on lower wing surfaces is allowable; however, all leading edge devices, all control surfaces, tab surfaces, winglet surfaces and control balance cavities must be free of snow, frost or ice. If the frost on the lower surface is greater than 1/8 inch (3 mm) in thickness, all ice or frost on the wings must be removed using appropriate deicing/anti-icing procedures.

Takeoff with cold-soaked fuel frost on upper wing surfaces is not allowable. If any frost is present on the upper wing surface, all ice or 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

[Option - Green ON light]
ON lights – Extinguish

Lights extinguish after approximately 1 minute.

[Option - Amber OFF light]
OFF lights – Illuminated

Lights illuminate 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

[Option - Green ON light]

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.

Power Test

[Option - Amber OFF light]

The power test verifies operation of the window heat system. The test may be accomplished when any of the window heat OFF lights are illuminated and the associated WINDOW HEAT switch is ON.

WINDOW HEAT switches .... ON

Note: Do not perform the power test when all OFF lights are extinguished

WINDOW HEAT TEST switch .... PWR

The controller is forced to full power, bypassing normal temperature control. Overheat protection is still available.

WINDOW HEAT OFF lights ....Extinguished

If any OFF light remains illuminated, 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

Temporary Level-Off during Climb or Descent (Not at FMC Cruise Altitude)

MCP altitude selector ....Set desired altitude

MCP N1 light will extinguish if leveling from a climb.

N1 Limit changes to CRZ if leveling from a climb.

To continue climb/descent:

MCP altitude selector..Set desired altitude

VNAV switch .... Push

Observe climb or descent initiated. Mode annunciations appear as initial climb or descent.

Intervention of FMC Altitude Constraints during VNAV Climb

[Option - Speed and altitude intervention]

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

[Option - Speed and altitude intervention]

MCP altitude selector .... Set

ALT INTV switch .... Push

If a higher altitude is selected, a CRZ climb will be initiated.

If a lower altitude is selected, an early descent will be initiated.

Intervention of FMC Altitude Constraints during VNAV Descent

[Option - Speed and altitude intervention]

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

[Option - Speed and altitude intervention]

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)

Note: Autopilot use is recommended until suitable visual reference is established.

Note: If required to remain at or above the MDA during the missed approach, the missed approach must be initiated at least 50 feet above MDA.

Recommended roll modes:

- RNAV, GPS, TACAN, LOC-BC, VOR or NDB approach: LNAV or HDG SEL.
- LOC, SDF or LDA approach: LOC or LNAV.

Ensure appropriate navaids (VOR, LOC or NDB) are tuned and identified prior to commencing approach.

RNP appropriate for approach (if required) .... Verify/Enter

Allows appropriate alerting to occur if ANP exceeds RNP.

Before descent to MDA(H):

MCP altitude .... Set

Set the first intermediate altitude constraint or the MDA(H). When the current constraint is assured, the next constraint may be set prior to ALT HOLD is engaged to achieve continuous descent path.

If constraints or MDA(H) do not end in zero zero, for example, 1820, set MCP ALTITUDE window to the closest 100 foot increment above the constraint.

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 the MDA(H).

Verify V/S mode annunciates.

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 a missed approach.

After a suitable visual reference is established:

A/P disengage switch ....Push

Disengage the autopilot before descending below MDA(H).

A/T disengage switch..Push

Disengage the autothrottle before descending below MDA(H).

Circling Approach

Note: Autopilot use is recommended until intercepting the landing profile.

MCP altitude selector ....Set

If the MDA(H) does not end in zero zero, for example, 1820, set MCP ALTITUDE window to the closest 100 foot increment above the MDA(H).

Accomplish an instrument approach, establish suitable visual reference and level off at MCP altitude.

[Option - VNAV ALT not enabled]
Verify ALT HLD mode annunciates.

[Option - VNAV ALT enabled]
Verify ALT HLD or VNAV ALT mode annunciates.

[Option - VNAV ALT enabled]
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.

Intercepting the landing profile:

Autopilot disengage switch .... Push

Autothrottle disengage switch .... Push

Instrument Approach - RNAV (RNP) SAAAR/AR

Note: Operators need approval to conduct RNAV (RNP) SAAAR/AR Instrument Approaches. For RNAV (GPS) and RNAV (GNSS) procedures use the Landing Procedure - Instrument Approach using VNAV in Normal Procedures.

Note: This procedure is not authorized using QFE.

[Option - Airplanes with IAN]

Note: This procedure is not authorized using IAN.

The RNAV (RNP) SAAAR/AR Instrument Approach Procedure below supplements Normal Cruise, Descent and Approach Procedures and replaces the complete Landing Procedure. Additional information is given in case of a go-around.

Pre-approach Requirements

Airplane equipment required to begin the approach:

- EGPWS
- 2 FMCs, CDUs *

- 2 GPS Receivers
- Current Navigation Database
- 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: Go-around/missed approach is required if the UNABLE REQ'D NAV PERF-RNP, FMC DISAGREE, or VERIFY POSITION alert is displayed unless suitable visual reference is established and maintained.

Note: Single failure of (*) items should cause the crew to consider a go-around/missed approach if that is the safest course of action.

Do the following prior to beginning the approach

- verify that the UNABLE REQD NAV PERF-RNP alert is not displayed
- review RNP availability predictions
- verify that the approach RNP is equal to or greater than:

[With NPS]

  - 0.10 (A/P or F/D)

[Without NPS]

  - 0.11 (A/P)

[Without NPS]

  - 0.15 (F/D)
- set current local altimeter (remote altimeter settings not allowed)
- verify that wind is within limits published for the approach (if applicable)
- verify that the reported airport temperature is within published limits for the approach
- review maximum IAS for Radius-to-Fix (RF) legs for each segment of the approach (if applicable)
  - IAF to FAF: 240 knots
  - FAF to DA(H): maximum IAS for Category C minimums is 140 knots. For IAS 141 to 165 knots use Category D minimums. Do not exceed 165 knots.
  - missed approach: 240 knots
  - other speed restrictions as published for the approach.

Cruise Procedure

Pilot Flying	Pilot Monitoring
	When selecting the approach from the navigation database verify FMC LEGS page matches the charted approach. If the IAF has an "at or above" altitude restriction, 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. No other lateral or vertical modifications after the IAF may be made.

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: Conditions permitting, when ATC clears the crew to proceed direct to an intermediate fix or the FAF, a direct-to or intercept-course-to modification is acceptable unless the fix or FAF is immediately before an RF leg.

Pilot Flying	Pilot Monitoring
	On the RNP PROGRESS Page set or verify RNP for the approach.

[With NPS]

Note: For airplanes with NPS, the flight crew may enter 125 feet for vertical RNP. 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

[With NPS]

Pilot Flying	Pilot Monitoring
	Notify the cabin crew to prepare for landing. Verify that the cabin is secure.
Select TERR on map. Select CDU: LEGS page.	Select TERR or WX radar on map.
Use LNAV and VNAV or other pitch mode for initial descent. VNAV is required FAF inbound. Some approach procedures may require use of VNAV from the IAF onward.	
Call “FLAPS ___” according to the flap extension schedule or approach speed constraint.	Set the flap lever as directed. Monitor flaps and slats extension.
Approximately 2 NM before the FAF 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)	
Maximum Lateral Deviation (XTK ERROR): NPS amber indication or 1 x RNP Maximum Vertical Deviation - FAF to DA: -75 feet Monitor NPS	

Pilot Flying	Pilot Monitoring
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. [Without automatic ignition] 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.
When at least 300 feet below the missed approach altitude, set the missed approach altitude on the MCP.	
At the final approach fix, verify the crossing altitude and crosscheck the altimeters (maximum 100 feet difference between primary altimeters).	
Monitor the approach.	
If suitable visual reference is established at DA(H), disengage the autopilot and autothrottle. Maintain the glide path to landing.	

[Without TO/GA to LNAV option]

Note: If a go-around/missed approach is needed, track the required course manually using the trend vector and map until LNAV is re-engaged.

Landing Procedure

[Without NPS]

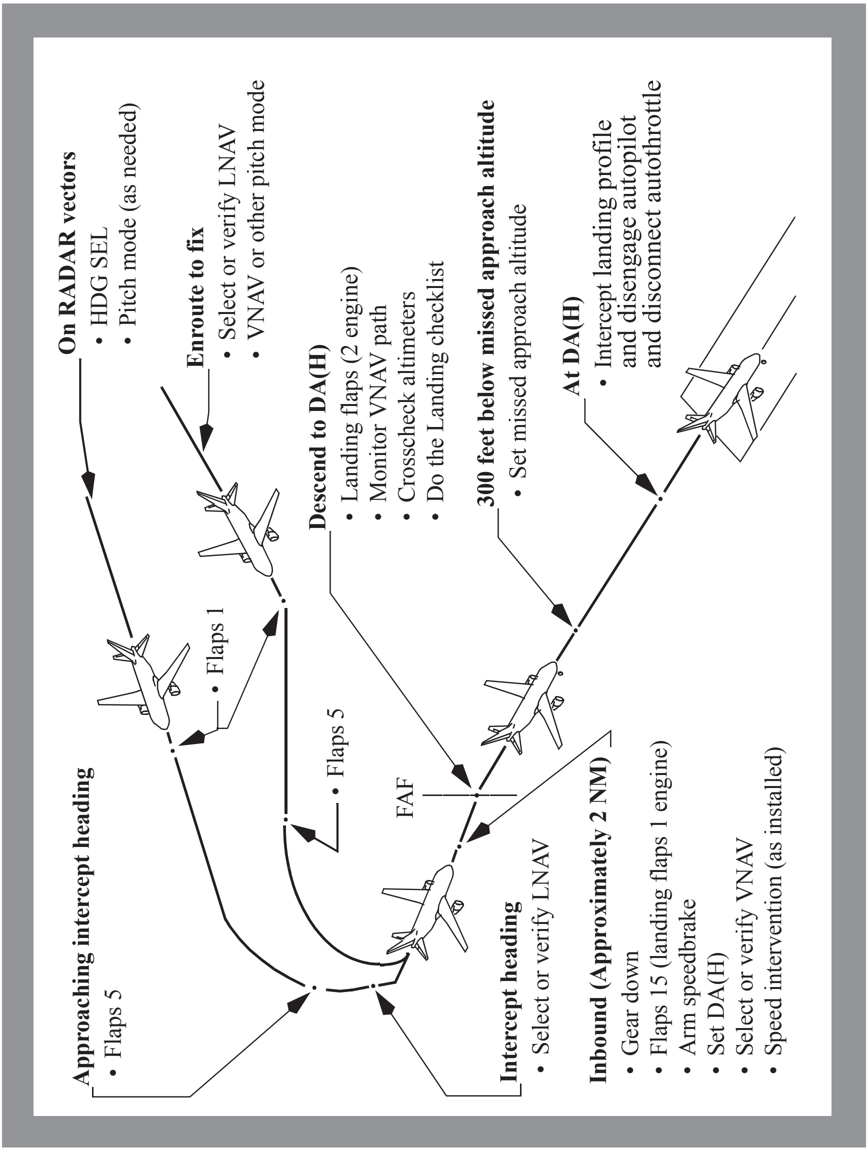
Pilot Flying	Pilot Monitoring
	Notify the cabin crew to prepare for landing. Verify that the cabin is secure.
Select TERR on map. Select CDU: LEGS page.	Select TERR or WX radar on map. Select CDU: RNP PROGRESS page.
One pilot should have the map display in the 10 NM or less range to monitor path tracking during the final approach segment.	
Use LNAV and VNAV or other pitch mode for initial descent. VNAV is required FAF inbound. Some approach procedures may require use of VNAV from the IAF onward.	
Call "FLAPS ___" according to the flap extension schedule or approach speed constraint.	Set the flap lever as directed. Monitor flaps and slats extension.
Approximately 2 NM before the FAF 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)	
Maximum Lateral Deviation (XTK ERROR): 1 x RNP Maximum Vertical Deviation - FAF to DA: -75 feet Monitor RNP PROGRESS page	

Pilot Flying	Pilot Monitoring
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. [Without automatic ignition] 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.
When at least 300 feet below the missed approach altitude, set the missed approach altitude on the MCP.	
At the final approach fix, verify the crossing altitude and crosscheck the altimeters (maximum 100 feet difference between primary altimeters).	
Monitor the approach.	
If suitable visual reference is established at DA(H), disengage the autopilot and autothrottle. Maintain the glide path to landing.	

[Without TO/GA to LNAV option]

Note: If a go-around/missed approach is needed, track the required course manually using the trend vector and map until LNAV is re-engaged.

Instrument Approach - RNAV (RNP) SAAAR/AR



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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

[Option - Voice Recorder switch]

Note: The Cockpit VOICE RECORDER switch must be in the ON position or at least one engine must be operating to perform this test.

Test switch .... Push

After a slight delay:

[Option]
Monitor indicator .... Green band

A tone may be heard through a headset plugged into the headset jack.

[Option]
Test light .... ON

A tone may be heard through a headset plugged into the headset jack.

Test switch .... Release

Electrical Power Up

The following procedure is accomplished to permit safe application of electrical power.

BATTERY switch .... Guard closed

[Option]

Note: Do not move the airplane until Integrated Standby Flight Display (ISFD) alignment is complete.

[Option - Airplanes with Flight Deck Auxiliary Power Outlets]

Note: Devices plugged into the flight deck auxiliary power outlets during Electrical Power Up will not be powered until the plugs are removed and reinserted.

STANDBY POWER switch .... Guard closed

ALTERNATE FLAPS master switch .... Guard closed

Windshield WIPER 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.

Verify that the ENG 1 OVERHEAT and ENG 2 OVERHEAT lights stay 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 - Start

Note: If extended APU operation is needed on the ground, position an AC operated fuel pump ON. 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 1000 lbs/453 kgs.

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

[Option - Without DC operated APU fuel pump.]

Note: Whenever the APU is operating and AC electrical power is on the airplane busses, operate at least one fuel boost pump to supply fuel under pressure to the APU to extend the service life of the APU fuel control unit.

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 warning 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

[Option - Single battery]

Battery switch .... ON

AC–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 +/-2 volts

Frequency meter .... Check

Check frequency meter for normal indication: 400 +/- 10 CPS.

STANDBY POWER switch .... AUTO

BUS TRANS switch .... AUTO

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

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

Standby Power Test

[Option – Dual battery]

Battery switch .... ON

AC–DC meter selectors .... STBY PWR

If APU generator is on–line:

APU GEN No. 1 switch .... OFF

APU GEN No. 2 switch .... OFF

If ground power is on–line:

GRD PWR switch .... OFF

STANDBY POWER switch .... OFF

Check STANDBY PWR OFF light illuminated.

AC–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 +/-2 volts

Frequency meter .... Check

Check frequency meter for normal indication: 400 +/- 10 CPS.

DC meter selector .... BAT

Check DC voltmeter for normal indication: 24 +/- 2 volts.

Check DC ammeter for discharge indication: a negative value.

DC meter selector .... AUX BAT

Check DC voltmeter for normal indication: 24 +/- 2 volts.

Check DC ammeter for discharge indication: a negative value.

STANDBY POWER switch .... AUTO

GRD PWR switch or APU GEN No. 1 and No. 2 switches .... ON

Note: It may 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

[Option]
FLIGHT DECK ACCESS SYSTEM switch .... Guard closed

BATTERY switch .... Guard closed

[Option]

Note: Do not move the airplane until Integrated Standby Flight Display (ISFD) alignment is complete.

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

[Option - GLS]
ILS light .... Verify extinguished

[Option - GLS]
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

Prior to 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.

High Altitude Airport Engine Start (Above 8400 Feet)

[Option - High Altitude Landing option with or without High Altitude Landing switch]

Engine start .... Accomplish

An indication of N1 rotation plus maximum motoring and a minimum of 20% N2 are required prior to introducing fuel to the engine.

Note: Maximum motoring occurs when N2 acceleration is less than 1% in approximately 5 seconds.

Fire and Overheat System Test with an Inoperative Loop

To determine the specific inoperative loop:

OVHT DET switches .... A

Test switch .... OVHT/FIRE

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

If the FAULT light illuminates and one of the ENG OVERHEAT lights and corresponding engine fire switch remain extinguished, there is a fault in loop A of the detection system of that engine.

OVHT DET switches .... B

Test switch .... OVHT/FIRE

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

If the FAULT light illuminates and one of the ENG OVERHEAT lights and corresponding engine fire switch remain extinguished, there is a fault in loop B of the detection system of that engine.

OVHT DET switches .... As required

Select the good loop for each engine (NORMAL if both loops tested good).

Test switch .... OVHT/FIRE

If the test is successful leave the fire panel in this configuration for flight.

Intentionally
Blank

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 then 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

QFE Operation

This procedure is accomplished when ATC altitude assignments are referenced to QFE altimeter settings.

Note: Do not use LNAV or VNAV below transition altitude/level. Altitudes in the navigation data base are not referenced to QFE. Use only raw data for navigation.

[Option - Altimeter with QFE]
FMC/CDU APPROACH REFERENCE page
or TAKEOFF REFERENCE page 2/2 .... Select

LANDING REF line select key .... Push

Verify QFE selected.

[This sets the landing altitude to zero.]

Altimeters ....Set

Set altimeters to QFE when below transition altitude/level.

Note: If QFE altimeter setting is beyond the range of the altimeters, QNH procedures must be used with QNH set in the altimeters.

Landing altitude indicator .... Set at zero

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 / 70,000 lbs 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 / 70,000 lbs 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 +15 bug are shown when a speed greater than 80 knots is set.

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

[Option - Rockwell Collins HUD]

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 -2.51° 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 -2.51° 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.

Intentionally
Blank

Tests

Transponder Test

Transponder mode selector .... 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.

[Option - Allied Signal TCAS computer]

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

STAB ....ON

WXR (EFIS control panel) ....ON

Verify test pattern consisting of the following colors appears:

- Green
- Yellow
- Red
- Magenta.

[Option - With predictive wind shear]
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.

[Option - With abeam points]
If abeam waypoints are desired:

ABEAM PTS key .... Push

EXEC key .... Push

Observe the MOD RTE LEGS page changes to ACT.

Proceeding Direct to a Waypoint (DIR/INTC)

[Option - CDU]

DIR INTC key .... Push

Observe DIRECT TO box prompts displayed in line 6L.

Enter desired waypoint on the DIRECT TO line. Observe the waypoint automatically transfers to line 1L.

Correct any ROUTE DISCONTINUITY if entered waypoint was not in the original flight plan.

EXEC key .... Push

Observe MOD RTE LEGS page changes to ACT.

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 but, with magnetic variation differences in line 1.

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.

Intercepting a Leg (Course) to a Waypoint (DIR/INTC)

[Option - CDU]

DIR INTC key .... Push

Observe INTC LEG TO box prompts displayed in line 6R.

Enter the desired waypoint on the INTC LEG TO line. Observe the waypoint automatically transfers to line 1L.

Enter the desired intercept course in the INTC CRS line. Observe the desired course is displayed on line 6R but, with magnetic variation differences in line 1.

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.

Route Modification

RTE LEGS or RTE 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 DISCONTINUITIES.

EXEC key .... Push

Observe MOD RTE or MOD RTE LEGS page changes to ACT.

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.

[Option - FMC update U10.2 and later]

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 DISCONTINUITIES.

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

[Option - FMC update U10.7 and later]

If the GPS-L INVALID, GPS-R INVALID, VERIFY POSITION, or UNABLE REQD NAV PERF – RNP message is displayed in the scratch pad, or course deviation is suspected, accomplish the following as necessary to ensure navigation accuracy:

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

[Option - With GPS]

Note: GPS position updates are allowed for all United States National Airspace approach operations. Outside this region, GPS position updates are allowed during approaches only if the FMC database and approach charts are referenced to the WGS-84 reference datum. GPS updates should be inhibited for all other approach operations, 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

[Option - With VNAV ALT]

Observe VNAV ALT on flight mode annunciator as level off is initiated.

MCP N1 light will extinguish if leveling from a climb.

N1 Limit changes to CRZ if leveling from a climb.

To continue climb/descent:

MCP altitude selector .... Set desired altitude

[Option - With speed and altitude intervention]
ALT INTV switch .... Push

Observe climb or descent initiated. Mode annunciations appear as initial climb or descent.

Intervention of FMC Altitude Constraints during VNAV Climb

[Option - With speed and altitude intervention]

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

[Option - With speed and altitude intervention]

MCP altitude selector .... Set

ALT INTV switch .... Push

If a higher altitude is selected, a CRZ climb will be initiated.

If a lower altitude is selected, an early descent will be initiated.

Intervention of FMC Altitude Constraints during VNAV Descent

[Option - With speed and altitude intervention]

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

[Option - With speed and altitude intervention]

SPD INTV switch .... Push

MCP IAS/MACH display shows current FMC target speed.

MCP speed selector .... Set desired speed

VNAV remains engaged.

To resume former FMC speed:

SPD INTV switch .... Push

MCP IAS/MACH display blanks and FMC commanded VNAV speed is active.

Entering Waypoint Speed and Altitude Restriction (On Climb or Descent Legs Only)

RTE LEGS page .... Select

Key–in desired speed and altitude, or speed only (followed by /), or altitude only, into scratch pad.

An altitude followed by A or B signifies a requirement to be “at or above” or “at or below” that altitude at the waypoint (for example, key–in 220A or 240B).

Line select to desired waypoint line.

EXEC key .... Push

Observe MOD RTE LEGS page changes to ACT.

Note: This changes any prior speed and altitude restriction at this waypoint.

Deleting Waypoint Speed and Altitude Restriction

RTE LEGS page .... Select

Push DEL key to enter DELETE in scratch pad. Line select to appropriate waypoint line.

EXEC key .... Push

Observe MOD RTE LEGS page changes to ACT and restriction is deleted and replaced with an FMC predicted value (small size characters).

Changing Speed and/or Altitude Restriction during Climb or Descent

CLB/DES page .... Select

Push DEL key to enter DELETE in the scratch pad, or key–in the desired speed and altitude in the scratch pad. Line select to the SPD REST line.

EXEC key .... Push

Observe the MOD CLB or the MOD DES page changes to ACT and the restriction is changed or deleted.

Changing Climb/Cruise/Descent Speed Schedule

CLB/CRZ/DES page .... Select

Select the prompt for the desired climb/cruise/descent schedule, or key–in the desired speed in the scratch pad and line select to the TGT SPD line.

EXEC key .... Push

Observe the MOD CLB, MOD CRZ, or MOD DES page changes to ACT and new speed schedule is specified.

Early Descent

MCP altitude selector .... Set

Set next level–off altitude.

DES page .... Select

Line select DES NOW prompt.

EXEC key .... Push

Observe MOD DES page changes to ACT. Observe descent is initiated (if VNAV engaged).

Note: For a PATH DES, this will result in a 1000 FPM rate of descent until the planned path is intercepted. For a SPD DES, this will result in an idle thrust normal rate of descent.

Step Climb or Descent from Cruise

MCP altitude selector .... Set

Set new level–off altitude.

FLT ALT indicator .... Set

Set new level–off altitude.

CRZ page .... Select

Enter new altitude on the CRZ ALT line. The display changes to MOD CRZ CLB or MOD CRZ DES.

If the desired climb/descent speed is different from the displayed cruise speed, manually enter the desired TGT SPD, or use access prompts to select desired CLB/DES page.

EXEC key .... Push

Observe the MOD CRZ CLB/MOD CRZ DES page (or other selected MOD CLB/MOD DES page) changes to ACT. Observe climb/descent is initiated at the TGT SPD (if VNAV engaged).

Performance and Progress Functions

Determining ETA and Fuel Remaining for New Destination

RTE page .... Select

Enter the new destination over the original DEST. Enter correct routing to the new destination using RTE, RTE LEGS, and ARRIVALS pages, as appropriate. Correct any ROUTE DISCONTINUITY.

PROGRESS page .... Select

Observe new destination with a MOD title. Check ETA and FUEL remaining.

RTE page .... Select

EXEC or ERASE the new destination/routing, as desired. Observe MOD RTE page changes to ACT.

Estimated Wind Entries for Cruise Waypoints

RTE LEGS page .... Select

Observe the DATA prompt displayed.

RTE DATA page .... Select

Enter the estimated true wind direction/speed on the appropriate line(s).

Step Climb Evaluation

CRZ page .... Select

Enter the desired step climb altitude on the STEP line. If known, enter the estimated average true wind direction/speed for the desired step climb altitude on the ACTUAL WIND line.

Step climb savings .... Determine

Observe the fuel SAVINGS/PENALTY and FUEL AT ______ (destination) lines to determine if a higher cruise altitude is advantageous.

If step climb fuel savings are significant, use the appropriate climb procedure to initiate climb to the higher altitude when NOW is displayed on STEP POINT line.

Note: Step climb evaluations do not consider buffet margin limits. If the altitude entered for the step climb evaluation is higher than the maximum altitude for flight with an adequate buffet margin, the message “MAX ALT FLXXX” will be displayed in the scratch pad. Ensure the new cruise altitude entered for the climb is at or below the MAX ALT displayed in the message in order to maintain a safe buffet margin.

Entering Descent Forecasts

DES page .... Select

Observe FORECAST prompt displayed.

DES FORECASTS page .... Select

Verify the TRANS LVL and revise if required. Enter average ISA DEV forecast for descent and destination QNH. Enter forecast descent WINDs (for up to three different altitudes).

EXEC key .... Push

Observe MOD DES FORECASTS page changes to ACT.

Engine Out

Engine out climb and cruise pages provide advisory information for engine out operation. Refer to section 11.41 and 11.42 for a complete description of ENG OUT CLB and ENG OUT CRZ pages.

Required Time of Arrival (RTA)

Note: An active FMC flight plan complete with all performance data must exist before the required time of arrival (RTA) mode can be used.

Entering an RTA Waypoint and Time

RTA PROGRESS page .... Select

On PROGRESS page 2, line 1L, enter the flight plan waypoint where required time of arrival is applicable. Observe the MOD RTA PROGRESS page displayed with the computed ETA, for the entered waypoint, displayed in line 1R.

RTA .... Enter

Enter required time of arrival into line 1R. Time should be entered in hours, minutes, and seconds (Examples: 174530, 1745, 1745.5). Observe MOD RTA PROGRESS page displayed with pertinent data for complying with entered RTA. Observe EXEC key illuminated.

EXEC key .... Push

Observe ACT RTA PROGRESS page displayed.

Entering Speed Restrictions for RTA Navigation

PERF LIMITS page .... Select

Enter minimum or maximum speed restriction for RTA navigation in lines 2, 3, or 4 depending on phase of flight. Observe RTA parameters change to reflect new limits (RTA PROGRESS page) and EXEC key illuminated.

EXEC key .... Push

Observe MOD PERF LIMITS page change to ACT PERF LIMITS page.

Note: Entered restrictions on line 2, 3, and 4 also restrict other navigation modes such as ECON.

Entering New Time Error Tolerances for RTA Navigation

PERF LIMITS page .... Select

Enter desired time error tolerance (5 to 30 seconds) for the RTA waypoint on line 1L (Example: 25). Observe MOD PERF LIMITS page displayed and EXEC key illuminated.

EXEC key .... Push

Observe ACT PERF LIMITS page displayed.

Additional CDU Functions

Navigation Display Plan Mode (Center Step Operation)

EFIS Control Panel Mode Selector ....PLAN

RTE LEGS page .... Select

EFIS Control Panel Range Selector .... As required

MAP CTR STEP key .... Push

Each push moves the CTR label to the next geographically fixed waypoint in the route. Selecting PREV PAGE or NEXT PAGE moves the CTR label to the first geographically fixed waypoint on the new page.

EFIS Control Panel Mode Selector .... As required

Enter Position Shift on Runway

TAKEOFF REF page .... Select

[Option - Runway position update with TO/GA activation]
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.

[Option - Runway remaining update with TO/GA activation]
RWY REMAIN distance ....Enter

Enter runway remaining distance. When TO/GA is pushed, FMC will update to the runway remaining distance.

If position shift must be removed

RTE page .... Select

RWY ....Enter

Reenter runway on RTE page. Check and reenter other performance data as required.

Fuel Balancing

If an engine fuel leak is suspected:

Accomplish the ENGINE FUEL LEAK 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 / 1,000 lbs of fuel. With less than 453 kgs / 1,000 lbs 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 / 300 U.S. gallons per minute.

Normal Refueling

[Option - Fuel Quantity selector]

When a full fuel load is required, the fuel shutoff system closes the fueling valves automatically when the tanks are full. When a partial fuel load is required, the fuel shutoff system closes the fueling valves automatically when the quantity preselected on the fuel quantity selector (located on the test gauges and fueling panel) is reached.

[Option - Without Fuel Quantity selector]

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 by using the appropriate fuel pumps, the fueling valve, the defueling valve, and the crossfeed valve. AC power must be available. 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.

Center tank fueling valve switch ....CLOSED

When the required amount of fuel has been transferred, the switch is closed at the fueling panel.

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.

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:

- Do not use reduced thrust (assumed temperature method) for takeoff if the runway is contaminated by slush, snow, standing water, or ice
- Reduced thrust (assumed temperature method) is allowed for takeoff on a wet runway if suitable performance accountability is made for the increased stopping distance on a wet surface
- Reduced thrust (fixed derate) takeoff is allowed on wet or contaminated runways provided takeoff performance accounts for the runway surface condition
- 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 less than one statute mile (1600m), 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 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 permissible; however, all leading edge devices, all control surfaces, tab surfaces, upper wing surfaces and balance panel cavities must be free of snow or ice.

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 balance 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
- Up to three and one–half minutes may be allowed for oil pressure to reach the minimum operating pressure. During this period, the LOW OIL PRESSURE light may remain illuminated, pressure may go above the normal range and the FILTER BYPASS light may illuminate. Operate the engine at idle thrust until oil pressure returns to the normal range
- 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:

[Without automatic ignition]
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, position APU BLEED air switch to OFF 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 will stabilize within one minute, although due to cold oil, up to five minutes may be needed to produce steady power.

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 evenly and smoothly. 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, do an engine run up, as needed, 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. Takeoff operations with reduced thrust (assumed temperature method or fixed derate) are permitted provided takeoff performance accounts for the runway surface condition. 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............................Full APL NOSE DOWN C

Trim the airplane to the electrical APL NOSE DOWN limit. Then continue trimming manually to the manual APL NOSE DOWN limit. The full nose down position prevents de-icing fluid and slush run-off from entering the stabilizer balance panel cavity.

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

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

[Without PRR 38506 or Service Bulletin 737-55A-1080]
Control column ....Move full forward/full aft C

Slowly cycle the control column full forward to full aft a minimum of 3 times to drain residual fluid from the elevator balance bay.

Stabilizer trim .... ___ UNITS C

Verify that the stabilizer trim is set for takeoff.

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 for approximately 30 seconds and confirm stable engine operation before the start of the takeoff roll.

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.

[Without Icing Advisory Light]

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.

[Option - Icing Advisory Light]

WARNING: Do not rely on airframe visual icing cues or illumination of the ICING light 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:

[Without automatic ignition]
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, 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.

[Without automatic ignition]
ENGINE START switches ....OFF PM

Fan Ice Removal

CAUTION: Avoid prolonged operation in moderate to severe icing conditions.

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 at approximately 15 minute intervals:

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.

Engine vibration may occur due to fan blade/spinner icing. If engine vibration continues after increasing thrust, do the following on both engines, one engine at a time:

ENGINE START switch ....FLT PM

Thrust ....Adjust PF

Adjust thrust to 45% N1. After approximately five seconds, increase thrust lever slowly to a minimum of 80% N1.

Note: Engine vibration may 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 may indicate full scale prior to shedding ice, however, this has no adverse effect on the engine.

If vibration does not decrease, do the procedure for HIGH ENGINE VIBRATION “If not in icing conditions.”

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.

The wing anti-ice system may be used as a de-icer or anti-icer in flight only. 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:

- no corrections are needed for reported temperatures above 0°C or if the airport temperature is at or above the minimum published temperature for the procedure being flown
- do not correct altimeter barometric reference settings
- ATC assigned altitudes or flight levels should not be adjusted for temperature when under radar control
- corrections apply to QNH and QFE operations
- 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

- 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.

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 unless a flaps 15 landing is planned.

If a flaps 15 landing will be made:

Set VREF 15

If any of the following conditions apply, set VREF ICE = VREF 15 + 10:

- 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.

After Landing Procedure

CAUTION: Taxi at a reduced speed. Use smaller nose wheel steering wheel and rudder inputs and apply minimum thrust evenly and smoothly. 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:

[Without automatic ignition]
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, 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.

[Without automatic ignition]
ENGINE START switches ....OFF F/O

When engine anti-ice is required and the OAT is 3°C or below, do an engine run up, as needed, 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 then 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 0 to 2 units C

Prevents melting snow and ice from running into balance bay areas and prevents the stabilizer limit switch from freezing. With flaps retracted, one unit of stabilizer trim requires approximately 16 hand wheel turns of manual trim.

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

[Option - Single battery]

- 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.

[Option - Dual battery]

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

Hot Weather Operation

During ground operation the following considerations will help keep the airplane as cool as possible:

- While the airplane is electrically powered, packs should be run or cooling air supplied to the airplane when the OAT exceeds 40° C (103° F) to protect the reliability of electrical and electronic equipment in the airplane.
- If cooling air is available from an outside source, the supply should be plugged in immediately after engine shutdown and should not be removed until just prior to engine start.
- Keep all doors and windows, including cargo doors, closed as much as possible.
- Electronic components which contribute to a high temperature level in the flight deck should be turned off while not needed.
- Open all passenger cabin gasper outlets and close all window shades on the sun–exposed side of the passenger cabin.

Note: If only cooling air from a ground air conditioning cart is supplied (no pressurized air from the APU or ground external air), then the TAT probes are not aspirated. Because of high TAT probe temperatures, the FMC's may not accept an assumed temperature derate. Delay selecting an assumed temperature derate until after bleed air is available.

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If these actions do not reduce cabin temperatures sufficiently:

PASSENGER CABIN temperature
selector .... AUTO COOL

PACK switches ....HIGH

If the cabin temperature remains high:

PASSENGER CABIN temperature selector .... MAN COOL

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 may 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:

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).

Turbulence

During flight in light to moderate turbulence, the autopilot and/or autothrottle may remain engaged unless performance is objectionable. Increased thrust lever activity can be expected when encountering wind, temperature changes and large pressure changes. Short–time airspeed excursions of 10 to 15 knots can be expected.

Passenger signs .... ON

Advise passengers to fasten seat belts prior to entering areas of reported or anticipated turbulence. Instruct flight attendants to check that all passengers' seat belts are fastened.

Severe Turbulence

Yaw Damper .... ON

Autothrottle .... Disengage

AUTOPILOT .... CWS

A/P status annunciators display CWS for pitch and roll.

Note: If sustained trimming occurs, disengage the autopilot.

ENGINE START switches .... FLT

Thrust .... Set

Set thrust as needed for the phase of flight. Change thrust setting only if needed to modify an unacceptable speed trend.

PHASE OF FLIGHT	AIRSPEED
CLIMB	280 knots or .76 Mach
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. 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

- Use maximum takeoff thrust instead of reduced thrust
- 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 build–up. 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. Stick shaker must be respected at all times.

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 ILS G/S, VNAV path or VASI/PAPI 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 20 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 this manual.

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Performance Dispatch Chapter PD

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Performance Dispatch — Chapter PD
Takeoff — Section 10

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	1230	1230	1220	1210	1200	1180	1150	1130	1100
1400	1460	1440	1430	1410	1400	1360	1320	1280	1250
1600	1680	1660	1640	1620	1600	1550	1500	1440	1390
1800	1910	1880	1850	1830	1800	1730	1670	1600	1540
2000	2130	2100	2070	2030	2000	1920	1840	1760	1680
2200	2360	2320	2280	2240	2200	2110	2010	1920	1830
2400	2580	2540	2490	2450	2400	2290	2190	2080	1970
2600	2810	2750	2700	2650	2600	2480	2360	2240	2120
2800	3030	2970	2910	2860	2800	2670	2530	2400	2260
3000	3250	3190	3130	3060	3000	2850	2700	2560	2410
3200	3480	3410	3340	3270	3200	3040	2880	2720	2550
3400	3700	3630	3550	3480	3400	3230	3050	2880	2700
3600	3930	3850	3760	3680	3600	3410	3220	3030	2850
3800	4150	4060	3980	3890	3800	3600	3400	3190	2990
4000	4380	4280	4190	4090	4000	3780	3570	3350	3140
4200	4600	4500	4400	4300	4200	3970	3740	3510	3280
4400	4830	4720	4610	4510	4400	4160	3910	3670	3430
4600	5050	4940	4820	4710	4600	4340	4090	3830	3570
4800	5270	5160	5040	4920	4800	4530	4260	3990	3720
5000	5500	5370	5250	5120	5000	4720	4430	4150	3860

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	850	970	1080	1200	1270	1350	1420	1500
1400	1030	1150	1280	1400	1470	1550	1630	1720
1600	1210	1340	1470	1600	1680	1760	1850	1940
1800	1380	1520	1660	1800	1880	1970	2060	2160
2000	1560	1710	1850	2000	2080	2170	2270	2380
2200	1740	1890	2050	2200	2290	2380	2490	2600
2400	1910	2080	2240	2400	2490	2590	2700	2820
2600	2090	2260	2430	2600	2690	2800	2910	3050
2800	2270	2450	2620	2800	2890	3000	3130	3270
3000	2450	2630	2820	3000	3100	3210	3340	3490
3200	2620	2820	3010	3200	3300	3420	3550	3710
3400	2800	3000	3200	3400	3500	3620	3770	3930
3600	2980	3190	3390	3600	3700	3830	3980	4150
3800	3150	3370	3580	3800	3910	4040	4190	4370
4000	3330	3550	3780	4000	4110	4250	4410	4600
4200	3510	3740	3970	4200	4310	4450	4620	4820
4400	3690	3920	4160	4400	4510	4660	4830	5040
4600	3860	4110	4350	4600	4720	4870	5050	5260
4800	4040	4290	4550	4800	4920	5070	5260	5480
5000	4220	4480	4740	5000	5120	5280	5470	5700

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	10	14	18	22	26	30	38	42	46	50
1250	72.5	58.6	57.4	56.1	54.9	53.6	52.4	49.8	48.5	47.1	45.6
1400	72.5	62.2	60.9	59.5	58.2	56.9	55.6	52.9	51.5	49.9	48.4
1600	72.5	66.8	65.4	63.9	62.5	61.1	59.7	56.8	55.3	53.6	52.0
1800	72.5	71.1	69.6	68.1	66.6	65.0	63.5	60.5	58.9	57.1	55.4
2000	72.5	72.5	72.5	71.8	70.2	68.6	67.0	63.8	62.1	60.2	58.4
2200	72.5	72.5	72.5	72.5	72.5	71.8	70.1	66.7	64.9	63.0	61.0
2400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	69.3	67.4	65.3	63.3
2600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.6	69.7	67.5	65.4
2800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.9	69.6	67.4
3000	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.8	69.5
3200	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.4
3400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
3600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
3800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4000	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4200	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
CLIMB LIMIT WT (1000 KG)	68.7	68.3	68.2	68.1	68.0	67.9	67.8	62.8	60.3	58.1	55.7

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1250	55.3	51.4	51.1	50.8	50.5	50.2	49.1	46.5	45.1	43.9	42.6
1400	58.6	54.6	54.3	53.9	53.6	53.3	52.1	49.3	47.9	46.6	45.2
1600	63.0	58.6	58.3	57.9	57.6	57.2	56.0	52.9	51.4	50.0	48.6
1800	67.0	62.4	62.0	61.7	61.3	61.0	59.6	56.4	54.8	53.2	51.7
2000	70.7	65.8	65.4	65.0	64.7	64.3	62.8	59.4	57.7	56.1	54.5
2200	72.5	68.9	68.4	68.0	67.6	67.2	65.7	62.1	60.3	58.7	57.0
2400	72.5	71.5	71.1	70.7	70.2	69.8	68.2	64.5	62.6	60.9	59.1
2600	72.5	72.5	72.5	72.5	72.5	72.2	70.5	66.6	64.7	62.8	61.0
2800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	68.7	66.7	64.7	62.8
3000	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.9	68.7	66.7	64.7
3200	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.6	68.5	66.5
3400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.4	70.3	68.2
3600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.9	69.8
3800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.4
4000	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4200	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
CLIMB LIMIT WT (1000 KG)	66.5	66.0	66.0	65.9	65.8	65.7	63.5	58.8	56.4	54.3	52.1

With engine bleed for packs off, increase field limit weight by 550 kg and climb limit weight by 1300 kg.
With engine anti-ice on, decrease field limit weight by 150 kg and climb limit weight by 200 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 600 kg and climb limit weight by 1050 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	10	14	18	22	26	30	38	42	46	50
1250	52.9	49.1	48.8	48.5	48.1	46.8	45.6	43.3	42.1	40.9	39.9
1400	56.2	52.1	51.7	51.4	51.1	49.7	48.4	46.0	44.7	43.4	42.3
1600	60.3	55.9	55.6	55.2	54.9	53.3	52.0	49.4	48.0	46.6	45.4
1800	64.2	59.5	59.2	58.8	58.4	56.8	55.4	52.6	51.1	49.7	48.4
2000	67.7	62.8	62.4	62.0	61.6	59.9	58.4	55.4	53.8	52.3	51.0
2200	70.9	65.6	65.3	64.8	64.4	62.6	61.0	57.9	56.3	54.7	53.3
2400	72.5	68.2	67.7	67.3	66.9	65.0	63.3	60.1	58.3	56.7	55.2
2600	72.5	70.5	70.0	69.6	69.1	67.1	65.4	62.1	60.2	58.5	57.0
2800	72.5	72.5	72.2	71.8	71.3	69.2	67.4	63.9	62.0	60.2	58.6
3000	72.5	72.5	72.5	72.5	72.5	71.4	69.6	65.9	63.9	62.0	60.4
3200	72.5	72.5	72.5	72.5	72.5	72.5	71.4	67.7	65.6	63.7	62.0
3400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	69.4	67.2	65.3	63.5
3600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.0	68.9	66.8	65.0
3800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.4	68.4	66.5
4000	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.0	69.9	68.0
4200	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.3	69.4
4400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.7
4600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.1
CLIMB LIMIT WT (1000 KG)	64.6	64.1	64.0	63.9	63.8	61.5	59.2	54.8	52.6	50.6	48.8

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1250	50.2	46.1	45.8	45.6	44.5	43.4	42.3	40.1	39.0	38.0	37.0
1400	53.3	49.0	48.6	48.3	47.3	46.1	44.9	42.6	41.4	40.3	39.3
1600	57.2	52.6	52.3	51.9	50.8	49.5	48.3	45.8	44.5	43.3	42.2
1800	60.9	56.0	55.6	55.3	54.0	52.7	51.4	48.7	47.3	46.1	44.9
2000	64.3	59.0	58.7	58.3	57.0	55.6	54.2	51.3	49.9	48.6	47.3
2200	67.2	61.7	61.3	60.9	59.6	58.1	56.6	53.6	52.1	50.7	49.4
2400	69.8	64.1	63.6	63.2	61.8	60.2	58.7	55.6	54.0	52.6	51.2
2600	72.2	66.2	65.7	65.3	63.8	62.2	60.6	57.4	55.7	54.2	52.8
2800	72.5	68.2	67.8	67.3	65.8	64.1	62.4	59.0	57.3	55.8	54.3
3000	72.5	70.4	69.9	69.4	67.8	66.0	64.3	60.8	59.0	57.4	55.8
3200	72.5	72.3	71.8	71.3	69.6	67.8	66.0	62.4	60.6	58.9	57.3
3400	72.5	72.5	72.5	72.5	71.4	69.5	67.7	64.0	62.1	60.4	58.7
3600	72.5	72.5	72.5	72.5	72.5	71.2	69.3	65.5	63.6	61.8	60.1
3800	72.5	72.5	72.5	72.5	72.5	72.5	70.9	67.0	65.0	63.2	61.5
4000	72.5	72.5	72.5	72.5	72.5	72.5	72.4	68.4	66.4	64.6	62.8
4200	72.5	72.5	72.5	72.5	72.5	72.5	72.5	69.9	67.8	65.9	64.1
4400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.3	69.1	67.2	65.4
4600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.4	68.5	66.6
CLIMB LIMIT WT (1000 KG)	61.8	61.3	61.2	61.1	59.0	56.8	54.7	50.6	48.6	46.9	45.3

With engine bleed for packs off, increase field limit weight by 550 kg and climb limit weight by 1300 kg.
With engine anti-ice on, decrease field limit weight by 150 kg and climb limit weight by 200 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 600 kg and climb limit weight by 1050 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	10	14	18	22	26	30	38	42	46	50
1250	47.4	43.5	43.3	42.1	40.9	39.9	38.9	36.7	35.7	34.8	33.8
1400	50.3	46.2	45.9	44.7	43.4	42.3	41.3	39.0	37.9	36.9	35.9
1600	54.0	49.6	49.3	48.0	46.7	45.5	44.3	41.9	40.8	39.7	38.6
1800	57.5	52.8	52.5	51.1	49.7	48.4	47.2	44.6	43.4	42.2	41.1
2000	60.6	55.7	55.3	53.8	52.4	51.0	49.7	47.0	45.7	44.5	43.3
2200	63.4	58.2	57.8	56.3	54.7	53.3	52.0	49.0	47.7	46.4	45.1
2400	65.8	60.4	60.0	58.3	56.7	55.2	53.8	50.8	49.4	48.1	46.7
2600	68.0	62.4	61.9	60.2	58.5	57.0	55.5	52.4	50.9	49.5	48.1
2800	70.1	64.2	63.8	62.0	60.2	58.6	57.1	53.8	52.3	50.8	49.4
3000	72.3	66.2	65.8	63.9	62.1	60.4	58.8	55.4	53.8	52.3	50.8
3200	72.5	68.0	67.5	65.6	63.7	62.0	60.4	56.8	55.2	53.6	52.1
3400	72.5	69.7	69.2	67.3	65.3	63.5	61.9	58.2	56.6	55.0	53.4
3600	72.5	71.4	70.9	68.9	66.9	65.0	63.4	59.6	57.9	56.3	54.6
3800	72.5	72.5	72.5	70.4	68.4	66.5	64.8	61.0	59.2	57.5	55.9
4000	72.5	72.5	72.5	72.0	69.9	68.0	66.2	62.3	60.5	58.8	57.1
4200	72.5	72.5	72.5	72.5	71.3	69.4	67.6	63.6	61.8	60.0	58.3
4400	72.5	72.5	72.5	72.5	72.5	70.8	68.9	64.9	63.0	61.2	59.4
4600	72.5	72.5	72.5	72.5	72.5	72.1	70.2	66.1	64.2	62.4	60.5
CLIMB LIMIT WT (1000 KG)	58.9	58.6	58.5	55.9	53.5	51.5	49.7	45.8	44.1	42.5	40.9

10000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1250	44.4	41.0	39.9	38.8	37.9	36.9	35.9	33.9	33.0	32.1	31.2
1400	47.2	43.5	42.4	41.2	40.2	39.2	38.1	36.0	35.0	34.1	33.1
1600	50.6	46.8	45.5	44.3	43.2	42.1	41.0	38.7	37.6	36.6	35.6
1800	53.9	49.8	48.5	47.2	46.0	44.8	43.6	41.2	40.1	39.0	37.9
2000	56.8	52.5	51.1	49.7	48.4	47.2	46.0	43.4	42.2	41.0	39.9
2200	59.4	54.8	53.4	51.9	50.6	49.3	48.0	45.3	44.0	42.8	41.6
2400	61.7	56.8	55.3	53.8	52.4	51.1	49.7	46.8	45.5	44.3	43.0
2600	63.7	58.7	57.1	55.5	54.1	52.6	51.2	48.2	46.9	45.6	44.2
2800	65.6	60.4	58.7	57.1	55.6	54.1	52.6	49.5	48.1	46.7	45.3
3000	67.6	62.2	60.5	58.7	57.2	55.7	54.1	50.9	49.4	48.0	46.5
3200	69.5	63.9	62.1	60.3	58.7	57.1	55.5	52.2	50.7	49.2	47.7
3400	71.2	65.5	63.6	61.8	60.2	58.6	56.9	53.5	52.0	50.4	48.9
3600	72.5	67.0	65.1	63.3	61.6	59.9	58.3	54.8	53.2	51.6	50.0
3800	72.5	68.6	66.6	64.7	63.0	61.3	59.6	56.0	54.4	52.8	51.2
4000	72.5	70.0	68.1	66.1	64.4	62.6	60.9	57.2	55.6	53.9	52.3
4200	72.5	71.5	69.5	67.5	65.7	63.9	62.1	58.4	56.7	55.0	53.4
4400	72.5	72.5	70.9	68.8	67.0	65.2	63.4	59.6	57.8	56.1	54.4
4600	72.5	72.5	72.2	70.2	68.3	66.4	64.6	60.7	58.9	57.2	55.5
CLIMB LIMIT WT (1000 KG)	56.1	55.7	53.3	51.2	49.4	47.5	45.7	42.2	40.6	39.0	37.5

With engine bleed for packs off, increase field limit weight by 550 kg and climb limit weight by 1300 kg.
With engine anti-ice on, decrease field limit weight by 150 kg and climb limit weight by 200 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 600 kg and climb limit weight by 1050 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	1250	1240	1230	1210	1200	1190	1180	1160	1150
1400	1480	1460	1440	1420	1400	1370	1350	1320	1300
1600	1700	1680	1650	1630	1600	1560	1520	1490	1450
1800	1930	1890	1860	1830	1800	1750	1700	1650	1600
2000	2150	2110	2080	2040	2000	1940	1870	1810	1750
2200	2380	2330	2290	2240	2200	2120	2050	1970	1900
2400	2600	2550	2500	2450	2400	2310	2220	2140	2050
2600	2830	2770	2710	2660	2600	2500	2400	2300	2200
2800	3050	2990	2930	2860	2800	2690	2570	2460	2350
3000	3280	3210	3140	3070	3000	2870	2750	2620	2500
3200	3500	3430	3350	3280	3200	3060	2920	2780	2650
3400	3730	3640	3560	3480	3400	3250	3100	2950	2800
3600	3950	3860	3780	3690	3600	3440	3270	3110	2950
3800	4180	4080	3990	3890	3800	3620	3450	3270	3100
4000	4400	4300	4200	4100	4000	3810	3620	3430	3250
4200	4630	4520	4410	4310	4200	4000	3800	3600	3390
4400	4850	4740	4630	4510	4400	4190	3970	3760	3540
4600	5080	4960	4840	4720	4600	4370	4150	3920	3690
4800	5300	5180	5050	4930	4800	4560	4320	4080	3840
5000	5530	5390	5260	5130	5000	4750	4500	4250	3990

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	830	960	1080	1200	1280	1370	1460	1540
1400	1000	1130	1270	1400	1490	1580	1670	1770
1600	1170	1310	1460	1600	1690	1790	1890	2000
1800	1340	1490	1650	1800	1890	2000	2110	2230
2000	1510	1670	1840	2000	2100	2210	2330	2460
2200	1680	1850	2030	2200	2300	2420	2550	2690
2400	1850	2030	2220	2400	2500	2630	2770	2920
2600	2020	2210	2410	2600	2710	2840	2980	3150
2800	2190	2390	2600	2800	2910	3050	3200	3380
3000	2360	2570	2790	3000	3120	3260	3420	3610
3200	2530	2750	2980	3200	3320	3470	3640	3840
3400	2700	2930	3170	3400	3520	3680	3860	4070
3600	2860	3110	3350	3600	3730	3880	4080	4300
3800	3030	3290	3540	3800	3930	4090	4290	4530
4000	3200	3470	3730	4000	4130	4300	4510	4760
4200	3370	3650	3920	4200	4340	4510	4730	4990
4400	3540	3830	4110	4400	4540	4720	4950	5220
4600	3710	4010	4300	4600	4740	4930	5170	5450
4800	3880	4190	4490	4800	4950	5140	5390	5670
5000	4050	4370	4680	5000	5150	5350	5600	5900

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	10	14	18	22	26	30	38	42	46	50
1500	63.7	59.0	58.7	58.3	57.9	57.5	57.2	54.3	52.8	51.2	49.8
1600	65.7	60.9	60.5	60.1	59.7	59.3	58.9	55.9	54.5	52.8	51.4
1800	69.5	64.4	64.0	63.6	63.2	62.8	62.4	59.2	57.7	55.9	54.4
2000	72.5	68.0	67.5	67.1	66.7	66.3	65.8	62.5	60.8	59.0	57.4
2200	72.5	71.2	70.8	70.3	69.9	69.4	69.0	65.4	63.7	61.8	60.1
2400	72.5	72.5	72.5	72.5	72.5	72.2	71.8	68.1	66.3	64.2	62.5
2600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.5	68.6	66.5	64.7
2800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.9	68.7	66.8
3000	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.0	69.0
3200	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.0
3400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
3600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
3800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4000	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4200	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
CLIMB LIMIT WT (1000 KG)	68.7	68.3	68.2	68.1	68.0	67.9	67.8	62.8	60.3	58.1	55.7

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1500	60.8	56.1	55.7	55.3	55.0	54.6	53.3	50.4	49.0	47.8	46.5
1600	62.7	57.8	57.4	57.1	56.7	56.3	55.0	51.9	50.6	49.3	48.0
1800	66.3	61.2	60.8	60.4	60.0	59.6	58.2	55.0	53.5	52.2	50.8
2000	70.0	64.6	64.1	63.7	63.3	62.9	61.4	58.0	56.5	55.0	53.5
2200	72.5	67.6	67.2	66.8	66.3	65.9	64.3	60.7	59.1	57.6	56.1
2400	72.5	70.4	69.9	69.5	69.0	68.6	66.9	63.2	61.5	59.9	58.3
2600	72.5	72.5	72.4	71.9	71.5	71.0	69.3	65.4	63.6	62.0	60.3
2800	72.5	72.5	72.5	72.5	72.5	72.5	71.6	67.6	65.7	64.0	62.3
3000	72.5	72.5	72.5	72.5	72.5	72.5	72.5	69.8	67.9	66.1	64.3
3200	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.8	69.9	68.0	66.1
3400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.8	69.8	67.9
3600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.6	69.6
3800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.3
4000	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4200	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
4800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
CLIMB LIMIT WT (1000 KG)	66.5	66.0	66.0	65.9	65.8	65.7	63.5	58.8	56.4	54.3	52.1

With engine bleed for packs off, increase field limit weight by 450 kg and climb limit weight by 1300 kg.
With engine anti-ice on, decrease field limit weight by 150 kg and climb limit weight by 200 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 550 kg and climb limit weight by 1050 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	10	14	18	22	26	30	38	42	46	50
1500	58.0	53.2	52.9	52.5	52.0	50.6	49.4	47.0	45.7	44.5	43.5
1600	59.8	54.9	54.5	54.2	53.6	52.2	51.0	48.4	47.1	45.9	44.8
1800	63.3	58.1	57.7	57.3	56.7	55.3	54.0	51.3	49.9	48.6	47.5
2000	66.7	61.3	60.9	60.5	59.9	58.3	56.9	54.1	52.6	51.3	50.0
2200	69.9	64.2	63.8	63.3	62.7	61.1	59.6	56.6	55.1	53.7	52.4
2400	72.5	66.8	66.3	65.9	65.2	63.5	62.0	58.9	57.3	55.8	54.4
2600	72.5	69.2	68.7	68.2	67.5	65.8	64.2	60.9	59.3	57.7	56.3
2800	72.5	71.5	71.0	70.5	69.8	67.9	66.3	62.9	61.2	59.6	58.1
3000	72.5	72.5	72.5	72.5	72.1	70.2	68.5	64.9	63.1	61.5	60.0
3200	72.5	72.5	72.5	72.5	72.5	72.2	70.4	66.8	65.0	63.2	61.7
3400	72.5	72.5	72.5	72.5	72.5	72.5	72.3	68.6	66.7	64.9	63.3
3600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.3	68.4	66.6	64.9
3800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.1	70.0	68.2	66.5
4000	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.7	69.7	68.0
4200	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.3	69.5
4400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	70.9
4600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.3
4800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.3
CLIMB LIMIT WT (1000 KG)	64.6	64.1	64.0	63.9	63.8	61.5	59.2	54.8	52.6	50.6	48.8

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1500	54.7	49.9	49.6	49.3	48.1	46.9	45.8	43.5	42.4	41.3	40.3
1600	56.4	51.5	51.1	50.8	49.6	48.4	47.2	44.8	43.7	42.6	41.6
1800	59.7	54.5	54.1	53.8	52.5	51.2	50.0	47.5	46.2	45.1	44.0
2000	63.0	57.5	57.1	56.7	55.4	54.0	52.7	50.1	48.8	47.6	46.4
2200	66.0	60.2	59.8	59.4	58.0	56.6	55.2	52.4	51.0	49.8	48.6
2400	68.7	62.6	62.2	61.8	60.3	58.8	57.4	54.5	53.0	51.7	50.5
2600	71.1	64.8	64.4	64.0	62.5	60.9	59.4	56.3	54.9	53.5	52.2
2800	72.5	66.9	66.5	66.1	64.5	62.8	61.3	58.1	56.6	55.2	53.8
3000	72.5	69.2	68.7	68.2	66.6	64.9	63.3	60.0	58.4	56.9	55.5
3200	72.5	71.2	70.7	70.2	68.5	66.8	65.1	61.7	60.0	58.5	57.0
3400	72.5	72.5	72.5	72.1	70.4	68.5	66.8	63.3	61.6	60.1	58.5
3600	72.5	72.5	72.5	72.5	72.2	70.3	68.5	64.9	63.2	61.6	60.0
3800	72.5	72.5	72.5	72.5	72.5	72.0	70.2	66.5	64.7	63.1	61.5
4000	72.5	72.5	72.5	72.5	72.5	72.5	71.8	68.0	66.2	64.5	62.9
4200	72.5	72.5	72.5	72.5	72.5	72.5	72.5	69.5	67.6	65.9	64.2
4400	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.0	69.0	67.3	65.6
4600	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.3	70.4	68.6	66.8
4800	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5	71.7	69.9	68.1
CLIMB LIMIT WT (1000 KG)	61.8	61.3	61.2	61.1	59.0	56.8	54.7	50.6	48.6	46.9	45.3

With engine bleed for packs off, increase field limit weight by 450 kg and climb limit weight by 1300 kg.
With engine anti-ice on, decrease field limit weight by 150 kg and climb limit weight by 200 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 550 kg and climb limit weight by 1050 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	10	14	18	22	26	30	38	42	46	50
1500	51.2	47.0	46.7	45.4	44.2	43.1	42.1	39.9	38.9	37.9	36.9
1600	52.8	48.5	48.1	46.8	45.5	44.4	43.4	41.1	40.1	39.1	38.1
1800	55.9	51.3	51.0	49.6	48.2	47.0	45.9	43.5	42.4	41.4	40.3
2000	59.0	54.1	53.7	52.3	50.8	49.6	48.4	45.9	44.7	43.6	42.5
2200	61.8	56.7	56.3	54.7	53.2	51.9	50.6	48.0	46.8	45.6	44.4
2400	64.3	58.9	58.5	56.9	55.3	53.9	52.6	49.9	48.6	47.4	46.2
2600	66.5	61.0	60.5	58.9	57.2	55.8	54.4	51.6	50.2	49.0	47.7
2800	68.8	63.0	62.5	60.8	59.0	57.6	56.2	53.2	51.8	50.5	49.1
3000	71.0	65.0	64.5	62.7	60.9	59.4	57.9	54.8	53.4	52.0	50.6
3200	72.5	66.9	66.4	64.5	62.7	61.1	59.6	56.3	54.9	53.4	52.0
3400	72.5	68.7	68.2	66.2	64.3	62.7	61.1	57.8	56.3	54.8	53.4
3600	72.5	70.4	69.9	67.9	66.0	64.3	62.7	59.3	57.7	56.2	54.7
3800	72.5	72.1	71.6	69.6	67.6	65.8	64.2	60.7	59.1	57.5	56.0
4000	72.5	72.5	72.5	71.2	69.1	67.3	65.7	62.1	60.4	58.8	57.3
4200	72.5	72.5	72.5	72.5	70.6	68.8	67.1	63.4	61.7	60.1	58.5
4400	72.5	72.5	72.5	72.5	72.1	70.2	68.5	64.7	63.0	61.4	59.7
4600	72.5	72.5	72.5	72.5	72.5	71.6	69.8	66.0	64.3	62.6	60.9
4800	72.5	72.5	72.5	72.5	72.5	72.5	71.1	67.2	65.5	63.8	62.1
CLIMB LIMIT WT (1000 KG)	58.9	58.6	58.5	55.9	53.5	51.5	49.7	45.8	44.1	42.5	40.9

10000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1500	48.1	44.2	43.0	41.9	40.9	39.9	38.8	36.8	35.9	34.9	34.0
1600	49.6	45.5	44.3	43.2	42.1	41.1	40.0	37.9	37.0	36.0	35.1
1800	52.5	48.2	46.9	45.7	44.6	43.5	42.4	40.2	39.2	38.2	37.2
2000	55.4	50.8	49.5	48.2	47.0	45.9	44.7	42.3	41.3	40.2	39.1
2200	58.0	53.2	51.8	50.4	49.2	48.0	46.8	44.3	43.2	42.0	40.9
2400	60.4	55.3	53.8	52.4	51.1	49.9	48.6	46.0	44.8	43.6	42.5
2600	62.5	57.2	55.7	54.2	52.9	51.6	50.2	47.5	46.3	45.1	43.9
2800	64.5	59.1	57.4	55.9	54.5	53.2	51.8	49.0	47.7	46.4	45.2
3000	66.6	61.0	59.3	57.7	56.2	54.8	53.4	50.5	49.1	47.8	46.5
3200	68.5	62.7	61.0	59.3	57.8	56.3	54.8	51.8	50.5	49.1	47.8
3400	70.4	64.4	62.6	60.8	59.3	57.8	56.3	53.2	51.8	50.4	49.0
3600	72.2	66.0	64.1	62.4	60.8	59.3	57.7	54.5	53.0	51.6	50.2
3800	72.5	67.6	65.7	63.9	62.3	60.7	59.1	55.8	54.3	52.8	51.4
4000	72.5	69.1	67.2	65.3	63.7	62.1	60.4	57.1	55.5	54.0	52.5
4200	72.5	70.6	68.7	66.8	65.1	63.4	61.7	58.3	56.7	55.2	53.7
4400	72.5	72.1	70.1	68.2	66.4	64.7	63.0	59.5	57.9	56.3	54.8
4600	72.5	72.5	71.5	69.5	67.7	66.0	64.2	60.7	59.1	57.5	55.9
4800	72.5	72.5	72.5	70.8	69.0	67.3	65.4	61.8	60.2	58.5	56.9
CLIMB LIMIT WT (1000 KG)	56.1	55.7	53.3	51.2	49.4	47.5	45.7	42.2	40.6	39.0	37.5

With engine bleed for packs off, increase field limit weight by 450 kg and climb limit weight by 1300 kg.
With engine anti-ice on, decrease field limit weight by 150 kg and climb limit weight by 200 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 550 kg and climb limit weight by 1050 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)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)										
	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	67.8	70.8									
20	61.6	65.4	68.0	69.8	71.1						
40	56.6	60.3	63.2	65.5	67.2	68.5	69.6	70.5	71.2	71.8	
60	52.8	56.6	59.6	62.0	63.9	65.5	66.8	67.8	68.7	69.5	70.1
80	49.7	53.5	56.6	59.1	61.1	62.8	64.3	65.5	66.5	67.4	68.1
100	47.1	50.9	54.0	56.6	58.7	60.5	62.0	63.4	64.5	65.5	66.3
120	44.8	48.6	51.8	54.4	56.6	58.4	60.0	61.4	62.6	63.7	64.6
140	42.8	46.6	49.7	52.4	54.6	56.5	58.2	59.6	60.9	62.0	63.0
160	41.0	44.8	47.9	50.6	52.9	54.8	56.5	58.0	59.3	60.5	61.5
180	39.4	43.1	46.3	48.9	51.2	53.2	55.0	56.5	57.8	59.0	60.1
200		41.6	44.7	47.4	49.7	51.7	53.5	55.1	56.5	57.7	58.8
220		40.2	43.3	46.0	48.3	50.4	52.1	53.7	55.2	56.4	57.6
240		38.9	42.0	44.7	47.0	49.1	50.9	52.5	53.9	55.2	56.4
260			40.8	43.5	45.8	47.8	49.7	51.3	52.8	54.1	55.3
280			39.7	42.3	44.6	46.7	48.5	50.2	51.7	53.0	54.2
300				41.3	43.5	45.6	47.4	49.1	50.6	52.0	53.2

When using line-up allowances the obstacle distance from brake release must be reduced by the ASDA adjustment.
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	44	48	52	56	60	64	68	72
30 & BELOW	0	0	0	0	0	0	0	0	0
32	-0.7	-0.8	-0.9	-0.9	-1.0	-1.1	-1.2	-1.3	-1.3
34	-1.4	-1.6	-1.7	-1.9	-2.0	-2.2	-2.3	-2.5	-2.7
36	-2.1	-2.4	-2.6	-2.8	-3.1	-3.3	-3.5	-3.8	-4.0
38	-2.8	-3.1	-3.5	-3.8	-4.1	-4.4	-4.7	-5.0	-5.3
40	-3.5	-3.9	-4.3	-4.7	-5.1	-5.5	-5.9	-6.3	-6.6
42	-4.2	-4.6	-5.1	-5.5	-6.0	-6.5	-6.9	-7.4	-7.8
44	-4.8	-5.3	-5.9	-6.4	-6.9	-7.4	-8.0	-8.5	-9.0
46	-5.4	-6.0	-6.6	-7.2	-7.8	-8.4	-9.0	-9.6	-10.2
48	-6.0	-6.7	-7.4	-8.1	-8.7	-9.4	-10.1	-10.8	-11.4
50	-6.7	-7.4	-8.1	-8.9	-9.6	-10.4	-11.1	-11.9	-12.6

Takeoff Obstacle Limit Weight
Flaps 5
Sea Level, 30°C & Below, Zero Wind
Based on engine bleed for packs on and anti-ice off
Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)								
	40	44	48	52	56	60	64	68	72
S.L. & BELOW	0	0	0	0	0	0	0	0	0
1000	-1.5	-1.6	-1.7	-1.8	-1.9	-2.1	-2.2	-2.3	-2.4
2000	-2.9	-3.2	-3.4	-3.6	-3.9	-4.1	-4.4	-4.6	-4.9
3000	-4.2	-4.6	-5.0	-5.3	-5.7	-6.1	-6.4	-6.8	-7.1
4000	-5.6	-6.1	-6.5	-7.0	-7.5	-8.0	-8.5	-8.9	-9.4
5000	-6.9	-7.5	-8.2	-8.8	-9.4	-10.0	-10.6	-11.2	-11.8
6000	-8.3	-9.0	-9.8	-10.5	-11.2	-12.0	-12.7	-13.4	-14.2
7000	-9.6	-10.5	-11.4	-12.3	-13.2	-14.1	-15.0	-15.8	-16.7
8000	-10.9	-12.0	-13.0	-14.1	-15.1	-16.2	-17.2	-18.3	-19.3
9000	-12.1	-13.2	-14.4	-15.6	-16.7	-17.9	-19.1	-20.2	-21.4
10000	-13.2	-14.5	-15.8	-17.1	-18.4	-19.6	-20.9	-22.2	-23.5

Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)								
	40	44	48	52	56	60	64	68	72
15 TW	-7.9	-7.6	-7.3	-7.1	-6.8	-6.5	-6.2	-5.9	-5.7
10 TW	-5.3	-5.1	-4.9	-4.7	-4.5	-4.3	-4.1	-4.0	-3.8
5 TW	-2.6	-2.5	-2.4	-2.4	-2.3	-2.2	-2.1	-2.0	-1.9
0	0	0	0	0	0	0	0	0	0
10 HW	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.5	0.4
20 HW	2.0	1.9	1.7	1.6	1.5	1.3	1.2	1.0	0.9
30 HW	3.1	2.9	2.7	2.4	2.2	2.0	1.8	1.6	1.3
40 HW	4.2	3.9	3.6	3.3	3.0	2.7	2.4	2.1	1.8

With engine bleed for packs off, increase weight by 1000 kg.
With engine anti-ice on, decrease weight by 250 kg.
With engine and wing anti-ice on, decrease weight by 1150 kg (optional system).

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°)
70	34300	-14	37700*	37700*	37700*	36400	35100
65	35800	-18	39200*	39200*	39200*	38000	36600
60	37500	-18	40700*	40700*	40700*	39700	38300
55	39300	-18	41000	41000	41000	41000	40100
50	41000	-18	41000	41000	41000	41000	41000
45	41000	-18	41000	41000	41000	41000	41000
40	41000	-18	41000	41000	41000	41000	41000
35	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°)
70	34300	-9	37000*	37000*	37000*	36400	35100
65	35800	-12	38300*	38300*	38300*	38000	36600
60	37500	-13	39800*	39800*	39800*	39700	38300
55	39300	-13	41000	41000	41000	41000	40100
50	41000	-13	41000	41000	41000	41000	41000
45	41000	-13	41000	41000	41000	41000	41000
40	41000	-13	41000	41000	41000	41000	41000
35	41000	-13	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°)
70	34300	-3	35700*	35700*	35700*	35700*	35100
65	35800	-7	37200*	37200*	37200*	37200*	36600
60	37500	-7	38700*	38700*	38700*	38700*	38300
55	39300	-7	40200*	40200*	40200*	40200*	40100
50	41000	-7	41000	41000	41000	41000	41000
45	41000	-7	41000	41000	41000	41000	41000
40	41000	-7	41000	41000	41000	41000	41000
35	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
278	258	240	225	212	200	190	181	173	166	159
551	513	479	450	424	400	381	364	349	334	322
823	767	717	673	635	600	573	548	524	504	485
1095	1021	955	897	846	800	764	731	700	673	648
1366	1274	1192	1120	1057	1000	955	914	877	842	811
1636	1527	1429	1344	1268	1200	1147	1098	1053	1011	974
1906	1780	1666	1567	1480	1400	1338	1281	1229	1181	1137
2175	2032	1903	1790	1691	1600	1530	1465	1405	1350	1300
2443	2283	2139	2013	1901	1800	1721	1648	1581	1520	1464
2711	2535	2375	2236	2112	2000	1913	1832	1757	1689	1627
2978	2785	2611	2458	2323	2200	2104	2016	1934	1859	1791
3245	3035	2846	2681	2534	2400	2296	2199	2110	2028	1954
3511	3285	3081	2903	2744	2600	2488	2383	2287	2198	2118
3776	3534	3316	3125	2955	2800	2679	2567	2463	2368	2281
4041	3783	3550	3346	3165	3000	2871	2751	2640	2538	2445
4305	4032	3784	3568	3375	3200	3062	2935	2816	2708	2609
4569	4280	4018	3789	3586	3400	3254	3119	2993	2878	2773
4831	4527	4252	4011	3796	3600	3446	3302	3170	3048	2936
5093	4774	4485	4232	4006	3800	3637	3486	3346	3218	3100
5355	5021	4718	4453	4216	4000	3829	3670	3523	3388	3264
5616	5267	4951	4674	4426	4200	4021	3854	3699	3557	3428
5876	5513	5184	4894	4636	4400	4212	4038	3876	3727	3592
6136	5758	5416	5114	4846	4600	4404	4221	4052	3897	3755
6395	6003	5648	5335	5055	4800	4595	4405	4229	4067	3919
6653	6247	5879	5555	5265	5000	4787	4589	4405	4237	4083

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	1.4	0:38	1.4	0:37	1.4	0:37	1.4	0:36	1.4	0:36
400	2.4	1:08	2.4	1:07	2.4	1:06	2.3	1:05	2.3	1:04
600	3.4	1:39	3.4	1:37	3.3	1:34	3.3	1:33	3.2	1:31
800	4.5	2:09	4.4	2:06	4.3	2:03	4.2	2:00	4.1	1:59
1000	5.5	2:39	5.4	2:36	5.2	2:31	5.1	2:28	5.0	2:26
1200	6.5	3:09	6.4	3:04	6.2	2:59	6.1	2:56	6.0	2:53
1400	7.6	3:38	7.4	3:33	7.2	3:27	7.1	3:23	6.9	3:20
1600	8.7	4:07	8.4	4:01	8.2	3:55	8.0	3:50	7.8	3:47
1800	9.7	4:37	9.5	4:30	9.2	4:23	9.0	4:18	8.8	4:14
2000	10.8	5:06	10.5	4:58	10.2	4:51	9.9	4:45	9.7	4:41
2200	11.9	5:34	11.6	5:26	11.3	5:18	11.0	5:12	10.7	5:08
2400	13.0	6:03	12.7	5:53	12.3	5:45	12.0	5:39	11.7	5:34
2600	14.1	6:31	13.7	6:21	13.4	6:12	13.0	6:06	12.7	6:01
2800	15.3	6:59	14.8	6:49	14.4	6:39	14.0	6:33	13.7	6:28
3000	16.4	7:28	15.9	7:16	15.5	7:06	15.0	7:00	14.7	6:55
3200	17.5	7:55	17.0	7:43	16.6	7:33	16.1	7:26	15.8	7:21
3400	18.7	8:22	18.2	8:10	17.7	8:00	17.2	7:53	16.9	7:48
3600	19.9	8:50	19.3	8:37	18.8	8:27	18.2	8:20	18.0	8:14
3800	21.1	9:17	20.5	9:04	19.9	8:53	19.3	8:46	19.1	8:41
4000	22.2	9:44	21.6	9:31	21.0	9:20	20.4	9:13	20.1	9:07
4200	23.5	10:11	22.8	9:58	22.1	9:47	21.6	9:39	21.3	9:34
4400	24.7	10:38	24.0	10:24	23.3	10:13	22.7	10:06	22.5	10:00
4600	25.9	11:05	25.2	10:51	24.4	10:39	23.9	10:32	23.7	10:27
4800	27.2	11:31	26.4	11:17	25.6	11:06	25.0	10:59	24.9	10:53
5000	28.4	11:58	27.6	11:44	26.8	11:32	26.2	11:25	26.1	11:20

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)			
	30	40	50	60
5	-0.8	-0.4	0.0	0.7
10	-1.7	-0.9	0.0	1.5
15	-2.5	-1.3	0.0	2.5
20	-3.4	-1.8	0.0	3.7
25	-4.3	-2.3	0.0	5.1
30	-5.2	-2.7	0.0	6.6

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) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
1325	1244	1173	1109	1052	1000	953	911	872	836	803
1843	1733	1636	1549	1471	1400	1336	1277	1224	1174	1129
2360	2222	2099	1989	1890	1800	1718	1644	1576	1513	1455
2876	2710	2561	2428	2309	2200	2101	2011	1928	1852	1781
3392	3197	3023	2868	2727	2600	2484	2378	2281	2191	2108
3907	3684	3485	3307	3146	3000	2867	2745	2633	2530	2435
4421	4170	3947	3746	3565	3400	3250	3113	2986	2870	2762
4934	4656	4408	4185	3983	3800	3633	3480	3339	3210	3090
5448	5142	4869	4624	4402	4200	4016	3847	3693	3550	3417
5961	5628	5330	5062	4820	4600	4399	4215	4046	3890	3745
6474	6113	5791	5501	5238	5000	4782	4583	4399	4230	4073

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG) LANDING WEIGHT (1000 KG)				TIME (HR:MIN)
	30	40	50	60	
1000	3.7	4.3	5.0	5.7	2:27
1400	5.1	5.9	6.8	7.9	3:22
1800	6.5	7.5	8.7	10.1	4:16
2200	7.8	9.1	10.7	12.3	5:10
2600	9.3	10.8	12.6	14.7	6:04
3000	10.7	12.5	14.7	17.1	6:58
3400	12.2	14.2	16.8	19.5	7:51
3800	13.7	16.0	19.0	22.1	8:44
4200	15.3	17.9	21.2	24.7	9:37
4600	16.9	19.8	23.5	27.4	10:30
5000	18.5	21.8	25.9	30.1	11:23

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) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
92	79	69	61	55	50	46	42	39	37	34
157	141	128	117	108	100	93	87	82	77	73
222	203	186	172	160	150	141	133	125	119	113
287	264	244	228	213	200	189	178	169	161	153
351	325	302	283	265	250	236	224	213	203	194
415	385	360	337	318	300	284	270	257	246	235
478	446	417	392	370	350	332	316	301	288	276
542	506	475	447	422	400	380	362	346	331	317
607	568	533	502	475	450	428	408	389	373	357
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)
		30	35	40	45	50	55	60	
50	FUEL (1000 KG)	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0:14
	ALT (FT)	13000	11000	11000	11000	11000	9000	9000	
100	FUEL (1000 KG)	0.7	0.8	0.8	0.9	0.9	1.0	1.0	0:22
	ALT (FT)	21000	21000	19000	19000	19000	19000	17000	
150	FUEL (1000 KG)	0.9	1.0	1.1	1.1	1.2	1.3	1.3	0:30
	ALT (FT)	29000	29000	27000	25000	25000	25000	23000	
200	FUEL (1000 KG)	1.1	1.2	1.3	1.4	1.4	1.5	1.6	0:37
	ALT (FT)	41000	39000	35000	31000	29000	29000	27000	
250	FUEL (1000 KG)	1.3	1.4	1.5	1.6	1.7	1.8	1.9	0:43
	ALT (FT)	41000	41000	41000	37000	37000	35000	35000	
300	FUEL (1000 KG)	1.4	1.6	1.7	1.8	1.9	2.0	2.1	0:50
	ALT (FT)	41000	41000	41000	41000	39000	37000	35000	
350	FUEL (1000 KG)	1.6	1.7	1.9	2.0	2.1	2.3	2.4	0:57
	ALT (FT)	41000	41000	41000	41000	39000	37000	35000	
400	FUEL (1000 KG)	1.8	1.9	2.0	2.2	2.3	2.5	2.6	1:03
	ALT (FT)	41000	41000	41000	41000	39000	37000	37000	
450	FUEL (1000 KG)	1.9	2.1	2.2	2.4	2.5	2.7	2.9	1:10
	ALT (FT)	41000	41000	41000	41000	41000	39000	37000	
500	FUEL (1000 KG)	2.1	2.3	2.4	2.6	2.8	3.0	3.1	1:18
	ALT (FT)	41000	41000	41000	41000	41000	39000	37000	

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
70	2490	2450	2420	2400	2360	2330	2390	2470	
65	2330	2290	2260	2230	2200	2150	2210	2260	
60	2180	2130	2100	2070	2040	1980	2020	2060	2330
55	2020	1970	1940	1910	1870	1830	1840	1880	2030
50	1870	1820	1780	1750	1710	1680	1690	1710	1810
45	1720	1660	1650	1610	1580	1550	1530	1530	1610
40	1600	1550	1490	1450	1420	1400	1380	1360	1420
35	1450	1400	1350	1310	1280	1250	1230	1210	1240

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 Cu. 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	43.7	42.4	40.9
28	47.3	45.7	44.2
26	51.0	49.3	47.8
24	54.5	52.8	51.0
22	57.7	55.8	53.7
20	61.0	58.7	56.1
18	64.2	61.6	58.6
16	67.3	64.3	61.0
14	70.7	67.4	64.0

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)								
	PRESSURE ALTITUDE (1000 FT)								
	14	16	18	20	22	24	26	28	30
ENGINE ONLY	-2.1	-1.9	-1.8	-1.8	-1.6	-1.4	-1.2	-1.1	-1.0
ENGINE & WING*	-8.1	-7.5	-7.0	-6.6	-5.9	-5.3	-4.9	-4.6	

***Optional System**

ALL ENGINES

Decompression Critical Fuel Reserves - LRC Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEAD WIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
292	268	247	229	213	200	188	178	168	160	152
605	549	502	463	429	400	375	352	332	315	299
918	830	757	696	645	600	561	527	497	470	446
1231	1111	1013	930	860	800	748	702	661	625	593
1544	1392	1268	1164	1076	1000	934	877	826	780	740
1857	1674	1523	1398	1291	1200	1121	1051	990	935	886
2170	1955	1779	1632	1507	1400	1307	1226	1154	1090	1033
2483	2236	2034	1865	1723	1600	1494	1401	1319	1246	1180
2796	2518	2289	2099	1938	1800	1680	1575	1483	1401	1327

Critical Fuel (1000 KG)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	35	40	45	50	55	60	65	70
200	1.5	1.5	1.6	1.7	1.7	1.8	1.9	1.9
300	2.1	2.2	2.3	2.4	2.5	2.6	2.6	2.7
400	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.6
500	3.4	3.5	3.7	3.8	4.0	4.1	4.2	4.4
600	4.1	4.2	4.4	4.5	4.7	4.9	5.0	5.2
700	4.7	4.9	5.1	5.3	5.4	5.6	5.8	6.0
800	5.4	5.5	5.8	6.0	6.2	6.4	6.6	6.8
900	6.0	6.2	6.4	6.7	6.9	7.1	7.4	7.6
1000	6.7	6.8	7.1	7.4	7.6	7.9	8.1	8.4
1100	7.3	7.5	7.8	8.1	8.3	8.6	8.9	9.2
1200	7.9	8.1	8.4	8.7	9.1	9.4	9.7	10.0
1300	8.6	8.8	9.1	9.4	9.8	10.1	10.5	10.8
1400	9.2	9.4	9.8	10.1	10.5	10.9	11.2	11.6
1500	9.9	10.1	10.4	10.8	11.2	11.6	12.0	12.3
1600	10.5	10.7	11.1	11.5	11.9	12.3	12.7	13.1
1700	11.2	11.4	11.7	12.2	12.6	13.0	13.4	13.9
1800	11.8	12.0	12.4	12.8	13.3	13.7	14.2	14.6

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.7% per 10°C above ISA.
-When icing conditions are forecast, use the greater of engine and wing anti-ice on (12%) for the total forecast time or engine and wing anti-ice on and ice drag (18%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

MAX CONTINUOUS THRUST

Decompression Critical Fuel Reserves - LRC Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
301	273	250	231	214	200	187	176	167	158	150
620	559	508	466	431	400	373	350	330	312	295
940	844	766	702	647	600	560	524	493	465	441
1260	1130	1025	937	863	800	746	698	656	619	586
1581	1416	1283	1172	1079	1000	932	872	819	773	731
1901	1702	1541	1408	1296	1200	1118	1046	983	927	877
2221	1988	1799	1643	1512	1400	1304	1220	1146	1080	1022
2541	2274	2057	1878	1728	1600	1490	1394	1309	1234	1168
2862	2560	2315	2114	1944	1800	1676	1567	1472	1388	1313

Critical Fuel (1000 KG)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	35	40	45	50	55	60	65	70
200	1.3	1.3	1.4	1.5	1.5	1.6	1.7	1.8
300	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5
400	2.4	2.5	2.6	2.8	2.9	3.0	3.1	3.3
500	2.9	3.1	3.2	3.4	3.6	3.7	3.9	4.0
600	3.5	3.7	3.9	4.0	4.2	4.4	4.6	4.8
700	4.0	4.3	4.5	4.7	4.9	5.1	5.3	5.6
800	4.6	4.9	5.1	5.3	5.6	5.8	6.1	6.3
900	5.2	5.4	5.7	6.0	6.2	6.5	6.8	7.0
1000	5.7	6.0	6.3	6.6	6.9	7.2	7.5	7.8
1100	6.3	6.6	6.9	7.2	7.5	7.8	8.2	8.5
1200	6.8	7.1	7.5	7.8	8.2	8.5	8.9	9.2
1300	7.4	7.7	8.1	8.4	8.8	9.2	9.6	10.0
1400	8.0	8.2	8.6	9.1	9.5	9.9	10.3	10.7
1500	8.5	8.8	9.2	9.7	10.1	10.5	11.0	11.4
1600	9.1	9.4	9.8	10.3	10.7	11.2	11.7	12.1
1700	9.6	9.9	10.4	10.9	11.4	11.8	12.3	12.8
1800	10.2	10.5	11.0	11.5	12.0	12.5	13.0	13.5

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5%if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.7% per 10°C above ISA.
-When icing conditions are forecast, use the greater of engine and wing anti-ice on (7%) for the total forecast time or engine and wing anti-ice on and ice drag (15%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						DISTANCE				
100	80	60	40	20		(NM)	20	40	60	80
268	251	236	222	210	200	190	181	173	166	159
540	504	473	446	421	400	380	362	346	331	317
814	760	712	670	633	600	569	542	518	495	474
1091	1017	952	895	845	800	759	722	689	659	631
1370	1275	1193	1121	1057	1000	948	902	860	822	787
1648	1534	1434	1346	1269	1200	1138	1082	1031	985	943
1927	1792	1675	1572	1481	1400	1327	1261	1202	1148	1099
2205	2050	1915	1797	1693	1600	1516	1441	1373	1311	1255
2482	2307	2155	2022	1904	1800	1706	1621	1545	1475	1411

Critical Fuel (1000 KG)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	35	40	45	50	55	60	65	70
200	1.3	1.4	1.5	1.5	1.6	1.6	1.7	1.7
300	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4
400	2.1	2.2	2.4	2.5	2.7	2.8	2.9	3.0
500	2.4	2.6	2.8	3.0	3.2	3.4	3.5	3.7
600	2.8	3.0	3.3	3.5	3.7	3.9	4.2	4.3
700	3.2	3.4	3.7	4.0	4.2	4.5	4.8	5.0
800	3.5	3.8	4.1	4.4	4.8	5.1	5.4	5.6
900	3.9	4.2	4.6	4.9	5.3	5.6	5.9	6.3
1000	4.2	4.6	5.0	5.4	5.8	6.2	6.5	6.9
1100	4.6	5.0	5.4	5.8	6.3	6.7	7.1	7.5
1200	4.9	5.4	5.8	6.3	6.8	7.2	7.7	8.1
1300	5.2	5.7	6.3	6.8	7.3	7.8	8.3	8.8
1400	5.6	6.1	6.7	7.2	7.8	8.3	8.8	9.4
1500	5.9	6.5	7.1	7.7	8.2	8.8	9.4	10.0
1600	6.2	6.8	7.5	8.1	8.7	9.3	10.0	10.6
1700	6.5	7.2	7.9	8.5	9.2	9.9	10.5	11.2
1800	6.9	7.6	8.3	9.0	9.7	10.4	11.1	11.8

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.7% per 10°C above ISA.
-When icing conditions are forecast, use the greater of the engine and wing anti-ice on (12%) for the total forecast time or engine and wing anti-ice on and ice drag (26%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

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		800	900	1000	1070	1140	1200	1280
1200	900	990	1090	1200	1270	1350	1420	1500
1400	1070	1170	1280	1400	1480	1560	1640	1720
1600	1250	1360	1470	1600	1680	1770	1860	1950
1800	1430	1550	1660	1800	1890	1980	2080	2170
2000	1610	1730	1860	2000	2090	2180	2290	2390
2200	1780	1920	2050	2200	2290	2390	2510	2620
2400	1960	2110	2240	2400	2500	2600	2730	
2600	2140	2290	2430	2600	2700			
2800	2320	2480	2620	2800				

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
1000	36.8					
1200	47.5	44.6	42.0	39.4	36.9	
1400	57.4	54.8	51.7	48.6	45.6	42.7
1600	66.2	62.7	59.7	56.8	54.1	50.7
1800	72.5	70.8	67.4	63.6	60.5	57.5
2000		72.5	72.5	70.7	67.2	63.4
2200				72.5	72.5	69.7

Decrease field limit weight by 4450 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	1940	2100	2260	2390
2000			1750	2000	2150	2310	2480	2620
2200		1720	1940	2200	2360	2520	2700	2850
2400	1680	1910	2140	2400	2560	2740	2920	3070
2600	1850	2090	2330	2600	2770	2950	3140	3300
2800	2030	2280	2520	2800	2980	3160	3350	3530
3000	2200	2460	2720	3000	3180	3370	3570	3760
3200	2380	2640	2910	3200	3390	3580	3790	3980
3400	2550	2830	3100	3400	3590	3800	4010	4210
3600	2730	3010	3290	3600	3800	4010	4230	4440
3800	2900	3200	3490	3800	4010	4220	4450	4660
4000	3080	3380	3680	4000	4210	4430	4670	4890
4200	3250	3560	3870	4200	4420	4640	4890	5120
4400	3430	3750	4070	4400	4630	4860	5110	5350
4600	3600	3930	4260	4600	4830	5070	5330	5570
4800	3780	4120	4450	4800	5040	5280	5540	5800
5000	3950	4300	4650	5000	5240	5490	5760	6030
5200	4130	4480	4840	5200	5450	5700	5980	6250
5400	4310	4670	5030	5400	5660	5920	6200	6480
5600	4480	4850	5230	5600	5860	6130	6420	6710

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
2000	37.7					
2200	42.9	40.3	37.3			
2400	48.1	45.2	42.0	39.2	36.5	
2600	53.4	50.2	46.7	43.6	40.6	37.8
2800	58.6	55.1	51.3	48.0	44.8	41.7
3000	63.8	60.0	55.9	52.3	48.9	45.5
3200	69.5	64.9	60.5	56.6	52.9	49.3
3400	72.5	70.1	65.1	60.8	56.8	53.0
3600		72.5	69.9	65.0	60.7	56.7
3800			72.5	69.6	64.7	60.3
4000				72.5	69.0	64.0
4200					72.5	68.1
4400						71.8
4600						72.5

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	1080	1150	1220	1300
1200		970	1080	1200	1280	1360	1440	1520
1400	1050	1150	1270	1400	1490	1570	1650	1750
1600	1230	1340	1460	1600	1690	1780	1870	1970
1800	1400	1530	1650	1800	1890	1990	2090	2190
2000	1580	1710	1850	2000	2100	2200	2310	2420
2200	1760	1900	2040	2200	2300	2410	2530	2640
2400	1940	2090	2230	2400	2510	2620	2750	2860
2600	2110	2270	2420	2600	2710	2830	2960	3090
2800	2290	2460	2610	2800	2910	3030	3180	
3000	2470	2650	2810	3000	3120			
3200	2650	2830	3000	3200				

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
1200	39.1	36.7				
1400	48.4	45.5	42.8	40.2	37.7	
1600	57.1	54.4	51.3	48.2	45.3	42.3
1800	64.5	61.3	58.5	55.6	52.6	49.3
2000	71.9	68.5	64.8	61.6	58.6	55.7
2200	72.5	72.5	71.4	67.9	64.1	60.8
2400			72.5	72.5	69.9	66.3
2600					72.5	71.5

Decrease field limit weight by 4450 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					1960	2130	2300	2450
2000				2000	2160	2340	2520	2670
2200			1920	2200	2370	2550	2740	2900
2400		1860	2110	2400	2580	2760	2960	3130
2600		2050	2300	2600	2780	2980	3180	3350
2800	1960	2230	2500	2800	2990	3190	3400	3580
3000	2140	2410	2690	3000	3190	3400	3620	3810
3200	2310	2600	2880	3200	3400	3610	3840	4040
3400	2490	2780	3070	3400	3610	3820	4050	4260
3600	2660	2970	3270	3600	3810	4040	4270	4490
3800	2840	3150	3460	3800	4020	4250	4490	4720
4000	3010	3340	3650	4000	4230	4460	4710	4940
4200	3190	3520	3850	4200	4430	4670	4930	5170
4400	3370	3700	4040	4400	4640	4880	5150	5400
4600	3540	3890	4230	4600	4840	5100	5370	5630
4800	3720	4070	4430	4800	5050	5310	5590	5850
5000	3890	4260	4620	5000	5260	5520	5810	6080
5200	4070	4440	4810	5200	5460	5730	6030	6310
5400	4240	4620	5010	5400	5670	5940	6240	6530
5600	4420	4810	5200	5600	5880	6160	6460	6760

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
2400	40.0	37.5				
2600	44.5	41.8	38.7	36.1		
2800	49.0	46.1	42.8	39.9	37.2	
3000	53.6	50.4	46.9	43.8	40.8	37.9
3200	58.1	54.7	50.9	47.6	44.4	41.3
3400	62.6	58.9	54.9	51.4	48.0	44.7
3600	67.7	63.2	58.9	55.1	51.5	48.0
3800	72.0	67.8	62.8	58.8	54.9	51.2
4000	72.5	71.9	67.1	62.4	58.3	54.4
4200		72.5	71.1	66.3	61.7	57.6
4400			72.5	70.2	65.3	60.8
4600				72.5	69.0	64.0
4800					72.1	67.6
5000					72.5	70.8
5200						72.5

Landing Climb Limit Weight

Valid for approach with Flaps 15 and landing with Flaps 40
Based on engine bleed for packs on and anti-ice off

AIRPORT OAT (°C)	LANDING CLIMB LIMIT WEIGHT (1000 KG)						
	AIRPORT PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
54	56.7	54.1					
52	57.8	55.2					
50	59.0	56.3	52.7				
48	60.2	57.5	53.8				
46	61.4	58.6	54.8	51.2			
44	62.6	59.8	55.9	52.2			
42	63.9	60.9	57.0	53.2	49.1		
40	65.2	62.1	58.1	54.2	50.1		
38	66.5	63.4	59.3	55.3	51.1	46.3	
36	67.7	64.7	60.5	56.4	52.2	47.2	
34	69.0	66.0	61.6	57.5	53.2	48.2	44.3
32	69.0	67.3	62.8	58.6	54.2	49.1	45.2
30	69.1	68.5	64.0	59.7	55.1	50.1	46.1
28	69.2	68.6	65.1	60.7	56.1	51.0	47.0
26	69.2	68.7	66.3	61.8	57.2	51.9	47.9
24	69.3	68.7	66.4	63.0	58.2	52.8	48.8
22	69.4	68.8	66.4	64.1	59.3	53.9	49.7
20	69.4	68.8	66.5	64.2	60.3	54.9	50.6
18	69.5	68.9	66.5	64.2	61.3	56.1	51.5
16	69.5	68.9	66.6	64.2	61.3	57.4	52.4
14	69.6	69.0	66.6	64.3	61.4	58.5	53.5
12	69.6	69.0	66.6	64.3	61.4	58.6	54.7
10	69.7	69.1	66.7	64.4	61.4	58.6	55.7
-40	70.2	69.5	67.2	64.9	61.9	59.0	56.0

With engine bleed for packs off, increase weight by 1050 kg.
With engine anti-ice on, decrease weight by 200 kg.
With engine and wing anti-ice on, decrease weight by 800 kg .
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 4550 kg.

ENGINE INOP

Go-Around Climb Gradient

Flaps 15

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	2.76					
50	3.30	2.41				
46	3.87	2.93	2.04			
42	4.43	3.46	2.52	1.56		
38	5.03	4.02	3.05	2.03	0.87	
34	5.65	4.60	3.59	2.53	1.32	
30	6.27	5.17	4.11	3.00	1.79	0.84
26	6.31	5.72	4.63	3.49	2.22	1.27
22	6.33	5.74	5.19	4.02	2.69	1.70
18	6.36	5.77	5.21	4.51	3.25	2.13
14	6.38	5.79	5.23	4.53	3.85	2.63
10	6.41	5.81	5.25	4.54	3.87	3.19

Gradient Adjustment for Weight (%)

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)							
	0	1	2	3	4	5	6	7
65	-2.35	-2.53	-2.84	-3.11	-3.36	-3.61	-3.86	-4.08
60	-1.72	-1.84	-2.06	-2.25	-2.43	-2.61	-2.79	-2.96
55	-0.93	-1.01	-1.13	-1.24	-1.34	-1.44	-1.53	-1.62
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45	1.12	1.24	1.36	1.48	1.61	1.74	1.87	2.01
40	2.53	2.84	3.09	3.36	3.65	3.96	4.24	4.60

Gradient Adjustment for Speed (%)

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)											
	0	1	2	3	4	5	6	7	8	9	10	11
VREF40	-0.33	-0.34	-0.35	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36
VREF40+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF40+10	0.17	0.18	0.18	0.19	0.19	0.19	0.18	0.18	0.18	0.18	0.18	0.17
VREF40+15	0.28	0.29	0.29	0.29	0.28	0.27	0.26	0.25	0.24	0.24	0.24	0.22
VREF40+20	0.32	0.33	0.32	0.30	0.27	0.25	0.23	0.22	0.21	0.20	0.19	0.18
VREF40+25	0.31	0.29	0.25	0.21	0.18	0.15	0.13	0.11	0.09	0.08	0.06	0.04
VREF40+30	0.24	0.19	0.12	0.05	-0.02	-0.06	-0.08	-0.09	-0.11	-0.13	-0.17	-0.19

With engine bleed for packs off, increase gradient by 0.3%.
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 0.6%.

Quick Turnaround Limit Weight
Flaps 40

OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
54	71.8					
50	72.2	69.5				
45	72.5	70.0	67.4			
40	72.5	70.6	67.9	65.0		
35	72.5	71.2	68.5	65.8	62.9	
30	72.5	71.8	69.0	66.3	63.4	60.8
25	72.5	72.4	69.6	66.9	63.9	61.3
20	72.5	72.5	70.2	67.4	64.5	61.8
15	72.5	72.5	70.8	68.0	65.1	62.4
10	72.5	72.5	71.4	68.6	65.9	62.9
5	72.5	72.5	72.1	69.2	66.5	63.5
0	72.5	72.5	72.5	69.9	67.1	64.1
-5	72.5	72.5	72.5	70.5	67.7	64.7
-10	72.5	72.5	72.5	71.2	68.4	65.4
-15	72.5	72.5	72.5	71.9	69.0	66.2
-20	72.5	72.5	72.5	72.5	69.7	66.8
-30	72.5	72.5	72.5	72.5	71.1	68.2
-40	72.5	72.5	72.5	72.5	72.5	69.6
-50	72.5	72.5	72.5	72.5	72.5	71.2
-54	72.5	72.5	72.5	72.5	72.5	71.8

Increase weight by 650 kg per 1% uphill slope. Decrease weight by 950 kg per 1% downhill slope. Increase weight by 1800 kg per 10 knots headwind. Decrease weight by 6350 kg per 10 knots tailwind.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 62 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 62 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 62 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.

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GEAR DOWN

Gear Down

TO BE SUPPLIED

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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 and Obstacle Limit Weights as determined from the tables shown. Tire and Brake Energy Limits are not shown as they are not limiting for the range of conditions shown in this chapter.

JAROPS-1 requires that the runway length be adjusted to account for alignment of the airplane prior to takeoff. The table below provides TORA, TODA and ASDA adjustments for both 90 degree taxiway entry and 180 degree turnaround. These values may be used when obtaining takeoff weights from the Airplane Flight Manual or a takeoff analysis program. When using line-up allowances with the Field Length Limit chart, the field length available must be reduced by the ASDA adjustment.

	90 DEGREE TAXIWAY ENTRY	180 DEGREE TURNAROUND	
		60 M (200 FT) RUNWAY	45 M (150 FT) RUNWAY
	LINE-UP DISTANCE - M (FT)	LINE-UP DISTANCE - M (FT)	LINE-UP DISTANCE - M (FT)
TORA & TODA	9 (31)	15 (49)	15 (49)
ASDA	21 (68)	26 (86)	26 (86)

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.

When using line-up allowances with the Obstacle Limit chart, the obstacle distance from brake release must be reduced by the ASDA adjustment.

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

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.

Extended Operations - LRC Critical Fuel Reserves

ETOPS regulations require that flights conducted over a route that contains a point further than one hour's time at "normal one-engine-inoperative speed" from an adequate airport comply with rules specific to extended operations for airplanes with two or more engines. This section provides reserve fuel planning information for the "Critical Fuel Diversion Scenario".

ETOPS regulations require reserve planning to include a "Critical Fuel Diversion Scenario" calculation. The information shown is the fuel required to satisfy the flight profile as described below the charts. This information is shown for all engines operating and one engine inoperative at Long Range Cruise (LRC). There are two engine-inoperative scenarios, a decompression scenario and a driftdown scenario. The decompression scenario assumes an engine failure, loss of pressurization, emergency descent, and subsequent cruise at 10000 ft. The driftdown scenario assumes an engine failure without loss of pressurization, where the airplane "drifts down" to the thrust limited level-off altitude for the remainder of the diversion.

The ETOPS critical fuel required is the greater of the all-engine fuel or the engine-inoperative fuel. The ETOPS critical fuel required is compared to the amount of fuel that is predicted to be onboard the airplane at the critical point. If the fuel required by the ETOPS critical fuel reserves of the route exceeds the amount of fuel predicted, the fuel load must be adjusted accordingly. The data does not include an allowance for performance deterioration. However, regulations require a 5% allowance for performance deterioration, unless a value has been established by the operator for in-service deterioration.

To determine the ETOPS critical fuel required, enter the Ground to Air Mile Conversion table with the forecast wind (factored if applicable) and ground distance to the diversion airport from the critical point to obtain the air distance. Then enter the Critical Fuel table with air distance and expected weight at the critical point and read the required fuel. Apply the noted fuel adjustments for non-standard conditions, as necessary. When using a wind forecasting model acceptable to the FAA (such as the World Area Forecast System, WAFS), regulations allow the wind factor applied in this step to be 5% of the forecast wind (increase headwinds, decrease tailwinds), as indicated in the note below the chart. However, if a FAA-acceptable wind forecasting model is not used, the ETOPS critical fuel must be increased by 5%, instead of factoring the forecast winds.

LRC Cruise/Driftdown Critical Fuel Reserves

Enter the Ground to Air Miles Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter the Critical Fuel table with air distance and expected weight at the critical point and read required fuel. Apply the noted fuel adjustments as necessary. Regulations require a 5% allowance for performance deterioration unless a value has been established by the operator for inservice deterioration.

As noted below each table, the fuel required is the greater of the two engine fuel and the single engine fuel. This fuel is compared to the amount of fuel normally onboard the airplane at that point in the route. If the fuel required by the critical fuel reserves exceeds the amount of fuel normally expected, the fuel load must be adjusted accordingly.

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 table with airport pressure altitude and OAT to read maximum quick turnaround weight. Apply the noted adjustments as required.

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, or ensure the brake temperature is within limits using the alternate procedure described on the page.

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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737-700 CFM56-7B24 LB FAA CATB

Takeoff Field Corrections - Dry Runway

Slope Corrections

FIELD LENGTH AVAILABLE (FT)	SLOPE CORRECTED FIELD LENGTH (FT)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
4200	4230	4230	4220	4210	4200	4110	4030	3940	3850
4600	4680	4660	4640	4620	4600	4490	4380	4270	4160
5000	5130	5100	5070	5030	5000	4870	4730	4600	4470
5400	5580	5540	5490	5450	5400	5240	5090	4930	4770
5800	6030	5970	5920	5860	5800	5620	5440	5260	5080
6200	6480	6410	6340	6270	6200	6000	5790	5590	5390
6600	6930	6850	6760	6680	6600	6370	6150	5920	5690
7000	7380	7280	7190	7090	7000	6750	6500	6250	6000
7400	7830	7720	7610	7510	7400	7120	6830	6550	6270
7800	8280	8160	8040	7920	7800	7480	7170	6850	6530
8200	8730	8590	8460	8330	8200	7850	7500	7150	6800
8600	9180	9030	8890	8740	8600	8220	7830	7450	7070
9000	9630	9470	9310	9160	9000	8580	8170	7750	7330
9400	10080	9910	9740	9570	9400	8950	8500	8050	7600
9800	10530	10340	10160	9980	9800	9320	8830	8350	7870
10200	10980	10780	10590	10390	10200	9690	9180	8660	8150
10600	11430	11220	11010	10810	10600	10060	9530	8990	8450
11000	11880	11660	11440	11220	11000	10440	9880	9310	8750
11400	12330	12090	11860	11630	11400	10810	10230	9640	9050
11800	12780	12530	12290	12040	11800	11190	10580	9960	9350

Wind Corrections

SLOPE CORR'D FIELD LENGTH (FT)	SLOPE & WIND CORRECTED FIELD LENGTH (FT)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
4200	3040	3430	3810	4200	4450	4710	4960	5220
4600	3380	3790	4190	4600	4860	5130	5390	5650
5000	3720	4150	4570	5000	5270	5540	5810	6080
5400	4060	4510	4950	5400	5680	5960	6240	6520
5800	4400	4870	5330	5800	6090	6380	6660	6950
6200	4740	5230	5710	6200	6500	6790	7090	7380
6600	5080	5590	6090	6600	6900	7210	7510	7820
7000	5420	5950	6470	7000	7310	7630	7940	8250
7400	5760	6310	6850	7400	7720	8040	8360	8680
7800	6100	6670	7230	7800	8130	8460	8790	9120
8200	6440	7030	7610	8200	8540	8880	9210	9550
8600	6780	7390	7990	8600	8950	9290	9640	9980
9000	7120	7750	8370	9000	9350	9710	10060	10420
9400	7460	8110	8750	9400	9760	10130	10490	10850
9800	7800	8470	9130	9800	10170	10540	10910	11280
10200	8140	8830	9510	10200	10580	10960	11340	11720
10600	8480	9190	9890	10600	10990	11380	11760	12150
11000	8820	9550	10270	11000	11400	11790	12190	12580
11400	9160	9910	10650	11400	11800	12210	12610	13020
11800	9500	10260	11030	11800	12210	12630	13040	13450

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 5

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT										
°F	-40	60	70	75	79	82	86	100	105	110	120
°C	-40	16	21	24	26	28	30	38	41	43	49
4000	129.1	119.1	118.1	117.6	117.2	116.9	116.5	111.3	109.3	107.4	103.3
4200	132.6	122.2	121.2	120.7	120.3	120.0	119.6	114.2	112.2	110.2	106.1
4600	139.3	128.4	127.3	126.8	126.4	126.0	125.6	120.0	117.9	115.8	111.4
5000	145.5	134.2	133.0	132.5	132.0	131.7	131.2	125.4	123.2	121.0	116.4
5400	151.1	139.4	138.2	137.7	137.2	136.8	136.4	130.3	128.1	125.8	121.1
5800	156.6	144.5	143.3	142.7	142.2	141.8	141.3	135.1	132.8	130.4	125.5
6200	162.0	149.4	148.2	147.5	147.0	146.7	146.2	139.7	137.3	134.9	129.8
6600	167.1	154.2	152.9	152.3	151.7	151.4	150.8	144.1	141.7	139.2	133.9
7000	172.2	158.8	157.5	156.8	156.3	155.9	155.4	148.4	145.9	143.3	137.9
7400	177.1	163.2	161.9	161.2	160.6	160.2	159.7	152.5	149.9	147.2	141.6
7800	180.0	167.6	166.2	165.5	164.9	164.5	163.9	156.5	153.8	151.1	145.3
8200	180.0	172.1	170.6	169.9	169.3	168.9	168.3	160.7	157.9	155.1	149.2
8600	180.0	176.4	174.9	174.2	173.6	173.1	172.5	164.7	161.9	159.0	152.9
9000	180.0	180.0	178.6	177.8	177.2	176.7	176.1	168.2	165.2	162.2	156.0
9400	180.0	180.0	180.0	180.0	180.5	180.0	179.3	171.2	168.2	165.1	158.7
9800	180.0	180.0	180.0	180.0	180.0	180.0	180.0	174.2	171.1	167.9	161.4
10200	180.0	180.0	180.0	180.0	180.0	180.0	180.0	177.0	173.9	170.7	164.0
10600	180.0	180.0	180.0	180.0	180.0	180.0	180.0	179.9	176.6	173.4	166.5
CLIMB LIMIT WT (1000 LB)	164.1	162.6	162.3	162.1	161.9	161.8	161.6	150.5	146.6	142.7	135.1

1000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT										
°F	-40	60	70	75	79	82	86	100	105	110	120
°C	-40	16	21	24	26	28	30	38	41	43	49
4000	126.2	116.1	115.1	114.6	114.2	113.9	112.6	107.3	105.4	103.5	99.5
4200	129.6	119.2	118.2	117.7	117.3	117.0	115.6	110.1	108.2	106.2	102.2
4600	136.1	125.2	124.1	123.6	123.2	122.9	121.4	115.7	113.6	111.6	107.3
5000	142.2	130.8	129.7	129.2	128.7	128.4	126.9	120.9	118.8	116.6	112.2
5400	147.7	135.9	134.8	134.2	133.8	133.4	131.8	125.7	123.5	121.2	116.6
5800	153.1	140.9	139.7	139.1	138.7	138.3	136.7	130.3	128.0	125.7	120.9
6200	158.3	145.7	144.5	143.9	143.4	143.0	141.3	134.7	132.4	130.0	125.1
6600	163.4	150.3	149.1	148.5	148.0	147.6	145.8	139.0	136.6	134.1	129.0
7000	168.3	154.8	153.5	152.9	152.4	152.0	150.2	143.1	140.6	138.1	132.8
7400	173.1	159.1	157.8	157.1	156.6	156.2	154.3	147.0	144.4	141.8	136.4
7800	177.7	163.4	162.0	161.3	160.8	160.3	158.4	150.9	148.2	145.5	139.9
8200	180.0	167.7	166.3	165.6	165.1	164.6	162.6	154.9	152.2	149.4	143.7
8600	180.0	171.9	170.5	169.8	169.2	168.7	166.7	158.8	155.9	153.1	147.2
9000	180.0	175.5	174.0	173.3	172.7	172.3	170.2	162.0	159.1	156.2	150.2
9400	180.0	178.7	177.2	176.5	175.9	175.4	173.2	164.9	161.9	158.9	152.7
9800	180.0	180.0	180.0	179.6	179.0	178.5	176.3	167.7	164.7	161.6	155.3
10200	180.0	180.0	180.0	180.0	180.0	180.0	179.2	170.5	167.4	164.2	157.7
10600	180.0	180.0	180.0	180.0	180.0	180.0	180.0	173.1	170.0	166.7	160.1
CLIMB LIMIT WT (1000 LB)	161.1	159.5	159.2	159.0	158.9	158.8	155.9	145.1	141.2	137.5	130.2

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 5

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT										
°F	-40	60	70	75	79	82	86	100	105	110	120
°C	-40	16	21	24	26	28	30	38	41	43	49
4000	123.4	113.1	112.1	111.6	111.2	110.0	108.5	103.3	101.5	99.6	95.7
4200	126.6	116.1	115.1	114.6	114.1	112.9	111.4	106.0	104.1	102.2	98.3
4600	133.0	122.0	120.9	120.3	119.9	118.6	117.0	111.4	109.4	107.4	103.2
5000	139.0	127.5	126.3	125.8	125.3	124.0	122.3	116.4	114.4	112.3	107.9
5400	144.4	132.5	131.3	130.7	130.2	128.9	127.1	121.0	118.9	116.7	112.2
5800	149.6	137.3	136.1	135.5	135.0	133.6	131.8	125.5	123.3	121.0	116.4
6200	154.8	142.0	140.7	140.1	139.6	138.1	136.3	129.7	127.5	125.2	120.4
6600	159.7	146.5	145.2	144.6	144.0	142.5	140.6	133.9	131.5	129.1	124.2
7000	164.5	150.9	149.6	148.9	148.3	146.8	144.8	137.8	135.4	133.0	127.8
7400	169.1	155.1	153.7	153.0	152.4	150.8	148.8	141.6	139.1	136.5	131.2
7800	173.6	159.2	157.7	157.0	156.4	154.8	152.7	145.3	142.7	140.1	134.6
8200	178.3	163.5	162.0	161.2	160.6	158.9	156.8	149.1	146.5	143.8	138.2
8600	180.0	167.5	166.0	165.2	164.6	162.9	160.6	152.8	150.1	147.3	141.5
9000	180.0	171.0	169.4	168.7	168.0	166.3	164.0	155.9	153.1	150.3	144.4
9400	180.0	174.1	172.5	171.7	171.0	169.2	166.9	158.6	155.8	152.9	146.8
9800	180.0	177.2	175.5	174.7	174.0	172.2	169.8	161.3	158.4	155.4	149.2
10200	180.0	180.0	178.4	177.6	176.9	175.0	172.5	163.9	160.9	157.9	151.5
10600	180.0	180.0	180.0	180.0	179.7	177.8	175.3	166.4	163.4	160.2	153.7
CLIMB LIMIT WT (1000 LB)	158.1	156.4	156.1	156.0	155.8	153.4	150.2	139.7	136.0	132.4	125.3

3000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT										
°F	-40	60	70	75	79	82	86	100	105	110	120
°C	-40	16	21	24	26	28	30	38	41	43	49
4000	120.1	110.0	109.0	108.5	107.2	106.0	104.5	99.4	97.7	95.8	92.2
4200	123.3	113.0	111.9	111.4	110.0	108.8	107.3	102.1	100.2	98.4	94.7
4600	129.5	118.7	117.6	117.1	115.6	114.3	112.7	107.2	105.3	103.3	99.4
5000	135.3	124.0	122.9	122.3	120.8	119.5	117.8	112.1	110.1	108.0	104.0
5400	140.6	128.9	127.7	127.2	125.5	124.2	122.4	116.5	114.5	112.3	108.2
5800	145.7	133.6	132.4	131.8	130.1	128.7	126.9	120.8	118.7	116.5	112.2
6200	150.7	138.2	136.9	136.3	134.6	133.1	131.3	125.0	122.8	120.5	116.0
6600	155.5	142.6	141.3	140.7	138.9	137.4	135.4	128.9	126.6	124.3	119.7
7000	160.1	146.8	145.5	144.8	143.0	141.4	139.4	132.7	130.4	127.9	123.2
7400	164.6	150.8	149.5	148.8	146.9	145.3	143.2	136.3	133.9	131.4	126.4
7800	169.0	154.8	153.4	152.7	150.7	149.1	147.0	139.8	137.3	134.7	129.6
8200	173.6	159.0	157.5	156.8	154.8	153.1	150.9	143.5	141.0	138.3	133.1
8600	177.9	162.9	161.4	160.7	158.6	156.9	154.6	147.1	144.4	141.7	136.3
9000	180.0	166.3	164.8	164.0	161.9	160.1	157.8	150.0	147.3	144.5	139.0
9400	180.0	169.2	167.7	166.9	164.7	162.9	160.5	152.6	149.8	146.9	141.3
9800	180.0	172.2	170.6	169.8	167.6	165.7	163.3	155.1	152.3	149.3	143.6
10200	180.0	175.0	173.4	172.6	170.3	168.4	165.9	157.6	154.7	151.6	145.7
10600	180.0	177.8	176.1	175.3	173.0	171.0	168.5	159.9	157.0	153.9	147.8
CLIMB LIMIT WT (1000 LB)	154.9	153.4	153.1	152.9	150.0	147.7	144.6	134.5	130.8	127.4	120.5

Takeoff Field Corrections - Wet Runway

Slope Corrections

FIELD LENGTH AVAILABLE (FT)	SLOPE CORRECTED FIELD LENGTH (FT)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
4200	4240	4230	4220	4210	4200	4140	4080	4020	3970
4600	4700	4670	4650	4620	4600	4520	4450	4370	4300
5000	5160	5120	5080	5040	5000	4910	4810	4720	4630
5400	5620	5560	5510	5450	5400	5290	5180	5070	4960
5800	6080	6010	5940	5870	5800	5670	5540	5410	5290
6200	6530	6450	6370	6280	6200	6050	5910	5760	5620
6600	6990	6900	6800	6700	6600	6440	6270	6110	5950
7000	7450	7340	7230	7110	7000	6820	6640	6460	6280
7400	7910	7780	7660	7530	7400	7200	7000	6800	6610
7800	8370	8230	8090	7940	7800	7580	7370	7150	6940
8200	8830	8670	8520	8360	8200	7960	7730	7490	7260
8600	9290	9120	8950	8770	8600	8340	8080	7820	7570
9000	9750	9560	9380	9190	9000	8720	8440	8160	7880
9400	10210	10010	9810	9600	9400	9100	8790	8490	8190
9800	10670	10450	10240	10020	9800	9470	9150	8820	8500
10200	11130	10900	10670	10430	10200	9850	9500	9150	8810
10600	11590	11340	11100	10850	10600	10230	9860	9490	9120
11000	12050	11790	11530	11260	11000	10610	10210	9820	9430
11400	12510	12230	11960	11680	11400	10980	10570	10150	9740
11800	12970	12680	12390	12090	11800	11360	10920	10480	10050

Wind Corrections

SLOPE CORR'D FIELD LENGTH (FT)	SLOPE & WIND CORRECTED FIELD LENGTH (FT)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
4200	2970	3380	3790	4200	4470	4760	5050	5350
4600	3310	3740	4170	4600	4880	5180	5490	5810
5000	3650	4100	4550	5000	5300	5610	5930	6280
5400	3990	4460	4930	5400	5710	6030	6380	6740
5800	4330	4820	5310	5800	6120	6460	6820	7200
6200	4660	5180	5690	6200	6530	6880	7260	7660
6600	5000	5540	6070	6600	6940	7310	7700	8130
7000	5340	5890	6450	7000	7350	7730	8150	8590
7400	5680	6250	6830	7400	7760	8160	8590	9050
7800	6020	6610	7210	7800	8170	8580	9030	9510
8200	6360	6970	7590	8200	8580	9010	9470	9980
8600	6700	7330	7970	8600	9000	9430	9910	10440
9000	7030	7690	8340	9000	9410	9860	10360	10900
9400	7370	8050	8720	9400	9820	10280	10800	11360
9800	7710	8410	9100	9800	10230	10710	11240	11830
10200	8050	8770	9480	10200	10640	11130	11680	12290
10600	8390	9130	9860	10600	11050	11560	12130	12750
11000	8730	9480	10240	11000	11460	11980	12570	13210
11400	9060	9840	10620	11400	11870	12410	13010	13680
11800	9400	10200	11000	11800	12280	12830	13450	14140

Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 5

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT										
°F	-40	60	70	75	79	82	86	100	105	110	120
°C	-40	16	21	24	26	28	30	38	41	43	49
4800	142.8	130.6	129.4	128.8	128.4	128.0	127.5	121.3	119.1	116.9	112.6
5000	146.0	133.4	132.2	131.6	131.1	130.8	130.3	123.9	121.7	119.4	115.0
5400	151.5	138.4	137.2	136.6	136.1	135.7	135.2	128.6	126.2	123.9	119.3
5800	156.9	143.4	142.1	141.4	140.9	140.5	140.0	133.1	130.7	128.3	123.5
6200	162.1	148.1	146.8	146.1	145.6	145.2	144.6	137.5	135.0	132.5	127.6
6600	167.2	152.7	151.3	150.7	150.1	149.7	149.1	141.8	139.2	136.6	131.5
7000	172.1	157.2	155.8	155.0	154.5	154.1	153.5	145.9	143.2	140.6	135.3
7400	176.8	161.4	159.9	159.2	158.6	158.2	157.6	149.8	147.0	144.3	138.9
7800	180.0	165.6	164.0	163.3	162.7	162.2	161.6	153.6	150.7	147.9	142.3
8200	180.0	169.7	168.1	167.4	166.7	166.3	165.6	157.4	154.4	151.6	145.8
8600	180.0	173.7	172.1	171.3	170.7	170.2	169.6	161.1	158.1	155.1	149.2
9000	180.0	177.5	175.9	175.1	174.4	173.9	173.2	164.6	161.5	158.5	152.4
9400	180.0	180.0	179.3	178.5	177.8	177.3	176.6	167.7	164.6	161.5	155.3
9800	180.0	180.0	180.0	180.0	180.0	180.0	179.9	170.8	167.6	164.4	158.1
10200	180.0	180.0	180.0	180.0	180.0	180.0	180.0	174.0	170.7	167.5	161.0
10600	180.0	180.0	180.0	180.0	180.0	180.0	180.0	177.2	173.9	170.5	163.9
11000	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	177.0	173.6	166.8
11400	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	176.5	169.6
CLIMB LIMIT WT (1000 LB)	164.1	162.6	162.3	162.1	161.9	161.8	161.6	150.5	146.6	142.7	135.1

1000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT										
°F	-40	60	70	75	79	82	86	100	105	110	120
°C	-40	16	21	24	26	28	30	38	41	43	49
4800	139.1	127.1	125.9	125.3	124.8	124.5	122.8	116.7	114.7	112.6	108.4
5000	142.1	129.8	128.6	128.0	127.5	127.1	125.4	119.2	117.1	115.0	110.7
5400	147.5	134.7	133.5	132.9	132.4	132.0	130.2	123.7	121.5	119.3	114.9
5800	152.8	139.5	138.2	137.6	137.0	136.6	134.8	128.1	125.8	123.5	118.9
6200	157.9	144.1	142.8	142.1	141.6	141.1	139.2	132.3	129.9	127.6	122.8
6600	162.8	148.6	147.3	146.6	146.0	145.5	143.5	136.4	134.0	131.5	126.6
7000	167.6	152.9	151.5	150.8	150.2	149.7	147.7	140.3	137.8	135.3	130.2
7400	172.1	157.0	155.6	154.8	154.2	153.8	151.6	144.0	141.4	138.8	133.6
7800	176.6	161.0	159.6	158.8	158.2	157.7	155.5	147.7	145.0	142.3	136.9
8200	180.0	165.0	163.5	162.7	162.1	161.6	159.3	151.3	148.5	145.8	140.3
8600	180.0	168.9	167.4	166.6	165.9	165.4	163.1	154.8	152.0	149.2	143.5
9000	180.0	172.6	171.0	170.2	169.5	169.0	166.6	158.2	155.3	152.4	146.6
9400	180.0	176.0	174.4	173.5	172.8	172.3	169.9	161.2	158.2	155.3	149.3
9800	180.0	179.3	177.6	176.7	176.0	175.4	173.0	164.1	161.1	158.0	152.0
10200	180.0	180.0	180.0	180.0	179.3	178.7	176.2	167.2	164.1	160.9	154.7
10600	180.0	180.0	180.0	180.0	180.0	180.0	179.5	170.2	167.1	163.9	157.5
11000	180.0	180.0	180.0	180.0	180.0	180.0	180.0	173.2	170.0	166.7	160.2
11400	180.0	180.0	180.0	180.0	180.0	180.0	180.0	176.2	172.9	169.5	162.9
CLIMB LIMIT WT (1000 LB)	161.1	159.5	159.2	159.0	158.9	158.8	155.9	145.1	141.2	137.5	130.2

Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 5

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT										
°F	-40	60	70	75	79	82	86	100	105	110	120
°C	-40	16	21	24	26	28	30	38	41	43	49
4800	135.8	123.4	122.2	121.6	121.1	119.8	118.1	112.3	110.3	108.3	104.4
5000	138.8	126.1	124.8	124.2	123.7	122.4	120.6	114.7	112.7	110.6	106.7
5400	144.0	130.8	129.6	128.9	128.4	127.0	125.2	119.0	116.9	114.8	110.7
5800	149.2	135.5	134.1	133.5	132.9	131.5	129.6	123.2	121.0	118.8	114.5
6200	154.1	140.0	138.6	137.9	137.4	135.8	133.9	127.3	125.0	122.7	118.3
6600	158.9	144.3	142.9	142.2	141.6	140.0	138.0	131.2	128.8	126.5	121.9
7000	163.6	148.5	147.0	146.3	145.7	144.1	142.0	135.0	132.5	130.1	125.4
7400	168.0	152.4	150.9	150.2	149.6	147.9	145.8	138.5	136.0	133.5	128.6
7800	172.4	156.3	154.8	154.0	153.4	151.6	149.4	142.0	139.4	136.8	131.8
8200	176.7	160.2	158.6	157.8	157.2	155.4	153.1	145.4	142.8	140.1	135.0
8600	180.0	164.0	162.3	161.5	160.8	159.0	156.7	148.8	146.1	143.4	138.1
9000	180.0	167.5	165.8	165.0	164.3	162.5	160.1	152.0	149.2	146.4	141.0
9400	180.0	170.8	169.1	168.2	167.5	165.6	163.2	154.9	152.1	149.2	143.7
9800	180.0	173.9	172.2	171.3	170.6	168.6	166.2	157.7	154.8	151.8	146.2
10200	180.0	177.2	175.4	174.5	173.8	171.8	169.2	160.6	157.6	154.6	148.8
10600	180.0	180.0	178.6	177.7	177.0	174.9	172.3	163.5	160.4	157.3	151.4
11000	180.0	180.0	180.0	180.0	180.0	178.1	175.4	166.3	163.2	160.1	154.0
11400	180.0	180.0	180.0	180.0	180.0	180.0	178.4	169.2	166.0	162.7	156.5
CLIMB LIMIT WT (1000 LB)	158.1	156.4	156.1	156.0	155.8	153.4	150.2	139.7	136.0	132.4	125.3

3000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT										
°F	-40	60	70	75	79	82	86	100	105	110	120
°C	-40	16	21	24	26	28	30	38	41	43	49
4800	132.2	119.8	118.7	118.1	116.6	115.3	113.6	108.1	106.1	104.3	100.7
5000	135.1	122.4	121.2	120.6	119.1	117.7	116.1	110.4	108.4	106.6	102.9
5400	140.2	127.0	125.8	125.2	123.5	122.2	120.4	114.5	112.5	110.5	106.7
5800	145.2	131.5	130.2	129.6	127.9	126.5	124.7	118.5	116.4	114.4	110.4
6200	150.0	135.8	134.5	133.9	132.1	130.7	128.8	122.4	120.2	118.2	114.0
6600	154.7	140.0	138.7	138.0	136.2	134.7	132.7	126.2	123.9	121.8	117.5
7000	159.2	144.1	142.7	142.0	140.1	138.6	136.5	129.8	127.4	125.2	120.8
7400	163.5	147.9	146.5	145.8	143.8	142.2	140.1	133.2	130.7	128.5	123.9
7800	167.7	151.6	150.2	149.5	147.4	145.8	143.6	136.5	134.0	131.6	127.0
8200	171.9	155.4	153.9	153.1	151.1	149.4	147.2	139.8	137.2	134.8	130.0
8600	176.0	159.0	157.5	156.7	154.6	152.9	150.6	143.1	140.4	138.0	133.0
9000	179.8	162.5	160.9	160.1	157.9	156.1	153.8	146.1	143.4	140.9	135.8
9400	180.0	165.6	164.0	163.2	161.0	159.1	156.8	148.9	146.1	143.5	138.3
9800	180.0	168.6	167.0	166.2	163.9	162.0	159.6	151.5	148.7	146.0	140.7
10200	180.0	171.8	170.0	169.2	166.9	165.0	162.5	154.2	151.3	148.6	143.2
10600	180.0	174.9	173.2	172.4	170.0	168.0	165.5	157.0	154.0	151.2	145.7
11000	180.0	178.1	176.3	175.4	173.0	171.0	168.4	159.7	156.7	153.8	148.2
11400	180.0	180.0	179.3	178.4	175.9	173.9	171.2	162.4	159.3	156.4	150.6
CLIMB LIMIT WT (1000 LB)	154.9	153.4	153.1	152.9	150.0	147.7	144.6	134.5	130.8	127.4	120.5

Takeoff Obstacle Limit Weight
Flaps 5
Sea Level, 86°F & Below, Zero Wind
Based on engine bleed for packs on and anti-ice off
Reference Obstacle Limit Weight (1000 LB)

OBSTACLE HEIGHT (FT)	DISTANCE FROM BRAKE RELEASE (1000 FT)								
	8	10	12	14	16	18	20	22	24
10	156.6	166.8	173.7						
50	143.4	155.6	163.4	168.3	171.9	174.5			
100	133.9	145.4	153.9	160.2	164.3	167.5	170.0	172.0	173.6
150	126.5	137.8	146.4	153.0	158.0	161.9	164.7	167.1	169.0
200	120.4	131.6	140.2	147.0	152.4	156.6	160.1	162.8	164.9
250	115.1	126.3	134.9	141.8	147.4	151.9	155.6	158.7	161.2
300	110.4	121.6	130.3	137.3	142.9	147.7	151.6	154.8	157.6
350	106.2	117.3	126.1	133.1	138.9	143.8	147.8	151.3	154.2
400	102.4	113.5	122.3	129.4	135.3	140.2	144.4	148.0	151.0
450	98.9	109.9	118.7	125.9	131.9	136.9	141.2	144.8	148.0
500	95.7	106.7	115.5	122.7	128.7	133.8	138.2	141.9	145.2
550	92.7	103.6	112.4	119.7	125.8	130.9	135.4	139.2	142.5
600		100.8	109.6	116.9	123.0	128.2	132.7	136.6	140.0
650		98.2	106.9	114.2	120.4	125.6	130.2	134.1	137.6
700		95.7	104.4	111.7	117.9	123.2	127.8	131.8	135.3
750		93.3	102.0	109.3	115.5	120.8	125.5	129.5	133.1
800		91.1	99.7	107.0	113.2	118.6	123.3	127.4	131.0
850			97.6	104.9	111.1	116.5	121.2	125.3	129.0
900			95.6	102.8	109.0	114.4	119.2	123.4	127.1
950			93.6	100.8	107.1	112.5	117.3	121.5	125.2
1000			91.8	99.0	105.2	110.6	115.4	119.6	123.4

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

OAT Adjustments

OAT (°F)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 LB)							
	100	110	120	130	140	150	160	170
86 & BELOW	0	0	0	0	0	0	0	0
90	-1.8	-2.0	-2.2	-2.4	-2.6	-2.9	-3.1	-3.3
95	-4.0	-4.5	-5.0	-5.5	-6.0	-6.4	-6.9	-7.4
100	-6.3	-7.0	-7.8	-8.5	-9.3	-10.0	-10.8	-11.5
105	-8.4	-9.4	-10.4	-11.4	-12.4	-13.5	-14.5	-15.5
110	-10.5	-11.8	-13.1	-14.4	-15.6	-16.9	-18.2	-19.5
115	-12.6	-14.2	-15.7	-17.3	-18.9	-20.4	-22.0	-23.6
120	-14.7	-16.6	-18.4	-20.2	-22.1	-23.9	-25.8	-27.6

Takeoff Obstacle Limit Weight
Flaps 5
Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 LB)							
	100	110	120	130	140	150	160	170
S.L.& BELOW	0	0	0	0	0	0	0	0
1000	-3.8	-4.1	-4.5	-4.9	-5.2	-5.6	-5.9	-6.3
2000	-7.6	-8.3	-9.0	-9.7	-10.4	-11.1	-11.8	-12.6
3000	-11.0	-12.1	-13.2	-14.2	-15.3	-16.3	-17.4	-18.5
4000	-14.5	-15.9	-17.3	-18.7	-20.1	-21.5	-23.0	-24.4
5000	-17.9	-19.6	-21.4	-23.1	-24.8	-26.6	-28.3	-30.1
6000	-21.3	-23.3	-25.4	-27.5	-29.5	-31.6	-33.7	-35.8
7000	-24.5	-26.9	-29.3	-31.7	-34.1	-36.5	-38.9	-41.3
8000	-27.7	-30.5	-33.2	-35.9	-38.7	-41.4	-44.1	-46.9
9000	-30.6	-33.6	-36.7	-39.7	-42.8	-45.8	-48.9	-51.9
10000	-33.4	-36.8	-40.1	-43.5	-46.9	-50.3	-53.7	-57.0

Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 LB)							
	100	110	120	130	140	150	160	170
15 TW	-18.7	-18.1	-17.4	-16.7	-16.1	-15.4	-14.7	-14.1
10 TW	-12.5	-12.0	-11.6	-11.1	-10.7	-10.3	-9.8	-9.4
5 TW	-6.2	-6.0	-5.8	-5.6	-5.4	-5.1	-4.9	-4.7
0	0	0	0	0	0	0	0	0
10 HW	2.2	2.0	1.9	1.7	1.5	1.4	1.2	1.0
20 HW	4.4	4.1	3.7	3.4	3.1	2.7	2.4	2.0
30 HW	6.7	6.2	5.7	5.2	4.6	4.1	3.6	3.1
40 HW	9.0	8.3	7.6	6.9	6.2	5.5	4.8	4.1

With engine bleed for packs off, increase weight by 1900 lb.
With engine anti-ice on, decrease weight by 400 lb.
With engine and wing anti-ice on, decrease weight by 2000 lb (optional system).

Long Range Cruise Maximum Operating Altitude

Max Cruise Thrust

ISA + 10°C and Below

WEIGHT (1000 LB)	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°)
170	31800	-9	35300*	35300*	35300*	34300	32900
160	33100	-12	36600*	36600*	36600*	35500	34200
150	34500	-15	37900*	37900*	37900*	36900	35500
140	36000	-19	39200*	39200*	39200*	38300	37000
130	37500	-19	40600*	40600*	40600*	39900	38500
120	39200	-19	41000	41000	41000	41000	40200
110	41000	-19	41000	41000	41000	41000	41000
100	41000	-19	41000	41000	41000	41000	41000
90	41000	-19	41000	41000	41000	41000	41000
80	41000	-19	41000	41000	41000	41000	41000

ISA + 15°C

WEIGHT (1000 LB)	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°)
170	31800	-4	34100*	34100*	34100*	34100*	32900
160	33100	-7	35700*	35700*	35700*	35500	34200
150	34500	-10	37000*	37000*	37000*	36900	35500
140	36000	-13	38300*	38300*	38300*	38300	37000
130	37500	-13	39700*	39700*	39700*	39700*	38500
120	39200	-13	41000	41000	41000	41000	40200
110	41000	-13	41000	41000	41000	41000	41000
100	41000	-13	41000	41000	41000	41000	41000
90	41000	-13	41000	41000	41000	41000	41000
80	41000	-13	41000	41000	41000	41000	41000

ISA + 20°C

WEIGHT (1000 LB)	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°)
170	31800	2	32300*	32300*	32300*	32300*	32300*
160	33100	-1	34200*	34200*	34200*	34200*	34200
150	34500	-4	35800*	35800*	35800*	35800*	35500
140	36000	-7	37200*	37200*	37200*	37200*	37000
130	37500	-8	38600*	38600*	38600*	38600*	38500
120	39200	-8	40000*	40000*	40000*	40000*	40000*
110	41000	-8	41000	41000	41000	41000	41000
100	41000	-8	41000	41000	41000	41000	41000
90	41000	-8	41000	41000	41000	41000	41000
80	41000	-8	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
278	258	240	225	212	200	190	181	173	166	159
552	514	480	450	424	400	381	364	348	334	322
825	769	718	674	635	600	573	548	525	503	484
1098	1023	956	898	846	800	764	731	700	672	647
1370	1277	1194	1122	1058	1000	956	914	876	842	810
1641	1531	1432	1345	1269	1200	1147	1098	1052	1011	973
1911	1783	1669	1569	1480	1400	1338	1281	1228	1180	1136
2180	2036	1905	1792	1691	1600	1530	1464	1404	1349	1299
2449	2287	2142	2015	1902	1800	1721	1648	1580	1518	1462
2717	2539	2378	2238	2113	2000	1913	1831	1756	1688	1625
2985	2790	2614	2460	2324	2200	2104	2015	1932	1857	1788
3251	3040	2849	2682	2535	2400	2295	2198	2108	2026	1952
3518	3290	3084	2905	2745	2600	2487	2382	2285	2196	2115
3783	3539	3319	3127	2956	2800	2678	2565	2461	2365	2278
4048	3788	3554	3349	3166	3000	2870	2749	2637	2535	2442
4312	4037	3788	3570	3376	3200	3062	2933	2814	2705	2606
4575	4285	4022	3792	3587	3400	3253	3117	2991	2875	2770
4838	4532	4256	4013	3797	3600	3445	3301	3167	3045	2933
5100	4780	4489	4234	4007	3800	3637	3485	3344	3215	3097
5362	5026	4722	4455	4217	4000	3828	3668	3521	3385	3261
5623	5272	4955	4676	4427	4200	4020	3852	3697	3555	3425
5883	5518	5187	4896	4637	4400	4211	4036	3874	3725	3589
6143	5764	5419	5117	4847	4600	4403	4220	4050	3894	3752
6402	6008	5651	5337	5056	4800	4594	4403	4227	4064	3916
6661	6253	5883	5557	5266	5000	4786	4587	4403	4234	4080

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 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	3.3	0:38	3.3	0:37	3.3	0:37	3.3	0:37	3.3	0:37
400	5.5	1:09	5.5	1:07	5.4	1:06	5.3	1:05	5.3	1:04
600	7.8	1:39	7.7	1:37	7.5	1:35	7.4	1:33	7.3	1:32
800	10.1	2:10	9.9	2:07	9.7	2:04	9.5	2:01	9.3	2:00
1000	12.4	2:40	12.1	2:36	11.8	2:32	11.6	2:29	11.4	2:27
1200	14.7	3:09	14.4	3:05	14.1	3:00	13.7	2:57	13.5	2:54
1400	17.1	3:39	16.7	3:33	16.3	3:28	15.9	3:24	15.6	3:22
1600	19.5	4:08	19.0	4:02	18.5	3:56	18.1	3:52	17.7	3:49
1800	21.9	4:38	21.3	4:31	20.8	4:24	20.2	4:20	19.9	4:16
2000	24.3	5:07	23.6	4:59	23.0	4:52	22.4	4:47	22.0	4:43
2200	26.8	5:36	26.1	5:27	25.4	5:19	24.7	5:14	24.2	5:10
2400	29.3	6:04	28.5	5:55	27.7	5:47	27.0	5:42	26.5	5:37
2600	31.8	6:32	30.9	6:23	30.1	6:14	29.3	6:09	28.8	6:04
2800	34.3	7:01	33.3	6:50	32.4	6:42	31.6	6:36	31.1	6:31
3000	36.8	7:29	35.8	7:18	34.8	7:09	33.8	7:03	33.3	6:58
3200	39.4	7:57	38.3	7:45	37.2	7:36	36.3	7:30	35.8	7:24
3400	42.1	8:24	40.9	8:12	39.7	8:03	38.7	7:57	38.3	7:51
3600	44.7	8:52	43.4	8:40	42.2	8:30	41.1	8:23	40.7	8:17
3800	47.3	9:19	46.0	9:07	44.7	8:57	43.6	8:50	43.2	8:44
4000	49.9	9:47	48.5	9:34	47.2	9:24	46.0	9:17	45.7	9:11
4200	52.7	10:13	51.2	10:01	49.8	9:50	48.7	9:43	48.1	9:37
4400	55.5	10:40	53.9	10:27	52.4	10:17	51.3	10:10	50.6	10:04
4600	58.3	11:07	56.6	10:54	55.1	10:43	54.0	10:36	53.1	10:30
4800	61.0	11:34	59.3	11:21	57.7	11:10	56.6	11:03	55.6	10:57
5000	63.8	12:01	62.0	11:48	60.4	11:37	59.3	11:29	58.0	11:24

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	LANDING WEIGHT (1000 LB)					
	80	90	100	110	120	130
10	-1.2	-0.8	-0.4	0.0	0.6	1.2
20	-2.3	-1.6	-0.8	0.0	1.3	2.8
30	-3.6	-2.5	-1.3	0.0	2.1	4.6
40	-4.8	-3.3	-1.7	0.0	3.1	6.8
50	-6.1	-4.2	-2.1	0.0	4.3	9.2
60	-7.4	-5.1	-2.6	0.0	5.6	12.0

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
1326	1245	1173	1109	1052	1000	953	910	871	836	803
1845	1735	1637	1549	1471	1400	1336	1277	1223	1174	1128
2363	2224	2100	1990	1890	1800	1718	1643	1575	1512	1454
2880	2712	2563	2429	2309	2200	2101	2010	1927	1850	1780
3396	3200	3026	2869	2728	2600	2484	2377	2279	2189	2106
3912	3688	3488	3309	3147	3000	2866	2744	2632	2528	2433
4427	4175	3950	3748	3565	3400	3249	3111	2984	2868	2760
4942	4662	4412	4187	3984	3800	3632	3478	3337	3207	3087
5456	5148	4873	4626	4403	4200	4015	3846	3690	3547	3414
5970	5635	5335	5065	4821	4600	4398	4213	4043	3886	3741
6484	6121	5796	5504	5240	5000	4781	4581	4396	4226	4069

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 LB)					TIME (HRS:MIN)
	LANDING WEIGHT (1000 LB)					
	90	100	110	120	130	
1000	9.8	10.4	11.2	12.0	12.7	2:25
1400	13.3	14.2	15.3	16.4	17.4	3:20
1800	17.0	18.1	19.6	21.0	22.3	4:14
2200	20.7	22.2	23.9	25.6	27.3	5:08
2600	24.5	26.3	28.4	30.5	32.5	6:01
3000	28.4	30.6	33.0	35.4	37.8	6:55
3400	32.5	35.0	37.8	40.5	43.3	7:49
3800	36.6	39.5	42.7	45.8	49.0	8:42
4200	40.9	44.2	47.7	51.3	54.8	9:36
4600	45.3	49.0	52.9	56.8	60.8	10:29
5000	49.8	53.9	58.2	62.6	67.0	11:22

Based on 280/.78 climb, LRC or .78 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
94	80	70	62	55	50	46	42	39	36	34
159	142	129	117	108	100	93	87	82	77	73
224	204	187	173	161	150	141	132	125	119	113
289	265	245	228	213	200	188	178	169	161	153
353	326	303	283	265	250	236	224	213	203	194
416	386	360	338	318	300	284	270	257	245	235
480	447	418	393	370	350	332	316	301	288	275
544	508	476	447	422	400	380	362	345	330	316
610	569	534	503	475	450	428	407	389	372	357
676	632	593	558	528	500	475	453	432	414	397

Trip Fuel and Time Required

AIR DIST (NM)		LANDING WEIGHT (1000 LB)					TIME (HRS:MIN)
		90	100	110	120	130	
50	FUEL (1000 LB)	1.1	1.2	1.3	1.3	1.4	0:14
	ALT (FT)	11000	11000	11000	11000	9000	
100	FUEL (1000 LB)	1.8	1.9	2.0	2.1	2.2	0:22
	ALT (FT)	19000	19000	19000	19000	21000	
150	FUEL (1000 LB)	2.4	2.5	2.6	2.7	2.9	0:30
	ALT (FT)	27000	25000	25000	25000	23000	
200	FUEL (1000 LB)	2.9	3.0	3.2	3.4	3.5	0:37
	ALT (FT)	31000	31000	29000	29000	27000	
250	FUEL (1000 LB)	3.3	3.5	3.7	3.9	4.1	0:43
	ALT (FT)	41000	37000	37000	35000	33000	
300	FUEL (1000 LB)	3.7	4.0	4.2	4.4	4.7	0:50
	ALT (FT)	41000	39000	39000	37000	35000	
350	FUEL (1000 LB)	4.2	4.4	4.7	5.0	5.2	0:56
	ALT (FT)	41000	39000	39000	37000	35000	
400	FUEL (1000 LB)	4.6	4.9	5.2	5.5	5.8	1:03
	ALT (FT)	41000	41000	39000	37000	37000	
450	FUEL (1000 LB)	5.0	5.3	5.7	6.0	6.4	1:10
	ALT (FT)	41000	41000	39000	37000	37000	
500	FUEL (1000 LB)	5.4	5.8	6.2	6.5	6.9	1:17
	ALT (FT)	41000	41000	39000	39000	37000	

Holding Planning

Flaps Up

WEIGHT (1000 LB)	TOTAL FUEL FLOW (LB/HR)								
	PRESSURE ALTITUDE (FT)								
	1500	5000	10000	15000	20000	25000	30000	35000	41000
170	6160	6060	6010	5990	5870	5880	6020	6470	
160	5830	5730	5670	5640	5530	5510	5630	5890	
150	5500	5400	5340	5290	5200	5140	5250	5400	
140	5170	5080	5010	4950	4880	4770	4870	4970	
130	4850	4750	4680	4610	4540	4420	4500	4570	5200
120	4530	4420	4350	4280	4210	4100	4130	4190	4560
110	4210	4100	4020	3950	3880	3790	3770	3860	4100
100	3900	3780	3690	3680	3600	3540	3490	3510	3680
90	3670	3550	3430	3350	3280	3220	3190	3150	3290
80	3360	3250	3120	3030	2970	2910	2880	2820	2910
70	3060	2950	2830	2730	2670	2620	2570	2530	2570

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

Required Pressure (PSI) for 114/115 Cu. Ft. Cylinder

BOTTLE TEMPERATURE		NUMBER OF CREW USING OXYGEN		
°F	°C	2	3	4
122	50	530	735	945
113	45	520	725	930
104	40	510	715	915
95	35	505	700	900
86	30	495	690	885
77	25	485	680	870
68	20	480	670	860
59	15	470	655	840
50	10	460	645	830
41	5	455	635	815
32	0	445	620	800
23	-5	440	610	785
14	-10	430	600	770

ENGINE INOP

MAX CONTINUOUS THRUST

Net Level Off Weight

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 LB)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
30	95.0	92.1	
28	102.7	99.4	96.2
26	111.0	107.3	103.9
24	119.0	115.3	111.5
22	126.9	122.8	118.3
20	135.2	130.5	125.2
18	143.7	138.3	132.3
16	152.1	146.2	139.4
14	160.8	154.2	146.6
12	168.3	160.7	152.7
10	175.3	166.8	158.7

Anti-Ice Adjustments

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 LB)									
	PRESSURE ALTITUDE (1000 FT)									
	10	12	14	16	18	20	22	24	26	28
ENGINE ONLY	-5.6	-4.9	-4.4	-4.3	-4.0	-3.6	-3.2	-2.9	-2.6	-2.3
ENGINE & WING*	-19.2	-18.3	-16.8	-16.0	-15.4	-14.8	-12.9	-11.5	-10.5	

***Optional System**

ALL ENGINES

Decompression Critical Fuel Reserves - LRC Cruise

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
291	267	246	229	213	200	188	178	168	160	152
602	547	501	462	429	400	375	353	333	315	300
912	826	755	695	644	600	562	528	498	471	447
1223	1106	1010	929	859	800	748	703	662	627	594
1534	1386	1264	1162	1075	1000	935	878	827	782	742
1845	1666	1519	1395	1290	1200	1122	1053	992	938	889
2156	1946	1773	1628	1506	1400	1308	1228	1157	1093	1036
2467	2226	2028	1862	1721	1600	1495	1403	1321	1249	1184
2778	2506	2282	2095	1936	1800	1682	1578	1486	1404	1331

Critical Fuel (1000 LB)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 LB)							
	90	100	110	120	130	140	150	160
200	3.5	3.6	3.7	3.9	4.0	4.2	4.3	4.4
300	5.0	5.2	5.3	5.5	5.7	5.9	6.1	6.2
400	6.5	6.7	6.9	7.2	7.5	7.7	8.0	8.1
500	8.0	8.3	8.5	8.9	9.2	9.5	9.8	9.9
600	9.5	9.8	10.1	10.5	10.9	11.2	11.5	11.7
700	11.0	11.4	11.8	12.2	12.5	12.9	13.3	13.5
800	12.5	12.9	13.3	13.8	14.2	14.6	15.1	15.4
900	13.9	14.4	14.9	15.4	15.9	16.4	16.9	17.2
1000	15.4	15.9	16.4	17.0	17.5	18.1	18.6	19.0
1100	16.8	17.4	18.0	18.6	19.2	19.8	20.4	20.8
1200	18.3	18.9	19.5	20.2	20.8	21.5	22.1	22.6
1300	19.7	20.4	21.0	21.8	22.5	23.1	23.8	24.3
1400	21.2	21.8	22.6	23.3	24.1	24.8	25.5	26.1
1500	22.6	23.3	24.1	24.9	25.7	26.5	27.2	27.9
1600	24.1	24.8	25.6	26.4	27.3	28.1	29.0	29.6
1700	25.5	26.2	27.1	28.0	28.9	29.8	30.7	31.4
1800	27.0	27.7	28.6	29.5	30.5	31.4	32.3	33.1

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.5% per 10°C above ISA.
-When icing conditions are forecast, use the greater of engine and wing anti-ice on (10%) for the total forecast time or engine and wing anti-ice on and ice drag (16%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

MAX CONTINUOUS THRUST

Decompression Critical Fuel Reserves - LRC Cruise

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
297	271	249	230	214	200	188	177	167	158	151
613	554	506	465	430	400	374	351	331	313	297
930	838	762	699	646	600	560	525	495	467	443
1246	1121	1019	934	862	800	747	700	659	622	589
1563	1405	1276	1168	1078	1000	933	874	822	776	735
1879	1688	1532	1403	1294	1200	1119	1048	986	931	881
2196	1972	1789	1637	1509	1400	1305	1223	1150	1085	1028
2512	2255	2046	1872	1725	1600	1492	1397	1314	1240	1174
2829	2539	2302	2106	1941	1800	1678	1571	1478	1394	1320

Critical Fuel (1000 LB)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 LB)							
	90	100	110	120	130	140	150	160
200	3.1	3.2	3.3	3.5	3.6	3.8	3.9	4.0
300	4.4	4.6	4.7	5.0	5.2	5.4	5.6	5.7
400	5.7	5.9	6.2	6.5	6.8	7.0	7.3	7.4
500	7.0	7.3	7.6	8.0	8.3	8.7	9.0	9.1
600	8.3	8.7	9.1	9.5	9.9	10.3	10.7	10.8
700	9.6	10.1	10.5	11.0	11.4	11.8	12.3	12.5
800	10.9	11.4	11.9	12.4	12.9	13.4	13.9	14.2
900	12.2	12.8	13.3	13.9	14.4	15.0	15.6	15.9
1000	13.5	14.1	14.7	15.3	15.9	16.5	17.2	17.6
1100	14.8	15.4	16.1	16.7	17.4	18.1	18.8	19.3
1200	16.1	16.7	17.4	18.2	18.9	19.7	20.4	20.9
1300	17.3	18.0	18.8	19.6	20.4	21.2	22.0	22.6
1400	18.5	19.3	20.2	21.0	21.9	22.7	23.5	24.2
1500	19.8	20.7	21.5	22.5	23.3	24.2	25.1	25.8
1600	21.0	22.0	22.9	23.8	24.8	25.7	26.7	27.5
1700	22.3	23.3	24.2	25.2	26.2	27.2	28.2	29.1
1800	23.5	24.5	25.5	26.6	27.6	28.7	29.8	30.7

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5%if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.5% per 10°C above ISA.
-When icing conditions are forecast, use the greater of engine and wing anti-ice on (7%) for the total forecast time or engine and wing anti-ice on and ice drag (15%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

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
268	251	236	222	210	200	190	181	173	165	159
540	505	474	446	421	400	380	362	345	331	317
815	760	712	670	633	600	569	542	517	495	474
1091	1017	952	895	845	800	759	722	689	659	631
1369	1275	1193	1120	1057	1000	948	902	860	822	787
1648	1533	1434	1346	1269	1200	1138	1082	1031	985	943
1927	1792	1675	1572	1481	1400	1327	1261	1202	1148	1099
2206	2051	1916	1797	1693	1600	1516	1441	1373	1311	1254
2485	2309	2156	2023	1905	1800	1705	1621	1544	1474	1410

Critical Fuel (1000 LB)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 LB)							
	90	100	110	120	130	140	150	160
200	3.2	3.3	3.4	3.5	3.6	3.7	3.9	3.9
300	4.1	4.3	4.5	4.7	4.9	5.1	5.3	5.4
400	5.1	5.3	5.6	5.9	6.2	6.5	6.7	7.0
500	6.0	6.4	6.7	7.1	7.4	7.8	8.2	8.5
600	6.9	7.4	7.8	8.2	8.7	9.1	9.6	10.0
700	7.8	8.4	8.9	9.4	9.9	10.5	11.0	11.5
800	8.7	9.3	10.0	10.5	11.2	11.8	12.4	13.0
900	9.6	10.3	11.0	11.7	12.4	13.1	13.8	14.4
1000	10.5	11.3	12.1	12.8	13.6	14.4	15.2	15.9
1100	11.3	12.2	13.1	13.9	14.8	15.6	16.5	17.4
1200	12.2	13.2	14.1	15.0	16.0	16.9	17.9	18.8
1300	13.0	14.1	15.1	16.1	17.1	18.2	19.2	20.2
1400	13.9	15.0	16.1	17.2	18.3	19.4	20.6	21.7
1500	14.7	15.9	17.1	18.3	19.5	20.7	21.9	23.1
1600	15.6	16.8	18.1	19.3	20.6	21.9	23.2	24.5
1700	16.4	17.7	19.1	20.4	21.8	23.1	24.5	25.9
1800	17.2	18.6	20.1	21.5	22.9	24.3	25.8	27.3

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5%if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.5% per 10°C above ISA.
-When icing conditions are forecast, use the greater of engine and wing anti-ice on (12%) for the total forecast time or engine and wing anti-ice on and ice drag (26%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

Performance Dispatch — Chapter PD
Landing — Section 22

Landing Field Limit Weight
Flaps 40
Based on anti-skid operative and automatic speedbrakes
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
3000			2670	3000	3220	3440	3680	3910
3400		2720	3060	3400	3630	3870	4110	4360
3800	2750	3090	3440	3800	4040	4290	4540	4800
4200	3110	3470	3830	4200	4450	4710	4970	5240
4600	3480	3840	4210	4600	4860	5130	5410	5690
5000	3840	4210	4600	5000	5270	5550	5840	6130
5400	4200	4590	4990	5400	5680	5970	6270	6570
5800	4560	4960	5370	5800	6090	6390	6700	7020
6200	4920	5330	5760	6200	6500	6810	7130	7460
6600	5280	5710	6140	6600	6910	7230	7560	7900
7000	5640	6080	6530	7000	7320	7650	7990	8350
7400	6000	6450	6910	7400	7730	8070	8420	
7800	6360	6830	7300	7800	8140	8490		
8200	6720	7200	7690	8200	8550			

Field Limit Weight (1000 LB)

WIND CORR'D FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)							
	0		1000		2000		3000	
	DRY	WET	DRY	WET	DRY	WET	DRY	WET
3800	92.6		89.8		87.0			
4200	106.2	87.6	103.0	85.0	99.9		96.9	
4600	120.0	99.4	116.5	96.4	112.9	93.4	109.5	90.6
5000	134.0	111.3	130.1	108.0	126.2	104.7	122.4	101.5
5400	147.4	123.4	143.3	119.7	139.2	116.1	135.1	112.6
5800	158.9	135.5	154.8	131.6	150.8	127.6	146.9	123.8
6200	170.4	147.1	165.9	143.0	161.4	138.9	157.3	134.8
6600	180.0	157.1	176.4	153.2	172.1	149.2	167.6	145.1
7000		167.1		162.8	180.0	158.4	177.4	154.4
7400		176.5		172.1		167.8		163.4

Decrease field limit weight by 1000 lb when using manual speedbrakes.

Landing Field Limit Weight - Dry Runway

Flaps 40

Based on anti-skid inoperative and manual speedbrakes

Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
6000				6000	6450	7010	7500	8060
6400				6400	6860	7430	7940	8500
6800			5980	6800	7280	7860	8370	8950
7200			6370	7200	7690	8280	8810	9390
7600		5940	6750	7600	8100	8700	9250	9840
8000		6310	7140	8000	8510	9130	9680	10290
8400	5850	6690	7530	8400	8920	9550	10120	10730
8800	6210	7060	7910	8800	9340	9970	10550	11180
9200	6570	7430	8300	9200	9750	10400	10990	11620
9600	6930	7800	8680	9600	10160	10820	11430	12070
10000	7290	8180	9070	10000	10570	11240	11860	12520
10400	7650	8550	9450	10400	10980	11670	12300	12960
10800	8010	8920	9840	10800	11400	12090	12740	13410
11200	8370	9290	10230	11200	11810	12510	13170	13860
11600	8730	9670	10610	11600	12220	12940	13610	14300
12000	9090	10040	11000	12000	12630	13360	14050	14750
12400	9450	10410	11380	12400	13040	13790	14480	15190
12800	9810	10780	11770	12800	13460	14210	14920	15640
13200	10170	11160	12150	13200	13870	14630	15350	16090
13600	10530	11530	12540	13600	14280	15060	15790	16530

Field Limit Weight (1000 LB)

WIND CORR'D FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
6800	86.3					
7200	93.2	87.4				
7600	100.0	93.9	87.3			
8000	107.0	100.5	93.5	87.4		
8400	113.9	107.0	99.7	93.2	86.9	
8800	120.9	113.6	105.9	99.1	92.5	86.1
9200	127.9	120.2	112.2	104.9	98.0	91.2
9600	134.8	126.8	118.4	110.8	103.6	96.4
10000	141.8	133.3	124.6	116.5	109.1	101.5
10400	149.2	139.7	130.8	122.3	114.4	106.6
10800	156.8	146.4	136.8	128.0	119.7	111.7
11200	164.5	153.4	142.8	133.6	125.0	116.6
11600	172.1	160.5	149.2	139.2	130.2	121.6
12000	179.0	167.8	155.7	145.0	135.5	126.5
12400		174.5	162.4	151.0	140.7	131.4
12800		181.0	169.2	157.2	146.1	136.3
13200			175.4	163.4	151.9	141.2
13600			181.4	169.7	157.6	146.3
14000				175.6	163.5	151.6
14400				181.2	169.5	157.0
14800					174.9	162.4
15200					180.2	168.1
15600						173.4
16000						178.3
16400						183.2

Landing Field Limit Weight - Wet Runway
Flaps 40
Based on anti-skid inoperative and manual speedbrakes
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
6000					6490	7110	7640	8260
6400					6910	7530	8080	8710
6800				6800	7320	7950	8520	9150
7200				7200	7730	8380	8950	9600
7600			6670	7600	8140	8800	9390	10040
8000			7050	8000	8550	9230	9820	10490
8400		6520	7440	8400	8970	9650	10260	10940
8800		6890	7830	8800	9380	10070	10700	11380
9200		7260	8210	9200	9790	10500	11130	11830
9600	6680	7630	8600	9600	10200	10920	11570	12270
10000	7040	8010	8980	10000	10610	11340	12010	12720
10400	7400	8380	9370	10400	11030	11770	12440	13170
10800	7760	8750	9750	10800	11440	12190	12880	13610
11200	8120	9120	10140	11200	11850	12610	13320	14060
11600	8480	9500	10530	11600	12260	13040	13750	14510
12000	8840	9870	10910	12000	12670	13460	14190	14950
12400	9200	10240	11300	12400	13090	13880	14620	15400
12800	9560	10610	11680	12800	13500	14310	15060	15840
13200	9920	10990	12070	13200	13910	14730	15500	16290
13600	10280	11360	12450	13600	14320	15150	15930	16740

Field Limit Weight (1000 LB)

WIND CORR'D FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
8000	89.0					
8400	95.0	89.1				
8800	100.9	94.8	88.2			
9200	107.0	100.5	93.5	87.4		
9600	113.0	106.2	98.9	92.4	86.2	
10000	119.1	111.9	104.3	97.5	91.0	
10400	125.1	117.6	109.7	102.6	95.8	89.2
10800	131.2	123.4	115.1	107.8	100.7	93.7
11200	137.2	129.1	120.6	112.8	105.5	98.2
11600	143.3	134.7	126.0	117.8	110.3	102.6
12000	149.8	140.3	131.3	122.8	114.9	107.1
12400	156.5	146.1	136.5	127.8	119.5	111.5
12800	163.2	152.2	141.7	132.7	124.1	115.8
13200	169.9	158.4	147.2	137.5	128.6	120.1
13600	176.0	164.6	152.9	142.4	133.2	124.3
14000	182.0	170.9	158.6	147.6	137.8	128.6
14400		176.5	164.4	152.9	142.3	132.9
14800		182.1	170.3	158.2	147.1	137.1
15200			175.7	163.7	152.1	141.4
15600			180.9	169.2	157.1	145.8
16000				174.4	162.2	150.5
16400				179.3	167.4	155.1
16800				184.1	172.4	159.8
17200					177.0	164.6
17600					181.6	169.5

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 (°F)	LANDING CLIMB LIMIT WEIGHT (1000 LB)					
	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
125	131.9					
120	135.5	125.7				
115	139.3	129.1	119.6			
110	143.0	132.6	122.9			
105	146.8	136.2	126.2	116.4		
100	150.7	139.7	129.4	119.5	110.3	
95	154.4	143.2	132.8	122.6	113.0	
90	158.4	147.0	136.2	125.8	116.0	106.8
85	161.8	150.8	139.6	129.1	119.0	109.7
80	162.0	154.6	143.2	132.4	122.1	112.5
75	162.2	155.6	146.9	135.6	125.3	115.5
70	162.4	155.8	149.3	139.2	128.6	118.5
65	162.6	155.9	149.5	142.7	131.7	121.6
60	162.7	156.1	149.6	143.1	135.0	124.5
55	162.9	156.2	149.7	143.2	136.5	127.2
50	163.1	156.4	149.9	143.3	136.6	129.4
-40	164.4	157.7	150.9	144.2	137.3	130.2

With engine bleed for packs off, increase weight by 2600 lb.
With engine anti-ice on, decrease weight by 500 lb.
With engine and wing anti-ice on, decrease weight by 1600 lb .
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 10900 lb

ENGINE INOP

ADVISORY INFORMATION

Go-Around Climb Gradient

Flaps 15

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

OAT (°F)	REFERENCE GO-AROUND GRADIENT (%)					
	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
120	4.61	3.49				
110	5.45	4.28	3.18			
100	6.31	5.06	3.91	2.80	1.77	
90	7.18	5.89	4.67	3.51	2.41	1.42
86	7.55	6.23	4.98	3.80	2.69	1.67
80	7.58	6.73	5.46	4.24	3.10	2.04
79	7.59	6.82	5.54	4.31	3.17	2.11
72	7.62	6.85	6.12	4.84	3.68	2.58
70	7.63	6.86	6.15	5.00	3.83	2.72
65	7.64	6.88	6.17	5.41	4.17	3.06
60	7.66	6.89	6.18	5.45	4.53	3.40
58	7.67	6.90	6.19	5.46	4.67	3.52
50	7.70	6.93	6.21	5.48	4.72	3.96
40	7.74	6.96	6.24	5.49	4.74	3.97
30	7.77	6.99	6.26	5.52	4.75	3.99

Gradient Adjustment for Weight (%)

WEIGHT (1000 LB)	REFERENCE GO-AROUND GRADIENT (%)							
	1	2	3	4	5	6	7	8
160	-3.40	-3.77	-4.18	-4.55	-4.89	-5.22	-5.55	-5.88
150	-2.93	-3.24	-3.58	-3.90	-4.19	-4.47	-4.76	-5.04
140	-2.35	-2.62	-2.89	-3.15	-3.38	-3.61	-3.84	-4.06
130	-1.69	-1.91	-2.10	-2.27	-2.44	-2.60	-2.77	-2.93
120	-0.92	-1.04	-1.14	-1.24	-1.33	-1.42	-1.51	-1.60
110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	1.13	1.24	1.34	1.45	1.56	1.68	1.80	1.91
90	2.51	2.78	3.01	3.24	3.50	3.77	4.03	4.29

Gradient Adjustment for Speed (%)

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)													
	0	1	2	3	4	5	6	7	8	9	10	11	12	13
VREF40	-0.32	-0.34	-0.36	-0.38	-0.38	-0.38	-0.38	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39
VREF40+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF40+10	0.18	0.19	0.19	0.21	0.21	0.21	0.21	0.20	0.20	0.20	0.20	0.20	0.20	0.20
VREF40+15	0.32	0.33	0.33	0.33	0.31	0.30	0.29	0.28	0.26	0.25	0.24	0.22	0.21	0.20
VREF40+20	0.40	0.40	0.39	0.36	0.33	0.31	0.28	0.26	0.23	0.21	0.19	0.16	0.14	0.11
VREF40+25	0.40	0.39	0.37	0.29	0.25	0.22	0.19	0.15	0.12	0.09	0.06	0.02	-0.01	-0.04
VREF40+30	0.35	0.32	0.27	0.12	0.07	0.03	-0.01	-0.05	-0.09	-0.12	-0.16	-0.20	-0.24	-0.28

With engine bleed for packs off, increase gradient by 0.3%.
With engine anti-ice on, decrease gradient by 0.1%.
With engine and wing anti-ice on, decrease gradient by 0.4% .
When operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C decrease gradient by 0.9%.

Quick Turnaround Limit Weight
Flaps 40

OAT (°F)	LIMIT WEIGHT (1000 LB)					
	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
120	160.0	153.5				
110	161.6	155.0	148.7			
100	163.2	156.5	150.1	143.9	138.3	
90	164.8	158.1	151.6	145.3	139.5	134.0
80	166.5	159.7	153.1	146.7	140.8	135.2
70	168.2	161.3	154.6	148.2	142.1	136.4
60	170.0	162.9	156.2	149.7	143.4	137.7
50	171.7	164.7	157.8	151.3	144.9	139.0
40	173.4	166.4	159.5	152.9	146.4	140.4
30	175.2	168.3	161.2	154.5	148.0	141.8
20	176.9	170.1	163.0	156.2	149.6	143.2
10	178.8	172.0	164.9	158.0	151.3	144.8
0	179.8	173.8	166.8	159.8	153.1	146.4
-10	180.0	175.7	168.8	161.7	154.9	148.2
-20	180.0	177.7	170.8	163.6	156.7	149.9
-30	180.0	179.7	172.8	165.6	158.6	151.8
-40	180.0	180.0	174.8	167.8	160.6	153.7
-50	180.0	180.0	176.9	169.9	162.6	155.6
-60	180.0	180.0	179.0	172.1	164.8	157.6

Increase weight by 1400 lb per 1% uphill slope. Decrease weight by 2400 lb per 1% downhill slope. Increase weight by 3500 lb per 10 knots headwind. Decrease weight by 17100 lb per 10 knots tailwind.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 62 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 425°F 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 425°F, immediate dispatch is allowed; otherwise the required minimum ground wait period of 62 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 62 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.

Performance Dispatch — Chapter PD

Gear Down — Section 23

GEAR DOWN

Gear Down

TO BE SUPPLIED

Intentionally
Blank

Performance Dispatch — Chapter PD
Text — Section 24

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 and Obstacle Limit Weights as determined from the tables shown. Tire and Brake Energy Limits are not shown as they are not limiting for the range of conditions shown in this chapter.

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.

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

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.

Extended Operations - LRC Critical Fuel Reserves

ETOPS regulations require that flights conducted over a route that contains a point further than one hour's time at "normal one-engine-inoperative speed" from an adequate airport comply with rules specific to extended operations for airplanes with two or more engines. This section provides reserve fuel planning information for the "Critical Fuel Diversion Scenario".

ETOPS regulations require reserve planning to include a "Critical Fuel Diversion Scenario" calculation. The information shown is the fuel required to satisfy the flight profile as described below the charts. This information is shown for all engines operating and one engine inoperative at Long Range Cruise (LRC). There are two engine-inoperative scenarios, a decompression scenario and a driftdown scenario. The decompression scenario assumes an engine failure, loss of pressurization, emergency descent, and subsequent cruise at 10000 ft. The driftdown scenario assumes an engine failure without loss of pressurization, where the airplane "drifts down" to the thrust limited level-off altitude for the remainder of the diversion.

The ETOPS critical fuel required is the greater of the all-engine fuel or the engine-inoperative fuel. The ETOPS critical fuel required is compared to the amount of fuel that is predicted to be onboard the airplane at the critical point. If the fuel required by the ETOPS critical fuel reserves of the route exceeds the amount of fuel predicted, the fuel load must be adjusted accordingly. The data does not include an allowance for performance deterioration. However, regulations require a 5% allowance for performance deterioration, unless a value has been established by the operator for in-service deterioration.

To determine the ETOPS critical fuel required, enter the Ground to Air Mile Conversion table with the forecast wind (factored if applicable) and ground distance to the diversion airport from the critical point to obtain the air distance. Then enter the Critical Fuel table with air distance and expected weight at the critical point and read the required fuel. Apply the noted fuel adjustments for non-standard conditions, as necessary. When using a wind forecasting model acceptable to the FAA (such as the World Area Forecast System, WAFS), regulations allow the wind factor applied in this step to be 5% of the forecast wind (increase headwinds, decrease

tailwinds), as indicated in the note below the chart. However, if a FAA-acceptable wind forecasting model is not used, the ETOPS critical fuel must be increased by 5%, instead of factoring the forecast winds.

LRC Cruise/Driftdown Critical Fuel Reserves

Enter the Ground to Air Miles Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter the Critical Fuel table with air distance and expected weight at the critical point and read required fuel. Apply the noted fuel adjustments as necessary. Regulations require a 5% allowance for performance deterioration unless a value has been established by the operator for inservice deterioration.

As noted below each table, the fuel required is the greater of the two engine fuel and the single engine fuel. This fuel is compared to the amount of fuel normally onboard the airplane at that point in the route. If the fuel required by the critical fuel reserves exceeds the amount of fuel normally expected, the fuel load must be adjusted accordingly.

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 table with airport pressure altitude and OAT to read maximum quick turnaround weight. Apply the noted adjustments as required.

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, or ensure the brake temperature is within limits using the alternate procedure described on the page.

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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Performance Dispatch — Chapter PD

Takeoff — Section 30

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	1240	1230	1220	1210	1200	1190	1180	1170	1150
1400	1460	1450	1430	1420	1400	1380	1350	1330	1310
1600	1680	1660	1640	1620	1600	1570	1530	1500	1460
1800	1900	1870	1850	1820	1800	1750	1710	1660	1610
2000	2110	2090	2060	2030	2000	1940	1880	1820	1770
2200	2330	2300	2270	2230	2200	2130	2060	1990	1920
2400	2550	2510	2470	2440	2400	2320	2240	2150	2070
2600	2770	2730	2690	2640	2600	2510	2410	2320	2220
2800	3000	2950	2900	2850	2800	2690	2590	2480	2380
3000	3220	3170	3110	3060	3000	2880	2770	2650	2530
3200	3450	3390	3320	3260	3200	3070	2940	2810	2680
3400	3670	3600	3540	3470	3400	3260	3120	2980	2840
3600	3900	3820	3750	3670	3600	3450	3290	3140	2990
3800	4130	4050	3970	3880	3800	3640	3470	3310	3140
4000	4370	4280	4190	4090	4000	3820	3650	3470	3290
4200	4610	4510	4410	4300	4200	4010	3820	3640	3450
4400	4850	4740	4630	4510	4400	4200	4000	3800	3600
4600	5090	4970	4850	4720	4600	4390	4180	3960	3750
4800	5330	5200	5070	4930	4800	4580	4350	4130	3910
5000	5570	5430	5290	5140	5000	4760	4530	4290	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	880	990	1090	1200	1270	1340	1410	1490
1400	1050	1170	1280	1400	1480	1550	1630	1710
1600	1220	1350	1470	1600	1680	1760	1850	1930
1800	1390	1530	1660	1800	1890	1980	2070	2160
2000	1560	1700	1850	2000	2090	2190	2280	2380
2200	1720	1880	2040	2200	2300	2400	2500	2600
2400	1890	2060	2230	2400	2500	2610	2720	2830
2600	2060	2240	2420	2600	2710	2820	2930	3050
2800	2230	2420	2610	2800	2910	3030	3150	3270
3000	2400	2600	2800	3000	3120	3240	3370	3500
3200	2570	2780	2990	3200	3330	3450	3590	3720
3400	2730	2960	3180	3400	3530	3660	3800	3940
3600	2900	3140	3370	3600	3740	3880	4020	4170
3800	3070	3310	3560	3800	3940	4090	4240	4390
4000	3240	3490	3750	4000	4150	4300	4450	4610
4200	3410	3670	3940	4200	4350	4510	4670	4840
4400	3580	3850	4130	4400	4560	4720	4890	5060
4600	3740	4030	4310	4600	4760	4930	5110	5280
4800	3910	4210	4500	4800	4970	5140	5320	5510
5000	4080	4390	4690	5000	5170	5350	5540	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	10	14	18	22	26	30	38	42	46	50
1200	58.1	53.3	52.9	52.6	52.2	51.9	51.5	49.1	47.9	46.7	45.4
1400	63.7	58.5	58.1	57.7	57.3	57.0	56.6	53.9	52.5	51.2	49.8
1600	68.9	63.3	62.8	62.4	62.0	61.6	61.2	58.3	56.8	55.4	53.9
1800	73.7	67.6	67.2	66.7	66.3	65.9	65.4	62.4	60.7	59.2	57.6
2000	78.2	71.8	71.3	70.8	70.3	69.9	69.4	66.1	64.4	62.7	61.0
2200	82.5	75.6	75.1	74.6	74.1	73.6	73.1	69.7	67.8	66.0	64.3
2400	86.1	79.2	78.7	78.2	77.6	77.1	76.6	73.0	71.0	69.2	67.3
2600	86.1	82.4	81.8	81.3	80.7	80.2	79.6	75.8	73.8	71.9	69.9
2800	86.1	85.4	84.8	84.2	83.6	83.1	82.5	78.6	76.5	74.4	72.4
3000	86.1	86.1	86.1	86.1	86.1	85.9	85.3	81.2	79.0	76.9	74.8
3200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	83.4	81.2	79.0	76.9
3400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.6	83.3	81.1	78.8
3600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.3	83.1	80.8
3800	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.9	82.6
4000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.4
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)	82.4	81.9	81.8	81.7	81.6	81.5	81.3	76.0	73.5	71.0	68.4

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1200	54.7	50.3	50.0	49.6	49.3	49.0	48.2	45.8	44.6	43.5	42.4
1400	60.1	55.2	54.9	54.5	54.2	53.8	52.8	50.3	49.0	47.7	46.5
1600	65.0	59.7	59.3	59.0	58.6	58.2	57.2	54.4	53.0	51.6	50.3
1800	69.5	63.9	63.5	63.1	62.7	62.3	61.1	58.1	56.6	55.2	53.8
2000	73.7	67.7	67.3	66.8	66.4	66.0	64.8	61.6	60.0	58.4	56.9
2200	77.7	71.3	70.9	70.4	70.0	69.5	68.2	64.8	63.2	61.5	59.9
2400	81.4	74.7	74.2	73.8	73.3	72.8	71.4	67.9	66.1	64.4	62.7
2600	84.6	77.7	77.2	76.7	76.2	75.7	74.3	70.5	68.7	66.9	65.2
2800	86.1	80.5	80.0	79.4	78.9	78.4	76.9	73.1	71.1	69.3	67.5
3000	86.1	83.1	82.6	82.1	81.5	81.0	79.5	75.5	73.5	71.5	69.6
3200	86.1	85.5	84.9	84.4	83.8	83.3	81.7	77.6	75.5	73.5	71.6
3400	86.1	86.1	86.1	86.1	86.0	85.5	83.8	79.6	77.5	75.4	73.4
3600	86.1	86.1	86.1	86.1	86.1	86.1	85.8	81.5	79.4	77.3	75.2
3800	86.1	86.1	86.1	86.1	86.1	86.1	86.1	83.4	81.2	79.0	76.9
4000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.2	82.9	80.7	78.6
4200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.6	82.4	80.2
4400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.0	81.8
4600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.7	83.4
CLIMB LIMIT WT (1000 KG)	78.5	78.1	78.0	77.9	77.8	77.7	75.9	71.1	68.7	66.4	64.0

With engine bleed for packs off, increase field limit weight by 350 kg and climb limit weight by 1250 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 950 kg and climb limit weight by 1400 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	10	14	18	22	26	30	38	42	46	50
1200	51.1	47.0	46.7	46.4	46.1	45.5	44.7	42.7	41.6	40.5	39.6
1400	56.1	51.6	51.3	50.9	50.6	49.9	49.1	46.8	45.7	44.5	43.5
1600	60.7	55.8	55.4	55.1	54.8	54.0	53.1	50.6	49.4	48.2	47.0
1800	64.9	59.6	59.3	58.9	58.5	57.7	56.7	54.1	52.8	51.4	50.2
2000	68.8	63.2	62.8	62.4	62.0	61.1	60.1	57.3	55.9	54.4	53.2
2200	72.5	66.6	66.1	65.7	65.3	64.4	63.3	60.3	58.8	57.3	56.0
2400	75.9	69.7	69.3	68.8	68.4	67.4	66.3	63.2	61.6	60.0	58.6
2600	78.9	72.4	72.0	71.5	71.1	70.1	68.8	65.6	63.9	62.3	60.8
2800	81.8	75.0	74.5	74.1	73.6	72.5	71.3	67.9	66.2	64.5	62.9
3000	84.5	77.5	77.0	76.5	76.0	74.9	73.6	70.1	68.3	66.5	64.9
3200	86.1	79.7	79.2	78.7	78.1	77.0	75.7	72.1	70.2	68.4	66.7
3400	86.1	81.7	81.2	80.7	80.2	79.0	77.6	73.9	72.0	70.2	68.5
3600	86.1	83.7	83.2	82.6	82.1	80.9	79.5	75.7	73.8	71.9	70.1
3800	86.1	85.6	85.1	84.5	84.0	82.8	81.3	77.5	75.5	73.5	71.7
4000	86.1	86.1	86.1	86.1	85.8	84.6	83.1	79.1	77.1	75.1	73.3
4200	86.1	86.1	86.1	86.1	86.1	86.1	84.8	80.8	78.7	76.7	74.8
4400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	82.4	80.3	78.2	76.3
4600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.0	81.8	79.7	77.8
CLIMB LIMIT WT (1000 KG)	73.9	73.4	73.3	73.3	73.2	72.1	70.6	66.3	64.1	61.9	60.0

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1200	47.7	43.8	43.6	43.3	42.8	42.2	41.5	39.6	38.6	37.8	36.9
1400	52.3	48.1	47.8	47.6	47.0	46.3	45.6	43.5	42.4	41.4	40.5
1600	56.5	52.1	51.7	51.4	50.8	50.1	49.3	47.0	45.8	44.8	43.8
1800	60.4	55.6	55.3	55.0	54.3	53.5	52.7	50.2	49.0	47.8	46.7
2000	64.0	58.9	58.6	58.2	57.5	56.7	55.7	53.1	51.8	50.6	49.4
2200	67.5	62.0	61.7	61.3	60.5	59.7	58.7	55.9	54.5	53.2	52.0
2400	70.6	64.9	64.6	64.2	63.3	62.5	61.4	58.5	57.0	55.7	54.4
2600	73.4	67.5	67.1	66.6	65.8	64.9	63.8	60.8	59.2	57.8	56.4
2800	76.1	69.9	69.4	69.0	68.1	67.2	66.0	62.9	61.3	59.8	58.4
3000	78.6	72.1	71.7	71.2	70.3	69.3	68.2	64.9	63.2	61.7	60.2
3200	80.8	74.1	73.7	73.2	72.3	71.3	70.1	66.7	65.0	63.4	61.9
3400	82.9	76.1	75.6	75.1	74.1	73.1	71.9	68.4	66.7	65.0	63.5
3600	84.9	77.9	77.4	77.0	76.0	74.9	73.6	70.1	68.3	66.6	65.0
3800	86.1	79.7	79.2	78.7	77.7	76.6	75.3	71.7	69.8	68.2	66.5
4000	86.1	81.4	80.9	80.4	79.4	78.3	76.9	73.3	71.4	69.6	68.0
4200	86.1	83.1	82.6	82.1	81.0	79.9	78.5	74.8	72.8	71.1	69.4
4400	86.1	84.8	84.2	83.7	82.6	81.5	80.1	76.3	74.3	72.5	70.8
4600	86.1	86.1	85.8	85.3	84.2	83.1	81.6	77.8	75.8	73.9	72.2
CLIMB LIMIT WT (1000 KG)	69.3	68.9	68.8	68.7	67.8	66.9	65.5	61.4	59.3	57.4	55.7

With engine bleed for packs off, increase field limit weight by 350 kg and climb limit weight by 1250 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 950 kg and climb limit weight by 1400 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	10	14	18	22	26	30	38	42	46	50
1200	44.4	40.9	40.7	40.2	39.7	39.0	38.2	36.4	35.6	34.7	33.9
1400	48.7	45.0	44.7	44.1	43.6	42.9	42.0	40.0	39.0	38.1	37.2
1600	52.7	48.6	48.3	47.7	47.1	46.4	45.5	43.2	42.2	41.2	40.3
1800	56.3	51.9	51.6	51.0	50.4	49.6	48.5	46.1	45.1	44.0	43.0
2000	59.6	55.0	54.6	54.0	53.3	52.4	51.3	48.8	47.6	46.5	45.4
2200	62.8	57.9	57.5	56.8	56.1	55.2	54.0	51.3	50.1	48.9	47.8
2400	65.8	60.6	60.2	59.5	58.7	57.8	56.5	53.7	52.4	51.2	49.9
2600	68.3	62.9	62.5	61.7	60.9	60.0	58.7	55.7	54.4	53.1	51.8
2800	70.7	65.1	64.7	63.9	63.1	62.1	60.7	57.6	56.2	54.9	53.6
3000	73.1	67.2	66.8	65.9	65.1	64.0	62.7	59.4	58.0	56.6	55.2
3200	75.1	69.1	68.6	67.8	66.9	65.8	64.4	61.1	59.6	58.2	56.7
3400	77.0	70.9	70.4	69.5	68.6	67.5	66.1	62.7	61.1	59.7	58.2
3600	78.9	72.6	72.1	71.2	70.3	69.2	67.7	64.2	62.6	61.1	59.6
3800	80.7	74.2	73.8	72.9	71.9	70.7	69.2	65.7	64.1	62.5	61.0
4000	82.4	75.9	75.4	74.4	73.5	72.3	70.7	67.1	65.5	63.9	62.3
4200	84.2	77.4	76.9	76.0	75.0	73.8	72.2	68.5	66.8	65.2	63.7
4400	85.8	79.0	78.5	77.5	76.5	75.3	73.7	69.9	68.2	66.6	64.9
4600	86.1	80.5	80.0	79.0	78.0	76.7	75.1	71.3	69.5	67.9	66.2
CLIMB LIMIT WT (1000 KG)	64.8	64.5	64.4	63.7	62.9	61.7	59.9	55.9	54.1	52.5	50.8

10000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1200	41.5	38.2	37.8	37.3	36.8	36.2	35.4	33.6	32.7	31.9	31.0
1400	45.5	42.0	41.4	40.9	40.4	39.8	38.9	36.9	35.9	35.0	34.1
1600	49.3	45.4	44.8	44.3	43.7	43.0	42.1	39.9	38.9	37.9	36.8
1800	52.6	48.5	47.9	47.3	46.6	45.9	44.9	42.6	41.5	40.4	39.3
2000	55.7	51.3	50.6	50.0	49.3	48.5	47.4	45.0	43.8	42.6	41.4
2200	58.7	53.9	53.3	52.6	51.9	51.1	49.9	47.3	46.0	44.8	43.6
2400	61.4	56.5	55.7	55.0	54.3	53.4	52.2	49.5	48.2	46.9	45.5
2600	63.8	58.6	57.8	57.1	56.3	55.4	54.2	51.3	49.9	48.6	47.2
2800	66.0	60.6	59.8	59.1	58.3	57.3	56.0	53.1	51.6	50.2	48.8
3000	68.1	62.6	61.7	60.9	60.1	59.1	57.8	54.7	53.2	51.7	50.3
3200	70.0	64.3	63.4	62.6	61.8	60.8	59.4	56.2	54.7	53.2	51.6
3400	71.8	66.0	65.1	64.2	63.4	62.3	60.9	57.7	56.1	54.5	53.0
3600	73.6	67.6	66.7	65.8	64.9	63.9	62.4	59.1	57.5	55.9	54.3
3800	75.3	69.1	68.2	67.3	66.4	65.3	63.8	60.4	58.8	57.2	55.5
4000	76.9	70.6	69.7	68.8	67.8	66.8	65.2	61.8	60.1	58.4	56.7
4200	78.5	72.1	71.1	70.2	69.3	68.2	66.6	63.1	61.3	59.6	57.9
4400	80.1	73.5	72.6	71.6	70.7	69.5	67.9	64.3	62.6	60.9	59.1
4600	81.6	75.0	74.0	73.0	72.0	70.9	69.3	65.6	63.8	62.1	60.3
CLIMB LIMIT WT (1000 KG)	60.9	60.3	59.6	58.9	58.0	56.9	55.2	51.4	49.6	47.8	46.0

With engine bleed for packs off, increase field limit weight by 350 kg and climb limit weight by 1250 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 950 kg and climb limit weight by 1400 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	1230	1220	1210	1210	1200	1190	1180	1170	1160
1400	1450	1440	1430	1410	1400	1380	1360	1340	1320
1600	1680	1660	1640	1620	1600	1570	1550	1520	1490
1800	1900	1880	1850	1830	1800	1760	1730	1690	1660
2000	2130	2100	2060	2030	2000	1960	1910	1870	1830
2200	2350	2310	2280	2240	2200	2150	2100	2050	1990
2400	2580	2530	2490	2440	2400	2340	2280	2220	2160
2600	2800	2750	2700	2650	2600	2530	2470	2400	2340
2800	3030	2970	2910	2860	2800	2730	2660	2580	2510
3000	3250	3190	3130	3060	3000	2920	2840	2760	2690
3200	3480	3410	3340	3270	3200	3120	3030	2950	2860
3400	3700	3630	3550	3480	3400	3310	3220	3130	3040
3600	3930	3850	3760	3680	3600	3500	3410	3310	3210
3800	4170	4080	3990	3890	3800	3690	3590	3480	3380
4000	4420	4320	4210	4110	4000	3880	3770	3650	3540
4200	4670	4550	4440	4320	4200	4080	3950	3830	3700
4400	4920	4790	4660	4530	4400	4270	4130	4000	3860
4600	5170	5030	4890	4740	4600	4460	4310	4170	4030
4800	5420	5270	5110	4960	4800	4650	4490	4340	4190
5000	5670	5500	5340	5170	5000	4840	4680	4510	4350

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	1280	1360	1440	1520
1400	1030	1150	1280	1400	1480	1570	1660	1750
1600	1200	1330	1470	1600	1690	1790	1880	1980
1800	1370	1510	1660	1800	1900	2000	2100	2210
2000	1540	1690	1850	2000	2110	2210	2320	2440
2200	1710	1870	2040	2200	2310	2430	2550	2670
2400	1880	2050	2230	2400	2520	2640	2770	2890
2600	2050	2230	2420	2600	2730	2860	2990	3120
2800	2220	2410	2610	2800	2930	3070	3210	3350
3000	2390	2590	2800	3000	3140	3280	3430	3580
3200	2560	2770	2990	3200	3350	3500	3650	3810
3400	2730	2950	3180	3400	3560	3710	3870	4040
3600	2900	3130	3370	3600	3760	3930	4090	4260
3800	3060	3310	3550	3800	3970	4140	4310	4490
4000	3230	3490	3740	4000	4180	4350	4540	4720
4200	3400	3670	3930	4200	4380	4570	4760	4950
4400	3570	3850	4120	4400	4590	4780	4980	5180
4600	3740	4030	4310	4600	4800	5000	5200	5400
4800	3910	4210	4500	4800	5000	5210	5420	5630
5000	4080	4390	4690	5000	5210	5430	5640	5860

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	10	14	18	22	26	30	38	42	46	50
1200	58.2	52.9	52.5	52.1	51.8	51.4	51.0	48.7	47.5	46.3	45.1
1400	63.7	58.0	57.5	57.1	56.7	56.3	55.9	53.2	51.9	50.6	49.3
1600	68.8	62.6	62.1	61.7	61.2	60.8	60.3	57.4	56.0	54.6	53.2
1800	73.5	66.8	66.3	65.8	65.3	64.9	64.4	61.3	59.8	58.3	56.8
2000	77.8	70.8	70.2	69.7	69.2	68.7	68.2	64.9	63.3	61.7	60.2
2200	82.0	74.5	74.0	73.4	72.9	72.3	71.8	68.4	66.6	65.0	63.3
2400	85.8	78.0	77.4	76.8	76.2	75.7	75.1	71.5	69.7	68.0	66.2
2600	86.1	81.0	80.4	79.8	79.2	78.6	78.0	74.3	72.4	70.6	68.8
2800	86.1	83.9	83.2	82.6	82.0	81.4	80.8	76.9	74.9	73.0	71.1
3000	86.1	86.1	85.9	85.2	84.6	83.9	83.3	79.3	77.2	75.3	73.3
3200	86.1	86.1	86.1	86.1	86.1	86.1	85.9	81.7	79.6	77.5	75.5
3400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.0	81.8	79.8	77.6
3600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.0	81.9	79.7
3800	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	83.9	81.6
4000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.8	83.5
4200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.3
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)	82.4	81.9	81.8	81.7	81.6	81.5	81.3	76.0	73.5	71.0	68.4

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1200	54.7	49.7	49.3	49.1	48.7	48.4	47.5	45.3	44.2	43.1	42.1
1400	59.9	54.5	54.1	53.7	53.3	52.9	51.9	49.5	48.3	47.2	46.0
1600	64.7	58.8	58.4	57.9	57.5	57.1	56.1	53.5	52.2	50.9	49.7
1800	69.1	62.7	62.3	61.8	61.4	60.9	59.8	57.0	55.7	54.3	53.0
2000	73.2	66.5	66.0	65.5	65.0	64.6	63.4	60.4	58.9	57.5	56.1
2200	77.0	70.0	69.4	68.9	68.4	67.9	66.7	63.6	62.0	60.5	59.1
2400	80.6	73.2	72.7	72.1	71.6	71.1	69.8	66.5	64.9	63.3	61.8
2600	83.8	76.0	75.5	74.9	74.4	73.8	72.5	69.0	67.3	65.7	64.1
2800	86.1	78.7	78.1	77.5	77.0	76.4	75.0	71.4	69.7	68.0	66.3
3000	86.1	81.2	80.5	79.9	79.4	78.8	77.3	73.6	71.8	70.0	68.3
3200	86.1	83.6	83.0	82.4	81.8	81.2	79.6	75.8	73.9	72.1	70.3
3400	86.1	86.0	85.4	84.7	84.1	83.5	81.9	78.0	76.0	74.1	72.3
3600	86.1	86.1	86.1	86.1	86.1	85.7	84.1	80.0	78.0	76.1	74.2
3800	86.1	86.1	86.1	86.1	86.1	86.1	86.1	82.0	79.9	77.9	76.0
4000	86.1	86.1	86.1	86.1	86.1	86.1	86.1	83.9	81.7	79.7	77.7
4200	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.7	83.5	81.4	79.4
4400	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	85.3	83.1	81.0
4600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	84.8	82.6
CLIMB LIMIT WT (1000 KG)	78.5	78.1	78.0	77.9	77.8	77.7	75.9	71.1	68.7	66.4	64.0

With engine bleed for packs off, increase field limit weight by 350 kg and climb limit weight by 1250 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 800 kg and climb limit weight by 1400 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	10	14	18	22	26	30	38	42	46	50
1200	51.0	46.4	46.1	45.8	45.4	44.8	44.1	42.2	41.2	40.2	39.4
1400	55.9	50.8	50.4	50.1	49.7	49.0	48.2	46.1	45.1	44.0	43.0
1600	60.3	54.8	54.4	54.0	53.6	52.9	52.0	49.8	48.6	47.4	46.4
1800	64.4	58.5	58.1	57.6	57.2	56.4	55.5	53.1	51.8	50.6	49.5
2000	68.2	61.9	61.5	61.1	60.6	59.8	58.8	56.2	54.9	53.6	52.4
2200	71.8	65.2	64.7	64.3	63.8	62.9	61.9	59.2	57.8	56.4	55.1
2400	75.1	68.2	67.7	67.2	66.7	65.8	64.7	61.9	60.4	58.9	57.6
2600	78.1	70.8	70.3	69.8	69.3	68.3	67.2	64.2	62.7	61.2	59.8
2800	80.8	73.3	72.7	72.2	71.7	70.7	69.5	66.4	64.8	63.2	61.8
3000	83.3	75.5	75.0	74.4	73.9	72.8	71.6	68.4	66.7	65.1	63.6
3200	85.9	77.8	77.2	76.7	76.1	75.0	73.7	70.4	68.7	67.0	65.5
3400	86.1	80.0	79.4	78.8	78.3	77.1	75.8	72.4	70.6	68.9	67.3
3600	86.1	82.1	81.5	80.9	80.3	79.2	77.8	74.3	72.5	70.7	69.0
3800	86.1	84.1	83.5	82.9	82.3	81.1	79.7	76.1	74.2	72.4	70.7
4000	86.1	86.1	85.4	84.8	84.2	82.9	81.5	77.8	75.9	74.0	72.3
4200	86.1	86.1	86.1	86.1	86.0	84.8	83.3	79.5	77.6	75.6	73.9
4400	86.1	86.1	86.1	86.1	86.1	86.1	85.1	81.2	79.2	77.2	75.4
4600	86.1	86.1	86.1	86.1	86.1	86.1	86.1	82.8	80.8	78.7	76.9
CLIMB LIMIT WT (1000 KG)	73.9	73.4	73.3	73.3	73.2	72.1	70.6	66.3	64.1	61.9	60.0

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1200	47.6	43.3	43.0	42.7	42.1	41.6	40.9	39.2	38.3	37.4	36.6
1400	52.0	47.4	47.0	46.7	46.1	45.5	44.8	42.8	41.8	40.9	40.0
1600	56.1	51.1	50.7	50.4	49.7	49.1	48.3	46.2	45.1	44.1	43.1
1800	59.9	54.5	54.1	53.8	53.1	52.4	51.5	49.2	48.1	47.0	45.9
2000	63.4	57.7	57.3	56.9	56.2	55.4	54.5	52.1	50.9	49.7	48.6
2200	66.8	60.7	60.3	59.9	59.1	58.3	57.4	54.9	53.5	52.3	51.2
2400	69.9	63.5	63.1	62.7	61.9	61.0	60.0	57.4	56.0	54.7	53.5
2600	72.6	65.9	65.5	65.0	64.2	63.3	62.3	59.5	58.1	56.7	55.5
2800	75.1	68.2	67.7	67.2	66.4	65.5	64.4	61.5	60.0	58.6	57.3
3000	77.4	70.3	69.8	69.3	68.4	67.4	66.3	63.3	61.7	60.3	59.0
3200	79.7	72.4	71.8	71.3	70.4	69.4	68.3	65.2	63.6	62.1	60.7
3400	82.0	74.4	73.9	73.3	72.4	71.4	70.2	67.0	65.3	63.8	62.3
3600	84.2	76.4	75.8	75.3	74.3	73.2	72.0	68.7	67.0	65.5	63.9
3800	86.1	78.2	77.6	77.1	76.1	75.0	73.7	70.4	68.6	67.0	65.5
4000	86.1	80.0	79.4	78.8	77.8	76.7	75.4	72.0	70.2	68.5	66.9
4200	86.1	81.7	81.1	80.6	79.5	78.4	77.1	73.5	71.7	70.0	68.4
4400	86.1	83.4	82.8	82.2	81.2	80.0	78.7	75.0	73.2	71.4	69.8
4600	86.1	85.1	84.5	83.9	82.8	81.6	80.2	76.5	74.6	72.9	71.2
CLIMB LIMIT WT (1000 KG)	69.3	68.9	68.8	68.7	67.8	66.9	65.5	61.4	59.3	57.4	55.7

With engine bleed for packs off, increase field limit weight by 350 kg and climb limit weight by 1250 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 800 kg and climb limit weight by 1400 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	10	14	18	22	26	30	38	42	46	50
1200	44.3	40.4	40.1	39.7	39.2	38.6	37.8	36.0	35.2	34.4	33.7
1400	48.4	44.2	43.9	43.3	42.8	42.1	41.3	39.4	38.5	37.6	36.8
1600	52.2	47.6	47.3	46.7	46.1	45.4	44.5	42.4	41.5	40.6	39.6
1800	55.7	50.8	50.5	49.8	49.2	48.4	47.5	45.2	44.2	43.2	42.3
2000	59.0	53.8	53.4	52.8	52.1	51.3	50.3	47.9	46.8	45.8	44.7
2200	62.1	56.6	56.2	55.5	54.8	54.0	52.9	50.4	49.2	48.1	47.1
2400	65.0	59.2	58.8	58.1	57.3	56.4	55.3	52.7	51.5	50.3	49.2
2600	67.5	61.4	61.0	60.2	59.5	58.5	57.3	54.6	53.4	52.1	51.0
2800	69.8	63.5	63.0	62.3	61.4	60.5	59.2	56.4	55.1	53.8	52.6
3000	71.9	65.4	64.9	64.1	63.3	62.2	61.0	58.0	56.7	55.4	54.1
3200	74.1	67.3	66.8	66.0	65.1	64.1	62.8	59.7	58.3	57.0	55.6
3400	76.1	69.2	68.7	67.8	66.9	65.9	64.5	61.3	59.9	58.5	57.1
3600	78.2	71.0	70.5	69.6	68.7	67.6	66.2	62.9	61.4	60.0	58.6
3800	80.0	72.7	72.2	71.3	70.3	69.2	67.7	64.4	62.9	61.4	60.0
4000	81.9	74.4	73.8	72.9	71.9	70.7	69.3	65.9	64.3	62.8	61.3
4200	83.7	76.0	75.4	74.5	73.5	72.3	70.8	67.3	65.7	64.1	62.6
4400	85.4	77.6	77.0	76.0	75.0	73.8	72.2	68.7	67.0	65.5	63.9
4600	86.1	79.1	78.5	77.5	76.5	75.2	73.7	70.0	68.4	66.7	65.2
CLIMB LIMIT WT (1000 KG)	64.8	64.5	64.4	63.7	62.9	61.7	59.9	55.9	54.1	52.5	50.8

10000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	10	14	18	22	26	30	38	42	46	50
1200	41.3	37.7	37.2	36.7	36.3	35.7	35.0	33.3	32.4	31.6	30.8
1400	45.2	41.2	40.6	40.1	39.6	39.0	38.2	36.3	35.4	34.5	33.6
1600	48.8	44.4	43.8	43.3	42.7	42.0	41.2	39.2	38.2	37.2	36.2
1800	52.0	47.3	46.7	46.1	45.5	44.8	43.9	41.7	40.7	39.7	38.6
2000	55.1	50.1	49.5	48.8	48.2	47.5	46.4	44.2	43.1	42.0	40.9
2200	58.0	52.7	52.1	51.4	50.7	49.9	48.9	46.5	45.3	44.1	43.0
2400	60.6	55.1	54.4	53.7	53.0	52.2	51.1	48.6	47.3	46.1	44.9
2600	62.9	57.2	56.4	55.7	54.9	54.1	52.9	50.3	49.0	47.8	46.5
2800	65.0	59.1	58.3	57.5	56.8	55.9	54.6	51.9	50.6	49.3	47.9
3000	67.0	60.8	60.0	59.2	58.4	57.5	56.2	53.4	52.0	50.6	49.3
3200	69.0	62.6	61.7	60.9	60.1	59.1	57.8	54.9	53.5	52.1	50.6
3400	70.9	64.3	63.4	62.6	61.7	60.8	59.4	56.4	54.9	53.5	52.0
3600	72.8	66.0	65.1	64.2	63.3	62.3	60.9	57.8	56.3	54.8	53.3
3800	74.5	67.5	66.6	65.7	64.8	63.8	62.4	59.2	57.6	56.1	54.5
4000	76.2	69.1	68.1	67.2	66.3	65.2	63.8	60.5	58.9	57.3	55.7
4200	77.9	70.6	69.6	68.7	67.7	66.6	65.1	61.8	60.2	58.5	56.9
4400	79.5	72.0	71.0	70.1	69.1	68.0	66.5	63.1	61.4	59.7	58.1
4600	81.1	73.4	72.4	71.5	70.5	69.3	67.8	64.3	62.6	60.9	59.2
CLIMB LIMIT WT (1000 KG)	60.9	60.3	59.6	58.9	58.0	56.9	55.2	51.4	49.6	47.8	46.0

With engine bleed for packs off, increase field limit weight by 350 kg and climb limit weight by 1250 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 800 kg and climb limit weight by 1400 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)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)													
	DISTANCE FROM BRAKE RELEASE (100 M)													
	25	30	35	40	45	50	55	60	65	70	75	80	85	90
5	73.4	79.2	83.0											
20	67.2	72.8	77.1	80.3	82.5	84.1								
40	62.2	67.4	71.6	75.0	77.7	79.8	81.4	82.7	83.7	84.6	85.3			
60	58.4	63.4	67.6	70.9	73.7	76.0	77.9	79.5	80.8	81.8	82.7	83.4	84.1	84.7
80	55.1	60.1	64.2	67.6	70.5	72.8	74.9	76.6	78.0	79.2	80.3	81.2	82.0	82.7
100	52.4	57.3	61.4	64.8	67.6	70.1	72.2	74.0	75.5	76.9	78.1	79.1	80.0	80.8
120	49.9	54.8	58.9	62.3	65.1	67.6	69.8	71.7	73.3	74.7	76.0	77.1	78.1	78.9
140	47.7	52.6	56.6	60.0	62.9	65.4	67.6	69.5	71.2	72.7	74.0	75.2	76.3	77.2
160	45.7	50.6	54.6	58.0	60.9	63.4	65.6	67.6	69.3	70.9	72.2	73.5	74.6	75.6
180	43.9	48.7	52.7	56.1	59.0	61.6	63.8	65.8	67.6	69.2	70.6	71.8	73.0	74.0
200	42.3	47.0	51.0	54.4	57.3	59.9	62.1	64.1	65.9	67.5	69.0	70.3	71.5	72.6
220		45.4	49.4	52.8	55.7	58.3	60.6	62.6	64.4	66.0	67.5	68.9	70.1	71.2
240		44.0	47.9	51.3	54.2	56.8	59.1	61.1	63.0	64.6	66.1	67.5	68.7	69.9
260		42.6	46.5	49.9	52.8	55.4	57.7	59.8	61.6	63.3	64.8	66.2	67.4	68.6
280			45.2	48.6	51.5	54.1	56.4	58.4	60.3	62.0	63.5	64.9	66.2	67.4
300			44.0	47.3	50.2	52.8	55.1	57.2	59.1	60.8	62.3	63.7	65.0	66.2

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	80	85	90
30 & BELOW	0	0	0	0	0	0	0	0	0	0	0
32	-0.6	-0.7	-0.7	-0.8	-0.9	-1.0	-1.1	-1.2	-1.3	-1.3	-1.4
34	-1.1	-1.3	-1.5	-1.6	-1.8	-2.0	-2.2	-2.3	-2.5	-2.7	-2.8
36	-1.7	-2.0	-2.2	-2.5	-2.7	-3.0	-3.2	-3.5	-3.8	-4.0	-4.3
38	-2.3	-2.6	-2.9	-3.3	-3.6	-4.0	-4.3	-4.7	-5.0	-5.3	-5.7
40	-2.8	-3.3	-3.7	-4.1	-4.5	-5.0	-5.4	-5.8	-6.3	-6.7	-7.1
42	-3.4	-3.9	-4.4	-4.9	-5.4	-5.9	-6.4	-6.9	-7.5	-8.0	-8.5
44	-3.9	-4.5	-5.1	-5.7	-6.3	-6.9	-7.5	-8.1	-8.7	-9.2	-9.8
46	-4.5	-5.1	-5.8	-6.5	-7.2	-7.8	-8.5	-9.2	-9.9	-10.5	-11.2
48	-5.0	-5.7	-6.5	-7.3	-8.0	-8.8	-9.5	-10.3	-11.0	-11.8	-12.6
50	-5.5	-6.4	-7.2	-8.1	-8.9	-9.7	-10.6	-11.4	-12.2	-13.1	-13.9

Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)										
	40	45	50	55	60	65	70	75	80	85	90
S.L. & BELOW	0	0	0	0	0	0	0	0	0	0	0
1000	-1.5	-1.6	-1.8	-2.0	-2.1	-2.3	-2.5	-2.6	-2.8	-3.0	-3.1
2000	-2.9	-3.3	-3.6	-3.9	-4.3	-4.6	-4.9	-5.3	-5.6	-5.9	-6.3
3000	-4.3	-4.8	-5.3	-5.8	-6.3	-6.8	-7.3	-7.8	-8.3	-8.8	-9.3
4000	-5.6	-6.3	-7.0	-7.6	-8.3	-9.0	-9.6	-10.3	-11.0	-11.6	-12.3
5000	-6.9	-7.7	-8.6	-9.4	-10.2	-11.0	-11.9	-12.7	-13.5	-14.3	-15.2
6000	-8.2	-9.2	-10.2	-11.1	-12.1	-13.1	-14.1	-15.1	-16.1	-17.0	-18.0
7000	-9.3	-10.5	-11.7	-12.8	-14.0	-15.1	-16.3	-17.5	-18.6	-19.8	-20.9
8000	-10.5	-11.8	-13.2	-14.5	-15.9	-17.2	-18.5	-19.9	-21.2	-22.5	-23.9
9000	-11.6	-13.1	-14.6	-16.1	-17.6	-19.0	-20.5	-22.0	-23.5	-25.0	-26.5
10000	-12.8	-14.4	-16.0	-17.7	-19.3	-20.9	-22.5	-24.2	-25.8	-27.4	-29.0

Takeoff Obstacle Limit Weight
Flaps 5
Sea Level 30°C & Below, Zero Wind
Based on engine bleed for packs on and anti-ice off
Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)										
	40	45	50	55	60	65	70	75	80	85	90
15 TW	-9.8	-9.5	-9.3	-9.0	-8.7	-8.5	-8.2	-7.9	-7.7	-7.4	-7.1
10 TW	-6.5	-6.4	-6.2	-6.0	-5.8	-5.6	-5.5	-5.3	-5.1	-4.9	-4.8
5 TW	-3.3	-3.2	-3.1	-3.0	-2.9	-2.8	-2.7	-2.6	-2.6	-2.5	-2.4
0	0	0	0	0	0	0	0	0	0	0	0
10 HW	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.6	0.6	0.5	0.4
20 HW	2.3	2.2	2.0	1.9	1.7	1.6	1.4	1.3	1.1	1.0	0.8
30 HW	3.5	3.3	3.1	2.8	2.6	2.4	2.2	2.0	1.7	1.5	1.3
40 HW	4.7	4.4	4.1	3.8	3.5	3.2	2.9	2.6	2.3	2.0	1.7

With engine bleed for packs off, increase weight by 650 kg.
With engine anti-ice on, decrease weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease weight by 1550 kg.

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	30300	-5	32800*	32800*	32800*	32100	30700
80	31600	-8	34400*	34400*	34400*	33400	32000
75	33000	-11	35900*	35900*	35900*	34800	33400
70	34500	-15	37300*	37300*	37300*	36200	34900
65	36000	-18	38700*	38700*	38700*	37800	36400
60	37700	-18	40200*	40200*	40200*	39400	38100
55	39500	-18	41000	41000	41000	41000	39900
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	30300	0	30600*	30600*	30600*	30600*	30600*
80	31600	-3	32900*	32900*	32900*	32900*	32000
75	33000	-6	34800*	34800*	34800*	34800	33400
70	34500	-9	36300*	36300*	36300*	36200	34900
65	36000	-13	37800*	37800*	37800*	37800	36400
60	37700	-13	39200*	39200*	39200*	39200*	38100
55	39500	-13	40800*	40800*	40800*	40800*	39900
50	41000	-13	41000	41000	41000	41000	41000
45	41000	-13	41000	41000	41000	41000	41000
40	41000	-13	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	30300	6	27500*	27500*	27500*	27500*	27500*
80	31600	3	30000*	30000*	30000*	30000*	30000*
75	33000	0	32800*	32800*	32800*	32800*	32800*
70	34500	-3	34900*	34900*	34900*	34900*	34900
65	36000	-7	36500*	36500*	36500*	36500*	36400
60	37700	-7	38000*	38000*	38000*	38000*	38000*
55	39500	-7	39500*	39500*	39500*	39500*	39500*
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	160
554	515	480	450	424	400	382	365	349	335	322
829	771	720	675	636	600	573	548	525	504	485
1103	1027	958	899	847	800	764	732	701	673	648
1376	1282	1197	1123	1059	1000	956	915	877	843	811
1649	1536	1435	1348	1270	1200	1147	1098	1053	1012	974
1921	1791	1673	1571	1482	1400	1339	1282	1229	1181	1138
2192	2044	1911	1795	1693	1600	1530	1465	1405	1351	1301
2463	2297	2148	2019	1904	1800	1721	1648	1581	1520	1465
2733	2550	2386	2242	2115	2000	1913	1832	1758	1690	1628
3003	2803	2622	2465	2326	2200	2105	2016	1934	1859	1791
3272	3054	2859	2688	2537	2400	2296	2200	2111	2029	1955
3540	3306	3095	2911	2748	2600	2488	2384	2287	2199	2119
3807	3556	3330	3133	2959	2800	2680	2568	2464	2369	2282
4074	3807	3566	3356	3169	3000	2871	2752	2641	2539	2446
4340	4057	3801	3578	3380	3200	3063	2935	2817	2709	2610
4606	4306	4036	3800	3590	3400	3255	3119	2994	2879	2774
4870	4555	4270	4021	3801	3600	3446	3303	3171	3049	2938
5134	4803	4504	4243	4011	3800	3638	3487	3347	3219	3102
5397	5051	4738	4464	4221	4000	3830	3671	3524	3389	3266
5659	5298	4971	4685	4431	4200	4021	3855	3701	3559	3430
5920	5544	5204	4906	4641	4400	4213	4038	3877	3729	3594
6181	5790	5437	5127	4851	4600	4404	4222	4054	3899	3758
6440	6035	5669	5347	5061	4800	4596	4406	4230	4069	3921
6699	6280	5901	5568	5271	5000	4787	4589	4406	4238	4085

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	1:09	2.5	1:08	2.4	1:06	2.4	1:05	2.4	1:04
600	3.5	1:40	3.5	1:38	3.4	1:36	3.4	1:33	3.3	1:31
800	4.6	2:11	4.5	2:09	4.4	2:05	4.3	2:01	4.3	1:58
1000	5.7	2:42	5.5	2:39	5.4	2:34	5.3	2:29	5.2	2:25
1200	6.8	3:12	6.6	3:08	6.5	3:02	6.3	2:56	6.2	2:52
1400	7.9	3:42	7.7	3:37	7.5	3:30	7.3	3:23	7.2	3:19
1600	9.0	4:12	8.7	4:06	8.5	3:58	8.3	3:51	8.2	3:46
1800	10.1	4:42	9.8	4:35	9.6	4:26	9.3	4:18	9.1	4:13
2000	11.2	5:11	10.9	5:04	10.6	4:55	10.3	4:45	10.1	4:40
2200	12.3	5:40	12.0	5:32	11.7	5:22	11.4	5:12	11.2	5:07
2400	13.5	6:09	13.1	5:59	12.8	5:49	12.5	5:39	12.2	5:34
2600	14.7	6:38	14.3	6:27	13.9	6:17	13.5	6:06	13.3	6:00
2800	15.8	7:06	15.4	6:55	15.0	6:44	14.6	6:33	14.3	6:27
3000	17.0	7:35	16.5	7:23	16.1	7:11	15.6	7:00	15.4	6:54
3200	18.2	8:03	17.7	7:49	17.2	7:38	16.8	7:26	16.5	7:20
3400	19.4	8:30	18.9	8:16	18.4	8:05	17.9	7:53	17.6	7:47
3600	20.7	8:58	20.1	8:43	19.5	8:31	19.0	8:20	18.8	8:13
3800	21.9	9:26	21.3	9:10	20.7	8:58	20.2	8:46	19.9	8:39
4000	23.1	9:53	22.5	9:37	21.8	9:25	21.3	9:13	21.0	9:06
4200	24.4	10:20	23.7	10:03	23.0	9:51	22.5	9:39		
4400	25.7	10:47	25.0	10:30	24.3	10:18	23.7	10:05		
4600	27.0	11:14	26.2	10:56	25.5	10:44	24.9	10:32		
4800	28.3	11:41	27.5	11:23	26.7	11:10	26.2	10:58		
5000	29.5	12:08	28.7	11:49	27.9	11:37	27.4	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	0.2	0.4	0.5
4	-0.4	-0.2	0.0	0.2	0.5	0.8	1.2
6	-0.5	-0.3	0.0	0.3	0.8	1.4	2.0
8	-0.7	-0.4	0.0	0.5	1.1	2.0	3.0
10	-0.9	-0.5	0.0	0.6	1.5	2.6	4.0
12	-1.1	-0.5	0.0	0.7	1.8	3.3	5.2
14	-1.2	-0.6	0.0	0.8	2.2	4.1	6.5
16	-1.4	-0.7	0.0	1.0	2.6	4.9	7.9
18	-1.6	-0.8	0.0	1.1	3.1	5.9	9.5
20	-1.8	-0.9	0.0	1.3	3.5	6.8	11.1
22	-2.0	-1.0	0.0	1.4	4.0	7.9	12.9
24	-2.2	-1.1	0.0	1.6	4.5	9.0	14.8
26	-2.4	-1.2	0.0	1.7	5.1	10.1	16.8
28	-2.6	-1.3	0.0	1.9	5.7	11.3	18.9
30	-2.8	-1.4	0.0	2.0	6.3	12.6	21.2
32	-3.0	-1.5	0.0	2.2	6.9	14.0	23.5

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
1316	1237	1168	1106	1050	1000	954	912	874	839	807
1830	1724	1630	1545	1469	1400	1337	1280	1227	1179	1134
2343	2210	2091	1984	1888	1800	1720	1647	1580	1518	1461
2856	2695	2552	2423	2306	2200	2103	2015	1933	1858	1789
3369	3181	3013	2861	2724	2600	2486	2382	2287	2198	2117
3882	3666	3474	3300	3143	3000	2870	2750	2640	2539	2445
4395	4152	3934	3738	3561	3400	3253	3118	2993	2879	2772
4907	4637	4395	4177	3980	3800	3636	3485	3347	3219	3100
5420	5123	4856	4616	4398	4200	4019	3853	3700	3559	3428
5933	5608	5317	5054	4816	4600	4402	4221	4054	3899	3756
6447	6094	5778	5493	5235	5000	4785	4588	4407	4239	4084

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	5.2	5.6	5.9	6.4	6.7	2:24
1400	6.2	6.5	7.1	7.7	8.2	8.8	9.2	3:17
1800	7.8	8.3	9.1	9.8	10.5	11.2	11.9	4:10
2200	9.5	10.2	11.1	12.0	12.8	13.7	14.6	5:03
2600	11.3	12.1	13.2	14.2	15.3	16.3	17.4	5:56
3000	13.0	14.1	15.3	16.6	17.8	19.0	20.2	6:49
3400	14.9	16.1	17.5	19.0	20.3	21.8	23.2	7:42
3800	16.8	18.2	19.8	21.4	23.0	24.6	26.2	8:34
4200	18.8	20.4	22.2	24.0	25.7	27.6		9:27
4600	20.8	22.6	24.6	26.6	28.6	30.6		10:20
5000	22.9	24.9	27.0	29.3	31.5	33.7		11:13

Based on 280/.78 climb, Long Range Cruise or .78 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
160	143	129	118	108	100	93	87	82	77	73
225	205	188	173	161	150	141	132	125	118	112
290	266	246	228	213	200	188	178	169	160	153
353	326	303	283	265	250	236	224	213	203	194
416	386	360	338	318	300	284	270	257	245	235
478	446	417	392	370	350	332	316	301	288	276
542	506	474	447	422	400	380	362	346	331	317
606	567	532	502	474	450	428	408	390	373	358
672	629	591	557	527	500	476	454	434	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	0.5	0.6	0.6	0.7	0.7	0.7	0:14
	ALT (FT)	12000	12000	11000	11000	9000	9000	8000	
100	FUEL (1000 KG)	0.8	0.9	0.9	1.0	1.0	1.1	1.1	0:22
	ALT (FT)	19000	18000	18000	18000	17000	17000	17000	
150	FUEL (1000 KG)	1.1	1.1	1.2	1.3	1.3	1.4	1.5	0:30
	ALT (FT)	26000	25000	25000	24000	23000	22000	22000	
200	FUEL (1000 KG)	1.3	1.4	1.5	1.6	1.6	1.7	1.8	0:37
	ALT (FT)	35000	30000	28000	27000	26000	26000	26000	
250	FUEL (1000 KG)	1.5	1.6	1.7	1.8	1.9	2.0	2.1	0:44
	ALT (FT)	40000	37000	36000	35000	34000	31000	30000	
300	FUEL (1000 KG)	1.7	1.8	1.9	2.1	2.2	2.3	2.4	0:50
	ALT (FT)	41000	40000	39000	37000	35000	34000	32000	
350	FUEL (1000 KG)	1.9	2.0	2.2	2.3	2.4	2.6	2.7	0:56
	ALT (FT)	41000	40000	40000	38000	36000	35000	33000	
400	FUEL (1000 KG)	2.1	2.2	2.4	2.5	2.7	2.9	3.0	1:03
	ALT (FT)	41000	40000	40000	38000	36000	35000	33000	
450	FUEL (1000 KG)	2.3	2.5	2.6	2.8	3.0	3.1	3.3	1:10
	ALT (FT)	41000	41000	40000	38000	36000	35000	34000	
500	FUEL (1000 KG)	2.5	2.7	2.8	3.0	3.2	3.4	3.6	1:17
	ALT (FT)	41000	41000	40000	38000	36000	35000	34000	

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	3080	3030	3020	2990	2970	2980	3080		
80	2910	2870	2840	2830	2780	2790	2860	3130	
75	2750	2700	2670	2650	2600	2600	2660	2800	
70	2590	2540	2500	2480	2430	2420	2470	2550	
65	2420	2370	2340	2310	2270	2230	2280	2330	
60	2260	2210	2180	2140	2110	2050	2090	2130	
55	2100	2050	2010	1980	1940	1890	1910	1940	2110
50	1950	1890	1850	1810	1780	1730	1750	1770	1890
45	1790	1730	1690	1680	1640	1610	1590	1590	1670
40	1670	1620	1560	1520	1480	1450	1440	1420	1480

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 Cu. 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	43.0	41.7	
28	46.5	45.0	43.5
26	50.3	48.6	47.1
24	54.5	52.7	51.0
22	59.3	57.2	55.2
20	64.5	62.1	59.8
18	69.3	66.8	64.0
16	74.0	71.4	68.5
14	78.3	75.9	73.3
12	83.0	80.1	77.0

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	-1.9	-1.8	-1.7	-1.7	-1.6	-1.5	-1.4	-1.2	-1.1
ENGINE AND WING*	-7.5	-6.9	-6.6	-6.5	-6.3	-5.8	-5.2	-4.8	

***Optional System**

ALL ENGINES

Decompression Critical Fuel Reserves - LRC Cruise

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
292	267	246	229	213	200	188	178	168	160	152
592	540	497	460	428	400	376	354	335	318	302
893	814	747	691	642	600	563	530	501	475	452
1194	1087	997	922	857	800	750	707	668	633	602
1495	1360	1248	1153	1071	1000	938	883	834	791	751
1796	1633	1498	1384	1285	1200	1125	1059	1001	948	901
2096	1907	1748	1615	1500	1400	1313	1236	1167	1106	1051
2397	2180	1999	1845	1714	1600	1500	1412	1334	1264	1201
2698	2453	2249	2076	1928	1800	1688	1589	1500	1421	1350

Critical Fuel (1000 KG)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	45	50	55	60	65	70	75	80
200	1.7	1.8	1.9	1.9	2.0	2.1	2.1	2.2
300	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1
400	3.2	3.3	3.4	3.5	3.6	3.8	3.9	4.0
500	3.9	4.0	4.2	4.3	4.5	4.6	4.8	4.9
600	4.6	4.8	4.9	5.1	5.3	5.5	5.6	5.8
700	5.3	5.5	5.7	5.9	6.1	6.3	6.5	6.7
800	6.0	6.3	6.5	6.7	6.9	7.1	7.3	7.6
900	6.7	7.0	7.2	7.5	7.7	7.9	8.2	8.4
1000	7.4	7.7	8.0	8.2	8.5	8.8	9.0	9.3
1100	8.1	8.4	8.7	9.0	9.3	9.6	9.9	10.2
1200	8.8	9.1	9.5	9.8	10.1	10.4	10.7	11.1
1300	9.5	9.9	10.2	10.5	10.9	11.2	11.6	11.9
1400	10.2	10.6	10.9	11.3	11.7	12.0	12.4	12.8
1500	10.9	11.3	11.7	12.0	12.4	12.8	13.2	13.6
1600	11.6	12.0	12.4	12.8	13.2	13.6	14.0	14.5
1700	12.3	12.7	13.1	13.5	14.0	14.4	14.8	15.3
1800	12.9	13.4	13.8	14.3	14.7	15.2	15.7	16.1

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.5% per 10°C above ISA.
-When icing conditions are forecast, use the greater of engine and wing anti-ice on (7%) for the total forecast time or engine and wing anti-ice on and ice drag (15%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

MAX CONTINUOUS THRUST

Decompression Critical Fuel Reserves - LRC Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		(NM)	20	40	60	80
292	267	247	229	213	200	188	178	168	160	152
598	544	499	461	428	400	375	353	334	316	301
904	821	752	693	643	600	562	529	499	473	449
1210	1098	1004	926	858	800	749	704	665	629	597
1517	1375	1257	1158	1073	1000	936	880	830	786	746
1823	1652	1510	1390	1288	1200	1123	1056	996	942	894
2130	1929	1762	1622	1503	1400	1310	1231	1161	1099	1043
2436	2206	2015	1855	1718	1600	1497	1407	1327	1255	1191
2742	2483	2268	2087	1933	1800	1684	1582	1492	1412	1340

Critical Fuel (1000 KG)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	45	50	55	60	65	70	75	80
200	1.5	1.5	1.6	1.7	1.7	1.8	1.9	2.0
300	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
400	2.7	2.9	3.0	3.1	3.3	3.4	3.5	3.7
500	3.4	3.5	3.7	3.9	4.0	4.2	4.4	4.5
600	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4
700	4.7	4.9	5.1	5.3	5.5	5.8	6.0	6.2
800	5.3	5.5	5.8	6.0	6.3	6.5	6.8	7.0
900	5.9	6.2	6.4	6.7	7.0	7.3	7.6	7.8
1000	6.5	6.8	7.1	7.4	7.7	8.0	8.4	8.7
1100	7.1	7.5	7.8	8.1	8.5	8.8	9.1	9.5
1200	7.8	8.1	8.4	8.8	9.2	9.6	9.9	10.3
1300	8.4	8.7	9.1	9.5	9.9	10.3	10.7	11.1
1400	9.0	9.4	9.8	10.2	10.6	11.1	11.5	11.9
1500	9.6	10.0	10.5	10.9	11.3	11.8	12.2	12.7
1600	10.2	10.7	11.1	11.6	12.0	12.5	13.0	13.5
1700	10.8	11.3	11.7	12.2	12.7	13.2	13.7	14.3
1800	11.4	11.9	12.4	12.9	13.4	14.0	14.5	15.1

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5%if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.5% per 10°C above ISA.
-When icing conditions are forecast, use the greater of engine and wing anti-ice on (6%) for the total forecast time or engine and wing anti-ice on and ice drag (15%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT				
100	80	60	40	20		20	40	60	80	100
268	250	235	222	210	200	190	181	173	166	159
539	504	473	446	421	400	380	362	346	331	317
812	758	711	670	633	600	570	543	518	496	475
1088	1015	951	894	844	800	759	723	690	660	632
1365	1272	1191	1119	1056	1000	949	903	861	823	788
1643	1530	1431	1345	1268	1200	1138	1083	1032	986	944
1922	1788	1672	1570	1480	1400	1327	1262	1203	1150	1100
2200	2046	1913	1796	1692	1600	1517	1442	1374	1313	1256
2478	2304	2153	2021	1904	1800	1706	1622	1546	1476	1413

Critical Fuel (1000 KG)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	45	50	55	60	65	70	75	80
200	1.5	1.6	1.6	1.7	1.7	1.8	1.9	2.0
300	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7
400	2.5	2.6	2.7	2.9	3.0	3.2	3.4	3.5
500	2.9	3.1	3.3	3.5	3.7	3.9	4.1	4.3
600	3.4	3.6	3.9	4.1	4.3	4.5	4.8	5.1
700	3.8	4.1	4.4	4.7	4.9	5.2	5.5	5.8
800	4.3	4.6	4.9	5.3	5.6	5.9	6.2	6.6
900	4.8	5.1	5.5	5.8	6.2	6.6	6.9	7.3
1000	5.2	5.6	6.0	6.4	6.8	7.2	7.6	8.1
1100	5.6	6.1	6.5	7.0	7.4	7.9	8.3	8.8
1200	6.1	6.6	7.0	7.5	8.0	8.5	9.0	9.5
1300	6.5	7.0	7.6	8.1	8.6	9.1	9.7	10.2
1400	6.9	7.5	8.1	8.6	9.2	9.8	10.4	11.0
1500	7.4	8.0	8.6	9.2	9.8	10.4	11.0	11.7
1600	7.8	8.4	9.1	9.7	10.4	11.0	11.7	12.4
1700	8.2	8.9	9.6	10.3	10.9	11.7	12.4	13.1
1800	8.6	9.3	10.1	10.8	11.5	12.3	13.0	13.8

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.5% per 10°C above ISA.
-When icing conditions are forecast, use the greater of the engine and wing anti-ice on (10%) for the total forecast time or engine and wing anti-ice on and ice drag (26%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

Performance Dispatch — Chapter PD

Landing — Section 32

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
1200			1090	1200	1270	1350	1420	1500
1400	1060	1160	1270	1400	1480	1560	1640	1720
1600	1240	1340	1460	1600	1680	1770	1850	1940
1800	1420	1520	1650	1800	1890	1980	2070	2170
2000	1600	1710	1840	2000	2090	2190	2290	2390
2200	1770	1890	2030	2200	2300	2400	2500	2610
2400	1950	2070	2220	2400	2500	2610	2720	2830
2600	2110	2250	2380	2600	2710	2820	2930	3050
2800	2210	2350	2530	2800	2910	3030	3150	3280
3000	2300	2450	2680	3000	3120	3240	3360	3500
3200	2390	2540	2840	3200	3320	3450	3580	
3400	2480	2630	2990	3400	3530			
3600	2570	2730	3140	3600				
3800	2660	2820	3290					
4000	2750	2910	3450					
4200	2850	3000	3600					
4400	2940	3100						
4600	3030	3190						
4800	3120	3280						
5000	3210	3380						

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
1200	46.2	43.6	41.1	38.7		
1400	56.0	53.2	50.2	47.3	44.5	41.8
1600	64.0	61.1	58.3	55.6	52.7	49.5
1800	72.7	69.0	65.5	62.5	59.5	56.7
2000	81.8	77.5	73.5	69.7	66.0	62.8
2200		85.6	81.6	77.3	73.2	69.2
2400			88.1	84.8	80.4	75.9
2600					85.9	81.9
2800						85.3

Decrease field limit weight by 4350 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
1200				1200	1350	1470	1650	1770
1400			1170	1400	1560	1680	1860	1990
1600		1130	1370	1600	1760	1890	2070	2210
1800	1080	1320	1560	1800	1960	2100	2290	2430
2000	1260	1500	1750	2000	2170	2310	2500	2650
2200	1440	1690	1950	2200	2370	2520	2710	2870
2400	1620	1880	2140	2400	2570	2730	2920	3090
2600	1800	2060	2330	2600	2780	2940	3130	3310
2800	1980	2250	2520	2800	2980	3150	3340	3530
3000	2160	2440	2720	3000	3180	3360	3550	3750
3200	2340	2620	2910	3200	3390	3580	3760	3970
3400	2520	2810	3100	3400	3590	3790	3970	4190
3600	2700	3000	3300	3600	3790	4000	4180	4410
3800	2890	3180	3490	3800	4000	4210	4400	4630
4000	3070	3370	3680	4000	4200	4420	4610	4850
4200	3250	3560	3870	4200	4400	4630	4820	5070
4400	3430	3750	4070	4400	4610	4840	5030	5290
4600	3610	3930	4260	4600	4810	5050	5240	5510
4800	3790	4120	4450	4800	5020	5260	5450	5730
5000	3970	4310	4650	5000	5220	5470	5660	5950

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
2200	41.8	39.1				
2400	46.6	43.7	40.3			
2600	51.4	48.2	44.7	41.8	39.1	
2800	56.2	52.8	49.0	45.9	43.0	40.0
3000	60.9	57.3	53.3	50.0	46.8	43.7
3200	65.8	61.8	57.6	54.1	50.7	47.4
3400	71.2	66.5	61.9	58.2	54.6	51.1
3600	76.6	71.6	66.3	62.3	58.4	54.7
3800	82.2	76.8	71.2	66.5	62.3	58.4
4000	87.8	82.1	76.1	71.1	66.2	62.0
4200		87.4	81.1	75.7	70.6	65.7
4400			86.1	80.4	74.9	69.8
4600				85.1	79.4	73.9
4800					83.8	77.9
5000						82.0
5200						86.0

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
1200				1200	1280	1360	1440	1530
1400			1270	1400	1480	1570	1660	1750
1600	1220	1330	1460	1600	1690	1780	1870	1970
1800	1390	1510	1640	1800	1890	1990	2090	2190
2000	1570	1690	1830	2000	2100	2200	2300	2410
2200	1750	1870	2020	2200	2300	2410	2520	2630
2400	1920	2050	2210	2400	2510	2620	2740	2860
2600	2100	2230	2400	2600	2710	2830	2950	3080
2800	2280	2420	2590	2800	2920	3040	3170	3300
3000	2440	2600	2740	3000	3120	3250	3380	3520
3200	2530	2700	2900	3200	3330	3460	3600	
3400	2620	2790	3050	3400	3530			
3600	2710	2880	3200					
3800	2800	2980	3350					
4000	2890	3070	3510					
4200	2980	3160						
4400	3080	3250						
4600	3170	3350						
4800	3260	3440						
5000	3350							

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
1200	38.4					
1400	47.1	44.5	41.9	39.5		
1600	55.6	52.8	49.8	46.9	44.1	41.5
1800	62.6	59.8	57.1	54.4	51.2	48.2
2000	70.0	66.5	63.3	60.4	57.6	54.8
2200	77.8	73.8	70.0	66.4	63.2	60.1
2400	85.3	81.3	77.0	73.0	69.1	65.4
2600		87.5	84.0	79.6	75.4	71.3
2800				85.7	81.6	77.1
3000					86.0	82.1
3200						85.0
3400						88.0

Decrease field limit weight by 4350 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
1200				1200	1370	1500	1710	1840
1400				1400	1580	1710	1920	2060
1600			1340	1600	1780	1920	2130	2280
1800		1260	1530	1800	1980	2130	2340	2500
2000	1180	1450	1730	2000	2190	2340	2550	2720
2200	1360	1640	1920	2200	2390	2550	2760	2940
2400	1540	1820	2110	2400	2590	2760	2980	3160
2600	1720	2010	2310	2600	2800	2970	3190	3380
2800	1900	2200	2500	2800	3000	3180	3400	3600
3000	2080	2380	2690	3000	3200	3390	3610	3820
3200	2260	2570	2880	3200	3410	3610	3820	4040
3400	2440	2760	3080	3400	3610	3820	4030	4260
3600	2620	2940	3270	3600	3810	4030	4240	4480
3800	2800	3130	3460	3800	4020	4240	4450	4700
4000	2980	3320	3660	4000	4220	4450	4660	4920
4200	3160	3500	3850	4200	4420	4660	4880	5140
4400	3350	3690	4040	4400	4630	4870	5090	5360
4600	3530	3880	4230	4600	4830	5080	5300	5580
4800	3710	4060	4430	4800	5040	5290	5510	5800
5000	3890	4250	4620	5000	5240	5500	5720	6020

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
2400	39.0					
2600	43.2	40.5				
2800	47.4	44.5	41.1	38.4		
3000	51.6	48.4	44.9	42.0	39.2	
3200	55.7	52.4	48.6	45.6	42.6	39.7
3400	59.9	56.3	52.4	49.2	46.0	42.9
3600	64.1	60.3	56.2	52.7	49.4	46.1
3800	68.6	64.2	59.9	56.3	52.7	49.3
4000	73.3	68.5	63.6	59.8	56.1	52.5
4200	78.1	73.0	67.6	63.3	59.4	55.7
4400	82.9	77.5	71.9	67.0	62.8	58.8
4600	87.8	82.1	76.1	71.1	66.2	62.0
4800		86.7	80.5	75.1	70.0	65.2
5000			84.8	79.2	73.8	68.7
5200				83.3	77.6	72.3
5400				87.4	81.5	75.8
5600					85.4	79.3
5800						82.8
6000						86.4

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
50	122	66.4	61.4				
48	118	67.8	62.9				
46	115	69.0	64.4	59.4			
44	111	70.2	65.6	60.8			
42	108	71.5	66.8	62.2	57.1		
40	104	72.7	68.0	63.4	58.4		
38	100	74.0	69.1	64.5	59.7	54.4	
36	97	75.3	70.4	65.7	60.8	55.3	
34	93	76.7	71.7	66.9	61.9	56.3	51.5
32	90	78.1	72.9	68.0	62.9	57.3	52.7
30	86	79.4	74.0	68.8	63.8	58.3	53.7
28	82	79.5	75.0	69.6	64.6	59.2	54.5
26	79	79.5	75.9	70.3	65.2	60.1	55.5
24	75	79.6	75.9	70.9	65.7	60.9	56.0
22	72	79.7	76.0	71.4	66.1	61.3	56.6
20	68	79.7	76.0	71.4	66.7	61.7	57.1
18	64	79.8	76.1	71.5	67.1	62.1	57.3
16	61	79.9	76.1	71.5	67.1	62.5	57.8
14	57	79.9	76.2	71.6	67.2	62.9	58.1
12	54	80.0	76.2	71.6	67.2	62.9	58.4
10	50	80.0	76.3	71.6	67.2	62.9	58.8
-40	-40	80.6	76.8	72.1	67.7	63.3	59.3

With engine bleeds for packs off, increase weight by 1200 kg.
With engine anti-ice on, decrease weight by 300 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 5500 kg.

ENGINE INOP

ADVISORY INFORMATION

Go-Around Climb Gradient

Flaps 15

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	2.54					
50	3.21	2.15				
46	3.72	2.80	1.75			
42	4.23	3.27	2.35	1.29		
38	4.75	3.74	2.79	1.82	0.73	
34	5.27	4.25	3.26	2.25	1.11	0.19
30	5.82	4.71	3.65	2.62	1.52	0.60
26	5.85	5.07	3.94	2.90	1.87	0.94
22	5.88	5.09	4.16	3.09	2.11	1.16
18	5.90	5.11	4.17	3.27	2.27	1.33
14	5.92	5.12	4.18	3.28	2.41	1.47
10	5.95	5.14	4.20	3.29	2.42	1.61
6	5.97	5.16	4.21	3.30	2.44	1.62
2	5.99	5.17	4.22	3.31	2.45	1.63

Gradient Adjustment for Weight (%)

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)						
	0	1	2	3	4	5	6
80	-2.44	-2.78	-3.08	-3.35	-3.62	-3.88	-4.15
75	-1.98	-2.23	-2.47	-2.68	-2.90	-3.11	-3.32
70	-1.42	-1.60	-1.76	-1.92	-2.07	-2.23	-2.38
65	-0.76	-0.86	-0.95	-1.03	-1.12	-1.20	-1.28
60	0	0	0	0	0	0	0
55	0.90	1.00	1.10	1.21	1.31	1.41	1.52
50	2.01	2.23	2.45	2.67	2.90	3.13	3.37

Gradient Adjustment for Speed (%)

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)												
	0	1	2	3	4	5	6	7	8	9	10	11	12
VREF40	-0.25	-0.27	-0.29	-0.30	-0.31	-0.31	-0.30	-0.30	-0.30	-0.30	-0.29	-0.29	-0.27
VREF40+5	0	0	0	0	0	0	0	0	0	0	0	0	0
VREF40+10	0.15	0.14	0.14	0.14	0.13	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.11
VREF40+15	0.22	0.21	0.20	0.20	0.18	0.16	0.14	0.13	0.14	0.15	0.16	0.16	0.14
VREF40+20	0.24	0.22	0.21	0.19	0.17	0.13	0.10	0.09	0.09	0.10	0.11	0.09	0.05
VREF40+25	0.20	0.17	0.14	0.12	0.08	0.04	-0.01	-0.04	-0.04	-0.03	-0.03	-0.05	-0.11
VREF40+30	0.12	0.07	0.03	-0.02	-0.08	-0.14	-0.19	-0.22	-0.23	-0.23	-0.23	-0.25	-0.31

With engine bleed for packs off, increase gradient by 0.2%.
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 0.6%.

Quick Turnaround Limit Weight
Flaps 40

AIRPORT OAT (°C)	LIMIT WEIGHT (1000 KG)					
	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
54	79.6					
50	80.2	77.2				
45	80.9	77.8	74.8			
40	81.6	78.5	75.4	72.4		
35	82.3	79.2	76.1	73.1	70.1	
30	83.0	79.9	76.7	73.7	70.8	67.9
25	83.8	80.6	77.4	74.4	71.4	68.5
20	84.6	81.3	78.1	75.1	72.1	69.1
15	85.4	82.1	78.9	75.8	72.7	69.8
10	86.1	82.9	79.6	76.5	73.4	70.4
5	86.1	83.7	80.4	77.2	74.1	71.1
0	86.1	84.5	81.2	78.0	74.9	71.8
-5	86.1	85.4	82.0	78.8	75.6	72.5
-10	86.1	86.1	82.8	79.6	76.4	73.3
-15	86.1	86.1	83.7	80.4	77.2	74.0
-20	86.1	86.1	84.6	81.2	78.0	74.8
-30	86.1	86.1	86.1	83.0	79.7	76.4
-40	86.1	86.1	86.1	84.9	81.5	78.1
-50	86.1	86.1	86.1	86.1	83.4	79.9
-54	86.1	86.1	86.1	86.1	84.1	80.7

Increase weight by 700 kg per 1% uphill slope. Decrease weight by 1200 kg per 1% downhill slope. Increase weight by 1850 kg per 10 knots headwind. Decrease weight by 7750 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.

Intentionally
Blank

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	59.3	55.7	52.1	48.4	44.1	
52	126	60.4	56.3	53.0	49.2	44.9	
50	122	61.5	56.6	53.1	50.0	45.7	41.3
48	118	62.6	57.9	53.1	49.9	46.4	42.1
46	115	63.8	59.2	53.4	49.9	46.5	42.9
44	111	64.9	60.5	54.7	49.9	46.5	43.7
42	108	66.0	61.7	56.0	50.2	46.5	43.8
40	104	67.2	62.8	57.2	51.5	46.5	43.8
38	100	68.3	63.8	58.4	52.7	46.8	43.7
36	97	69.5	64.9	59.6	53.9	48.0	43.7
34	93	70.7	66.1	60.8	55.1	49.2	44.1
32	90	72.0	67.2	62.0	56.3	50.4	45.3
30	86	73.2	68.2	63.2	57.4	51.6	46.4
28	82	73.3	69.1	64.1	58.6	52.8	47.6
26	79	73.3	69.8	64.7	59.8	54.0	48.8
24	75	73.4	69.9	65.2	60.5	55.2	50.0
22	72	73.4	69.9	65.7	60.9	56.4	51.2
20	68	73.5	70.0	65.7	61.3	56.8	52.3
18	64	73.6	70.0	65.8	61.7	57.2	52.9
16	61	73.6	70.1	65.8	61.7	57.5	53.2
14	57	73.7	70.1	65.8	61.7	57.8	53.5
12	54	73.7	70.1	65.9	61.8	57.9	53.8
10	50	73.8	70.2	65.9	61.8	57.9	54.1

With engine bleeds for packs off, increase weight by 300 kg.
With engine anti-ice on, decrease weight by 250 kg.
With engine and wing anti-ice on, decrease weight by 1600 kg (optional system).

GEAR DOWN

Landing Climb Limit Weight

Valid for approach with Flaps 15 and landing with Flaps 30 or 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	-2000	0	2000	4000	6000	8000	10000
54	129	58.8	55.4					
52	126	59.9	56.8					
50	122	60.9	58.3	53.8				
48	118	62.1	59.4	55.2				
46	115	63.3	60.5	56.5	52.1			
44	111	64.4	61.5	57.5	53.3			
42	108	65.5	62.6	58.5	54.6	50.1		
40	104	66.6	63.7	59.5	55.6	51.2		
38	100	67.7	64.8	60.6	56.5	52.3	47.7	
36	97	68.8	65.9	61.6	57.5	53.3	48.5	
34	93	69.8	67.0	62.7	58.6	54.2	49.3	45.3
32	90	70.0	68.3	63.8	59.5	55.0	50.3	46.2
30	86	70.0	69.4	64.7	60.2	55.8	51.1	47.1
28	82	70.1	69.5	65.5	60.9	56.6	51.9	47.8
26	79	70.2	69.6	66.3	61.5	57.0	52.6	48.6
24	75	70.2	69.6	66.3	62.0	57.4	53.3	49.1
22	72	70.3	69.7	66.4	62.4	57.9	53.7	49.5
20	68	70.4	69.7	66.4	62.4	58.3	54.0	49.9
18	64	70.4	69.8	66.5	62.5	58.6	54.3	50.2
16	61	70.5	69.8	66.5	62.5	58.7	54.7	50.6
14	57	70.5	69.9	66.5	62.5	58.7	55.0	50.9
12	54	70.6	69.9	66.6	62.6	58.7	55.0	51.2
10	50	70.7	70.0	66.6	62.6	58.7	55.0	51.4
-40	-40	71.2	70.5	67.1	63.1	59.1	55.4	51.9

With engine bleed for packs off, increase weight by 1150 kg.
With engine anti-ice on, decrease weight by 200 kg.
With engine and wing anti-ice on, decrease weight by 1200 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 6200 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)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)										
	DISTANCE FROM BRAKE RELEASE (100 M)										
	25	30	35	40	45	50	55	60	65	70	75
5	72.2	76.1									
20	65.7	70.0	73.0	75.0							
40	60.4	64.7	67.9	70.4	72.3	73.7	74.8	75.7	76.4	77.1	
60	56.6	60.8	64.1	66.7	68.8	70.5	71.9	73.0	73.9	74.7	75.3
80	53.4	57.6	61.0	63.7	65.9	67.8	69.3	70.6	71.6	72.6	73.3
100	50.7	54.9	58.3	61.1	63.4	65.3	67.0	68.3	69.5	70.6	71.4
120	48.4	52.6	56.0	58.8	61.2	63.2	64.9	66.3	67.6	68.7	69.7
140	46.3	50.5	53.9	56.8	59.2	61.2	63.0	64.5	65.8	67.0	68.0
160	44.4	48.6	52.0	54.9	57.4	59.5	61.3	62.8	64.2	65.4	66.5
180	42.6	46.8	50.3	53.2	55.7	57.8	59.7	61.3	62.7	64.0	65.1
200		45.2	48.7	51.6	54.1	56.3	58.2	59.8	61.3	62.6	63.7
220		43.7	47.2	50.1	52.7	54.9	56.8	58.4	59.9	61.3	62.5
240		42.4	45.8	48.8	51.3	53.5	55.4	57.1	58.7	60.0	61.3
260			44.5	47.5	50.0	52.2	54.2	55.9	57.5	58.9	60.1
280			43.3	46.2	48.8	51.0	53.0	54.8	56.3	57.7	59.0
300			42.1	45.1	47.6	49.9	51.9	53.6	55.2	56.7	58.0

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)					
	30	40	50	60	70	80
30 & BELOW	0	0	0	0	0	0
32	-0.5	-0.7	-0.9	-1.1	-1.2	-1.4
34	-1.0	-1.4	-1.7	-2.1	-2.5	-2.9
36	-1.5	-2.1	-2.6	-3.2	-3.7	-4.3
38	-2.0	-2.7	-3.5	-4.2	-5.0	-5.7
40	-2.5	-3.4	-4.4	-5.3	-6.2	-7.2
42	-2.9	-4.1	-5.2	-6.3	-7.5	-8.6
44	-3.4	-4.7	-6.1	-7.4	-8.7	-10.0
46	-3.8	-5.4	-6.9	-8.4	-9.9	-11.5
48	-4.3	-6.0	-7.7	-9.5	-11.2	-12.9
50	-4.7	-6.7	-8.6	-10.5	-12.4	-14.4

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
Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)					
	30	40	50	60	70	80
S.L. & BELOW	0	0	0	0	0	0
1000	-1.5	-1.9	-2.2	-2.6	-3.0	-3.4
2000	-2.9	-3.7	-4.5	-5.2	-6.0	-6.7
3000	-4.0	-5.2	-6.4	-7.6	-8.8	-9.9
4000	-5.1	-6.7	-8.3	-9.9	-11.5	-13.2
5000	-5.6	-7.7	-9.8	-11.9	-14.0	-16.1
6000	-6.2	-8.8	-11.4	-13.9	-16.5	-19.1
7000	-6.8	-10.0	-13.1	-16.3	-19.4	-22.6
8000	-7.5	-11.2	-14.9	-18.6	-22.3	-26.0
9000	-7.8	-11.9	-16.1	-20.4	-24.6	-28.8
10000	-8.0	-12.7	-17.4	-22.1	-26.8	-31.5

Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)					
	30	40	50	60	70	80
15 TW	-10.1	-9.4	-8.8	-8.1	-7.5	-6.8
10 TW	-6.7	-6.3	-5.9	-5.4	-5.0	-4.6
5 TW	-3.4	-3.1	-2.9	-2.7	-2.5	-2.3
0	0	0	0	0	0	0
10 HW	1.0	0.8	0.7	0.6	0.4	0.2
20 HW	2.0	1.7	1.4	1.1	0.8	0.5
30 HW	3.0	2.6	2.2	1.8	1.4	1.0
40 HW	4.0	3.5	3.0	2.5	2.0	1.5

With engine bleed for packs off, increase weight by 200 kg.
With engine anti-ice on, decrease weight by 250 kg.
With engine and wing anti-ice on, decrease weight by 4300 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	14600	11500	8500
80	17400	14600	11700
75	20300	17600	14900
70	22800	20500	17800
65	25400	23500	20900
60	27800	26300	24400
55	30200	29000	27300
50	32300	31300	30100
45	34500	33500	32400
40	36900	36000	34900

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	186	174	163	153	145
509	449	399	359	327	300	279	260	244	229	217
676	598	531	479	437	400	372	347	325	306	289
842	745	663	598	546	500	465	434	407	383	362
1007	892	794	717	654	600	559	521	488	460	435
1170	1038	925	836	763	700	652	609	570	537	508
1333	1183	1055	954	872	800	745	696	652	614	581
1494	1328	1185	1072	980	900	839	784	734	691	654
1655	1472	1315	1190	1089	1000	932	871	817	769	728
1815	1615	1444	1308	1197	1100	1025	958	899	847	802
1973	1758	1573	1426	1305	1200	1119	1046	981	925	876
2131	1900	1701	1543	1413	1300	1212	1134	1064	1003	950
2288	2041	1829	1660	1521	1400	1306	1221	1146	1081	1025
2444	2182	1957	1777	1629	1500	1400	1309	1229	1159	1099
2599	2323	2084	1894	1737	1600	1493	1397	1312	1238	1174
2753	2462	2211	2011	1845	1700	1587	1486	1395	1316	1248
2907	2602	2338	2127	1953	1800	1681	1574	1479	1395	1323
3059	2740	2465	2243	2060	1900	1775	1663	1562	1474	1398
3211	2878	2591	2359	2168	2000	1869	1751	1646	1553	1473

GEAR DOWN

Long Range Cruise Trip Fuel and Time

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	2.6	0:53	2.5	0:51	2.3	0:49	2.3	0:48	2.3	0:47
300	3.9	1:18	3.7	1:14	3.4	1:10	3.3	1:07	3.2	1:05
400	5.1	1:42	4.8	1:37	4.4	1:31	4.2	1:27	4.1	1:24
500	6.4	2:06	6.0	2:00	5.5	1:52	5.2	1:47	5.1	1:43
600	7.7	2:29	7.2	2:22	6.6	2:12	6.3	2:06	6.0	2:01
700	9.0	2:52	8.5	2:44	7.7	2:32	7.3	2:25	7.0	2:19
800	10.3	3:15	9.7	3:06	8.8	2:53	8.3	2:44	8.0	2:37
900	11.7	3:39	10.9	3:28	9.9	3:13	9.4	3:03	9.0	2:55
1000	13.0	4:02	12.1	3:50	11.0	3:33	10.4	3:22	10.0	3:14
1100	14.4	4:24	13.4	4:11	12.2	3:52	11.5	3:41		
1200	15.8	4:46	14.7	4:32	13.3	4:12	12.6	3:59		
1300	17.2	5:08	16.0	4:53	14.5	4:31	13.7	4:18		
1400	18.6	5:30	17.3	5:14	15.7	4:51	14.8	4:36		
1500	20.0	5:52	18.6	5:35	16.8	5:10	15.8	4:54		
1600	21.4	6:13	20.0	5:55	18.1	5:29	17.0	5:12		
1700	22.9	6:34	21.4	6:15	19.3	5:47	18.2	5:30		
1800	24.4	6:55	22.8	6:35	20.5	6:06	19.3	5:48		
1900	25.9	7:16	24.2	6:55	21.8	6:25	20.5	6:06		
2000	27.3	7:37	25.5	7:15	23.0	6:43	21.7	6:24		

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	-0.4	-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	1.9
10	-1.0	-0.5	0.0	0.6	1.2	1.8	2.3
12	-1.2	-0.6	0.0	0.7	1.4	2.1	2.8
14	-1.4	-0.7	0.0	0.8	1.6	2.4	3.3
16	-1.5	-0.8	0.0	0.9	1.8	2.8	3.7
18	-1.7	-0.9	0.0	1.0	2.1	3.1	4.2
20	-1.9	-1.0	0.0	1.1	2.3	3.5	4.6
22	-2.1	-1.1	0.0	1.3	2.5	3.8	5.1
24	-2.3	-1.2	0.0	1.4	2.7	4.1	5.6
26	-2.5	-1.2	0.0	1.5	3.0	4.5	6.0
28	-2.7	-1.3	0.0	1.6	3.2	4.8	6.5

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

GEAR DOWN

Holding Planning
Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (LB/HR)							
	PRESSURE ALTITUDE (FT)							
	1500	5000	10000	15000	20000	25000	30000	35000
85	4580	4560	4550	4590	4670			
80	4330	4300	4290	4310	4350			
75	4080	4050	4030	4040	4060			
70	3840	3800	3770	3770	3780	3880		
65	3610	3560	3530	3520	3510	3560		
60	3370	3320	3280	3260	3240	3260	3490	
55	3130	3080	3040	3010	2980	2990	3090	
50	2900	2850	2800	2760	2720	2720	2780	
45	2670	2620	2570	2530	2480	2460	2500	2640
40	2440	2390	2350	2300	2250	2220	2250	2290

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
20	43.4	42.2	40.9
18	46.8	45.2	43.6
16	50.1	48.3	46.5
14	53.1	51.5	49.8
12	56.5	54.6	52.5
10	59.9	57.9	55.2
8	63.6	61.3	58.5
6	67.4	64.7	61.6
4	70.9	68.0	64.7
2	74.3	71.1	67.8
0	77.5	74.2	70.9

Anti-Ice Adjustments

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)									
	PRESSURE ALTITUDE (1000 FT)									
	0	2	4	6	8	10	12	14	16	18
ENGINE ONLY	-1.2	-1.2	-1.3	-1.3	-1.3	-1.3	-1.3	-1.2	-1.2	-1.1
ENGINE AND WING*	-6.0	-5.9	-5.8	-5.6	-5.4	-5.2	-5.0	-4.9	-4.8	

***Optional System**

Intentionally
Blank

Performance Dispatch — Chapter PD
Text — Section 34

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 and Obstacle Limit Weights as determined from the tables shown. Tire and Brake Energy Limits are not shown as they are not limiting for the range of conditions shown in this chapter.

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.

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

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.

Extended Operations - LRC Critical Fuel Reserves

ETOPS regulations require that flights conducted over a route that contains a point further than one hour's time at "normal one-engine-inoperative speed" from an adequate airport comply with rules specific to extended operations for airplanes with two or more engines. This section provides reserve fuel planning information for the "Critical Fuel Diversion Scenario".

ETOPS regulations require reserve planning to include a "Critical Fuel Diversion Scenario" calculation. The information shown is the fuel required to satisfy the flight profile as described below the charts. This information is shown for all engines operating and one engine inoperative at Long Range Cruise (LRC). There are two engine-inoperative scenarios, a decompression scenario and a driftdown scenario. The decompression scenario assumes an engine failure, loss of pressurization, emergency descent, and subsequent cruise at 10000 ft. The driftdown scenario assumes an engine failure without loss of pressurization, where the airplane "drifts down" to the thrust limited level-off altitude for the remainder of the diversion.

The ETOPS critical fuel required is the greater of the all-engine fuel or the engine-inoperative fuel. The ETOPS critical fuel required is compared to the amount of fuel that is predicted to be onboard the airplane at the critical point. If the fuel required by the ETOPS critical fuel reserves of the route exceeds the amount of fuel predicted, the fuel load must be adjusted accordingly. The data does not include an allowance for performance deterioration. However, regulations require a 5% allowance for performance deterioration, unless a value has been established by the operator for in-service deterioration.

To determine the ETOPS critical fuel required, enter the Ground to Air Mile Conversion table with the forecast wind (factored if applicable) and ground distance to the diversion airport from the critical point to obtain the air distance. Then enter the Critical Fuel table with air distance and expected weight at the critical point and read the required fuel. Apply the noted fuel adjustments for non-standard conditions, as necessary. When using a wind forecasting model acceptable to the FAA (such as the World Area Forecast System, WAFS), regulations allow the wind factor applied in this step to be 5% of the forecast wind (increase headwinds, decrease

tailwinds), as indicated in the note below the chart. However, if a FAA-acceptable wind forecasting model is not used, the ETOPS critical fuel must be increased by 5%, instead of factoring the forecast winds.

LRC Cruise/Driftdown Critical Fuel Reserves

Enter the Ground to Air Miles Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter the Critical Fuel table with air distance and expected weight at the critical point and read required fuel. Apply the noted fuel adjustments as necessary. Regulations require a 5% allowance for performance deterioration unless a value has been established by the operator for inservice deterioration.

As noted below each table, the fuel required is the greater of the two engine fuel and the single engine fuel. This fuel is compared to the amount of fuel normally onboard the airplane at that point in the route. If the fuel required by the critical fuel reserves exceeds the amount of fuel normally expected, the fuel load must be adjusted accordingly.

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 table with airport pressure altitude and OAT to read maximum quick turnaround weight. Apply the noted adjustments as required.

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, or ensure the brake temperature is within limits using the alternate procedure described on the page.

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.

Performance Dispatch — Chapter PD

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737-900 CFM56-7B26 LB FAA CATG

Takeoff Field Corrections - Dry Runway

Slope Corrections

FIELD LENGTH AVAILABLE (FT)	SLOPE CORRECTED FIELD LENGTH (FT)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
4200	4280	4260	4240	4220	4200	4150	4100	4050	4000
4600	4710	4680	4650	4630	4600	4520	4450	4370	4300
5000	5130	5100	5070	5030	5000	4900	4800	4700	4600
5400	5560	5520	5480	5440	5400	5270	5150	5020	4900
5800	5990	5940	5890	5850	5800	5650	5500	5350	5200
6200	6420	6370	6310	6260	6200	6030	5850	5680	5500
6600	6870	6800	6730	6670	6600	6400	6200	6000	5800
7000	7310	7230	7160	7080	7000	6780	6550	6330	6100
7400	7760	7670	7580	7490	7400	7150	6900	6650	6400
7800	8200	8100	8000	7900	7800	7530	7250	6980	6700
8200	8650	8540	8420	8310	8200	7900	7600	7300	7000
8600	9090	8970	8850	8720	8600	8280	7950	7630	7300
9000	9540	9400	9270	9130	9000	8650	8300	7950	7600
9400	9980	9840	9690	9550	9400	9030	8650	8280	7900
9800	10430	10270	10110	9960	9800	9400	9000	8600	8200
10200	10890	10710	10540	10370	10200	9780	9350	8930	8500
10600	11360	11170	10980	10790	10600	10150	9700	9250	8810
11000	11830	11620	11420	11210	11000	10530	10050	9580	9110
11400	12300	12080	11850	11630	11400	10900	10400	9900	9410
11800	12770	12530	12290	12040	11800	11280	10750	10230	9710

Wind Corrections

SLOPE CORR'D FIELD LENGTH (FT)	SLOPE & WIND CORRECTED FIELD LENGTH (FT)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
4200	3130	3490	3840	4200	4430	4670	4900	5140
4600	3460	3840	4220	4600	4840	5090	5340	5590
5000	3800	4200	4600	5000	5250	5510	5770	6040
5400	4130	4550	4980	5400	5670	5930	6210	6480
5800	4470	4910	5360	5800	6080	6360	6640	6930
6200	4800	5270	5730	6200	6490	6780	7080	7380
6600	5130	5620	6110	6600	6900	7200	7510	7820
7000	5470	5980	6490	7000	7310	7630	7950	8270
7400	5800	6340	6870	7400	7720	8050	8380	8720
7800	6140	6690	7250	7800	8130	8470	8820	9160
8200	6470	7050	7620	8200	8540	8890	9250	9610
8600	6810	7400	8000	8600	8960	9320	9680	10060
9000	7140	7760	8380	9000	9370	9740	10120	10500
9400	7470	8120	8760	9400	9780	10160	10550	10950
9800	7810	8470	9140	9800	10190	10590	10990	11400
10200	8140	8830	9510	10200	10600	11010	11420	11850
10600	8480	9180	9890	10600	11010	11430	11860	12290
11000	8810	9540	10270	11000	11420	11850	12290	12740
11400	9140	9900	10650	11400	11830	12280	12730	13190
11800	9480	10250	11030	11800	12250	12700	13160	13630

Takeoff Field & Climb Limit Weights - Dry Runway
Flaps 5
Sea Level Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	0	11	14	18	22	26	30	35	40	50
4000	123.5	115.5	113.4	112.8	112.0	111.2	110.5	109.7	106.5	103.4	97.1
4200	127.2	119.0	116.8	116.2	115.4	114.6	113.8	113.0	109.8	106.5	100.0
4600	134.4	125.8	123.4	122.8	122.0	121.1	120.3	119.5	116.1	112.7	105.9
5000	141.2	132.2	129.7	129.1	128.2	127.4	126.5	125.7	122.1	118.5	111.4
5400	147.6	138.2	135.6	135.0	134.1	133.2	132.3	131.4	127.6	123.9	116.5
5800	153.8	144.0	141.3	140.6	139.7	138.7	137.8	136.9	133.0	129.1	121.4
6200	159.7	149.5	146.8	146.0	145.0	144.1	143.1	142.1	138.1	134.1	126.0
6600	165.4	154.9	152.0	151.2	150.2	149.2	148.2	147.2	143.0	138.8	130.5
7000	170.9	160.0	157.0	156.2	155.2	154.1	153.1	152.1	147.7	143.4	134.8
7400	176.2	165.0	161.9	161.1	160.0	158.9	157.9	156.8	152.3	147.9	139.0
7800	181.3	169.7	166.5	165.7	164.6	163.5	162.4	161.3	156.7	152.1	142.9
8200	186.2	174.3	171.1	170.2	169.1	167.9	166.8	165.7	160.9	156.3	146.9
8600	189.9	178.7	175.4	174.5	173.3	172.2	171.1	169.9	165.0	160.3	150.6
9000	189.9	182.8	179.4	178.4	177.2	176.1	174.9	173.7	168.8	163.9	154.0
9400	189.9	186.3	182.9	181.9	180.7	179.5	178.3	177.1	172.1	167.1	157.0
9800	189.9	189.7	186.2	185.3	184.0	182.8	181.6	180.3	175.2	170.1	159.8
10200	189.9	189.9	189.3	188.3	187.1	185.8	184.6	183.3	178.1	172.9	162.4
10600	189.9	189.9	189.9	189.9	189.9	188.7	187.4	186.2	180.8	175.6	165.0
CLIMB LIMIT WT (1000 LB)	188.1	187.4	186.8	186.6	186.4	186.1	185.8	185.4	177.7	170.3	155.9

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	0	11	14	18	22	26	30	35	40	50
4000	116.9	108.9	106.9	106.3	105.6	104.9	104.3	102.4	99.5	96.4	90.4
4200	120.4	112.2	110.1	109.6	108.8	108.1	107.4	105.5	102.5	99.4	93.2
4600	127.2	118.6	116.5	115.9	115.1	114.4	113.6	111.6	108.5	105.2	98.7
5000	133.7	124.7	122.5	121.9	121.1	120.3	119.5	117.4	114.1	110.6	103.9
5400	139.8	130.4	128.0	127.4	126.6	125.8	124.9	122.8	119.3	115.7	108.6
5800	145.6	135.9	133.4	132.8	131.9	131.0	130.2	127.9	124.4	120.6	113.2
6200	151.2	141.1	138.5	137.8	136.9	136.1	135.2	132.8	129.1	125.2	117.5
6600	156.6	146.1	143.4	142.7	141.8	140.9	140.0	137.5	133.7	129.6	121.7
7000	161.8	150.9	148.2	147.4	146.5	145.5	144.6	142.1	138.1	133.9	125.7
7400	166.8	155.6	152.8	152.0	151.0	150.1	149.1	146.5	142.4	138.0	129.5
7800	171.6	160.1	157.2	156.4	155.4	154.3	153.3	150.7	146.4	142.0	133.3
8200	176.3	164.5	161.5	160.7	159.6	158.6	157.5	154.8	150.5	145.9	136.9
8600	180.8	168.7	165.6	164.8	163.7	162.6	161.6	158.7	154.3	149.6	140.4
9000	184.8	172.4	169.3	168.4	167.3	166.3	165.2	162.3	157.8	153.0	143.6
9400	188.5	175.8	172.6	171.7	170.6	169.5	168.4	165.5	160.8	155.9	146.4
9800	189.9	179.0	175.7	174.9	173.7	172.6	171.5	168.5	163.7	158.7	149.0
10200	189.9	182.0	178.6	177.8	176.6	175.4	174.3	171.2	166.5	161.4	151.4
10600	189.9	184.8	181.4	180.5	179.3	178.1	177.0	173.9	169.0	163.9	153.8
CLIMB LIMIT WT (1000 LB)	179.3	178.6	178.1	178.0	177.8	177.6	177.3	173.1	166.2	159.2	145.8

With engine bleed for packs off, increase field limit weight by 800 lb and climb limit weight by 3100 lb.
With engine anti-ice on, decrease field limit weight by 500 lb and climb limit weight by 600 lb.
With engine and wing anti-ice on (optional system), decrease field limit weight by 1900 lb and climb limit weight by 3200 lb.

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 5

4000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	0	11	14	18	22	26	30	35	40	50
4000	109.4	101.9	100.0	99.5	98.8	98.1	96.7	95.1	92.5	89.5	84.3
4200	112.7	105.0	103.1	102.6	101.8	101.1	99.7	98.0	95.3	92.3	86.9
4600	119.2	111.1	109.1	108.5	107.8	107.0	105.5	103.8	101.0	97.8	92.1
5000	125.3	116.9	114.7	114.1	113.4	112.6	111.0	109.2	106.2	102.9	97.0
5400	131.0	122.2	120.0	119.4	118.6	117.7	116.1	114.2	111.1	107.7	101.5
5800	136.5	127.3	125.0	124.4	123.5	122.7	121.0	119.0	115.8	112.2	105.7
6200	141.7	132.2	129.8	129.1	128.3	127.4	125.6	123.5	120.2	116.5	109.8
6600	146.8	136.9	134.4	133.7	132.8	131.9	130.0	127.9	124.4	120.6	113.6
7000	151.6	141.4	138.8	138.1	137.2	136.2	134.3	132.1	128.5	124.5	117.3
7400	156.3	145.8	143.1	142.4	141.4	140.5	138.5	136.2	132.5	128.4	121.0
7800	160.8	150.0	147.2	146.5	145.5	144.5	142.5	140.1	136.3	132.1	124.4
8200	165.2	154.1	151.3	150.5	149.5	148.4	146.4	143.9	140.1	135.7	127.9
8600	169.4	158.0	155.1	154.3	153.3	152.2	150.1	147.6	143.7	139.2	131.2
9000	173.2	161.6	158.6	157.8	156.7	155.7	153.5	150.9	146.9	142.3	134.1
9400	176.6	164.7	161.7	160.9	159.8	158.7	156.5	153.9	149.7	145.1	136.7
9800	179.8	167.7	164.6	163.8	162.7	161.5	159.3	156.6	152.4	147.7	139.1
10200	182.8	170.5	167.3	166.5	165.3	164.2	161.9	159.2	154.9	150.1	141.4
10600	185.6	173.1	169.9	169.1	167.9	166.8	164.4	161.7	157.3	152.4	143.6
CLIMB LIMIT WT (1000 LB)	168.6	167.9	167.5	167.4	167.2	167.0	164.5	161.0	155.2	148.5	136.5

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	0	11	14	18	22	26	30	35	40	50
4000	102.2	95.0	93.1	92.7	92.0	90.8	89.5	88.0	85.6	83.0	78.1
4200	105.3	97.9	96.0	95.5	94.9	93.6	92.3	90.8	88.3	85.6	80.6
4600	111.4	103.7	101.7	101.2	100.5	99.1	97.8	96.1	93.6	90.7	85.5
5000	117.1	109.1	107.0	106.4	105.7	104.3	102.9	101.2	98.5	95.5	90.1
5400	122.5	114.1	111.9	111.3	110.6	109.1	107.6	105.9	103.1	100.0	94.2
5800	127.6	118.9	116.6	116.0	115.2	113.7	112.2	110.3	107.4	104.2	98.2
6200	132.5	123.4	121.1	120.4	119.6	118.1	116.4	114.5	111.5	108.1	101.9
6600	137.2	127.7	125.3	124.7	123.8	122.2	120.5	118.5	115.4	111.9	105.5
7000	141.7	132.0	129.4	128.8	127.9	126.2	124.5	122.4	119.2	115.6	108.9
7400	146.1	136.1	133.5	132.8	131.9	130.1	128.4	126.2	122.9	119.1	112.3
7800	150.3	139.9	137.3	136.6	135.6	133.9	132.0	129.8	126.4	122.6	115.5
8200	154.4	143.8	141.1	140.3	139.4	137.6	135.7	133.4	129.9	125.9	118.7
8600	158.4	147.5	144.7	143.9	143.0	141.1	139.1	136.8	133.2	129.2	121.8
9000	161.9	150.8	147.9	147.2	146.2	144.3	142.3	139.9	136.2	132.1	124.5
9400	165.1	153.7	150.8	150.0	149.0	147.0	145.0	142.6	138.8	134.6	126.9
9800	168.1	156.5	153.5	152.7	151.7	149.7	147.6	145.2	141.3	137.0	129.2
10200	170.9	159.1	156.0	155.2	154.2	152.1	150.0	147.5	143.6	139.3	131.3
10600	173.5	161.5	158.4	157.6	156.5	154.5	152.4	149.8	145.9	141.4	133.3
CLIMB LIMIT WT (1000 LB)	158.1	157.5	157.2	157.1	156.9	154.8	152.5	149.3	143.6	137.3	126.7

With engine bleed for packs off, increase field limit weight by 800 lb and climb limit weight by 3100 lb.
With engine anti-ice on, decrease field limit weight by 500 lb and climb limit weight by 600 lb.
With engine and wing anti-ice on (optional system), decrease field limit weight by 1900 lb and climb limit weight by 3200 lb.

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 5

8000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	0	11	14	18	22	26	30	35	40	50
4000	95.2	88.4	86.7	86.3	85.2	84.1	82.8	81.1	78.5	76.1	71.6
4200	98.1	91.1	89.4	89.0	87.9	86.7	85.4	83.6	81.1	78.6	73.9
4600	103.8	96.5	94.7	94.3	93.1	91.9	90.5	88.7	86.0	83.3	78.5
5000	109.2	101.6	99.7	99.2	98.0	96.8	95.3	93.4	90.6	87.8	82.7
5400	114.3	106.3	104.3	103.8	102.6	101.3	99.7	97.7	94.8	91.9	86.6
5800	119.1	110.8	108.7	108.2	106.9	105.5	103.9	101.8	98.8	95.8	90.3
6200	123.6	115.0	112.9	112.3	110.9	109.5	107.9	105.7	102.5	99.4	93.7
6600	128.0	119.0	116.8	116.2	114.8	113.4	111.6	109.4	106.1	102.8	96.9
7000	132.2	122.9	120.7	120.1	118.6	117.1	115.3	113.0	109.5	106.2	100.1
7400	136.3	126.7	124.4	123.8	122.3	120.7	118.9	116.4	112.9	109.5	103.1
7800	140.2	130.4	128.0	127.3	125.8	124.2	122.2	119.8	116.2	112.6	106.1
8200	144.0	134.0	131.5	130.8	129.2	127.6	125.6	123.1	119.4	115.7	109.1
8600	147.7	137.4	134.9	134.2	132.6	130.9	128.9	126.3	122.5	118.7	111.9
9000	151.0	140.5	137.9	137.2	135.5	133.8	131.8	129.1	125.2	121.4	114.4
9400	154.0	143.2	140.6	139.9	138.2	136.4	134.3	131.6	127.6	123.7	116.6
9800	156.7	145.8	143.1	142.4	140.6	138.8	136.7	133.9	129.9	125.9	118.6
10200	159.3	148.2	145.4	144.7	142.9	141.1	138.9	136.1	132.0	128.0	120.6
10600	161.8	150.4	147.7	146.9	145.1	143.3	141.1	138.2	134.0	129.9	122.4
CLIMB LIMIT WT (1000 LB)	148.0	147.4	147.2	147.0	145.3	143.4	140.6	136.5	130.7	125.3	115.7

10000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	0	11	14	18	22	26	30	35	40	50
4000	88.6	82.3	80.7	79.9	78.8	77.8	76.5	74.8	72.4	69.9	65.2
4200	91.3	84.9	83.2	82.4	81.3	80.3	79.0	77.3	74.7	72.2	67.3
4600	96.7	90.0	88.2	87.4	86.3	85.1	83.8	82.0	79.3	76.7	71.6
5000	101.8	94.8	92.9	92.0	90.9	89.7	88.3	86.4	83.6	80.8	75.5
5400	106.5	99.2	97.2	96.3	95.1	93.8	92.4	90.4	87.5	84.6	79.0
5800	111.0	103.4	101.3	100.3	99.1	97.8	96.3	94.2	91.2	88.2	82.4
6200	115.2	107.3	105.2	104.2	102.8	101.5	100.0	97.8	94.6	91.5	85.5
6600	119.3	111.0	108.9	107.8	106.4	105.0	103.4	101.2	97.9	94.7	88.4
7000	123.2	114.7	112.4	111.3	109.9	108.5	106.8	104.5	101.1	97.8	91.3
7400	127.0	118.2	115.9	114.8	113.3	111.8	110.1	107.7	104.2	100.8	94.1
7800	130.6	121.6	119.2	118.0	116.5	115.0	113.3	110.8	107.2	103.7	96.8
8200	134.2	125.0	122.5	121.3	119.8	118.2	116.4	113.9	110.2	106.6	99.5
8600	137.7	128.2	125.7	124.5	122.9	121.3	119.4	116.8	113.1	109.3	102.1
9000	140.8	131.1	128.5	127.2	125.6	124.0	122.1	119.4	115.6	111.8	104.4
9400	143.5	133.6	131.0	129.7	128.0	126.4	124.4	121.7	117.8	113.9	106.3
9800	146.1	136.0	133.3	132.0	130.3	128.6	126.6	123.8	119.8	115.9	108.2
10200	148.5	138.2	135.5	134.1	132.4	130.7	128.7	125.9	121.8	117.8	109.9
10600	150.8	140.3	137.6	136.2	134.5	132.7	130.7	127.8	123.7	119.6	111.6
CLIMB LIMIT WT (1000 LB)	138.8	137.9	137.2	136.0	134.3	132.4	129.7	125.8	120.3	115.1	104.9

With engine bleed for packs off, increase field limit weight by 800 lb and climb limit weight by 3100 lb.
With engine anti-ice on, decrease field limit weight by 500 lb and climb limit weight by 600 lb.
With engine and wing anti-ice on (optional system), decrease field limit weight by 1900 lb and climb limit weight by 3200 lb.

Takeoff Field Corrections - Wet Runway

Slope Corrections

FIELD LENGTH AVAILABLE (FT)	SLOPE CORRECTED FIELD LENGTH (FT)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
4200	4330	4300	4260	4230	4200	4160	4110	4070	4020
4600	4770	4730	4690	4640	4600	4540	4480	4420	4360
5000	5210	5160	5110	5050	5000	4930	4850	4780	4700
5400	5660	5590	5530	5460	5400	5310	5220	5130	5040
5800	6100	6030	5950	5880	5800	5700	5590	5490	5380
6200	6540	6460	6370	6290	6200	6080	5960	5840	5720
6600	6990	6890	6790	6700	6600	6470	6330	6200	6060
7000	7430	7320	7210	7110	7000	6850	6700	6550	6400
7400	7870	7750	7640	7520	7400	7240	7070	6910	6740
7800	8310	8190	8060	7930	7800	7620	7440	7260	7080
8200	8760	8620	8480	8340	8200	8010	7810	7620	7420
8600	9200	9050	8900	8750	8600	8390	8180	7970	7760
9000	9640	9480	9320	9160	9000	8780	8550	8330	8100
9400	10090	9910	9740	9570	9400	9160	8920	8680	8440
9800	10530	10350	10160	9980	9800	9550	9290	9040	8780
10200	11000	10800	10600	10400	10200	9930	9660	9390	9120
10600	11500	11270	11050	10820	10600	10320	10030	9750	9460
11000	11990	11740	11500	11250	11000	10700	10400	10100	9800
11400	12490	12220	11940	11670	11400	11090	10770	10460	10140
11800	12990	12690	12390	12100	11800	11470	11140	10810	10480

Wind Corrections

SLOPE CORR'D FIELD LENGTH (FT)	SLOPE & WIND CORRECTED FIELD LENGTH (FT)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
4200	3050	3430	3820	4200	4460	4730	5000	5280
4600	3390	3790	4200	4600	4870	5160	5440	5740
5000	3730	4150	4580	5000	5290	5580	5890	6190
5400	4070	4520	4960	5400	5700	6010	6330	6650
5800	4410	4880	5340	5800	6120	6440	6770	7110
6200	4750	5240	5720	6200	6530	6870	7220	7570
6600	5100	5600	6100	6600	6940	7300	7660	8030
7000	5440	5960	6480	7000	7360	7730	8100	8490
7400	5780	6320	6860	7400	7770	8150	8550	8950
7800	6120	6680	7240	7800	8190	8580	8990	9410
8200	6460	7040	7620	8200	8600	9010	9430	9870
8600	6800	7400	8000	8600	9010	9440	9880	10320
9000	7140	7760	8380	9000	9430	9870	10320	10780
9400	7480	8120	8760	9400	9840	10300	10760	11240
9800	7820	8480	9140	9800	10260	10720	11210	11700
10200	8160	8840	9520	10200	10670	11150	11650	12160
10600	8500	9200	9900	10600	11080	11580	12090	12620
11000	8840	9560	10280	11000	11500	12010	12540	13080
11400	9180	9920	10660	11400	11910	12440	12980	13540
11800	9520	10280	11040	11800	12330	12870	13420	14000

Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 5

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	0	11	14	18	22	26	30	35	40	50
4000	124.0	115.5	113.2	112.6	111.8	111.0	110.2	109.4	106.1	103.0	96.8
4200	127.6	118.8	116.4	115.8	114.9	114.1	113.3	112.5	109.2	105.9	99.5
4600	134.6	125.3	122.8	122.1	121.2	120.3	119.5	118.6	115.1	111.6	104.8
5000	141.2	131.4	128.8	128.1	127.1	126.2	125.3	124.4	120.7	117.0	109.9
5400	147.5	137.2	134.5	133.7	132.7	131.8	130.8	129.9	126.0	122.2	114.7
5800	153.5	142.8	139.9	139.1	138.1	137.1	136.1	135.1	131.1	127.1	119.3
6200	159.1	148.0	145.0	144.2	143.2	142.1	141.1	140.1	135.9	131.7	123.6
6600	164.6	153.1	150.0	149.1	148.0	147.0	145.9	144.8	140.5	136.2	127.8
7000	169.9	157.9	154.7	153.9	152.8	151.6	150.6	149.4	144.9	140.5	131.8
7400	175.0	162.7	159.4	158.5	157.3	156.2	155.1	153.9	149.3	144.7	135.8
7800	179.9	167.3	163.9	163.0	161.8	160.6	159.4	158.2	153.4	148.7	139.5
8200	184.8	171.7	168.2	167.3	166.1	164.9	163.7	162.4	157.5	152.7	143.2
8600	189.4	176.0	172.4	171.5	170.2	169.0	167.7	166.5	161.4	156.5	146.7
9000	189.9	180.0	176.3	175.3	174.0	172.8	171.5	170.2	165.0	160.0	150.0
9400	189.9	183.7	180.0	179.0	177.6	176.3	175.0	173.7	168.4	163.2	153.0
9800	189.9	187.4	183.5	182.5	181.1	179.8	178.5	177.2	171.7	166.4	156.0
10200	189.9	189.9	187.0	185.9	184.5	183.2	181.8	180.5	174.9	169.5	158.8
10600	189.9	189.9	189.9	189.2	187.8	186.4	185.1	183.7	178.0	172.4	161.6
CLIMB LIMIT WT (1000 LB)	188.1	187.4	186.8	186.6	186.4	186.1	185.8	185.4	177.7	170.3	155.9

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	0	11	14	18	22	26	30	35	40	50
4000	117.0	108.6	106.5	105.9	105.2	104.4	103.7	101.8	98.9	96.0	90.3
4200	120.4	111.7	109.5	108.9	108.1	107.4	106.6	104.7	101.7	98.7	92.8
4600	127.0	117.8	115.4	114.8	114.0	113.2	112.4	110.4	107.2	104.0	97.7
5000	133.2	123.5	121.1	120.4	119.6	118.7	117.9	115.7	112.4	109.0	102.5
5400	139.1	128.9	126.4	125.7	124.8	123.9	123.1	120.8	117.3	113.8	106.9
5800	144.7	134.1	131.5	130.8	129.8	128.9	128.0	125.7	122.0	118.3	111.2
6200	150.0	139.1	136.3	135.6	134.6	133.6	132.7	130.2	126.5	122.6	115.2
6600	155.1	143.8	140.9	140.1	139.1	138.2	137.2	134.6	130.7	126.7	119.1
7000	160.1	148.4	145.4	144.6	143.6	142.5	141.5	138.9	134.9	130.7	122.8
7400	164.9	152.8	149.7	148.9	147.9	146.8	145.8	143.1	138.9	134.6	126.5
7800	169.6	157.1	153.9	153.1	152.0	150.9	149.8	147.1	142.8	138.4	130.0
8200	174.1	161.3	158.0	157.2	156.0	154.9	153.8	151.0	146.5	142.0	133.4
8600	178.4	165.3	161.9	161.1	159.9	158.8	157.6	154.7	150.2	145.5	136.6
9000	182.5	169.0	165.6	164.7	163.5	162.3	161.2	158.1	153.5	148.8	139.7
9400	186.3	172.5	169.0	168.0	166.8	165.6	164.5	161.4	156.6	151.8	142.4
9800	189.9	175.9	172.3	171.3	170.1	168.9	167.7	164.5	159.6	154.7	145.1
10200	189.9	179.1	175.5	174.5	173.2	172.0	170.8	167.5	162.6	157.5	147.8
10600	189.9	182.3	178.6	177.6	176.3	175.0	173.8	170.5	165.4	160.2	150.3
CLIMB LIMIT WT (1000 LB)	179.3	178.6	178.1	178.0	177.8	177.6	177.3	173.1	166.2	159.2	145.8

With engine bleed for packs off, increase field limit weight by 800 lb and climb limit weight by 3100 lb.
With engine anti-ice on, decrease field limit weight by 400 lb and climb limit weight by 600 lb.
With engine and wing anti-ice on (optional system), decrease field limit weight by 1700 lb and climb limit weight by 3200 lb.

Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 5

4000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	0	11	14	18	22	26	30	35	40	50
4000	109.3	101.4	99.4	98.9	98.2	97.6	96.2	94.6	92.1	89.4	84.4
4200	112.4	104.3	102.2	101.7	101.0	100.3	98.9	97.3	94.7	91.9	86.8
4600	118.5	109.9	107.7	107.2	106.4	105.7	104.2	102.5	99.8	96.8	91.4
5000	124.3	115.2	113.0	112.4	111.6	110.8	109.3	107.5	104.6	101.5	95.7
5400	129.8	120.3	117.9	117.3	116.5	115.7	114.1	112.2	109.2	105.9	99.9
5800	135.0	125.1	122.7	122.0	121.1	120.3	118.6	116.6	113.5	110.1	103.9
6200	140.0	129.7	127.1	126.5	125.6	124.7	122.9	120.9	117.6	114.1	107.6
6600	144.7	134.1	131.4	130.7	129.8	128.9	127.1	124.9	121.6	117.9	111.2
7000	149.3	138.3	135.6	134.8	133.9	133.0	131.1	128.9	125.4	121.6	114.7
7400	153.8	142.5	139.6	138.9	137.9	136.9	135.0	132.7	129.1	125.2	118.0
7800	158.1	146.4	143.5	142.7	141.7	140.7	138.7	136.4	132.7	128.7	121.3
8200	162.4	150.3	147.3	146.5	145.5	144.5	142.4	140.0	136.2	132.1	124.5
8600	166.4	154.0	150.9	150.1	149.1	148.0	145.9	143.5	139.6	135.3	127.5
9000	170.1	157.5	154.3	153.5	152.4	151.3	149.2	146.6	142.6	138.3	130.3
9400	173.6	160.7	157.4	156.6	155.5	154.4	152.2	149.6	145.5	141.0	132.9
9800	177.0	163.8	160.5	159.6	158.5	157.3	155.1	152.4	148.3	143.7	135.4
10200	180.3	166.8	163.4	162.5	161.4	160.2	157.9	155.2	150.9	146.3	137.8
10600	183.5	169.7	166.3	165.4	164.2	163.0	160.7	157.9	153.5	148.8	140.1
CLIMB LIMIT WT (1000 LB)	168.6	167.9	167.5	167.4	167.2	167.0	164.5	161.0	155.2	148.5	136.5

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	0	11	14	18	22	26	30	35	40	50
4000	101.9	94.6	92.8	92.3	91.7	90.5	89.3	87.9	85.6	83.1	78.6
4200	104.8	97.2	95.4	94.9	94.2	93.0	91.8	90.3	88.0	85.4	80.8
4600	110.4	102.4	100.4	99.9	99.2	98.0	96.7	95.1	92.6	89.9	85.0
5000	115.8	107.4	105.3	104.8	104.0	102.7	101.3	99.7	97.1	94.2	89.1
5400	120.9	112.1	109.9	109.3	108.6	107.2	105.8	104.0	101.3	98.3	92.9
5800	125.7	116.6	114.3	113.7	112.9	111.5	110.0	108.2	105.3	102.2	96.6
6200	130.3	120.8	118.4	117.8	117.0	115.5	114.0	112.1	109.1	105.9	100.0
6600	134.7	124.9	122.4	121.8	120.9	119.4	117.8	115.8	112.8	109.4	103.3
7000	139.0	128.8	126.3	125.6	124.7	123.1	121.5	119.5	116.3	112.8	106.5
7400	143.2	132.6	130.0	129.3	128.4	126.8	125.1	123.0	119.7	116.1	109.7
7800	147.2	136.3	133.6	132.9	132.0	130.3	128.5	126.4	123.0	119.3	112.7
8200	151.1	139.9	137.2	136.4	135.5	133.7	131.9	129.7	126.3	122.5	115.6
8600	154.8	143.4	140.5	139.8	138.8	137.0	135.1	132.9	129.4	125.4	118.4
9000	158.3	146.5	143.6	142.9	141.8	140.0	138.1	135.8	132.2	128.2	121.0
9400	161.5	149.5	146.5	145.7	144.7	142.8	140.9	138.5	134.8	130.7	123.3
9800	164.6	152.4	149.3	148.5	147.4	145.5	143.5	141.1	137.3	133.1	125.6
10200	167.6	155.1	152.0	151.2	150.1	148.1	146.1	143.6	139.8	135.5	127.8
10600	170.6	157.8	154.6	153.8	152.7	150.7	148.6	146.1	142.2	137.8	129.9
CLIMB LIMIT WT (1000 LB)	158.1	157.5	157.2	157.1	156.9	154.8	152.5	149.3	143.6	137.3	126.7

With engine bleed for packs off, increase field limit weight by 800 lb and climb limit weight by 3100 lb.
With engine anti-ice on, decrease field limit weight by 400 lb and climb limit weight by 600 lb.
With engine and wing anti-ice on (optional system), decrease field limit weight by 1700 lb and climb limit weight by 3200 lb.

Takeoff Field & Climb Limit Weights - Wet Runway
Flaps 5
8000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	0	11	14	18	22	26	30	35	40	50
4000	95.0	88.3	86.6	86.2	85.2	84.1	82.8	81.2	78.8	76.6	72.5
4200	97.7	90.7	89.0	88.6	87.5	86.4	85.1	83.4	81.0	78.7	74.5
4600	102.9	95.5	93.7	93.3	92.1	91.0	89.6	87.8	85.2	82.8	78.3
5000	107.9	100.1	98.2	97.7	96.6	95.3	93.9	92.0	89.3	86.7	82.0
5400	112.6	104.5	102.5	102.0	100.8	99.5	97.9	96.0	93.1	90.5	85.6
5800	117.1	108.7	106.6	106.1	104.8	103.4	101.8	99.8	96.8	94.0	88.9
6200	121.3	112.6	110.5	109.9	108.5	107.2	105.5	103.4	100.3	97.4	92.1
6600	125.4	116.3	114.1	113.5	112.2	110.7	109.0	106.8	103.6	100.6	95.1
7000	129.4	120.0	117.7	117.1	115.7	114.2	112.4	110.1	106.8	103.7	98.0
7400	133.2	123.6	121.2	120.6	119.1	117.6	115.7	113.4	110.0	106.8	100.9
7800	136.9	127.0	124.5	123.9	122.4	120.8	118.9	116.5	113.0	109.7	103.7
8200	140.6	130.3	127.8	127.1	125.6	124.0	122.0	119.5	115.9	112.6	106.4
8600	144.0	133.5	130.9	130.3	128.6	127.0	125.0	122.5	118.8	115.3	108.9
9000	147.2	136.4	133.8	133.1	131.4	129.7	127.7	125.1	121.3	117.8	111.2
9400	150.2	139.1	136.4	135.7	134.0	132.3	130.2	127.5	123.7	120.0	113.3
9800	153.0	141.8	139.0	138.3	136.6	134.8	132.6	129.9	125.9	122.2	115.4
10200	155.8	144.3	141.5	140.8	139.0	137.2	135.0	132.2	128.1	124.3	117.4
10600	158.5	146.8	143.9	143.1	141.3	139.5	137.3	134.4	130.3	126.4	119.3
CLIMB LIMIT WT (1000 LB)	148.0	147.4	147.2	147.0	145.3	143.4	140.6	136.5	130.7	125.3	115.7

10000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	0	11	14	18	22	26	30	35	40	50
4000	88.7	82.4	80.8	80.0	79.0	78.0	76.8	75.2	73.0	70.8	66.5
4200	91.2	84.7	83.0	82.2	81.2	80.1	78.9	77.3	75.0	72.7	68.3
4600	96.0	89.1	87.4	86.5	85.4	84.3	83.0	81.3	78.9	76.5	71.8
5000	100.7	93.4	91.5	90.6	89.5	88.3	87.0	85.1	82.6	80.1	75.1
5400	105.0	97.5	95.5	94.6	93.4	92.1	90.7	88.8	86.1	83.5	78.3
5800	109.2	101.3	99.3	98.3	97.1	95.8	94.3	92.3	89.5	86.8	81.4
6200	113.2	105.0	102.8	101.8	100.5	99.2	97.7	95.6	92.7	89.9	84.3
6600	117.0	108.4	106.2	105.2	103.9	102.5	100.9	98.8	95.8	92.8	87.0
7000	120.6	111.8	109.6	108.5	107.1	105.7	104.0	101.8	98.7	95.6	89.7
7400	124.2	115.1	112.8	111.7	110.2	108.8	107.1	104.8	101.6	98.4	92.3
7800	127.6	118.3	115.9	114.7	113.3	111.8	110.0	107.7	104.4	101.1	94.8
8200	131.0	121.4	118.9	117.7	116.2	114.7	112.9	110.5	107.1	103.7	97.2
8600	134.2	124.3	121.8	120.6	119.0	117.5	115.6	113.1	109.6	106.2	99.5
9000	137.2	127.0	124.4	123.2	121.6	120.0	118.1	115.5	112.0	108.5	101.6
9400	139.9	129.5	126.9	125.6	124.0	122.3	120.4	117.8	114.1	110.5	103.5
9800	142.5	131.9	129.2	127.9	126.3	124.6	122.6	119.9	116.2	112.5	105.3
10200	145.1	134.3	131.5	130.2	128.5	126.7	124.7	122.0	118.2	114.4	107.1
10600	147.6	136.5	133.7	132.3	130.6	128.8	126.8	124.0	120.1	116.3	108.8
CLIMB LIMIT WT (1000 LB)	138.8	137.9	137.2	136.0	134.3	132.4	129.7	125.8	120.3	115.1	104.9

With engine bleed for packs off, increase field limit weight by 800 lb and climb limit weight by 3100 lb.
With engine anti-ice on, decrease field limit weight by 400 lb and climb limit weight by 600 lb.
With engine and wing anti-ice on (optional system), decrease field limit weight by 1700 lb and climb limit weight by 3200 lb.

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 LB)

OBSTACLE HEIGHT (FT)	DISTANCE FROM BRAKE RELEASE (1000 FT)								
	8	10	12	14	16	18	20	22	24
10	157.5	175.5	188.6						
50	147.5	163.9	176.8	186.3					
100	138.4	153.9	166.1	175.5	182.9	187.9			
150	131.4	146.1	158.0	167.3	174.7	180.7	185.3	188.6	
200	125.4	139.7	151.3	160.6	168.1	174.2	179.2	183.2	186.5
250	120.2	134.2	145.5	154.8	162.4	168.6	173.8	178.1	181.7
300	115.6	129.3	140.4	149.6	157.3	163.6	168.9	173.4	177.2
350	111.4	124.9	135.8	145.0	152.7	159.1	164.6	169.2	173.1
400	107.5	120.8	131.7	140.8	148.5	155.0	160.5	165.3	169.3
450	103.9	117.2	127.9	136.9	144.6	151.2	156.8	161.6	165.8
500	100.6	113.7	124.4	133.4	141.0	147.6	153.3	158.2	162.5
550	97.5	110.6	121.2	130.1	137.7	144.3	150.0	155.0	159.3
600	94.6	107.6	118.1	127.0	134.6	141.1	146.9	151.9	156.3
650	91.9	104.7	115.2	124.1	131.6	138.2	144.0	149.0	153.5
700		102.1	112.5	121.3	128.9	135.4	141.2	146.3	150.8
750		99.5	109.9	118.7	126.2	132.8	138.6	143.7	148.3
800		97.2	107.5	116.2	123.7	130.3	136.1	141.2	145.8
850		94.9	105.2	113.9	121.3	127.9	133.7	138.8	143.4
900		92.7	102.9	111.6	119.1	125.6	131.4	136.6	141.2
950		90.7	100.8	109.4	116.9	123.4	129.2	134.4	139.0
1000			98.8	107.4	114.8	121.3	127.1	132.3	136.9

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 LB)					
	90	110	130	150	170	190
30 & BELOW	0	0	0	0	0	0
32	-1.3	-1.7	-2.0	-2.3	-2.7	-3.0
34	-2.6	-3.3	-4.0	-4.7	-5.4	-6.0
36	-4.0	-5.0	-6.0	-7.0	-8.0	-9.1
38	-5.3	-6.6	-8.0	-9.4	-10.7	-12.1
40	-6.5	-8.2	-9.9	-11.6	-13.3	-14.9
42	-7.7	-9.8	-11.8	-13.8	-15.8	-17.8
44	-9.0	-11.3	-13.6	-16.0	-18.3	-20.7
46	-10.2	-12.9	-15.5	-18.2	-20.8	-23.5
48	-11.4	-14.4	-17.4	-20.4	-23.4	-26.3
50	-12.7	-16.0	-19.3	-22.6	-25.9	-29.2

Takeoff Obstacle Limit Weight
Flaps 5
Sea Level 30°C & Below, Zero Wind
Based on engine bleed for packs on and anti-ice off
Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 LB)					
	90	110	130	150	170	190
S.L.& BELOW	0	0	0	0	0	0
1000	-3.3	-4.0	-4.6	-5.3	-6.0	-6.7
2000	-6.5	-7.9	-9.3	-10.6	-12.0	-13.4
3000	-9.6	-11.6	-13.7	-15.7	-17.8	-19.8
4000	-12.6	-15.3	-18.1	-20.8	-23.5	-26.2
5000	-15.5	-18.8	-22.2	-25.6	-29.0	-32.3
6000	-18.3	-22.4	-26.4	-30.4	-34.4	-38.4
7000	-20.9	-25.6	-30.3	-35.1	-39.8	-44.5
8000	-23.4	-28.9	-34.3	-39.8	-45.2	-50.6
9000	-26.0	-32.0	-38.0	-44.0	-50.1	-56.1
10000	-28.5	-35.1	-41.7	-48.3	-54.9	-61.5

Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 LB)					
	90	110	130	150	170	190
15 TW	-19.2	-18.8	-18.3	-17.9	-17.4	-16.9
10 TW	-12.8	-12.5	-12.2	-11.9	-11.6	-11.3
5 TW	-6.4	-6.3	-6.1	-6.0	-5.8	-5.6
0	0	0	0	0	0	0
10 HW	2.3	2.1	1.9	1.7	1.5	1.3
20 HW	4.5	4.1	3.8	3.4	3.0	2.6
30 HW	7.0	6.5	5.9	5.3	4.7	4.1
40 HW	9.5	8.8	8.0	7.2	6.4	5.6

With engine bleed for packs off, increase weight by 1400 lb.
With engine anti-ice on, decrease weight by 700 lb.
With engine and wing anti-ice on, decrease weight by 3300 lb (optional system).

Tire Speed Limit Weight

Flaps 5 Limit Weight (1000 LB)

OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
54	190.0	187.8	173.3	159.8	147.2	
52	190.0	189.0	174.5	160.9	148.2	
50	190.0	190.0	175.7	162.0	149.2	137.6
48	190.0	190.0	176.9	163.1	150.3	138.5
46	190.0	190.0	178.2	164.3	151.3	139.4
44	190.0	190.0	179.4	165.4	152.4	140.3
42	190.0	190.0	180.7	166.6	153.4	141.3
40	190.0	190.0	182.0	167.7	154.5	142.2
38	190.0	190.0	183.3	169.0	155.6	143.2
36	190.0	190.0	184.6	170.2	156.7	144.3
34	190.0	190.0	186.0	171.4	157.8	145.3
32	190.0	190.0	187.3	172.7	159.0	146.3
30	190.0	190.0	188.7	173.9	160.1	147.4
28	190.0	190.0	190.0	175.2	161.3	148.5
26	190.0	190.0	190.0	176.5	162.5	149.6
24	190.0	190.0	190.0	177.8	163.7	150.7
22	190.0	190.0	190.0	179.1	164.9	151.8
20	190.0	190.0	190.0	180.4	166.1	152.9
18	190.0	190.0	190.0	181.8	167.4	154.0
16	190.0	190.0	190.0	183.1	168.6	155.2
14	190.0	190.0	190.0	184.5	169.9	156.3
12	190.0	190.0	190.0	185.9	171.2	157.5
10	190.0	190.0	190.0	187.3	172.5	158.7
-40	190.0	190.0	190.0	190.0	190.0	190.0

Increase tire speed limit weight by 1200 lb per knot headwind.
Decrease tire speed limit weight by 2500 lb per knot tailwind.

Brake Energy Limits VMBE

Maximum Brake Energy Speed

OAT (°C)	REFERENCE VMBE (KIAS)						
	PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
54	181	174					
50	182	175	169				
46	183	176	170	164			
42	184	177	171	164	159		
38	184	178	171	165	159	153	
34	185	178	172	166	160	154	146
30	187	179	173	167	161	155	148
26	188	180	174	168	162	156	149
22	189	182	175	169	163	157	150
18	191	183	177	170	164	158	152
14	193	185	178	172	165	159	153
10	194	186	179	173	167	161	154
6	196	188	181	174	168	162	156
2	197	189	182	176	169	163	157
-2	199	191	184	177	171	164	158
-6	201	193	186	179	172	166	160
-10	203	194	187	180	174	167	161

Weight Adjusted VMBE

WEIGHT (1000 LB)	REFERENCE VMBE (KIAS)										
	160	165	170	175	180	185	190	195	200	205	210
190	139	144	148	152	156	160	164	168	172	176	181
180	143	147	151	156	160	164	169	173	177	182	186
170	147	152	156	161	165	170	174	179	183	188	192
160	152	157	161	166	171	175	180	185	190	194	199
150	157	162	167	172	177	182	187	192	197	201	206
140	163	169	174	179	184	189	194	199	204	209	210
130	170	176	181	186	192	197	202	208	210	210	210
120	178	184	190	195	201	206	210	210	210	210	210
110	188	194	200	206	210	210	210	210	210	210	210
100	199	205	210	210	210	210	210	210	210	210	210

Increase VMBE by 1 knot per 1% uphill runway slope. Decrease VMBE by 4 knots per 1% downhill runway slope.
Increase VMBE by 2 knots per 10 knots headwind. Decrease VMBE by 19 knots per 10 knots tailwind.
Decrease brake release weight by 1100 lb for each knot V1 exceeds VMBE.
Determine normal V1, VR, V2 speeds for lower brake release weight.

Performance Dispatch — Chapter PD
Enroute — Section 41

Long Range Cruise Maximum Operating Altitude
Max Cruise Thrust

ISA + 10°C and Below

WEIGHT (1000 LB)	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°)
190	30000	-5	31900*	31900*	31900*	31500	30100
180	31200	-7	33500*	33500*	33500*	32600	31300
170	32400	-10	35000*	35000*	35000*	33900	32500
160	33700	-13	36300*	36300*	36300*	35100	33800
150	35100	-16	37600*	37600*	37600*	36500	35100
140	36500	-18	38900*	38900*	38900*	37900	36600
130	38100	-18	40300*	40300*	40300*	39500	38100
120	39700	-18	41000	41000	41000	41000	39800
110	41000	-18	41000	41000	41000	41000	41000
100	41000	-18	41000	41000	41000	41000	41000
90	41000	-18	41000	41000	41000	41000	41000

ISA + 15°C

WEIGHT (1000 LB)	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°)
190	30000	1	29300*	29300*	29300*	29300*	29300*
180	31200	-2	31500*	31500*	31500*	31500*	31300
170	32400	-4	33600*	33600*	33600*	33600*	32500
160	33700	-7	35300*	35300*	35300*	35100	33800
150	35100	-10	36700*	36700*	36700*	36500	35100
140	36500	-13	38000*	38000*	38000*	37900	36600
130	38100	-13	39300*	39300*	39300*	39300*	38100
120	39700	-13	40700*	40700*	40700*	40700*	39800
110	41000	-13	41000	41000	41000	41000	41000
100	41000	-13	41000	41000	41000	41000	41000
90	41000	-13	41000	41000	41000	41000	41000

ISA + 20°C

WEIGHT (1000 LB)	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°)
190	30000	7	26000*	26000*	26000*	26000*	26000*
180	31200	4	28200*	28200*	28200*	28200*	28200*
170	32400	1	30600*	30600*	30600*	30600*	30600*
160	33700	-2	33200*	33200*	33200*	33200*	33200*
150	35100	-5	35200*	35200*	35200*	35200*	35100
140	36500	-7	36600*	36600*	36600*	36600*	36600
130	38100	-7	38000*	38000*	38000*	38000*	38000*
120	39700	-7	39400*	39400*	39400*	39400*	39400*
110	41000	-7	40900*	40900*	40900*	40900*	40900*
100	41000	-7	41000	41000	41000	41000	41000
90	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) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
276	257	240	225	212	200	190	181	173	165	158
544	508	475	447	423	400	381	364	348	333	320
810	758	711	670	633	600	572	547	523	502	482
1077	1008	946	892	844	800	763	730	699	670	645
1342	1258	1181	1114	1054	1000	955	913	874	839	807
1606	1506	1416	1336	1265	1200	1146	1096	1050	1008	969
1870	1754	1650	1557	1475	1400	1337	1279	1225	1176	1132
2133	2002	1883	1779	1685	1600	1528	1462	1401	1345	1295
2395	2249	2117	2000	1895	1800	1720	1645	1577	1514	1458
2657	2496	2350	2221	2105	2000	1911	1829	1753	1684	1621
2917	2741	2582	2441	2315	2200	2103	2012	1929	1853	1784
3177	2987	2814	2661	2525	2400	2294	2196	2106	2023	1948
3437	3232	3046	2882	2735	2600	2486	2380	2282	2193	2111
3696	3477	3278	3102	2944	2800	2677	2563	2458	2362	2275
3955	3721	3509	3322	3154	3000	2869	2747	2635	2532	2439
4213	3966	3741	3542	3363	3200	3061	2931	2812	2703	2603
4471	4210	3972	3762	3573	3400	3252	3115	2989	2873	2767
4729	4454	4203	3981	3782	3600	3444	3299	3166	3043	2931
4986	4697	4434	4201	3992	3800	3636	3483	3343	3213	3096
5243	4940	4665	4420	4201	4000	3828	3668	3520	3384	3260
5500	5183	4895	4640	4410	4200	4019	3852	3696	3554	3424
5756	5426	5126	4859	4620	4400	4211	4036	3873	3724	3589
6011	5669	5356	5079	4829	4600	4403	4220	4050	3895	3753
6267	5911	5586	5298	5038	4800	4595	4404	4227	4065	3918
6522	6153	5816	5517	5247	5000	4786	4588	4404	4236	4082

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 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	3.7	0:38	3.7	0:38	3.7	0:37	3.7	0:38	3.7	0:38
400	6.3	1:06	6.2	1:05	6.2	1:05	6.1	1:04	6.1	1:04
600	8.8	1:35	8.7	1:33	8.6	1:32	8.5	1:31	8.4	1:31
800	11.4	2:03	11.2	2:01	11.0	1:59	10.9	1:58	10.8	1:57
1000	14.1	2:31	13.8	2:28	13.5	2:26	13.3	2:25	13.2	2:24
1200	16.8	2:59	16.4	2:55	16.1	2:53	15.8	2:51	15.7	2:50
1400	19.5	3:26	19.1	3:22	18.6	3:20	18.3	3:18	18.3	3:17
1600	22.2	3:54	21.7	3:50	21.2	3:47	20.8	3:44	20.8	3:43
1800	24.9	4:21	24.3	4:17	23.8	4:13	23.3	4:11	23.3	4:09
2000	27.6	4:49	27.0	4:44	26.3	4:40	25.8	4:38	25.8	4:36
2200	30.5	5:15	29.7	5:10	29.0	5:06	28.5	5:04		
2400	33.3	5:42	32.5	5:37	31.8	5:33	31.3	5:30		
2600	36.2	6:09	35.3	6:03	34.5	5:59	34.0	5:57		
2800	39.0	6:36	38.1	6:30	37.2	6:25	36.7	6:23		
3000	41.9	7:03	40.9	6:56	39.9	6:52	39.4	6:49		
3200	44.9	7:29	43.8	7:23	42.9	7:18				
3400	47.9	7:56	46.8	7:49	45.8	7:44				
3600	51.0	8:22	49.7	8:15	48.7	8:10				
3800	54.0	8:48	52.7	8:41	51.7	8:36				
4000	57.0	9:15	55.6	9:07	54.6	9:02				
4200	60.2	9:40	58.8	9:33						
4400	63.4	10:06	62.0	9:59						
4600	66.6	10:32	65.2	10:25						
4800	69.8	10:58	68.3	10:51						
5000	73.1	11:24	71.5	11:17						

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	LANDING WEIGHT (1000 LB)				
	90	110	130	150	170
5	-0.8	-0.4	0.0	0.5	1.0
10	-1.6	-0.8	0.0	0.9	2.1
15	-2.4	-1.3	0.0	1.4	3.3
20	-3.2	-1.7	0.0	2.0	4.6
25	-4.0	-2.1	0.0	2.6	5.9
30	-4.8	-2.5	0.0	3.2	7.4
35	-5.6	-2.9	0.0	3.8	9.0
40	-6.4	-3.3	0.0	4.6	10.7
45	-7.2	-3.7	0.0	5.3	12.4
50	-8.0	-4.1	0.0	6.1	14.3
55	-8.8	-4.5	0.0	7.0	16.3
60	-9.6	-4.9	0.0	7.9	18.3
65	-10.4	-5.3	0.0	8.8	20.5
70	-11.2	-5.7	0.0	9.8	22.8
75	-12.0	-6.1	0.0	10.8	25.1
80	-12.8	-6.5	0.0	11.9	27.6

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
1317	1239	1169	1107	1051	1000	954	912	874	838	806
1832	1725	1631	1546	1469	1400	1337	1279	1227	1178	1133
2346	2212	2092	1985	1888	1800	1720	1647	1580	1518	1460
2859	2698	2553	2424	2306	2200	2103	2014	1933	1857	1788
3372	3183	3014	2862	2725	2600	2486	2382	2286	2197	2115
3885	3669	3475	3301	3143	3000	2869	2749	2639	2538	2443
4397	4154	3936	3739	3562	3400	3252	3117	2993	2878	2771
4909	4638	4396	4178	3980	3800	3636	3485	3346	3218	3100
5421	5123	4856	4616	4398	4200	4019	3853	3700	3559	3428
5932	5607	5316	5054	4816	4600	4402	4221	4054	3900	3757
6443	6091	5776	5492	5234	5000	4786	4589	4408	4240	4085

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 LB)							TIME (HRS:MIN)
	LANDING WEIGHT (1000 LB)							
	90	100	110	120	130	140	150	
1000	10.4	11.0	11.7	12.4	13.3	14.0	14.8	2:25
1400	14.2	15.0	15.9	17.1	18.2	19.2	20.4	3:18
1800	18.0	19.1	20.3	21.8	23.3	24.6	26.1	4:11
2200	22.0	23.3	24.9	26.7	28.5	30.2	32.1	5:04
2600	26.0	27.6	29.6	31.7	33.9	35.9	38.2	5:57
3000	30.1	32.1	34.4	36.9	39.4	41.9	44.5	6:50
3400	34.4	36.7	39.4	42.2	45.2	48.0	50.9	7:43
3800	38.7	41.5	44.5	47.7	51.1	54.3	57.6	8:35
4200	43.2	46.4	49.7	53.4	57.1	60.7	64.5	9:28
4600	47.9	51.4	55.2	59.3	63.4	67.4	71.6	10:20
5000	52.7	56.5	60.8	65.3	69.8	74.3	78.9	11:12

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) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
94	80	69	61	55	50	46	42	39	36	34
160	143	129	118	108	100	93	87	82	77	73
226	205	188	173	161	150	141	132	125	118	112
291	267	246	229	213	200	188	178	168	160	152
354	327	304	283	266	250	236	224	213	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 LB)					TIME (HRS:MIN)
		90	110	130	150	170	
50	FUEL (1000 LB)	1.2	1.3	1.5	1.6	1.7	0:14
	ALT (FT)	12000	11000	9000	8000	7000	
100	FUEL (1000 LB)	1.9	2.1	2.3	2.5	2.7	0:23
	ALT (FT)	19000	17000	17000	16000	15000	
150	FUEL (1000 LB)	2.5	2.7	3.0	3.3	3.5	0:30
	ALT (FT)	25000	24000	23000	22000	20000	
200	FUEL (1000 LB)	3.0	3.3	3.7	4.0	4.3	0:37
	ALT (FT)	31000	27000	26000	26000	24000	
250	FUEL (1000 LB)	3.5	3.9	4.3	4.7	5.1	0:44
	ALT (FT)	39000	35000	31000	31000	27000	
300	FUEL (1000 LB)	3.9	4.4	4.9	5.4	5.8	0:50
	ALT (FT)	41000	39000	35000	33000	29000	
350	FUEL (1000 LB)	4.4	4.9	5.5	6.0	6.6	0:57
	ALT (FT)	41000	39000	37000	33000	31000	
400	FUEL (1000 LB)	4.8	5.4	6.0	6.7	7.3	1:03
	ALT (FT)	41000	39000	37000	33000	31000	
450	FUEL (1000 LB)	5.3	5.9	6.6	7.3	8.1	1:10
	ALT (FT)	41000	41000	37000	35000	31000	
500	FUEL (1000 LB)	5.7	6.4	7.2	8.0	8.8	1:17
	ALT (FT)	41000	41000	37000	35000	31000	

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

Holding Planning
Flaps Up

WEIGHT (1000 LB)	TOTAL FUEL FLOW (LB/HR)								
	PRESSURE ALTITUDE (FT)								
	1500	5000	10000	15000	20000	25000	30000	35000	41000
190	6890	6790	6760	6720	6690	6750	7040		
180	6560	6460	6400	6370	6300	6360	6570		
170	6240	6130	6060	6030	5930	5970	6140	6640	
160	5910	5800	5720	5680	5580	5590	5740	6040	
150	5590	5480	5400	5330	5240	5200	5340	5540	
140	5260	5150	5070	4990	4910	4830	4950	5080	
130	4940	4830	4740	4660	4580	4470	4570	4670	5360
120	4620	4510	4420	4330	4250	4140	4190	4270	4690
110	4310	4190	4090	4000	3920	3830	3880	3940	4220
100	4010	3880	3770	3750	3660	3590	3540	3570	3770
90	3800	3670	3540	3440	3350	3280	3240	3210	3360

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

Flight Crew Oxygen Requirements
Required Pressure (PSI) for 76 Cubic 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 LB)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
30	94.2	91.4	
28	101.9	98.7	95.5
26	110.2	106.5	103.2
24	119.4	115.5	111.7
22	130.0	125.5	121.1
20	141.4	136.2	131.0
18	151.9	146.3	140.2
16	162.2	156.6	150.2
14	171.6	166.2	160.7
12	181.9	175.5	168.7

Anti-Ice Adjustments

ANTI-ICE CONFIGURATION	EQUIVALENT WEIGHT ADJUSTMENT (1000 LB)								
	PRESSURE ALTITUDE (1000 FT)								
	12	14	16	18	20	22	24	26	28
ENGINE ONLY	-4.1	-3.8	-3.7	-3.6	-3.4	-3.2	-2.9	-2.6	-2.3
ENGINE & WING*	-16.4	-15.3	-14.4	-14.2	-13.9	-12.6	-11.5	-10.6	

***Optional System**

ALL ENGINES

Decompression Critical Fuel Reserves - LRC Cruise

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
286	263	244	227	213	200	189	179	169	161	154
583	534	493	458	427	400	376	355	337	320	304
881	806	742	688	641	600	564	532	504	478	455
1179	1077	991	918	855	800	752	709	671	636	605
1477	1348	1240	1148	1069	1000	939	886	838	795	756
1775	1620	1489	1379	1283	1200	1127	1062	1005	953	906
2073	1891	1739	1609	1497	1400	1315	1239	1172	1111	1057
2371	2162	1988	1839	1711	1600	1502	1416	1339	1270	1207
2669	2434	2237	2069	1925	1800	1690	1593	1506	1428	1358

Critical Fuel (1000 LB)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 LB)								
	100	110	120	130	140	150	160	170	180
200	3.8	3.9	4.0	4.1	4.3	4.4	4.6	4.7	4.9
300	5.4	5.5	5.7	5.9	6.1	6.3	6.5	6.7	6.9
400	7.0	7.2	7.5	7.7	8.0	8.2	8.5	8.7	8.9
500	8.6	8.9	9.2	9.5	9.8	10.1	10.4	10.7	11.0
600	10.2	10.6	10.9	11.3	11.6	11.9	12.3	12.6	13.0
700	11.8	12.2	12.6	13.0	13.4	13.8	14.2	14.6	15.0
800	13.5	13.9	14.3	14.7	15.1	15.6	16.1	16.5	17.0
900	15.0	15.5	16.0	16.5	16.9	17.4	18.0	18.5	19.0
1000	16.6	17.1	17.6	18.2	18.7	19.3	19.8	20.4	20.9
1100	18.1	18.7	19.3	19.9	20.5	21.1	21.7	22.3	22.9
1200	19.7	20.3	21.0	21.6	22.2	22.9	23.5	24.2	24.9
1300	21.2	22.0	22.7	23.3	24.0	24.6	25.3	26.1	26.8
1400	22.8	23.6	24.3	25.0	25.7	26.4	27.2	28.0	28.7
1500	24.4	25.1	25.9	26.7	27.4	28.2	29.0	29.8	30.6
1600	25.9	26.7	27.5	28.3	29.2	30.0	30.8	31.7	32.5
1700	27.4	28.2	29.1	30.0	30.9	31.7	32.6	33.5	34.4
1800	28.9	29.8	30.8	31.7	32.6	33.5	34.4	35.3	36.3

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included.

Adjustments:

-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.

-Increase fuel required 0.5% per 10°C above ISA.

-When icing conditions are forecast, use the greater of engine and wing anti-ice on (7%) for the total forecast time or engine and wing anti-ice on and ice drag (14%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

MAX CONTINUOUS THRUST

Decompression Critical Fuel Reserves - LRC Cruise

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
290	266	246	228	213	200	188	178	169	160	153
592	540	497	460	428	400	376	354	335	318	302
894	815	748	691	642	600	563	530	501	475	451
1197	1089	999	922	857	800	750	706	667	632	601
1499	1363	1250	1154	1071	1000	938	882	833	790	750
1802	1638	1501	1385	1286	1200	1125	1059	1000	947	900
2104	1912	1752	1616	1500	1400	1312	1235	1166	1104	1049
2407	2186	2003	1848	1715	1600	1499	1411	1332	1262	1198
2709	2461	2254	2079	1929	1800	1687	1587	1498	1419	1348

Critical Fuel (1000 LB)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 LB)								
	100	110	120	130	140	150	160	170	180
200	3.3	3.4	3.6	3.7	3.9	4.0	4.2	4.3	4.5
300	4.7	4.9	5.1	5.3	5.6	5.8	6.0	6.2	6.4
400	6.2	6.4	6.7	7.0	7.3	7.6	7.8	8.1	8.3
500	7.6	7.9	8.3	8.6	9.0	9.3	9.6	9.9	10.2
600	9.1	9.4	9.8	10.3	10.6	11.0	11.4	11.8	12.1
700	10.5	10.9	11.4	11.8	12.3	12.7	13.1	13.6	14.0
800	11.9	12.4	12.9	13.4	13.9	14.4	14.9	15.4	15.9
900	13.4	13.9	14.4	15.0	15.5	16.1	16.7	17.3	17.8
1000	14.7	15.3	15.9	16.6	17.2	17.8	18.5	19.1	19.6
1100	16.1	16.8	17.4	18.1	18.8	19.5	20.2	20.8	21.5
1200	17.5	18.2	19.0	19.7	20.5	21.2	21.9	22.6	23.3
1300	18.9	19.7	20.5	21.3	22.0	22.8	23.6	24.4	25.2
1400	20.2	21.1	22.0	22.8	23.6	24.4	25.3	26.1	27.0
1500	21.6	22.5	23.4	24.3	25.2	26.1	27.0	27.9	28.8
1600	23.0	23.9	24.9	25.8	26.7	27.7	28.7	29.6	30.6
1700	24.4	25.3	26.3	27.3	28.3	29.3	30.4	31.3	32.3
1800	25.7	26.7	27.8	28.8	29.9	31.0	32.0	33.0	34.1

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5%if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.5% per 10°C above ISA.
-When icing conditions are forecast, use the greater of engine and wing anti-ice on (6%) for the total forecast time or engine and wing anti-ice on and ice drag (15%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

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
270	252	237	223	211	200	190	181	172	165	158
544	507	475	447	422	400	379	361	345	330	316
820	764	715	672	634	600	569	541	516	493	473
1098	1022	955	897	845	800	758	721	687	657	629
1377	1281	1196	1123	1058	1000	948	901	858	820	784
1658	1540	1438	1349	1270	1200	1137	1080	1029	982	940
1939	1800	1680	1575	1482	1400	1326	1259	1199	1145	1095
2220	2060	1922	1801	1694	1600	1515	1439	1370	1307	1250
2500	2320	2163	2027	1906	1800	1704	1618	1540	1470	1405

Critical Fuel (1000 LB)

AIRDIST (NM)	WEIGHT AT CRITICAL POINT (1000 LB)								
	100	110	120	130	140	150	160	170	180
200	3.3	3.5	3.6	3.7	3.8	4.0	4.1	4.2	4.4
300	4.4	4.6	4.9	5.0	5.2	5.5	5.7	5.9	6.2
400	5.5	5.8	6.1	6.3	6.6	7.0	7.3	7.6	7.9
500	6.5	6.9	7.3	7.7	8.1	8.5	8.9	9.3	9.7
600	7.6	8.1	8.6	9.0	9.4	10.0	10.5	10.9	11.4
700	8.6	9.2	9.8	10.3	10.8	11.4	12.0	12.6	13.2
800	9.6	10.3	10.9	11.5	12.2	12.9	13.6	14.2	14.9
900	10.6	11.4	12.1	12.8	13.5	14.3	15.1	15.8	16.6
1000	11.6	12.5	13.3	14.1	14.9	15.7	16.6	17.4	18.3
1100	12.6	13.5	14.5	15.3	16.2	17.2	18.1	19.0	19.9
1200	13.6	14.6	15.6	16.5	17.5	18.6	19.6	20.5	21.6
1300	14.6	15.6	16.7	17.7	18.8	19.9	21.1	22.1	23.2
1400	15.5	16.7	17.9	19.0	20.1	21.3	22.5	23.6	24.9
1500	16.5	17.7	19.0	20.2	21.4	22.7	24.0	25.2	26.5
1600	17.4	18.7	20.1	21.3	22.7	24.0	25.4	26.7	28.1
1700	18.4	19.8	21.2	22.5	23.9	25.4	26.8	28.2	29.7
1800	19.3	20.8	22.3	23.7	25.2	26.7	28.2	29.7	31.3

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.5% per 10°C above ISA.
-When icing conditions are forecast, use the greater of the engine and wing anti-ice on (10%) for the total forecast time or engine and wing anti-ice on and ice drag (26%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

Performance Dispatch — Chapter PD
Landing — Section 42

Landing Field Limit Weight - Dry Runway
Based on anti-skid operative and automatic speedbrakes
Flaps 40
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
3000						3430	3650	3880
3400					3620	3850	4090	4320
3800			3440	3800	4030	4270	4520	4770
4200		3490	3830	4200	4440	4690	4950	5210
4600	3520	3860	4220	4600	4850	5110	5380	5660
5000	3870	4230	4610	5000	5260	5530	5810	6100
5400	4220	4600	4990	5400	5670	5950	6240	6540
5800	4560	4970	5380	5800	6080	6370	6680	6990
6200	4910	5340	5770	6200	6490	6790	7110	7430
6600	5260	5710	6160	6600	6900	7210	7540	7880
7000	5610	6090	6550	7000	7310	7630	7970	8320
7400	5950	6460	6940	7400	7720	8060	8400	8770
7800	6300	6830	7330	7800	8130	8480	8840	9210
8200	6650	7200	7720	8200	8540	8900	9270	9650
8600	6860	7410	7990	8600	8950	9320	9700	
9000	7070	7620	8260	9000	9360	9740		
9400	7280	7830	8540	9400	9770			
9800	7490	8040	8810					
10200	7710	8260	9090					
10600	7920	8470	9360					

Field Limit Weight (1000 LB)

WIND CORR'D FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
3800	93.3	87.8				
4200	107.1	100.8	94.7	88.9		
4600	121.0	114.0	107.1	100.6	94.3	88.3
5000	132.2	125.9	119.8	112.5	105.5	98.8
5400	143.5	136.5	130.0	123.7	116.8	109.4
5800	159.6	151.9	140.0	133.2	126.6	120.2
6200	171.1	162.9	154.9	142.7	135.6	128.8
6600	182.7	173.8	165.2	157.1	146.7	137.3
7000	191.9	184.8	175.6	166.9	158.5	150.4
7400		193.0	186.0	176.7	167.8	159.2
7800			193.3	186.5	177.1	168.0
8200				193.3	186.3	176.7
8600					190.7	183.1
9000					194.3	187.2
9400						191.3

Decrease field limit weight 13300 lb when using manual speedbrakes.

Landing Field Limit Weight - Dry Runway

Based on anti-skid inoperative and manual speedbrakes

Flaps 40

Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
7000				7000	7460	8070	8610	9160
7400			6610	7400	7880	8490	9050	9610
7800			6990	7800	8300	8910	9480	10060
8200			7370	8200	8710	9330	9920	10510
8600		6940	7750	8600	9130	9760	10350	10960
9000		7300	8130	9000	9540	10180	10790	11410
9400	6870	7670	8510	9400	9960	10600	11220	11860
9800	7210	8030	8890	9800	10380	11020	11660	12310
10200	7560	8390	9280	10200	10790	11450	12090	12760
10600	7900	8750	9660	10600	11210	11870	12530	13200
11000	8240	9120	10040	11000	11620	12290	12960	13650
11400	8580	9480	10420	11400	12040	12710	13400	14100
11800	8920	9840	10800	11800	12450	13140	13830	14550
12200	9260	10200	11180	12200	12870	13560	14270	15000
12600	9600	10570	11560	12600	13290	13980	14700	15450
13000	9940	10930	11950	13000	13700	14400	15140	15900
13400	10290	11290	12330	13400	14120	14830	15570	16350
13800	10630	11650	12710	13800	14530	15250	16000	16800
14200	10970	12020	13090	14200	14950	15670	16440	17240
14600	11310	12380	13470	14600	15360	16090	16870	17690

Field Limit Weight (1000 LB)

WIND CORR'D FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
7400	91.3	85.1				
7800	97.9	91.3				
8200	104.5	97.6	89.9			
8600	111.1	103.9	95.8	89.4		
9000	117.8	110.2	101.8	95.0	88.5	
9400	124.5	116.5	107.8	100.6	93.8	87.1
9800	131.2	122.8	113.7	106.3	99.1	92.2
10200	138.0	129.2	119.7	112.0	104.5	97.2
10600	148.9	135.5	125.8	117.6	109.8	102.3
11000	156.8	142.0	131.8	123.3	115.2	107.3
11400	163.8	153.6	137.9	129.0	120.5	112.4
11800	170.9	160.2	144.5	134.8	125.9	117.4
12200	177.9	166.8	155.3	140.5	131.3	122.5
12600	185.0	173.5	161.6	151.4	136.7	127.6
13000	192.1	180.2	167.9	157.3	142.2	132.7
13400		186.9	174.2	163.3	152.8	137.8
13800		193.6	180.6	169.3	158.4	143.1
14200			186.9	175.3	164.1	153.3
14600			193.3	181.2	169.7	158.6
15000				187.2	175.4	163.9
15400				193.3	181.0	169.3
15800					186.7	174.6
16200					192.4	179.9
16600						185.3
17000						190.7

Landing Field Limit Weight - Wet Runway
Based on anti-skid operative and automatic speedbrakes
Flaps 40
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
3000								3960
3400						3900	4150	4400
3800					4060	4320	4580	4850
4200				4200	4460	4740	5010	5290
4600			4180	4600	4870	5160	5440	5740
5000		4170	4570	5000	5280	5580	5880	6180
5400	4150	4540	4960	5400	5690	6000	6310	6630
5800	4490	4910	5340	5800	6100	6420	6740	7070
6200	4840	5280	5730	6200	6510	6840	7170	7510
6600	5190	5650	6120	6600	6920	7260	7600	7960
7000	5540	6020	6510	7000	7330	7680	8030	8400
7400	5880	6400	6900	7400	7740	8100	8470	8850
7800	6230	6770	7290	7800	8150	8520	8900	9290
8200	6580	7140	7680	8200	8560	8940	9330	9740
8600	6930	7510	8070	8600	8970	9360	9760	10180
9000	7270	7880	8460	9000	9380	9780	10190	10630
9400	7620	8250	8840	9400	9790	10200	10620	11070
9800	7840	8480	9130	9800	10200	10620	11060	
10200	8050	8690	9400	10200	10610	11040		
10600	8270	8900	9680	10600	11020			

Field Limit Weight (1000 LB)

WIND CORR'D FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
4200	88.3					
4600	100.2	94.3	88.6			
5000	112.3	105.6	99.3	93.2	87.4	
5400	123.7	117.2	110.1	103.5	97.0	90.8
5800	133.4	127.1	120.9	113.8	106.7	100.0
6200	143.2	136.3	129.7	123.5	116.6	109.2
6600	157.8	148.5	138.5	131.7	125.2	118.6
7000	167.9	159.8	151.8	140.0	133.0	126.4
7400	177.9	169.3	161.0	153.0	140.9	133.8
7800	187.5	178.8	170.0	161.6	153.5	141.1
8200	194.6	187.8	179.0	170.1	161.5	153.3
8600		194.5	187.5	178.6	169.6	160.9
9000			193.8	186.9	177.7	168.5
9400				192.9	185.7	176.1
9800					189.9	182.3
10200					193.1	185.9
10600						189.4
11000						192.9

Decrease field limit weight 13300 lb when using manual speedbrakes.

Landing Field Limit Weight - Wet Runway

Based on anti-skid inoperative and manual speedbrakes

Flaps 40

Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
7000						8170	8770	9360
7400					7910	8590	9200	9810
7800				7800	8320	9010	9630	10260
8200				8200	8740	9430	10070	10710
8600			7680	8600	9160	9860	10500	11160
9000			8060	9000	9570	10280	10940	11610
9400			8450	9400	9990	10700	11370	12050
9800		7900	8830	9800	10400	11120	11810	12500
10200		8260	9210	10200	10820	11550	12240	12950
10600	7720	8630	9590	10600	11240	11970	12680	13400
11000	8070	8990	9970	11000	11650	12390	13110	13850
11400	8410	9350	10350	11400	12070	12810	13550	14300
11800	8750	9710	10730	11800	12480	13240	13980	14750
12200	9090	10080	11120	12200	12900	13660	14420	15200
12600	9430	10440	11500	12600	13310	14080	14850	15650
13000	9770	10800	11880	13000	13730	14500	15290	16090
13400	10110	11160	12260	13400	14150	14930	15720	16540
13800	10460	11530	12640	13800	14560	15350	16160	16990
14200	10800	11890	13020	14200	14980	15770	16590	17440
14600	11140	12250	13400	14600	15390	16190	17020	17890

Landing Field Limit Weight - Wet Runway

Based on anti-skid inoperative and manual speedbrakes

Flaps 40

Field Limit Weight (1000 LB)

WIND CORR/D FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
8200	86.8					
8600	92.6	86.3				
9000	98.3	91.7				
9400	104.1	97.2	89.5			
9800	109.8	102.6	94.7	88.3		
10200	115.6	108.1	99.8	93.2	86.7	
10600	121.5	113.6	105.0	98.1	91.4	
11000	127.3	119.1	110.2	103.0	96.0	89.2
11400	133.1	124.6	115.4	107.9	100.6	93.6
11800	139.0	130.1	120.7	112.8	105.3	98.0
12200	149.1	135.7	125.9	117.8	109.9	102.4
12600	156.0	141.3	131.1	122.7	114.6	106.8
13000	162.1	152.0	136.4	127.7	119.3	111.2
13400	168.2	157.7	141.8	132.6	123.9	115.6
13800	174.4	163.5	152.2	137.6	128.6	120.0
14200	180.5	169.3	157.6	142.7	133.3	124.4
14600	186.7	175.1	163.1	152.8	138.0	128.8
15000	192.8	180.9	168.6	158.0	142.9	133.3
15400		186.8	174.1	163.2	152.7	137.7
15800		192.6	179.6	168.4	157.6	142.2
16200			185.1	173.6	162.5	151.8
16600			190.6	178.8	167.4	156.4
17000				184.0	172.3	161.1
17400				189.2	177.2	165.7
17800				194.4	182.1	170.3
18200					187.1	175.0
18600					192.0	179.6

Landing Climb Limit Weight

Valid for approach with flaps 15 and landing with flaps 40

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

AIRPORT OAT (°C)	LANDING CLIMB LIMIT WEIGHT (1000 LB)						
	AIRPORT PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
54	150.1	140.6					
52	152.8	144.3					
50	155.5	148.6	136.4				
48	158.4	151.4	140.0				
46	161.4	154.2	143.5	132.1			
44	164.3	156.8	146.5	135.3			
42	167.0	159.5	149.2	138.6	127.1		
40	169.8	162.3	151.8	141.0	130.0		
38	172.6	165.1	154.5	143.5	132.9	121.0	
36	175.4	168.0	157.1	146.6	135.3	123.1	
34	178.0	170.9	160.1	149.5	137.7	125.2	115.0
32	178.2	174.0	162.8	151.9	139.8	127.6	117.4
30	178.4	176.9	165.2	153.7	141.9	129.8	119.6
28	178.6	177.1	167.2	155.5	143.9	131.8	121.5
26	178.8	177.3	169.3	157.0	145.3	133.8	123.4
24	178.9	177.4	169.4	158.3	146.6	135.5	124.8
22	179.1	177.6	169.5	159.4	147.8	136.5	125.9
20	179.2	177.7	169.6	159.5	148.9	137.4	127.0
18	179.4	177.8	169.7	159.6	149.9	138.2	127.8
16	179.5	178.0	169.8	159.7	150.0	139.0	128.6
14	179.7	178.1	169.9	159.7	150.1	139.8	129.3
12	179.8	178.2	170.0	159.8	150.1	139.8	130.1
10	180.0	178.4	170.1	159.9	150.2	139.9	130.8
-40	181.4	179.6	171.2	161.0	151.2	140.8	132.1

With engine bleed for packs off, increase weight by 2700 lb.
With engine anti-ice on, decrease weight by 500 lb.
With engine and wing anti-ice on, decrease weight by 3000 lb .
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 12100 lb.
Includes brake energy limits.

ENGINE INOP

ADVISORY INFORMATION

Go-Around Climb Gradient

Flaps 15

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	2.88					
50	3.57	2.48				
46	4.08	3.14	2.08			
42	4.60	3.62	2.68	1.61		
38	5.13	4.11	3.14	2.14	1.03	
34	5.66	4.63	3.61	2.58	1.42	0.49
30	6.22	5.10	4.01	2.97	1.84	0.91
26	6.26	5.46	4.31	3.25	2.20	1.25
22	6.28	5.48	4.53	3.44	2.45	1.48
18	6.31	5.50	4.54	3.62	2.61	1.65
14	6.33	5.52	4.56	3.63	2.75	1.79
10	6.35	5.53	4.57	3.64	2.76	1.93

Gradient Adjustment for Weight (%)

WEIGHT (1000 LB)	REFERENCE GO-AROUND GRADIENT (%)							
	0	1	2	3	4	5	6	7
180	-2.85	-3.06	-3.37	-3.69	-3.99	-4.29	-4.57	-4.93
170	-2.42	-2.59	-2.86	-3.13	-3.38	-3.64	-3.88	-4.18
160	-1.92	-2.07	-2.29	-2.50	-2.70	-2.91	-3.10	-3.32
150	-1.35	-1.48	-1.64	-1.79	-1.93	-2.07	-2.21	-2.38
140	-0.73	-0.80	-0.88	-0.96	-1.04	-1.12	-1.19	-1.29
130	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
120	0.86	0.93	1.02	1.12	1.21	1.30	1.40	1.51
110	1.89	2.04	2.24	2.44	2.64	2.85	3.06	3.33

Gradient Adjustment for Speed (%)

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)							
	0	1	2	3	4	5	6	7
VREF40	-0.24	-0.24	-0.24	-0.25	-0.25	-0.25	-0.25	-0.25
VREF40+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF40+10	0.14	0.14	0.13	0.12	0.11	0.10	0.09	0.08
VREF40+20	0.27	0.24	0.20	0.16	0.12	0.08	0.05	0.03
VREF40+30	0.14	0.07	-0.01	-0.08	-0.15	-0.21	-0.26	-0.28

With engine bleed for packs off, increase gradient by 0.3%.
With engine anti-ice on, decrease gradient by 0.1%.
With engine and wing anti-ice on, decrease gradient by 0.3% .
Decrease gradient by 0.6% for ice accumulation when operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C.

Quick Turnaround Limit Weight

Flaps 40

OAT (°C)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
54	176.6					
50	177.7	171.2				
45	179.2	172.6	166.1			
40	180.7	174.1	167.5	161.1		
35	182.3	175.6	168.9	162.5	156.2	
30	183.8	177.1	170.4	163.9	157.5	151.3
25	185.4	178.6	171.8	165.3	158.9	152.6
20	187.1	180.2	173.3	166.8	160.3	154.0
15	188.9	181.8	174.9	168.3	161.7	155.4
10	190.0	183.4	176.5	169.8	163.2	156.8
5	190.0	185.1	178.2	171.4	164.7	158.2
0	190.0	186.9	179.8	173.0	166.3	159.8
-5	190.0	188.8	181.6	174.7	167.9	161.3
-10	190.0	190.0	183.3	176.4	169.6	162.9
-15	190.0	190.0	185.2	178.2	171.3	164.5
-20	190.0	190.0	187.1	180.0	173.0	166.2
-30	190.0	190.0	190.0	183.8	176.7	169.7
-40	190.0	190.0	190.0	187.9	180.6	173.5
-50	190.0	190.0	190.0	190.0	184.7	177.4
-54	190.0	190.0	190.0	190.0	186.4	179.1

Increase weight by 1500 lb per 1% uphill slope. Decrease weight by 3100 lb per 1% downhill slope. Increase weight by 4000 lb per 10 knots headwind. Decrease weight by 16600 lb 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 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.

Performance Dispatch — Chapter PD
Gear Down — Section 43

GEAR DOWN

Gear Down

TO BE SUPPLIED

Intentionally
Blank

Performance Dispatch — Chapter PD
Text — Section 44

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.

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

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

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

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.

Extended Operations - LRC Critical Fuel Reserves

ETOPS regulations require that flights conducted over a route that contains a point further than one hour's time at "normal one-engine-inoperative speed" from an adequate airport comply with rules specific to extended operations for airplanes with two or more engines. This section provides reserve fuel planning information for the "Critical Fuel Diversion Scenario".

ETOPS regulations require reserve planning to include a "Critical Fuel Diversion Scenario" calculation. The information shown is the fuel required to satisfy the flight profile as described below the charts. This information is shown for all engines operating and one engine inoperative at Long Range Cruise (LRC). There are two engine-inoperative scenarios, a decompression scenario and a driftdown scenario. The decompression scenario assumes an engine failure, loss of pressurization, emergency descent, and subsequent cruise at 10000 ft. The driftdown scenario assumes an engine failure without loss of pressurization, where the airplane "drifts down" to the thrust limited level-off altitude for the remainder of the diversion.

The ETOPS critical fuel required is the greater of the all-engine fuel or the engine-inoperative fuel. The ETOPS critical fuel required is compared to the amount of fuel that is predicted to be onboard the airplane at the critical point. If the fuel required by the ETOPS critical fuel reserves of the route exceeds the amount of fuel predicted, the fuel load must be adjusted accordingly. The data does not include an allowance for performance deterioration. However, regulations require a 5% allowance for performance deterioration, unless a value has been established by the operator for in-service deterioration.

To determine the ETOPS critical fuel required, enter the Ground to Air Mile Conversion table with the forecast wind (factored if applicable) and ground distance to the diversion airport from the critical point to obtain the air distance. Then enter the Critical Fuel table with air distance and expected weight at the critical point and read the required fuel. Apply the noted fuel adjustments for non-standard conditions, as necessary. When using a wind forecasting model acceptable to the FAA (such as the World Area Forecast System, WAFS), regulations allow the wind factor applied in this step to be 5% of the forecast wind (increase headwinds, decrease tailwinds), as indicated in the note below the chart. However, if a FAA-acceptable wind forecasting model is not used, the ETOPS critical fuel must be increased by 5%, instead of factoring the forecast winds.

LRC Cruise/Driftdown Critical Fuel Reserves

Enter the Ground to Air Miles Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter the Critical Fuel table with air distance and expected weight at the critical point and read required fuel. Apply the noted fuel adjustments as necessary. Regulations require a 5% allowance for performance deterioration unless a value has been established by the operator for inservice deterioration.

As noted below each table, the fuel required is the greater of the two engine fuel and the single engine fuel. This fuel is compared to the amount of fuel normally onboard the airplane at that point in the route. If the fuel required by the critical fuel reserves exceeds the amount of fuel normally expected, the fuel load must be adjusted accordingly.

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 table with airport pressure altitude and OAT to read maximum quick turnaround weight. Apply the noted adjustments as required.

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, or ensure the brake temperature is within limits using the alternate procedure described on the page.

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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Performance Dispatch — Chapter PD

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737-900ERW CFM56-7B26 KG FAA

Takeoff Field Corrections - Dry Runway

Slope Corrections

FIELD LENGTH AVAILABLE (FT)	SLOPE CORRECTED FIELD LENGTH (FT)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
4200	4230	4220	4220	4210	4200	4130	4050	3980	3900
4600	4690	4670	4650	4620	4600	4500	4400	4300	4200
5000	5160	5120	5080	5040	5000	4880	4750	4630	4510
5400	5620	5570	5510	5460	5400	5250	5100	4960	4810
5800	6080	6010	5940	5870	5800	5630	5450	5280	5110
6200	6550	6460	6370	6290	6200	6000	5800	5610	5410
6600	7010	6910	6800	6700	6600	6380	6160	5930	5710
7000	7470	7350	7240	7120	7000	6750	6510	6260	6010
7400	7930	7800	7670	7530	7400	7130	6860	6580	6310
7800	8400	8250	8100	7950	7800	7500	7210	6910	6610
8200	8860	8700	8530	8370	8200	7880	7560	7240	6920
8600	9320	9140	8960	8780	8600	8250	7910	7560	7220
9000	9790	9590	9390	9200	9000	8630	8260	7890	7520
9400	10250	10040	9820	9610	9400	9000	8610	8210	7820
9800	10710	10480	10260	10030	9800	9380	8960	8540	8120
10200	11170	10930	10690	10440	10200	9760	9310	8870	8420
10600	11640	11380	11120	10860	10600	10130	9660	9190	8720
11000	12100	11830	11550	11280	11000	10510	10010	9520	9020
11400	12560	12270	11980	11690	11400	10880	10360	9840	9320
11800	13030	12720	12410	12110	11800	11260	10710	10170	9630

Wind Corrections

SLOPE CORR'D FIELD LENGTH (FT)	SLOPE & WIND CORRECTED FIELD LENGTH (FT)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
4200	3170	3510	3860	4200	4420	4640	4860	5080
4600	3510	3870	4240	4600	4830	5060	5290	5530
5000	3840	4230	4610	5000	5240	5490	5730	5980
5400	4170	4580	4990	5400	5660	5910	6170	6430
5800	4500	4940	5370	5800	6070	6340	6610	6870
6200	4840	5290	5750	6200	6480	6760	7040	7330
6600	5170	5650	6120	6600	6890	7190	7480	7780
7000	5500	6000	6500	7000	7310	7610	7920	8230
7400	5840	6360	6880	7400	7720	8040	8360	8680
7800	6170	6710	7260	7800	8130	8460	8790	9130
8200	6500	7070	7630	8200	8540	8890	9230	9580
8600	6830	7420	8010	8600	8960	9310	9670	10030
9000	7170	7780	8390	9000	9370	9740	10110	10480
9400	7500	8130	8770	9400	9780	10160	10540	10930
9800	7830	8490	9140	9800	10190	10590	10980	11380
10200	8170	8840	9520	10200	10610	11010	11420	11820
10600	8500	9200	9900	10600	11020	11440	11860	12280
11000	8830	9550	10280	11000	11430	11860	12290	12730
11400	9170	9910	10660	11400	11840	12290	12730	13180
11800	9500	10270	11030	11800	12260	12710	13170	13630

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 5

Sea Level Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	10	14	18	22	26	30	38	40	50
4000	56.6	53.0	52.0	51.7	51.3	51.0	50.6	50.3	47.9	47.4	44.5
4200	58.3	54.6	53.6	53.2	52.9	52.5	52.2	51.8	49.4	48.8	45.9
4600	61.6	57.7	56.7	56.3	56.0	55.6	55.2	54.8	52.3	51.7	48.6
5000	64.8	60.7	59.7	59.3	58.9	58.5	58.1	57.7	55.1	54.4	51.2
5400	67.7	63.5	62.4	62.0	61.6	61.1	60.7	60.3	57.6	56.9	53.6
5800	70.5	66.2	65.0	64.6	64.2	63.7	63.3	62.9	60.0	59.3	55.8
6200	73.3	68.7	67.6	67.1	66.7	66.2	65.8	65.3	62.4	61.6	58.0
6600	76.0	71.2	70.0	69.5	69.1	68.6	68.1	67.7	64.6	63.9	60.1
7000	78.5	73.6	72.3	71.8	71.3	70.9	70.4	69.9	66.7	66.0	62.1
7400	80.7	75.7	74.4	73.9	73.4	72.9	72.5	72.0	68.7	67.9	63.9
7800	83.0	77.8	76.5	76.0	75.5	75.0	74.5	74.0	70.7	69.8	65.7
8200	85.3	80.0	78.6	78.1	77.6	77.1	76.5	76.0	72.6	71.8	67.5
8600	86.1	82.0	80.7	80.1	79.6	79.0	78.5	78.0	74.5	73.6	69.3
9000	86.1	83.9	82.5	81.9	81.4	80.8	80.3	79.8	76.2	75.3	70.8
9400	86.1	85.5	84.0	83.4	82.9	82.3	81.8	81.2	77.6	76.7	72.1
9800	86.1	86.1	85.5	84.9	84.3	83.8	83.2	82.6	78.9	78.0	73.4
10200	86.1	86.1	86.1	86.1	85.7	85.2	84.6	84.0	80.2	79.3	74.6
10600	86.1	86.1	86.1	86.1	86.1	86.1	86.0	85.4	81.5	80.6	75.8
CLIMB LIMIT WT (1000 KG)	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	81.1	79.8	73.1

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	10	14	18	22	26	30	38	40	50
4000	53.6	49.9	49.0	48.7	48.4	48.1	47.7	46.9	44.7	44.2	41.4
4200	55.2	51.4	50.5	50.2	49.9	49.5	49.2	48.3	46.1	45.6	42.7
4600	58.4	54.4	53.5	53.1	52.8	52.4	52.1	51.2	48.9	48.3	45.3
5000	61.4	57.3	56.3	55.9	55.6	55.2	54.8	53.9	51.5	50.9	47.7
5400	64.2	59.9	58.9	58.5	58.1	57.7	57.4	56.4	53.9	53.2	49.9
5800	66.9	62.4	61.4	61.0	60.6	60.2	59.8	58.8	56.2	55.5	52.1
6200	69.5	64.9	63.8	63.4	62.9	62.5	62.1	61.0	58.3	57.7	54.1
6600	72.0	67.2	66.1	65.6	65.2	64.8	64.3	63.2	60.4	59.7	56.0
7000	74.4	69.4	68.2	67.8	67.3	66.9	66.5	65.3	62.4	61.7	57.9
7400	76.6	71.5	70.3	69.8	69.3	68.9	68.4	67.3	64.3	63.5	59.6
7800	78.7	73.5	72.2	71.8	71.3	70.8	70.4	69.2	66.1	65.3	61.3
8200	80.9	75.5	74.2	73.7	73.3	72.8	72.3	71.1	67.9	67.1	63.0
8600	83.0	77.4	76.1	75.6	75.1	74.7	74.2	72.9	69.7	68.9	64.6
9000	84.9	79.2	77.9	77.4	76.8	76.4	75.9	74.5	71.3	70.4	66.1
9400	86.1	80.6	79.3	78.8	78.3	77.7	77.2	75.9	72.6	71.7	67.3
9800	86.1	82.1	80.7	80.2	79.6	79.1	78.6	77.2	73.8	73.0	68.4
10200	86.1	83.4	82.0	81.5	81.0	80.4	79.9	78.5	75.1	74.2	69.6
10600	86.1	84.8	83.4	82.8	82.3	81.7	81.2	79.8	76.3	75.4	70.7
CLIMB LIMIT WT (1000 KG)	84.0	83.6	83.4	83.4	83.3	83.2	83.1	81.1	75.9	74.6	68.4

With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1500 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 900 kg and climb limit weight by 1500 kg.

Takeoff Field & Climb Limit Weights - Dry Runway

Flaps 5

4000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	10	14	18	22	26	30	38	40	50
4000	50.1	46.7	45.9	45.6	45.3	45.0	44.3	43.6	41.6	41.0	38.5
4200	51.7	48.1	47.3	47.0	46.7	46.3	45.7	45.0	42.9	42.3	39.7
4600	54.7	51.0	50.1	49.8	49.4	49.1	48.5	47.7	45.5	44.9	42.2
5000	57.5	53.6	52.8	52.4	52.1	51.7	51.0	50.2	47.9	47.3	44.5
5400	60.2	56.1	55.2	54.8	54.5	54.1	53.4	52.6	50.2	49.6	46.5
5800	62.7	58.5	57.5	57.2	56.8	56.4	55.7	54.8	52.3	51.7	48.5
6200	65.2	60.8	59.8	59.4	59.0	58.6	57.8	56.9	54.3	53.7	50.4
6600	67.5	63.0	61.9	61.5	61.1	60.7	59.9	59.0	56.3	55.6	52.2
7000	69.7	65.0	63.9	63.5	63.1	62.7	61.9	60.9	58.1	57.4	53.9
7400	71.8	67.0	65.9	65.4	65.0	64.6	63.7	62.7	59.9	59.2	55.6
7800	73.8	68.9	67.7	67.3	66.8	66.4	65.5	64.5	61.6	60.8	57.2
8200	75.8	70.8	69.6	69.1	68.7	68.2	67.3	66.3	63.3	62.5	58.8
8600	77.8	72.6	71.4	70.9	70.5	70.0	69.1	68.0	64.9	64.1	60.2
9000	79.6	74.2	73.0	72.5	72.0	71.6	70.6	69.5	66.4	65.6	61.6
9400	81.0	75.6	74.3	73.8	73.4	72.9	71.9	70.8	67.6	66.8	62.7
9800	82.5	76.9	75.6	75.1	74.6	74.2	73.2	72.0	68.8	67.9	63.8
10200	83.8	78.2	76.9	76.4	75.9	75.4	74.4	73.2	69.9	69.0	64.9
10600	85.2	79.4	78.1	77.6	77.1	76.6	75.6	74.4	71.0	70.1	65.9
CLIMB LIMIT WT (1000 KG)	79.0	78.6	78.5	78.4	78.3	78.2	77.1	75.5	70.8	69.6	64.0

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	10	14	18	22	26	30	38	40	50
4000	46.8	43.6	42.8	42.5	42.2	41.6	41.0	40.3	38.4	37.9	35.6
4200	48.2	44.9	44.1	43.8	43.5	42.9	42.3	41.6	39.6	39.1	36.8
4600	51.1	47.6	46.8	46.5	46.2	45.5	44.9	44.1	42.1	41.6	39.1
5000	53.8	50.2	49.3	49.0	48.6	48.0	47.3	46.5	44.4	43.8	41.3
5400	56.3	52.5	51.6	51.2	50.9	50.2	49.5	48.7	46.5	45.9	43.2
5800	58.6	54.7	53.8	53.4	53.1	52.4	51.6	50.8	48.5	47.9	45.1
6200	60.9	56.9	55.9	55.5	55.1	54.4	53.6	52.7	50.3	49.7	46.8
6600	63.1	58.9	57.9	57.5	57.1	56.3	55.6	54.6	52.1	51.5	48.5
7000	65.2	60.8	59.8	59.4	59.0	58.2	57.4	56.4	53.9	53.2	50.1
7400	67.1	62.7	61.6	61.2	60.8	60.0	59.1	58.1	55.5	54.8	51.6
7800	69.0	64.4	63.3	62.9	62.5	61.7	60.8	59.8	57.1	56.4	53.1
8200	70.9	66.2	65.1	64.6	64.1	63.3	62.5	61.4	58.7	57.9	54.6
8600	72.8	67.9	66.8	66.3	65.8	65.0	64.1	63.0	60.2	59.4	56.0
9000	74.4	69.5	68.3	67.8	67.3	66.4	65.5	64.4	61.5	60.7	57.2
9400	75.8	70.7	69.5	69.0	68.6	67.7	66.7	65.6	62.6	61.8	58.2
9800	77.1	71.9	70.7	70.2	69.7	68.8	67.9	66.7	63.7	62.9	59.2
10200	78.4	73.1	71.9	71.4	70.9	70.0	69.0	67.8	64.8	63.9	60.2
10600	79.6	74.3	73.0	72.5	72.0	71.1	70.1	68.9	65.8	65.0	61.2
CLIMB LIMIT WT (1000 KG)	74.1	73.8	73.7	73.6	73.6	72.6	71.5	70.0	65.6	64.4	59.4

With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1500 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 900 kg and climb limit weight by 1500 kg.

Takeoff Field & Climb Limit Weights - Dry Runway
Flaps 5
8000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	10	14	18	22	26	30	38	40	50
4000	43.6	40.5	39.8	39.5	39.0	38.5	37.8	37.0	35.1	34.7	32.6
4200	44.9	41.8	41.0	40.7	40.2	39.7	39.1	38.2	36.3	35.8	33.7
4600	47.6	44.3	43.5	43.3	42.7	42.2	41.5	40.6	38.6	38.1	35.9
5000	50.2	46.7	45.9	45.6	45.0	44.5	43.8	42.9	40.7	40.2	37.9
5400	52.5	48.9	48.1	47.7	47.1	46.5	45.8	44.9	42.6	42.1	39.7
5800	54.7	51.0	50.1	49.8	49.2	48.5	47.8	46.8	44.5	43.9	41.4
6200	56.9	53.0	52.0	51.7	51.1	50.4	49.6	48.6	46.2	45.6	43.0
6600	58.9	54.8	53.9	53.5	52.9	52.2	51.4	50.3	47.8	47.2	44.5
7000	60.8	56.6	55.7	55.3	54.6	53.9	53.1	52.0	49.4	48.8	46.0
7400	62.7	58.4	57.4	57.0	56.3	55.6	54.7	53.6	50.9	50.3	47.4
7800	64.4	60.0	59.0	58.6	57.9	57.2	56.3	55.1	52.4	51.8	48.8
8200	66.2	61.7	60.6	60.2	59.5	58.7	57.8	56.6	53.8	53.2	50.1
8600	67.9	63.2	62.2	61.7	61.0	60.2	59.3	58.1	55.2	54.5	51.4
9000	69.4	64.7	63.6	63.2	62.4	61.6	60.6	59.4	56.4	55.8	52.6
9400	70.7	65.9	64.7	64.3	63.5	62.7	61.7	60.5	57.4	56.8	53.5
9800	71.9	67.0	65.9	65.4	64.6	63.8	62.8	61.5	58.4	57.7	54.4
10200	73.1	68.1	66.9	66.5	65.7	64.8	63.8	62.5	59.4	58.7	55.3
10600	74.3	69.2	68.0	67.6	66.7	65.9	64.9	63.5	60.3	59.6	56.2
CLIMB LIMIT WT (1000 KG)	69.4	69.1	69.0	69.0	68.1	67.3	66.0	64.0	59.7	58.7	54.3

10000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	10	14	18	22	26	30	38	40	50
4000	40.5	37.6	37.0	36.5	36.0	35.5	34.9	34.1	32.2	31.8	29.6
4200	41.8	38.8	38.2	37.7	37.2	36.6	36.0	35.2	33.3	32.9	30.6
4600	44.3	41.2	40.6	40.0	39.5	39.0	38.3	37.5	35.5	35.0	32.6
5000	46.7	43.5	42.8	42.2	41.7	41.1	40.5	39.5	37.5	37.0	34.5
5400	48.9	45.5	44.8	44.2	43.6	43.1	42.4	41.4	39.3	38.8	36.2
5800	51.0	47.5	46.7	46.1	45.5	44.9	44.2	43.2	41.0	40.4	37.8
6200	53.0	49.3	48.5	47.9	47.3	46.6	45.9	44.9	42.5	42.0	39.2
6600	54.8	51.1	50.2	49.6	48.9	48.3	47.5	46.4	44.0	43.5	40.6
7000	56.7	52.8	51.9	51.2	50.6	49.9	49.1	48.0	45.5	44.9	41.9
7400	58.4	54.4	53.5	52.8	52.1	51.4	50.6	49.5	46.9	46.3	43.3
7800	60.0	55.9	55.0	54.3	53.6	52.9	52.1	50.9	48.3	47.7	44.5
8200	61.7	57.5	56.6	55.8	55.1	54.4	53.5	52.3	49.6	49.0	45.8
8600	63.3	58.9	58.0	57.2	56.5	55.8	54.9	53.6	50.9	50.2	46.9
9000	64.7	60.3	59.3	58.5	57.8	57.0	56.1	54.8	52.0	51.3	47.9
9400	65.9	61.4	60.4	59.6	58.8	58.0	57.1	55.8	52.9	52.2	48.8
9800	67.0	62.4	61.4	60.6	59.8	59.0	58.1	56.8	53.9	53.1	49.6
10200	68.1	63.4	62.4	61.6	60.8	60.0	59.0	57.7	54.7	54.0	50.4
10600	69.2	64.4	63.4	62.6	61.8	60.9	60.0	58.6	55.6	54.9	51.2
CLIMB LIMIT WT (1000 KG)	65.1	64.7	64.5	63.8	63.0	62.1	60.8	59.0	54.9	54.0	49.2

With engine bleed for packs off, increase field limit weight by 400 kg and climb limit weight by 1500 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 900 kg and climb limit weight by 1500 kg.

Takeoff Field Corrections - Wet Runway

Slope Corrections

FIELD LENGTH AVAILABLE (FT)	SLOPE CORRECTED FIELD LENGTH (FT) RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
4200	4230	4220	4210	4210	4200	4150	4090	4040	3990
4600	4680	4660	4640	4620	4600	4530	4460	4390	4320
5000	5130	5090	5060	5030	5000	4910	4820	4730	4640
5400	5580	5530	5490	5440	5400	5290	5190	5080	4970
5800	6030	5970	5910	5860	5800	5680	5550	5430	5300
6200	6480	6410	6340	6270	6200	6060	5920	5770	5630
6600	6930	6840	6760	6680	6600	6440	6280	6120	5960
7000	7380	7280	7190	7090	7000	6820	6640	6470	6290
7400	7830	7720	7610	7510	7400	7200	7010	6810	6620
7800	8280	8160	8040	7920	7800	7590	7370	7160	6950
8200	8730	8590	8460	8330	8200	7970	7740	7510	7280
8600	9180	9030	8890	8740	8600	8350	8100	7850	7600
9000	9630	9470	9310	9160	9000	8730	8470	8200	7930
9400	10080	9910	9740	9570	9400	9120	8830	8550	8260
9800	10530	10340	10160	9980	9800	9500	9200	8890	8590
10200	10980	10780	10590	10390	10200	9880	9560	9240	8920
10600	11430	11220	11010	10810	10600	10260	9920	9590	9250
11000	11880	11660	11440	11220	11000	10640	10290	9930	9580
11400	12330	12090	11860	11630	11400	11030	10650	10280	9910
11800	12780	12530	12290	12040	11800	11410	11020	10630	10240

Wind Corrections

SLOPE CORR'D FIELD LENGTH (FT)	SLOPE & WIND CORRECTED FIELD LENGTH (FT) WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
4200	3060	3440	3820	4200	4460	4710	4970	5230
4600	3400	3800	4200	4600	4870	5140	5410	5680
5000	3740	4160	4580	5000	5280	5560	5840	6130
5400	4080	4520	4960	5400	5690	5990	6280	6580
5800	4420	4880	5340	5800	6110	6410	6720	7030
6200	4760	5240	5720	6200	6520	6840	7160	7480
6600	5100	5600	6100	6600	6930	7260	7590	7930
7000	5440	5960	6480	7000	7340	7690	8030	8380
7400	5780	6320	6860	7400	7760	8110	8470	8830
7800	6120	6680	7240	7800	8170	8540	8910	9280
8200	6460	7040	7620	8200	8580	8960	9340	9730
8600	6800	7400	8000	8600	8990	9390	9780	10180
9000	7140	7760	8380	9000	9410	9810	10220	10630
9400	7480	8120	8760	9400	9820	10240	10660	11080
9800	7820	8480	9140	9800	10230	10660	11090	11530
10200	8160	8840	9520	10200	10640	11090	11530	11980
10600	8500	9200	9900	10600	11060	11510	11970	12430
11000	8840	9560	10280	11000	11470	11940	12410	12880
11400	9180	9920	10660	11400	11880	12360	12840	13330
11800	9520	10280	11040	11800	12290	12790	13280	13780

Takeoff Field & Climb Limit Weights - Wet Runway
Flaps 5
Sea Level Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	10	14	18	22	26	30	38	40	50
4000	56.9	53.0	52.1	51.7	51.3	51.0	50.6	50.2	47.9	47.3	44.4
4200	58.5	54.5	53.6	53.2	52.8	52.4	52.0	51.6	49.2	48.6	45.7
4600	61.8	57.6	56.5	56.1	55.7	55.3	54.9	54.5	51.9	51.3	48.2
5000	64.9	60.4	59.3	58.9	58.5	58.1	57.6	57.2	54.5	53.8	50.6
5400	67.8	63.1	62.0	61.5	61.1	60.6	60.2	59.8	56.9	56.2	52.8
5800	70.6	65.7	64.5	64.0	63.6	63.1	62.7	62.2	59.3	58.5	55.0
6200	73.2	68.2	66.9	66.4	66.0	65.5	65.0	64.5	61.5	60.7	57.0
6600	75.8	70.5	69.2	68.7	68.2	67.7	67.2	66.7	63.6	62.8	58.9
7000	78.2	72.8	71.5	70.9	70.4	69.9	69.4	68.9	65.6	64.8	60.8
7400	80.6	75.0	73.6	73.1	72.5	72.0	71.5	71.0	67.6	66.7	62.6
7800	82.9	77.1	75.7	75.1	74.6	74.0	73.5	73.0	69.5	68.6	64.4
8200	85.1	79.2	77.7	77.2	76.6	76.0	75.5	74.9	71.3	70.5	66.1
8600	86.1	81.2	79.7	79.1	78.5	77.9	77.4	76.8	73.1	72.2	67.8
9000	86.1	83.1	81.5	80.9	80.3	79.7	79.1	78.5	74.8	73.8	69.3
9400	86.1	84.8	83.2	82.6	81.9	81.3	80.8	80.1	76.3	75.3	70.7
9800	86.1	86.1	84.8	84.1	83.5	82.9	82.3	81.7	77.7	76.8	72.0
10200	86.1	86.1	86.1	85.7	85.1	84.5	83.8	83.2	79.2	78.2	73.3
10600	86.1	86.1	86.1	86.1	86.1	86.0	85.3	84.7	80.6	79.6	74.6
CLIMB LIMIT WT (1000 KG)	86.1	86.1	86.1	86.1	86.1	86.1	86.1	86.1	81.1	79.8	73.1

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	10	14	18	22	26	30	38	40	50
4000	53.8	49.9	49.0	48.6	48.3	48.0	47.6	46.8	44.6	44.1	41.4
4200	55.3	51.3	50.4	50.0	49.7	49.3	49.0	48.1	45.9	45.3	42.6
4600	58.4	54.1	53.1	52.8	52.4	52.0	51.7	50.7	48.4	47.8	44.9
5000	61.3	56.8	55.8	55.4	55.0	54.6	54.2	53.2	50.8	50.1	47.1
5400	64.0	59.3	58.3	57.8	57.4	57.0	56.6	55.6	53.0	52.4	49.2
5800	66.6	61.8	60.6	60.2	59.8	59.4	58.9	57.9	55.2	54.5	51.2
6200	69.1	64.1	62.9	62.5	62.0	61.6	61.1	60.0	57.2	56.5	53.1
6600	71.5	66.3	65.1	64.6	64.1	63.7	63.2	62.1	59.2	58.4	54.9
7000	73.8	68.4	67.2	66.7	66.2	65.7	65.3	64.1	61.1	60.3	56.6
7400	76.1	70.5	69.2	68.7	68.2	67.7	67.2	66.0	62.9	62.1	58.3
7800	78.2	72.4	71.1	70.6	70.1	69.6	69.1	67.8	64.6	63.8	59.9
8200	80.3	74.4	73.0	72.5	72.0	71.5	71.0	69.6	66.4	65.5	61.5
8600	82.3	76.2	74.8	74.3	73.8	73.2	72.7	71.4	68.0	67.2	63.0
9000	84.2	78.0	76.6	76.0	75.4	74.9	74.4	73.0	69.6	68.7	64.4
9400	85.9	79.6	78.1	77.5	77.0	76.4	75.9	74.5	71.0	70.1	65.7
9800	86.1	81.1	79.6	79.0	78.4	77.9	77.3	75.9	72.3	71.4	66.9
10200	86.1	82.6	81.1	80.5	79.9	79.3	78.8	77.3	73.6	72.7	68.1
10600	86.1	84.1	82.5	81.9	81.3	80.7	80.2	78.7	74.9	74.0	69.3
CLIMB LIMIT WT(1000 KG)	84.0	83.6	83.4	83.4	83.3	83.2	83.1	81.1	75.9	74.6	68.4

With engine bleed for packs off, increase field limit weight by 350 kg and climb limit weight by 1500 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 750 kg and climb limit weight by 1500 kg.

Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 5

4000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	10	14	18	22	26	30	38	40	50
4000	50.2	46.6	45.8	45.4	45.1	44.8	44.2	43.5	41.5	41.0	38.7
4200	51.6	47.9	47.0	46.7	46.4	46.1	45.4	44.7	42.7	42.2	39.8
4600	54.5	50.5	49.6	49.3	48.9	48.6	47.9	47.1	45.0	44.5	41.9
5000	57.2	53.0	52.1	51.7	51.3	51.0	50.3	49.4	47.2	46.6	44.0
5400	59.7	55.4	54.4	54.0	53.6	53.2	52.5	51.6	49.3	48.7	45.9
5800	62.2	57.6	56.6	56.2	55.8	55.4	54.6	53.7	51.3	50.7	47.8
6200	64.5	59.8	58.7	58.3	57.9	57.5	56.6	55.7	53.2	52.5	49.5
6600	66.7	61.8	60.7	60.3	59.8	59.4	58.6	57.6	55.0	54.3	51.2
7000	68.9	63.8	62.6	62.2	61.8	61.3	60.5	59.4	56.7	56.0	52.8
7400	71.0	65.7	64.5	64.1	63.6	63.1	62.3	61.2	58.4	57.7	54.4
7800	72.9	67.6	66.3	65.8	65.4	64.9	64.0	62.9	60.0	59.3	55.9
8200	74.9	69.4	68.1	67.6	67.1	66.6	65.7	64.6	61.6	60.9	57.4
8600	76.8	71.1	69.8	69.3	68.8	68.3	67.3	66.2	63.2	62.4	58.8
9000	78.5	72.7	71.4	70.9	70.3	69.8	68.9	67.7	64.6	63.8	60.1
9400	80.1	74.2	72.8	72.3	71.8	71.2	70.2	69.0	65.9	65.0	61.3
9800	81.7	75.6	74.2	73.6	73.1	72.6	71.5	70.3	67.1	66.2	62.4
10200	83.2	77.0	75.5	75.0	74.4	73.9	72.8	71.6	68.3	67.4	63.5
10600	84.7	78.3	76.9	76.3	75.8	75.2	74.1	72.9	69.5	68.6	64.6
CLIMB LIMIT WT (1000 KG)	79.0	78.6	78.5	78.4	78.3	78.2	77.1	75.5	70.8	69.6	64.0

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	10	14	18	22	26	30	38	40	50
4000	46.8	43.4	42.7	42.4	42.1	41.5	41.0	40.3	38.6	38.1	36.1
4200	48.1	44.6	43.8	43.5	43.2	42.7	42.1	41.4	39.6	39.2	37.0
4600	50.8	47.1	46.2	45.9	45.6	45.0	44.4	43.7	41.8	41.3	39.0
5000	53.3	49.4	48.5	48.2	47.8	47.2	46.6	45.8	43.8	43.3	40.9
5400	55.7	51.6	50.7	50.3	49.9	49.3	48.6	47.8	45.7	45.2	42.7
5800	57.9	53.7	52.7	52.3	52.0	51.3	50.6	49.8	47.6	47.0	44.4
6200	60.1	55.7	54.7	54.3	53.9	53.2	52.5	51.6	49.3	48.7	46.1
6600	62.1	57.6	56.5	56.1	55.7	55.0	54.2	53.3	51.0	50.4	47.6
7000	64.1	59.4	58.3	57.9	57.5	56.7	56.0	55.0	52.6	52.0	49.1
7400	66.0	61.2	60.1	59.6	59.2	58.4	57.6	56.7	54.2	53.5	50.5
7800	67.9	62.9	61.7	61.3	60.9	60.0	59.2	58.2	55.7	55.0	51.9
8200	69.7	64.5	63.4	62.9	62.5	61.6	60.8	59.8	57.1	56.4	53.3
8600	71.5	66.1	64.9	64.4	64.0	63.2	62.3	61.3	58.5	57.8	54.6
9000	73.1	67.7	66.4	65.9	65.5	64.6	63.7	62.6	59.8	59.1	55.8
9400	74.5	69.0	67.7	67.2	66.8	65.9	64.9	63.9	61.0	60.3	56.9
9800	76.0	70.3	69.0	68.5	68.0	67.1	66.1	65.0	62.1	61.4	57.9
10200	77.4	71.6	70.2	69.7	69.2	68.3	67.3	66.2	63.2	62.4	58.9
10600	78.7	72.8	71.5	71.0	70.4	69.5	68.5	67.4	64.3	63.5	59.9
CLIMB LIMIT WT (1000 KG)	74.1	73.8	73.7	73.6	73.6	72.6	71.5	70.0	65.6	64.4	59.4

With engine bleed for packs off, increase field limit weight by 350 kg and climb limit weight by 1500 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 750 kg and climb limit weight by 1500 kg.

Takeoff Field & Climb Limit Weights - Wet Runway

Flaps 5

8000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	10	14	18	22	26	30	38	40	50
4000	43.6	40.5	39.8	39.5	39.0	38.6	38.0	37.2	35.5	35.1	33.2
4200	44.8	41.6	40.9	40.6	40.1	39.6	39.0	38.2	36.5	36.1	34.1
4600	47.3	43.9	43.1	42.8	42.3	41.8	41.1	40.3	38.4	38.0	36.0
5000	49.6	46.0	45.2	44.9	44.4	43.8	43.1	42.3	40.3	39.8	37.7
5400	51.8	48.0	47.2	46.9	46.3	45.7	45.0	44.1	42.1	41.6	39.3
5800	53.9	50.0	49.1	48.8	48.2	47.6	46.8	45.9	43.8	43.3	40.9
6200	55.9	51.8	50.9	50.6	50.0	49.3	48.6	47.6	45.4	44.8	42.4
6600	57.8	53.6	52.7	52.3	51.6	51.0	50.2	49.2	46.9	46.3	43.8
7000	59.7	55.3	54.3	53.9	53.3	52.6	51.8	50.7	48.3	47.8	45.2
7400	61.5	56.9	55.9	55.5	54.8	54.1	53.3	52.2	49.8	49.2	46.5
7800	63.2	58.5	57.5	57.1	56.4	55.6	54.8	53.7	51.1	50.5	47.8
8200	64.9	60.1	59.0	58.6	57.9	57.1	56.2	55.1	52.5	51.9	49.0
8600	66.5	61.6	60.5	60.0	59.3	58.5	57.6	56.4	53.8	53.1	50.2
9000	68.0	62.9	61.8	61.4	60.6	59.8	58.9	57.7	54.9	54.3	51.3
9400	69.3	64.2	63.0	62.6	61.8	61.0	60.0	58.8	56.0	55.3	52.3
9800	70.6	65.3	64.2	63.7	62.9	62.1	61.1	59.9	57.0	56.3	53.2
10200	71.9	66.5	65.3	64.9	64.1	63.2	62.2	60.9	58.0	57.3	54.1
10600	73.2	67.7	66.5	66.0	65.2	64.3	63.3	62.0	59.0	58.3	55.0
CLIMB LIMIT WT (1000 KG)	69.4	69.1	69.0	69.0	68.1	67.3	66.0	64.0	59.7	58.7	54.3

10000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	10	14	18	22	26	30	38	40	50
4000	40.7	37.8	37.1	36.7	36.2	35.8	35.2	34.5	32.8	32.4	30.5
4200	41.8	38.8	38.2	37.7	37.2	36.7	36.2	35.4	33.7	33.3	31.3
4600	44.1	40.9	40.2	39.7	39.2	38.7	38.1	37.3	35.5	35.1	32.9
5000	46.3	42.9	42.2	41.6	41.1	40.6	40.0	39.1	37.2	36.8	34.5
5400	48.3	44.8	44.0	43.5	42.9	42.4	41.7	40.8	38.9	38.4	36.0
5800	50.3	46.6	45.8	45.2	44.6	44.1	43.4	42.5	40.4	39.9	37.4
6200	52.1	48.3	47.5	46.9	46.3	45.7	45.0	44.0	41.9	41.4	38.8
6600	53.9	49.9	49.1	48.4	47.8	47.2	46.5	45.5	43.3	42.7	40.1
7000	55.6	51.5	50.6	50.0	49.3	48.7	47.9	46.9	44.6	44.0	41.3
7400	57.2	53.0	52.1	51.4	50.8	50.1	49.3	48.3	45.9	45.3	42.5
7800	58.8	54.5	53.5	52.8	52.2	51.5	50.7	49.6	47.2	46.6	43.6
8200	60.4	55.9	55.0	54.3	53.6	52.8	52.0	50.9	48.4	47.8	44.8
8600	61.9	57.3	56.3	55.6	54.9	54.1	53.3	52.1	49.6	49.0	45.9
9000	63.3	58.6	57.6	56.8	56.1	55.3	54.5	53.3	50.7	50.0	46.9
9400	64.5	59.7	58.7	57.9	57.2	56.4	55.5	54.3	51.6	51.0	47.7
9800	65.7	60.8	59.7	58.9	58.2	57.4	56.5	55.3	52.5	51.8	48.5
10200	66.9	61.9	60.8	60.0	59.2	58.4	57.5	56.2	53.4	52.7	49.4
10600	68.1	63.0	61.8	61.0	60.2	59.4	58.5	57.2	54.3	53.6	50.2
CLIMB LIMIT WT(1000 KG)	65.1	64.7	64.5	63.8	63.0	62.1	60.8	59.0	54.9	54.0	49.2

With engine bleed for packs off, increase field limit weight by 350 kg and climb limit weight by 1500 kg.
With engine anti-ice on, decrease field limit weight by 200 kg and climb limit weight by 250 kg.
With engine and wing anti-ice on (optional system), decrease field limit weight by 750 kg and climb limit weight by 1500 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 (FT)	DISTANCE FROM BRAKE RELEASE (1000 FT)								
	8	10	12	14	16	18	20	22	24
10	72.7	81.0							
50	68.2	75.9	82.0						
100	64.0	71.3	77.0	81.5	85.0				
150	60.8	67.7	73.3	77.7	81.3	84.1			
200	58.0	64.7	70.2	74.6	78.2	81.1	83.5	85.4	
250	55.5	62.1	67.5	71.9	75.5	78.4	80.9	83.0	84.7
300	53.4	59.8	65.1	69.5	73.1	76.1	78.6	80.8	82.6
350	51.4	57.8	62.9	67.3	70.9	74.0	76.6	78.8	80.7
400	49.6	55.9	61.0	65.3	69.0	72.1	74.7	76.9	78.9
450	48.0	54.1	59.2	63.5	67.1	70.3	72.9	75.2	77.2
500	46.5	52.5	57.6	61.8	65.4	68.6	71.3	73.6	75.6
550	45.0	51.1	56.0	60.3	63.8	67.0	69.7	72.1	74.2
600	43.7	49.7	54.6	58.8	62.4	65.5	68.3	70.7	72.8
650	42.5	48.4	53.3	57.4	61.0	64.1	66.9	69.3	71.4
700	41.3	47.1	52.0	56.1	59.7	62.8	65.6	68.0	70.2
750		46.0	50.8	54.9	58.5	61.6	64.3	66.8	68.9
800		44.9	49.6	53.7	57.3	60.4	63.1	65.6	67.8
850		43.8	48.6	52.6	56.2	59.3	62.0	64.4	66.6
900		42.8	47.5	51.6	55.1	58.2	60.9	63.4	65.6
950		41.9	46.5	50.6	54.1	57.2	59.9	62.3	64.5
1000		41.0	45.6	49.6	53.1	56.2	58.9	61.4	63.5

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	80	85
30 & BELOW	0	0	0	0	0	0	0	0	0	0
32	-0.6	-0.7	-0.8	-0.8	-0.9	-1.0	-1.1	-1.2	-1.2	-1.3
34	-1.2	-1.3	-1.5	-1.7	-1.8	-2.0	-2.2	-2.3	-2.5	-2.6
36	-1.8	-2.0	-2.3	-2.5	-2.7	-3.0	-3.2	-3.5	-3.7	-4.0
38	-2.4	-2.7	-3.0	-3.3	-3.7	-4.0	-4.3	-4.6	-5.0	-5.3
40	-2.9	-3.3	-3.8	-4.2	-4.6	-5.0	-5.4	-5.8	-6.2	-6.6
42	-3.5	-4.0	-4.5	-5.0	-5.4	-5.9	-6.4	-6.9	-7.4	-7.9
44	-4.1	-4.6	-5.2	-5.7	-6.3	-6.9	-7.4	-8.0	-8.5	-9.1
46	-4.6	-5.3	-5.9	-6.5	-7.2	-7.8	-8.4	-9.1	-9.7	-10.4
48	-5.2	-5.9	-6.6	-7.3	-8.0	-8.8	-9.5	-10.2	-10.9	-11.6
50	-5.7	-6.5	-7.3	-8.1	-8.9	-9.7	-10.5	-11.3	-12.1	-12.9

Takeoff Obstacle Limit Weight

Flaps 5

Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)									
	40	45	50	55	60	65	70	75	80	85
S.L. & BELOW	0	0	0	0	0	0	0	0	0	0
1000	-1.5	-1.6	-1.8	-2.0	-2.1	-2.3	-2.5	-2.6	-2.8	-3.0
2000	-2.9	-3.2	-3.6	-3.9	-4.3	-4.6	-5.0	-5.3	-5.6	-6.0
3000	-4.2	-4.8	-5.3	-5.8	-6.3	-6.8	-7.3	-7.8	-8.3	-8.8
4000	-5.6	-6.3	-6.9	-7.6	-8.3	-9.0	-9.6	-10.3	-11.0	-11.7
5000	-6.9	-7.7	-8.6	-9.4	-10.2	-11.1	-11.9	-12.8	-13.6	-14.4
6000	-8.2	-9.2	-10.2	-11.2	-12.2	-13.2	-14.2	-15.2	-16.2	-17.2
7000	-9.3	-10.5	-11.7	-12.9	-14.0	-15.2	-16.4	-17.5	-18.7	-19.9
8000	-10.5	-11.8	-13.2	-14.5	-15.9	-17.2	-18.6	-19.9	-21.3	-22.6
9000	-11.6	-13.1	-14.6	-16.1	-17.6	-19.1	-20.6	-22.1	-23.5	-25.0
10000	-12.8	-14.4	-16.0	-17.7	-19.3	-20.9	-22.6	-24.2	-25.8	-27.5

Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)									
	40	45	50	55	60	65	70	75	80	85
15TW	-8.8	-8.7	-8.6	-8.5	-8.5	-8.4	-8.3	-8.2	-8.1	-8.0
10TW	-5.9	-5.8	-5.8	-5.7	-5.6	-5.6	-5.5	-5.5	-5.4	-5.3
5TW	-2.9	-2.9	-2.9	-2.8	-2.8	-2.8	-2.8	-2.7	-2.7	-2.7
0	0	0	0	0	0	0	0	0	0	0
10HW	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.8
20HW	2.2	2.1	2.0	2.0	1.9	1.8	1.8	1.7	1.6	1.5
30HW	3.4	3.3	3.2	3.0	2.9	2.8	2.7	2.6	2.4	2.3
40HW	4.6	4.5	4.3	4.1	4.0	3.8	3.6	3.4	3.3	3.1

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 1650 kg (optional system).

Performance Dispatch — Chapter PD
Enroute — Section 51

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	31200	-7	33400*	33400*	33400	31800	30400
80	32500	-10	35000*	35000*	34700	33100	31700
75	33900	-13	36400*	36400*	36100	34500	33100
70	35400	-16	37800*	37800*	37500	36000	34600
65	36900	-18	39200*	39200*	39000	37500	36100
60	38600	-18	40700*	40700*	40700	39200	37800
55	40400	-18	41000	41000	41000	41000	39600
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	31200	-1	31400*	31400*	31400*	31400*	30400
80	32500	-4	33600*	33600*	33600*	33100	31700
75	33900	-7	35400*	35400*	35400*	34500	33100
70	35400	-11	36800*	36800*	36800*	36000	34600
65	36900	-12	38200*	38200*	38200*	37500	36100
60	38600	-12	39600*	39600*	39600*	39200	37800
55	40400	-12	41000	41000	41000	41000	39600
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	31200	4	27900*	27900*	27900*	27900*	27900*
80	32500	1	30400*	30400*	30400*	30400*	30400*
75	33900	-2	33200*	33200*	33200*	33200*	33100
70	35400	-5	35400*	35400*	35400*	35400*	34600
65	36900	-7	36900*	36900*	36900*	36900*	36100
60	38600	-7	38300*	38300*	38300*	38300*	37800
55	40400	-7	39800*	39800*	39800*	39800*	39600
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) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
277	257	240	225	212	200	190	181	173	166	159
547	510	477	448	423	400	381	364	348	334	321
815	761	713	671	634	600	573	548	524	503	484
1083	1013	949	894	845	800	764	731	700	672	647
1350	1263	1185	1116	1055	1000	956	914	876	842	810
1616	1513	1420	1338	1266	1200	1147	1098	1053	1011	974
1882	1762	1655	1560	1476	1400	1339	1282	1229	1181	1137
2146	2011	1889	1782	1687	1600	1530	1466	1406	1351	1301
2410	2260	2124	2004	1897	1800	1722	1649	1582	1520	1464
2673	2507	2357	2225	2107	2000	1913	1833	1759	1690	1628
2935	2754	2590	2446	2317	2200	2105	2017	1935	1860	1792
3196	3000	2823	2667	2527	2400	2296	2200	2111	2030	1956
3457	3247	3055	2887	2737	2600	2488	2384	2288	2200	2120
3718	3493	3288	3108	2947	2800	2680	2568	2465	2370	2284
3978	3738	3521	3329	3157	3000	2872	2752	2642	2540	2448
4238	3984	3753	3549	3367	3200	3063	2936	2819	2711	2613
4497	4229	3985	3769	3576	3400	3255	3120	2996	2881	2777
4755	4473	4216	3989	3786	3600	3447	3304	3173	3051	2941
5013	4717	4447	4209	3996	3800	3639	3489	3349	3222	3105
5271	4961	4679	4429	4205	4000	3830	3673	3526	3392	3269
5528	5205	4910	4649	4415	4200	4022	3857	3703	3562	3434
5786	5448	5141	4869	4624	4400	4214	4041	3880	3733	3598
6042	5691	5372	5088	4833	4600	4406	4225	4057	3903	3762
6299	5934	5602	5307	5043	4800	4597	4408	4233	4073	3926
6555	6176	5832	5526	5252	5000	4789	4592	4410	4243	4090

Long Range Cruise Trip Fuel and Time

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	27		29		31		33		35	
	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	1.7	0:38	1.7	0:38	1.7	0:38	1.7	0:38	1.7	0:38
400	2.8	1:08	2.8	1:07	2.8	1:06	2.8	1:05	2.8	1:05
600	4.0	1:38	4.0	1:35	3.9	1:34	3.9	1:33	3.8	1:31
800	5.2	2:07	5.1	2:04	5.0	2:02	5.0	2:00	4.9	1:58
1000	6.4	2:37	6.3	2:32	6.2	2:30	6.1	2:27	6.0	2:25
1200	7.6	3:05	7.5	3:00	7.3	2:57	7.2	2:54	7.1	2:52
1400	8.9	3:34	8.7	3:28	8.5	3:24	8.3	3:21	8.2	3:18
1600	10.1	4:02	9.9	3:56	9.7	3:52	9.4	3:48	9.3	3:45
1800	11.4	4:30	11.1	4:23	10.9	4:19	10.6	4:14	10.4	4:11
2000	12.6	4:58	12.3	4:51	12.0	4:46	11.8	4:41	11.5	4:38
2200	13.9	5:26	13.6	5:18	13.3	5:12	12.9	5:07	12.7	5:04
2400	15.2	5:54	14.8	5:45	14.5	5:39	14.1	5:34	13.9	5:30
2600	16.5	6:21	16.1	6:13	15.7	6:06	15.3	6:00	15.1	5:57
2800	17.8	6:49	17.4	6:39	17.0	6:32	16.6	6:26	16.3	6:23
3000	19.2	7:16	18.7	7:06	18.2	6:59	17.8	6:53	17.5	6:49
3200	20.5	7:43	20.0	7:33	19.5	7:25	19.1	7:19	18.8	7:16
3400	21.9	8:10	21.3	7:59	20.8	7:51	20.3	7:45	20.1	7:42
3600	23.2	8:37	22.7	8:26	22.1	8:17	21.6	8:11	21.4	8:09
3800	24.6	9:04	24.0	8:52	23.4	8:43	23.0	8:37	22.8	8:35
4000	26.0	9:30	25.4	9:18	24.8	9:09	24.3	9:03	24.1	9:01
4200	27.5	9:57	26.8	9:44	26.1	9:35	25.7	9:30		
4400	28.9	10:23	28.2	10:10	27.5	10:01	27.0	9:56		
4600	30.3	10:49	29.6	10:36	28.9	10:27	28.4	10:22		
4800	31.8	11:15	31.0	11:02	30.3	10:53	29.9	10:48		
5000	33.3	11:41	32.5	11:28	31.8	11:19	31.3	11:14		

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	40	50	60	70	80
4	-0.7	-0.4	0.0	0.4	0.9
8	-1.3	-0.7	0.0	0.8	1.9
12	-2.0	-1.0	0.0	1.3	3.2
16	-2.6	-1.4	0.0	1.9	4.5
20	-3.3	-1.7	0.0	2.5	6.1
24	-4.0	-2.1	0.0	3.2	7.8
28	-4.7	-2.4	0.0	4.0	9.7
32	-5.4	-2.8	0.0	4.8	11.7

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) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
1316	1238	1168	1106	1050	1000	954	912	874	839	806
1829	1724	1630	1545	1469	1400	1337	1280	1227	1179	1134
2343	2209	2091	1984	1887	1800	1720	1647	1580	1519	1461
2855	2695	2551	2422	2306	2200	2103	2015	1934	1859	1789
3368	3180	3012	2861	2724	2600	2487	2383	2287	2199	2117
3880	3665	3473	3299	3143	3000	2870	2750	2641	2539	2445
4392	4150	3933	3738	3561	3400	3253	3118	2994	2880	2774
4904	4634	4393	4176	3979	3800	3636	3486	3348	3220	3102
5415	5119	4853	4614	4397	4200	4020	3854	3702	3561	3430
5926	5603	5313	5052	4816	4600	4403	4222	4055	3902	3759
6437	6087	5773	5490	5234	5000	4786	4590	4409	4242	4087

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG) LANDING WEIGHT (1000 KG)								TIME (HRS:MIN)
	40	45	50	55	60	65	70	75	
1000	4.5	4.8	5.2	5.6	5.9	6.3	6.7	7.1	2:24
1400	6.1	6.5	7.1	7.6	8.1	8.7	9.2	9.7	3:17
1800	7.8	8.3	9.0	9.7	10.4	11.1	11.8	12.5	4:10
2200	9.5	10.1	11.0	11.9	12.7	13.6	14.4	15.3	5:03
2600	11.2	12.0	13.0	14.1	15.1	16.1	17.1	18.2	5:56
3000	13.0	14.0	15.2	16.4	17.5	18.8	20.0	21.2	6:48
3400	14.8	16.0	17.3	18.7	20.1	21.5	22.9	24.2	7:41
3800	16.7	18.0	19.5	21.2	22.7	24.3	25.8	27.4	8:33
4200	18.6	20.1	21.8	23.6	25.3	27.2	28.9	30.7	9:25
4600	20.6	22.3	24.2	26.2	28.1	30.1	32.1	34.1	10:18
5000	22.6	24.5	26.7	28.8	31.0	33.2	35.3	37.5	11:10

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
95	81	70	62	55	50	46	42	39	36	34
161	144	130	118	108	100	93	87	81	77	72
227	206	188	174	161	150	140	132	125	118	112
292	267	246	229	213	200	188	178	168	160	152
355	328	304	284	266	250	236	224	212	202	193
418	387	361	338	318	300	284	270	257	245	234
481	447	418	393	370	350	332	316	301	287	275
544	508	476	447	422	400	380	362	345	330	316
608	568	533	502	475	450	428	408	389	372	357
674	630	592	558	527	500	475	453	433	414	397

Trip Fuel and Time Required

AIR DIST (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		40	50	60	70	80	
50	FUEL (1000 KG)	0.5	0.6	0.7	0.8	0.8	0:14
	ALT (FT)	11000	11000	9000	7000	7000	
100	FUEL (1000 KG)	0.9	1.0	1.1	1.2	1.3	0:23
	ALT (FT)	19000	17000	17000	15000	15000	
150	FUEL (1000 KG)	1.1	1.3	1.4	1.5	1.6	0:31
	ALT (FT)	25000	25000	23000	21000	19000	
200	FUEL (1000 KG)	1.4	1.5	1.7	1.8	2.0	0:38
	ALT (FT)	33000	27000	25000	25000	23000	
250	FUEL (1000 KG)	1.6	1.8	2.0	2.2	2.4	0:44
	ALT (FT)	39000	35000	31000	29000	27000	
300	FUEL (1000 KG)	1.8	2.0	2.2	2.5	2.7	0:51
	ALT (FT)	41000	39000	35000	33000	29000	
350	FUEL (1000 KG)	2.0	2.2	2.5	2.8	3.0	0:57
	ALT (FT)	41000	39000	35000	33000	31000	
400	FUEL (1000 KG)	2.1	2.4	2.7	3.1	3.4	1:04
	ALT (FT)	41000	41000	37000	33000	31000	
450	FUEL (1000 KG)	2.3	2.7	3.0	3.3	3.7	1:10
	ALT (FT)	41000	41000	37000	35000	31000	
500	FUEL (1000 KG)	2.5	2.9	3.3	3.6	4.0	1:17
	ALT (FT)	41000	41000	37000	35000	31000	

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
90	3160	3110	3100	3080	3060	3090	3210		
85	3000	2950	2930	2910	2880	2900	2990		
80	2840	2790	2760	2740	2700	2710	2790		
75	2690	2640	2600	2580	2530	2530	2590	2720	
70	2530	2480	2440	2410	2370	2340	2400	2480	
65	2380	2320	2280	2240	2210	2160	2220	2270	
60	2220	2170	2130	2080	2050	2000	2030	2070	
55	2070	2010	1970	1930	1890	1840	1850	1890	2040
50	1920	1860	1810	1770	1730	1730	1700	1730	1830
45	1760	1710	1690	1640	1600	1570	1550	1550	1630
40	1650	1600	1540	1490	1450	1420	1400	1380	1440

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

Flight Crew Oxygen Requirements
Required Pressure (PSI) for 76 Cubic 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	43.8	42.5	41.0
28	47.5	45.9	44.5
26	51.3	49.6	48.1
24	55.6	53.8	52.1
22	60.6	58.5	56.4
20	65.9	63.5	61.1
18	70.8	68.2	65.3
16	75.6	73.0	70.0
14	80.0	77.5	75.0
12	84.8	81.9	78.8

Anti-Ice Adjustments

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)								
	PRESSURE ALITITUDE (1000 FT)								
	12	14	16	18	20	22	24	26	28
ENGINE ONLY	-2.0	-1.8	-1.8	-1.8	-1.6	-1.5	-1.4	-1.3	-1.1
ENGINE & WING	-7.6	-7.1	-6.7	-6.7	-6.4	-5.9	-5.3	-4.9	

ALL ENGINES

Decompression Critical Fuel Reserves - LRC Cruise

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
284	262	243	227	213	200	189	179	170	162	154
577	530	490	456	426	400	377	356	338	321	306
870	798	737	685	640	600	565	534	506	481	458
1163	1066	984	914	853	800	753	711	674	640	610
1455	1334	1231	1143	1067	1000	941	889	842	800	762
1748	1602	1478	1372	1280	1200	1129	1066	1010	959	913
2041	1870	1725	1601	1494	1400	1317	1244	1178	1119	1065
2334	2138	1972	1830	1707	1600	1505	1421	1346	1278	1217
2627	2406	2219	2059	1921	1800	1693	1599	1514	1438	1369

Critical Fuel (1000 KG)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 KG)				
	50	60	70	80	90
200	1.7	1.9	2.0	2.1	2.2
300	2.5	2.7	2.9	3.0	3.2
400	3.2	3.5	3.7	4.0	4.1
500	4.0	4.3	4.5	4.8	5.0
600	4.7	5.0	5.4	5.7	6.0
700	5.5	5.8	6.2	6.6	6.9
800	6.2	6.6	7.1	7.5	7.8
900	6.9	7.4	7.9	8.4	8.8
1000	7.7	8.2	8.7	9.3	9.7
1100	8.4	8.9	9.5	10.1	10.6
1200	9.1	9.7	10.3	11.0	11.5
1300	9.8	10.5	11.1	11.8	12.4
1400	10.6	11.2	11.9	12.7	13.3
1500	11.3	12.0	12.7	13.5	14.2
1600	12.0	12.7	13.5	14.4	15.1
1700	12.7	13.5	14.3	15.2	16.0
1800	13.4	14.2	15.1	16.1	16.9

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.7% per 10°C above ISA.
-When icing conditions are forecast, use the greater of engine and wing anti-ice on (7%) for the total forecast time or engine and wing anti-ice on and ice drag (17%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

MAX CONTINUOUS THRUST

Decompression Critical Fuel Reserves - LRC Cruise

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
289	266	245	228	213	200	188	178	169	160	153
586	536	494	458	427	400	376	355	336	319	304
883	807	743	688	641	600	564	532	503	478	455
1179	1077	991	918	855	800	752	709	671	636	605
1476	1348	1240	1148	1069	1000	939	886	838	795	756
1773	1618	1488	1378	1283	1200	1127	1063	1005	954	907
2069	1889	1737	1608	1497	1400	1315	1240	1172	1112	1058
2366	2159	1986	1838	1711	1600	1503	1417	1340	1271	1209
2663	2430	2234	2068	1925	1800	1690	1594	1507	1430	1360

Critical Fuel (1000 KG)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 KG)				
	50	60	70	80	90
200	1.5	1.7	1.8	2.0	2.1
300	2.2	2.4	2.6	2.8	2.9
400	2.9	3.2	3.4	3.7	3.8
500	3.6	3.9	4.2	4.5	4.7
600	4.2	4.6	5.0	5.3	5.6
700	4.9	5.3	5.8	6.2	6.5
800	5.6	6.1	6.5	7.0	7.4
900	6.2	6.8	7.3	7.8	8.2
1000	6.9	7.5	8.1	8.6	9.1
1100	7.5	8.2	8.8	9.4	10.0
1200	8.2	8.9	9.6	10.3	10.8
1300	8.8	9.6	10.3	11.1	11.7
1400	9.5	10.3	11.1	11.9	12.6
1500	10.1	11.0	11.8	12.7	13.4
1600	10.7	11.7	12.6	13.5	14.2
1700	11.4	12.3	13.3	14.2	15.1
1800	12.0	13.0	14.0	15.0	15.9

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5%if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.7% per 10°C above ISA.
-When icing conditions are forecast, use the greater of engine and wing anti-ice on (7%) for the total forecast time or engine and wing anti-ice on and ice drag (18%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Critical Fuel Reserves - LRC Driftdown/Cruise

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
268	251	236	222	210	200	190	181	173	165	159
541	505	474	446	422	400	380	362	345	330	317
815	761	713	671	633	600	569	542	517	495	474
1092	1018	953	896	845	800	759	722	689	658	630
1371	1276	1193	1121	1057	1000	948	902	860	822	786
1650	1535	1434	1347	1269	1200	1137	1081	1031	984	942
1930	1794	1676	1572	1481	1400	1327	1261	1201	1147	1098
2209	2053	1917	1798	1693	1600	1516	1440	1372	1310	1254
2488	2311	2158	2023	1905	1800	1705	1620	1543	1473	1410

Critical Fuel (1000 KG)

AIR DIST (NM)	WEIGHT AT CRITICAL POINT (1000 KG)				
	50	60	70	80	90
200	1.5	1.6	1.8	1.9	2.1
300	2.1	2.2	2.5	2.7	2.9
400	2.6	2.8	3.1	3.4	3.7
500	3.1	3.4	3.8	4.2	4.6
600	3.6	4.0	4.5	4.9	5.4
700	4.1	4.6	5.1	5.7	6.2
800	4.5	5.1	5.8	6.4	7.1
900	5.0	5.7	6.4	7.1	7.9
1000	5.5	6.3	7.1	7.9	8.7
1100	6.0	6.8	7.7	8.6	9.5
1200	6.4	7.4	8.3	9.3	10.3
1300	6.9	7.9	9.0	10.0	11.1
1400	7.4	8.4	9.6	10.7	11.9
1500	7.8	9.0	10.2	11.4	12.7
1600	8.3	9.5	10.8	12.1	13.4
1700	8.7	10.0	11.4	12.8	14.2
1800	9.2	10.6	12.0	13.4	15.0

Based on: Driftdown to and cruise at level off altitude, 250 KIAS descent to 1500 ft, 15 minutes hold at 1500 ft, approach and land. Allowance for performance deterioration not included. Includes APU fuel burn.

Adjustments:
-Increase forecast headwind or decrease forecast tailwind by 5% if an acceptable wind forecasting model is used; otherwise, increase diversion fuel by 5% to account for wind errors.
-Increase fuel required 0.7% per 10°C above ISA.
-When icing conditions are forecast, use the greater of the engine and wing anti-ice on (12%) for the total forecast time or engine and wing anti-ice on and ice drag (31%) for 10% of the forecast time.

Compare the critical fuel reserves required for all engines cruise, engine inoperative cruise, and engine inoperative driftdown and use the higher of the three.

Performance Dispatch — Chapter PD
Landing — Section 52

Landing Field Limit Weight - Dry Runway
Based on anti-skid operative and automatic speedbrakes
Flaps 40

Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
3000			2720	3000	3220	3440	3660	3880
3400		2770	3100	3400	3630	3860	4080	4310
3800	2780	3130	3470	3800	4040	4270	4510	4740
4200	3120	3480	3850	4200	4440	4690	4930	5180
4600	3460	3840	4220	4600	4850	5100	5360	5610
5000	3800	4200	4600	5000	5260	5520	5780	6040
5400	4140	4560	4980	5400	5670	5940	6200	6470
5800	4480	4920	5350	5800	6080	6350	6630	6900
6200	4820	5270	5730	6200	6480	6770	7050	7340
6600	5160	5630	6100	6600	6890	7180	7480	7770
7000	5500	5990	6480	7000	7300	7600	7900	8200
7400	5840	6350	6850	7400	7710	8020	8320	8630
7800	6180	6700	7230	7800	8120	8430	8750	9060
8200	6520	7060	7610	8200	8520	8850	9170	9500
8600	6760	7300	7850	8600	8930	9260	9600	9930
9000	6970	7500	8050	9000	9340	9680	10020	10360
9400	7190	7700	8250	9400	9750	10100	10440	10790
9800	7400	7900	8450	9800	10160	10510	10870	
10200	7610	8100	8650	10200	10560	10930		
10600	7830	8300	8850	10600	10970			

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
3400	38.0					
3800	46.4	43.6	41.0	38.4		
4200	54.2	51.6	48.5	45.5	42.6	39.8
4600	60.6	57.8	55.0	52.4	49.1	46.0
5000	67.0	63.7	60.6	57.6	54.8	52.0
5400	73.4	69.7	66.1	62.7	59.6	56.6
5800	78.9	75.3	71.4	67.6	63.9	60.6
6200	82.8	80.2	76.3	72.3	68.4	64.6
6600	86.2	83.6	80.9	76.9	72.8	68.8
7000		86.7	84.0	81.2	77.2	72.9
7400			87.1	84.2	81.3	77.0
7800				87.2	84.2	81.0
8200					87.1	83.4
8600						84.9
9000						86.4
9400						87.9

Decrease field limit weight by 5800 kg when using manual speedbrakes.

Landing Field Limit Weight - Dry Runway
Based on anti-skid inoperative and manual speedbrakes
Flaps 40
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
6000				6000	6500	7000	7500	8000
6400				6400	6910	7420	7930	8440
6800			5970	6800	7320	7840	8360	8880
7200			6360	7200	7730	8260	8790	9320
7600		5880	6740	7600	8140	8680	9220	9760
8000		6250	7130	8000	8550	9100	9650	10200
8400	5730	6620	7510	8400	8960	9520	10080	10640
8800	6090	6990	7900	8800	9370	9940	10510	11080
9200	6440	7360	8280	9200	9780	10360	10940	11520
9600	6800	7730	8670	9600	10190	10780	11370	11960
10000	7150	8100	9050	10000	10600	11200	11800	12400
10400	7510	8470	9440	10400	11010	11620	12230	12840
10800	7860	8840	9820	10800	11420	12040	12660	13280
11200	8220	9210	10210	11200	11830	12460	13090	13720
11600	8570	9580	10590	11600	12240	12880	13520	14160
12000	8930	9950	10980	12000	12650	13300	13950	14600
12400	9280	10320	11360	12400	13060	13720	14380	15040
12800	9640	10690	11750	12800	13470	14140	14810	15480
13200	9990	11060	12130	13200	13880	14560	15240	15920
13600	10350	11430	12520	13600	14290	14980	15670	16360

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
6800	40.8	38.0				
7200	44.4	41.4				
7600	48.0	44.8	41.1	38.3		
8000	51.6	48.2	44.4	41.3	38.5	
8400	55.1	51.6	47.6	44.4	41.3	38.3
8800	58.7	54.9	50.8	47.4	44.2	41.0
9200	62.3	58.2	53.9	50.4	47.0	43.6
9600	65.9	61.5	57.0	53.3	49.7	46.3
10000	69.6	64.9	60.1	56.2	52.5	48.8
10400	73.2	68.3	63.2	59.1	55.2	51.4
10800	76.5	71.8	66.4	62.0	57.9	53.9
11200	79.5	75.0	69.6	64.8	60.6	56.5
11600	82.3	78.0	72.6	67.7	63.1	58.9
12000	85.1	80.8	75.6	70.6	65.7	61.2
12400	87.9	83.4	78.5	73.4	68.4	63.6
12800		86.1	81.2	76.2	71.0	66.0
13200			83.7	79.0	73.7	68.6
13600			86.3	81.6	76.3	71.1
14000				84.1	79.0	73.5
14400				86.7	81.6	76.0
14800					84.1	78.5
15200					86.7	80.9
15600						83.4
16000						85.9

Landing Field Limit Weight - Wet Runway
Based on anti-skid operative and automatic speedbrakes
Flaps 40
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
3000				3000	3240	3490	3730	3980
3400			3080	3400	3650	3900	4160	4410
3800		3090	3460	3800	4060	4320	4580	4840
4200	3050	3440	3830	4200	4470	4740	5000	5270
4600	3390	3800	4210	4600	4880	5150	5430	5700
5000	3730	4160	4590	5000	5280	5570	5850	6140
5400	4070	4520	4960	5400	5690	5980	6280	6570
5800	4410	4870	5340	5800	6100	6400	6700	7000
6200	4750	5230	5710	6200	6510	6820	7120	7430
6600	5090	5590	6090	6600	6920	7230	7550	7860
7000	5430	5950	6460	7000	7320	7650	7970	8300
7400	5770	6310	6840	7400	7730	8060	8400	8730
7800	6110	6660	7220	7800	8140	8480	8820	9160
8200	6450	7020	7590	8200	8550	8900	9240	9590
8600	6790	7380	7970	8600	8960	9310	9670	10020
9000	7130	7740	8340	9000	9360	9730	10090	10460
9400	7470	8090	8720	9400	9770	10140	10520	10890
9800	7730	8350	8980	9800	10180	10560	10940	11320
10200	7940	8550	9180	10200	10590	10980	11360	11750
10600	8150	8750	9380	10600	11000	11390	11790	12180

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
4200	43.3	40.7	38.1			
4600	50.7	47.7	44.7	42.0	39.3	
5000	56.6	54.0	51.3	48.1	45.0	42.1
5400	62.1	59.2	56.4	53.6	50.7	47.4
5800	67.7	64.3	61.2	58.2	55.3	52.5
6200	73.3	69.6	66.0	62.6	59.5	56.5
6600	78.1	74.5	70.6	66.9	63.3	60.0
7000	81.9	78.8	75.0	71.0	67.1	63.4
7400	84.8	82.2	79.2	75.0	71.0	67.0
7800	87.7	85.0	82.3	79.0	74.8	70.7
8200		87.8	85.0	82.2	78.6	74.2
8600			87.6	84.8	81.8	77.8
9000				87.4	84.4	81.1
9400					87.0	83.3
9800						84.6
10200						85.9
10600						87.2

Decrease field limit weight by 5800 kg when using manual speedbrakes.

Landing Field Limit Weight - Wet Runway
Based on anti-skid inoperative and manual speedbrakes
Flaps 40
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
6000					6550	7100	7660	8210
6400					6960	7520	8090	8650
6800				6800	7370	7950	8520	9090
7200				7200	7780	8370	8950	9530
7600			6650	7600	8190	8780	9380	9970
8000			7040	8000	8600	9200	9810	10410
8400		6450	7420	8400	9010	9630	10240	10850
8800		6820	7810	8800	9420	10040	10670	11290
9200		7190	8190	9200	9830	10470	11100	11730
9600	6540	7560	8580	9600	10240	10890	11530	12170
10000	6890	7930	8960	10000	10650	11310	11960	12610
10400	7250	8300	9350	10400	11060	11730	12390	13050
10800	7600	8670	9730	10800	11470	12150	12820	13490
11200	7960	9040	10120	11200	11880	12560	13250	13930
11600	8310	9410	10500	11600	12290	12980	13680	14370
12000	8670	9780	10890	12000	12700	13400	14110	14810
12400	9020	10150	11270	12400	13110	13830	14540	15250
12800	9380	10520	11660	12800	13520	14240	14970	15690
13200	9730	10890	12040	13200	13930	14660	15400	16130
13600	10090	11260	12430	13600	14340	15090	15830	16570

Field Limit Weight (1000 KG)

WIND CORR'D FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
7600	39.1					
8000	42.2	39.3				
8400	45.3	42.3	38.8			
8800	48.4	45.2	41.6	38.7		
9200	51.6	48.2	44.4	41.3	38.5	
9600	54.7	51.1	47.2	44.0	40.9	38.0
10000	57.8	54.0	50.0	46.6	43.4	40.3
10400	60.9	56.9	52.7	49.2	45.9	42.6
10800	63.9	59.8	55.4	51.8	48.3	44.9
11200	67.2	62.7	58.1	54.3	50.7	47.2
11600	70.4	65.6	60.8	56.8	53.0	49.4
12000	73.5	68.6	63.5	59.3	55.4	51.6
12400	76.3	71.6	66.3	61.8	57.8	53.8
12800	79.0	74.5	69.0	64.3	60.1	56.0
13200	81.5	77.1	71.7	66.8	62.3	58.1
13600	83.9	79.6	74.3	69.3	64.5	60.2
14000	86.3	81.9	76.9	71.8	66.9	62.2
14400		84.2	79.4	74.2	69.2	64.3
14800		86.5	81.6	76.7	71.5	66.5
15200			83.9	79.1	73.8	68.7
15600			86.0	81.3	76.1	70.8
16000				83.6	78.4	73.0
16400				85.8	80.7	75.1
16800				88.0	82.9	77.3
17200					85.1	79.5
17600					87.3	81.6

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	-2000	0	2000	4000	6000	8000	10000
54	129	68.7	64.8					
52	126	70.0	66.5					
50	122	71.3	68.2	62.9				
48	118	72.6	69.5	64.6				
46	115	74.1	70.8	66.2	61.0			
44	111	75.5	72.0	67.4	62.5			
42	108	76.9	73.3	68.6	64.0	58.7		
40	104	78.3	74.7	69.8	65.1	60.0		
38	100	79.7	76.1	71.0	66.3	61.4	55.9	
36	97	81.0	77.4	72.2	67.5	62.5	56.9	
34	93	82.3	78.9	73.6	68.7	63.6	57.9	53.2
32	90	82.5	80.4	74.9	69.9	64.6	59.0	54.3
30	86	82.5	81.8	76.0	70.7	65.6	60.0	55.3
28	82	82.6	81.9	77.0	71.5	66.4	60.9	56.2
26	79	82.7	82.0	77.9	72.2	67.0	61.8	57.1
24	75	82.8	82.1	78.0	72.8	67.5	62.6	57.7
22	72	82.9	82.1	78.0	73.3	68.0	63.0	58.2
20	68	83.0	82.2	78.1	73.3	68.5	63.4	58.7
18	64	83.0	82.3	78.1	73.4	68.9	63.8	59.1
16	61	83.1	82.3	78.2	73.4	68.9	64.2	59.4
14	57	83.2	82.4	78.2	73.5	68.9	64.6	59.8
12	54	83.3	82.5	78.3	73.5	69.0	64.6	60.1
10	50	83.3	82.5	78.3	73.5	69.0	64.6	60.5
-40	-40	84.1	83.1	78.9	74.1	69.4	65.0	61.1

With engine bleed for packs off, increase weight by 1350 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 12000 kg.

ENGINE INOP

ADVISORY INFORMATION

Go-Around Climb Gradient

Flaps 15

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	3.07					
50	3.74	2.69				
46	4.25	3.34	2.30			
42	4.77	3.81	2.90	1.85		
38	5.28	4.29	3.35	2.38	1.31	
34	5.81	4.79	3.82	2.82	1.69	0.78
30	6.36	5.27	4.21	3.20	2.10	1.20
26	6.40	5.62	4.50	3.47	2.45	1.54
22	6.43	5.64	4.72	3.66	2.69	1.76
18	6.45	5.66	4.73	3.84	2.85	1.93
14	6.47	5.68	4.74	3.85	3.00	2.07
10	6.49	5.69	4.76	3.86	3.01	2.20

Gradient Adjustment for Weight (%)

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)							
	0	1	2	3	4	5	6	7
85	-2.63	-2.98	-3.31	-3.63	-3.94	-4.26	-4.57	-4.90
80	-2.25	-2.56	-2.85	-3.13	-3.41	-3.67	-3.93	-4.18
75	-1.81	-2.06	-2.30	-2.54	-2.77	-2.98	-3.19	-3.39
70	-1.31	-1.48	-1.66	-1.83	-2.00	-2.16	-2.31	-2.44
65	-0.72	-0.81	-0.91	-1.00	-1.09	-1.18	-1.26	-1.33
60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55	0.81	0.92	1.03	1.14	1.25	1.36	1.47	1.59
50	1.80	2.05	2.30	2.54	2.78	3.02	3.27	3.54

Gradient Adjustment for Speed (%)

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)										
	0	1	2	3	4	5	6	7	8	9	10
VREF	-0.25	-0.26	-0.27	-0.28	-0.28	-0.28	-0.29	-0.29	-0.29	-0.28	-0.28
VREF+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF+10	0.13	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.12	0.11	0.10
VREF+15	0.21	0.21	0.21	0.21	0.21	0.20	0.19	0.18	0.17	0.16	0.14
VREF+20	0.23	0.22	0.21	0.20	0.19	0.18	0.17	0.16	0.14	0.13	0.11
VREF+25	0.18	0.16	0.14	0.12	0.10	0.08	0.07	0.05	0.04	0.03	0.01
VREF+30	0.08	0.03	-0.01	-0.04	-0.07	-0.10	-0.12	-0.13	-0.14	-0.15	-0.15

With engine bleed for packs off, increase gradient by 0.2%.
With engine anti-ice on, decrease gradient by 0.3%.
With engine and wing anti-ice on, decrease gradient by 0.5%.
With operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease gradient by 1.8%.

Quick Turnaround Limit Weight

Flaps 40

OAT		QUICK TURNAROUND LIMIT WEIGHT (1000 KG) AIRPORT PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
54	129	84.0	81.2	78.5				
50	122	84.5	81.7	79.0	76.0	72.9		
45	113	85.1	82.4	79.6	76.6	73.5	70.5	
40	104	85.9	83.0	80.2	77.3	74.2	71.1	
35	95	86.1	83.7	80.8	77.9	74.8	71.7	
30	86	86.1	84.3	81.4	78.5	75.4	72.3	69.2
25	77	86.1	85.0	82.1	79.2	76.0	72.9	69.8
20	68	86.1	85.8	82.8	79.8	76.7	73.5	70.4
15	59	86.1	86.1	83.5	80.5	77.4	74.2	71.1
10	50	86.1	86.1	84.2	81.1	78.1	74.9	71.7
5	41	86.1	86.1	84.9	81.9	78.8	75.6	72.4
0	32	86.1	86.1	85.6	82.6	79.5	76.3	73.0
-5	23	86.1	86.1	86.1	83.3	80.2	77.0	73.7
-10	14	86.1	86.1	86.1	84.1	80.9	77.7	74.4
-15	5	86.1	86.1	86.1	84.8	81.7	78.5	75.2
-20	-4	86.1	86.1	86.1	85.7	82.5	79.3	75.9
-30	-22	86.1	86.1	86.1	86.1	84.2	80.9	77.5
-40	-40	86.1	86.1	86.1	86.1	86.0	82.7	79.2
-50	-58	86.1	86.1	86.1	86.1	86.1	84.6	80.9
-54	-65	86.1	86.1	86.1	86.1	86.1	85.4	81.7

Increase weight by 750 kg per 1% uphill slope. Decrease weight by 1200 kg per 1% downhill slope. Increase weight by 1850 kg per 10 knots headwind. Decrease weight by 7750 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 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.

Intentionally
Blank

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	62.3	58.4	54.7	50.8	46.3	
52	126	63.4	58.8	55.5	51.7	47.1	
50	122	64.6	59.1	55.5	52.1	47.9	43.4
48	118	65.8	60.5	55.4	52.1	48.5	44.3
46	115	67.0	61.8	55.8	52.1	48.5	45.1
44	111	68.1	63.2	57.1	52.0	48.5	45.6
42	108	69.3	64.5	58.4	52.4	48.5	45.6
40	104	70.6	65.8	59.7	53.7	48.4	45.5
38	100	71.8	67.1	61.0	54.9	48.8	45.5
36	97	73.0	68.2	62.2	56.2	50.1	45.5
34	93	74.3	69.5	63.4	57.4	51.3	45.9
32	90	75.6	70.7	64.6	58.6	52.5	47.1
30	86	76.9	71.7	65.9	59.8	53.7	48.3
28	82	77.0	72.6	67.2	61.1	54.9	49.5
26	79	77.0	73.4	68.1	62.3	56.1	50.7
24	75	77.1	73.5	68.6	63.5	57.4	52.0
22	72	77.2	73.5	69.1	64.0	58.6	53.2
20	68	77.2	73.6	69.1	64.5	59.7	54.4
18	64	77.3	73.6	69.2	64.9	60.1	55.5
16	61	77.3	73.7	69.2	64.9	60.5	55.9
14	57	77.4	73.7	69.2	64.9	60.8	56.2
12	54	77.4	73.7	69.3	64.9	60.8	56.6
10	50	77.5	73.8	69.3	65.0	60.8	56.9
-40	-40	78.0	74.2	69.8	65.4	61.2	57.4

With engine bleeds for packs off, increase weight by 300 kg.
With engine anti-ice on, decrease weight by 250 kg.
With engine and wing anti-ice on, decrease weight by 3550 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	58.8					
52	126	60.3					
50	122	61.9	57.1				
48	118	63.0	58.6				
46	115	64.2	60.0	55.3			
44	111	65.3	61.1	56.6			
42	108	66.5	62.1	58.0	53.2		
40	104	67.7	63.2	59.0	54.4		
38	100	68.9	64.3	60.0	55.6	50.6	
36	97	70.1	65.4	61.1	56.6	51.5	
34	93	71.3	66.7	62.2	57.6	52.4	48.2
32	90	72.6	67.8	63.2	58.5	53.4	49.2
30	86	73.8	68.8	63.9	59.3	54.3	50.1
28	82	73.9	69.7	64.7	60.1	55.1	50.9
26	79	74.0	70.5	65.3	60.6	55.9	51.6
24	75	74.0	70.5	65.8	61.0	56.6	52.2
22	72	74.1	70.6	66.3	61.4	57.0	52.6
20	68	74.1	70.6	66.3	61.9	57.3	53.0
18	64	74.2	70.7	66.4	62.2	57.7	53.3
16	61	74.3	70.7	66.4	62.3	58.0	53.7
14	57	74.3	70.7	66.4	62.3	58.4	54.0
12	54	74.4	70.8	66.5	62.3	58.4	54.3
10	50	74.4	70.8	66.5	62.3	58.4	54.6
-40	-40	74.9	71.3	67.0	62.7	58.8	55.2

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 1300 kg.
When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 11000 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 (FT)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG) DISTANCE FROM BRAKE RELEASE (1000 FT)								
	8	10	12	14	16	18	20	22	24
10	72.1	78.6							
50	66.7	73.0	77.2	79.7					
100	62.3	68.2	72.6	75.8	77.9	79.4			
150	58.9	64.6	69.1	72.4	74.9	76.8	78.1	79.3	80.2
200	56.1	61.7	66.1	69.5	72.2	74.3	75.9	77.2	78.3
250	53.7	59.3	63.6	67.1	69.9	72.1	73.9	75.3	76.5
300	51.5	57.1	61.4	64.9	67.7	70.1	72.0	73.5	74.8
350	49.6	55.1	59.5	62.9	65.8	68.2	70.2	71.9	73.3
400	47.9	53.3	57.7	61.2	64.1	66.5	68.6	70.3	71.8
450	46.3	51.7	56.0	59.6	62.5	64.9	67.0	68.8	70.4
500	44.8	50.2	54.5	58.0	61.0	63.5	65.6	67.4	69.0
550	43.5	48.8	53.1	56.6	59.6	62.1	64.3	66.1	67.8
600	42.2	47.5	51.7	55.3	58.3	60.8	63.0	64.9	66.6
650	41.0	46.2	50.5	54.1	57.1	59.6	61.8	63.7	65.4
700		45.1	49.3	52.9	55.9	58.5	60.7	62.6	64.3
750		44.0	48.2	51.8	54.8	57.4	59.6	61.6	63.3
800		42.9	47.1	50.7	53.7	56.3	58.6	60.6	62.3
850		41.9	46.1	49.7	52.7	55.3	57.6	59.6	61.4
900		41.0	45.2	48.7	51.7	54.4	56.6	58.7	60.5
950			44.3	47.8	50.8	53.4	55.7	57.8	59.6
1000			43.4	46.9	49.9	52.6	54.9	56.9	58.7

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	80
30 & BELOW	0	0	0	0	0	0	0	0	0
32	-0.6	-0.7	-0.8	-0.9	-1.0	-1.1	-1.1	-1.2	-1.3
34	-1.2	-1.4	-1.6	-1.8	-1.9	-2.1	-2.3	-2.5	-2.7
36	-1.9	-2.1	-2.4	-2.7	-2.9	-3.2	-3.4	-3.7	-4.0
38	-2.5	-2.8	-3.2	-3.5	-3.9	-4.2	-4.6	-4.9	-5.3
40	-3.1	-3.5	-4.0	-4.4	-4.9	-5.3	-5.7	-6.2	-6.6
42	-3.6	-4.2	-4.7	-5.2	-5.7	-6.2	-6.8	-7.3	-7.8
44	-4.2	-4.8	-5.4	-6.0	-6.6	-7.2	-7.8	-8.4	-9.0
46	-4.7	-5.4	-6.1	-6.8	-7.4	-8.1	-8.8	-9.5	-10.2
48	-5.3	-6.0	-6.8	-7.6	-8.3	-9.1	-9.8	-10.6	-11.3
50	-5.8	-6.7	-7.5	-8.3	-9.2	-10.0	-10.8	-11.7	-12.5

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
Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)								
	40	45	50	55	60	65	70	75	80
S.L. & BELOW	0	0	0	0	0	0	0	0	0
1000	-1.4	-1.6	-1.8	-2.0	-2.2	-2.4	-2.6	-2.8	-3.0
2000	-2.7	-3.1	-3.5	-4.0	-4.4	-4.8	-5.2	-5.6	-6.0
3000	-4.2	-4.7	-5.3	-5.8	-6.4	-6.9	-7.4	-8.0	-8.5
4000	-5.7	-6.3	-7.0	-7.7	-8.3	-9.0	-9.7	-10.3	-11.0
5000	-6.8	-7.7	-8.5	-9.3	-10.2	-11.0	-11.8	-12.7	-13.5
6000	-8.0	-9.0	-10.0	-11.0	-12.0	-13.0	-14.0	-15.0	-16.0
7000	-9.3	-10.5	-11.7	-12.9	-14.1	-15.2	-16.4	-17.6	-18.8
8000	-10.7	-12.0	-13.4	-14.8	-16.1	-17.5	-18.9	-20.2	-21.6
9000	-12.0	-13.4	-14.9	-16.4	-17.8	-19.3	-20.8	-22.2	-23.7
10000	-13.3	-14.8	-16.4	-18.0	-19.5	-21.1	-22.7	-24.2	-25.8

Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)								
	40	45	50	55	60	65	70	75	80
15 TW	-9.4	-9.2	-8.9	-8.7	-8.4	-8.2	-7.9	-7.7	-7.4
10 TW	-6.3	-6.1	-6.0	-5.8	-5.6	-5.5	-5.3	-5.1	-5.0
5 TW	-3.1	-3.1	-3.0	-2.9	-2.8	-2.7	-2.6	-2.6	-2.5
0	0	0	0	0	0	0	0	0	0
10 HW	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.5
20 HW	2.4	2.2	2.0	1.8	1.7	1.5	1.3	1.1	0.9
30 HW	3.5	3.3	3.0	2.7	2.4	2.2	1.9	1.6	1.3
40 HW	4.6	4.3	3.9	3.6	3.2	2.9	2.5	2.1	1.8

With engine bleed for packs off, increase weight by 250 kg.
With engine anti-ice on, decrease weight by 550 kg.
With engine and wing anti-ice on, decrease weight by 5950 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	15100	12000	8900
80	17900	15100	12100
75	20800	18000	15300
70	23300	20900	18200
65	25800	24000	21300
60	28300	26800	24900
55	30600	29400	27800
50	32700	31700	30400
45	34900	33900	32700
40	37300	36300	35200

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
323	288	259	236	217	200	187	175	165	156	148
483	432	389	354	325	300	280	263	247	234	222
642	575	518	471	433	400	374	351	330	312	296
800	718	646	589	542	500	468	438	412	390	370
957	859	774	706	650	600	561	526	495	468	444
1113	1000	902	823	758	700	655	615	578	546	519
1268	1140	1029	940	865	800	749	703	661	625	593
1422	1280	1156	1056	973	900	843	791	745	704	668
1576	1419	1283	1173	1081	1000	937	879	828	783	743
1729	1558	1410	1289	1189	1100	1031	968	911	862	818
1881	1697	1536	1405	1296	1200	1125	1056	995	941	894
2033	1835	1662	1521	1404	1300	1218	1145	1079	1020	969
2184	1972	1788	1637	1511	1400	1313	1233	1162	1100	1045
2334	2109	1913	1753	1619	1500	1407	1322	1246	1179	1121
2483	2245	2038	1868	1726	1600	1501	1411	1330	1259	1197
2632	2381	2163	1984	1833	1700	1595	1500	1414	1339	1273
2780	2517	2287	2099	1940	1800	1689	1589	1499	1419	1349
2927	2652	2411	2214	2047	1900	1784	1678	1583	1499	1426
3074	2786	2535	2328	2154	2000	1878	1767	1668	1579	1502

GEAR DOWN

Long Range Cruise Trip Fuel and Time

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	10		14		20		24	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	2.9	0:50	2.7	0:49	2.6	0:47	2.6	0:46
300	4.2	1:12	4.0	1:10	3.8	1:06	3.7	1:04
400	5.6	1:35	5.3	1:31	4.9	1:25	4.7	1:23
500	7.0	1:57	6.6	1:52	6.1	1:45	5.8	1:41
600	8.4	2:18	7.9	2:12	7.3	2:04	7.0	1:59
700	9.9	2:40	9.3	2:32	8.5	2:22	8.1	2:17
800	11.3	3:01	10.6	2:53	9.7	2:41	9.3	2:35
900	12.7	3:23	12.0	3:13	10.9	3:00	10.4	2:53
1000	14.2	3:44	13.3	3:33	12.2	3:18	11.6	3:11
1100	15.7	4:05	14.7	3:53	13.4	3:36		
1200	17.2	4:25	16.2	4:12	14.7	3:55		
1300	18.7	4:45	17.6	4:32	16.0	4:13		
1400	20.2	5:06	19.0	4:51	17.3	4:31		
1500	21.7	5:26	20.4	5:11	18.6	4:49		
1600	23.3	5:46	21.9	5:29				
1700	24.9	6:06	23.4	5:48				
1800	26.5	6:25	24.9	6:07				
1900	28.1	6:45	26.4	6:25				
2000	29.8	7:04	27.9	6:44				

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	40	50	60	70	80
2	-0.4	-0.2	0.0	0.2	0.4
4	-0.7	-0.4	0.0	0.4	0.8
6	-1.1	-0.5	0.0	0.6	1.2
8	-1.4	-0.7	0.0	0.8	1.5
10	-1.7	-0.9	0.0	0.9	1.9
12	-2.1	-1.0	0.0	1.1	2.3
14	-2.4	-1.2	0.0	1.3	2.6
16	-2.7	-1.4	0.0	1.5	3.0
18	-3.1	-1.5	0.0	1.7	3.3
20	-3.4	-1.7	0.0	1.8	3.7
22	-3.8	-1.9	0.0	2.0	4.1
24	-4.1	-2.0	0.0	2.2	4.4
26	-4.4	-2.2	0.0	2.4	4.8
28	-4.8	-2.4	0.0	2.6	5.2
30	-5.1	-2.6	0.0	2.7	5.5

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
90	4780	4760	4760	4810				
85	4520	4490	4480	4510				
80	4260	4230	4210	4230	4250			
75	4010	3980	3950	3950	3960			
70	3770	3730	3690	3680	3680	3760		
65	3530	3480	3450	3420	3410	3440		
60	3300	3240	3200	3170	3140	3160	3340	
55	3060	3010	2960	2920	2880	2890	2970	
50	2830	2780	2730	2690	2640	2630	2680	
45	2600	2560	2500	2460	2400	2380	2410	2510
40	2380	2340	2300	2240	2190	2140	2170	2200

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	42.5	41.3	
20	45.9	44.6	43.3
18	49.6	48.0	46.2
16	53.2	51.3	49.4
14	56.2	54.8	53.0
12	60.0	58.0	55.8
10	63.5	61.4	58.6
8	67.4	64.9	61.9
6	71.1	68.4	65.2
4	74.9	71.8	68.3
2	78.4	75.0	71.6
0	81.7	78.2	74.8

Anti-Ice Adjustments

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)										
	PRESSURE ALTITUDE (1000 FT)										
	0	2	4	6	8	10	12	14	16	18	20
ENGINE ONLY	-1.3	-1.3	-1.3	-1.3	-1.4	-1.3	-1.5	-1.4	-1.3	-1.2	-1.0
ENGINE AND WING	-6.3	-6.3	-6.2	-5.9	-5.8	-5.4	-5.3	-5.2	-5.0	-4.5	

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Performance Dispatch — Chapter PD
Text — Section 54

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 and Obstacle Limit Weights as determined from the tables shown. Tire and Brake Energy Limits are not shown as they are not limiting for the range of conditions shown in this chapter.

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.

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

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.

Extended Operations - LRC Critical Fuel Reserves

ETOPS regulations require that flights conducted over a route that contains a point further than one hour's time at "normal one-engine-inoperative speed" from an adequate airport comply with rules specific to extended operations for airplanes with two or more engines. This section provides reserve fuel planning information for the "Critical Fuel Diversion Scenario".

ETOPS regulations require reserve planning to include a "Critical Fuel Diversion Scenario" calculation. The information shown is the fuel required to satisfy the flight profile as described below the charts. This information is shown for all engines operating and one engine inoperative at Long Range Cruise (LRC). There are two engine-inoperative scenarios, a decompression scenario and a driftdown scenario. The decompression scenario assumes an engine failure, loss of pressurization, emergency descent, and subsequent cruise at 10000 ft. The driftdown scenario assumes an engine failure without loss of pressurization, where the airplane "drifts down" to the thrust limited level-off altitude for the remainder of the diversion.

The ETOPS critical fuel required is the greater of the all-engine fuel or the engine-inoperative fuel. The ETOPS critical fuel required is compared to the amount of fuel that is predicted to be onboard the airplane at the critical point. If the fuel required by the ETOPS critical fuel reserves of the route exceeds the amount of fuel predicted, the fuel load must be adjusted accordingly. The data does not include an allowance for performance deterioration. However, regulations require a 5% allowance for performance deterioration, unless a value has been established by the operator for in-service deterioration.

To determine the ETOPS critical fuel required, enter the Ground to Air Mile Conversion table with the forecast wind (factored if applicable) and ground distance to the diversion airport from the critical point to obtain the air distance. Then enter the Critical Fuel table with air distance and expected weight at the critical point and read the required fuel. Apply the noted fuel adjustments for non-standard conditions, as necessary. When using a wind forecasting model acceptable to the FAA (such as the World Area Forecast System, WAFS), regulations allow the wind factor applied in this step to be 5% of the forecast wind (increase headwinds, decrease

tailwinds), as indicated in the note below the chart. However, if a FAA-acceptable wind forecasting model is not used, the ETOPS critical fuel must be increased by 5%, instead of factoring the forecast winds.

LRC Cruise/Driftdown Critical Fuel Reserves

Enter the Ground to Air Miles Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter the Critical Fuel table with air distance and expected weight at the critical point and read required fuel. Apply the noted fuel adjustments as necessary. Regulations require a 5% allowance for performance deterioration unless a value has been established by the operator for inservice deterioration.

As noted below each table, the fuel required is the greater of the two engine fuel and the single engine fuel. This fuel is compared to the amount of fuel normally onboard the airplane at that point in the route. If the fuel required by the critical fuel reserves exceeds the amount of fuel normally expected, the fuel load must be adjusted accordingly.

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 table with airport pressure altitude and OAT to read maximum quick turnaround weight. Apply the noted adjustments as required.

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, or ensure the brake temperature is within limits using the alternate procedure described on the page.

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.

Performance Inflight Chapter PI

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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
72	142	143	149	138	139	146									
68	137	138	145	134	134	142	129	129	135	126	126	133	125	125	132
64	133	134	141	129	130	138	124	125	132	121	122	129	120	121	128
60	127	128	136	124	125	134	119	120	128	117	117	125	116	116	124
56	122	122	132	118	119	129	114	114	123	112	112	121	111	111	120
52	116	117	127	112	113	124	108	109	119	106	107	117	105	106	115
48	110	111	122	106	107	119	103	103	114	101	101	112	100	101	111
44	104	105	117	100	101	114	97	97	110	95	96	108	94	95	107
40	98	99	112	94	95	109	91	92	105	90	90	103	89	90	102

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						6	7						-1	-1					
60	140	5	6	7	8				4	5	6	7				-1	-1	-1	-1			
50	122	3	4	5	6	7	9	10	3	4	5	6	7	9	10	0	0	0	-1	-1	-1	-1
40	104	1	2	3	4	6	7	9	1	2	3	4	6	7	9	0	0	0	0	0	0	0
30	86	0	0	1	3	4	6	7	0	0	1	3	4	6	7	0	0	0	0	0	0	0
20	68	0	0	1	1	3	4	6	0	0	1	1	3	4	6	0	0	0	0	0	0	0
-60	-76	0	0	1	1	2	3	4	0	0	1	1	2	3	5	0	0	0	0	0	0	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
72	-3	-1	0	1	1	-2	-1	-1	0	0	1	1	1
68	-3	-1	0	1	1	-2	-1	-1	0	0	1	1	1
64	-3	-1	0	1	1	-2	-1	-1	0	0	1	1	1
60	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	1
56	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	1
52	-2	-1	0	1	1	-2	-1	0	0	0	1	1	1
48	-1	-1	0	1	1	-2	-1	0	0	0	1	1	1
44	-1	0	0	1	1	-2	-1	0	0	0	1	1	1
40	0	0	0	1	1	-2	-1	0	0	0	1	1	1

***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	100	98					
60	140	100	98	96	95			
50	122	102	100	97	95	93	91	89
40	104	107	105	101	98	94	91	89
30	86	110	110	106	102	98	94	91
20	68	110	110	108	106	103	98	94
-60	-76	112	111	109	107	105	102	99

Takeoff Speeds - Wet 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
72	136	143	149	131	139	146									
68	131	138	145	126	134	142	123	129	135	122	126	133	122	125	132
64	126	134	141	121	130	138	118	125	132	117	122	129	116	121	128
60	120	128	136	116	125	134	113	120	128	111	117	125	110	116	124
56	114	122	132	110	119	129	107	114	123	105	112	121	104	111	120
52	108	117	127	104	113	124	101	109	119	100	107	117	99	106	115
48	101	111	122	98	107	119	95	103	114	94	101	112	93	101	111
44	95	105	117	92	101	114	89	97	110	88	96	108	87	95	107
40	89	99	112	85	95	109	83	92	105	82	90	103	81	90	102

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	9	10						6	7						-1	-1					
60	140	7	7	9	10				4	5	6	7				-1	-1	-1	-1			
50	122	4	5	6	8	9	12	13	3	4	5	6	7	9	10	0	0	0	-1	-1	-1	-1
40	104	1	2	4	5	7	9	11	1	2	3	4	6	7	9	0	0	0	0	0	0	0
30	86	0	0	2	3	5	7	9	0	0	1	3	4	6	7	0	0	0	0	0	0	0
20	68	0	0	1	2	3	5	7	0	0	1	1	3	4	6	0	0	0	0	0	0	0
-60	-76	0	0	1	2	3	4	5	0	0	1	1	2	3	5	0	0	0	0	0	0	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
72	-4	-2	0	2	5	-4	-2	-1	0	1	1	2	3
68	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
64	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
60	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
56	-3	-2	0	2	3	-4	-3	-1	0	1	2	2	3
52	-3	-1	0	2	3	-4	-3	-1	0	1	2	2	3
48	-3	-1	0	1	3	-4	-3	-1	0	1	2	3	3
44	-2	-1	0	1	3	-4	-3	-1	0	1	2	3	4
40	-2	-1	0	1	2	-5	-3	-1	0	1	2	3	4

***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	100	98					
60	140	100	98	96	95			
50	122	102	100	97	95	93	91	89
40	104	107	105	101	98	94	91	89
30	86	110	110	106	102	98	94	91
20	68	110	110	108	106	103	98	94
-60	-76	112	111	109	107	105	102	99

Maximum Allowable Clearway

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	170
2000	200
2500	240
3000	280
3500	330
4000	350

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
300	-2	-3	-4			
200	-2	-3	-4			
100	-1	-2	-2			
0	0	0	0	0	0	0
-100	1	1	0	2	2	1
-200	1	1	0	3	3	2
-300	1	1	0	3	3	2

Use of clearway not permitted on wet runways.

Stab Trim Setting
Max Takeoff Thrust
Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)								
	13	15	16	18	21	24	27	30	33
70	8 1/2	8 1/2	8 1/4	7 1/4	6 1/2	6	5 1/4	4 1/2	4
60	8 1/2	8	7 1/2	6 3/4	6	5 1/4	4 3/4	4	3 1/2
50	7 3/4	7 1/4	6 3/4	6	5 1/4	4 3/4	4	3 1/2	2 3/4
40	6	5 1/2	5 1/2	5	4 1/4	3 3/4	3 1/4	2 3/4	2 1/4
36	5	4 3/4	4 3/4	4 1/2	4	3 1/2	3	2 3/4	2 1/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)									
	13	15	16	18	21	24	27	29	32	33
70	8 1/2	8 1/2	8 1/4	7	6 1/4	5 1/2	4 3/4	4	3 1/4	3
60	8 1/2	7 3/4	7 1/4	6 1/4	5 1/2	4 3/4	4	3 1/2	2 3/4	2 1/2
50	7 3/4	6 3/4	6 1/4	5 1/4	4 3/4	4	3 1/4	2 3/4	2 1/4	2 1/4
40	5 1/2	5	4 3/4	4 1/4	3 1/2	3	3 1/2	2 1/4	2 1/4	2 1/4
36	4 1/4	4	4	3 3/4	3 1/4	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4

VREF

WEIGHT (1000 KG)	FLAPS		
	40	30	15
70	144	146	152
66	139	141	147
62	135	137	143
58	130	132	138
54	125	127	133
50	120	122	128
46	115	117	122
42	110	112	117
38	104	106	111

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
80	-9.0	-12.0	-14.9	-10.8	-13.7	-16.7	-14.6	-17.5	-20.5
75	-8.0	-10.9	-13.9	-9.4	-12.4	-15.3	-12.6	-15.5	-18.5
70	-7.0	-10.0	-12.9	-8.2	-11.1	-14.1	-10.7	-13.7	-16.6
65	-6.1	-9.1	-12.0	-7.1	-10.0	-13.0	-9.1	-12.1	-15.0
60	-5.3	-8.3	-11.2	-6.1	-9.0	-12.0	-7.7	-10.7	-13.6
55	-4.6	-7.6	-10.5	-5.2	-8.1	-11.1	-6.5	-9.4	-12.4
50	-4.0	-7.0	-9.9	-4.4	-7.4	-10.3	-5.5	-8.4	-11.4
45	-3.5	-6.4	-9.4	-3.8	-6.8	-9.7	-4.6	-7.6	-10.5
40	-3.0	-6.0	-8.9	-3.3	-6.2	-9.2	-4.0	-6.9	-9.9
35	-2.7	-5.6	-8.6	-2.9	-5.8	-8.8	-3.6	-6.5	-9.5

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
1400	25.3			28.5			33.1		
1600	38.1			41.1			45.4	26.7	
1800	51.1	31.4		53.7	34.5		57.7	39.0	
2000	64.1	44.3		66.6	47.1	27.9	69.9	51.3	32.5
2200	77.2	57.2	37.5	79.6	59.8	40.5	82.2	63.5	44.8
2400		70.3	50.4		72.7	53.1		75.8	57.1
2600		83.5	63.5		85.8	65.9		88.0	69.4
2800			76.6			78.9			81.6
3000			89.8						

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/+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
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
80	-14	-9	-4	-6	-1	0	1	1	1
75	-16	-11	-6	-9	-4	0	1	1	1
70	-17	-12	-7	-11	-6	-1	0	1	1
65	-18	-13	-8	-14	-9	-4	-5	0	1
60	-19	-14	-9	-16	-11	-6	-8	-3	1
55	-20	-15	-10	-17	-12	-7	-11	-6	-1
50	-21	-16	-11	-19	-14	-9	-14	-9	-4
45	-22	-17	-12	-20	-15	-10	-16	-11	-6
40	-22	-17	-12	-21	-16	-11	-18	-13	-8
35	-23	-18	-13	-21	-16	-11	-19	-14	-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
80	-10.7	-13.9	-17.1	-13.0	-16.1	-19.3	-17.4	-20.6	-23.8
75	-9.6	-12.7	-15.9	-11.3	-14.5	-17.7	-14.8	-17.9	-21.1
70	-8.5	-11.7	-14.8	-9.8	-13.0	-16.2	-12.5	-15.7	-18.8
65	-7.5	-10.7	-13.9	-8.5	-11.7	-14.9	-10.6	-13.7	-16.9
60	-6.6	-9.8	-13.0	-7.4	-10.6	-13.8	-9.0	-12.2	-15.4
55	-5.8	-9.0	-12.2	-6.5	-9.7	-12.8	-7.9	-11.0	-14.2
50	-5.1	-8.2	-11.4	-5.7	-8.9	-12.1	-7.1	-10.3	-13.4
45	-4.4	-7.6	-10.8	-5.2	-8.3	-11.5	-6.7	-9.8	-13.0
40	-3.9	-7.0	-10.2	-4.8	-8.0	-11.1	-6.6	-9.8	-13.0
35	-3.4	-6.5	-9.7	-4.6	-7.7	-10.9	-7.0	-10.1	-13.3

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				27.3			38.9		
2000	34.1			42.4			53.0	27.6	
2200	50.3			57.1	31.1		65.9	42.5	
2400	65.3	38.2		71.1	46.1		77.9	56.2	31.3
2600	79.4	54.1	25.7	84.7	60.6	34.8	89.2	68.9	46.0
2800		68.9	42.3		74.5	49.7		80.8	59.5
3000		82.8	57.8		88.0	64.1			71.9
3200			72.4			77.9			83.6
3400			86.1						

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 -50 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 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
80	-21	-16	-11	-10	-5	0	0	0	0
75	-21	-16	-11	-13	-8	-3	0	0	0
70	-22	-17	-12	-16	-11	-6	-1	0	0
65	-23	-18	-13	-19	-14	-9	-6	-1	0
60	-24	-19	-14	-21	-16	-11	-11	-6	-1
55	-25	-20	-15	-23	-18	-13	-15	-10	-5
50	-27	-22	-17	-24	-19	-14	-19	-14	-9
45	-28	-23	-18	-26	-21	-16	-21	-16	-11
40	-29	-24	-19	-27	-22	-17	-23	-18	-13
35	-30	-25	-20	-28	-23	-18	-25	-20	-15

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
80	-0.5	-0.5	-0.5	-5.0	-5.0	-5.0	-9.0	-9.0	-9.0
75	-0.8	-0.8	-0.8	-4.9	-4.9	-4.9	-8.4	-8.4	-8.4
70	-0.9	-0.9	-0.9	-4.7	-4.7	-4.7	-7.9	-7.9	-7.9
65	-1.0	-1.0	-1.0	-4.5	-4.5	-4.5	-7.3	-7.3	-7.3
60	-1.0	-1.0	-1.0	-4.1	-4.1	-4.1	-6.7	-6.7	-6.7
55	-0.8	-0.8	-0.8	-3.8	-3.8	-3.8	-6.1	-6.1	-6.1
50	-0.6	-0.6	-0.6	-3.3	-3.3	-3.3	-5.5	-5.5	-5.5
45	-0.2	-0.2	-0.2	-2.8	-2.8	-2.8	-4.9	-4.9	-4.9
40	0.0	0.0	0.0	-2.2	-2.2	-2.2	-4.3	-4.3	-4.3
35	0.0	0.0	0.0	-1.5	-1.5	-1.5	-3.6	-3.6	-3.6

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	28.0								
1200	44.7	28.2							
1400	63.0	44.9	28.3	31.4					
1600	83.9	63.2	45.0	45.0	26.3				
1800		84.1	63.4	59.7	39.9		29.3		
2000			84.3	75.7	54.1	34.8	39.8		
2200					69.6	48.7	50.4	31.1	
2400					86.6	63.7	61.3	41.6	
2600						80.1	72.5	52.3	32.9
2800							84.0	63.2	43.4
3000								74.4	54.1
3200								85.9	65.1
3400									76.4
3600									87.9

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 -30 m/+25 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -30 m/+25 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -45 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
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
80	-6	-4	-3	-14	-13	-11	-26	-25	-23
75	-6	-5	-4	-15	-14	-13	-27	-25	-24
70	-7	-6	-5	-16	-15	-14	-28	-26	-25
65	-8	-6	-5	-18	-16	-15	-29	-28	-27
60	-8	-7	-6	-19	-17	-16	-31	-29	-28
55	-9	-8	-6	-20	-18	-17	-32	-31	-30
50	-10	-8	-7	-21	-19	-18	-34	-32	-31
45	-10	-9	-8	-22	-20	-19	-35	-34	-33
40	-10	-9	-8	-23	-22	-20	-37	-35	-34
35	-11	-10	-8	-24	-23	-21	-38	-37	-36

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
80	-1.2	-1.2	-1.2	-6.9	-6.9	-6.9	-11.7	-11.7	-11.7
75	-1.5	-1.5	-1.5	-6.6	-6.6	-6.6	-10.8	-10.8	-10.8
70	-1.7	-1.7	-1.7	-6.3	-6.3	-6.3	-9.9	-9.9	-9.9
65	-1.8	-1.8	-1.8	-5.9	-5.9	-5.9	-9.2	-9.2	-9.2
60	-1.8	-1.8	-1.8	-5.6	-5.6	-5.6	-8.5	-8.5	-8.5
55	-1.7	-1.7	-1.7	-5.2	-5.2	-5.2	-7.9	-7.9	-7.9
50	-1.6	-1.6	-1.6	-4.8	-4.8	-4.8	-7.4	-7.4	-7.4
45	-1.4	-1.4	-1.4	-4.4	-4.4	-4.4	-7.0	-7.0	-7.0
40	-1.1	-1.1	-1.1	-3.9	-3.9	-3.9	-6.7	-6.7	-6.7
35	-0.7	-0.7	-0.7	-3.5	-3.5	-3.5	-6.5	-6.5	-6.5

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	36.2								
1400	55.2	36.4							
1600	76.9	55.4	36.5						
1800		77.1	55.6	36.7					
2000			77.3	54.1	30.5				
2200				72.9	47.5				
2400					65.7	41.1			
2600					85.5	58.8			
2800						78.0	36.8		
3000							53.2		
3200							67.6	37.2	
3400							80.7	53.5	
3600								67.9	37.5
3800								80.9	53.8
4000									68.1
4200									81.1

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 -35 m/+30 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -35 m/+30 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -55 m/+50 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
80	-7	-5	-2	-18	-16	-13	-36	-34	-31
75	-8	-5	-3	-20	-17	-15	-37	-35	-32
70	-9	-6	-4	-21	-18	-16	-38	-36	-33
65	-10	-7	-5	-22	-20	-17	-40	-38	-35
60	-11	-8	-6	-24	-22	-19	-42	-40	-37
55	-12	-9	-7	-26	-24	-21	-45	-42	-40
50	-13	-11	-8	-28	-26	-23	-47	-45	-42
45	-14	-12	-9	-30	-28	-25	-50	-47	-45
40	-15	-13	-10	-32	-30	-27	-52	-49	-47
35	-17	-14	-12	-34	-32	-29	-54	-51	-49

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 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	87.7	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	88.5	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.3	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.2	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.1	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	91.9	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	91.5	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	90.8	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	90.0	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	89.3	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	88.5	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
5	87.8	88.9	90.0	90.7	91.3	92.0	92.7	93.2	93.7	94.3	94.9	95.6	96.3
0	87.0	88.1	89.2	89.9	90.5	91.2	91.9	92.4	92.9	93.5	94.1	94.8	95.5
-5	86.2	87.3	88.4	89.1	89.7	90.4	91.1	91.6	92.1	92.7	93.3	94.0	94.7
-10	85.4	86.5	87.6	88.3	88.9	89.6	90.3	90.8	91.3	91.9	92.5	93.2	93.9
-15	84.6	85.7	86.8	87.5	88.1	88.8	89.4	90.0	90.5	91.1	91.7	92.4	93.1
-20	83.8	84.9	86.0	86.6	87.3	87.9	88.6	89.1	89.7	90.3	90.8	91.6	92.3
-25	83.0	84.1	85.2	85.8	86.4	87.1	87.8	88.3	88.8	89.4	90.0	90.7	91.5
-30	82.2	83.3	84.4	85.0	85.6	86.3	86.9	87.4	88.0	88.6	89.2	89.9	90.6
-35	81.4	82.4	83.5	84.1	84.7	85.4	86.1	86.6	87.1	87.7	88.3	89.0	89.8
-40	80.6	81.6	82.7	83.3	83.9	84.5	85.2	85.7	86.2	86.8	87.4	88.2	88.9
-45	79.7	80.7	81.8	82.4	83.0	83.7	84.3	84.8	85.3	86.0	86.6	87.3	88.0
-50	78.9	79.9	80.9	81.5	82.1	82.8	83.4	83.9	84.5	85.1	85.7	86.4	87.2

%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	0.9	0.9	0.9

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	67								
50	73	71	69	67	65	63						
45	73	71	69	67	65	63	61	59	57			
40	72	71	69	67	65	63	61	59	57	55		
35	66	66	66	66	65	63	61	59	57	55	53	
30	63	61	61	61	61	61	61	59	57	55	53	51
25	63	61	59	57	56	56	56	56	56	55	53	51
20	63	61	59	57	55	53	51	51	51	50	50	50
15	63	61	59	57	55	53	51	50	47	45	45	45
10 & BELOW	63	61	59	57	55	53	51	50	47	45	43	41

Takeoff %N1 (Table 2 of 3)

Based on engine bleed for packs on and engine 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	85.7	86.0	86.7	87.4	88.2	88.9	89.5	90.1	90.2	90.2	90.6	91.1
70	86.6	87.0	87.1	87.1	87.5	88.3	88.9	89.4	89.5	89.6	90.0	90.4
65	87.4	87.8	88.0	88.0	88.2	88.3	88.3	88.8	88.9	88.9	89.4	89.8
60	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
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 0.9.

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	11.6													
100	10.3	7.9												
90	10.8	8.4												
80	12.2	7.1	5.0											
70	11.0	7.6	5.4	5.2	3.5									
60	9.6	9.0	4.1	4.0	3.9	3.8	2.1							
50	8.0	7.7	4.5	2.8	2.6	2.7	2.6	2.4	0.8					
40		6.2	5.9	4.7	3.0	2.6	2.7	2.8	2.6	2.5	2.9			
30		4.7	4.6	4.5	4.4	4.2	4.1	4.0	4.0	3.9	3.8	3.7	3.6	
20			3.1	3.0	3.0	3.0	2.9	2.8	2.7	2.7	2.6	2.6	2.5	2.4
10			1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	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.**

Takeoff Speeds - Dry Runway (20K 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
72	144	144	148												
68	140	140	145	136	136	142									
64	135	135	141	131	131	138	126	126	132	123	124	129			
60	129	130	136	126	126	134	121	121	127	118	119	125			
56	124	124	131	120	121	129	116	116	123	113	113	121	113	113	120
52	118	118	126	115	115	124	110	111	119	108	108	116	107	107	115
48	112	112	121	109	109	119	105	105	114	103	103	112	102	102	111
44	106	106	116	102	103	114	99	99	109	97	97	107	96	97	106
40	100	100	111	96	97	108	93	93	104	91	92	103	91	91	102

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						6	7						0	0					
60	140	5	6	5	6				5	6	6	6				0	0	0	0			
50	122	3	4	4	4	5	7	9	3	4	4	4	6	7	9	0	0	0	0	0	0	0
40	104	1	2	2	2	4	6	8	1	2	2	3	4	6	8	0	0	0	0	0	0	0
30	86	0	0	0	0	2	4	7	0	0	0	1	3	5	7	0	0	0	0	0	0	0
20	68	0	0	0	0	1	3	5	0	0	0	1	2	3	5	0	0	0	0	0	1	0
-60	-76	0	0	0	0	1	2	4	0	0	0	1	2	3	4	0	0	0	0	0	1	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
72	-2	-1	0	0	0	-1	0	0	0	0	0	0	0
68	-2	-1	0	0	0	-1	0	0	0	0	0	0	0
64	-2	-1	0	0	0	-1	0	0	0	0	0	0	0
60	-2	-1	0	0	0	-1	-1	0	0	0	0	0	0
56	-2	-1	0	0	0	-1	-1	0	0	0	0	0	0
52	-2	-1	0	0	0	-1	-1	0	0	0	0	0	0
48	-1	-1	0	0	0	-1	-1	0	0	0	0	0	0
44	-1	0	0	0	0	-1	-1	0	0	0	0	0	0
40	-1	0	0	1	1	-2	-1	0	0	0	1	1	1

***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	94	95			
50	122	97	95	94	95	93	90	86
40	104	102	99	99	98	94	90	86
30	86	105	105	104	103	98	93	88
20	68	105	105	104	103	100	97	92
-60	-76	107	106	105	104	102	99	97

Takeoff Speeds - Wet Runway (20K 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
72	139	144	148												
68	134	140	145	130	136	142									
64	129	135	141	125	131	138	122	126	132	121	124	129			
60	123	130	136	119	126	134	116	121	127	115	119	125			
56	117	124	131	113	121	129	110	116	123	109	113	121	108	113	120
52	111	118	126	107	115	124	104	111	119	103	108	116	102	107	115
48	104	112	121	101	109	119	98	105	114	97	103	112	96	102	111
44	98	106	116	95	103	114	92	99	109	91	97	107	90	97	106
40	92	100	111	88	97	108	86	93	104	85	92	103	84	91	102

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	11						6	7						0	0					
60	140	7	8	7	8				5	6	6	6				0	0	0	0			
50	122	4	5	5	5	7	9	13	3	4	4	4	6	7	9	0	0	0	0	0	0	0
40	104	2	2	2	2	4	7	10	1	2	2	3	4	6	8	0	0	0	0	0	0	0
30	86	0	0	0	0	2	5	8	0	0	0	1	3	5	7	0	0	0	0	0	0	0
20	68	0	0	0	0	1	3	6	0	0	0	1	2	3	5	0	0	0	0	0	1	0
-60	-76	0	0	0	0	1	3	4	0	0	0	1	2	3	4	0	0	0	0	0	1	1

Slope and Wind V1 Adjustment*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
72	-5	-2	0	2	5	-3	-2	-1	0	0	1	2	2
68	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
64	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
60	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
56	-3	-2	0	2	4	-4	-2	-1	0	1	1	2	3
52	-3	-2	0	2	3	-4	-2	-1	0	1	2	2	3
48	-3	-1	0	1	3	-4	-3	-1	0	1	2	2	3
44	-2	-1	0	1	2	-4	-3	-1	0	1	2	2	3
40	-2	-1	0	1	2	-5	-3	-1	0	1	2	3	3

***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	94	95			
50	122	97	95	94	95	93	90	86
40	104	102	99	99	98	94	90	86
30	86	105	105	104	103	98	93	88
20	68	105	104	104	103	100	97	92
-60	-76	107	106	105	104	102	99	97

Maximum Allowable Clearway (20K Derate)

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	170
2000	210
2500	250
3000	300
3500	340
4000	370

Clearway and Stopway V1 Adjustments (20K Derate)

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
300	-2	-3	-3			
200	-2	-3	-3			
100	-1	-1	-1			
0	0	0	0	0	0	0
-100	1	1	0	2	2	0
-200	1	1	0	3	2	1
-300	1	1	0	3	2	1

Use of clearway not permitted on wet runways.

Stab Trim Setting (20K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)							
	12	14	16	18	24	28	31	33
70	8 1/2	8 1/2	8 1/4	7 3/4	6 1/4	5 1/2	4 3/4	4 1/4
60	8 1/2	8 1/4	7 3/4	7	5 3/4	4 3/4	4 1/4	3 3/4
50	8 1/4	7 3/4	7	6 1/4	5	4 1/4	3 3/4	3 1/4
40	6 3/4	6 1/4	5 3/4	5 1/4	4 1/4	3 1/2	3	2 1/2
36	5 3/4	5 1/2	5 1/4	4 3/4	3 3/4	3 1/4	2 3/4	2 1/2

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)							
	12	14	16	18	24	28	31	33
70	8 1/2	8 1/2	8 1/4	7 1/4	5 3/4	4 3/4	4	3 1/2
60	8 1/2	8 1/4	7 1/2	6 1/2	5	4	3 1/4	2 3/4
50	8 1/4	7 1/2	6 3/4	5 3/4	4 1/2	3 1/4	2 3/4	2 1/4
40	6 1/4	5 3/4	5	4 1/2	3 1/2	2 1/2	2 1/4	2 1/4
36	5	4 3/4	4 1/4	4	3	2 1/4	2 1/4	2 1/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (20K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

20K 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
80	-10.7	-12.5	-14.3	-13.0	-14.9	-16.7	-17.9	-19.7	-21.5
75	-9.0	-10.9	-12.7	-11.0	-12.8	-14.6	-14.9	-16.8	-18.6
70	-7.6	-9.4	-11.3	-9.1	-10.9	-12.7	-12.3	-14.1	-15.9
65	-6.4	-8.2	-10.0	-7.5	-9.4	-11.2	-10.1	-11.9	-13.7
60	-5.4	-7.2	-9.0	-6.2	-8.0	-9.9	-8.2	-10.0	-11.8
55	-4.5	-6.3	-8.2	-5.2	-7.0	-8.8	-6.6	-8.4	-10.3
50	-3.9	-5.7	-7.5	-4.4	-6.2	-8.0	-5.5	-7.3	-9.1
45	-3.5	-5.3	-7.1	-3.8	-5.6	-7.5	-4.6	-6.5	-8.3
40	-3.2	-5.0	-6.9	-3.5	-5.4	-7.2	-4.2	-6.0	-7.8
35	-3.2	-5.0	-6.8	-3.5	-5.3	-7.1	-4.1	-5.9	-7.7

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
1200							26.7		
1400	32.4			34.8			38.7		
1600	45.5	25.6		47.7	28.2		51.1	32.4	
1800	58.9	38.6		61.0	40.9		64.0	44.5	26.1
2000	72.8	51.8	31.8	74.6	54.0	34.2	77.4	57.1	38.1
2200	87.1	65.5	44.9	88.7	67.4	47.1		70.3	50.5
2400		79.5	58.3		81.2	60.3		84.1	63.3
2600			72.1			73.9			76.8
2800			86.4			88.0			

1. **Enter Weight Adjustment table with slush/standing water depth and 20K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -35 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.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff (20K 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
80	-12	-10	-7	-2	0	0	0	0	0
75	-13	-11	-8	-5	-3	0	0	0	0
70	-14	-12	-9	-8	-5	-3	0	0	0
65	-15	-13	-10	-10	-8	-5	0	0	0
60	-16	-14	-11	-13	-10	-8	-4	-2	0
55	-17	-15	-12	-15	-12	-10	-8	-5	-3
50	-18	-16	-13	-16	-14	-11	-11	-8	-6
45	-19	-17	-14	-18	-15	-13	-13	-11	-8
40	-20	-18	-15	-19	-16	-14	-15	-13	-10
35	-21	-19	-16	-20	-17	-15	-17	-14	-12

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

20K 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
80	-12.7	-15.6	-18.6	-15.2	-18.1	-21.1	-20.1	-23.1	-26.0
75	-10.9	-13.8	-16.8	-12.9	-15.8	-18.8	-16.9	-19.8	-22.8
70	-9.3	-12.2	-15.2	-10.9	-13.8	-16.8	-14.1	-17.0	-20.0
65	-7.9	-10.8	-13.8	-9.1	-12.1	-15.0	-11.6	-14.6	-17.5
60	-6.7	-9.6	-12.6	-7.6	-10.6	-13.5	-9.6	-12.5	-15.5
55	-5.7	-8.7	-11.6	-6.4	-9.4	-12.3	-7.9	-10.9	-13.8
50	-5.0	-7.9	-10.9	-5.5	-8.5	-11.4	-6.6	-9.6	-12.5
45	-4.4	-7.4	-10.3	-4.8	-7.8	-10.7	-5.7	-8.7	-11.6
40	-4.1	-7.0	-10.0	-4.4	-7.4	-10.3	-5.2	-8.1	-11.1
35	-3.9	-6.9	-9.8	-4.3	-7.3	-10.2	-5.0	-8.0	-10.9

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
1600							35.5		
1800	33.4			39.0			48.3	26.2	
2000	49.1			53.8	28.1		62.8	38.5	
2200	64.4	37.3		69.0	42.6		80.0	51.7	29.3
2400	79.4	52.9	25.4	84.9	57.5	31.7		66.8	41.6
2600		68.1	41.2		72.9	46.3		84.8	55.2
2800		83.0	56.7		88.9	61.3			70.9
3000			71.9			76.8			89.9
3200			86.6						

1. **Enter Weight Adjustment table with slush/standing water depth and 20K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -45 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
80	-18	-15	-13	-4	-2	0	0	0	0
75	-19	-16	-14	-8	-5	-3	0	0	0
70	-20	-17	-15	-11	-9	-6	0	0	0
65	-21	-18	-16	-14	-12	-9	0	0	0
60	-22	-19	-17	-17	-14	-12	-6	-3	-1
55	-23	-20	-18	-19	-17	-14	-11	-8	-6
50	-24	-21	-19	-21	-19	-16	-15	-12	-10
45	-25	-22	-20	-23	-20	-18	-18	-15	-13
40	-26	-23	-21	-24	-22	-19	-20	-18	-15
35	-27	-25	-22	-25	-23	-20	-23	-20	-18

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

20K 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
80	-0.8	-0.8	-0.8	-5.4	-5.4	-5.4	-9.8	-9.8	-9.8
75	-0.8	-0.8	-0.8	-5.0	-5.0	-5.0	-8.9	-8.9	-8.9
70	-0.8	-0.8	-0.8	-4.6	-4.6	-4.6	-8.0	-8.0	-8.0
65	-0.9	-0.9	-0.9	-4.3	-4.3	-4.3	-7.3	-7.3	-7.3
60	-0.9	-0.9	-0.9	-4.0	-4.0	-4.0	-6.6	-6.6	-6.6
55	-0.8	-0.8	-0.8	-3.7	-3.7	-3.7	-6.1	-6.1	-6.1
50	-0.8	-0.8	-0.8	-3.5	-3.5	-3.5	-5.6	-5.6	-5.6
45	-0.8	-0.8	-0.8	-3.2	-3.2	-3.2	-5.2	-5.2	-5.2
40	-0.7	-0.7	-0.7	-3.0	-3.0	-3.0	-4.9	-4.9	-4.9
35	-0.6	-0.6	-0.6	-2.9	-2.9	-2.9	-4.7	-4.7	-4.7

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	31.1								
1200	49.5	31.3							
1400	68.9	49.6	31.4	36.2					
1600	89.8	69.1	49.8	50.9	30.9				
1800		90.0	69.3	66.6	45.3	25.6	35.1		
2000				83.6	60.6	39.9	45.6	25.8	
2200					77.1	54.8	56.5	36.1	
2400						70.8	68.0	46.6	26.8
2600						88.2	80.0	57.6	37.1
2800								69.1	47.6
3000								81.2	58.7
3200									70.2
3400									82.3

1. **Enter Weight Adjustment table with reported braking action and 20K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -25 m/+20 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -25 m/+20 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -40 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 (20K 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
80	-12	-9	-7	-19	-17	-14	-32	-29	-27
75	-9	-6	-4	-16	-14	-11	-28	-25	-23
70	-7	-5	-2	-15	-13	-10	-26	-24	-21
65	-7	-4	-2	-15	-13	-10	-26	-24	-21
60	-7	-5	-2	-16	-14	-11	-27	-25	-22
55	-8	-6	-3	-18	-15	-13	-29	-27	-24
50	-9	-7	-4	-20	-17	-15	-32	-29	-27
45	-10	-8	-5	-21	-19	-16	-34	-31	-29
40	-11	-9	-6	-22	-20	-17	-35	-33	-30
35	-11	-8	-6	-23	-20	-18	-36	-33	-31

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

20K 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
80	-1.4	-1.4	-1.4	-7.2	-7.2	-7.2	-13.4	-13.4	-13.4
75	-1.5	-1.5	-1.5	-6.7	-6.7	-6.7	-11.7	-11.7	-11.7
70	-1.5	-1.5	-1.5	-6.2	-6.2	-6.2	-10.3	-10.3	-10.3
65	-1.5	-1.5	-1.5	-5.7	-5.7	-5.7	-9.1	-9.1	-9.1
60	-1.5	-1.5	-1.5	-5.3	-5.3	-5.3	-8.3	-8.3	-8.3
55	-1.5	-1.5	-1.5	-4.9	-4.9	-4.9	-7.7	-7.7	-7.7
50	-1.4	-1.4	-1.4	-4.6	-4.6	-4.6	-7.4	-7.4	-7.4
45	-1.4	-1.4	-1.4	-4.3	-4.3	-4.3	-7.4	-7.4	-7.4
40	-1.3	-1.3	-1.3	-4.0	-4.0	-4.0	-7.7	-7.7	-7.7
35	-1.2	-1.2	-1.2	-3.8	-3.8	-3.8	-8.2	-8.2	-8.2

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	41.6								
1400	62.4	41.8							
1600	84.3	62.6	41.9	28.1					
1800		84.5	62.8	46.2					
2000			84.7	64.9	39.4				
2200				84.6	57.9	32.7			
2400					77.2	50.9			
2600						69.9	37.4		
2800						89.8	52.3		
3000							66.8	35.4	
3200							80.9	50.4	
3400								64.9	33.3
3600								79.1	48.4
3800									63.0
4000									77.2

1. **Enter Weight Adjustment table with reported braking action and 20K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -30 m/+25 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -30 m/+25 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -50 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 (20K 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
80	-12	-10	-7	-23	-20	-18	-42	-39	-37
75	-10	-7	-5	-20	-18	-15	-38	-35	-33
70	-8	-6	-3	-19	-17	-14	-36	-34	-31
65	-8	-6	-3	-20	-17	-15	-36	-34	-31
60	-9	-6	-4	-21	-19	-16	-38	-36	-33
55	-10	-8	-5	-23	-20	-18	-41	-38	-36
50	-11	-9	-6	-25	-23	-20	-43	-41	-38
45	-13	-10	-8	-27	-25	-22	-46	-43	-41
40	-14	-11	-9	-29	-26	-24	-47	-45	-42
35	-14	-11	-9	-30	-27	-25	-48	-45	-43

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K 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	84.0	84.4	84.7	86.1	87.3	88.1	89.1	89.3	89.5	88.8	88.2	87.9	87.5
55	84.8	85.3	85.8	87.0	88.1	89.0	90.0	90.1	90.3	89.6	88.8	87.9	86.9
50	85.8	86.3	86.8	87.9	88.9	89.8	90.8	90.9	91.0	90.3	89.6	88.7	87.7
45	86.8	87.2	87.7	88.7	89.7	90.7	91.7	91.7	91.7	91.1	90.4	89.5	88.6
40	87.7	88.2	88.6	89.7	90.6	91.6	92.5	92.4	92.4	91.8	91.2	90.3	89.4
35	88.6	89.0	89.5	90.6	91.5	92.4	93.4	93.3	93.2	92.5	91.9	91.0	90.1
30	88.2	89.3	90.5	91.4	92.5	93.3	94.3	94.1	94.0	93.4	92.7	91.8	90.9
25	87.5	88.6	89.7	90.7	91.8	92.7	93.8	94.2	94.7	94.2	93.5	92.6	91.7
20	86.8	87.9	89.0	90.0	91.1	91.9	93.0	93.4	93.9	94.5	94.3	93.4	92.5
15	86.0	87.2	88.3	89.3	90.3	91.2	92.2	92.6	93.1	93.7	94.2	94.2	93.4
10	85.3	86.4	87.5	88.5	89.6	90.4	91.5	91.9	92.3	92.9	93.4	93.7	94.3
5	84.6	85.7	86.8	87.7	88.8	89.6	90.7	91.1	91.6	92.1	92.6	92.9	93.5
0	83.8	84.9	86.0	87.0	88.0	88.9	89.9	90.3	90.8	91.4	91.8	92.1	92.7
-5	83.1	84.2	85.2	86.2	87.2	88.1	89.1	89.5	90.0	90.5	91.0	91.3	91.9
-10	82.3	83.4	84.5	85.4	86.4	87.3	88.3	88.7	89.2	89.7	90.2	90.5	91.0
-15	81.6	82.6	83.7	84.6	85.6	86.5	87.5	87.9	88.3	88.9	89.3	89.7	90.2
-20	80.8	81.8	82.9	83.8	84.8	85.7	86.7	87.0	87.5	88.1	88.5	88.8	89.4
-25	80.0	81.1	82.1	83.0	84.0	84.8	85.8	86.2	86.7	87.3	87.7	88.0	88.5
-30	79.2	80.3	81.3	82.2	83.2	84.0	85.0	85.4	85.8	86.4	86.8	87.2	87.7
-35	78.4	79.5	80.5	81.4	82.4	83.2	84.1	84.5	85.0	85.6	86.0	86.3	86.8
-40	77.6	78.6	79.6	80.6	81.5	82.3	83.3	83.7	84.1	84.7	85.1	85.4	86.0
-45	76.8	77.8	78.8	79.7	80.7	81.5	82.4	82.8	83.3	83.8	84.2	84.5	85.1
-50	76.0	77.0	78.0	78.9	79.8	80.6	81.6	81.9	82.4	82.9	83.3	83.7	84.2

%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	0.9	0.9	0.9

Assumed Temperature Reduced Thrust (20K 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	69	68	69	67	65	63	61	59	57	55		
35	64	63	65	66	65	63	61	59	57	55	53	
30	61	59	60	61	61	61	61	59	57	55	53	51
25	61	59	60	60	60	60	59	58	57	55	53	51
20	61	59	60	60	60	60	59	58	53	51	52	51
15	61	59	60	60	60	60	59	58	53	49	46	46
10 & BELOW	61	59	60	60	60	60	59	58	53	49	45	40

Takeoff %N1 (Table 2 of 3)

Based on engine bleed for packs on and engine 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	81.4	81.5	84.0	85.8	87.2	88.8	89.7	90.6	90.4	90.1	89.8	89.4
70	82.5	82.6	84.3	85.5	86.6	88.2	89.1	89.9	89.7	89.5	89.2	88.8
65	83.4	83.7	85.2	86.4	87.2	88.2	88.5	89.3	89.1	88.9	88.6	88.1
60	84.4	84.7	86.1	87.3	88.1	89.1	89.3	89.5	88.8	88.2	87.9	87.5
55	85.3	85.8	87.0	88.1	89.0	90.0	90.1	90.3	89.6	88.8	87.9	86.9
50	86.3	86.8	87.9	88.9	89.8	90.8	90.9	91.0	90.3	89.6	88.7	87.7
45	87.2	87.7	88.7	89.7	90.7	91.7	91.7	91.7	91.1	90.4	89.5	88.6
40	88.2	88.6	89.7	90.6	91.6	92.5	92.4	92.4	91.8	91.2	90.3	89.4
35	89.0	89.5	90.6	91.5	92.4	93.4	93.3	93.2	92.5	91.9	91.0	90.1
30	89.3	90.5	91.4	92.5	93.3	94.3	94.1	94.0	93.4	92.7	91.8	90.9
25	88.6	89.7	90.7	91.8	92.7	93.8	94.2	94.7	94.2	93.5	92.6	91.7
20	87.9	89.0	90.0	91.1	91.9	93.0	93.4	93.9	94.5	94.3	93.4	92.5
15	87.2	88.3	89.3	90.3	91.2	92.2	92.6	93.1	93.7	94.2	94.2	93.4
10	86.4	87.5	88.5	89.6	90.4	91.5	91.9	92.3	92.9	93.4	93.7	94.3
MINIMUM ASSUMED TEMP (°C)	32	30	30	30	29	29	27	25	21	18	14	10

With engine bleed for packs off, increase %N1 by 0.9.

Assumed Temperature Reduced Thrust (20K 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	11.2													
100	10.3	6.0												
90	10.5	8.2												
80	11.8	7.1	3.2											
70	10.7	7.4	5.3	3.6	1.8									
60	9.2	8.7	4.1	4.0	3.9	2.2	0.5							
50	7.8	7.5	4.3	2.7	2.6	3.7	2.7	0.9	0.5					
40		6.0	5.7	4.4	2.8	2.9	3.3	3.1	1.4	1.1	0.8			
30		4.6	4.4	4.3	4.2	4.1	4.0	3.9	3.5	3.3	3.0	2.8	3.4	
20			3.0	2.9	2.9	2.9	2.8	2.7	2.6	2.6	2.5	2.5	2.4	2.3
10			1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2
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 (18.5K 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
68	140	140	144												
64	135	136	140	132	132	138									
60	130	131	136	127	127	133									
56	125	125	131	122	122	129	117	117	123	114	115	121	114	114	120
52	119	120	126	116	116	124	112	112	118	109	109	116	108	109	115
48	113	113	121	110	110	119	106	106	114	104	104	112	103	103	111
44	107	107	116	104	104	114	100	100	109	98	98	107	97	98	106
40	101	101	111	97	98	108	94	94	104	92	93	102	92	92	101

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						6	7						0	0					
60	140	4	5	5	6				4	5	6	6				0	0	0	0			
50	122	3	4	4	4	6	7	9	3	4	4	4	6	7	9	0	0	0	0	0	0	0
40	104	1	2	2	3	4	6	8	1	2	2	3	4	6	8	0	0	0	0	0	0	0
30	86	0	0	0	1	2	5	7	0	0	1	1	3	5	7	0	0	0	0	0	0	0
20	68	0	0	0	1	2	3	5	0	0	1	1	2	3	5	0	0	0	0	0	0	0
-60	-76	0	0	0	1	2	3	3	0	0	1	1	2	3	4	0	0	0	0	0	0	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
72	-2	0	0	0	0	-1	0	0	0	0	0	0	0
68	-2	0	0	0	0	-1	0	0	0	0	0	0	0
64	-2	0	0	0	0	-1	0	0	0	0	0	0	0
60	-2	0	0	0	0	-1	0	0	0	0	0	0	0
56	-1	0	0	0	0	-1	0	0	0	0	0	0	0
52	-1	0	0	0	0	-1	0	0	0	0	0	0	0
48	-1	0	0	0	0	-1	0	0	0	0	0	0	0
44	-1	0	0	0	0	-1	-1	0	0	0	0	0	0
40	-1	0	0	0	0	-1	-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	92	90					
60	140	92	90	91	92			
50	122	94	92	91	92	90	86	82
40	104	99	97	96	94	91	86	82
30	86	102	101	100	99	95	90	84
20	68	102	102	101	99	97	94	89
-60	-76	103	103	102	100	98	96	94

Takeoff Speeds - Wet Runway (18.5K 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
68	136	140	144												
64	131	136	140	126	132	138									
60	125	131	136	121	127	133									
56	119	125	131	115	122	129	113	117	123	111	115	121	111	114	120
52	113	120	126	109	116	124	106	112	118	105	109	116	105	109	115
48	107	113	121	103	110	119	100	106	114	99	104	112	98	103	111
44	100	107	116	97	104	114	94	100	109	93	98	107	92	98	106
40	94	101	111	90	98	108	88	94	104	87	93	102	86	92	101

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	9	10						6	7						0	0					
60	140	7	8	8	8				4	5	6	6				0	0	0	0			
50	122	4	5	5	5	7	10	14	3	4	4	4	6	7	9	0	0	0	0	0	0	0
40	104	2	3	3	3	5	7	11	1	2	2	3	4	6	8	0	0	0	0	0	0	0
30	86	0	0	0	1	3	5	8	0	0	1	1	3	5	7	0	0	0	0	0	0	0
20	68	0	0	0	1	2	3	6	0	0	1	1	2	3	5	0	0	0	0	0	0	0
-60	-76	0	0	0	1	2	3	4	0	0	1	1	2	3	4	0	0	0	0	0	0	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
72	-5	-2	0	2	5	-3	-2	-1	0	0	1	2	2
68	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
64	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
60	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
56	-3	-2	0	2	4	-4	-2	-1	0	1	1	2	3
52	-3	-2	0	2	3	-4	-2	-1	0	1	2	2	3
48	-3	-1	0	1	3	-4	-3	-1	0	1	2	2	3
44	-2	-1	0	1	2	-4	-3	-1	0	1	2	2	3
40	-2	-1	0	1	2	-5	-3	-1	0	1	2	3	3

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	92	90					
60	140	92	90	91	92			
50	122	94	92	91	92	90	86	82
40	104	99	97	96	94	91	86	82
30	86	102	101	100	99	95	90	84
20	68	102	102	101	99	97	94	89
-60	-76	103	103	102	100	98	96	94

Maximum Allowable Clearway (18.5K Derate)

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	170
2000	210
2500	260
3000	300
3500	350
4000	400

Clearway and Stopway V1 Adjustments (18.5K Derate)

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
300	-2	-3	-3			
200	-2	-3	-3			
100	-1	-1	-1			
0	0	0	0	0	0	0
-100	0	0	-1	2	2	1
-200	0	0	-1	2	2	1
-300	0	0	-1	2	2	1

Use of clearway not permitted on wet runways.

Stab Trim Setting (18.5K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)							
	12	14	16	18	24	28	31	33
70	8 1/2	8 1/2	8 1/4	7 3/4	6 1/2	5 1/2	5	4 1/2
60	8 1/2	8 1/2	7 3/4	7 1/4	5 3/4	5	4 1/2	4
50	8 1/4	8	7 1/4	6 3/4	5 1/4	4 1/2	4	3 1/2
40	7	6 3/4	6	5 1/2	4 1/2	3 3/4	3 1/4	2 3/4
36	6	6	5 1/2	5	4	3 1/2	3	2 1/2

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)								
	12	14	16	18	24	28	30	31	33
70	8 1/2	8 1/2	8 1/4	7 1/2	6	5	4 1/2	4 1/4	3 3/4
60	8 1/2	8 1/4	7 1/2	6 3/4	5 1/4	4 1/4	3 3/4	3 1/2	3
50	8 1/4	7 1/2	6 3/4	6	4 1/2	3 3/4	3 1/4	3	2 1/2
40	6 1/4	5 3/4	5 1/2	5	3 3/4	3	2 1/2	2 1/4	2 1/4
36	5 1/4	5	4 3/4	4 1/4	3 1/4	2 1/2	2 1/4	2 1/4	2 1/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (18.5K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

18.5K 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
80	-11.4	-13.2	-15.1	-14.2	-16.0	-17.8	-19.8	-21.6	-23.4
75	-9.6	-11.4	-13.2	-11.8	-13.6	-15.4	-16.3	-18.2	-20.0
70	-8.0	-9.8	-11.6	-9.7	-11.5	-13.3	-13.3	-15.2	-17.0
65	-6.6	-8.4	-10.2	-7.9	-9.7	-11.5	-10.8	-12.6	-14.4
60	-5.4	-7.2	-9.0	-6.4	-8.2	-10.0	-8.6	-10.4	-12.2
55	-4.5	-6.3	-8.1	-5.2	-7.0	-8.8	-6.8	-8.7	-10.5
50	-3.8	-5.6	-7.4	-4.3	-6.1	-8.0	-5.5	-7.3	-9.1
45	-3.3	-5.2	-7.0	-3.7	-5.6	-7.4	-4.6	-6.4	-8.2
40	-3.1	-4.9	-6.7	-3.5	-5.3	-7.1	-4.1	-5.9	-7.8
35	-3.1	-4.9	-6.7	-3.5	-5.3	-7.1	-4.0	-5.9	-7.7

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
1200				25.2			29.1		
1400	36.3			38.3			41.6		
1600	49.8	29.3		51.7	31.5		54.4	35.1	
1800	63.8	42.7		65.4	44.6		67.6	47.7	28.5
2000	78.3	56.4	35.6	79.6	58.2	37.7	81.3	60.7	41.0
2200		70.6	49.1		72.1	51.0		74.1	53.8
2400		85.4	63.1		86.5	64.8		87.9	67.0
2600			77.5			78.9			80.6

1. **Enter Weight Adjustment table with slush/standing water depth and 18.5K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -35 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.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff (18.5K 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
80	-9	-6	-4	0	0	0	0	0	0
75	-10	-8	-5	-2	0	0	0	0	0
70	-12	-9	-7	-5	-3	0	0	0	0
65	-13	-11	-8	-8	-5	-3	0	0	0
60	-14	-12	-9	-10	-8	-5	-1	0	0
55	-16	-13	-11	-13	-10	-8	-5	-3	0
50	-17	-14	-12	-14	-12	-9	-9	-6	-4
45	-18	-15	-13	-16	-13	-11	-12	-9	-7
40	-19	-16	-14	-17	-15	-12	-14	-11	-9
35	-20	-17	-15	-18	-16	-13	-15	-13	-10

1. **Obtain V1, VR and V2 for the actual weight using the 18.5K 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 (18.5K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

18.5K 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
80	-13.6	-16.1	-18.6	-16.4	-18.9	-21.4	-22.0	-24.5	-27.0
75	-11.5	-14.0	-16.5	-13.8	-16.3	-18.8	-18.4	-20.9	-23.3
70	-9.7	-12.2	-14.7	-11.5	-14.0	-16.5	-15.2	-17.6	-20.1
65	-8.1	-10.6	-13.1	-9.5	-12.0	-14.5	-12.4	-14.9	-17.4
60	-6.8	-9.3	-11.8	-7.9	-10.4	-12.9	-10.0	-12.5	-15.0
55	-5.7	-8.2	-10.7	-6.5	-9.0	-11.5	-8.1	-10.6	-13.1
50	-4.9	-7.4	-9.9	-5.5	-8.0	-10.5	-6.7	-9.2	-11.7
45	-4.3	-6.8	-9.3	-4.8	-7.3	-9.7	-5.6	-8.1	-10.6
40	-4.0	-6.5	-9.0	-4.3	-6.8	-9.3	-5.1	-7.5	-10.0
35	-3.9	-6.4	-8.9	-4.2	-6.7	-9.2	-4.9	-7.4	-9.9

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
1400							27.2		
1600	25.4			30.9			39.7		
1800	41.1			45.5			53.4	33.1	
2000	56.8	32.8		60.8	37.8		69.6	46.0	26.6
2200	72.5	48.5		77.3	52.7	30.2		60.7	39.1
2400	88.4	64.3	40.3		68.5	44.8		78.7	52.7
2600		80.1	56.0		85.5	60.1			68.8
2800			71.8			76.4			89.2
3000			87.6						

1. **Enter Weight Adjustment table with slush/standing water depth and 18.5K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -45 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
80	-14	-11	-9	0	0	0	0	0	0
75	-15	-13	-10	-4	-2	0	0	0	0
70	-17	-14	-12	-8	-5	-3	0	0	0
65	-18	-16	-13	-11	-9	-6	0	0	0
60	-19	-17	-14	-14	-12	-9	-2	0	0
55	-21	-18	-16	-17	-14	-12	-7	-5	-2
50	-22	-19	-17	-19	-17	-14	-12	-9	-7
45	-23	-21	-18	-21	-18	-16	-16	-13	-11
40	-24	-22	-19	-22	-20	-17	-18	-16	-13
35	-25	-23	-20	-24	-21	-19	-21	-18	-16

1. **Obtain V1, VR and V2 for the actual weight using the 18.5K 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 (18.5K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

18.5K 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
80	-0.8	-0.8	-0.8	-5.8	-5.8	-5.8	-10.5	-10.5	-10.5
75	-0.8	-0.8	-0.8	-5.2	-5.2	-5.2	-9.2	-9.2	-9.2
70	-0.7	-0.7	-0.7	-4.6	-4.6	-4.6	-8.2	-8.2	-8.2
65	-0.7	-0.7	-0.7	-4.2	-4.2	-4.2	-7.2	-7.2	-7.2
60	-0.6	-0.6	-0.6	-3.8	-3.8	-3.8	-6.5	-6.5	-6.5
55	-0.6	-0.6	-0.6	-3.5	-3.5	-3.5	-5.9	-5.9	-5.9
50	-0.6	-0.6	-0.6	-3.3	-3.3	-3.3	-5.4	-5.4	-5.4
45	-0.7	-0.7	-0.7	-3.1	-3.1	-3.1	-5.2	-5.2	-5.2
40	-0.7	-0.7	-0.7	-3.0	-3.0	-3.0	-5.0	-5.0	-5.0
35	-0.7	-0.7	-0.7	-3.0	-3.0	-3.0	-5.1	-5.1	-5.1

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	33.6								
1200	52.6	35.2							
1400	72.4	54.2	36.8	39.4					
1600		74.1	55.9	54.6	36.2		27.7		
1800			75.8	70.8	51.1	33.0	38.2		
2000				88.4	67.2	47.8	48.9	30.3	
2200					84.4	63.5	60.2	40.8	
2400						80.5	72.2	51.7	32.9
2600							84.9	63.1	43.4
2800								75.3	54.5
3000								88.1	66.1
3200									78.4

1. **Enter Weight Adjustment table with reported braking action and 18.5K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -25 m/+20 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -25 m/+20 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -40 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 (18.5K 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
80	-10	-8	-7	-15	-14	-13	-26	-25	-23
75	-7	-6	-5	-14	-12	-11	-24	-22	-21
70	-6	-5	-4	-13	-12	-11	-23	-22	-21
65	-6	-5	-3	-14	-13	-11	-24	-22	-21
60	-6	-5	-4	-15	-14	-12	-25	-24	-22
55	-7	-6	-5	-16	-15	-14	-27	-26	-24
50	-8	-7	-6	-18	-17	-15	-29	-28	-27
45	-9	-8	-7	-20	-18	-17	-31	-30	-29
40	-10	-9	-8	-21	-20	-18	-33	-32	-31
35	-10	-9	-8	-22	-21	-20	-35	-34	-32

1. **Obtain V1, VR and V2 for the actual weight using the 18.5K 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 (18.5K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

18.5K 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
80	-2.0	-2.0	-2.0	-7.7	-7.7	-7.7	-15.3	-15.3	-15.3
75	-1.8	-1.8	-1.8	-6.9	-6.9	-6.9	-12.9	-12.9	-12.9
70	-1.6	-1.6	-1.6	-6.2	-6.2	-6.2	-10.9	-10.9	-10.9
65	-1.4	-1.4	-1.4	-5.6	-5.6	-5.6	-9.4	-9.4	-9.4
60	-1.3	-1.3	-1.3	-5.1	-5.1	-5.1	-8.2	-8.2	-8.2
55	-1.2	-1.2	-1.2	-4.7	-4.7	-4.7	-7.5	-7.5	-7.5
50	-1.2	-1.2	-1.2	-4.4	-4.4	-4.4	-7.1	-7.1	-7.1
45	-1.2	-1.2	-1.2	-4.2	-4.2	-4.2	-7.2	-7.2	-7.2
40	-1.3	-1.3	-1.3	-4.1	-4.1	-4.1	-7.7	-7.7	-7.7
35	-1.4	-1.4	-1.4	-4.0	-4.0	-4.0	-8.5	-8.5	-8.5

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	45.5	26.5							
1400	66.7	47.3	28.2						
1600	88.4	68.5	49.1	33.8					
1800			70.4	52.2	28.5				
2000				71.5	46.7				
2200					65.7	41.2			
2400					85.6	60.0	30.8		
2600						79.6	45.4		
2800							60.1	31.1	
3000							74.9	45.7	
3200							89.7	60.4	31.4
3400								75.1	46.0
3600								90.0	60.7
3800									75.4

1. **Enter Weight Adjustment table with reported braking action and 18.5K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -25 m/+20 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -25 m/+20 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -45 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 (18.5K 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
80	-10	-7	-5	-18	-15	-13	-36	-33	-31
75	-8	-6	-3	-17	-14	-12	-33	-31	-28
70	-7	-5	-2	-17	-14	-12	-32	-30	-27
65	-7	-5	-2	-18	-15	-13	-33	-31	-28
60	-8	-5	-3	-19	-17	-14	-35	-33	-30
55	-9	-6	-4	-21	-18	-16	-38	-35	-33
50	-10	-8	-5	-23	-21	-18	-40	-38	-35
45	-11	-9	-6	-25	-23	-20	-43	-41	-38
40	-12	-10	-7	-27	-25	-22	-45	-43	-40
35	-13	-11	-8	-29	-26	-24	-46	-44	-41

1. **Obtain V1, VR and V2 for the actual weight using the 18.5K 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 (18.5K 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	82.0	82.4	82.8	83.6	84.5	85.5	86.5	86.4	86.4	85.6	85.2	84.7	84.3
55	82.8	83.3	83.7	84.5	85.5	86.4	87.3	87.3	87.2	86.5	85.8	84.8	83.8
50	83.7	84.1	84.5	85.5	86.5	87.3	88.2	88.1	88.1	87.4	86.7	85.7	84.7
45	84.6	85.1	85.5	86.4	87.4	88.2	89.0	88.9	88.9	88.2	87.5	86.6	85.6
40	85.7	86.1	86.6	87.4	88.2	89.0	89.8	89.7	89.6	89.0	88.4	87.4	86.5
35	86.6	87.1	87.5	88.3	89.1	89.9	90.7	90.5	90.4	89.8	89.2	88.3	87.4
30	86.2	87.3	88.4	89.2	90.1	90.8	91.6	91.4	91.3	90.6	90.0	89.1	88.2
25	85.5	86.6	87.7	88.5	89.4	90.2	91.0	91.6	92.0	91.5	90.9	90.0	89.0
20	84.8	85.9	87.0	87.8	88.7	89.5	90.3	90.8	91.3	91.8	91.7	90.8	90.0
15	84.1	85.2	86.3	87.1	88.0	88.8	89.5	90.1	90.5	91.1	91.6	91.7	90.8
10	83.4	84.5	85.5	86.3	87.2	88.0	88.8	89.3	89.8	90.3	90.8	91.3	91.9
5	82.7	83.7	84.8	85.6	86.5	87.3	88.0	88.5	89.0	89.5	90.1	90.5	91.1
0	82.0	83.0	84.1	84.9	85.7	86.5	87.3	87.8	88.2	88.8	89.3	89.7	90.3
-5	81.2	82.3	83.3	84.1	85.0	85.7	86.5	87.0	87.4	88.0	88.5	88.9	89.5
-10	80.5	81.5	82.5	83.3	84.2	84.9	85.7	86.2	86.6	87.2	87.7	88.1	88.7
-15	79.7	80.8	81.8	82.6	83.4	84.2	84.9	85.4	85.8	86.4	86.9	87.3	87.9
-20	79.0	80.0	81.0	81.8	82.6	83.4	84.1	84.6	85.0	85.6	86.1	86.5	87.1
-25	78.2	79.2	80.2	81.0	81.8	82.6	83.3	83.8	84.2	84.7	85.2	85.7	86.2
-30	77.5	78.4	79.4	80.2	81.0	81.8	82.5	82.9	83.4	83.9	84.4	84.8	85.4
-35	76.7	77.7	78.6	79.4	80.2	80.9	81.7	82.1	82.6	83.1	83.6	84.0	84.6
-40	75.9	76.9	77.8	78.6	79.4	80.1	80.8	81.3	81.7	82.2	82.7	83.1	83.7
-45	75.1	76.1	77.0	77.8	78.6	79.3	80.0	80.4	80.9	81.4	81.9	82.3	82.8
-50	74.3	75.2	76.2	76.9	77.7	78.4	79.1	79.6	80.0	80.5	81.0	81.4	81.9

%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	0.9	0.9	0.9

Assumed Temperature Reduced Thrust (18.5K Derate)

Maximum Assumed Temperature (Table 1 of 3)

Based on 25% Takeoff Thrust Reduction

OAT (°C)	PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	400	5000	6000	7000	8000	9000	10000
54	73	71	69	67								
50	73	71	69	67	65	63						
45	73	71	69	67	65	63	61	59	57			
40	69	69	68	67	65	63	61	59	57	55		
35	64	64	63	64	65	63	61	59	57	55	53	
30	61	59	59	59	60	61	61	59	57	55	53	51
25	61	59	58	59	59	60	58	57	56	55	53	51
20	61	59	58	59	59	60	58	57	52	51	50	50
15	61	59	58	59	59	60	58	57	52	48	45	44
10 & BELOW	61	59	58	59	59	60	58	57	52	48	44	39

Takeoff %N1 (Table 2 of 3)

Based on engine bleed for packs on and engine 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	79.8	80.1	81.1	82.7	84.5	86.2	86.7	87.3	87.1	87.0	86.6	86.2
70	80.7	81.1	81.5	82.5	83.9	85.6	86.1	86.7	86.5	86.4	86.0	85.6
65	81.6	82.0	82.6	83.5	84.5	85.6	85.5	86.1	85.9	85.8	85.4	84.9
60	82.4	82.8	83.6	84.5	85.5	86.5	86.4	86.4	85.6	85.2	84.7	84.3
55	83.3	83.7	84.5	85.5	86.4	87.3	87.3	87.2	86.5	85.8	84.8	83.8
50	84.1	84.5	85.5	86.5	87.3	88.2	88.1	88.1	87.4	86.7	85.7	84.7
45	85.1	85.5	86.4	87.4	88.2	89.0	88.9	88.9	88.2	87.5	86.6	85.6
40	86.1	86.6	87.4	88.2	89.0	89.8	89.7	89.6	89.0	88.4	87.4	86.5
35	87.1	87.5	88.3	89.1	89.9	90.7	90.5	90.4	89.8	89.2	88.3	87.4
30	87.3	88.4	89.2	90.1	90.8	91.6	91.4	91.3	90.6	90.0	89.1	88.2
25	86.6	87.7	88.5	89.4	90.2	91.0	91.6	92.0	91.5	90.9	90.0	89.0
20	85.9	87.0	87.8	88.7	89.5	90.3	90.8	91.3	91.8	91.7	90.8	90.0
15	85.2	86.3	87.1	88.0	88.8	89.5	90.1	90.5	91.1	91.6	91.7	90.8
10	84.5	85.5	86.3	87.2	88.0	88.8	89.3	89.8	90.3	90.8	91.3	91.9
MINIMUM ASSUMED TEMP (°C)	32	30	30	30	29	29	27	25	21	18	14	10

With engine bleed for packs off, increase %N1 by 0.9.

Assumed Temperature Reduced Thrust (18.5K 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	10.4													
100	9.2	6.5												
90	9.6	7.3												
80	11.3	6.1	3.7											
70	10.5	6.5	4.4	4.0	2.4									
60	9.0	8.2	3.1	3.0	2.9	2.7	1.1							
50	7.6	7.3	3.5	1.9	1.7	2.9	2.7	1.4	1.2					
40		5.9	5.3	3.7	2.1	2.2	2.8	3.1	1.5	1.6	1.5			
30		4.5	4.3	4.2	3.9	4.0	3.9	3.8	3.5	3.3	3.2	3.4	3.4	
20			2.9	2.9	2.8	2.8	2.7	2.7	2.6	2.5	2.5	2.4	2.3	2.3
10			1.5	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2
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	88.4	88.6	88.5	88.2	88.9	91.3	92.9	94.3	94.4	92.7
55	89.2	89.4	89.3	89.1	89.3	90.6	92.3	93.6	93.7	92.0
50	90.0	90.1	90.1	89.9	90.2	90.7	91.6	92.9	93.0	91.3
45	90.7	90.8	90.9	90.7	91.1	91.6	91.6	92.2	92.3	90.6
40	91.5	91.6	91.6	91.4	92.0	92.4	92.4	91.5	91.6	89.9
35	92.0	92.3	92.3	92.2	92.8	93.2	93.2	92.3	91.6	90.0
30	91.3	93.0	93.0	92.9	93.6	94.0	93.9	93.1	92.5	91.0
25	90.5	93.0	93.8	93.6	94.3	94.8	94.6	93.9	93.3	92.0
20	89.8	92.3	94.5	94.3	95.1	95.5	95.3	94.6	94.1	92.9
15	89.1	91.5	93.9	95.1	95.8	96.2	96.0	95.4	94.9	93.9
10	88.3	90.8	93.1	95.3	96.7	96.9	96.6	96.1	95.7	94.8
5	87.5	90.0	92.4	94.5	97.7	97.8	97.3	96.9	96.5	95.7
0	86.8	89.2	91.6	93.7	97.1	98.9	98.3	97.8	97.4	96.6
-5	86.0	88.4	90.8	92.9	96.3	98.8	99.3	98.5	98.2	97.7
-10	85.2	87.6	89.9	92.1	95.5	98.0	99.6	99.4	99.1	98.6
-15	84.4	86.8	89.1	91.2	94.7	97.3	98.8	100.4	100.1	99.6
-20	83.6	86.0	88.3	90.4	93.9	96.5	98.0	100.1	100.6	100.2
-25	82.8	85.2	87.5	89.6	93.1	95.7	97.2	99.2	99.8	99.4
-30	82.0	84.3	86.6	88.7	92.3	94.9	96.4	98.4	98.9	98.6
-35	81.2	83.5	85.8	87.9	91.4	94.0	95.5	97.6	98.1	97.7
-40	80.4	82.6	84.9	87.0	90.6	93.2	94.7	96.7	97.2	96.9

%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	88.5	89.3	89.4									
52	125	55	89.2	90.1	90.3	90.4	90.5							
47	116	50	90.0	90.9	91.0	91.2	91.3	91.4	91.4	91.3				
42	108	45	90.9	91.7	91.9	92.0	92.1	92.2	92.2	92.1	91.8	91.4		
37	99	40	91.8	92.6	92.7	92.8	92.9	93.0	93.0	92.9	92.6	92.2	92.1	92.0
32	90	35	91.9	93.5	93.6	93.7	93.7	93.8	93.7	93.7	93.4	93.0	93.0	92.9
27	81	30	91.2	93.4	94.1	94.5	94.6	94.6	94.6	94.5	94.1	93.8	93.8	93.7
22	72	25	90.5	92.6	93.3	94.0	94.7	95.5	95.4	95.3	95.0	94.6	94.5	94.5
17	63	20	89.7	91.9	92.6	93.3	94.0	94.7	95.2	95.8	96.0	95.7	95.3	95.3
12	54	15	89.0	91.1	91.8	92.5	93.2	93.9	94.5	95.0	95.6	96.2	96.8	96.5
7	45	10	88.3	90.4	91.0	91.7	92.4	93.2	93.7	94.2	94.8	95.4	96.1	96.7
2	36	5	87.5	89.6	90.3	90.9	91.6	92.4	92.9	93.4	94.0	94.6	95.3	95.9
-3	27	0	86.7	88.8	89.5	90.1	90.9	91.6	92.1	92.6	93.2	93.8	94.5	95.1
-8	18	-5	86.0	88.0	88.7	89.4	90.1	90.8	91.3	91.8	92.4	93.0	93.7	94.3
-13	9	-10	85.2	87.2	87.9	88.5	89.2	89.9	90.5	91.0	91.6	92.2	92.9	93.5
-17	1	-15	84.4	86.4	87.1	87.7	88.4	89.1	89.7	90.2	90.8	91.4	92.0	92.7
-22	-8	-20	83.6	85.6	86.3	86.9	87.6	88.3	88.8	89.3	90.0	90.5	91.2	91.9
-27	-17	-25	82.8	84.8	85.4	86.1	86.8	87.5	88.0	88.5	89.1	89.7	90.4	91.1
-32	-26	-30	82.0	84.0	84.6	85.2	85.9	86.6	87.1	87.6	88.3	88.9	89.5	90.2
-37	-35	-35	81.2	83.1	83.8	84.4	85.1	85.8	86.3	86.8	87.4	88.0	88.7	89.4
-42	-44	-40	80.3	82.3	82.9	83.5	84.2	84.9	85.4	85.9	86.5	87.1	87.8	88.5
-47	-53	-45	79.5	81.4	82.1	82.7	83.4	84.0	84.5	85.0	85.7	86.3	87.0	87.6
-52	-62	-50	78.6	80.6	81.2	81.8	82.5	83.1	83.6	84.1	84.8	85.4	86.1	86.8

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8
A/C HIGH	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2

DO NOT USE FOR FLIGHT

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
40000	**PITCH ATT**	**4.5**	**4.0**	**4.0**	
	V/S (FT/MIN)	1800	1100	500	
30000	**PITCH ATT**	**4.5**	**4.0**	**4.0**	**4.0**
	V/S (FT/MIN)	2700	2000	1500	1200
20000	**PITCH ATT**	**7.5**	**6.5**	**6.0**	**6.0**
	V/S (FT/MIN)	4200	3200	2600	2100
10000	**PITCH ATT**	**10.5**	**9.0**	**8.5**	**8.0**
	V/S (FT/MIN)	5400	4300	3400	2800
SEA LEVEL	**PITCH ATT**	**14.5**	**12.5**	**11.0**	**10.0**
	V/S (FT/MIN)	6600	5200	4300	3600

Cruise (.76/280)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG) 40	50	60	70
40000	**PITCH ATT**	**2.0**	**2.5**	**3.5**	
	%N1	82	85	90	
35000	**PITCH ATT**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	80	82	84	87
30000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**
	%N1	80	81	82	84
25000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**
	%N1	76	77	78	80
20000	**PITCH ATT**	**1.0**	**1.5**	**2.5**	**3.0**
	%N1	72	74	75	76
15000	**PITCH ATT**	**1.0**	**1.5**	**2.5**	**3.0**
	%N1	69	70	71	73

Descent (.76/280)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG) 40	50	60	70
40000	**PITCH ATT**	**-1.5**	**-0.5**	**0.0**	**0.5**
	V/S (FT/MIN)	-2800	-2500	-2500	-2800
30000	**PITCH ATT**	**-3.0**	**-2.0**	**-1.0**	**0.0**
	V/S (FT/MIN)	-3000	-2500	-2200	-2100
20000	**PITCH ATT**	**-3.0**	**-1.5**	**-0.5**	**0.0**
	V/S (FT/MIN)	-2700	-2200	-2000	-1800
10000	**PITCH ATT**	**-3.0**	**-2.0**	**-1.0**	**0.0**
	V/S (FT/MIN	-2400	-2000	-1800	-1600
SEA LEVEL	**PITCH ATT**	**-3.5**	**-2.0**	**-1.0**	**0.0**
	V/S (FT/MIN)	-2200	-1800	-1600	-1500

Flight With Unreliable Airspeed/Turbulent Air Penetration

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

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)			
		40	50	60	70
10000	**PITCH ATT**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	52	57	62	66
5000	**PITCH ATT**	**5.0**	**5.5**	**5.0**	**5.0**
	%N1	48	54	58	62

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		40	50	60	70
FLAPS 1 (GEAR UP)	**PITCH ATT**	**5.0**	**5.5**	**6.0**	**6.0**
(VREF40 + 50)	%N1	51	56	60	64
FLAPS 5 (GEAR UP)	**PITCH ATT**	**5.5**	**6.0**	**6.5**	**6.5**
(VREF40 + 30)	%N1	52	57	62	66
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**6.0**	**6.0**	**6.5**	**6.5**
(VREF40 + 20)	%N1	59	65	70	74

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		40	50	60	70
FLAPS 15	**PITCH ATT**	**3.5**	**3.5**	**3.5**	**4.0**
(VREF15 + 10)	%N1	42	47	51	54
FLAPS 30	**PITCH ATT**	**2.0**	**2.0**	**2.0**	**2.5**
(VREF30 + 10)	%N1	47	52	56	60
FLAPS 40	**PITCH ATT**	**0.0**	**0.5**	**0.5**	**0.5**
(VREF40 + 10)	%N1	54	59	64	68

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°)
70	34300	-14	37700*	37700*	37700*	36400	35100
65	35800	-18	39200*	39200*	39200*	38000	36600
60	37500	-18	40700*	40700*	40700*	39700	38300
55	39300	-18	41000	41000	41000	41000	40100
50	41000	-18	41000	41000	41000	41000	41000
45	41000	-18	41000	41000	41000	41000	41000
40	41000	-18	41000	41000	41000	41000	41000
35	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°)
70	34300	-9	37000*	37000*	37000*	36400	35100
65	35800	-12	38300*	38300*	38300*	38000	36600
60	37500	-13	39800*	39800*	39800*	39700	38300
55	39300	-13	41000	41000	41000	41000	40100
50	41000	-13	41000	41000	41000	41000	41000
45	41000	-13	41000	41000	41000	41000	41000
40	41000	-13	41000	41000	41000	41000	41000
35	41000	-13	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°)
70	34300	-3	35700*	35700*	35700*	35700*	35100
65	35800	-7	37200*	37200*	37200*	37200*	36600
60	37500	-7	38700*	38700*	38700*	38700*	38300
55	39300	-7	40200*	40200*	40200*	40200*	40100
50	41000	-7	41000	41000	41000	41000	41000
45	41000	-7	41000	41000	41000	41000	41000
40	41000	-7	41000	41000	41000	41000	41000
35	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)									
		23	25	27	29	31	33	35	37	39	41
70	%N1	79.8	81.2	82.7	84.0	85.2	86.4	87.9	90.6		
	MACH	.674	.699	.726	.750	.768	.781	.788	.791		
	KIAS	293	292	292	290	284	277	268	257		
	FF/ENG	1309	1303	1307	1304	1285	1265	1261	1290		
65	%N1	78.2	79.5	81.0	82.5	83.8	85.0	86.2	88.2	92.1	
	MACH	.655	.677	.704	.731	.754	.771	.783	.790	.791	
	KIAS	284	282	282	281	279	273	265	256	245	
	FF/ENG	1223	1211	1214	1216	1210	1189	1172	1181	1226	
60	%N1	76.7	77.9	79.2	80.7	82.2	83.5	84.7	86.3	88.9	93.4
	MACH	.637	.657	.679	.707	.734	.757	.773	.784	.790	.791
	KIAS	276	273	271	271	271	268	262	254	245	234
	FF/ENG	1142	1126	1120	1124	1124	1115	1094	1090	1107	1162
55	%N1	75.0	76.2	77.4	78.7	80.3	81.7	83.1	84.6	86.7	89.5
	MACH	.618	.637	.657	.680	.708	.736	.758	.774	.785	.791
	KIAS	267	264	262	260	260	259	256	250	243	234
	FF/ENG	1067	1044	1035	1030	1033	1031	1022	1010	1012	1030
50	%N1	72.9	74.4	75.6	76.8	78.1	79.7	81.2	82.9	84.9	87.0
	MACH	.592	.616	.635	.656	.679	.707	.735	.758	.774	.785
	KIAS	256	255	253	251	249	249	248	245	239	232
	FF/ENG	983	968	953	945	939	940	938	935	931	933
45	%N1	70.6	72.1	73.5	74.8	76.0	77.3	78.9	80.8	82.9	84.9
	MACH	.564	.587	.611	.632	.652	.675	.704	.733	.756	.773
	KIAS	243	243	243	241	238	237	236	236	233	228
	FF/ENG	895	884	877	865	856	849	848	851	855	859
40	%N1	67.7	69.4	71.0	72.5	73.8	75.0	76.3	78.2	80.5	82.7
	MACH	.532	.555	.579	.604	.626	.647	.669	.697	.726	.752
	KIAS	228	229	229	229	228	226	224	223	223	221
	FF/ENG	805	797	793	788	788	776	768	767	776	782
35	%N1	64.5	66.1	67.9	69.5	71.1	72.5	73.8	75.4	77.5	79.9
	MACH	.498	.520	.543	.567	.592	.617	.638	.660	.685	.715
	KIAS	213	214	214	215	215	215	212	210	209	209
	FF/ENG	728	722	718	715	709	700	688	682	683	691

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
302	275	251	231	215	200	190	180	172	164	158
455	413	377	347	322	300	285	271	258	247	238
608	552	504	464	430	400	380	362	345	330	317
762	692	631	580	538	500	475	452	431	413	396
917	832	758	697	646	600	570	543	518	495	475
1073	973	886	814	754	700	665	633	604	577	554
1229	1114	1014	931	861	800	760	723	690	660	633
1386	1255	1142	1048	969	900	855	814	776	742	711
1543	1397	1270	1165	1078	1000	950	904	862	824	790
1701	1539	1398	1283	1186	1100	1045	995	948	907	869
1859	1681	1527	1400	1294	1200	1140	1085	1034	989	948
2018	1824	1656	1518	1402	1300	1235	1175	1120	1071	1027
2178	1968	1785	1636	1511	1400	1330	1265	1206	1153	1105
2339	2112	1915	1754	1619	1500	1425	1355	1292	1235	1184
2500	2257	2045	1872	1727	1600	1520	1446	1378	1317	1262
2662	2401	2175	1990	1836	1700	1615	1536	1464	1399	1341
2824	2546	2305	2109	1945	1800	1709	1626	1550	1481	1419
2988	2692	2436	2227	2053	1900	1804	1716	1635	1562	1497
3152	2839	2567	2346	2162	2000	1899	1806	1721	1644	1575

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	1.3	0:44	1.2	0:42	1.0	0:39	0.9	0:37	0.8	0:36
300	2.0	1:05	1.8	1:01	1.6	0:57	1.4	0:54	1.3	0:52
400	2.7	1:26	2.5	1:21	2.2	1:14	1.9	1:10	1.8	1:08
500	3.4	1:47	3.1	1:41	2.7	1:32	2.5	1:27	2.3	1:23
600	4.1	2:08	3.8	2:01	3.3	1:50	3.0	1:44	2.7	1:39
700	4.8	2:29	4.4	2:21	3.9	2:08	3.5	2:01	3.2	1:55
800	5.5	2:51	5.0	2:41	4.4	2:27	4.0	2:18	3.7	2:11
900	6.2	3:13	5.7	3:01	5.0	2:45	4.6	2:35	4.2	2:27
1000	6.8	3:34	6.3	3:22	5.6	3:03	5.1	2:52	4.7	2:43
1100	7.5	3:56	6.9	3:43	6.1	3:22	5.6	3:09	5.1	3:00
1200	8.2	4:19	7.6	4:03	6.7	3:41	6.1	3:27	5.6	3:16
1300	8.8	4:41	8.2	4:24	7.2	3:59	6.6	3:44	6.1	3:32
1400	9.5	5:03	8.8	4:45	7.8	4:18	7.1	4:02	6.5	3:49
1500	10.2	5:26	9.4	5:06	8.3	4:37	7.6	4:19	7.0	4:05
1600	10.8	5:49	10.0	5:28	8.9	4:57	8.1	4:37	7.5	4:21
1700	11.5	6:12	10.6	5:49	9.4	5:16	8.6	4:55	7.9	4:38
1800	12.1	6:35	11.2	6:11	9.9	5:35	9.1	5:13	8.4	4:55
1900	12.8	6:58	11.8	6:33	10.5	5:55	9.6	5:31	8.9	5:12
2000	13.4	7:22	12.4	6:55	11.0	6:15	10.1	5:49	9.3	5:28

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)				
	30	40	50	60	70
2	-0.3	-0.1	0.0	0.2	0.3
4	-0.5	-0.3	0.0	0.4	0.7
6	-0.8	-0.4	0.0	0.5	1.1
8	-1.1	-0.6	0.0	0.7	1.5
10	-1.5	-0.7	0.0	0.9	1.9
12	-1.8	-0.8	0.0	1.1	2.3
14	-2.1	-1.0	0.0	1.3	2.6

Based on .78/280/250 descent.

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
544	508	476	448	423	400	382	365	350	335	323
814	761	713	671	634	600	573	548	525	504	485
1086	1015	951	895	845	800	764	731	701	673	648
1358	1269	1189	1119	1056	1000	956	914	876	842	810
1631	1524	1427	1343	1268	1200	1147	1097	1052	1010	972
1904	1779	1665	1567	1479	1400	1338	1280	1227	1178	1133
2178	2034	1904	1791	1691	1600	1529	1462	1401	1345	1294
2453	2290	2143	2016	1903	1800	1720	1645	1576	1513	1455
2729	2547	2383	2241	2114	2000	1910	1827	1750	1680	1616
3006	2805	2624	2466	2327	2200	2101	2009	1925	1847	1777
3285	3064	2865	2692	2539	2400	2292	2191	2099	2014	1937
3564	3323	3106	2917	2751	2600	2482	2373	2273	2181	2097
3844	3582	3347	3143	2963	2800	2673	2555	2446	2347	2257
4125	3843	3589	3369	3176	3000	2863	2737	2620	2513	2417
4408	4104	3832	3596	3388	3200	3054	2918	2793	2679	2576
4691	4367	4076	3823	3601	3400	3244	3099	2966	2845	2735
4977	4631	4320	4051	3814	3600	3434	3281	3139	3010	2893
5264	4895	4565	4279	4027	3800	3624	3462	3312	3175	3052
5552	5161	4810	4507	4241	4000	3814	3643	3485	3340	3210
5842	5428	5056	4736	4454	4200	4005	3824	3657	3505	3368
6134	5696	5303	4965	4668	4400	4194	4004	3829	3670	3525
6427	5965	5551	5194	4882	4600	4384	4185	4001	3834	3683
6722	6235	5799	5424	5096	4800	4574	4365	4173	3998	3840
7019	6507	6049	5655	5311	5000	4764	4546	4345	4162	3997

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	1.7	1:07	1.7	1:05	1.6	1:04	1.6	1:03	1.5	1:01
600	2.7	1:38	2.6	1:36	2.5	1:34	2.4	1:32	2.3	1:29
800	3.6	2:10	3.5	2:07	3.4	2:04	3.3	2:00	3.2	1:57
1000	4.6	2:42	4.4	2:38	4.3	2:34	4.1	2:29	4.0	2:25
1200	5.5	3:14	5.3	3:09	5.1	3:04	5.0	2:59	4.8	2:54
1400	6.4	3:46	6.2	3:41	6.0	3:35	5.8	3:29	5.6	3:22
1600	7.3	4:19	7.1	4:13	6.9	4:06	6.6	3:58	6.4	3:51
1800	8.2	4:51	8.0	4:45	7.7	4:37	7.5	4:29	7.2	4:20
2000	9.1	5:24	8.8	5:17	8.6	5:08	8.3	4:59	8.0	4:49
2200	10.0	5:58	9.7	5:49	9.4	5:40	9.1	5:30	8.8	5:19
2400	10.9	6:31	10.6	6:22	10.2	6:12	9.9	6:00	9.6	5:48
2600	11.8	7:05	11.4	6:55	11.0	6:44	10.7	6:32	10.4	6:18
2800	12.7	7:40	12.3	7:28	11.9	7:16	11.5	7:03	11.1	6:49
3000	13.6	8:14	13.1	8:01	12.7	7:48	12.3	7:34	11.9	7:19
3200	14.4	8:50	13.9	8:35	13.5	8:21	13.0	8:06	12.6	7:50
3400	15.3	9:25	14.8	9:09	14.3	8:54	13.8	8:38	13.4	8:21
3600	16.1	10:01	15.6	9:44	15.1	9:27	14.6	9:11	14.1	8:52
3800	17.0	10:38	16.4	10:19	15.8	10:01	15.3	9:43	14.9	9:23
4000	17.8	11:15	17.2	10:54	16.6	10:35	16.1	10:16	15.6	9:55
4200	18.6	11:52	18.0	11:30	17.4	11:09	16.8	10:49	16.3	10:27
4400	19.4	12:30	18.8	12:06	18.1	11:44	17.5	11:22	17.0	10:59
4600	20.2	13:08	19.6	12:42	18.9	12:19	18.3	11:56	17.7	11:32
4800	21.0	13:47	20.3	13:20	19.6	12:54	19.0	12:30	18.4	12:04
5000	21.8	14:26	21.1	13:57	20.4	13:30	19.7	13:04	19.1	12:37

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	30	40	50	60	70
2	-0.3	-0.1	0.0	0.2	0.5
4	-0.6	-0.3	0.0	0.4	1.0
6	-1.0	-0.4	0.0	0.6	1.5
8	-1.4	-0.6	0.0	0.9	2.0
10	-1.7	-0.8	0.0	1.1	2.5
12	-2.2	-0.9	0.0	1.3	3.0
14	-2.6	-1.1	0.0	1.5	3.4
16	-3.0	-1.3	0.0	1.7	3.8
18	-3.5	-1.6	0.0	1.9	4.2
20	-4.0	-1.8	0.0	2.1	4.6
22	-4.5	-2.0	0.0	2.3	5.0

Based on .78/280/250 descent.

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)							
	70	65	60	55	50	45	40	35
41		63	24	4	0	8	23	43
39	50	19	3	0	7	20	37	56
37	13	2	0	7	19	34	51	67
35	1	1	8	19	33	48	63	76
33	2	9	20	32	46	60	72	82
31	11	21	33	46	58	70	79	86
29	24	35	46	58	68	78	85	89
27	37	48	58	68	76	83	88	90
25	50	59	68	76	82	87	89	89

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
41000	25	280	106	123	135
39000	25	280	101	117	129
37000	24	270	96	112	123
35000	23	270	92	107	118
33000	22	270	88	102	113
31000	22	260	84	97	107
29000	21	260	79	91	100
27000	20	250	74	85	94
25000	19	250	69	79	87
23000	18	240	64	74	81
21000	17	240	59	68	75
19000	16	230	55	63	68
17000	15	220	50	57	62
15000	14	210	45	51	56
10000	10	180	32	35	37
5000	7	140	18	20	21
1500	4	100	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
70	%N1	58.9	61.8	65.8	69.8	74.0	78.5	82.7	87.2	
	KIAS	229	229	230	231	233	234	237	240	
	FF/ENG	1250	1220	1210	1200	1180	1170	1200	1240	
65	%N1	57.2	59.8	64.1	67.8	72.2	76.5	80.8	85.2	
	KIAS	221	221	222	223	224	225	227	230	
	FF/ENG	1170	1140	1130	1110	1100	1080	1100	1130	
60	%N1	55.3	57.8	62.0	65.9	70.1	74.4	78.8	83.2	92.7
	KIAS	212	212	213	214	215	216	218	220	224
	FF/ENG	1090	1060	1050	1030	1020	990	1010	1030	1170
55	%N1	53.2	55.8	59.6	63.9	67.8	72.2	76.6	81.0	88.9
	KIAS	203	203	204	204	205	207	208	210	214
	FF/ENG	1010	990	970	950	940	910	920	940	1020
50	%N1	51.0	53.6	57.2	61.5	65.4	69.9	74.2	78.7	86.0
	KIAS	193	194	194	195	196	197	198	200	203
	FF/ENG	930	910	890	870	860	840	840	850	910
45	%N1	48.6	51.1	54.8	58.7	63.0	67.1	71.5	76.0	83.3
	KIAS	183	183	184	185	185	186	187	189	191
	FF/ENG	860	830	820	810	790	780	770	770	810
40	%N1	46.1	48.5	52.2	55.9	60.2	64.2	68.7	73.1	80.3
	KIAS	177	177	177	177	177	177	177	178	180
	FF/ENG	800	770	750	730	710	700	690	680	710
35	%N1	43.5	45.8	49.4	53.1	56.9	61.3	65.5	69.9	77.0
	KIAS	170	170	170	170	170	170	170	170	170
	FF/ENG	720	700	670	650	640	630	620	610	620

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

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ADVISORY INFORMATION

Normal Configuration Landing Distances
Flaps 15
Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	50000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 50000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	775	65/-45	15	-30	100	10	-5	15	-15	60	15	30
MAX AUTO	1005	65/-60	20	-40	130	0	0	20	-20	100	0	0
AUTOBRAKE 3	1375	105/-105	35	-65	215	0	0	35	-35	165	0	0
AUTOBRAKE 2	1745	150/-150	50	-85	300	20	-25	50	-50	170	50	50
AUTOBRAKE 1	1925	175/-175	60	-100	350	50	-60	55	-55	160	20	230

Good Reported Braking Action

MAX MANUAL	1240	90/-80	30	-55	210	30	-20	30	-25	100	70	160
MAX AUTO	1365	95/-90	30	-55	215	25	-15	30	-25	115	75	175
AUTOBRAKE 3	1585	125/-120	45	-70	255	10	0	45	-40	190	10	20
AUTOBRAKE 2	2010	175/-170	60	-95	345	25	-25	60	-55	200	60	60

Medium Reported Braking Action

MAX MANUAL	1670	140/-130	50	-90	340	70	-55	45	-40	130	190	485
MAX AUTO	1750	140/-130	50	-90	340	65	-45	45	-40	145	190	480
AUTOBRAKE 3	1785	140/-130	50	-90	345	50	-25	50	-45	190	140	445
AUTOBRAKE 2	2060	180/-175	60	-105	395	50	-45	60	-55	200	100	240

Poor Reported Braking Action

MAX MANUAL	2165	200/-180	70	-135	545	175	-110	55	-55	160	420	1205
MAX AUTO	2275	200/-180	70	-135	535	175	-105	55	-55	160	430	1215
AUTOBRAKE 3	2275	200/-180	70	-135	535	175	-100	55	-55	175	420	1210
AUTOBRAKE 2	2320	210/-200	70	-140	555	150	-95	60	-60	200	330	1095

Reference distance is for sea level, standard day, no wind or slope, VREF15 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 50 m.
Distances for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (305 m of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	50000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 50000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	750	55/-40	15	-30	95	5	-5	15	-15	55	10	25
MAX AUTO	955	60/-60	20	-35	125	0	0	20	-20	95	0	0
AUTOBRAKE 3	1290	95/-95	30	-60	210	0	0	35	-35	155	0	0
AUTOBRAKE 2	1635	135/-135	45	-85	285	20	-30	45	-45	150	45	45
AUTOBRAKE 1	1800	160/-160	55	-95	335	50	-50	50	-50	145	170	210

Good Reported Braking Action

MAX MANUAL	1200	85/-80	30	-55	205	30	-20	30	-25	100	65	145
MAX AUTO	1315	90/-85	30	-55	210	25	-15	30	-25	115	70	160
AUTOBRAKE 3	1490	110/-105	35	-65	245	10	-5	45	-40	180	10	20
AUTOBRAKE 2	1885	160/-155	55	-95	330	25	-30	55	-50	175	55	55

Medium Reported Braking Action

MAX MANUAL	1595	130/-120	50	-85	335	70	-50	45	-40	130	175	430
MAX AUTO	1665	130/-120	50	-85	330	65	-45	45	-40	145	170	420
AUTOBRAKE 3	1695	135/-125	50	-90	340	50	-30	45	-40	180	135	405
AUTOBRAKE 2	1935	165/-160	60	-100	380	50	-50	55	-50	175	95	215

Poor Reported Braking Action

MAX MANUAL	2045	185/-170	65	-130	525	170	-105	55	-50	150	370	1030
MAX AUTO	2145	180/-165	65	-130	525	170	-100	55	-50	150	375	1035
AUTOBRAKE 3	2145	185/-165	65	-130	525	165	-95	55	-50	170	370	1030
AUTOBRAKE 2	2180	190/-180	65	-135	545	145	-95	60	-55	175	395	940

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 50 m.
Distances for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (305 m of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 40

Dry Runway

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
	50000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 50000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV
MAX MANUAL	750	55/-40	15	-30	100	10	-5	15	-15	60	10	25
MAX AUTO	930	55/-55	20	-35	125	0	0	20	-20	95	0	0
AUTOBRAKE 3	1255	90/-90	30	-60	205	0	0	30	-30	150	0	0
AUTOBRAKE 2	1590	130/-130	45	-80	285	20	-30	40	-40	145	35	35
AUTOBRAKE 1	1750	155/-150	55	-95	330	50	-50	45	-45	140	150	185

Good Reported Braking Action

MAX MANUAL	1185	85/-70	30	-55	205	30	-20	30	-25	100	65	140
MAX AUTO	1290	90/-85	30	-55	210	25	-15	30	-25	115	65	150
AUTOBRAKE 3	1445	105/-100	35	-65	245	10	-5	35	-30	175	10	20
AUTOBRAKE 2	1830	150/-145	55	-90	330	25	-30	50	-45	170	45	45

Medium Reported Braking Action

MAX MANUAL	1565	130/-120	45	-85	330	70	-50	45	-40	130	165	405
MAX AUTO	1635	130/-120	50	-85	330	65	-45	45	-40	145	165	395
AUTOBRAKE 3	1660	130/-120	50	-90	335	55	-30	45	-40	175	140	390
AUTOBRAKE 2	1875	150/-155	55	-100	375	50	-50	55	-50	170	85	205

Poor Reported Braking Action

MAX MANUAL	2005	180/-165	60	-130	525	165	-105	55	-50	150	345	945
MAX AUTO	2095	180/-165	60	-130	520	170	-100	55	-50	150	355	955
AUTOBRAKE 3	2095	180/-165	65	-130	520	165	-95	55	-50	165	345	945
AUTOBRAKE 2	2125	185/-175	65	-135	530	145	-95	55	-55	170	285	870

Reference distance is for sea level, standard day, no wind or slope, VREF40 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 50 m.
Distances for GOOD, MEDIUM, and POOR are increased by 15%.
Includes distance from 50 ft above threshold (305 m of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (M) REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APP SPD PER 10 KTS ABV VREF
ALL FLAPS UP	VREF40+55	1075	105/-55	30/30	-40	145	10	-10	65
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1300	95/-90	35/45	-65	265	40	-30	115
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	890	55/-50	20/30	-35	120	10	-10	80
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	865	50/-50	20/25	-35	120	10	-10	85
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	865	50/-50	20/25	-35	120	15	-10	90
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	895	55/-55	20/25	-35	130	10	-10	70
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1255	80/-80	30/40	-55	185	30	-30	135
LEADING EDGE FLAPS TRANSIT	VREF15+15	910	60/-50	20/25	-35	120	10	-10	65
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	810	55/-45	15/20	-30	110	10	-10	60
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	790	50/-45	15/20	-30	110	10	-10	60

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCE AND ADJUSTMENT (M)							
		REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APP SPD
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	800	55/-45	15/25	-30	110	10	-10	60
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	800	55/-45	15/25	-30	110	10	-10	60
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	790	55/-40	20/25	-30	110	10	-5	65
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	800	55/-45	15/20	-30	110	10	-10	60
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	925	70/-50	20/30	-35	120	10	-10	60
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	790	55/-40	20/25	-30	110	10	-5	65
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	800	55/-45	15/20	-30	110	10	-10	60
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	925	70/-50	20/30	-35	120	10	-10	60
TRAILING EDGE FLAPS UP	VREF40+40	970	80/-50	20/30	-35	125	10	-10	65

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (M)							
		REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APP SPD
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABV VREF
ALL FLAPS UP	VREF40+55	1455	90/-90	40/55	-60	210	30	-25	80
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1435	115/-105	40/60	-80	320	60	-45	120
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	1200	85/-85	30/45	-55	200	30	-25	115
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1155	80/-80	30/40	-55	195	30	-25	115
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1140	80/-80	30/40	-55	195	30	-25	115
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1105	75/-75	25/40	-50	185	25	-20	90
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1420	95/-90	35/50	-65	225	45	-40	150
LEADING EDGE FLAPS TRANSIT	VREF15+15	1225	80/-80	30/40	-55	195	25	-25	85
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	1105	75/-75	25/30	-50	190	25	-25	90
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	1065	70/-70	25/35	-50	185	25	-25	90

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (M)							
		REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APP SPD
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	1065	70/-70	25/35	-50	180	25	-20	80
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	1065	70/-70	25/35	-50	180	25	-20	80
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1040	70/-70	25/35	-50	175	25	-20	85
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1065	70/-70	25/30	-50	180	25	-20	80
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1250	80/-80	30/45	-55	195	25	-25	80
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1040	70/-70	25/35	-50	175	25	-20	85
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1065	70/-70	25/30	-50	180	25	-20	80
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	1250	80/-80	30/45	-55	195	25	-25	80
TRAILING EDGE FLAPS UP	VREF40+40	1310	80/-80	35/45	-55	200	25	-25	80

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (M)							
		REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPD SPD
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABV VREF
ALL FLAPS UP	VREF40+55	2005	145/-150	65/85	-95	345	80	-60	110
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1790	155/-140	55/80	-115	490	150	-90	140
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	1610	135/-130	50/70	-85	325	80	-60	145
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1530	130/-120	45/65	-85	320	80	-60	140
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1500	125/-120	45/65	-85	315	80	-60	140
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1480	120/-115	45/60	-80	310	65	-50	115
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1945	150/-145	55/80	-100	355	95	-80	185
LEADING EDGE FLAPS TRANSIT	VREF15+15	1640	130/-125	50/70	-85	320	70	-55	115
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	1555	125/-125	45/60	-85	325	75	-60	125
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	1470	115/-115	40/60	-85	315	70	-55	120

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (M)							
		REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPD SPD
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	1430	115/-110	40/55	-80	300	60	-45	105
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	1430	115/-110	40/55	-80	300	60	-45	105
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1385	110/-105	40/55	-75	290	60	-45	110
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1430	115/-110	40/60	-80	300	55	-45	105
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1695	130/-125	50/70	-85	320	70	-55	110
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1385	110/-105	40/55	-75	290	60	-45	110
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1430	115/-110	40/60	-80	300	55	-45	105
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	1695	130/-125	50/70	-85	320	70	-55	110
TRAILING EDGE FLAPS UP	VREF40+40	1785	135/-130	55/75	-85	330	65	-55	105

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (M): REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS: HEAD WIND	WIND ADJ PER 10 KTS: TAIL WIND	SLOPE ADJ PER 1%: DOWN HILL	SLOPE ADJ PER 1%: UP HILL	APPD SPD: PER 10 KTS ABV VREF
ALL FLAPS UP	VREF40+55	2610	220/-215	90/115	-140	545	200	-120	135
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	2340	220/-205	75/110	-190	890	420	-200	150
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	2055	195/-180	70/100	-130	510	200	-115	170
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1940	180/-170	65/95	-125	500	190	-110	160
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1890	175/-160	60/90	-120	495	190	-110	155
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1900	175/-160	60/90	-120	490	175	-100	140
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	2480	215/-200	75/115	-145	545	190	-145	205
LEADING EDGE FLAPS TRANSIT	VREF15+15	2100	185/-175	70/100	-125	505	180	-105	135
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	2100	190/-180	65/95	-135	535	235	-130	155
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	1965	175/-165	60/85	-130	520	170	-120	150

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (M) REF DIST FOR 50000 KG LND WT	WT ADJ PER 5000 KG ABV/BLW 50000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APPD SPD PER 10 KTS ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	1835	165/-155	60/80	-115	475	165	-95	130
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	1835	165/-155	60/80	-115	475	165	-95	130
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1775	160/-150	55/80	-115	455	145	-95	130
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1835	165/-155	60/80	-115	475	165	-95	130
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	2185	185/-180	75/100	-125	505	180	-105	130
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1775	160/-150	55/80	-115	455	145	-95	130
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1835	165/-155	60/80	-115	475	165	-95	130
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	2185	185/-180	75/100	-125	505	180	-105	130
TRAILING EDGE FLAPS UP	VREF40+40	2310	195/-190	80/110	-130	515	180	-110	130

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft 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)	PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT		
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
70	0	13.0	14.9	17.0	19.6	22.8	26.4	27.1	31.6	36.8	35.5	41.5	48.2	44.8	52.1	60.4	54.2	62.7	72.5
	10	13.4	15.4	17.6	20.3	23.6	27.3	28.0	32.7	38.0	36.7	42.9	49.8	46.3	53.8	62.3	56.0	64.6	74.7
	15	13.6	15.6	17.9	20.6	24.0	27.8	28.5	33.3	38.7	37.4	43.6	50.6	47.0	54.6	63.2	56.8	65.6	75.7
	20	13.8	15.8	18.1	20.9	24.4	28.2	29.0	33.8	39.3	38.0	44.3	51.4	47.7	55.4	64.1	57.7	66.5	76.6
	30	14.1	16.2	18.6	21.4	25.0	28.9	29.7	34.7	40.3	39.0	45.4	52.7	49.0	56.9	65.8	59.2	68.2	78.5
	40	14.3	16.4	18.9	21.8	25.4	29.5	30.3	35.4	41.1	39.7	46.4	53.8	50.0	58.1	67.2	60.4	69.7	80.3
	50	14.4	16.6	19.0	22.0	25.7	29.8	30.6	35.8	41.7	40.3	47.1	54.7	50.8	59.1	68.5	61.5	71.1	82.1
60	0	11.6	13.2	15.0	17.3	20.1	23.1	23.7	27.7	32.2	31.0	36.2	42.1	38.9	45.4	52.8	47.5	55.2	64.0
	10	11.9	13.6	15.5	17.9	20.7	23.9	24.6	28.7	33.3	32.1	37.4	43.5	40.3	46.9	54.5	49.1	57.0	66.0
	15	12.1	13.8	15.7	18.2	21.1	24.3	25.0	29.2	33.8	32.6	38.1	44.2	41.0	47.7	55.3	49.9	57.8	66.9
	20	12.3	14.0	15.9	18.4	21.4	24.7	25.4	29.6	34.4	33.1	38.7	44.9	41.6	48.4	56.2	50.6	58.7	67.8
	30	12.5	14.3	16.3	18.9	21.9	25.3	26.0	30.4	35.3	34.0	39.7	46.1	42.7	49.7	57.6	52.0	60.2	69.6
	40	12.7	14.5	16.5	19.2	22.3	25.8	26.5	31.0	36.0	34.7	40.5	47.1	43.6	50.8	58.9	53.1	61.5	71.1
	50	12.7	14.6	16.7	19.3	22.5	26.1	26.8	31.3	36.4	35.1	41.1	47.8	44.2	51.6	59.9	53.9	62.6	72.5
50	0	10.2	11.5	13.0	15.0	17.3	19.9	20.4	23.7	27.5	26.4	30.9	35.8	33.0	38.6	44.9	40.3	47.0	54.6
	10	10.5	11.9	13.4	15.5	17.9	20.5	21.1	24.5	28.4	27.3	31.9	37.1	34.2	39.9	46.4	41.7	48.5	56.3
	15	10.6	12.0	13.6	15.7	18.2	20.9	21.4	25.0	28.9	27.8	32.5	37.7	34.8	40.6	47.1	42.4	49.3	57.2
	20	10.7	12.2	13.8	16.0	18.4	21.2	21.8	25.4	29.4	28.3	33.0	38.3	35.3	41.2	47.9	43.0	50.1	58.0
	30	10.9	12.4	14.0	16.3	18.9	21.7	22.3	26.0	30.2	29.0	33.9	39.3	36.3	42.3	49.1	44.2	51.4	59.5
	40	11.1	12.6	14.2	16.6	19.2	22.1	22.7	26.5	30.7	29.5	34.5	40.1	37.0	43.2	50.2	45.1	52.5	60.8
	50	11.1	12.6	14.3	16.7	19.3	22.3	22.9	26.8	31.1	29.9	34.9	40.7	37.4	43.8	51.0	45.7	53.3	61.9
40	0	8.8	9.9	11.1	12.7	14.5	16.6	17.0	19.7	22.7	21.8	25.4	29.5	27.0	31.6	36.7	32.6	38.0	44.2
	10	9.0	10.2	11.4	13.1	15.0	17.1	17.6	20.4	23.5	22.6	26.3	30.5	28.0	32.7	38.0	33.7	39.3	45.7
	15	9.1	10.3	11.5	13.3	15.2	17.4	17.9	20.7	23.9	23.0	26.8	31.0	28.5	33.2	38.6	34.3	40.0	46.5
	20	9.2	10.4	11.7	13.5	15.5	17.7	18.1	21.0	24.3	23.3	27.2	31.5	28.9	33.8	39.2	34.8	40.7	47.2
	30	9.4	10.6	11.9	13.7	15.8	18.1	18.6	21.6	24.9	23.9	27.9	32.4	29.7	34.7	40.3	35.8	41.7	48.5
	40	9.5	10.7	12.0	13.9	16.0	18.4	18.9	21.9	25.3	24.3	28.4	33.0	30.2	35.4	41.1	36.4	42.6	49.5
	50	9.5	10.7	12.1	14.0	16.2	18.5	19.0	22.1	25.6	24.6	28.7	33.4	30.6	35.8	41.6	36.9	43.2	50.2

***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.**

Adjusted Brake Energy Per Brake (Millions of Foot Pounds)

No Reverse Thrust

		REFERENCE 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	6.8	16.4	25.9	35.1	44.4	54.2	64.5	75.2	86.4
	MAX AUTO	6.4	15.7	24.8	33.9	43.1	52.8	63.0	73.7	84.9
	AUTOBRAKE 3	5.9	14.5	22.7	30.6	38.8	47.8	57.7	68.2	79.7
	AUTOBRAKE 2	5.4	13.4	20.8	27.8	34.9	43.0	52.0	61.8	72.6
	AUTOBRAKE 1	4.9	12.3	19.1	25.3	31.6	38.5	46.2	54.5	63.6

Two Engine Reverse Thrust

		REFERENCE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	6.3	15.3	24.0	32.5	41.1	50.1	59.5	69.4	79.6
	MAX AUTO	4.9	12.9	21.0	29.0	37.4	46.4	56.1	66.4	77.3
	AUTOBRAKE 3	2.7	8.5	14.4	20.3	26.7	34.0	42.0	51.0	60.8
	AUTOBRAKE 2	1.1	5.2	9.3	13.3	17.8	23.2	29.6	36.8	45.0
	AUTOBRAKE 1	0.2	2.9	5.6	8.0	10.8	14.4	18.7	23.8	29.7

ADVISORY INFORMATION

Recommended Brake Cooling Schedule

Cooling Time (Minutes)

	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 2.5	2.8	3.1	3.5	3.8	4.3	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		

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.

Intentionally
Blank

Performance Inflight — Chapter PI
Engine Inoperative — Section 13

ENGINE INOP

Initial Max Continuous %N1
Based on .79M, A/C high and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	25	27	29	31	33	35	37	39	41
20	96.0	95.8	95.6	95.4	95.1	94.7	94.2	93.9	93.1
15	96.6	96.4	96.1	96.0	95.9	95.4	95.0	94.7	94.0
10	97.2	97.1	96.7	96.6	96.6	96.2	95.7	95.5	94.9
5	97.4	97.8	97.5	97.3	97.3	96.9	96.5	96.3	95.8
0	96.7	98.0	98.4	98.2	98.1	97.7	97.4	97.1	96.7
-5	95.9	97.2	98.4	99.1	99.0	98.5	98.2	98.0	97.7
-10	95.1	96.4	97.6	98.9	99.8	99.4	99.1	98.9	98.6
-15	94.3	95.7	96.9	98.1	99.4	100.3	100.0	99.8	99.6
-20	93.5	94.9	96.1	97.3	98.6	99.8	100.3	100.1	99.9
-25	92.7	94.1	95.3	96.5	97.8	98.9	99.5	99.3	99.1
-30	91.8	93.3	94.5	95.7	96.9	98.1	98.6	98.4	98.2
-35	91.0	92.5	93.6	94.8	96.1	97.2	97.8	97.6	97.4
-40	90.1	91.7	92.8	94.0	95.3	96.4	96.9	96.7	96.5

%N1 Adjustments for Engine Bleed

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	96.0	96.9	97.8	98.7	99.5	98.9	98.0	96.8	95.5	93.9	92.4	91.1
200	.63	95.3	96.2	97.1	98.0	98.8	99.7	99.4	98.6	97.7	96.7	95.5	94.4
240	.74	94.4	95.3	96.1	97.0	97.9	98.7	99.6	100.0	99.2	98.4	97.6	96.6
280	.86	93.6	94.5	95.4	96.3	97.1	98.0	98.8	99.6	100.4	100.1	99.2	98.4

35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.49	95.8	96.7	97.6	98.5	99.4	99.1	98.3	97.2	96.0	94.6	93.2	92.0
200	.60	95.4	96.4	97.2	98.1	99.0	99.9	99.8	98.8	97.9	96.9	95.7	94.6
240	.71	94.3	95.2	96.1	97.0	97.9	98.7	99.6	100.1	99.4	98.8	97.9	96.9
280	.82	93.1	94.0	94.8	95.7	96.5	97.4	98.2	99.0	99.8	99.6	98.8	98.0

33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.47	96.7	97.6	98.4	99.3	100.1	99.3	98.4	97.2	95.9	94.5	93.1	91.9
200	.58	96.3	97.2	98.1	99.0	99.8	100.7	99.8	98.9	97.9	96.7	95.5	94.4
240	.68	95.2	96.1	97.0	97.8	98.7	99.5	100.4	100.1	99.5	98.6	97.6	96.6
280	.79	93.6	94.4	95.3	96.1	97.0	97.8	98.6	99.4	99.8	99.0	98.1	97.3
320	.89	92.9	93.8	94.7	95.5	96.3	97.2	98.0	98.8	99.6	100.3	100.0	99.1

31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.45	96.7	97.5	98.4	99.3	100.2	100.3	99.5	98.4	97.2	95.8	94.4	93.1
200	.55	96.4	97.3	98.1	99.0	99.9	100.7	100.9	100.0	99.0	97.9	96.6	95.4
240	.66	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.6	99.8	99.0	98.0	97.0
280	.76	93.1	94.0	94.8	95.6	96.5	97.3	98.1	98.9	99.7	99.0	98.1	97.2
320	.85	91.7	92.5	93.4	94.2	95.0	95.8	96.6	97.4	98.2	99.0	99.2	98.3

29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.43	97.4	98.3	99.2	100.0	100.9	100.5	99.5	98.4	97.1	95.6	94.3	93.0
200	.53	96.8	97.7	98.6	99.4	100.3	101.1	100.6	99.6	98.6	97.4	96.2	95.0
240	.63	95.6	96.4	97.3	98.1	99.0	99.8	100.6	100.3	99.4	98.5	97.4	96.5
280	.73	93.5	94.3	95.2	96.0	96.8	97.6	98.4	99.2	99.3	98.4	97.4	96.7
320	.82	91.3	92.2	93.0	93.8	94.6	95.4	96.2	97.0	97.7	98.5	97.7	96.9
360	.91	91.3	92.2	93.0	93.8	94.6	95.4	96.2	97.0	97.7	98.5	99.2	99.3

%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	97.3	98.1	99.0	99.9	100.7	101.5	100.5	99.5	98.3	96.9	95.6	94.3
200	.51	96.2	97.1	98.0	98.8	99.7	100.5	101.0	100.1	99.1	98.0	96.8	95.6
240	.60	94.9	95.8	96.7	97.5	98.3	99.2	100.0	100.6	99.6	98.6	97.6	96.7
280	.70	92.9	93.7	94.6	95.4	96.2	97.0	97.8	98.6	99.4	98.6	97.6	96.8
320	.79	90.8	91.6	92.5	93.3	94.1	94.9	95.6	96.4	97.2	97.9	97.8	97.1
360	.88	90.0	90.9	91.7	92.5	93.4	94.2	95.0	95.7	96.5	97.3	98.0	98.6

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.39	98.1	98.9	99.8	100.7	101.5	101.6	100.6	99.5	98.3	96.9	95.7	94.4
200	.49	96.7	97.6	98.5	99.3	100.1	100.9	100.8	99.8	98.8	97.6	96.5	95.4
240	.58	95.0	95.8	96.7	97.5	98.3	99.1	99.9	99.7	98.8	97.8	96.8	95.9
280	.67	93.1	94.0	94.8	95.6	96.4	97.2	98.0	98.7	98.8	97.8	96.8	96.1
320	.76	90.8	91.7	92.5	93.3	94.1	94.9	95.7	96.5	97.2	97.8	97.1	96.4
360	.85	89.5	90.3	91.2	92.0	92.9	93.7	94.5	95.3	96.1	96.9	97.6	97.4

24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.38	97.3	98.2	99.1	99.9	100.7	101.5	100.4	99.3	98.1	96.8	95.6	94.4
200	.48	96.1	96.9	97.8	98.6	99.4	100.2	100.6	99.6	98.6	97.4	96.3	95.3
240	.57	94.5	95.3	96.1	96.9	97.8	98.6	99.3	99.7	98.7	97.6	96.7	95.8
280	.66	92.7	93.5	94.3	95.1	95.9	96.7	97.5	98.3	98.8	97.7	96.7	96.0
320	.75	90.2	91.1	91.9	92.7	93.5	94.4	95.2	95.9	96.7	97.5	96.9	96.2
360	.83	88.7	89.6	90.4	91.2	92.1	92.9	93.7	94.5	95.3	96.1	96.9	96.9

22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.37	96.7	97.6	98.4	99.2	100.1	100.2	99.0	97.8	96.6	95.5	94.4	93.3
200	.46	95.5	96.4	97.2	98.0	98.8	99.6	99.3	98.1	97.0	96.0	95.0	94.0
240	.55	94.1	94.9	95.8	96.5	97.3	98.1	98.9	98.5	97.3	96.4	95.5	94.7
280	.63	92.5	93.3	94.1	94.9	95.7	96.4	97.2	97.9	97.6	96.7	95.8	95.1
320	.72	90.1	91.0	91.8	92.7	93.5	94.3	95.1	95.9	96.7	96.8	96.0	95.3
360	.80	88.4	89.2	90.1	90.9	91.7	92.6	93.4	94.2	95.0	95.8	96.3	95.8

20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.35	95.3	96.1	97.0	97.8	98.6	99.4	98.8	97.4	96.2	95.2	94.2	93.2
200	.44	94.2	95.0	95.8	96.6	97.4	98.2	98.9	97.8	96.4	95.5	94.6	93.7
240	.53	92.8	93.6	94.4	95.2	96.0	96.8	97.5	98.2	97.0	95.9	95.1	94.3
280	.61	91.1	92.0	92.8	93.6	94.4	95.2	96.0	96.8	97.4	96.5	95.6	94.9
320	.69	89.1	90.0	90.8	91.6	92.5	93.3	94.1	94.9	95.7	96.5	95.8	95.1
360	.77	87.4	88.3	89.1	90.0	90.8	91.6	92.4	93.2	94.0	94.8	95.6	95.4

%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	94.5	95.3	96.1	96.9	97.7	98.4	97.3	95.9	94.9	94.0	93.0	92.1
200	.42	93.4	94.2	95.0	95.8	96.6	97.3	97.6	96.3	95.2	94.4	93.5	92.6
240	.51	91.9	92.7	93.5	94.3	95.1	95.9	96.7	96.7	95.6	94.7	94.0	93.2
280	.59	90.4	91.3	92.1	92.9	93.8	94.6	95.4	96.1	96.1	95.2	94.4	93.7
320	.67	88.9	89.7	90.5	91.4	92.2	93.0	93.8	94.6	95.4	95.5	94.8	94.1
360	.75	87.3	88.2	89.0	89.8	90.7	91.5	92.3	93.1	93.9	94.7	95.1	94.5

16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.33	93.0	93.8	94.6	95.4	96.1	96.9	97.2	96.0	94.8	94.0	93.1	92.2
200	.41	91.6	92.4	93.2	94.0	94.8	95.6	96.4	96.1	95.0	94.1	93.3	92.5
240	.49	90.3	91.1	92.0	92.8	93.6	94.4	95.2	96.0	95.4	94.5	93.7	92.9
280	.57	89.0	89.9	90.7	91.5	92.4	93.2	94.0	94.8	95.6	94.9	94.1	93.4
320	.64	87.8	88.6	89.5	90.3	91.1	91.9	92.7	93.5	94.3	95.1	94.5	93.8
360	.72	86.5	87.3	88.2	89.0	89.8	90.6	91.4	92.2	93.0	93.8	94.6	94.2

14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
160	.31	92.4	93.2	94.1	94.9	95.7	96.4	96.4	95.5	94.6	93.8	92.9	92.0
200	.39	91.0	91.9	92.7	93.5	94.3	95.1	95.9	95.1	94.2	93.4	92.6	91.8
240	.47	90.0	90.9	91.7	92.5	93.3	94.1	94.9	95.4	94.6	93.7	93.0	92.3
280	.54	88.9	89.8	90.6	91.4	92.3	93.1	93.9	94.7	94.9	94.1	93.4	92.7
320	.62	87.8	88.7	89.5	90.3	91.2	92.0	92.8	93.5	94.3	94.5	93.8	93.1
360	.69	86.7	87.5	88.3	89.1	90.0	90.8	91.5	92.3	93.1	93.9	94.2	93.6

12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.30	91.8	92.6	93.4	94.2	95.0	95.8	95.5	94.8	94.0	93.2	92.4	91.5
200	.38	90.7	91.5	92.3	93.1	93.9	94.7	95.2	94.3	93.5	92.7	92.0	91.2
240	.45	89.8	90.7	91.5	92.3	93.1	93.9	94.7	94.7	93.8	93.1	92.4	91.6
280	.52	88.9	89.8	90.6	91.4	92.2	93.0	93.8	94.6	94.2	93.5	92.8	92.1
320	.60	87.9	88.8	89.6	90.4	91.2	92.0	92.8	93.6	94.3	93.9	93.2	92.5
360	.67	86.8	87.7	88.5	89.3	90.1	90.9	91.6	92.4	93.2	93.9	93.5	92.9

%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	90.5	91.4	92.2	93.0	93.8	94.6	95.4	94.7	94.1	93.3	92.5	91.7
200	.36	89.6	90.4	91.3	92.1	92.9	93.7	94.5	94.5	93.7	92.9	92.2	91.4
240	.43	88.9	89.7	90.6	91.4	92.2	93.0	93.8	94.5	94.0	93.1	92.4	91.7
280	.51	88.1	89.0	89.8	90.6	91.4	92.2	93.0	93.8	94.4	93.6	92.8	92.2
320	.58	87.2	88.0	88.8	89.6	90.4	91.2	92.0	92.8	93.5	93.9	93.2	92.5
360	.65	86.2	87.0	87.8	88.6	89.4	90.2	91.0	91.7	92.5	93.2	93.6	92.9
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
160	.26	89.1	89.9	90.7	91.5	92.3	93.1	93.7	93.5	93.2	92.5	91.8	91.0
200	.33	88.7	89.5	90.3	91.1	91.8	92.6	93.4	93.3	92.9	92.3	91.6	90.8
240	.40	88.1	88.9	89.7	90.5	91.3	92.0	92.8	93.3	92.5	91.8	91.1	90.3
280	.46	87.5	88.3	89.1	89.8	90.6	91.4	92.2	92.9	92.9	92.1	91.4	90.7
320	.53	86.8	87.6	88.3	89.1	89.9	90.7	91.4	92.2	92.9	92.5	91.8	91.1
360	.59	86.0	86.7	87.5	88.3	89.1	89.8	90.6	91.3	92.0	92.8	92.2	91.5
3000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.26	88.8	89.6	90.4	91.2	91.9	92.7	93.1	92.9	92.6	91.8	91.1	90.3
200	.32	88.5	89.3	90.0	90.8	91.6	92.3	93.1	92.8	92.5	91.8	91.1	90.3
240	.38	87.9	88.7	89.5	90.3	91.0	91.8	92.5	92.6	91.8	91.0	90.3	89.6
280	.45	87.4	88.1	88.9	89.7	90.5	91.2	92.0	92.7	92.2	91.4	90.7	90.0
320	.51	86.7	87.5	88.3	89.0	89.8	90.5	91.3	92.0	92.5	91.8	91.1	90.4
360	.57	85.9	86.7	87.5	88.2	89.0	89.7	90.5	91.2	91.9	92.2	91.5	90.7
1000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.25	87.7	88.5	89.3	90.0	90.8	91.6	92.3	92.3	91.8	91.2	90.5	89.7
200	.31	87.4	88.2	89.0	89.7	90.5	91.3	92.0	92.4	92.0	91.5	90.8	90.0
240	.37	86.9	87.7	88.5	89.3	90.0	90.8	91.5	92.3	91.9	91.2	90.4	89.7
280	.43	86.4	87.2	87.9	88.7	89.5	90.2	90.9	91.7	92.1	91.4	90.7	89.9
320	.49	85.8	86.6	87.4	88.1	88.9	89.6	90.4	91.1	91.8	91.8	91.1	90.3
360	.55	85.1	85.9	86.7	87.4	88.1	88.9	89.6	90.3	91.1	91.8	91.4	90.7

%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	-3.1	-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
70	67	241	21800	20300	18100
65	62	233	24300	22900	21300
60	57	225	26500	25500	24300
55	53	215	28800	27800	26700
50	48	205	30900	30100	29100
45	43	195	33000	32300	31400
40	38	184	35400	34700	33800
35	33	172	38000	37300	36500

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown/LRC Cruise Range Capability

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
140	130	121	113	106	100	95	90	85	81	78
280	259	241	226	212	200	189	180	171	163	156
419	388	362	339	318	300	284	269	256	244	234
559	518	482	451	424	400	378	359	342	326	312
698	647	602	564	530	500	473	449	427	408	390
837	776	723	677	636	600	568	539	513	489	468
976	905	843	789	742	700	663	629	599	571	546
1115	1033	963	902	848	800	757	719	684	653	624
1253	1162	1083	1014	954	900	852	809	770	734	702
1392	1291	1203	1127	1060	1000	947	899	855	816	780
1531	1420	1324	1240	1166	1100	1041	989	941	898	858
1670	1549	1444	1352	1272	1200	1136	1079	1027	980	936
1809	1677	1564	1465	1377	1300	1231	1169	1112	1061	1015
1948	1806	1684	1577	1483	1400	1325	1258	1198	1143	1093
2087	1936	1805	1690	1589	1500	1420	1348	1283	1224	1171
2227	2065	1925	1803	1695	1600	1515	1438	1369	1306	1249

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG) WEIGHT AT START OF DRIFTDOWN (1000 KG)								TIME (HR:MIN)
	35	40	45	50	55	60	65	70	
100	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0:17
200	0.7	0.8	0.8	0.9	0.9	1.0	1.1	1.1	0:34
300	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	0:51
400	1.5	1.6	1.8	1.9	2.1	2.3	2.4	2.5	1:08
500	1.9	2.0	2.2	2.4	2.6	2.8	3.0	3.2	1:25
600	2.2	2.4	2.7	2.9	3.2	3.4	3.6	3.9	1:42
700	2.6	2.8	3.1	3.4	3.7	4.0	4.2	4.5	1:59
800	2.9	3.2	3.5	3.9	4.2	4.5	4.8	5.1	2:15
900	3.3	3.6	4.0	4.3	4.7	5.1	5.4	5.8	2:32
1000	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.4	2:49
1100	3.9	4.4	4.8	5.3	5.7	6.2	6.6	7.0	3:06
1200	4.3	4.7	5.2	5.7	6.2	6.7	7.2	7.6	3:23
1300	4.6	5.1	5.6	6.2	6.7	7.2	7.7	8.3	3:39
1400	4.9	5.5	6.0	6.6	7.2	7.8	8.3	8.9	3:56
1500	5.3	5.8	6.4	7.1	7.7	8.3	8.9	9.5	4:13
1600	5.6	6.2	6.8	7.5	8.2	8.8	9.4	10.1	4:30

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
70	16400	13800	11300
65	20600	17200	14300
60	23800	21300	18200
55	26600	25100	22200
50	29200	28000	26300
45	31600	30800	29500
40	34000	33200	32100
35	36600	35900	34800

With engine anti-ice on, decrease altitude capability by 2000 ft.
With engine and wing anti-ice on, decrease altitude capability by 7000 ft (optional system).

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)											
		10	15	17	19	21	23	25	27	29	31	33	35
70	%N1	86.2	90.5	92.1	93.8								
	MACH	.510	.562	.582	.595								
	KIAS	282	284	283	278								
	FF/ENG	2470	2497	2499	2463								
65	%N1	84.1	88.4	90.2	91.9	93.7	96.2						
	MACH	.491	.542	.563	.584	.596	.612						
	KIAS	271	274	274	273	268	265						
	FF/ENG	2280	2305	2309	2310	2279	2303						
60	%N1	82.0	86.3	88.0	89.8	91.6	93.5	96.2					
	MACH	.471	.521	.543	.564	.585	.597	.614					
	KIAS	261	263	263	263	263	258	254					
	FF/ENG	2097	2115	2119	2121	2123	2098	2132					
55	%N1	79.7	83.9	85.7	87.4	89.2	91.1	93.1	95.9				
	MACH	.453	.498	.520	.541	.563	.585	.597	.614				
	KIAS	250	251	252	252	253	252	247	244				
	FF/ENG	1924	1926	1929	1931	1935	1940	1922	1958				
50	%N1	77.3	81.3	83.1	84.9	86.7	88.5	90.4	92.4	95.4			
	MACH	.434	.475	.495	.516	.538	.561	.583	.596	.613			
	KIAS	240	239	239	240	241	241	241	236	233			
	FF/ENG	1760	1740	1741	1743	1746	1750	1759	1750	1779			
45	%N1	74.9	78.6	80.2	82.0	83.8	85.6	87.5	89.4	91.5	94.4	98.2	
	MACH	.415	.452	.469	.489	.511	.533	.556	.578	.593	.610	.632	
	KIAS	229	227	227	227	228	229	229	229	225	222	220	
	FF/ENG	1602	1569	1560	1556	1559	1563	1569	1583	1578	1599	1673	
40	%N1	72.2	75.7	77.3	78.9	80.6	82.5	84.3	86.1	88.0	90.3	93.1	96.7
	MACH	.395	.429	.445	.462	.480	.502	.525	.548	.571	.589	.604	.626
	KIAS	218	215	215	214	214	215	216	216	216	214	210	208
	FF/ENG	1448	1407	1392	1381	1373	1377	1384	1394	1406	1409	1417	1475
35	%N1	69.1	72.7	74.1	75.6	77.3	79.0	80.7	82.5	84.4	86.3	88.6	91.3
	MACH	.375	.406	.420	.435	.452	.469	.490	.513	.536	.560	.584	.597
	KIAS	207	203	202	202	201	201	201	202	203	203	202	198
	FF/ENG	1302	1255	1236	1219	1205	1197	1200	1211	1219	1228	1241	1237

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion 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
309	279	253	233	215	200	190	180	172	164	157
625	564	511	467	432	400	379	360	342	326	312
943	850	769	703	648	600	568	539	513	489	468
1263	1137	1027	939	865	800	757	718	683	651	623
1585	1425	1287	1175	1082	1000	947	897	853	813	777
1910	1716	1547	1412	1299	1200	1136	1076	1023	975	932
2237	2008	1810	1649	1517	1400	1324	1255	1193	1136	1087
2567	2302	2072	1887	1734	1600	1513	1434	1362	1297	1240
2899	2597	2336	2126	1952	1800	1702	1613	1531	1459	1394

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	1.2	0:46	1.1	0:43	1.0	0:41	0.9	0:39	0.8	0:38
400	2.6	1:30	2.3	1:25	2.1	1:20	2.0	1:15	1.8	1:12
600	3.8	2:14	3.5	2:07	3.3	2:00	3.0	1:52	2.8	1:46
800	5.1	2:59	4.7	2:50	4.4	2:39	4.1	2:29	3.8	2:21
1000	6.4	3:45	5.9	3:33	5.5	3:20	5.1	3:07	4.8	2:56
1200	7.7	4:31	7.1	4:16	6.6	4:01	6.1	3:45	5.7	3:31
1400	8.9	5:18	8.3	5:00	7.7	4:42	7.1	4:23	6.7	4:07
1600	10.1	6:05	9.4	5:45	8.7	5:24	8.1	5:02	7.6	4:43
1800	11.3	6:53	10.5	6:30	9.8	6:06	9.1	5:41	8.6	5:19

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	30	40	50	60	70
1	-0.1	-0.1	0.0	0.1	0.3
2	-0.3	-0.2	0.0	0.2	0.6
3	-0.5	-0.2	0.0	0.4	1.0
4	-0.6	-0.3	0.0	0.5	1.3
5	-0.8	-0.4	0.0	0.7	1.7
6	-1.0	-0.5	0.0	0.8	2.0
7	-1.1	-0.6	0.0	0.9	2.3
8	-1.3	-0.7	0.0	1.0	2.5
9	-1.5	-0.7	0.0	1.2	2.8
10	-1.7	-0.8	0.0	1.3	3.0
11	-1.8	-0.9	0.0	1.4	3.3
12	-2.0	-1.0	0.0	1.5	3.5

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
70	%N1	75.7	78.5	82.7	87.1	92.3			
	KIAS	229	229	230	231	233			
	FF/ENG	2240	2230	2230	2250	2290			
65	%N1	73.6	76.5	80.7	85.0	89.7	98.0		
	KIAS	221	221	222	223	224	225		
	FF/ENG	2080	2070	2060	2070	2090	2260		
60	%N1	71.3	74.4	78.4	82.8	87.4	94.0		
	KIAS	212	212	213	214	215	216		
	FF/ENG	1930	1910	1900	1900	1910	1990		
55	%N1	69.0	71.9	76.0	80.4	84.9	90.1		
	KIAS	203	203	204	204	205	207		
	FF/ENG	1770	1750	1740	1730	1730	1770		
50	%N1	66.5	69.2	73.6	77.7	82.2	87.0	95.2	
	KIAS	193	194	194	195	196	197	198	
	FF/ENG	1620	1600	1580	1570	1560	1580	1700	
45	%N1	63.7	66.5	70.6	74.9	79.3	84.0	89.7	
	KIAS	183	183	184	185	185	186	187	
	FF/ENG	1470	1450	1430	1420	1400	1400	1460	
40	%N1	60.5	63.6	67.5	71.9	76.1	80.7	85.6	94.4
	KIAS	177	177	177	177	177	177	177	178
	FF/ENG	1330	1310	1280	1270	1240	1240	1270	1370
35	%N1	57.3	60.1	64.3	68.4	72.9	77.3	81.9	87.7
	KIAS	170	170	170	170	170	170	170	170
	FF/ENG	1180	1160	1150	1130	1100	1090	1110	1140

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

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
70	23100	19900	16300
65	25900	24000	20200
60	28400	26900	25100
55	30700	29500	27900
50	32800	31800	30600
45	35000	34000	32900
40	37400	36400	35300
35	40100	39200	38100

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)										
		10	21	23	25	27	29	31	33	35	37	39
70	%N1	80.7	90.0	92.0								
	MACH	.440	.541	.557								
	KIAS	243	242	240								
	FF/ENG	1980	1970	1959								
65	%N1	78.7	88.1	89.7	91.9	94.8						
	MACH	.425	.524	.543	.560	.578						
	KIAS	235	234	233	231	229						
	FF/ENG	1835	1820	1814	1812	1845						
60	%N1	76.6	85.8	87.6	89.3	91.6	94.7					
	MACH	.409	.504	.525	.544	.562	.580					
	KIAS	226	225	225	224	222	220					
	FF/ENG	1694	1666	1667	1664	1669	1703					
55	%N1	74.4	83.4	85.2	87.0	88.7	91.1	94.4				
	MACH	.393	.484	.504	.525	.545	.562	.581				
	KIAS	217	216	216	216	215	213	211				
	FF/ENG	1554	1517	1515	1519	1522	1527	1561				
50	%N1	71.8	80.9	82.6	84.4	86.2	88.0	90.4	93.7			
	MACH	.376	.463	.482	.502	.523	.544	.561	.580			
	KIAS	207	206	206	206	206	205	203	201			
	FF/ENG	1417	1371	1368	1370	1377	1381	1383	1415			
45	%N1	69.0	78.1	79.8	81.5	83.3	85.1	86.9	89.3	92.7		
	MACH	.358	.441	.458	.477	.498	.520	.541	.559	.578		
	KIAS	197	196	196	196	196	196	195	193	191		
	FF/ENG	1285	1229	1222	1224	1231	1236	1239	1240	1267		
40	%N1	66.1	74.9	76.7	78.4	80.1	81.9	83.8	85.6	87.8	91.6	
	MACH	.340	.417	.434	.452	.471	.491	.513	.535	.554	.573	
	KIAS	187	185	185	185	185	185	185	185	183	181	
	FF/ENG	1158	1094	1081	1081	1088	1091	1095	1097	1098	1122	
35	%N1	63.0	71.6	73.2	74.9	76.7	78.4	80.2	82.0	83.9	86.4	90.2
	MACH	.321	.392	.408	.425	.442	.461	.481	.503	.526	.547	.566
	KIAS	177	174	174	173	173	173	173	173	173	172	170
	FF/ENG	1034	964	949	944	949	950	952	953	955	962	982

GEAR DOWN

Long Range Cruise Enroute 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
343	302	267	240	219	200	187	176	166	157	150
694	610	538	483	438	400	376	353	333	316	300
1052	921	811	726	658	600	563	530	499	472	449
1416	1238	1087	971	879	800	750	705	664	629	598
1788	1559	1365	1217	1101	1000	937	880	829	785	746
2166	1884	1646	1465	1322	1200	1124	1056	994	940	893
2554	2215	1930	1714	1545	1400	1311	1230	1158	1095	1040
2950	2551	2217	1965	1768	1600	1497	1405	1322	1249	1186
3355	2893	2507	2217	1992	1800	1683	1578	1485	1402	1331

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	2.2	0:53	2.0	0:51	1.8	0:49	1.6	0:47	1.5	0:45
400	4.5	1:45	4.1	1:39	3.8	1:34	3.5	1:29	3.2	1:25
600	6.7	2:37	6.2	2:29	5.7	2:21	5.3	2:13	4.9	2:06
800	8.9	3:31	8.3	3:20	7.6	3:08	7.0	2:57	6.6	2:47
1000	11.0	4:27	10.3	4:12	9.5	3:57	8.8	3:43	8.2	3:29
1200	13.1	5:23	12.2	5:05	11.3	4:46	10.5	4:29	9.8	4:12
1400	15.2	6:21	14.1	5:59	13.1	5:37	12.1	5:16	11.4	4:56
1600	17.2	7:21	16.0	6:55	14.8	6:29	13.7	6:04	12.9	5:41
1800	19.1	8:22	17.8	7:52	16.5	7:22	15.3	6:53	14.4	6:26

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	30	40	50	60	70
2	-0.4	-0.2	0.0	0.2	0.5
4	-0.8	-0.4	0.0	0.5	1.0
6	-1.2	-0.6	0.0	0.7	1.5
8	-1.6	-0.8	0.0	0.9	2.0
10	-1.9	-1.0	0.0	1.2	2.5
12	-2.3	-1.2	0.0	1.4	3.0
14	-2.7	-1.4	0.0	1.7	3.5
16	-3.0	-1.6	0.0	1.9	3.9
18	-3.4	-1.8	0.0	2.2	4.4
20	-3.7	-2.0	0.0	2.4	4.9

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM)
41000	22	240	89
39000	21	240	85
37000	21	240	80
35000	20	230	76
33000	19	230	72
31000	18	230	68
29000	17	220	64
27000	17	220	60
25000	16	210	56
23000	15	210	52
21000	14	200	48
19000	13	190	44
17000	12	190	40
15000	11	180	36
10000	9	150	26
5000	6	120	16
1500	4	100	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	40000
70	%N1	70.4	73.4	77.4	81.8	86.3	92.0			
	KIAS	213	213	213	213	213	213			
	FF/ENG	1860	1840	1830	1830	1830	1870			
65	%N1	68.6	71.5	75.7	79.9	84.4	89.3			
	KIAS	208	208	208	208	208	208			
	FF/ENG	1740	1720	1710	1700	1700	1720			
60	%N1	66.7	69.5	73.8	77.8	82.3	87.0	94.5		
	KIAS	203	203	203	203	203	203	203		
	FF/ENG	1630	1600	1590	1580	1570	1580	1670		
55	%N1	64.7	67.4	71.6	75.7	80.1	84.7	90.4		
	KIAS	196	196	196	196	196	196	196		
	FF/ENG	1510	1490	1470	1460	1440	1440	1490		
50	%N1	62.3	65.2	69.1	73.4	77.7	82.2	87.0		
	KIAS	190	190	190	190	190	190	190		
	FF/ENG	1400	1380	1350	1340	1320	1310	1340		
45	%N1	59.8	62.8	66.7	71.0	75.2	79.7	84.3	91.4	
	KIAS	183	183	183	183	183	183	183	183	
	FF/ENG	1280	1260	1240	1220	1200	1190	1210	1260	
40	%N1	57.4	60.1	64.3	68.3	72.7	77.0	81.5	86.7	
	KIAS	177	177	177	177	177	177	177	177	
	FF/ENG	1170	1160	1140	1120	1090	1070	1090	1100	
35	%N1	54.9	57.4	61.6	65.6	70.0	74.2	78.7	83.3	92.4
	KIAS	170	170	170	170	170	170	170	170	170
	FF/ENG	1070	1050	1030	1010	990	960	970	980	1060

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

Intentionally
Blank

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Gear Down, Engine Inop — Section 15

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
70	66	212	3400	1300	
65	62	207	6600	4800	3000
60	57	202	9900	8000	6300
55	52	196	13000	11300	9500
50	48	190	16300	14800	13000
45	43	183	19500	18100	16500
40	38	176	22700	21600	20300
35	34	170	25700	25000	24100

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
60	4300	1300	
55	8700	6400	4000
50	12900	10700	8400
45	17000	15300	13100
40	21300	19800	18000
35	25000	23900	22600

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
60	%N1	90.2								
	MACH	.364								
	KIAS	220								
	FF/ENG	3193								
55	%N1	87.7	89.3	91.0						
	MACH	.351	.362	.374						
	KIAS	212	211	210						
	FF/ENG	2922	2910	2908						
50	%N1	85.2	86.7	88.2	90.0	91.7				
	MACH	.338	.348	.359	.371	.384				
	KIAS	204	203	202	201	200				
	FF/ENG	2665	2644	2630	2627	2634				
45	%N1	82.5	83.9	85.4	86.9	88.6	90.4	92.7		
	MACH	.325	.334	.344	.355	.367	.380	.393		
	KIAS	196	195	193	192	191	190	189		
	FF/ENG	2419	2391	2369	2354	2350	2352	2359		
40	%N1	79.6	81.0	82.4	83.8	85.3	87.0	88.8	90.8	94.1
	MACH	.311	.320	.329	.339	.349	.361	.374	.387	.402
	KIAS	188	186	184	183	182	181	180	179	179
	FF/ENG	2188	2152	2122	2100	2085	2075	2068	2065	2101
35	%N1	76.5	77.8	79.1	80.4	81.9	83.4	85.0	87.0	88.9
	MACH	.296	.305	.313	.322	.331	.342	.353	.367	.383
	KIAS	179	178	176	174	172	171	170	170	170
	FF/ENG	1959	1929	1891	1861	1838	1818	1800	1802	1808

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)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
178	156	137	122	110	100	94	87	82	76	72
361	314	274	244	220	200	186	173	161	152	143
546	473	412	366	331	300	278	258	241	226	214
732	634	551	489	441	400	370	344	321	301	285
920	796	691	613	552	500	463	430	401	376	355
1109	958	832	737	663	600	555	515	480	450	425
1300	1122	973	861	774	700	648	601	560	525	495
1493	1287	1115	986	885	800	740	686	639	599	565
1687	1452	1256	1110	997	900	832	772	719	673	635
1883	1619	1399	1235	1108	1000	924	857	797	747	704

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT) 6		10		14		18	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
100	1.1	0:29	1.0	0:28	0.9	0:27	0.8	0:26
200	2.3	0:56	2.1	0:54	2.0	0:52	1.9	0:50
300	3.5	1:24	3.3	1:21	3.0	1:17	2.9	1:14
400	4.7	1:52	4.4	1:47	4.1	1:42	4.0	1:37
500	5.9	2:20	5.5	2:14	5.1	2:08	4.9	2:01
600	7.1	2:49	6.6	2:41	6.2	2:33	5.9	2:26
700	8.2	3:17	7.6	3:09	7.2	3:00	6.9	2:50
800	9.3	3:47	8.7	3:36	8.2	3:26	7.8	3:15
900	10.4	4:16	9.7	4:04	9.2	3:52	8.8	3:40
1000	11.5	4:46	10.8	4:33	10.1	4:19	9.7	4:05

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG) 30	40	50	60	70
1	-0.2	-0.1	0.0	0.2	0.4
2	-0.4	-0.2	0.0	0.4	0.9
3	-0.6	-0.3	0.0	0.7	1.3
4	-0.8	-0.4	0.0	0.9	1.8
5	-1.0	-0.5	0.0	1.1	2.3
6	-1.2	-0.6	0.0	1.3	2.7
7	-1.4	-0.7	0.0	1.5	3.1
8	-1.6	-0.8	0.0	1.7	3.5
9	-1.8	-0.9	0.0	1.9	4.0
10	-2.0	-1.0	0.0	2.1	4.4
11	-2.2	-1.1	0.0	2.3	4.7
12	-2.4	-1.2	0.0	2.4	5.1

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
70	%N1	89.1					
	KIAS	213					
	FF/ENG	3570					
65	%N1	87.1	90.2				
	KIAS	208	208				
	FF/ENG	3310	3340				
60	%N1	84.8	87.9				
	KIAS	203	203				
	FF/ENG	3060	3070				
55	%N1	82.4	85.5	90.1			
	KIAS	196	196	196			
	FF/ENG	2820	2820	2840			
50	%N1	79.9	82.9	87.3	92.4		
	KIAS	190	190	190	190		
	FF/ENG	2580	2570	2580	2630		
45	%N1	77.3	80.2	84.6	89.3		
	KIAS	183	183	183	183		
	FF/ENG	2360	2340	2340	2360		
40	%N1	74.6	77.4	81.7	86.2	91.7	
	KIAS	177	177	177	177	177	
	FF/ENG	2140	2120	2110	2120	2140	
35	%N1	71.5	74.5	78.7	83.1	88.0	96.8
	KIAS	170	170	170	170	170	170
	FF/ENG	1930	1910	1890	1890	1900	2030

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

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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 provided that adjustments are made to V1 for clearway, stopway, anti-skid inoperative, thrust reversers inoperative, improved climb, contaminated runway situations or brake energy limits. These speeds may be used for weights less than or equal to the performance limited weight.

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. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (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.

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.

Clearway and Stopway V1 Adjustments

Maximum allowable clearway limits are provided for guidance when more precise data is not available. Use of clearway is not allowed on wet runways.

Takeoff speed adjustments are to be applied to V1 speed when using takeoff weights based on the use of clearway and stopway.

Adjust V1 speed by the amount shown in the table. The adjusted V1 speed must not exceed VR. If the adjusted V1 speed is greater than VR, reduce V1 to equal VR.

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.

With autothrottles disengaged an approach speed wind correction (max 20 knots) of 1/2 steady headwind component + gust increment above steady wind is recommended. Do not apply a wind correction for tailwinds. The maximum command speed should not exceed landing flap placard speed minus 5 knots.

Flap Maneuver Speeds

This table provides the flap speed schedule for recommended maneuver speeds. Using VREF as the basis for the schedule makes it variable as a function of weight and will provide adequate maneuver margin above stall at all weights.

During flap retraction/extension, movement of the flap to the next position should be initiated when within 20 knots of the recommended speed for that position.

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 depths greater than 13 mm (0.5 inches) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. The use of assumed temperature for reduced thrust is not allowed on contaminated runways. Interpolation for slush/standing water depths between the values shown is permitted.

Takeoff weight 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 7050 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	-16
2500	-14
3000	-12
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 2300 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 field/obstacle limited weight and V1 speed 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/field/obstacle limited weight by 1000 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 1650 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. For packs off operation, apply the %N1 adjustment shown below the table. No takeoff %N1 adjustment is required for engine and wing anti-ice.

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.

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

Normal Configuration Landing Distance

The normal configuration distance tables are provided as advisory information to help determine the actual landing distance performance of the airplane for different runway surface conditions and brake configurations.

Flaps 15, 30, and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking actions, which are commonly referred to as slippery runway conditions. Landing distances for slippery runways are 115% of the actual landing distances.

If the surface is affected by water, snow or ice, and the 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 landing. 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 "poor" data reflects runways covered with wet ice.

Dry runway landing performance is shown for max manual braking configuration and autobrake settings max, 3, 2, and 1. Use of autobrake setting 1 is not recommended for landings on slippery runways, and is therefore not provided for these conditions. The autobrake performance may be used to assist in the selection of the most desirable autobrake setting for a given field length. Selection of an autobrake setting results in a constant rate of deceleration. Maximum effort manual braking should achieve shorter landing distance than the max autobrake setting. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and normal approach speed for the selected landing flap at sea level, zero wind, zero slope, and two engine detent reverse thrust. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, temperature, speed, and reverse thrust. Each adjustment is independently added to the reference landing distance.

Non-normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect the landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, and speed conditions. Each adjustment is independently added to the reference landing distance. Landing distance includes the effect of max manual braking and reverse thrust.

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 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.

Alternate Mode EEC

Introduction

No takeoff speed adjustments or other performance adjustments are required of Electronic Engine Control (EEC) in the alternate mode (ALTN EEC switch illuminated) for the CFM56-7B18, -7B20, -7B22 and -7B24 engine thrust ratings.

Operation with derate and/or assumed temperature reduced thrust is not permitted with the EEC in alternate mode.

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.

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737-700 CFM56-7B24 LB FAA CATB

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Performance Inflight — Chapter PI

General — Section 20

Takeoff Speeds - Dry Runway
Flaps 1 and 5
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5		
	V1	VR	V2	V1	VR	V2
170	148	150	156	144	147	152
160	143	146	152	140	142	148
150	138	140	147	134	137	144
140	132	135	142	129	132	139
130	125	128	137	123	126	134
120	119	122	132	116	119	129
110	112	115	126	109	113	124
100	104	108	120	102	106	117
90	97	101	114	94	98	111

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	6	7	8	10			4	5	6	7			-1	-1	-1	-1		
120	49	3	5	6	8	9	11	2	3	5	6	7	9	-1	-1	-1	-1	-1	-1
100	38	1	2	4	6	8	9	1	2	3	5	6	8	0	0	0	0	-1	-1
80	27	0	0	2	4	6	7	0	0	2	3	5	6	0	0	0	0	0	0
60	16	0	0	1	2	4	6	0	0	1	2	3	5	0	0	0	0	1	1
-60	-51	0	0	1	2	3	5	0	0	1	2	3	4	0	0	0	0	1	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
170	-3	-1	0	2	3	-1	-1	0	0	0	1	1	1
150	-3	-1	0	2	2	-1	-1	0	0	0	1	1	1
130	-2	-1	0	1	2	-2	-1	0	0	0	1	1	2
110	-1	-1	0	1	1	-2	-1	-1	0	0	1	1	2
90	-1	0	0	1	1	-2	-1	-1	0	1	1	2	2

***V1 not to exceed VR**

V1(MCG)
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	102						
140	60	102	99	97	96			
120	49	104	102	98	96	94	92	90
100	38	110	107	103	100	96	92	90
80	27	112	111	109	105	101	97	93
60	16	112	112	109	107	104	101	97
-60	-51	113	113	110	108	105	102	100

Takeoff Speeds - Dry Runway
Flaps 10, 15 and 25
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 LB)	FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
170	138	140	145	136	136	141			
160	134	135	141	132	132	138	131	131	136
150	129	131	137	128	128	135	126	126	133
140	124	126	133	123	123	131	121	122	129
130	118	121	129	117	118	127	116	117	125
120	112	115	124	111	113	122	109	111	121
110	106	109	119	105	107	117	103	106	116
100	99	103	114	98	101	113	97	100	111
90	92	97	109	91	95	107	90	94	106

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	5	6	7	9			3	4	5	6			-2	-2	-2	-3		
120	49	3	4	5	7	8	10	2	3	4	5	6	6	-1	-1	-2	-2	-3	-3
100	38	1	2	3	5	6	8	1	1	2	3	4	5	0	-1	-1	-2	-2	-3
80	27	0	0	2	3	5	6	0	0	1	2	3	4	0	0	0	-1	-1	-2
60	16	0	0	1	2	3	4	0	0	1	1	2	3	0	0	0	0	-1	-1
-60	-51	0	0	1	2	3	3	0	0	1	1	2	3	0	0	0	0	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
170	-3	-1	0	1	1	-1	-1	-1	0	0	1	1	1
150	-3	-1	0	1	2	-1	-1	-1	0	0	1	1	1
130	-2	-1	0	1	2	-2	-1	-1	0	0	1	1	1
110	-2	-1	0	1	2	-2	-1	-1	0	0	1	1	2
90	-1	-1	0	1	1	-2	-1	-1	0	0	1	2	2

***V1 not to exceed VR**

V1(MCG)
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	102						
140	60	102	99	97	96			
120	49	104	102	98	96	94	92	90
100	38	110	107	103	100	96	92	90
80	27	112	111	109	105	101	97	93
60	16	112	112	109	107	104	101	97
-60	-51	113	113	110	108	105	102	100

Takeoff Speeds - Wet Runway
Flaps 1 and 5
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 LB)	FLAPS 1			FLAPS 5		
	V1	VR	V2	V1	VR	V2
180	148	156	160	145	152	156
170	143	151	156	139	147	152
160	137	146	152	134	142	148
150	131	140	147	128	137	144
140	125	135	142	122	132	139
130	118	128	137	115	126	134
120	111	122	131	109	119	129
110	104	115	125	102	113	123
100	97	108	120	94	106	117
90	90	101	114	87	99	111

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	6	7	8	10			3	4	5	6			-2	-2	-2	-3		
120	49	4	4	6	8	9	11	2	3	4	5	5	6	-1	-1	-2	-2	-3	-3
100	38	1	2	4	5	7	9	1	1	2	3	4	5	0	-1	-1	-2	-2	-3
80	27	0	0	2	3	5	7	0	0	2	2	3	4	0	0	-1	0	-1	-2
60	16	0	0	1	2	3	5	0	0	1	1	2	3	0	0	0	0	-1	-1
-60	-51	0	0	1	2	3	4	0	0	1	1	2	3	0	0	0	0	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
180	-5	-2	0	3	5	-3	-2	-1	0	1	1	2	3
170	-5	-2	0	3	5	-3	-2	-1	0	1	1	2	3
160	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
150	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
140	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
130	-3	-1	0	2	3	-4	-2	-1	0	1	2	2	3
120	-3	-1	0	2	3	-4	-2	-1	0	1	2	2	3
110	-2	-1	0	2	3	-4	-3	-1	0	1	2	3	4
100	-2	-1	0	2	3	-4	-3	-1	0	1	2	3	4
90	-2	-1	0	1	2	-4	-3	-1	0	1	2	3	4

***V1 not to exceed VR**

Takeoff Speeds - Wet Runway
Flaps 1 and 5
V1(MCG)
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	102						
140	60	102	99	97	96			
120	49	104	102	98	96	94	92	90
100	38	110	107	103	100	96	92	90
80	27	112	111	109	105	101	97	93
60	16	112	112	109	107	104	101	97
-60	-51	113	113	110	108	105	102	100

Takeoff Speeds - Wet Runway
Flaps 10, 15 and 25
V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 LB)	FLAPS 10			FLAPS 15			FLAPS 25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
170	133	139	145	133	136	141			
160	128	135	141	128	132	138	126	131	136
150	123	131	137	122	128	135	121	126	133
140	117	126	133	117	123	131	115	122	129
130	111	121	129	111	118	127	109	117	125
120	105	115	124	104	113	122	103	111	121
110	99	109	119	98	107	117	97	106	116
100	92	103	114	92	101	112	91	100	111
90	86	97	109	85	95	107	84	94	106

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	6	7	9	10			3	4	5	6			-2	-2	-2	-3		
120	49	4	4	6	8	9	11	2	3	4	4	5	6	-1	-1	-2	-2	-3	-3
100	38	1	2	3	5	7	9	1	1	2	3	4	5	0	-1	-1	-2	-2	-2
80	27	0	0	1	3	4	6	0	0	1	2	3	4	0	0	0	-1	-1	-2
60	16	0	0	1	2	3	4	0	0	1	1	2	3	0	0	0	0	-1	-1
-60	-51	0	0	1	2	3	4	0	0	1	1	2	3	0	0	0	0	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
170	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
160	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
150	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
140	-4	-2	0	2	3	-4	-2	-1	0	1	1	2	3
130	-3	-1	0	1	3	-4	-3	-1	0	1	2	2	3
120	-3	-1	0	1	3	-4	-3	-1	0	1	2	2	3
110	-2	-1	0	1	2	-4	-3	-1	0	1	2	2	3
100	-2	-1	0	1	2	-4	-3	-1	0	1	2	2	3
90	-2	-1	0	1	2	-4	-3	-1	0	1	2	3	3

***V1 not to exceed VR**

Takeoff Speeds - Wet Runway
Flaps 10, 15 and 25
V1(MCG)
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	102						
140	60	102	99	97	96			
120	49	104	102	98	96	94	92	90
100	38	110	107	103	100	96	92	90
80	27	112	111	109	105	101	97	93
60	16	112	112	109	107	104	101	97
-60	-51	113	113	110	108	105	102	100

Maximum Allowable Clearway

FIELD LENGTH (FT)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	450
6000	650
8000	850
10000	1000
12000	1450
14000	1550

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
800	-3	-3	-3			
600	-3	-3	-3			
400	-2	-2	-2			
200	-1	-1	-1			
0	0	0	0	0	0	0
-200	1	1	1	1	1	1
-400	1	1	1	2	2	1
-600	2	2	2	4	3	2
-800	2	2	2	4	3	2

Use of clearway not allowed on wet runways.

Stab Trim Setting

Max Takeoff Thrust

Flaps 1 and 5

WEIGHT (1000 LB)	C.G. (%MAC)								
	9	11	13	16	20	24	28	30	33
160-180	8 1/2	8 1/2	8 1/2	7 3/4	6 3/4	6	5 1/4	4 3/4	4 1/4
140	8 1/2	8 1/2	8	7 1/4	6 1/2	5 1/2	4 3/4	4 1/2	3 3/4
120	8 1/2	8	7 1/2	6 1/2	5 3/4	5	4 1/4	4	3 1/4
80-100	6 3/4	6 1/2	6	5 1/2	5	4 1/4	3 1/2	3 1/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 LB)	C.G. (%MAC)								
	9	11	13	16	20	24	28	30	33
160-180	8 1/2	8 1/2	8 1/2	7 1/4	6 1/2	5 1/2	4 1/2	4 1/4	3 1/2
140	8 1/2	8 1/2	7 3/4	6 3/4	6	5	4 1/4	3 3/4	3
120	8 1/2	7 3/4	7	6	5 1/4	4 1/2	3 3/4	3 1/4	2 3/4
80-100	6 1/4	6	5 1/2	5	4 1/2	3 3/4	3	2 3/4	2 3/4

VREF

WEIGHT (1000 LB)	FLAPS		
	40	30	15
170	151	153	159
160	147	149	155
150	142	144	150
140	137	140	145
130	132	134	139
120	126	129	133
110	120	123	127
100	114	117	121
90	108	111	115

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 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
180	-21.9	-27.4	-32.9	-26.4	-31.9	-37.4	-37.5	-43.0	-48.5
170	-19.3	-24.8	-30.3	-22.8	-28.3	-33.8	-31.1	-36.6	-42.1
160	-17.0	-22.5	-28.0	-19.7	-25.2	-30.7	-25.8	-31.3	-36.8
150	-15.0	-20.5	-26.0	-17.2	-22.7	-28.2	-21.7	-27.2	-32.7
140	-13.3	-18.8	-24.3	-15.1	-20.6	-26.1	-18.8	-24.3	-29.8
130	-11.9	-17.4	-22.9	-13.4	-18.9	-24.4	-16.6	-22.1	-27.6
120	-10.5	-16.0	-21.5	-11.7	-17.2	-22.7	-14.4	-19.9	-25.4
110	-9.1	-14.6	-20.1	-10.0	-15.5	-21.0	-12.2	-17.7	-23.2
100	-7.6	-13.1	-18.6	-8.2	-13.7	-19.2	-10.0	-15.5	-21.0
90	-6.2	-11.7	-17.2	-6.5	-12.0	-17.5	-7.8	-13.3	-18.8

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
4600							74.3		
5000	75.8			82.9			93.3		
5400	94.0			100.9			111.9		
5800	112.6			119.4	73.9		130.1	83.9	
6200	131.5	84.9		138.2	91.9		147.9	102.7	
6600	150.8	103.2		157.4	110.1		165.4	121.1	74.3
7000	170.6	122.0	75.8	177.0	128.7	82.9	182.6	139.1	93.3
7400	190.9	141.1	94.0	197.0	147.7	100.9	199.5	156.7	111.9
7800		160.7	112.6		167.1	119.4		174.0	130.1
8200		180.7	131.5		186.9	138.2		191.0	147.9
8600			150.8			157.4			165.4
9000			170.6			177.0			182.6
9400			190.9			197.0			199.5

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 -130 ft/+130 ft for every 10°F above/below 40°F.**
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
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
180	-15	-12	-10	-8	-5	-3	-3	0	0
170	-16	-13	-11	-10	-7	-5	-3	-1	0
160	-17	-15	-12	-12	-10	-7	-4	-2	0
150	-18	-16	-13	-14	-11	-9	-6	-3	-1
140	-19	-16	-14	-15	-13	-10	-8	-5	-3
130	-20	-17	-15	-17	-14	-12	-10	-7	-5
120	-20	-18	-15	-18	-16	-13	-12	-10	-7
110	-21	-19	-16	-19	-17	-14	-15	-12	-10
100	-23	-20	-18	-21	-18	-16	-17	-14	-12
90	-24	-21	-19	-22	-20	-17	-19	-17	-14

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

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
180	-26.4	-34.9	-43.4	-30.8	-39.3	-47.8	-39.8	-48.3	-56.8
170	-23.4	-31.9	-40.4	-27.0	-35.5	-44.0	-34.4	-42.9	-51.4
160	-20.7	-29.2	-37.7	-23.6	-32.1	-40.6	-29.6	-38.1	-46.6
150	-18.3	-26.8	-35.3	-20.6	-29.1	-37.6	-25.5	-34.0	-42.5
140	-16.2	-24.7	-33.2	-18.0	-26.5	-35.0	-22.0	-30.5	-39.0
130	-14.4	-22.9	-31.4	-15.9	-24.4	-32.9	-19.3	-27.8	-36.3
120	-12.9	-21.4	-29.9	-14.2	-22.7	-31.2	-17.2	-25.7	-34.2
110	-11.6	-20.1	-28.6	-12.8	-21.3	-29.8	-15.6	-24.1	-32.6
100	-10.4	-18.9	-27.4	-11.4	-19.9	-28.4	-14.1	-22.6	-31.1
90	-9.1	-17.6	-26.1	-10.1	-18.6	-27.1	-12.5	-21.0	-29.5

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
5800							86.8		
6200				78.7			105.6		
6600	81.1			99.7			125.0	86.8	
7000	103.5			120.8	78.7		145.2	105.6	
7400	125.9	81.1		142.1	99.7		166.1	125.0	86.8
7800	148.3	103.5		163.6	120.8	78.7	188.0	145.2	105.6
8200	170.6	125.9	81.1	185.2	142.1	99.7		166.1	125.0
8600	192.9	148.3	103.5		163.6	120.8		188.0	145.2
9000		170.6	125.9		185.2	142.1			166.1
9400		192.9	148.3			163.6			188.0
9800			170.6			185.2			
10200			192.9						

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 -160 ft/+160 ft for every 10°F above/below 40°F.**
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
No Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
180	-21	-16	-11	-12	-7	-2	0	0	0
170	-22	-17	-12	-14	-9	-4	0	0	0
160	-23	-18	-13	-17	-12	-7	-3	0	0
150	-24	-19	-14	-19	-14	-9	-7	-2	0
140	-25	-20	-15	-21	-16	-11	-10	-5	0
130	-26	-21	-16	-22	-17	-12	-14	-9	-4
120	-27	-22	-17	-24	-19	-14	-17	-12	-7
110	-28	-23	-18	-25	-20	-15	-20	-15	-10
100	-29	-24	-19	-27	-22	-17	-22	-17	-12
90	-29	-24	-19	-28	-23	-18	-25	-20	-15

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 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-2.5	-2.5	-2.5	-12.5	-12.5	-12.5	-21.5	-21.5	-21.5
170	-2.7	-2.7	-2.7	-12.2	-12.2	-12.2	-20.3	-20.3	-20.3
160	-2.8	-2.8	-2.8	-11.8	-11.8	-11.8	-19.1	-19.1	-19.1
150	-2.8	-2.8	-2.8	-11.2	-11.2	-11.2	-17.8	-17.8	-17.8
140	-2.7	-2.7	-2.7	-10.5	-10.5	-10.5	-16.5	-16.5	-16.5
130	-2.5	-2.5	-2.5	-9.6	-9.6	-9.6	-15.2	-15.2	-15.2
120	-2.2	-2.2	-2.2	-8.6	-8.6	-8.6	-13.9	-13.9	-13.9
110	-1.8	-1.8	-1.8	-7.4	-7.4	-7.4	-12.5	-12.5	-12.5
100	-1.3	-1.3	-1.3	-6.1	-6.1	-6.1	-11.0	-11.0	-11.0
90	-0.7	-0.7	-0.7	-4.6	-4.6	-4.6	-9.5	-9.5	-9.5

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	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
3800	92.1								
4200	120.6	81.6							
4600	150.0	109.8	71.1						
5000	180.2	138.9	99.2	89.7					
5400		168.8	127.9	111.0					
5800		199.5	157.5	133.2	89.7				
6200			187.9	156.3	111.0		77.2		
6600				180.6	133.2	89.7	91.6		
7000					156.3	111.0	106.4		
7400					180.6	133.2	121.7	79.0	
7800						156.3	137.4	93.4	
8200						180.6	153.6	108.3	
8600							170.3	123.6	80.7
9000							187.7	139.4	95.3
9400								155.6	110.2
9800								172.5	125.6
10200								189.9	141.4
10600									157.7
11000									174.6
11400									192.1

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 -90 ft/+90 ft for every 10°F above/below 40°F.**
   Adjust "Medium" field length available by -90 ft/+90 ft for every 10°F above/below 40°F.
   Adjust "Poor" field length available by -140 ft/+140 ft for every 10°F above/below 40°F.
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 LB)	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
180	-5	-3	0	-14	-12	-9	-25	-23	-20
170	-6	-4	-1	-15	-13	-10	-27	-24	-22
160	-7	-4	-2	-17	-14	-12	-28	-26	-23
150	-8	-5	-3	-18	-15	-13	-30	-27	-25
140	-8	-6	-3	-19	-16	-14	-31	-29	-26
130	-9	-7	-4	-20	-18	-15	-33	-30	-28
120	-10	-8	-5	-21	-19	-16	-34	-32	-29
110	-11	-9	-6	-23	-20	-18	-36	-34	-31
100	-13	-10	-8	-24	-22	-19	-38	-35	-33
90	-14	-12	-9	-26	-24	-21	-40	-37	-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 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-4.4	-4.4	-4.4	-17.0	-17.0	-17.0	-27.2	-27.2	-27.2
170	-4.6	-4.6	-4.6	-16.1	-16.1	-16.1	-25.3	-25.3	-25.3
160	-4.6	-4.6	-4.6	-15.2	-15.2	-15.2	-23.4	-23.4	-23.4
150	-4.6	-4.6	-4.6	-14.3	-14.3	-14.3	-21.7	-21.7	-21.7
140	-4.4	-4.4	-4.4	-13.4	-13.4	-13.4	-20.1	-20.1	-20.1
130	-4.2	-4.2	-4.2	-12.5	-12.5	-12.5	-18.6	-18.6	-18.6
120	-3.8	-3.8	-3.8	-11.5	-11.5	-11.5	-17.2	-17.2	-17.2
110	-3.3	-3.3	-3.3	-10.5	-10.5	-10.5	-15.9	-15.9	-15.9
100	-2.7	-2.7	-2.7	-9.5	-9.5	-9.5	-14.7	-14.7	-14.7
90	-2.0	-2.0	-2.0	-8.5	-8.5	-8.5	-13.5	-13.5	-13.5

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	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
4200	99.2								
4600	130.9	91.4							
5000	163.1	122.9	83.6						
5400	195.8	155.0	115.0						
5800		187.6	146.9	75.4					
6200			179.4	102.1					
6600				129.6	82.0				
7000				157.8	108.9				
7400				186.8	136.5	88.7			
7800					164.9	115.7			
8200					194.2	143.6			
8600						172.2			
9000							85.2		
9400							105.5		
9800							125.9	75.1	
10200							146.4	95.4	
10600							167.0	115.7	
11000							187.7	136.2	85.2
11400								156.7	105.5
11800								177.4	125.9
12200								198.1	146.4
12600									167.0
13000									187.7

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 -100 ft/+100 ft for every 10°F above/below 40°F.
   Adjust "Medium" field length available by -100 ft/+100 ft for every 10°F above/below 40°F.
   Adjust "Poor" field length available by -180 ft/+180 ft for every 10°F above/below 40°F.**
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 LB)	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
180	-7	-4	-2	-18	-16	-13	-35	-33	-30
170	-8	-5	-3	-20	-17	-15	-37	-35	-32
160	-9	-6	-4	-21	-19	-16	-39	-37	-34
150	-10	-7	-5	-23	-20	-18	-41	-38	-36
140	-10	-8	-5	-24	-22	-19	-43	-40	-38
130	-11	-9	-6	-26	-23	-21	-44	-42	-39
120	-13	-10	-8	-27	-25	-22	-46	-44	-41
110	-14	-11	-9	-29	-26	-24	-48	-45	-43
100	-15	-13	-10	-31	-28	-26	-50	-47	-45
90	-17	-14	-12	-33	-30	-28	-52	-49	-47

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

OAT (°F)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
170	87.6	88.0	88.9	89.4	89.8	90.4	91.0	91.7	92.4	92.9	93.4	93.5	93.6
160	88.5	89.0	89.3	89.2	89.1	89.7	90.3	91.0	91.7	92.2	92.6	92.8	92.9
150	89.4	89.9	90.3	90.2	90.1	90.1	90.0	90.3	91.0	91.4	91.9	92.0	92.1
140	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
130	91.1	91.7	92.1	92.1	92.0	92.0	92.0	92.0	92.0	91.9	91.8	91.4	90.9
120	92.0	92.6	93.0	93.0	93.0	92.9	92.9	92.9	92.9	92.8	92.7	92.4	92.0
110	92.9	93.5	93.9	93.9	93.8	93.8	93.8	93.7	93.7	93.6	93.6	93.4	93.1
100	93.8	94.3	94.8	94.7	94.7	94.7	94.6	94.6	94.5	94.4	94.4	94.3	94.2
90	94.2	95.3	95.7	95.7	95.7	95.6	95.6	95.5	95.4	95.4	95.3	95.2	95.2
80	93.3	94.5	95.6	96.1	96.5	96.5	96.4	96.4	96.3	96.2	96.2	96.1	96.1
70	92.5	93.7	94.8	95.3	95.8	96.4	97.1	97.4	97.3	97.2	97.1	97.1	97.0
60	91.6	92.8	93.9	94.4	95.0	95.6	96.2	96.9	97.6	98.3	98.5	98.4	98.3
50	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
40	89.9	91.1	92.2	92.7	93.2	93.8	94.4	95.1	95.8	96.6	97.4	98.3	99.2
30	89.1	90.2	91.3	91.8	92.3	92.9	93.6	94.2	94.9	95.7	96.5	97.4	98.3
20	88.2	89.3	90.4	90.9	91.4	92.0	92.7	93.4	94.0	94.8	95.6	96.6	97.5
10	87.3	88.4	89.5	90.0	90.5	91.1	91.7	92.4	93.1	93.9	94.7	95.7	96.6
0	86.4	87.5	88.6	89.1	89.6	90.2	90.8	91.5	92.2	93.0	93.8	94.8	95.8
-10	85.5	86.6	87.6	88.1	88.6	89.3	89.9	90.6	91.3	92.1	92.9	94.0	94.9
-20	84.6	85.7	86.7	87.2	87.7	88.3	89.0	89.7	90.4	91.2	92.0	93.1	94.0
-30	83.6	84.7	85.7	86.2	86.7	87.4	88.0	88.7	89.4	90.2	91.1	92.2	93.1
-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
-50	81.7	82.8	83.8	84.3	84.8	85.4	86.1	86.8	87.5	88.3	89.2	90.3	91.3
-60	80.8	81.8	82.8	83.3	83.8	84.4	85.1	85.8	86.5	87.3	88.2	89.4	90.3

%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

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

OAT (°F)	PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
130	163	160	156	153								
120	163	160	156	153	149	146						
110	163	160	156	153	149	146	142	138	135			
100	158	158	156	153	149	146	142	138	135	131	128	
90	147	147	147	147	147	146	142	138	135	131	128	124
80	147	142	138	136	136	136	136	138	135	131	128	124
70	147	142	138	135	133	129	129	129	129	129	127	124
60	147	142	138	135	133	129	127	126	122	120	118	117
50 & BELOW	147	142	138	135	133	129	127	126	122	118	113	109

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

ASSUMED TEMP (°F)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
170	88.0	88.9	89.4	89.8	90.4	91.0	91.7	92.4	92.9	93.4	93.5	93.6
160	89.0	89.3	89.2	89.1	89.7	90.3	91.0	91.7	92.2	92.6	92.8	92.9
150	89.9	90.3	90.2	90.1	90.1	90.0	90.3	91.0	91.4	91.9	92.0	92.1
140	90.8	91.2	91.2	91.1	91.1	91.0	91.1	91.2	91.0	91.2	91.3	91.4
130	91.7	92.1	92.1	92.0	92.0	92.0	92.0	92.0	91.9	91.8	91.4	90.9
120	92.6	93.0	93.0	93.0	92.9	92.9	92.9	92.9	92.8	92.7	92.4	92.0
110	93.5	93.9	93.9	93.8	93.8	93.8	93.7	93.7	93.6	93.6	93.4	93.1
100	94.3	94.8	94.7	94.7	94.7	94.6	94.6	94.5	94.4	94.4	94.3	94.2
90	95.3	95.7	95.7	95.7	95.6	95.6	95.5	95.4	95.4	95.3	95.2	95.2
80	94.5	95.6	96.1	96.5	96.5	96.4	96.4	96.3	96.2	96.2	96.1	96.1
70	93.7	94.8	95.3	95.8	96.4	97.1	97.4	97.3	97.2	97.1	97.1	97.0
60	92.8	93.9	94.4	95.0	95.6	96.2	96.9	97.6	98.3	98.5	98.4	98.3
50	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 (°F)	90	86	82	79	75	72	68	64	61	59	54	50

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

%N1 Adjustment for Temperature Difference (Table 3 of 3)

ASSUMED TEMP MINUS OAT (°F)	OUTSIDE AIR TEMPERATURE (°F)													
	-40	0	20	30	40	50	60	70	80	90	100	110	120	130
200	12.1													
180	11.3	8.4												
160	11.9	8.6	6.7											
140	12.2	7.6	6.9	6.7	5.1									
120	10.7	8.3	5.9	5.8	5.2	5.1	3.5							
100	9.0	8.5	6.5	4.5	4.2	4.1	3.6	3.5	2.0					
80	7.0	7.0	6.8	6.6	4.8	2.8	3.5	2.9	2.2	2.2	2.3			
60		5.3	5.2	5.1	5.0	4.9	4.5	3.8	4.1	4.0	4.0	4.1	4.1	
40		3.4	3.5	3.5	3.4	3.4	3.3	3.2	3.1	3.0	3.0	2.9	2.8	2.8
20			1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	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 (22K Derate)

V1, VR, V2

WEIGHT (1000 LB)	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
160	145	147	151	142	144	148	135	136	141	133	133	138			
150	140	141	147	136	138	143	130	132	137	129	129	134	129	128	133
140	134	136	142	131	133	139	125	126	132	124	124	130	122	123	129
130	128	130	137	125	127	134	119	121	128	118	119	125	116	117	124
120	121	123	131	118	121	129	113	115	123	112	113	121	111	112	120
110	114	116	126	111	114	123	107	109	118	106	107	116	105	106	115
100	106	109	120	104	107	117	100	103	113	99	101	111	98	100	110
90	99	102	114	96	100	111	93	96	108	92	95	106	91	94	105

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	6	7	8	9			4	5	6	7			-1	-1	-1	-1		
120	49	3	4	6	7	9	11	2	3	4	5	7	8	-1	-1	-1	-1	-1	-1
100	38	1	2	3	5	7	9	1	1	3	4	5	7	0	0	0	0	-1	-1
80	27	0	0	1	3	4	7	0	0	1	2	4	6	0	0	0	0	0	0
60	16	0	0	1	2	3	4	0	0	1	2	3	4	0	0	0	0	1	1
-60	-51	0	0	1	2	3	4	0	0	1	2	3	4	0	0	0	0	1	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
160	-3	-1	0	1	1	-1	-1	0	0	0	1	1	1
150	-3	-1	0	1	1	-1	-1	0	0	0	1	1	1
140	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
130	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
120	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	2
110	-2	-1	0	1	2	-2	-1	-1	0	0	1	1	2
100	-1	-1	0	1	2	-2	-1	-1	0	1	1	1	2
90	-1	-1	0	1	2	-2	-1	-1	0	1	1	2	2

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	98						
140	60	98	96	95	93			
120	49	101	98	95	93	91	89	87
100	38	106	104	100	97	93	89	87
80	27	108	108	106	102	98	94	90
60	16	109	108	106	104	102	99	94
-60	-51	110	109	107	105	103	100	97

Takeoff Speeds - Wet Runway (22K Derate)

V1, VR, V2

WEIGHT (1000 LB)	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
160	140	147	151	136	144	148	130	136	141	131	133	138			
150	134	141	147	130	138	143	125	132	137	125	129	134	124	128	133
140	128	136	142	124	133	139	119	126	132	119	124	130	118	123	129
130	121	130	137	118	127	134	113	121	128	113	119	125	111	117	124
120	114	123	131	111	121	129	107	115	123	106	113	121	105	112	120
110	106	116	126	104	114	123	100	109	118	99	107	116	98	106	115
100	99	109	120	97	107	117	93	103	113	93	101	111	91	100	110
90	92	102	114	89	100	111	86	96	108	85	95	106	84	94	105

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	7	8	10	11			4	5	6	7			-1	-1	-1	-2		
120	49	4	5	7	8	10	13	2	3	4	6	7	8	-1	-1	-1	-1	-1	-1
100	38	1	2	4	6	8	10	1	1	3	4	5	7	0	0	0	0	-1	-1
80	27	0	0	1	3	5	7	0	0	1	2	4	6	0	0	0	0	0	0
60	16	0	0	1	2	3	5	0	0	1	2	3	4	0	0	0	0	0	0
-60	-51	0	0	1	2	3	5	0	0	1	2	3	4	0	0	0	0	0	0

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
160	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
150	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
140	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
130	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
120	-3	-2	0	2	3	-4	-2	-1	0	1	1	2	3
110	-3	-1	0	2	3	-4	-2	-1	0	1	2	2	3
100	-3	-1	0	2	3	-4	-3	-1	0	1	2	3	4
90	-2	-1	0	1	3	-4	-3	-1	0	1	2	3	4

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	98						
140	60	98	96	95	93			
120	49	101	98	95	93	91	89	87
100	38	106	104	100	97	93	89	87
80	27	108	108	106	102	98	94	90
60	16	109	108	106	104	102	99	94
-60	-51	110	109	107	105	103	100	97

Maximum Allowable Clearway (22K Derate)

FIELD LENGTH (FT)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	450
6000	650
8000	850
10000	1000
12000	1450
14000	1550

Clearway and Stopway V1 Adjustments (22K Derate)

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
800	-5	-4	-4			
600	-5	-3	-3			
400	-4	-2	-2			
200	-3	-1	-1			
0	0	0	0	0	0	0
-200	1	1	1	1	1	1
-400	1	2	2	2	2	1
-600	2	2	2	4	3	2
-800	2	2	2	5	3	2

Use of clearway not allowed on wet runways.

Stab Trim Setting (22K Derate)

Flaps 1 and 5

WEIGHT (1000 LB)	C.G. (%MAC)								
	9	11	13	16	20	24	28	31	33
160-180	8 1/2	8 1/2	8 1/2	7 3/4	7	6 1/4	5 1/2	4 3/4	4 1/2
140	8 1/2	8 1/2	8	7 1/4	6 1/2	5 3/4	5	4 1/2	4
120	8 1/2	8	7 1/2	6 3/4	6	5 1/4	4 1/2	4	3 1/2
80-100	7	6 3/4	6 1/2	6	5 1/4	4 1/2	4	3 1/2	3

Flaps 10, 15 and 25

WEIGHT (1000 LB)	C.G. (%MAC)								
	9	11	13	16	20	24	28	31	33
160-180	8 1/2	8 1/2	8 1/2	7 1/2	6 1/2	5 3/4	4 3/4	4 1/4	3 3/4
140	8 1/2	8 1/2	7 3/4	7	6 1/4	5 1/4	4 1/2	3 3/4	3 1/4
120	8 1/2	8	7 1/4	6 1/2	5 1/2	4 3/4	4	3 1/4	2 3/4
80-100	6 3/4	6 1/4	6	5 1/2	4 3/4	4	3 1/4	2 3/4	2 3/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (22K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
180	-24.8	-29.3	-33.8	-30.1	-34.6	-39.1	-42.0	-46.5	-51.0
170	-20.9	-25.4	-29.9	-25.0	-29.5	-34.0	-34.5	-39.0	-43.5
160	-17.8	-22.3	-26.8	-20.9	-25.4	-29.9	-28.3	-32.8	-37.3
150	-15.4	-19.9	-24.4	-17.8	-22.3	-26.8	-23.2	-27.7	-32.2
140	-13.4	-17.9	-22.4	-15.5	-20.0	-24.5	-19.9	-24.4	-28.9
130	-11.8	-16.3	-20.8	-13.4	-17.9	-22.4	-17.0	-21.5	-26.0
120	-10.3	-14.8	-19.3	-11.6	-16.1	-20.6	-14.4	-18.9	-23.4
110	-9.1	-13.6	-18.1	-10.1	-14.6	-19.1	-12.1	-16.6	-21.1
100	-8.1	-12.6	-17.1	-8.8	-13.3	-17.8	-10.3	-14.8	-19.3
90	-7.4	-11.9	-16.4	-7.9	-12.4	-16.9	-8.7	-13.2	-17.7

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
4600				75.2			86.0		
5000	87.8			93.6			103.4		
5400	106.4			112.3			121.7	77.6	
5800	125.5	78.6		131.4	84.4		140.9	94.6	
6200	145.4	97.0		151.1	102.9		161.2	112.4	
6600	165.9	115.9		171.3	121.8	75.2	182.9	131.1	86.0
7000	187.2	135.4	87.8	192.1	141.2	93.6		150.9	103.4
7400		155.5	106.4		161.1	112.3		171.8	121.7
7800		176.5	125.5		181.6	131.4		194.3	140.9
8200		198.2	145.4			151.1			161.2
8600			165.9			171.3			182.9
9000			187.2			192.1			

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -130 ft/+130 ft for every 10°F above/below 40°F.**
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 (22K Derate)

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
180	-13	-10	-8	-4	-2	0	0	0	0
170	-14	-12	-9	-7	-4	-2	0	0	0
160	-15	-13	-10	-9	-7	-4	-1	0	0
150	-16	-14	-11	-11	-9	-6	-3	-1	0
140	-17	-15	-12	-13	-11	-8	-5	-3	0
130	-18	-16	-13	-15	-13	-10	-8	-5	-3
120	-19	-17	-14	-17	-14	-12	-10	-8	-5
110	-20	-18	-15	-18	-15	-13	-13	-10	-8
100	-21	-19	-16	-19	-17	-14	-15	-13	-10
90	-22	-20	-17	-21	-18	-16	-17	-15	-12

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
180	-28.3	-34.8	-41.3	-32.9	-39.4	-45.9	-43.0	-49.5	-56.0
170	-24.8	-31.3	-37.8	-28.6	-35.1	-41.6	-36.9	-43.4	-49.9
160	-21.6	-28.1	-34.6	-24.8	-31.3	-37.8	-31.6	-38.1	-44.6
150	-18.9	-25.4	-31.9	-21.4	-27.9	-34.4	-26.9	-33.4	-39.9
140	-16.5	-23.0	-29.5	-18.6	-25.1	-31.6	-23.0	-29.5	-36.0
130	-14.5	-21.0	-27.5	-16.1	-22.6	-29.1	-19.8	-26.3	-32.8
120	-12.9	-19.4	-25.9	-14.2	-20.7	-27.2	-17.3	-23.8	-30.3
110	-11.6	-18.1	-24.6	-12.6	-19.1	-25.6	-15.3	-21.8	-28.3
100	-10.3	-16.8	-23.3	-11.0	-17.5	-24.0	-13.3	-19.8	-26.3
90	-9.0	-15.5	-22.0	-9.5	-16.0	-22.5	-11.4	-17.9	-24.4

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
5400							81.4		
5800				77.2			100.5		
6200	82.6			98.0			120.1	79.1	
6600	104.6			119.2	74.6		140.4	98.1	
7000	127.0	79.9		141.0	95.4		161.3	117.6	76.7
7400	149.9	101.8		163.2	116.6	72.0	182.9	137.8	95.7
7800	173.4	124.1	77.2	186.1	138.2	92.8		158.6	115.2
8200	197.5	147.0	99.0		160.4	113.9		180.1	135.2
8600		170.5	121.3		183.2	135.5			156.0
9000		194.5	144.1			157.6			177.4
9400			167.5			180.3			199.6
9800			191.5						

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -150 ft/+150 ft for every 10°F above/below 40°F.**
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 (22K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
180	-18	-13	-8	-7	-2	0	0	0	0
170	-20	-15	-10	-10	-5	0	0	0	0
160	-21	-16	-11	-13	-8	-3	0	0	0
150	-22	-17	-12	-16	-11	-6	-2	0	0
140	-23	-18	-13	-18	-13	-8	-7	-2	0
130	-24	-19	-14	-20	-15	-10	-11	-6	-1
120	-25	-20	-15	-22	-17	-12	-14	-9	-4
110	-26	-21	-16	-23	-18	-13	-17	-12	-7
100	-27	-22	-17	-25	-20	-15	-20	-15	-10
90	-28	-23	-18	-26	-21	-16	-22	-17	-12

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-4.0	-4.0	-4.0	-14.3	-14.3	-14.3	-23.4	-23.4	-23.4
170	-3.4	-3.4	-3.4	-13.0	-13.0	-13.0	-21.2	-21.2	-21.2
160	-2.9	-2.9	-2.9	-11.9	-11.9	-11.9	-19.3	-19.3	-19.3
150	-2.6	-2.6	-2.6	-10.9	-10.9	-10.9	-17.6	-17.6	-17.6
140	-2.4	-2.4	-2.4	-10.1	-10.1	-10.1	-16.2	-16.2	-16.2
130	-2.4	-2.4	-2.4	-9.5	-9.5	-9.5	-15.1	-15.1	-15.1
120	-2.5	-2.5	-2.5	-9.0	-9.0	-9.0	-14.2	-14.2	-14.2
110	-2.7	-2.7	-2.7	-8.7	-8.7	-8.7	-13.6	-13.6	-13.6
100	-3.1	-3.1	-3.1	-8.6	-8.6	-8.6	-13.3	-13.3	-13.3
90	-3.6	-3.6	-3.6	-8.6	-8.6	-8.6	-13.2	-13.2	-13.2

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	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
3400	71.5								
3800	100.8								
4200	130.4	89.8							
4600	160.3	119.2	78.8	78.0					
5000	190.5	149.0	108.2	99.3					
5400		179.1	137.8	121.5	80.6				
5800			167.8	144.6	102.1		71.9		
6200			198.1	168.7	124.3	83.3	86.2		
6600				194.0	147.5	104.8	100.9		
7000					171.8	127.2	116.1	73.7	
7400					197.2	150.5	131.9	88.1	
7800						174.9	148.2	102.8	
8200							165.3	118.0	75.5
8600							183.2	133.9	89.9
9000								150.3	104.7
9400								167.5	120.0
9800								185.5	135.9
10200									152.4
10600									169.7
11000									187.8

1. **Enter Weight Adjustment table with reported braking action and 22K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -90 ft/+90 ft for every 10°F above/below 40°F.**
   Adjust "Medium" field length available by -90 ft/+90 ft for every 10°F above/below 40°F.
   Adjust "Poor" field length available by -140 ft/+140 ft for every 10°F above/below 40°F.
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 (22K Derate)

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-6	-4	-3	-13	-12	-11	-24	-23	-22
170	-6	-5	-3	-14	-13	-12	-25	-24	-22
160	-6	-5	-4	-15	-14	-13	-26	-25	-24
150	-7	-6	-4	-16	-15	-14	-27	-26	-25
140	-8	-6	-5	-17	-16	-15	-29	-28	-27
130	-9	-7	-6	-19	-17	-16	-31	-30	-28
120	-10	-8	-7	-20	-19	-17	-33	-31	-30
110	-11	-9	-8	-21	-20	-19	-34	-33	-32
100	-12	-10	-9	-23	-22	-20	-36	-35	-33
90	-13	-11	-10	-24	-23	-22	-37	-36	-35

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-5.8	-5.8	-5.8	-18.2	-18.2	-18.2	-28.9	-28.9	-28.9
170	-5.2	-5.2	-5.2	-16.6	-16.6	-16.6	-26.2	-26.2	-26.2
160	-4.7	-4.7	-4.7	-15.3	-15.3	-15.3	-23.8	-23.8	-23.8
150	-4.3	-4.3	-4.3	-14.1	-14.1	-14.1	-21.8	-21.8	-21.8
140	-4.1	-4.1	-4.1	-13.1	-13.1	-13.1	-20.0	-20.0	-20.0
130	-4.0	-4.0	-4.0	-12.3	-12.3	-12.3	-18.6	-18.6	-18.6
120	-4.0	-4.0	-4.0	-11.7	-11.7	-11.7	-17.4	-17.4	-17.4
110	-4.1	-4.1	-4.1	-11.3	-11.3	-11.3	-16.6	-16.6	-16.6
100	-4.4	-4.4	-4.4	-11.1	-11.1	-11.1	-16.1	-16.1	-16.1
90	-4.7	-4.7	-4.7	-11.2	-11.2	-11.2	-15.9	-15.9	-15.9

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	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
3800	78.4								
4200	111.1	70.2							
4600	143.6	103.0							
5000	175.8	135.5	94.8						
5400		167.8	127.4						
5800		199.8	159.7	92.2					
6200			191.8	119.8	71.9				
6600				148.1	99.0				
7000				177.1	126.8	78.7			
7400					155.3	105.9			
7800					184.5	133.8			
8200						162.5			
8600						192.0	87.9		
9000							106.9		
9400							126.6	76.3	
9800							147.1	95.0	
10200							168.3	114.2	
10600							190.5	134.2	83.2
11000								154.9	102.1
11400								176.6	121.6
11800								199.0	141.9
12200									162.9
12600									184.9

1. **Enter Weight Adjustment table with reported braking action and 22K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -100 ft/+100 ft for every 10°F above/below 40°F.**
   Adjust "Medium" field length available by -100 ft/+100 ft for every 10°F above/below 40°F.
   Adjust "Poor" field length available by -170 ft/+170 ft for every 10°F above/below 40°F.
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 (22K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-7	-4	-2	-17	-14	-12	-33	-30	-28
170	-7	-5	-2	-18	-16	-13	-34	-32	-29
160	-8	-5	-3	-19	-17	-14	-36	-34	-31
150	-9	-6	-4	-21	-18	-16	-38	-35	-33
140	-9	-7	-4	-22	-20	-17	-40	-37	-35
130	-10	-8	-5	-24	-21	-19	-42	-39	-37
120	-12	-9	-7	-26	-23	-21	-44	-41	-39
110	-13	-10	-8	-27	-25	-22	-46	-43	-41
100	-14	-12	-9	-29	-27	-24	-48	-45	-43
90	-16	-13	-11	-31	-28	-26	-49	-47	-44

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)
Based on engine bleeds for packs on, engine and wing anti-ice on or off

OAT (°F)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
170	84.8	85.4	86.2	86.9	87.6	88.4	89.1	89.7	90.3	90.4	90.4	90.9	91.3
160	85.8	86.4	86.8	86.8	86.9	87.7	88.4	89.0	89.6	89.7	89.7	90.2	90.6
150	86.8	87.4	87.8	87.9	87.9	88.1	88.2	88.3	88.9	89.0	89.0	89.4	89.9
140	87.7	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
130	88.6	89.1	89.6	89.8	89.9	90.0	90.1	90.1	90.1	89.6	89.1	88.9	88.7
120	89.5	90.0	90.5	90.7	90.8	90.9	91.0	91.0	91.0	90.6	90.1	90.0	89.8
110	90.5	91.0	91.5	91.6	91.7	91.8	91.9	91.9	91.9	91.5	91.1	91.0	90.8
100	91.5	92.0	92.5	92.6	92.7	92.7	92.8	92.8	92.7	92.4	92.1	92.0	91.9
90	91.8	92.9	93.5	93.6	93.7	93.7	93.8	93.7	93.7	93.4	93.0	92.9	92.9
80	91.0	92.1	93.3	94.0	94.5	94.6	94.6	94.6	94.4	94.1	93.8	93.8	93.8
70	90.2	91.3	92.5	93.1	93.8	94.5	95.2	95.4	95.4	95.1	94.7	94.6	94.6
60	89.4	90.5	91.6	92.3	92.9	93.6	94.3	94.9	95.4	96.0	96.0	95.7	95.4
50	88.5	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
40	87.7	88.8	89.9	90.6	91.2	91.9	92.6	93.1	93.7	94.3	94.8	95.5	96.2
30	86.8	87.9	89.1	89.7	90.3	91.0	91.7	92.2	92.8	93.4	93.9	94.6	95.4
20	86.0	87.0	88.2	88.8	89.4	90.1	90.8	91.3	91.9	92.5	93.0	93.7	94.5
10	85.1	86.2	87.3	87.9	88.5	89.2	89.9	90.4	91.0	91.6	92.1	92.8	93.6
0	84.2	85.3	86.4	87.0	87.6	88.3	89.0	89.5	90.0	90.6	91.2	91.9	92.7
-10	83.3	84.4	85.5	86.1	86.7	87.4	88.1	88.6	89.1	89.7	90.3	91.0	91.7
-20	82.4	83.4	84.6	85.2	85.8	86.4	87.1	87.6	88.2	88.8	89.3	90.1	90.8
-30	81.5	82.5	83.6	84.2	84.8	85.5	86.2	86.7	87.2	87.8	88.4	89.1	89.9
-40	80.6	81.6	82.7	83.3	83.9	84.5	85.2	85.7	86.2	86.8	87.4	88.2	88.9
-50	79.6	80.6	81.7	82.3	82.9	83.6	84.2	84.7	85.2	85.9	86.5	87.2	87.9
-60	78.7	79.7	80.8	81.3	81.9	82.6	83.2	83.7	84.3	84.9	85.5	86.2	87.0

%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	0.9	0.9	0.9

Assumed Temperature Reduced Thrust (22K Derate)

Maximum Assumed Temperature (Table 1 of 3)

Based on 25% Takeoff Thrust Reduction

OAT (°F)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
130	163	160	156	153								
120	163	160	156	153	149	146						
110	163	160	156	153	149	146	142	138	135			
100	156	156	156	153	149	146	142	138	135	131	128	
90	147	145	145	145	145	146	142	138	135	131	128	124
80	145	142	138	136	136	136	136	136	135	131	128	124
70	145	142	138	135	131	127	126	126	126	126	124	124
60	145	142	138	135	131	127	124	122	117	115	115	115
50 & BELOW	145	142	138	135	131	127	124	122	117	113	109	106

Takeoff %N1 (Table 2 of 3)

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

ASSUMED TEMP (°F)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
170	85.4	86.2	86.9	87.6	88.4	89.1	89.7	90.3	90.4	90.4	90.9	91.3
160	86.4	86.8	86.8	86.9	87.7	88.4	89.0	89.6	89.7	89.7	90.2	90.6
150	87.4	87.8	87.9	87.9	88.1	88.2	88.3	88.9	89.0	89.0	89.4	89.9
140	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
130	89.1	89.6	89.8	89.9	90.0	90.1	90.1	90.1	89.6	89.1	88.9	88.7
120	90.0	90.5	90.7	90.8	90.9	91.0	91.0	91.0	90.6	90.1	90.0	89.8
110	91.0	91.5	91.6	91.7	91.8	91.9	91.9	91.9	91.5	91.1	91.0	90.8
100	92.0	92.5	92.6	92.7	92.7	92.8	92.8	92.7	92.4	92.1	92.0	91.9
90	92.9	93.5	93.6	93.7	93.7	93.8	93.7	93.7	93.4	93.0	92.9	92.9
80	92.1	93.3	94.0	94.5	94.6	94.6	94.6	94.4	94.1	93.8	93.8	93.8
70	91.3	92.5	93.1	93.8	94.5	95.2	95.4	95.4	95.1	94.7	94.6	94.6
60	90.5	91.6	92.3	92.9	93.6	94.3	94.9	95.4	96.0	96.0	95.7	95.4
50	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
MINIMUM ASSUMED TEMP (°F)	90	86	82	79	75	72	68	64	61	59	54	50

With engine bleed for packs off, increase %N1 by 0.9.

%N1 Adjustment for Temperature Difference (Table 3 of 3)

ASSUMED TEMP MINUS OAT (°F)	OUTSIDE AIR TEMPERATURE (°F)													
	-40	0	20	30	40	50	60	70	80	90	100	110	120	130
200	11.6													
180	10.3	8.0												
160	11.0	8.2	6.3											
140	12.0	6.8	6.5	6.2	4.8									
120	10.5	7.5	5.1	5.0	4.8	4.7	3.2							
100	8.9	8.4	5.8	3.8	3.4	3.3	3.3	3.1	1.7					
80	7.2	6.9	6.6	6.0	4.1	2.1	2.1	2.3	1.9	2.0	1.8			
60		5.2	5.1	5.0	4.9	4.3	3.9	3.5	3.9	3.8	3.7	3.7	4.0	
40		3.5	3.4	3.4	3.4	3.3	3.2	3.2	3.1	3.0	2.9	2.8	2.8	2.7
20			1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.5	1.5	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 (20K Derate)

V1, VR, V2

WEIGHT (1000 LB)	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
160	147	148	151												
150	143	143	147	139	140	143									
140	137	137	142	133	135	139	127	128	132	126	126	130	124	124	129
130	130	131	137	127	129	134	122	122	127	120	120	125	119	119	124
120	124	125	131	121	122	128	116	116	122	114	114	120	113	113	119
110	116	118	125	114	116	123	109	110	117	108	109	116	107	107	114
100	109	111	119	106	109	117	102	104	112	102	103	111	100	101	109
90	101	104	113	99	102	111	96	98	107	94	96	105	93	95	104

Check V1(MCG).

V1, VR, V2 Adjustments*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	5	6	7	9			4	5	5	5			-1	-1	-1	-1		
120	49	3	4	4	4	6	9	2	3	3	4	5	7	0	0	0	0	-1	-1
100	38	1	2	2	2	4	6	1	1	2	2	4	5	0	0	0	0	0	0
80	27	0	0	0	1	2	4	0	0	0	1	3	4	0	0	0	0	0	0
60	16	0	0	0	0	2	3	0	0	0	1	2	3	0	0	0	0	1	1
-60	-51	0	0	0	0	2	3	0	0	0	1	2	3	0	0	0	0	1	1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
160	-3	-1	0	0	0	-1	-1	0	0	0	0	0	0
150	-2	-1	0	0	0	-1	-1	0	0	0	0	0	0
140	-2	-1	0	1	1	-1	-1	0	0	0	0	1	1
130	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
120	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
110	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
100	-1	0	0	1	2	-2	-1	0	0	1	1	1	2
90	-1	0	0	1	2	-2	-1	0	0	1	1	2	2

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	93						
140	60	93	91	92	93			
120	49	96	94	93	93	91	88	84
100	38	101	99	98	97	93	88	84
80	27	103	103	102	101	98	93	87
60	16	103	103	102	101	99	96	92
-60	-51	105	104	103	102	100	97	95

Takeoff Speeds - Wet Runway (20K Derate)

V1, VR, V2

WEIGHT (1000 LB)	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
160	143	148	151												
150	137	143	147	134	140	143									
140	131	137	142	128	135	139	122	128	132	122	126	130	123	124	129
130	124	131	137	121	129	134	116	122	127	116	120	125	115	119	124
120	117	125	131	114	122	128	110	116	122	109	114	120	108	113	119
110	110	118	125	107	116	123	103	110	117	103	109	116	101	107	114
100	102	111	119	100	109	117	96	104	112	96	103	111	94	102	109
90	94	104	113	92	102	111	89	98	107	88	96	105	87	95	104

Check V1(MCG).

V1, VR, V2 Adjustment*

TEMP		V1						VR						V2					
		PRESS ALT (1000 FT)						PRESS ALT (1000 FT)						PRESS ALT (1000 FT)					
°F	°C	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
140	60	7	8	8	9			4	5	5	6			-1	-1	-1	-1		
120	49	4	5	5	6	7	10	2	3	3	4	5	7	0	0	0	0	-1	-1
100	38	1	2	2	2	4	7	1	1	2	2	4	5	0	0	0	0	0	0
80	27	0	0	0	1	2	5	0	0	0	1	3	4	0	0	0	0	0	0
60	16	0	0	0	0	2	3	0	0	0	1	2	3	0	0	0	0	1	1
-60	-51	0	0	0	0	2	3	0	0	0	1	2	3	0	0	0	0	1	1

Slope and Wind V1 Adjustment*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
160	-4	-2	0	2	5	-3	-2	-1	0	1	1	2	2
150	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
140	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	2
130	-3	-2	0	2	4	-3	-2	-1	0	1	2	2	3
120	-3	-1	0	2	4	-3	-2	-1	0	1	2	2	3
110	-3	-1	0	2	3	-3	-2	-1	0	1	2	3	3
100	-2	-1	0	2	3	-4	-2	-1	0	1	2	3	4
90	-2	-1	0	2	3	-4	-2	-1	0	1	2	3	4

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°F	°C	-2000	0	2000	4000	6000	8000	10000
160	71	93						
140	60	93	91	92	93			
120	49	96	94	93	93	91	88	84
100	38	101	99	98	97	93	88	84
80	27	103	103	102	101	98	93	87
60	16	103	103	102	101	99	96	92
-60	-51	105	104	103	102	100	97	95

Maximum Allowable Clearway (20K Derate)

FIELD LENGTH (FT)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	450
6000	650
8000	850
10000	1000
12000	1450
14000	1550

Clearway and Stopway V1 Adjustments (20K Derate)

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)					
	DRY RUNWAY			WET RUNWAY		
	100	120	140	100	120	140
800	-4	-4	-4			
600	-3	-3	-3			
400	-4	-2	-2			
200	-3	-1	-2			
0	0	0	0	0	0	0
-200	1	1	0	1	1	1
-400	2	1	1	2	1	1
-600	2	1	1	2	1	1
-800	2	1	1	2	1	1

Use of clearway not allowed on wet runways.

Stab Trim Setting (20K Derate)

Flaps 1 and 5

WEIGHT (1000 LB)	C.G. (%MAC)								
	9	11	13	16	20	24	28	31	33
160 - 180	8 1/2	8 1/2	8 1/2	8	7	6 1/4	5 1/2	4 3/4	4 1/4
140	8 1/2	8 1/2	8	7 1/2	6 3/4	5 3/4	5	4 1/2	4
120	8 1/2	8	7 3/4	7	6 1/4	5 1/4	4 1/2	4	3 1/2
80 - 100	7 3/4	7 1/4	6 3/4	6 1/4	5 1/2	4 3/4	4	3 1/4	3

Flaps 10, 15 and 25

WEIGHT (1000 LB)	C.G. (%MAC)								
	9	11	13	16	20	24	28	31	33
160 - 180	8 1/2	8 1/2	8 1/2	7 3/4	6 3/4	6	5	4 1/2	4
140	8 1/2	8 1/2	8	7 1/4	6 1/4	5 1/2	4 3/4	4	3 1/2
120	8 1/2	8	7 1/2	6 3/4	6	5	4 1/4	3 1/2	3 1/4
80 - 100	7 1/4	7	6 1/2	6	5 1/4	4 1/2	3 1/2	3	2 3/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (20K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 LB)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
180	-25.5	-29.0	-32.5	-31.3	-34.8	-38.3	-48.1	-51.6	-55.1
170	-22.0	-25.5	-29.0	-26.8	-30.3	-33.8	-39.9	-43.4	-46.9
160	-18.9	-22.4	-25.9	-22.8	-26.3	-29.8	-32.6	-36.1	-39.6
150	-16.2	-19.7	-23.2	-19.3	-22.8	-26.3	-26.4	-29.9	-33.4
140	-13.7	-17.2	-20.7	-16.1	-19.6	-23.1	-21.6	-25.1	-28.6
130	-11.6	-15.1	-18.6	-13.5	-17.0	-20.5	-17.7	-21.2	-24.7
120	-10.0	-13.5	-17.0	-11.5	-15.0	-18.5	-14.7	-18.2	-21.7
110	-8.6	-12.1	-15.6	-9.9	-13.4	-16.9	-12.5	-16.0	-19.5
100	-8.0	-11.5	-15.0	-8.9	-12.4	-15.9	-10.9	-14.4	-17.9
90	-7.6	-11.1	-14.6	-8.3	-11.8	-15.3	-10.1	-13.6	-17.1

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
4200				74.0			82.1		
4600	88.5			93.2			100.5		
5000	108.0			112.6			119.5	72.9	
5400	128.2	78.8		132.6	83.6		139.0	91.3	
5800	149.0	98.2		153.3	102.8		159.2	109.9	
6200	170.6	118.0		174.7	122.5	74.0	180.2	129.2	82.1
6600	193.0	138.5	88.5	196.8	142.9	93.2		149.0	100.5
7000		159.7	108.0		163.9	112.6		169.6	119.5
7400		181.7	128.2		185.6	132.6		191.0	139.0
7800			149.0			153.3			159.2
8200			170.6			174.7			180.2
8600			193.0			196.8			

1. **Enter Weight Adjustment table with slush/standing water depth and 20K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -110 ft/+110 ft for every 10°C above/below 40°F.**
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 (20K Derate)

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
180	-7	-2	0	0	0	0	0	0	0
170	-9	-4	0	0	0	0	0	0	0
160	-11	-6	-1	-4	0	0	0	0	0
150	-13	-8	-3	-7	-2	0	0	0	0
140	-14	-9	-4	-10	-5	0	0	0	0
130	-16	-11	-6	-12	-7	-2	-4	0	0
120	-17	-12	-7	-14	-9	-4	-7	-2	0
110	-18	-13	-8	-15	-10	-5	-10	-5	0
100	-19	-14	-9	-17	-12	-7	-13	-8	-3
90	-19	-14	-9	-18	-13	-8	-15	-10	-5

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

No Reverse Thrust

Weight Adjustments (1000 LB)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
180	-31.6	-37.6	-43.6	-37.7	-43.7	-49.7	-51.4	-57.4	-63.4
170	-27.2	-33.2	-39.2	-32.1	-38.1	-44.1	-43.1	-49.1	-55.1
160	-23.3	-29.3	-35.3	-27.3	-33.3	-39.3	-36.0	-42.0	-48.0
150	-19.9	-25.9	-31.9	-23.1	-29.1	-35.1	-29.9	-35.9	-41.9
140	-17.1	-23.1	-29.1	-19.6	-25.6	-31.6	-24.8	-30.8	-36.8
130	-14.9	-20.9	-26.9	-16.8	-22.8	-28.8	-20.9	-26.9	-32.9
120	-13.1	-19.1	-25.1	-14.6	-20.6	-26.6	-18.1	-24.1	-30.1
110	-11.8	-17.8	-23.8	-13.0	-19.0	-25.0	-16.0	-22.0	-28.0
100	-10.5	-16.5	-22.5	-11.4	-17.4	-23.4	-14.0	-20.0	-26.0
90	-9.2	-15.2	-21.2	-9.8	-15.8	-21.8	-12.1	-18.1	-24.1

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
5000							80.2		
5400				79.3			99.5		
5800	88.2			101.6			120.8	73.3	
6200	112.2			124.4	71.1		145.1	92.1	
6600	136.6	79.2		148.0	93.2		174.0	112.5	
7000	161.2	103.2		172.3	115.8			135.5	84.9
7400	186.2	127.4	70.3	197.5	139.1	84.8		162.4	104.6
7800		152.0	94.2		163.1	107.2		196.0	126.5
8200		176.8	118.3		188.0	130.3			151.8
8600			142.7			154.0			182.4
9000			167.4			178.6			
9400			192.5						

1. **Enter Weight Adjustment table with slush/standing water depth and 20K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -130 ft/+130 ft for every 10°C above/below 40°F.**
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 (20K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
180	-13	-11	-8	0	0	0	0	0	0
170	-15	-13	-10	-3	0	0	0	0	0
160	-17	-14	-12	-7	-4	-2	0	0	0
150	-18	-16	-13	-11	-8	-6	0	0	0
140	-20	-17	-15	-14	-11	-9	0	0	0
130	-21	-19	-16	-17	-14	-12	-5	-3	0
120	-22	-20	-17	-19	-16	-14	-10	-7	-5
110	-23	-21	-18	-21	-18	-16	-14	-11	-9
100	-24	-22	-19	-22	-20	-17	-17	-14	-12
90	-25	-23	-20	-23	-21	-18	-19	-17	-14

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 LB)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-4.4	-4.4	-4.4	-14.2	-14.2	-14.2	-23.2	-23.2	-23.2
170	-3.5	-3.5	-3.5	-12.9	-12.9	-12.9	-21.1	-21.1	-21.1
160	-3.1	-3.1	-3.1	-11.7	-11.7	-11.7	-19.2	-19.2	-19.2
150	-2.5	-2.5	-2.5	-10.6	-10.6	-10.6	-17.5	-17.5	-17.5
140	-2.1	-2.1	-2.1	-9.6	-9.6	-9.6	-15.9	-15.9	-15.9
130	-1.8	-1.8	-1.8	-8.8	-8.8	-8.8	-14.6	-14.6	-14.6
120	-1.7	-1.7	-1.7	-8.2	-8.2	-8.2	-13.5	-13.5	-13.5
110	-1.7	-1.7	-1.7	-7.8	-7.8	-7.8	-12.7	-12.7	-12.7
100	-1.9	-1.9	-1.9	-7.5	-7.5	-7.5	-12.1	-12.1	-12.1
90	-2.2	-2.2	-2.2	-7.3	-7.3	-7.3	-11.7	-11.7	-11.7

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	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
3400	84.7								
3800	114.6								
4200	144.5	95.9							
4600	174.5	125.8	77.3	91.3					
5000		155.8	107.1	113.9					
5400		185.7	137.1	137.4	88.5				
5800			167.0	161.8	111.1		82.9		
6200			197.0	187.1	134.4	85.7	98.2		
6600					158.7	108.2	114.0		
7000					183.9	131.5	130.4	82.9	
7400						155.6	147.4	98.2	
7800						180.7	165.2	114.0	
8200							183.8	130.4	82.9
8600								147.4	98.2
9000								165.2	114.0
9400								183.8	130.4
9800									147.4
10200									165.2
10600									183.8

1. **Enter Weight Adjustment table with reported braking action and 20K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -80 ft/+80 ft for every 10°F above/below 40°F.
Adjust "Medium" field length available by -80 ft/+80 ft for every 10°F above/below 40°F.
Adjust "Poor" field length available by -130 ft/+130 ft for every 10°F above/below 40°F.**
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 (20K Derate)
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-4	-3	-2	-12	-10	-9	-21	-20	-19
170	-5	-3	-2	-12	-11	-10	-21	-20	-19
160	-5	-4	-3	-13	-11	-10	-22	-21	-20
150	-6	-4	-3	-14	-12	-11	-24	-22	-21
140	-6	-5	-4	-15	-14	-12	-25	-24	-23
130	-7	-6	-5	-16	-15	-14	-27	-26	-25
120	-8	-7	-6	-18	-16	-15	-29	-28	-27
110	-9	-8	-7	-19	-18	-17	-31	-30	-29
100	-10	-9	-8	-21	-19	-18	-33	-32	-30
90	-11	-10	-9	-22	-21	-20	-35	-33	-32

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

No Reverse Thrust

Weight Adjustments (1000 LB)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
180	-6.9	-6.9	-6.9	-19.0	-19.0	-19.0	-30.0	-30.0	-30.0
170	-5.8	-5.8	-5.8	-17.0	-17.0	-17.0	-27.0	-27.0	-27.0
160	-4.9	-4.9	-4.9	-15.4	-15.4	-15.4	-24.4	-24.4	-24.4
150	-4.2	-4.2	-4.2	-13.9	-13.9	-13.9	-22.1	-22.1	-22.1
140	-3.7	-3.7	-3.7	-12.8	-12.8	-12.8	-20.1	-20.1	-20.1
130	-3.5	-3.5	-3.5	-11.9	-11.9	-11.9	-18.5	-18.5	-18.5
120	-3.5	-3.5	-3.5	-11.3	-11.3	-11.3	-17.1	-17.1	-17.1
110	-3.7	-3.7	-3.7	-10.9	-10.9	-10.9	-16.1	-16.1	-16.1
100	-4.2	-4.2	-4.2	-10.8	-10.8	-10.8	-15.4	-15.4	-15.4
90	-4.8	-4.8	-4.8	-10.9	-10.9	-10.9	-15.0	-15.0	-15.0

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	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
3800	96.4								
4200	129.1	83.9							
4600	161.2	116.9	71.4						
5000	192.6	149.2	104.6						
5400		180.9	137.2	88.4					
5800			169.1	116.9					
6200				145.8	92.0				
6600				175.0	120.5				
7000					149.4	95.5			
7400					178.7	124.1			
7800						153.1	73.5		
8200						182.4	93.6		
8600							114.3		
9000							135.4	76.0	
9400							157.2	96.2	
9800							179.6	116.9	
10200								138.1	78.5
10600								160.0	98.7
11000								182.5	119.5
11400									140.8
11800									162.7
12200									185.3

1. **Enter Weight Adjustment table with reported braking action and 20K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -90 ft/+90 ft for every 10°F above/below 40°F.**
   Adjust "Medium" field length available by -90 ft/+90 ft for every 10°F above/below 40°F.
   Adjust "Poor" field length available by -150 ft/+150 ft for every 10°F above/below 40°F.
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 (20K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
180	-9	-7	-4	-19	-17	-14	-34	-31	-29
170	-8	-5	-3	-18	-15	-13	-32	-30	-27
160	-7	-5	-2	-17	-15	-12	-32	-30	-27
150	-7	-5	-2	-18	-15	-13	-33	-31	-28
140	-8	-5	-3	-19	-16	-14	-35	-33	-30
130	-9	-6	-4	-21	-18	-16	-37	-35	-32
120	-10	-8	-5	-23	-20	-18	-40	-37	-35
110	-11	-9	-6	-25	-22	-20	-42	-40	-37
100	-13	-10	-8	-27	-24	-22	-44	-42	-39
90	-14	-11	-9	-28	-25	-23	-45	-43	-40

1. **Obtain V1, VR and V2 for the actual weight using the 20K 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 (20K Derate)

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

OAT (°F)	AIRPORT PRESSURE ALTITUDE (FT)												
	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
170	81.0	81.1	81.7	84.2	86.0	87.4	89.0	89.9	90.8	90.6	90.4	90.0	89.6
160	82.0	82.2	82.3	84.1	85.4	86.7	88.3	89.2	90.1	89.9	89.6	89.3	88.9
150	83.0	83.3	83.6	85.1	86.3	87.1	88.1	88.5	89.4	89.2	88.9	88.6	88.2
140	84.0	84.4	84.7	86.1	87.3	88.1	89.1	89.3	89.5	88.8	88.2	87.9	87.5
130	84.9	85.4	85.9	87.1	88.2	89.1	90.1	90.2	90.4	89.7	88.9	88.0	87.0
120	86.0	86.5	87.0	88.0	89.0	90.0	91.0	91.1	91.2	90.5	89.8	88.9	87.9
110	87.1	87.5	88.0	89.1	90.0	91.0	91.9	91.9	92.0	91.3	90.7	89.8	88.8
100	88.0	88.5	89.0	90.1	91.0	92.0	92.9	92.8	92.7	92.1	91.5	90.6	89.7
90	88.5	89.6	90.0	91.1	92.0	92.9	93.9	93.7	93.6	93.0	92.4	91.4	90.5
80	87.7	88.8	90.0	91.0	92.1	92.9	94.0	94.4	94.5	93.9	93.3	92.3	91.4
70	86.9	88.0	89.2	90.2	91.2	92.1	93.2	93.6	94.1	94.7	94.1	93.2	92.4
60	86.1	87.2	88.3	89.3	90.4	91.3	92.3	92.7	93.2	93.8	94.2	94.1	93.3
50	85.3	86.4	87.5	88.5	89.6	90.4	91.5	91.9	92.3	92.9	93.4	93.7	94.3
40	84.5	85.6	86.7	87.7	88.7	89.6	90.6	91.0	91.5	92.1	92.5	92.8	93.4
30	83.7	84.8	85.8	86.8	87.8	88.7	89.7	90.1	90.6	91.2	91.6	91.9	92.5
20	82.8	83.9	85.0	85.9	87.0	87.8	88.8	89.2	89.7	90.3	90.7	91.0	91.6
10	82.0	83.1	84.1	85.1	86.1	86.9	87.9	88.3	88.8	89.4	89.8	90.1	90.7
0	81.1	82.2	83.2	84.2	85.2	86.0	87.0	87.4	87.9	88.5	88.9	89.2	89.8
-10	80.3	81.3	82.4	83.3	84.3	85.1	86.1	86.5	87.0	87.5	87.9	88.3	88.8
-20	79.4	80.4	81.5	82.4	83.4	84.2	85.2	85.6	86.0	86.6	87.0	87.3	87.9
-30	78.5	79.5	80.6	81.5	82.5	83.3	84.2	84.6	85.1	85.6	86.1	86.4	86.9
-40	77.6	78.6	79.6	80.6	81.5	82.3	83.3	83.7	84.1	84.7	85.1	85.4	86.0
-50	76.7	77.7	78.7	79.6	80.6	81.4	82.3	82.7	83.2	83.7	84.1	84.4	85.0
-60	75.8	76.8	77.8	78.7	79.6	80.4	81.4	81.7	82.2	82.7	83.1	83.5	84.0

%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	0.9	0.9	0.9

Assumed Temperature Reduced Thrust (20K Derate)
Maximum Assumed Temperature (Table 1 of 3)
Based on 25% Takeoff Thrust Reduction

OAT (°F)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
130	163	160	156	153								
120	163	160	156	153	149	146						
110	162	160	156	153	149	146	142	138	135			
100	151	151	154	153	149	146	142	138	135	131	128	
90	142	142	144	145	145	145	142	138	135	131	128	124
80	142	138	140	140	140	140	138	138	135	131	128	124
70	142	138	140	140	140	140	138	136	127	127	127	124
60	142	138	140	140	140	140	138	136	127	120	117	115
50 & BELOW	142	138	140	140	140	140	138	136	127	120	113	104

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

ASSUMED TEMP (°F)	AIRPORT PRESSURE ALTITUDE (FT)											
	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
170	81.1	81.7	84.2	86.0	87.4	89.0	89.9	90.8	90.6	90.4	90.0	89.6
160	82.2	82.3	84.1	85.4	86.7	88.3	89.2	90.1	89.9	89.6	89.3	88.9
150	83.3	83.6	85.1	86.3	87.1	88.1	88.5	89.4	89.2	88.9	88.6	88.2
140	84.4	84.7	86.1	87.3	88.1	89.1	89.3	89.5	88.8	88.2	87.9	87.5
130	85.4	85.9	87.1	88.2	89.1	90.1	90.2	90.4	89.7	88.9	88.0	87.0
120	86.5	87.0	88.0	89.0	90.0	91.0	91.1	91.2	90.5	89.8	88.9	87.9
110	87.5	88.0	89.1	90.0	91.0	91.9	91.9	92.0	91.3	90.7	89.8	88.8
100	88.5	89.0	90.1	91.0	92.0	92.9	92.8	92.7	92.1	91.5	90.6	89.7
90	89.6	90.0	91.1	92.0	92.9	93.9	93.7	93.6	93.0	92.4	91.4	90.5
80	88.8	90.0	91.0	92.1	92.9	94.0	94.4	94.5	93.9	93.3	92.3	91.4
70	88.0	89.2	90.2	91.2	92.1	93.2	93.6	94.1	94.7	94.1	93.2	92.4
60	87.2	88.3	89.3	90.4	91.3	92.3	92.7	93.2	93.8	94.2	94.1	93.3
50	86.4	87.5	88.5	89.6	90.4	91.5	91.9	92.3	92.9	93.4	93.7	94.3
MINIMUM ASSUMED TEMP (°F)	90	86	86	86	84	81	78	78	71	64	57	50

With engine bleed for packs off, increase %N1 by 0.9.

%N1 Adjustment for Temperature Difference (Table 3 of 3)

ASSUMED TEMP MINUS OAT (°F)	OUTSIDE AIR TEMPERATURE (°F)													
	-40	0	20	30	40	50	60	70	80	90	100	110	120	130
200	10.9													
180	10.3	6.2												
160	10.7	7.7	4.7											
140	11.6	6.8	6.1	4.6	3.2									
120	10.2	7.2	5.1	4.9	4.6	3.1	1.7							
100	8.6	8.1	5.5	3.7	3.4	3.3	3.0	1.6	0.2					
80	6.9	6.7	6.4	5.6	3.8	2.1	3.2	3.5	1.6	0.7	0.5			
60		5.0	4.9	4.9	4.7	3.9	4.0	4.0	4.0	2.7	2.4	2.6	3.8	
40		3.4	3.3	3.3	3.3	3.2	3.1	3.0	3.0	2.9	2.8	2.7	2.6	2.6
20			1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.4	1.4	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	89.4	89.7	89.7	89.8	89.6	91.4	93.0	94.4	94.5	92.8
55	90.2	90.5	90.5	90.7	90.0	90.8	92.4	93.7	93.8	92.1
50	90.9	91.2	91.3	91.5	91.0	90.8	91.7	93.0	93.1	91.4
45	91.6	91.9	92.1	92.3	91.9	91.7	91.7	92.3	92.4	90.7
40	92.4	92.6	92.9	93.1	92.7	92.5	92.5	91.6	91.7	90.0
35	92.9	93.3	93.6	93.8	93.6	93.3	93.3	92.4	91.7	90.1
30	92.2	94.1	94.3	94.6	94.4	94.1	94.0	93.2	92.6	91.1
25	91.5	94.1	95.0	95.2	95.2	94.8	94.7	94.0	93.4	92.1
20	90.7	93.3	95.8	96.0	95.9	95.6	95.4	94.7	94.2	93.0
15	90.0	92.5	95.2	96.8	96.7	96.3	96.1	95.5	95.0	94.0
10	89.2	91.8	94.4	97.1	97.6	97.0	96.7	96.2	95.8	94.9
5	88.4	91.0	93.6	96.3	98.5	97.9	97.4	97.0	96.6	95.8
0	87.7	90.2	92.8	95.5	97.9	99.0	98.4	97.8	97.5	96.7
-5	86.9	89.4	92.0	94.7	97.2	98.9	99.4	98.6	98.3	97.7
-10	86.1	88.6	91.2	93.9	96.4	98.1	99.7	99.5	99.2	98.7
-15	85.3	87.8	90.3	93.1	95.6	97.4	98.9	100.5	100.1	99.7
-20	84.5	87.0	89.5	92.3	94.8	96.6	98.1	100.2	100.7	100.3
-25	83.7	86.1	88.7	91.4	94.1	95.8	97.3	99.3	99.9	99.5
-30	82.9	85.3	87.8	90.6	93.3	95.0	96.5	98.5	99.0	98.7
-35	82.0	84.5	87.0	89.8	92.4	94.1	95.6	97.6	98.2	97.8
-40	81.2	83.6	86.1	88.9	91.6	93.3	94.8	96.8	97.3	96.9

%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)											
°F	°C		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
134	57	60	91.0	91.8	91.8									
125	52	55	91.7	92.6	92.6	92.5	92.5							
116	47	50	92.5	93.3	93.3	93.3	93.3	93.3	93.2	93.2				
108	42	45	93.3	94.1	94.1	94.1	94.0	94.0	94.0	93.9	93.9	93.8		
99	37	40	94.1	94.9	94.9	94.8	94.8	94.7	94.7	94.6	94.6	94.6	94.5	94.4
90	32	35	94.3	95.8	95.8	95.7	95.7	95.6	95.5	95.5	95.4	95.3	95.3	95.2
81	27	30	93.5	95.7	96.3	96.5	96.5	96.4	96.4	96.3	96.2	96.2	96.1	96.0
72	22	25	92.8	94.9	95.5	96.1	96.7	97.3	97.3	97.2	97.1	97.0	97.0	96.9
63	17	20	92.0	94.2	94.7	95.3	95.9	96.5	97.2	97.9	98.3	98.2	98.1	98.0
54	12	15	91.3	93.4	94.0	94.5	95.1	95.8	96.5	97.2	97.9	98.7	99.4	99.4
45	7	10	90.5	92.6	93.2	93.8	94.4	95.0	95.7	96.4	97.1	97.9	98.7	99.5
36	2	5	89.7	91.8	92.4	93.0	93.6	94.2	94.9	95.6	96.4	97.1	98.0	98.8
27	-3	0	89.0	91.0	91.6	92.2	92.8	93.4	94.1	94.8	95.6	96.4	97.2	98.1
18	-8	-5	88.2	90.2	90.8	91.4	92.0	92.6	93.3	94.0	94.8	95.6	96.4	97.3
9	-13	-10	87.4	89.4	90.0	90.6	91.1	91.8	92.5	93.2	94.0	94.8	95.7	96.5
1	-17	-15	86.6	88.6	89.2	89.7	90.3	90.9	91.7	92.4	93.2	94.0	94.9	95.8
-8	-22	-20	85.8	87.8	88.3	88.9	89.5	90.1	90.8	91.6	92.3	93.2	94.1	95.0
-17	-27	-25	84.9	86.9	87.5	88.1	88.6	89.3	90.0	90.7	91.5	92.3	93.3	94.2
-26	-32	-30	84.1	86.1	86.7	87.2	87.8	88.4	89.2	89.9	90.7	91.5	92.5	93.4
-35	-37	-35	83.3	85.2	85.8	86.3	86.9	87.6	88.3	89.0	89.8	90.7	91.6	92.6
-44	-42	-40	82.4	84.4	84.9	85.5	86.1	86.7	87.4	88.2	89.0	89.8	90.8	91.8
-53	-47	-45	81.6	83.5	84.1	84.6	85.2	85.8	86.6	87.3	88.1	89.0	90.0	90.9
-62	-52	-50	80.7	82.6	83.2	83.7	84.3	84.9	85.7	86.4	87.2	88.1	89.1	90.1

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.6	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	1.0	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 LB)				
		90	110	130	150	170
40000	**PITCH ATT**	**4.0**	**4.0**	**4.0**		
	V/S (FT/MIN)	1700	1100	500		
30000	**PITCH ATT**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**
	V/S (FT/MIN)	2500	2000	1500	1200	900
20000	**PITCH ATT**	**7.5**	**6.5**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	4200	3300	2700	2200	1800
10000	**PITCH ATT**	**11.0**	**9.5**	**8.5**	**8.0**	**8.0**
	V/S (FT/MIN)	5600	4500	3700	3100	2600
SEA LEVEL	**PITCH ATT**	**14.5**	**12.5**	**11.5**	**10.5**	**10.0**
	V/S (FT/MIN)	6700	5400	4500	3800	3300

Cruise (.76/280)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		90	110	130	150	170
40000	**PITCH ATT**	**2.0**	**2.5**	**3.5**		
	%N1	83	87	91		
35000	**PITCH ATT**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	81	83	85	88	92
30000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	80	81	83	84	86
25000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	77	78	79	80	82
20000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	73	74	75	76	78
15000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.5**
	%N1	69	70	71	73	74

Descent (.76/280)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		90	110	130	150	170
40000	**PITCH ATT**	**-1.5**	**-0.5**	**0.0**	**0.5**	**1.0**
	V/S (FT/MIN)	-2800	-2600	-2600	-2800	-3000
30000	**PITCH ATT**	**-3.0**	**-2.0**	**-1.0**	**-0.5**	**0.0**
	V/S (FT/MIN)	-3100	-2700	-2400	-2200	-2100
20000	**PITCH ATT**	**-3.0**	**-2.0**	**-1.0**	**-0.5**	**0.5**
	V/S (FT/MIN)	-2900	-2400	-2200	-2000	-1900
10000	**PITCH ATT**	**-3.5**	**-2.5**	**-1.5**	**-0.5**	**0.0**
	V/S (FT/MIN	-2700	-2300	-2000	-1900	-1800
SEA LEVEL	**PITCH ATT**	**-4.0**	**-2.5**	**-1.5**	**-0.5**	**0.0**
	V/S (FT/MIN)	-2500	-2200	-1900	-1700	-1600

Flight With Unreliable Airspeed/ Turbulent Air Penetration

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

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		90	110	130	150	170
10000	**PITCH ATT**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	53	58	62	66	69
5000	**PITCH ATT**	**5.5**	**5.5**	**5.0**	**5.0**	**5.0**
	%N1	49	54	58	62	66

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)				
		90	110	130	150	170
FLAPS 1 (GEAR UP)	**PITCH ATT**	**5.0**	**5.5**	**6.0**	**6.0**	**6.5**
(VREF 40 + 50)	%N1	52	56	60	64	67
FLAPS 5 (GEAR UP)	**PITCH ATT**	**5.5**	**6.0**	**6.5**	**6.5**	**7.0**
(VREF 40 + 30)	%N1	52	57	62	65	69
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**6.0**	**6.0**	**6.5**	**6.5**	**7.0**
(VREF 40 + 20)	%N1	60	65	70	74	78

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)				
		90	110	130	150	170
FLAPS 15	**PITCH ATT**	**3.5**	**3.5**	**3.5**	**4.0**	**4.0**
(VREF 15 + 10)	%N1	43	46	50	54	57
FLAPS 30	**PITCH ATT**	**1.5**	**2.0**	**2.0**	**2.0**	**2.5**
(VREF 30 + 10)	%N1	47	51	55	59	62
FLAPS 40	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
(VREF 40 + 10)	%N1	53	58	63	66	69

Intentionally
Blank

Performance Inflight — Chapter PI
All Engine — Section 21

Long Range Cruise Maximum Operating Altitude
Max Cruise Thrust
ISA + 10°C and Below

WEIGHT (1000 LB)	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°)
170	31800	-9	35300*	35300*	35300*	34300	32900
160	33100	-12	36600*	36600*	36600*	35500	34200
150	34500	-15	37900*	37900*	37900*	36900	35500
140	36000	-19	39200*	39200*	39200*	38300	37000
130	37500	-19	40600*	40600*	40600*	39900	38500
120	39200	-19	41000	41000	41000	41000	40200
110	41000	-19	41000	41000	41000	41000	41000
100	41000	-19	41000	41000	41000	41000	41000
90	41000	-19	41000	41000	41000	41000	41000
80	41000	-19	41000	41000	41000	41000	41000

ISA + 15°C

WEIGHT (1000 LB)	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°)
170	31800	-4	34100*	34100*	34100*	34100*	32900
160	33100	-7	35700*	35700*	35700*	35500	34200
150	34500	-10	37000*	37000*	37000*	36900	35500
140	36000	-13	38300*	38300*	38300*	38300	37000
130	37500	-13	39700*	39700*	39700*	39700*	38500
120	39200	-13	41000	41000	41000	41000	40200
110	41000	-13	41000	41000	41000	41000	41000
100	41000	-13	41000	41000	41000	41000	41000
90	41000	-13	41000	41000	41000	41000	41000
80	41000	-13	41000	41000	41000	41000	41000

ISA + 20°C

WEIGHT (1000 LB)	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°)
170	31800	2	32300*	32300*	32300*	32300*	32300*
160	33100	-1	34200*	34200*	34200*	34200*	34200
150	34500	-4	35800*	35800*	35800*	35800*	35500
140	36000	-7	37200*	37200*	37200*	37200*	37000
130	37500	-8	38600*	38600*	38600*	38600*	38500
120	39200	-8	40000*	40000*	40000*	40000*	40000*
110	41000	-8	41000	41000	41000	41000	41000
100	41000	-8	41000	41000	41000	41000	41000
90	41000	-8	41000	41000	41000	41000	41000
80	41000	-8	41000	41000	41000	41000	41000

***Denotes altitude thrust limited in level flight, 100 fpm residual rate of climb.**

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		23	25	27	29	31	33	35	37	39	41
170	%N1	82.3	83.7	85.0	86.1	87.5	89.1	92.1			
	MACH	.701	.726	.748	.761	.775	.787	.790			
	KIAS	305	304	301	294	287	279	268			
	FF/ENG	3219	3203	3185	3142	3119	3139	3235			
160	%N1	80.8	82.4	83.7	84.9	86.2	87.6	89.6	94.1		
	MACH	.681	.709	.734	.752	.766	.779	.790	.787		
	KIAS	296	296	295	290	283	276	268	255		
	FF/ENG	3022	3021	3015	2987	2948	2932	2978	3139		
150	%N1	79.4	80.8	82.4	83.7	84.9	86.2	87.7	90.6		
	MACH	.664	.688	.716	.740	.756	.770	.783	.791		
	KIAS	288	287	287	285	280	273	266	256		
	FF/ENG	2842	2826	2838	2828	2790	2755	2753	2838		
140	%N1	78.0	79.3	80.8	82.3	83.6	84.8	86.1	88.2	92.2	
	MACH	.647	.669	.694	.722	.745	.760	.774	.786	.790	
	KIAS	280	278	278	278	275	269	262	255	244	
	FF/ENG	2665	2643	2648	2653	2638	2593	2565	2603	2715	
130	%N1	76.5	77.8	79.1	80.6	82.1	83.4	84.6	86.4	89.1	93.7
	MACH	.629	.650	.672	.699	.727	.748	.763	.777	.788	.789
	KIAS	272	270	269	268	268	264	258	251	244	233
	FF/ENG	2497	2466	2459	2467	2466	2443	2401	2403	2461	2593
120	%N1	74.9	76.2	77.5	78.8	80.3	81.8	83.1	84.7	86.9	90.0
	MACH	.610	.630	.652	.675	.703	.730	.751	.765	.779	.790
	KIAS	263	262	260	258	258	257	253	247	241	233
	FF/ENG	2337	2297	2281	2277	2282	2275	2250	2230	2248	2312
110	%N1	72.9	74.4	75.7	77.0	78.3	79.9	81.4	83.0	85.1	87.4
	MACH	.586	.610	.630	.652	.676	.705	.732	.752	.767	.780
	KIAS	253	253	251	249	248	248	247	242	236	230
	FF/ENG	2165	2137	2111	2099	2092	2095	2086	2073	2070	2090
100	%N1	70.7	72.3	73.8	75.1	76.4	77.8	79.4	81.2	83.3	85.3
	MACH	.559	.583	.608	.629	.651	.675	.704	.732	.752	.767
	KIAS	241	241	241	240	238	236	236	235	231	226
	FF/ENG	1986	1966	1951	1930	1917	1907	1908	1910	1911	1928
90	%N1	68.1	69.9	71.4	72.9	74.3	75.6	77.0	79.0	81.2	83.3
	MACH	.531	.554	.579	.603	.626	.648	.672	.701	.730	.751
	KIAS	228	229	229	229	228	226	225	225	224	220
	FF/ENG	1805	1789	1781	1770	1776	1757	1744	1750	1764	1767
80	%N1	65.2	66.9	68.7	70.3	71.9	73.3	74.6	76.4	78.7	80.9
	MACH	.500	.522	.546	.571	.596	.620	.642	.666	.694	.724
	KIAS	214	215	216	216	216	216	214	213	212	212
	FF/ENG	1653	1642	1636	1628	1615	1594	1575	1569	1580	1596

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Ground to Air Miles Conversions

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	181	173	166	159
449	410	375	346	322	300	285	272	260	248	239
601	548	501	462	429	400	380	362	346	331	318
753	686	627	578	537	500	475	453	433	414	398
905	824	753	694	644	600	571	544	519	497	477
1058	963	879	810	752	700	666	634	606	580	557
1212	1102	1006	927	860	800	761	725	692	662	636
1366	1242	1133	1043	967	900	856	815	778	745	715
1521	1382	1260	1160	1075	1000	951	906	865	828	794
1676	1523	1388	1277	1183	1100	1046	997	951	910	874
1832	1663	1516	1394	1291	1200	1141	1087	1038	993	953
1988	1804	1644	1511	1399	1300	1237	1178	1124	1076	1032
2145	1946	1772	1628	1507	1400	1332	1269	1211	1158	1111
2303	2088	1900	1746	1615	1500	1426	1359	1297	1241	1190
2462	2231	2029	1863	1723	1600	1521	1449	1383	1323	1269
2621	2374	2158	1981	1832	1700	1616	1539	1469	1405	1348
2780	2517	2287	2099	1940	1800	1711	1629	1554	1487	1426
2941	2661	2417	2217	2048	1900	1806	1719	1640	1569	1505
3102	2805	2546	2334	2157	2000	1901	1810	1726	1651	1583

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	3.0	0:43	2.7	0:41	2.3	0:38	2.0	0:37	1.8	0:36
300	4.7	1:03	4.2	1:00	3.6	0:55	3.2	0:53	2.9	0:51
400	6.3	1:24	5.7	1:19	5.0	1:12	4.5	1:09	4.1	1:06
500	7.9	1:44	7.2	1:38	6.3	1:30	5.7	1:25	5.2	1:22
600	9.5	2:05	8.7	1:58	7.6	1:47	6.9	1:41	6.4	1:37
700	11.0	2:26	10.1	2:17	8.9	2:05	8.1	1:58	7.5	1:53
800	12.6	2:46	11.6	2:37	10.2	2:23	9.3	2:14	8.6	2:08
900	14.2	3:08	13.1	2:57	11.5	2:40	10.5	2:31	9.7	2:24
1000	15.7	3:29	14.5	3:16	12.8	2:58	11.7	2:48	10.8	2:40
1100	17.3	3:50	16.0	3:37	14.1	3:16	12.9	3:04	11.9	2:55
1200	18.8	4:12	17.4	3:57	15.4	3:34	14.0	3:21	13.0	3:11
1300	20.4	4:33	18.8	4:17	16.7	3:52	15.2	3:38	14.1	3:27
1400	21.9	4:55	20.2	4:37	18.0	4:11	16.4	3:55	15.2	3:43
1500	23.4	5:17	21.6	4:58	19.2	4:29	17.5	4:12	16.3	3:59
1600	24.9	5:39	23.1	5:19	20.5	4:48	18.7	4:29	17.4	4:15
1700	26.4	6:02	24.4	5:40	21.7	5:06	19.9	4:47	18.4	4:31
1800	27.9	6:24	25.8	6:00	23.0	5:25	21.0	5:04	19.5	4:48
1900	29.4	6:47	27.2	6:22	24.2	5:44	22.1	5:21	20.6	5:04
2000	30.8	7:10	28.6	6:43	25.4	6:03	23.3	5:39	21.6	5:20

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	80	100	120	140	160
5	-0.6	-0.3	0.0	0.4	0.7
10	-1.2	-0.7	0.0	0.8	1.6
15	-1.8	-1.0	0.0	1.3	2.5
20	-2.4	-1.3	0.0	1.7	3.4
25	-3.0	-1.7	0.0	2.1	4.3
30	-3.7	-1.9	0.0	2.6	5.2
35	-4.3	-2.1	0.0	3.0	6.1

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

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
540	505	474	447	422	400	381	365	349	336	324
808	756	710	669	633	600	573	548	526	506	488
1076	1008	946	892	844	800	765	732	702	675	651
1346	1260	1183	1115	1055	1000	956	916	879	845	814
1616	1513	1420	1338	1266	1200	1148	1100	1055	1014	977
1887	1766	1657	1562	1477	1400	1339	1283	1231	1183	1140
2159	2020	1895	1785	1688	1600	1531	1466	1407	1352	1303
2432	2275	2133	2009	1900	1800	1722	1650	1583	1521	1465
2705	2530	2372	2234	2111	2000	1913	1833	1759	1690	1628
2978	2785	2611	2458	2323	2200	2105	2016	1934	1859	1791
3253	3041	2850	2683	2535	2400	2296	2199	2109	2028	1953
3528	3298	3090	2908	2747	2600	2487	2382	2285	2196	2115
3805	3555	3330	3133	2959	2800	2678	2565	2460	2364	2277
4083	3814	3571	3359	3171	3000	2869	2747	2635	2532	2439
4361	4072	3811	3584	3383	3200	3060	2930	2810	2700	2601
4641	4332	4053	3810	3595	3400	3251	3113	2985	2868	2762
4923	4592	4295	4036	3807	3600	3442	3295	3160	3036	2923
5205	4854	4537	4263	4020	3800	3633	3478	3335	3203	3084
5489	5116	4781	4490	4233	4000	3824	3660	3509	3371	3245
5774	5379	5025	4717	4446	4200	4014	3842	3683	3538	3405
6061	5644	5269	4945	4659	4400	4205	4024	3857	3705	3566
6349	5909	5515	5173	4872	4600	4396	4206	4031	3871	3726
6638	6176	5761	5402	5086	4800	4586	4388	4205	4038	3885
6929	6443	6007	5631	5300	5000	4777	4570	4379	4204	4045

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 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
400	4.3	1:03	4.1	1:01	3.9	1:00	3.8	0:59	3.7	1:00
600	6.4	1:34	6.2	1:32	5.9	1:29	5.7	1:28	5.6	1:28
800	8.5	2:06	8.2	2:03	8.0	1:59	7.7	1:57	7.5	1:56
1000	10.7	2:38	10.3	2:34	10.0	2:29	9.6	2:26	9.4	2:24
1200	12.8	3:09	12.4	3:04	12.0	2:59	11.6	2:55	11.3	2:52
1400	14.9	3:41	14.4	3:35	14.0	3:29	13.5	3:24	13.1	3:20
1600	17.0	4:13	16.5	4:06	16.0	3:59	15.5	3:52	15.0	3:48
1800	19.1	4:44	18.6	4:37	18.0	4:29	17.4	4:21	16.9	4:16
2000	21.3	5:16	20.6	5:08	20.0	4:58	19.4	4:50	18.8	4:44
2200	23.3	5:49	22.6	5:40	21.9	5:29	21.2	5:20	20.6	5:13
2400	25.3	6:22	24.6	6:12	23.8	6:01	23.1	5:50	22.4	5:42
2600	27.3	6:55	26.5	6:44	25.7	6:32	24.9	6:20	24.2	6:11
2800	29.4	7:28	28.5	7:16	27.6	7:03	26.8	6:50	26.0	6:39
3000	31.4	8:01	30.4	7:48	29.5	7:34	28.6	7:20	27.8	7:08
3200	33.4	8:36	32.3	8:21	31.4	8:06	30.4	7:52	29.6	7:38
3400	35.3	9:11	34.2	8:55	33.2	8:38	32.2	8:23	31.3	8:09
3600	37.3	9:45	36.1	9:28	35.0	9:11	34.0	8:54	33.0	8:39
3800	39.3	10:20	38.0	10:01	36.9	9:43	35.7	9:26	34.7	9:09
4000	41.2	10:55	39.9	10:35	38.7	10:16	37.5	9:57	36.5	9:39
4200	43.1	11:32	41.7	11:10	40.5	10:49	39.2	10:30	38.1	10:10
4400	45.0	12:08	43.6	11:45	42.2	11:23	40.9	11:02	39.8	10:42
4600	46.9	12:45	45.4	12:20	44.0	11:57	42.6	11:35	41.4	11:13
4800	48.8	13:22	47.2	12:56	45.7	12:31	44.3	12:08	43.1	11:45
5000	50.6	13:59	49.0	13:31	47.5	13:04	46.0	12:40	44.7	12:16

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	80	100	120	140	160
5	-0.7	-0.5	0.0	0.8	2.6
10	-1.4	-0.8	0.0	1.5	4.3
15	-2.1	-1.1	0.0	2.1	5.8
20	-2.9	-1.4	0.0	2.7	7.2
25	-3.7	-1.8	0.0	3.3	8.5
30	-4.5	-2.2	0.0	3.8	9.6
35	-5.3	-2.6	0.0	4.3	10.6
40	-6.2	-3.0	0.0	4.7	11.5
45	-7.2	-3.4	0.0	5.1	12.2
50	-8.2	-3.9	0.0	5.4	12.7
55	-9.2	-4.4	0.0	5.8	13.2

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 LB)									
	170	160	150	140	130	120	110	100	90	80
41				41	19	6	0	3	12	29
39			32	14	4	0	3	11	25	45
37	42	23	10	2	0	3	11	24	41	62
35	15	5	1	1	4	12	24	39	58	79
33	2	0	1	6	14	25	39	56	75	97
31	0	3	8	16	27	40	55	73	92	114
29	5	11	19	30	42	56	72	90	109	129
27	15	23	33	45	58	72	88	106	125	144
25	27	37	48	60	74	89	105	122	140	158

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. **Read wind factors for present and new altitudes from table.**
2. **Determine difference (new altitude wind factor minus present altitude wind factor); This difference may be negative or positive.**
3. **Break-even wind at new altitude is present altitude wind plus difference from step 2.**

Descent

.78/280/250

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (LB)	DISTANCE (NM)			
			LANDING WEIGHT (1000 LB)			
			80	100	120	140
41000	25	710	97	113	126	135
39000	25	700	92	108	121	130
37000	24	690	88	103	115	124
35000	23	680	84	98	110	119
33000	23	670	80	94	106	114
31000	22	660	76	89	100	108
29000	21	650	72	84	94	101
27000	20	630	68	79	88	95
25000	19	610	63	74	82	88
23000	18	600	59	68	76	82
21000	17	580	55	63	70	75
19000	16	550	51	58	64	69
17000	15	530	46	53	59	63
15000	14	510	42	48	53	56
10000	10	420	30	33	36	38
5000	7	320	17	19	20	21
1500	4	240	9	9	9	9

Allowances for a straight-in approach are included.

Holding

Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	41000
170	%N1	62.2	65.3	68.9	73.1	77.2	81.6	85.7	92.1	
	KIAS	242	243	243	245	246	248	251	246	
	FF/ENG	3080	3030	3010	2990	2940	2940	3010	3230	
160	%N1	60.6	63.6	67.4	71.5	75.6	80.0	84.1	89.1	
	KIAS	235	235	236	237	239	241	243	246	
	FF/ENG	2910	2870	2840	2820	2760	2750	2810	2950	
150	%N1	58.9	61.8	65.8	69.8	74.0	78.4	82.5	87.0	
	KIAS	227	228	228	229	231	233	235	238	
	FF/ENG	2750	2700	2670	2640	2600	2570	2620	2700	
140	%N1	57.3	59.9	64.2	67.9	72.3	76.6	80.8	85.2	
	KIAS	220	220	221	222	223	224	226	229	
	FF/ENG	2590	2540	2500	2470	2440	2380	2440	2480	
130	%N1	55.5	58.1	62.3	66.1	70.4	74.6	79.0	83.3	94.0
	KIAS	211	212	213	213	214	216	218	220	214
	FF/ENG	2420	2370	2340	2300	2270	2210	2250	2290	2600
120	%N1	53.6	56.2	60.1	64.3	68.3	72.6	77.0	81.3	89.3
	KIAS	202	204	204	205	206	207	209	211	214
	FF/ENG	2260	2210	2170	2140	2100	2050	2070	2100	2280
110	%N1	51.6	54.2	57.8	62.2	66.1	70.5	74.8	79.2	86.6
	KIAS	194	194	195	196	197	198	199	201	204
	FF/ENG	2110	2050	2010	1980	1940	1890	1890	1930	2050
100	%N1	49.5	51.9	55.6	59.6	63.8	68.1	72.3	76.9	84.0
	KIAS	185	185	186	187	187	188	190	191	194
	FF/ENG	1950	1890	1850	1840	1800	1770	1750	1750	1840
90	%N1	47.2	49.6	53.2	56.9	61.4	65.3	69.8	74.3	81.4
	KIAS	178	178	178	178	178	178	180	181	183
	FF/ENG	1840	1770	1720	1680	1640	1610	1590	1580	1640
80	%N1	44.8	47.1	50.6	54.3	58.4	62.6	67.0	71.3	78.5
	KIAS	172	172	172	172	172	172	172	172	172
	FF/ENG	1680	1620	1560	1520	1490	1460	1440	1410	1460

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

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 15

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	2910	210/-140	60/90	-110	380	30	-30	60	-60	220	60	130
MAX AUTO	3650	190/-180	80/120	-140	460	0	0	80	-80	350	0	10
AUTOBRAKE 3	5090	310/-300	140/190	-230	760	0	0	140	-140	580	0	0
AUTOBRAKE 2	6570	440/-440	200/270	-310	1060	70	-90	190	-190	620	130	130
AUTOBRAKE 1	7340	530/-520	240/330	-370	1260	200	-220	210	-210	580	650	750

Good Reported Braking Action

MAX MANUAL	3950	220/-220	100/140	-180	630	90	-80	90	-60	300	210	480
MAX AUTO	4340	240/-240	110/150	-180	650	80	-70	100	-80	350	240	540
AUTOBRAKE 3	5100	310/-300	140/190	-230	780	20	-10	140	-140	580	10	50
AUTOBRAKE 2	6570	440/-440	200/270	-310	1060	70	-90	190	-190	620	130	130

Medium Reported Braking Action

MAX MANUAL	5430	350/-340	160/230	-290	1050	240	-190	140	-140	400	600	1490
MAX AUTO	5650	360/-350	170/230	-290	1040	210	-160	140	-140	460	600	1470
AUTOBRAKE 3	5760	370/-350	170/230	-290	1070	170	-110	150	-150	580	460	1380
AUTOBRAKE 2	6740	450/-450	210/270	-340	1210	150	-150	190	-190	620	260	680

Poor Reported Braking Action

MAX MANUAL	7130	510/-490	240/330	-440	1670	600	-390	190	-200	490	1330	3670
MAX AUTO	7440	510/-490	240/330	-430	1650	600	-390	190	-200	490	1340	3700
AUTOBRAKE 3	7440	510/-490	240/340	-430	1660	600	-360	190	-200	550	1330	3680
AUTOBRAKE 2	7610	540/-520	250/340	-450	1710	520	-350	210	-210	610	1030	3320

Reference distance is for sea level, standard day, no wind or slope, VREF15 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 170 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).
***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 Distances

Flaps 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	2840	190/-130	60/80	-100	370	30	-30	60	-60	210	60	120
MAX AUTO	3480	170/-170	80/100	-130	450	0	0	80	-80	340	0	10
AUTOBRAKE 3	4820	290/-280	130/170	-220	740	0	-10	130	-130	550	0	0
AUTOBRAKE 2	6190	400/-400	180/250	-300	1030	80	-110	170	-170	550	130	130
AUTOBRAKE 1	6890	480/-480	220/300	-350	1210	190	-200	200	-190	540	570	710

Good Reported Braking Action

MAX MANUAL	3830	210/-210	100/130	-180	620	90	-80	90	-90	300	200	440
MAX AUTO	4190	230/-220	100/150	-180	640	70	-60	90	-100	350	220	490
AUTOBRAKE 3	4830	290/-280	130/170	-220	750	20	-10	130	-130	550	10	50
AUTOBRAKE 2	6190	400/-400	180/250	-300	1030	80	-110	170	-170	550	130	130

Medium Reported Braking Action

MAX MANUAL	5200	330/-320	150/220	-280	1030	240	-190	130	-140	400	540	1320
MAX AUTO	5400	340/-330	160/210	-280	1020	210	-160	130	-140	460	540	1300
AUTOBRAKE 3	5500	340/-330	160/210	-290	1050	170	-120	140	-140	550	440	1250
AUTOBRAKE 2	6350	410/-410	190/250	-330	1170	150	-170	170	-180	550	260	630

Poor Reported Braking Action

MAX MANUAL	6750	470/-460	220/310	-420	1630	570	-370	180	-190	470	1170	3140
MAX AUTO	7040	470/-450	220/310	-420	1620	580	-370	180	-180	480	1180	3170
AUTOBRAKE 3	7040	480/-460	220/310	-420	1620	560	-350	180	-190	520	1170	3150
AUTOBRAKE 2	7190	490/-480	230/320	-440	1670	500	-350	190	-200	550	940	2850

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 170 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).
***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 Distances

Flaps 40

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV
MAX MANUAL	2820	170/-130	60/80	-100	370	40	-30	60	-60	220	60	120
MAX AUTO	3390	170/-160	80/100	-130	440	10	0	70	-70	340	0	20
AUTOBRAKE 3	4660	280/-270	130/170	-210	720	0	-10	120	-120	540	0	0
AUTOBRAKE 2	5980	380/-380	180/240	-290	1010	80	-100	170	-170	540	110	110
AUTOBRAKE 1	6670	460/-450	210/300	-340	1190	180	-190	190	-190	520	500	640

Good Reported Braking Action

MAX MANUAL	3780	210/-200	100/130	-170	620	90	-80	90	-90	310	190	420
MAX AUTO	4120	230/-220	100/150	-180	640	80	-60	90	-90	360	210	460
AUTOBRAKE 3	4670	280/-270	130/170	-210	740	20	-10	120	-120	540	10	50
AUTOBRAKE 2	5980	380/-380	180/280	-290	1010	80	-100	170	-170	540	110	110

Medium Reported Braking Action

MAX MANUAL	5100	330/-310	150/220	-280	1020	240	-190	130	-130	400	510	1230
MAX AUTO	5290	330/-320	150/220	-280	1020	210	-160	130	-130	460	500	1210
AUTOBRAKE 3	5370	340/-320	160/210	-280	1030	180	-120	140	-140	540	450	1200
AUTOBRAKE 2	6140	400/-390	180/260	-320	1150	160	-160	170	-170	540	240	600

Poor Reported Braking Action

MAX MANUAL	6590	460/-440	210/310	-420	1620	570	-370	170	-180	470	1090	2870
MAX AUTO	6870	460/-440	210/310	-410	1600	570	-360	170	-180	470	1100	2900
AUTOBRAKE 3	6870	470/-440	220/300	-420	1610	560	-350	170	-180	510	1090	2880
AUTOBRAKE 2	6990	480/-460	220/320	-430	1650	510	-340	190	-190	530	880	2620

Reference distance is for sea level, standard day, no wind or slope, VREF40 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 170 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).
***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

Dry Runway

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	3760	340/-200	125/125	-135	605	45	-45	280
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	4540	270/-270	120/160	-230	850	135	-115	365
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	3070	160/-155	70/100	-115	405	40	-40	275
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	3000	150/-150	65/100	-115	405	45	-40	290
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	2990	150/-150	65/100	-115	405	45	-40	305
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3150	165/-165	70/90	-125	455	45	-40	245
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4220	225/-230	100/145	-180	605	105	-95	455
LEADING EDGE FLAPS TRANSIT	VREF15+15	3120	195/-150	70/100	-115	405	40	-35	220
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	2790	180/-135	60/80	-105	385	35	-30	210
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	2730	160/-135	55/75	-105	375	35	-30	215

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	2760	170/-130	60/80	-105	375	30	-30	205
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	2760	170/-130	60/80	-105	375	30	-30	205
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2710	190/-130	60/80	-100	370	30	-30	210
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	2760	170/-130	60/80	-105	375	30	-30	205
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	3200	215/-145	75/100	-115	415	35	-35	215
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2710	190/-130	60/80	-100	370	30	-30	210
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	2760	170/-130	60/80	-105	375	30	-30	205
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	3200	215/-145	75/100	-115	415	35	-35	215
TRAILING EDGE FLAPS UP	VREF40+40	3400	255/-160	85/100	-125	445	40	-40	225

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	5070	265/-275	140/190	-200	710	105	-95	275
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	5030	315/-315	140/190	-270	1035	195	-160	395
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	4170	255/-255	115/150	-185	675	110	-100	385
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	4040	240/-240	110/140	-185	665	110	-95	390
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	3990	240/-240	105/150	-185	665	110	-95	405
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3840	225/-225	100/130	-175	630	90	-80	310
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4915	280/-280	125/180	-220	750	155	-135	520
LEADING EDGE FLAPS TRANSIT	VREF15+15	4240	240/-245	115/150	-185	660	95	-85	300
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	3850	225/-225	95/130	-175	645	95	-85	305
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	3720	215/-215	90/125	-175	635	90	-80	310

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	3710	215/-215	95/120	-170	615	80	-70	280
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	3710	215/-215	95/120	-170	615	80	-70	280
TRAILING EDGE FLAP ASYMMETRY (30 FLAPS < 40)	VREF30	3620	210/-210	100/130	-180	620	90	-80	300
TRAILING EDGE FLAP ASYMMETRY (15 FLAPS < 30)	VREF15	3710	215/-215	95/120	-170	615	80	-70	280
TRAILING EDGE FLAP ASYMMETRY (1 FLAPS < 15)	VREF40+30	4340	230/-240	115/160	-185	660	90	-85	280
TRAILING EDGE FLAP DISAGREE (30 FLAPS < 40)	VREF30	3620	210/-210	100/130	-180	620	90	-80	300
TRAILING EDGE FLAP DISAGREE (15 FLAPS < 30)	VREF15	3710	215/-215	95/120	-170	615	80	-70	280
TRAILING EDGE FLAP DISAGREE (1 FLAPS < 15)	VREF40+30	4340	230/-240	115/160	-185	660	90	-85	280
TRAILING EDGE FLAPS UP	VREF40+40	4580	240/-250	125/170	-190	675	95	-85	270

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	7100	440/-450	230/310	-320	1185	265	-225	385
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	6310	445/-430	190/270	-400	1615	435	-320	455
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	5650	405/-395	180/230	-295	1110	265	-220	500
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	5400	380/-370	170/230	-290	1090	255	-210	490
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	5290	370/-360	165/250	-290	1080	255	-210	490
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	5190	355/-350	155/220	-275	1050	220	-185	405
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	6770	445/-435	200/285	-340	1210	340	-290	645
LEADING EDGE FLAPS TRANSIT	VREF15+15	5750	385/-380	180/240	-290	1090	235	-195	400
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	5440	370/-370	160/220	-295	1110	260	-215	430
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	5180	345/-345	150/205	-285	1085	250	-205	420

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	5010	340/-330	145/210	-270	1025	205	-170	375
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	5010	340/-330	145/210	-270	1025	205	-170	375
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	4880	330/-320	150/220	-280	1030	240	-190	400
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	5010	340/-330	145/210	-270	1025	205	-170	375
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	5940	375/-375	185/260	-295	1100	230	-195	375
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	4880	330/-320	150/220	-280	1030	240	-190	400
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	5010	340/-330	145/210	-270	1025	205	-170	375
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	5940	375/-375	185/260	-295	1100	230	-195	375
TRAILING EDGE FLAPS UP	VREF40+40	6330	395/-400	200/270	-305	1125	240	-205	370

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	9360	660/-655	335/470	-485	1875	610	-460	485
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	8300	640/-615	260/400	-655	3000	1530	-725	505
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	7280	580/-550	255/330	-445	1750	580	-425	585
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	6910	540/-515	235/340	-430	1715	555	-405	560
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	6710	520/-495	225/370	-425	1695	545	-395	550
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	6710	515/-490	225/320	-415	1670	500	-365	490
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	8700	640/-610	280/415	-500	1855	690	-525	725
LEADING EDGE FLAPS TRANSIT	VREF15+15	7420	555/-535	250/360	-435	1725	520	-385	475
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	7410	560/-550	240/330	-465	1835	655	-470	540
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	6960	515/-505	220/310	-450	1780	615	-435	510

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 120000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 120000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	6470	485/-465	210/300	-405	1630	465	-345	450
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	6470	485/-465	210/300	-405	1630	465	-345	450
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	6290	470/-460	220/310	-420	1630	570	-370	470
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	6470	485/-465	210/300	-405	1630	465	-345	450
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	7710	550/-540	265/370	-440	1740	520	-390	455
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	6290	470/-460	220/310	-420	1630	570	-370	470
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	6470	485/-465	210/300	-405	1630	465	-345	450
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	7710	550/-540	265/370	-440	1740	520	-390	455
TRAILING EDGE FLAPS UP	VREF40+40	8280	585/-575	285/400	-455	1785	550	-410	455

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft 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 LB)	OAT (°F)	PRESSURE ALTITUDE (1000 FT)																	
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
180	0	14.2	16.1	18.3	21.2	24.4	28.2	29.4	34.0	39.4	38.7	44.7	51.7	48.7	56.1	64.6	58.0	66.4	76.0
	20	14.7	16.7	19.0	22.0	25.4	29.3	30.5	35.3	40.9	40.1	46.4	53.6	50.5	58.2	66.9	60.1	68.8	78.7
	40	15.2	17.3	19.7	22.9	26.3	30.4	31.7	36.7	42.4	41.6	48.1	55.5	52.4	60.2	69.3	62.2	71.2	81.3
	60	15.7	17.9	20.4	23.7	27.3	31.5	32.9	38.0	44.0	43.1	49.8	57.5	54.3	62.3	71.6	64.4	73.6	84.0
	80	16.1	18.4	21.0	24.4	28.1	32.5	33.9	39.2	45.4	44.5	51.4	59.3	56.0	64.3	73.8	66.4	75.8	86.5
	100	16.4	18.7	21.4	24.8	28.7	33.2	34.6	40.1	46.4	45.5	52.6	60.7	57.3	65.8	75.6	68.0	77.7	88.7
	120	16.5	18.9	21.6	25.1	29.0	33.6	35.0	40.6	47.1	46.2	53.4	61.8	58.3	67.1	77.2	69.3	79.3	90.7
160	0	13.0	14.6	16.6	19.3	22.2	25.5	26.6	30.8	35.7	34.9	40.4	46.8	44.0	50.7	58.6	53.0	60.9	69.9
	20	13.5	15.2	17.3	20.1	23.0	26.5	27.7	32.0	37.1	36.2	41.9	48.5	45.6	52.6	60.7	54.9	63.1	72.4
	40	13.9	15.8	17.9	20.8	23.9	27.5	28.7	33.2	38.4	37.6	43.5	50.3	47.3	54.5	62.8	56.9	65.3	74.9
	60	14.4	16.3	18.5	21.5	24.8	28.5	29.8	34.4	39.9	39.0	45.1	52.1	49.0	56.5	65.0	58.9	67.5	77.3
	80	14.7	16.7	19.0	22.1	25.5	29.4	30.7	35.5	41.1	40.2	46.5	53.7	50.5	58.2	67.0	60.8	69.6	79.7
	100	15.0	17.0	19.4	22.6	26.0	30.0	31.3	36.3	42.0	41.1	47.5	55.0	51.7	59.6	68.7	62.2	71.3	81.7
	120	15.1	17.1	19.6	22.8	26.3	30.4	31.7	36.7	42.6	41.7	48.3	55.9	52.6	60.7	70.0	63.3	72.7	83.4
140	0	11.8	13.2	14.9	17.4	19.9	22.9	23.9	27.6	31.9	31.1	36.0	41.8	39.1	45.2	52.3	47.5	54.8	63.1
	20	12.3	13.8	15.5	18.1	20.7	23.8	24.8	28.6	33.1	32.3	37.4	43.3	40.6	46.9	54.2	49.3	56.8	65.4
	40	12.7	14.3	16.1	18.7	21.5	24.7	25.7	29.7	34.4	33.6	38.8	44.9	42.1	48.6	56.2	51.1	58.8	67.7
	60	13.1	14.7	16.6	19.4	22.2	25.6	26.7	30.8	35.6	34.8	40.2	46.6	43.7	50.4	58.2	53.0	60.9	70.0
	80	13.4	15.1	17.1	19.9	22.9	26.3	27.5	31.7	36.7	35.9	41.5	48.0	45.0	52.0	60.0	54.6	62.8	72.1
	100	13.6	15.3	17.4	20.3	23.3	26.9	28.0	32.4	37.5	36.6	42.4	49.1	46.1	53.2	61.4	55.9	64.3	73.9
	120	13.7	15.4	17.5	20.5	23.6	27.2	28.4	32.8	38.0	37.1	43.0	49.9	46.7	54.1	62.5	56.8	65.5	75.4
120	0	10.6	11.9	13.3	15.5	17.7	20.2	21.1	24.3	28.0	27.3	31.6	36.6	34.2	39.6	45.8	41.7	48.1	55.6
	20	11.1	12.3	13.8	16.1	18.4	21.0	21.9	25.2	29.1	28.4	32.8	38.0	35.5	41.1	47.5	43.2	49.9	57.6
	40	11.4	12.8	14.3	16.7	19.0	21.8	22.7	26.2	30.2	29.5	34.1	39.4	36.8	42.6	49.3	44.8	51.7	59.7
	60	11.8	13.1	14.8	17.3	19.7	22.6	23.5	27.1	31.3	30.5	35.3	40.9	38.2	44.2	51.1	46.5	53.6	61.8
	80	12.0	13.4	15.1	17.7	20.3	23.2	24.2	28.0	32.3	31.5	36.4	42.2	39.4	45.5	52.7	47.9	55.3	63.7
	100	12.2	13.7	15.4	18.0	20.6	23.7	24.7	28.5	33.0	32.1	37.2	43.1	40.3	46.6	53.9	49.0	56.6	65.3
	120	12.3	13.8	15.5	18.2	20.8	23.9	25.0	28.9	33.4	32.5	37.7	43.7	40.8	47.3	54.8	49.8	57.5	66.4
100	0	9.5	10.5	11.7	13.6	15.4	17.6	18.3	21.0	24.2	23.5	27.1	31.4	29.2	33.8	39.1	35.4	40.9	47.4
	20	9.9	10.9	12.1	14.2	16.0	18.3	19.0	21.8	25.1	24.4	28.2	32.6	30.3	35.1	40.6	36.7	42.5	49.1
	40	10.2	11.3	12.6	14.7	16.6	18.9	19.7	22.6	26.0	25.3	29.2	33.8	31.5	36.4	42.1	38.1	44.0	50.9
	60	10.5	11.6	12.9	15.1	17.2	19.6	20.4	23.4	27.0	26.2	30.3	35.1	32.6	37.7	43.7	39.5	45.6	52.8
	80	10.7	11.9	13.2	15.5	17.6	20.1	21.0	24.1	27.8	27.0	31.2	36.1	33.6	38.9	45.0	40.7	47.1	54.4
	100	10.8	12.0	13.4	15.8	17.9	20.5	21.4	24.6	28.4	27.6	31.9	36.9	34.3	39.8	46.1	41.6	48.2	55.7
	120	10.9	12.1	13.5	15.9	18.1	20.7	21.6	24.9	28.7	27.9	32.3	37.4	34.8	40.3	46.7	42.2	48.9	56.6

***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, 60°F.

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	6.3	16.0	25.5	34.8	44.3	54.2	64.5	75.4	86.7
	MAX AUTO	5.8	15.2	24.5	33.6	43.0	52.8	63.1	73.9	85.2
	AUTOBRAKE 3	5.4	14.1	22.4	30.4	38.6	47.8	57.9	68.9	80.8
	AUTOBRAKE 2	4.9	12.9	20.5	27.5	34.8	43.1	52.4	62.8	74.2
	AUTOBRAKE 1	4.4	11.9	18.8	25.0	31.4	38.6	46.7	55.7	65.5

Two Engine 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	6.2	15.0	23.8	32.3	41.1	50.6	60.7	71.5	83.0
	MAX AUTO	4.9	12.8	20.9	29.1	37.8	47.3	57.6	68.8	80.8
	AUTOBRAKE 3	2.8	8.7	14.8	21.0	27.8	35.6	44.5	54.5	65.5
	AUTOBRAKE 2	1.3	5.5	9.8	14.2	19.1	25.2	32.3	40.6	49.9
	AUTOBRAKE 1	0.2	3.1	6.0	8.7	11.9	16.0	21.1	27.1	34.0

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
	16 & BELOW	17	20	22	25	28	31	32 TO 48	49 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS								
	UP TO 2.4	2.6	3.1	3.5	3.8	4.3	4.9	5.0 TO 7.4	7.4 & 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		

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.

Intentionally
Blank

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	96.1	95.9	95.6	95.5	95.2	94.8	94.3	94.0	93.2
15	96.7	96.5	96.2	96.1	96.0	95.5	95.1	94.8	94.1
10	97.3	97.2	96.8	96.7	96.7	96.2	95.8	95.6	95.0
5	97.5	97.9	97.6	97.4	97.4	97.0	96.6	96.4	95.9
0	96.8	98.1	98.5	98.3	98.2	97.8	97.5	97.2	96.8
-5	96.0	97.3	98.5	99.2	99.1	98.6	98.3	98.1	97.8
-10	95.2	96.5	97.7	99.0	99.9	99.5	99.2	99.0	98.7
-15	94.4	95.8	96.9	98.2	99.5	100.4	100.1	99.9	99.7
-20	93.6	95.0	96.2	97.4	98.7	99.8	100.4	100.2	100.0
-25	92.8	94.2	95.4	96.6	97.9	99.0	99.6	99.4	99.2
-30	91.9	93.4	94.6	95.8	97.0	98.2	98.7	98.5	98.3
-35	91.1	92.6	93.7	94.9	96.2	97.3	97.9	97.7	97.5
-40	90.3	91.8	92.9	94.1	95.3	96.5	97.0	96.8	96.6

%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	96.0	97.0	97.9	98.7	99.6	98.9	98.1	96.9	95.6	94.0	92.5	91.1
200	.63	95.4	96.3	97.2	98.1	98.9	99.8	99.5	98.7	97.8	96.8	95.6	94.5
240	.74	94.4	95.3	96.2	97.1	98.0	98.8	99.7	100.1	99.3	98.5	97.7	96.7
280	.86	93.7	94.6	95.5	96.4	97.2	98.1	98.9	99.7	100.5	100.2	99.3	98.5
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0
160	.49	95.9	96.8	97.7	98.6	99.5	99.2	98.4	97.3	96.1	94.7	93.3	92.0
200	.60	95.5	96.4	97.3	98.2	99.1	100.0	99.9	98.9	98.0	97.0	95.8	94.7
240	.71	94.4	95.3	96.2	97.1	98.0	98.8	99.6	100.2	99.5	98.9	98.0	97.0
280	.82	93.2	94.0	94.9	95.8	96.6	97.5	98.3	99.1	99.9	99.7	98.9	98.1
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.47	96.8	97.7	98.5	99.4	100.2	99.3	98.5	97.3	96.0	94.6	93.2	92.0
200	.58	96.4	97.3	98.2	99.1	99.9	100.8	99.9	99.0	98.0	96.8	95.6	94.5
240	.68	95.3	96.2	97.1	97.9	98.8	99.6	100.4	100.2	99.6	98.7	97.7	96.7
280	.79	93.6	94.5	95.4	96.2	97.1	97.9	98.7	99.5	99.9	99.1	98.2	97.4
320	.89	93.0	93.9	94.7	95.6	96.4	97.2	98.1	98.9	99.7	100.4	100.0	99.2
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
160	.45	96.7	97.6	98.5	99.4	100.3	100.4	99.5	98.5	97.3	95.9	94.5	93.2
200	.55	96.5	97.3	98.2	99.1	100.0	100.8	101.0	100.1	99.1	98.0	96.7	95.5
240	.66	95.0	95.9	96.8	97.6	98.5	99.3	100.2	100.7	99.9	99.1	98.1	97.1
280	.76	93.2	94.0	94.9	95.7	96.6	97.4	98.2	99.0	99.8	99.1	98.2	97.3
320	.85	91.8	92.6	93.5	94.3	95.1	95.9	96.7	97.5	98.3	99.1	99.3	98.4
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.43	97.5	98.4	99.3	100.1	101.0	100.5	99.6	98.5	97.2	95.7	94.4	93.1
200	.53	96.9	97.8	98.7	99.5	100.4	101.2	100.7	99.7	98.7	97.5	96.2	95.1
240	.63	95.7	96.5	97.4	98.2	99.1	99.9	100.7	100.4	99.5	98.6	97.5	96.6
280	.73	93.6	94.4	95.2	96.1	96.9	97.7	98.5	99.3	99.4	98.5	97.5	96.8
320	.82	91.4	92.3	93.1	93.9	94.7	95.5	96.3	97.0	97.8	98.6	97.8	97.0
360	.91	91.4	92.3	93.1	93.9	94.7	95.5	96.3	97.0	97.8	98.6	99.3	99.4

%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

270000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
160	.41	97.3	98.2	99.1	100.0	100.8	101.5	100.6	99.6	98.4	97.0	95.7	94.4
200	.51	96.3	97.2	98.1	98.9	99.8	100.6	101.1	100.2	99.2	98.1	96.9	95.7
240	.60	95.0	95.9	96.7	97.6	98.4	99.2	100.1	100.7	99.7	98.7	97.7	96.8
280	.70	93.0	93.8	94.6	95.5	96.3	97.1	97.9	98.7	99.4	98.7	97.7	96.9
320	.79	90.9	91.7	92.6	93.4	94.2	95.0	95.7	96.5	97.3	98.0	97.9	97.2
360	.88	90.2	91.0	91.8	92.7	93.5	94.3	95.1	95.9	96.6	97.4	98.2	98.7
25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.39	98.2	99.0	99.9	100.7	101.6	101.7	100.7	99.6	98.4	97.0	95.8	94.5
200	.49	96.8	97.7	98.5	99.4	100.2	101.0	100.9	99.9	98.9	97.7	96.6	95.5
240	.58	95.1	95.9	96.8	97.6	98.4	99.2	100.0	99.8	98.9	97.9	96.9	96.0
280	.67	93.2	94.1	94.9	95.7	96.5	97.3	98.1	98.8	98.9	97.9	96.9	96.2
320	.76	90.9	91.8	92.6	93.4	94.2	95.0	95.8	96.6	97.3	97.9	97.2	96.5
360	.85	89.6	90.5	91.3	92.1	93.0	93.8	94.6	95.4	96.2	97.0	97.7	97.5
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
160	.38	97.7	98.5	99.4	100.3	101.1	101.9	100.8	99.7	98.5	97.2	96.0	94.7
200	.48	96.4	97.2	98.1	98.9	99.7	100.6	101.0	99.9	98.9	97.8	96.7	95.6
240	.57	94.7	95.6	96.4	97.2	98.0	98.8	99.6	99.9	99.0	97.9	97.0	96.1
280	.66	93.0	93.8	94.6	95.4	96.2	97.0	97.8	98.6	99.1	98.0	97.0	96.3
320	.75	90.6	91.4	92.3	93.1	93.9	94.7	95.5	96.3	97.1	97.8	97.2	96.5
360	.83	89.0	89.8	90.7	91.5	92.4	93.2	94.0	94.8	95.6	96.4	97.2	97.2
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.37	97.5	98.4	99.2	100.1	100.9	101.0	99.9	98.7	97.5	96.3	95.2	94.0
200	.46	96.3	97.1	98.0	98.8	99.6	100.4	100.1	98.9	97.8	96.8	95.8	94.8
240	.55	94.8	95.6	96.4	97.2	98.0	98.8	99.6	99.1	98.1	97.1	96.2	95.4
280	.63	93.2	94.0	94.8	95.6	96.4	97.1	97.9	98.7	98.4	97.4	96.6	95.8
320	.72	90.9	91.8	92.6	93.4	94.2	95.0	95.8	96.6	97.4	97.5	96.8	96.1
360	.80	89.0	89.9	90.7	91.6	92.4	93.2	94.0	94.8	95.6	96.4	97.0	96.4
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
160	.35	96.5	97.4	98.2	99.0	99.8	100.6	100.2	98.9	97.7	96.6	95.5	94.4
200	.44	95.4	96.2	97.0	97.9	98.7	99.4	100.2	99.1	97.8	96.8	95.8	94.9
240	.53	93.9	94.7	95.5	96.3	97.1	97.9	98.7	99.3	98.2	97.1	96.2	95.4
280	.61	92.4	93.3	94.1	94.8	95.6	96.4	97.2	97.9	98.5	97.6	96.7	95.9
320	.69	90.3	91.1	92.0	92.8	93.6	94.4	95.2	96.0	96.8	97.6	96.9	96.2
360	.77	88.5	89.3	90.2	91.0	91.8	92.6	93.5	94.3	95.1	95.8	96.6	96.4

%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	96.0	96.8	97.6	98.4	99.2	100.0	98.9	97.5	96.5	95.5	94.5	93.5
200	.42	95.1	95.9	96.7	97.5	98.2	99.0	99.3	98.0	96.7	95.9	95.0	94.1
240	.51	93.7	94.5	95.2	96.0	96.8	97.6	98.3	98.2	97.1	96.2	95.4	94.6
280	.59	92.0	92.9	93.7	94.5	95.3	96.1	96.8	97.6	97.5	96.6	95.8	95.1
320	.67	90.3	91.1	92.0	92.8	93.6	94.4	95.2	96.0	96.8	96.9	96.2	95.5
360	.75	88.7	89.5	90.4	91.2	92.0	92.8	93.6	94.4	95.2	96.0	96.4	95.8
16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
160	.33	95.0	95.8	96.6	97.4	98.2	99.0	99.4	98.2	97.0	96.1	95.2	94.2
200	.41	93.9	94.7	95.5	96.3	97.1	97.8	98.6	98.2	97.0	96.0	95.2	94.4
240	.49	92.5	93.3	94.1	94.9	95.7	96.5	97.2	98.0	97.3	96.3	95.5	94.7
280	.57	91.0	91.8	92.6	93.5	94.3	95.1	95.9	96.6	97.4	96.7	95.8	95.1
320	.64	89.4	90.3	91.1	91.9	92.8	93.6	94.4	95.2	95.9	96.7	96.1	95.5
360	.72	88.0	88.9	89.7	90.6	91.4	92.2	93.0	93.8	94.6	95.4	96.2	95.8
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
160	.31	94.9	95.7	96.5	97.3	98.0	98.8	99.2	98.2	97.3	96.4	95.5	94.6
200	.39	93.6	94.4	95.2	96.0	96.7	97.5	98.3	97.5	96.5	95.7	94.9	94.1
240	.47	92.1	92.9	93.8	94.6	95.4	96.2	96.9	97.4	96.5	95.6	94.8	94.1
280	.54	90.9	91.7	92.5	93.4	94.2	95.0	95.8	96.5	96.8	96.0	95.2	94.5
320	.62	89.6	90.4	91.2	92.1	92.9	93.7	94.5	95.3	96.1	96.2	95.5	94.8
360	.69	88.3	89.1	89.9	90.7	91.6	92.4	93.2	94.0	94.8	95.5	95.8	95.2
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
160	.30	94.8	95.6	96.4	97.1	97.9	98.6	97.9	96.8	95.9	95.2	94.4	93.5
200	.38	92.7	93.5	94.3	95.1	95.9	96.7	97.1	96.1	95.1	94.4	93.6	92.8
240	.45	91.6	92.5	93.3	94.1	94.9	95.7	96.4	96.4	95.5	94.7	94.0	93.2
280	.52	90.6	91.4	92.2	93.0	93.8	94.6	95.4	96.2	95.9	95.1	94.4	93.7
320	.60	89.5	90.3	91.2	92.0	92.8	93.6	94.4	95.2	96.0	95.5	94.8	94.1
360	.67	88.3	89.1	90.0	90.8	91.6	92.4	93.2	93.9	94.7	95.5	95.1	94.4

%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	92.7	93.5	94.4	95.2	95.9	96.7	97.5	96.5	95.6	94.9	94.2	93.4
200	.36	91.3	92.1	93.0	93.8	94.6	95.4	96.1	96.1	95.2	94.4	93.7	92.9
240	.43	90.3	91.1	92.0	92.8	93.6	94.4	95.2	95.9	95.4	94.6	93.8	93.1
280	.51	89.5	90.3	91.1	91.9	92.7	93.5	94.3	95.1	95.7	95.0	94.2	93.5
320	.58	88.6	89.4	90.2	91.0	91.8	92.6	93.4	94.2	95.0	95.4	94.7	93.9
360	.65	87.5	88.3	89.2	90.0	90.8	91.6	92.3	93.1	93.9	94.7	95.0	94.3

5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
160	.26	90.5	91.4	92.2	93.0	93.8	94.5	95.1	94.4	93.6	92.9	92.2	91.4
200	.33	90.0	90.8	91.6	92.4	93.2	93.9	94.7	94.4	93.7	93.0	92.3	91.5
240	.40	89.2	90.0	90.8	91.6	92.4	93.2	93.9	94.4	93.7	92.9	92.2	91.5
280	.46	88.5	89.3	90.1	90.9	91.7	92.5	93.3	94.0	94.0	93.2	92.5	91.8
320	.53	87.8	88.6	89.4	90.2	90.9	91.7	92.5	93.2	94.0	93.6	92.9	92.2
360	.59	86.9	87.7	88.5	89.3	90.1	90.8	91.6	92.3	93.1	93.8	93.3	92.6

3000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.26	90.5	91.3	92.1	92.8	93.6	94.4	94.6	93.9	93.2	92.4	91.6	90.7
200	.32	89.9	90.7	91.5	92.3	93.1	93.8	94.6	94.0	93.3	92.5	91.8	91.0
240	.38	88.8	89.6	90.4	91.2	92.0	92.7	93.5	93.5	92.8	92.0	91.3	90.6
280	.45	88.3	89.1	89.9	90.6	91.4	92.2	92.9	93.7	93.1	92.4	91.7	91.0
320	.51	87.6	88.4	89.2	90.0	90.7	91.5	92.2	93.0	93.5	92.8	92.0	91.3
360	.57	86.8	87.6	88.4	89.1	89.9	90.6	91.4	92.1	92.8	93.1	92.4	91.7

1000 FT PRESS ALT		TAT (°C)											
KIAS	M	-5	0	5	10	15	20	25	30	35	40	45	50
160	.25	89.0	89.8	90.6	91.4	92.2	92.9	93.7	93.4	92.7	91.9	91.2	90.3
200	.31	88.7	89.5	90.3	91.0	91.8	92.6	93.3	93.7	93.0	92.2	91.5	90.7
240	.37	87.8	88.6	89.4	90.2	90.9	91.7	92.5	93.2	92.8	92.0	91.3	90.6
280	.43	87.3	88.1	88.8	89.6	90.4	91.1	91.9	92.6	93.1	92.3	91.6	90.9
320	.49	86.7	87.5	88.2	89.0	89.8	90.5	91.3	92.0	92.7	92.7	91.9	91.2
360	.55	85.9	86.7	87.5	88.2	89.0	89.7	90.5	91.2	91.9	92.6	92.3	91.6

%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	-3.1	-3.2

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
170	163	257	18500	17000	15200
160	153	250	20400	19100	17300
150	144	242	22400	21100	19600
140	134	235	24400	23300	21900
130	125	226	26400	25400	24200
120	115	218	28500	27600	26400
110	106	209	30500	29700	28700
100	96	199	32500	31800	30900
90	87	189	34600	33900	33000
80	77	178	36900	36200	35400

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
140	129	120	113	106	100	95	90	85	82	78
279	259	241	226	212	200	189	180	171	163	156
418	388	361	338	318	300	284	270	256	245	234
558	517	482	451	424	400	379	359	342	326	312
697	646	602	564	530	500	473	449	428	408	390
836	775	722	676	636	600	568	539	513	490	468
975	904	843	789	742	700	663	629	599	571	546
1114	1033	963	902	848	800	757	719	684	653	624
1253	1162	1083	1014	954	900	852	809	770	734	702
1392	1291	1204	1127	1060	1000	947	899	855	816	780
1532	1420	1324	1240	1166	1100	1041	989	941	898	858
1671	1550	1444	1353	1272	1200	1136	1078	1026	979	936
1811	1679	1565	1465	1378	1300	1231	1168	1112	1061	1014
1951	1809	1686	1578	1484	1400	1325	1258	1197	1142	1092
2091	1938	1806	1691	1590	1500	1420	1348	1283	1223	1169
2231	2068	1927	1804	1696	1600	1514	1437	1368	1305	1247
2372	2198	2048	1917	1802	1700	1609	1527	1453	1386	1325
2513	2329	2169	2030	1908	1800	1703	1617	1538	1467	1402

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 LB)										TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 LB)										
	80	90	100	110	120	130	140	150	160	170	
100	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.1	1.1	1.1	0:17
200	1.7	1.8	1.9	2.0	2.0	2.2	2.3	2.5	2.5	2.6	0:34
300	2.6	2.8	3.0	3.2	3.3	3.5	3.8	4.0	4.1	4.3	0:50
400	3.5	3.7	4.0	4.3	4.6	4.9	5.2	5.6	5.8	6.1	1:07
500	4.3	4.7	5.1	5.4	5.8	6.2	6.6	7.0	7.4	7.8	1:24
600	5.1	5.6	6.1	6.5	7.0	7.5	8.0	8.4	8.9	9.4	1:41
700	5.9	6.5	7.0	7.6	8.1	8.7	9.3	9.9	10.4	11.0	1:58
800	6.7	7.4	8.0	8.7	9.3	9.9	10.6	11.2	11.9	12.5	2:14
900	7.5	8.3	9.0	9.7	10.4	11.2	11.9	12.6	13.3	14.1	2:31
1000	8.3	9.1	9.9	10.7	11.5	12.4	13.2	14.0	14.8	15.7	2:48
1100	9.1	10.0	10.9	11.8	12.7	13.6	14.5	15.4	16.2	17.2	3:05
1200	9.9	10.8	11.8	12.8	13.8	14.7	15.7	16.7	17.7	18.7	3:22
1300	10.7	11.7	12.8	13.8	14.8	15.9	17.0	18.1	19.1	20.3	3:39
1400	11.4	12.5	13.7	14.8	15.9	17.1	18.2	19.4	20.5	21.8	3:56
1500	12.2	13.4	14.6	15.8	17.0	18.2	19.5	20.7	21.9	23.3	4:13
1600	12.9	14.2	15.5	16.8	18.1	19.4	20.7	22.0	23.3	24.8	4:29
1700	13.7	15.0	16.4	17.8	19.1	20.5	21.9	23.3	24.7	26.3	4:46
1800	14.4	15.8	17.3	18.7	20.2	21.7	23.1	24.6	26.1	27.7	5:04

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at LRC speed.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Altitude Capability

100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
170	14000	11300	8300
160	16700	14200	11400
150	19300	16800	14400
140	21700	19400	17200
130	24000	22300	20000
120	26400	25000	22700
110	28900	27700	25800
100	31100	30200	28900
90	33300	32500	31400
80	35700	34800	33800

With engine anti-ice on, decrease altitude capability by 2000 ft.
With engine and wing anti-ice on, decrease altitude capability by 6400 ft (optional system).

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT) 10	15	17	19	21	23	25	27	29	31
170	%N1	89.2	93.3	95.0							
	MACH	.535	.585	.597							
	KIAS	297	296	291							
	FF/ENG	6118	6179	6101							
160	%N1	87.6	91.8	93.4	95.4						
	MACH	.519	.571	.588	.601						
	KIAS	288	288	286	281						
	FF/ENG	5729	5797	5767	5721						
150	%N1	85.8	90.0	91.7	93.5	95.6					
	MACH	.502	.554	.575	.590	.604					
	KIAS	278	280	280	276	272					
	FF/ENG	5342	5406	5415	5366	5363					
140	%N1	83.8	88.1	89.9	91.6	93.5	95.9				
	MACH	.485	.536	.557	.578	.593	.607				
	KIAS	268	270	271	270	266	262				
	FF/ENG	4957	5018	5028	5030	4984	5021				
130	%N1	81.8	86.1	87.9	89.7	91.5	93.4	96.1			
	MACH	.468	.517	.538	.559	.581	.594	.610			
	KIAS	259	260	261	261	261	256	253			
	FF/ENG	4593	4631	4640	4647	4655	4615	4684			
120	%N1	79.8	83.9	85.7	87.5	89.3	91.2	93.3	96.2		
	MACH	.451	.496	.517	.539	.560	.582	.595	.612		
	KIAS	249	250	250	251	251	251	246	243		
	FF/ENG	4245	4246	4256	4260	4271	4283	4258	4340		
110	%N1	77.5	81.5	83.3	85.1	86.9	88.7	90.7	92.9	96.0	
	MACH	.434	.474	.494	.516	.538	.560	.582	.595	.612	
	KIAS	240	238	239	240	241	241	241	236	233	
	FF/ENG	3911	3870	3872	3878	3886	3896	3921	3908	3990	
100	%N1	75.4	79.1	80.7	82.5	84.3	86.2	88.0	90.0	92.2	95.5
	MACH	.416	.454	.471	.491	.513	.535	.558	.580	.594	.611
	KIAS	230	228	228	228	229	230	230	230	226	222
	FF/ENG	3590	3522	3503	3497	3507	3515	3532	3567	3558	3633
90	%N1	73.0	76.4	78.1	79.7	81.5	83.3	85.2	87.0	89.0	91.4
	MACH	.399	.433	.449	.466	.485	.507	.530	.553	.576	.592
	KIAS	220	217	217	216	217	218	218	219	218	215
	FF/ENG	3279	3190	3161	3137	3128	3139	3154	3179	3211	3208
80	%N1	70.2	73.8	75.2	76.8	78.5	80.1	82.0	83.8	85.7	87.7
	MACH	.381	.412	.426	.442	.459	.477	.499	.522	.546	.569
	KIAS	210	207	206	205	204	204	205	206	206	206
	FF/ENG	2978	2878	2837	2803	2779	2764	2780	2803	2826	2849

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion 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
308	279	253	233	215	200	190	180	172	164	157
621	561	509	467	431	400	379	360	343	327	314
938	846	767	702	648	600	569	540	514	491	470
1256	1132	1025	937	864	800	758	720	685	654	626
1576	1419	1283	1173	1081	1000	948	899	856	816	781
1899	1708	1543	1409	1298	1200	1137	1079	1026	979	937
2224	1999	1804	1646	1515	1400	1326	1258	1197	1142	1093
2551	2291	2065	1884	1733	1600	1516	1438	1368	1304	1248
2881	2584	2328	2122	1950	1800	1705	1618	1538	1467	1403

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	2.9	0:44	2.5	0:42	2.3	0:40	2.0	0:38	1.9	0:37
400	5.9	1:27	5.4	1:22	5.0	1:17	4.5	1:13	4.3	1:11
600	8.9	2:10	8.2	2:03	7.6	1:55	7.0	1:48	6.6	1:44
800	11.9	2:53	11.0	2:43	10.2	2:33	9.5	2:24	9.0	2:18
1000	14.8	3:37	13.7	3:25	12.8	3:12	11.9	3:00	11.3	2:52
1200	17.7	4:21	16.5	4:07	15.3	3:51	14.3	3:36	13.5	3:26
1400	20.6	5:06	19.2	4:49	17.8	4:30	16.6	4:13	15.8	4:00
1600	23.4	5:52	21.8	5:32	20.3	5:10	19.0	4:50	18.0	4:35
1800	26.3	6:38	24.5	6:15	22.8	5:51	21.3	5:27	20.2	5:10

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	80	100	120	140	160
5	-0.7	-0.3	0.0	0.7	1.6
10	-1.4	-0.7	0.0	1.4	3.4
15	-2.1	-1.1	0.0	2.1	4.9
20	-2.8	-1.4	0.0	2.7	6.2
25	-3.5	-1.8	0.0	3.2	7.4
30	-4.2	-2.1	0.0	3.6	8.4
35	-4.9	-2.5	0.0	3.9	9.1

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
170	%N1	79.1	82.0	86.3	90.8			
	KIAS	242	243	243	245			
	FF/ENG	5600	5590	5620	5710			
160	%N1	77.5	80.2	84.6	89.0	95.1		
	KIAS	235	235	236	237	239		
	FF/ENG	5270	5250	5260	5330	5480		
150	%N1	75.7	78.5	82.8	87.1	92.3		
	KIAS	227	228	228	229	231		
	FF/ENG	4940	4920	4910	4960	5040		
140	%N1	73.8	76.6	80.8	85.2	89.9	98.2	
	KIAS	220	220	221	222	223	224	
	FF/ENG	4610	4590	4570	4600	4630	5010	
130	%N1	71.6	74.7	78.7	83.1	87.7	94.5	
	KIAS	211	212	213	213	214	216	
	FF/ENG	4290	4260	4230	4240	4260	4450	
120	%N1	69.4	72.4	76.5	80.9	85.4	90.8	
	KIAS	202	204	204	205	206	207	
	FF/ENG	3970	3930	3900	3890	3900	3980	
110	%N1	67.2	70.0	74.2	78.4	83.0	87.7	96.3
	KIAS	194	194	195	196	197	198	199
	FF/ENG	3670	3610	3580	3560	3540	3580	3890
100	%N1	64.7	67.4	71.7	75.8	80.3	85.0	91.4
	KIAS	185	185	186	187	187	188	190
	FF/ENG	3360	3300	3260	3230	3200	3220	3360
90	%N1	61.9	64.7	68.7	73.1	77.4	82.0	87.0
	KIAS	178	178	178	178	178	178	180
	FF/ENG	3060	3010	2950	2920	2870	2870	2940
80	%N1	58.9	61.7	65.7	70.0	74.3	78.8	83.6
	KIAS	172	172	172	172	172	172	172
	FF/ENG	2760	2710	2660	2620	2570	2540	2590

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

Intentionally
Blank

Performance Inflight — Chapter PI

Gear Down — Section 24

GEAR DOWN

Long Range Cruise Altitude Capability

Max Cruise Thrust, 100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
170	19100	16400	13600
160	21600	19100	16300
150	23900	21800	19000
140	26100	24500	22000
130	28400	26900	25200
120	30500	29300	27800
110	32400	31500	30200
100	34400	33500	32400
90	36600	35700	34600
80	39100	38100	37000

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	21	23	25	27	29	31	33	35	37
170	%N1	83.7									
	MACH	.460									
	KIAS	254									
	FF/ENG	4891									
160	%N1	82.0	91.4								
	MACH	.447	.548								
	KIAS	247	245								
	FF/ENG	4586	4570								
150	%N1	80.2	89.6	91.6	94.2						
	MACH	.434	.535	.552	.569						
	KIAS	240	239	237	235						
	FF/ENG	4287	4274	4260	4308						
140	%N1	78.3	87.8	89.5	91.6	94.6					
	MACH	.420	.518	.538	.555	.573					
	KIAS	232	232	231	229	227					
	FF/ENG	3996	3965	3962	3963	4033					
130	%N1	76.4	85.7	87.5	89.3	91.6	94.8				
	MACH	.406	.500	.521	.541	.558	.576				
	KIAS	224	223	224	223	221	218				
	FF/ENG	3709	3655	3656	3661	3676	3756				
120	%N1	74.4	83.5	85.3	87.1	88.9	91.4	94.8			
	MACH	.391	.482	.501	.523	.543	.560	.579			
	KIAS	216	215	215	215	214	212	210			
	FF/ENG	3427	3351	3349	3358	3372	3389	3475			
110	%N1	72.0	81.1	82.9	84.6	86.5	88.3	90.9	94.4		
	MACH	.375	.462	.481	.501	.523	.543	.561	.580		
	KIAS	207	206	206	206	206	205	203	201		
	FF/ENG	3149	3054	3049	3055	3072	3084	3100	3190		
100	%N1	69.5	78.5	80.3	82.1	83.8	85.7	87.6	90.3	93.8	
	MACH	.359	.442	.460	.479	.499	.521	.542	.560	.580	
	KIAS	198	197	197	197	196	197	196	194	192	
	FF/ENG	2881	2764	2753	2758	2773	2787	2796	2810	2896	
90	%N1	66.8	75.7	77.5	79.2	81.0	82.8	84.6	86.6	89.3	93.2
	MACH	.343	.421	.438	.456	.475	.496	.518	.540	.558	.578
	KIAS	189	187	187	187	187	187	187	186	184	182
	FF/ENG	2624	2486	2464	2465	2481	2491	2499	2508	2520	2610
80	%N1	64.0	72.7	74.4	76.2	77.9	79.6	81.4	83.3	85.3	88.2
	MACH	.326	.398	.415	.432	.450	.469	.490	.512	.534	.554
	KIAS	179	177	177	176	176	176	176	176	176	174
	FF/ENG	2373	2220	2189	2182	2196	2202	2208	2212	2220	2244

GEAR DOWN

Long Range Cruise Enroute 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
324	290	260	236	217	200	188	178	168	160	153
655	584	523	474	435	400	377	357	338	321	307
990	881	787	713	653	600	566	535	507	483	461
1330	1181	1054	953	871	800	755	713	676	642	613
1676	1486	1323	1195	1091	1000	943	891	844	803	766
2027	1793	1594	1437	1310	1200	1131	1069	1013	962	918
2385	2106	1868	1681	1531	1400	1319	1246	1180	1121	1069
2749	2422	2143	1926	1751	1600	1507	1423	1347	1279	1220
3120	2742	2421	2172	1973	1800	1695	1600	1514	1437	1370

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT) 10		14		20		24		28	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	5.1	0:51	4.6	0:49	4.0	0:46	3.7	0:44	3.4	0:43
400	10.4	1:40	9.6	1:35	8.5	1:28	7.9	1:24	7.4	1:21
600	15.6	2:30	14.5	2:22	12.9	2:11	12.0	2:04	11.3	1:59
800	20.7	3:22	19.3	3:10	17.2	2:55	16.0	2:46	15.1	2:38
1000	25.7	4:14	23.9	4:00	21.4	3:40	20.0	3:27	18.8	3:17
1200	30.5	5:08	28.5	4:50	25.5	4:25	23.8	4:10	22.5	3:57
1400	35.3	6:03	32.9	5:42	29.5	5:12	27.6	4:53	26.1	4:38
1600	39.9	6:59	37.3	6:34	33.4	5:59	31.3	5:37	29.6	5:19
1800	44.5	7:57	41.5	7:28	37.3	6:47	34.9	6:22	33.0	6:01

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB) 80	100	120	140	160
5	-0.8	-0.4	0.0	0.6	1.5
10	-1.7	-0.8	0.0	1.2	2.9
15	-2.5	-1.2	0.0	1.8	4.3
20	-3.4	-1.7	0.0	2.4	5.5
25	-4.2	-2.1	0.0	2.9	6.6
30	-5.1	-2.5	0.0	3.4	7.7
35	-5.9	-2.9	0.0	3.9	8.6
40	-6.8	-3.4	0.0	4.3	9.5
45	-7.6	-3.8	0.0	4.7	10.2

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (LB)	DISTANCE (NM)
41000	21	590	88
39000	20	580	84
37000	20	570	79
35000	19	560	75
33000	18	550	71
31000	18	540	67
29000	17	530	63
27000	16	520	59
25000	15	500	55
23000	14	490	51
21000	14	470	47
19000	13	450	43
17000	12	440	39
15000	11	410	35
10000	9	360	25
5000	6	290	16
1500	4	230	9

Allowances for a straight-in approach are included.

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT) 1500	5000	10000	15000	20000	25000	30000	35000
170	%N1	73.5	76.4	80.5	84.8	89.5			
	KIAS	221	221	221	221	221			
	FF/ENG	4550	4520	4500	4520	4550			
160	%N1	71.9	74.9	78.9	83.3	87.9	94.4		
	KIAS	217	217	217	217	217	217		
	FF/ENG	4310	4280	4260	4260	4270	4430		
150	%N1	70.2	73.3	77.3	81.6	86.1	91.6		
	KIAS	212	212	212	212	212	212		
	FF/ENG	4070	4040	4010	4000	4000	4080		
140	%N1	68.6	71.4	75.6	79.8	84.3	89.2		
	KIAS	207	207	207	207	207	207		
	FF/ENG	3840	3790	3760	3740	3730	3780		
130	%N1	66.8	69.5	73.8	77.9	82.4	87.1	94.6	
	KIAS	202	202	202	202	202	202	202	
	FF/ENG	3600	3550	3510	3490	3470	3490	3700	
120	%N1	64.9	67.6	71.8	75.9	80.4	85.0	90.8	
	KIAS	196	196	196	196	196	196	196	
	FF/ENG	3370	3320	3270	3240	3210	3220	3320	
110	%N1	62.7	65.6	69.6	73.9	78.2	82.7	87.6	
	KIAS	190	190	190	190	190	190	190	
	FF/ENG	3130	3080	3030	3000	2960	2960	3020	
100	%N1	60.5	63.5	67.4	71.7	75.9	80.4	85.1	92.6
	KIAS	184	184	184	184	184	184	184	184
	FF/ENG	2910	2860	2810	2770	2720	2700	2750	2900
90	%N1	58.3	61.0	65.1	69.3	73.5	78.0	82.5	88.1
	KIAS	178	178	178	178	178	178	178	178
	FF/ENG	2680	2630	2590	2540	2490	2460	2490	2550
80	%N1	56.0	58.6	62.8	66.7	71.2	75.4	79.9	84.6
	KIAS	172	172	172	172	172	172	172	172
	FF/ENG	2460	2420	2380	2330	2280	2230	2260	2270

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

Intentionally
Blank

Performance Inflight — Chapter PI
Gear Down, Engine Inop — Section 25

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
160	150	214	2600		
150	141	210	5600	3300	
140	132	205	8600	6600	4200
130	123	199	11400	9800	7600
120	114	194	14100	13000	11100
110	105	188	16700	15800	14600
100	95	183	19400	18300	17200
90	86	177	22000	21000	19900
80	76	171	24700	23800	22800

Includes APU fuel burn.

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
140	2300		
130	6500	3600	
120	10500	8100	5300
110	14000	12500	9800
100	17300	16300	15000
90	20600	19500	18300
80	23700	22700	21700

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		5	7	9	11	13	15	17	19	21	23
130	%N1	90.1	91.8								
	MACH	.361	.373								
	KIAS	218	217								
	FF/ENG	7007	7011								
120	%N1	87.8	89.4	91.2	93.0						
	MACH	.349	.360	.372	.385						
	KIAS	211	210	209	208						
	FF/ENG	6453	6432	6432	6452						
110	%N1	85.4	87.0	88.5	90.3	92.1	94.8				
	MACH	.337	.348	.359	.371	.383	.397				
	KIAS	204	203	201	200	200	199				
	FF/ENG	5926	5885	5860	5861	5882	5959				
100	%N1	83.0	84.4	85.9	87.5	89.2	91.1	93.7			
	MACH	.325	.335	.345	.356	.368	.381	.395			
	KIAS	197	195	194	193	192	191	190			
	FF/ENG	5423	5366	5324	5299	5299	5309	5350			
90	%N1	80.3	81.7	83.2	84.6	86.2	87.9	89.8	92.2	96.0	
	MACH	.313	.322	.331	.341	.352	.364	.377	.391	.406	
	KIAS	189	188	186	184	183	182	181	181	180	
	FF/ENG	4946	4872	4814	4772	4747	4736	4729	4743	4889	
80	%N1	77.5	78.8	80.2	81.6	83.1	84.7	86.4	88.4	90.5	94.2
	MACH	.300	.309	.317	.326	.336	.347	.359	.373	.388	.404
	KIAS	182	180	178	176	175	173	172	172	172	172
	FF/ENG	4485	4409	4333	4274	4231	4198	4170	4174	4196	4319

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)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
178	155	135	121	110	100	93	87	81	77	73
361	314	274	244	220	200	186	174	163	154	146
546	473	412	366	331	300	279	260	244	230	218
732	634	551	489	441	400	372	347	325	306	290
920	796	692	613	552	500	465	434	407	383	362
1109	958	832	737	663	600	558	520	487	458	434
1300	1122	973	861	774	700	651	607	568	534	505
1493	1287	1115	986	885	800	744	693	648	610	577
1688	1453	1257	1110	997	900	836	779	729	685	648
1884	1620	1400	1235	1108	1000	929	865	809	760	719

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT) 6		10		14	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
100	2.6	0:28	2.4	0:27	2.1	0:26
200	5.5	0:54	5.1	0:52	4.7	0:50
300	8.3	1:21	7.7	1:17	7.3	1:14
400	11.1	1:48	10.3	1:43	9.8	1:38
500	13.8	2:15	12.9	2:09	12.3	2:03
600	16.5	2:42	15.5	2:35	14.7	2:27
700	19.1	3:10	18.0	3:01	17.1	2:52
800	21.8	3:38	20.5	3:28	19.5	3:17
900	24.4	4:06	22.9	3:54	21.8	3:43
1000	26.9	4:35	25.3	4:22	24.1	4:08

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB) 80	100	120	140	160
2	-0.3	-0.2	0.0	0.3	0.6
6	-1.0	-0.5	0.0	1.0	2.0
10	-1.7	-0.8	0.0	1.8	3.5
14	-2.3	-1.2	0.0	2.5	4.9
18	-3.0	-1.5	0.0	3.2	6.3
22	-3.6	-1.8	0.0	3.8	7.6
26	-4.3	-2.1	0.0	4.4	9.0
30	-5.0	-2.5	0.0	5.0	10.3

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT) 1500	5000	10000	15000
160	%N1	90.8			
	KIAS	217			
	FF/ENG	8330			
150	%N1	88.9	92.1		
	KIAS	212	212		
	FF/ENG	7800	7880		
140	%N1	87.0	90.1		
	KIAS	207	207		
	FF/ENG	7280	7330		
130	%N1	84.9	87.9	92.7	
	KIAS	202	202	202	
	FF/ENG	6760	6790	6890	
120	%N1	82.7	85.7	90.3	
	KIAS	196	196	196	
	FF/ENG	6270	6270	6330	
110	%N1	80.4	83.4	87.8	93.1
	KIAS	190	190	190	190
	FF/ENG	5790	5770	5790	5920
100	%N1	78.0	80.9	85.3	90.1
	KIAS	184	184	184	184
	FF/ENG	5330	5300	5290	5370
90	%N1	75.6	78.3	82.7	87.3
	KIAS	178	178	178	178
	FF/ENG	4890	4840	4820	4850
80	%N1	72.9	75.8	79.9	84.4
	KIAS	172	172	172	172
	FF/ENG	4450	4410	4360	4370

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 provided that adjustments are made to V1 for clearway, stopway, anti-skid inoperative, thrust reversers inoperative, improved climb, contaminated runway situations or brake energy limits. These speeds may be used for weights less than or equal to the performance limited weight.

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. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (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.

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.

Clearway and Stopway V1 Adjustments

Maximum allowable clearway limits are provided for guidance when more precise data is not available. Use of clearway is not allowed on wet runways.

Takeoff speed adjustments are to be applied to V1 speed when using takeoff weights based on the use of clearway and stopway.

Adjust V1 speed by the amount shown in the table. The adjusted V1 speed must not exceed VR. If the adjusted V1 speed is greater than VR, reduce V1 to equal VR.

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.

With autothrottles disengaged an approach speed wind correction (max 20 knots) of 1/2 steady headwind component + gust increment above steady wind is recommended. Do not apply a wind correction for tailwinds. The maximum command speed should not exceed landing flap placard speed minus 5 knots.

Flap Maneuver Speeds

This table provides the flap speed schedule for recommended maneuver speeds. Using VREF as the basis for the schedule makes it variable as a function of weight and will provide adequate maneuver margin above stall at all weights.

During flap retraction/extension, movement of the flap to the next position should be initiated when within 20 knots of the recommended speed for that position.

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 depths greater than 0.5 inches (13 mm) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. The use of assumed temperature for reduced thrust is not allowed on contaminated runways. Interpolation for slush/standing water depths between the values shown is permitted.

Takeoff weight 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 17500 lb and the V1 associated with the reduced weight by the amount shown in the table below.

ANTI-SKID INOPERATIVE V1 ADJUSTMENTS	
FIELD LENGTH (FT)	V1 ADJUSTMENT (KIAS)
6000	-18
8000	-15
10000	-12
12000	-10
14000	-9

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 7200 ft.

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 field/obstacle limited weight and V1 speed 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/field/obstacle limited weight by 2200 lb 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 5200 ft.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

Takeoff %N1

To find Max Takeoff %N1 based on normal engine bleed for air conditioning packs on, enter Takeoff %N1 table with airport pressure altitude and airport OAT and read %N1. For packs off operation, apply the %N1 adjustment shown below the table. No takeoff %N1 adjustment is required for engine and wing anti-ice.

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.

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

Normal Configuration Landing Distance

The normal configuration distance tables are provided as advisory information to help determine the actual landing distance performance of the airplane for different runway surface conditions and brake configurations.

Flaps 15, 30, and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking action, which are commonly referred to as slippery runway conditions.

If the surface is affected by water, snow or ice, and the 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 landing. 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 "poor" data reflects runways covered with wet ice.

Dry runway landing performance is shown for max manual braking configuration and autobrake settings max, 3, 2, and 1. Use of autobrake setting 1 is not recommended for landings on slippery runways, and is therefore not provided for these conditions. The autobrake performance may be used to assist in the selection of the most desirable autobrake setting for a given field length. Selection of an autobrake setting results in a constant rate of deceleration. Maximum effort manual braking should achieve shorter landing distance than the max autobrake setting. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and normal approach speed for the selected landing flap at sea level, zero wind, zero slope, and two engine detent reverse thrust. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, temperature, speed, and reverse thrust. Each adjustment is independently added to the reference landing distance.

Non-normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect the landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, and speed conditions. Each adjustment is independently added to the reference landing distance. Landing distance includes the effect of max manual braking and reverse thrust.

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 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 (LB/HR)
39	100
35	100
31	110
25	130
20	150
15	160
10	180
5	200

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.

Alternate Mode EEC

Introduction

No takeoff speed adjustments or other performance adjustments are required of Electronic Engine Control (EEC) in the alternate mode (ALTN EEC switch illuminated) for the CFM56-7B18, -7B20, -7B22 and -7B24 engine thrust ratings.

Operation with derate and/or assumed temperature reduced thrust is not permitted with the EEC in alternate mode.

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.

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737-800 CFM56-7B26 KG FAA CATC

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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	169	171	175	161	163	168									
85	163	166	171	157	159	164	156	157	162						
80	158	160	167	152	154	160	151	152	158	148	149	155	145	146	153
75	153	155	162	147	148	156	146	147	154	142	144	151	140	141	149
70	147	149	158	141	143	152	140	141	150	137	138	147	135	136	145
65	141	143	153	135	137	147	134	136	146	131	133	143	129	130	140
60	135	136	148	129	131	143	128	129	141	125	126	138	123	124	136
55	128	129	143	123	124	137	122	123	136	119	120	133	117	118	131
50	121	122	137	116	117	132	115	116	130	112	113	128	110	111	126
45	113	114	131	109	110	126	108	108	125	105	106	122	103	104	120
40	105	106	125	101	102	120	100	101	119	98	99	117	96	97	115

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	-3					
60	140	4	5	6	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	3	4	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	3	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	-2	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	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	1
50	-1	0	0	0	1	-2	-1	0	0	0	1	1	1
40	0	0	0	0	0	-2	-1	0	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	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

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	164	171	175	156	164	168									
85	157	166	171	150	159	164	151	157	162						
80	151	160	167	145	154	160	145	152	158	141	149	155	140	146	153
75	145	155	162	139	148	156	139	147	154	136	144	151	134	141	149
70	139	149	158	133	143	152	133	141	150	130	138	147	128	136	145
65	133	143	153	127	137	148	127	136	146	124	133	143	122	130	140
60	126	136	148	121	131	143	120	129	141	117	126	138	115	124	136
55	119	129	143	114	124	137	113	123	136	111	120	133	109	118	131
50	111	122	137	107	117	132	106	116	130	104	113	128	102	111	126
45	104	114	131	99	110	126	99	108	125	96	106	122	95	104	120
40	96	106	125	92	102	120	91	101	119	89	99	117	87	97	115

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	8						4	5						-3	-4					
60	140	5	6	7	9				3	4	5	6				-2	-3	-3	-4			
50	122	3	4	5	6	8	9	12	2	3	4	5	6	7	8	-2	-2	-3	-3	-4	-5	-6
40	104	1	2	3	4	6	7	9	1	1	3	4	5	6	7	-1	-1	-2	-2	-3	-4	-5
30	86	0	0	1	3	4	6	7	0	0	1	3	4	5	6	0	0	-1	-2	-2	-3	-4
20	68	0	0	1	2	4	5	6	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	2	2	3
80	-5	-2	0	3	5	-4	-2	-1	0	1	2	2	3
70	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
60	-3	-1	0	2	3	-4	-3	-1	0	1	2	2	3
50	-2	-1	0	1	3	-4	-3	-1	0	1	2	3	4
40	-1	0	0	1	2	-5	-3	-1	0	1	3	4	5

***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	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

Maximum Allowable Clearway

FIELD LENGTH (M)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1200	150
1600	180
2000	210
2400	240
2800	270
3200	290

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
200	-5	-4	-3	-3				
100	-3	-2	-2	-2				
0	0	0	0	0	0	0	0	0
-100	1	1	1	1	2	2	2	1
-200	1	1	1	1	4	3	2	2
-300	1	1	1	1	6	5	3	2

Use of clearway not allowed on wet runway.

Stab Trim Setting
Max Takeoff Thrust
Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)										
	6	8	9	11	16	21	26	30	32	34	36
85	8 1/2	8 1/2	8 1/2	8 1/4	7	6 1/4	5 1/2	4 3/4	4 1/2	4 1/4	3 3/4
80	8 1/2	8 1/2	8 1/4	7 3/4	6 3/4	6	5 1/4	4 1/2	4 1/4	4	3 1/2
75	8 1/4	8	7 3/4	7 1/2	6 1/2	5 3/4	5	4 1/2	4	3 3/4	3 1/2
70	8	7 3/4	7 1/2	7 1/4	6 1/4	5 1/2	4 3/4	4 1/4	3 3/4	3 1/2	3 1/4
65	7 3/4	7 1/4	7	6 3/4	6	5 1/4	4 1/2	4	3 3/4	3 1/4	3
60	7 1/4	7	6 3/4	6 1/2	5 3/4	5	4 1/4	3 3/4	3 1/2	3 1/4	2 3/4
55	6 3/4	6 1/2	6 1/2	6 1/4	5 1/2	4 3/4	4 1/4	3 1/2	3 1/4	3	2 3/4
50	6 1/2	6	6	5 3/4	5	4 1/2	3 3/4	3 1/4	3	2 3/4	2 1/4
45	6	5 3/4	5 1/2	5 1/2	4 3/4	4	3 1/2	3	2 1/2	2 1/2	2 1/4
40	6	5 3/4	5 1/2	5 1/2	4 3/4	4	3 1/2	3	2 1/2	2 1/2	2 1/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)										
	6	8	9	11	16	21	26	30	32	34	36
85	8 1/2	8 1/2	8 1/2	8 1/2	6 1/2	5 1/2	4 1/4	3 1/2	3	2 1/2	2 1/4
80	8 1/2	8 1/2	8 1/2	8 1/2	6	5	4	3 1/4	2 3/4	2 1/2	2 1/4
75	8 1/2	8 1/2	8 1/2	7 3/4	5 3/4	4 3/4	3 3/4	3	2 1/2	2 1/4	2 1/4
70	8 1/2	8 1/4	8 1/4	7 1/4	5 1/2	4 1/2	3 1/2	2 3/4	2 1/2	2 1/4	2 1/4
65	8 1/4	7 3/4	7 1/2	6 3/4	5 1/4	4 1/4	3 1/4	2 1/2	2 1/4	2 1/4	2 1/4
60	7 3/4	7	6 3/4	6 1/4	4 3/4	4	3	2 1/4	2 1/4	2 1/4	2 1/4
55	7	6 1/2	6 1/4	5 3/4	4 1/2	3 3/4	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4
50	6	5 3/4	5 1/2	5	4	3 1/4	2 1/2	2 1/4	2 1/4	2 1/4	2 1/4
45	5	4 3/4	4 1/2	4 1/2	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4
40	5	4 3/4	4 1/2	4 1/2	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4

VREF

WEIGHT (1000 KG)	FLAPS		
	40	30	15
85	160	168	177
80	155	163	172
75	151	158	167
70	146	153	161
65	141	148	156
60	135	142	149
55	128	136	143
50	122	129	136
45	115	122	128
40	108	115	121

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	-12.7	-15.0	-17.3	-15.6	-17.8	-20.1	-21.5	-23.8	-26.0
90	-11.7	-14.0	-16.3	-14.2	-16.5	-18.7	-19.4	-21.7	-23.9
85	-10.7	-13.0	-15.3	-12.8	-15.1	-17.4	-17.3	-19.6	-21.8
80	-9.7	-12.0	-14.3	-11.5	-13.8	-16.0	-15.2	-17.5	-19.7
75	-8.8	-11.0	-13.3	-10.2	-12.5	-14.7	-13.2	-15.5	-17.8
70	-7.8	-10.1	-12.3	-9.0	-11.2	-13.5	-11.4	-13.6	-15.9
65	-6.9	-9.2	-11.4	-7.8	-10.0	-12.3	-9.7	-11.9	-14.2
60	-6.0	-8.3	-10.5	-6.7	-8.9	-11.2	-8.1	-10.4	-12.7
55	-5.2	-7.4	-9.7	-5.6	-7.9	-10.2	-6.7	-9.0	-11.2
50	-4.3	-6.6	-8.9	-4.7	-6.9	-9.2	-5.4	-7.7	-10.0
45	-3.5	-5.8	-8.1	-3.8	-6.0	-8.3	-4.3	-6.6	-8.8
40	-2.8	-5.0	-7.3	-2.9	-5.2	-7.5	-3.3	-5.5	-7.8

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							33.4		
1400	41.8			45.4			51.5	36.3	
1600	61.5	44.9		65.2	48.5	32.8	71.1	54.6	39.2
1800	83.3	64.9	48.0	86.8	68.5	51.7	92.5	74.4	57.7
2000		87.1	68.4		90.5	72.0		96.1	77.8
2200			90.9			94.1			99.7

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 -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	-15	-10	-5	-7	-2	0	0	0	0
85	-16	-11	-6	-10	-5	0	0	0	0
80	-18	-13	-8	-12	-7	-2	0	0	0
75	-19	-14	-9	-14	-9	-4	0	0	0
70	-20	-15	-10	-16	-11	-6	-4	0	0
65	-21	-16	-11	-17	-12	-7	-8	-3	0
60	-22	-17	-12	-19	-14	-9	-11	-6	-1
55	-23	-18	-13	-20	-15	-10	-14	-9	-4
50	-24	-19	-14	-22	-17	-12	-17	-12	-7
45	-25	-20	-15	-23	-18	-13	-19	-14	-9
40	-25	-20	-15	-24	-19	-14	-21	-16	-11

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	-14.6	-17.3	-20.1	-17.7	-20.4	-23.1	-23.9	-26.6	-29.3
90	-13.6	-16.3	-19.1	-16.3	-19.0	-21.7	-21.7	-24.4	-27.1
85	-12.6	-15.4	-18.1	-14.9	-17.6	-20.3	-19.4	-22.1	-24.9
80	-11.7	-14.4	-17.1	-13.5	-16.2	-18.9	-17.2	-19.9	-22.6
75	-10.6	-13.3	-16.0	-12.0	-14.8	-17.5	-15.0	-17.8	-20.5
70	-9.5	-12.2	-14.9	-10.6	-13.4	-16.1	-13.1	-15.8	-18.5
65	-8.4	-11.1	-13.8	-9.3	-12.0	-14.7	-11.2	-13.9	-16.7
60	-7.3	-10.0	-12.8	-8.0	-10.7	-13.4	-9.5	-12.2	-15.0
55	-6.3	-9.0	-11.7	-6.8	-9.5	-12.3	-8.0	-10.7	-13.4
50	-5.4	-8.1	-10.9	-5.8	-8.5	-11.2	-6.6	-9.3	-12.0
45	-4.7	-7.4	-10.1	-4.9	-7.6	-10.4	-5.4	-8.1	-10.8
40	-4.0	-6.7	-9.5	-4.1	-6.9	-9.6	-4.2	-6.9	-9.6

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				32.3			47.4	31.6	
1800	46.7			56.0	37.9		69.3	52.5	36.5
2000	73.2	52.8	33.6	81.3	61.9	43.5	92.9	74.7	57.6
2200	101.8	79.9	59.0		87.6	67.9		98.6	80.3
2400			86.7			94.0			104.3

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 -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 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	-20	-10	0	-11	-1	0	0	0	0
85	-22	-12	-2	-14	-4	0	0	0	0
80	-24	-14	-4	-16	-6	0	0	0	0
75	-25	-15	-5	-19	-9	0	0	0	0
70	-27	-17	-7	-21	-11	-1	-6	0	0
65	-28	-18	-8	-23	-13	-3	-11	-1	0
60	-29	-19	-9	-25	-15	-5	-15	-5	0
55	-30	-20	-10	-27	-17	-7	-19	-9	0
50	-31	-21	-11	-28	-18	-8	-22	-12	-2
45	-32	-22	-12	-30	-20	-10	-25	-15	-5
40	-32	-22	-12	-31	-21	-11	-27	-17	-7

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	-0.8	-0.8	-0.8	-6.4	-6.4	-6.4	-11.5	-11.5	-11.5
90	-1.0	-1.0	-1.0	-6.4	-6.4	-6.4	-11.1	-11.1	-11.1
85	-1.3	-1.3	-1.3	-6.3	-6.3	-6.3	-10.6	-10.6	-10.6
80	-1.4	-1.4	-1.4	-6.1	-6.1	-6.1	-10.1	-10.1	-10.1
75	-1.5	-1.5	-1.5	-5.9	-5.9	-5.9	-9.6	-9.6	-9.6
70	-1.6	-1.6	-1.6	-5.7	-5.7	-5.7	-9.0	-9.0	-9.0
65	-1.5	-1.5	-1.5	-5.4	-5.4	-5.4	-8.4	-8.4	-8.4
60	-1.5	-1.5	-1.5	-5.0	-5.0	-5.0	-7.6	-7.6	-7.6
55	-1.3	-1.3	-1.3	-4.5	-4.5	-4.5	-6.9	-6.9	-6.9
50	-1.1	-1.1	-1.1	-4.0	-4.0	-4.0	-6.1	-6.1	-6.1
45	-0.8	-0.8	-0.8	-3.4	-3.4	-3.4	-5.2	-5.2	-5.2
40	-0.5	-0.5	-0.5	-2.8	-2.8	-2.8	-4.3	-4.3	-4.3

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	39.6								
1200	72.0	57.3	42.4						
1400	103.9	89.4	74.8	46.2	31.3				
1600				69.6	53.3	38.1			
1800				95.6	77.5	60.6	41.6		
2000					104.1	85.6	55.7	40.7	
2200							71.2	54.7	39.8
2400							88.8	70.1	53.7
2600								87.5	69.0
2800									86.3

1. **Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Find V1(MCG) limit weight for available field length and pressure altitude.**
   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. **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	-5	-2	0	-13	-11	-8	-25	-23	-20
85	-6	-3	-1	-15	-13	-10	-27	-24	-22
80	-7	-4	-2	-17	-14	-12	-29	-26	-24
75	-8	-5	-3	-18	-16	-13	-31	-28	-26
70	-9	-6	-4	-20	-17	-15	-33	-30	-28
65	-9	-7	-4	-21	-19	-16	-35	-32	-30
60	-10	-8	-5	-22	-20	-17	-37	-34	-32
55	-11	-9	-6	-24	-21	-19	-38	-36	-33
50	-12	-9	-7	-25	-22	-20	-40	-37	-35
45	-13	-10	-8	-26	-24	-21	-41	-39	-36
40	-14	-11	-9	-27	-25	-22	-42	-40	-37

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	-2.1	-2.1	-2.1	-9.3	-9.3	-9.3	-15.9	-15.9	-15.9
90	-2.4	-2.4	-2.4	-9.2	-9.2	-9.2	-15.2	-15.2	-15.2
85	-2.7	-2.7	-2.7	-9.1	-9.1	-9.1	-14.5	-14.5	-14.5
80	-2.9	-2.9	-2.9	-9.0	-9.0	-9.0	-13.8	-13.8	-13.8
75	-3.1	-3.1	-3.1	-8.7	-8.7	-8.7	-13.0	-13.0	-13.0
70	-3.2	-3.2	-3.2	-8.4	-8.4	-8.4	-12.2	-12.2	-12.2
65	-3.2	-3.2	-3.2	-8.0	-8.0	-8.0	-11.3	-11.3	-11.3
60	-3.1	-3.1	-3.1	-7.5	-7.5	-7.5	-10.4	-10.4	-10.4
55	-3.0	-3.0	-3.0	-7.0	-7.0	-7.0	-9.4	-9.4	-9.4
50	-2.8	-2.8	-2.8	-6.3	-6.3	-6.3	-8.4	-8.4	-8.4
45	-2.5	-2.5	-2.5	-5.6	-5.6	-5.6	-7.3	-7.3	-7.3
40	-2.2	-2.2	-2.2	-4.8	-4.8	-4.8	-6.2	-6.2	-6.2

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	38.0								
1400	86.5	67.4	43.5						
1600			89.8						
2000				72.9	33.7				
2200					86.8	53.8			
2400						100.0			
3200							75.7		
3400								70.0	
3600									63.9
3800									101.4

1. **Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Find V1(MCG) limit weight for available field length and pressure altitude.**
   Adjust “Good” field length available by -25 m/+25 m for every 5°C above/below 4°C.
   Adjust “Medium” field length available by -25 m/+25 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. **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	-7	-2	0	-19	-14	-9	-39	-34	-29
85	-8	-3	0	-21	-16	-11	-42	-37	-32
80	-9	-4	0	-24	-19	-14	-45	-40	-35
75	-11	-6	-1	-26	-21	-16	-49	-44	-39
70	-12	-7	-2	-28	-23	-18	-52	-47	-42
65	-14	-9	-4	-31	-26	-21	-56	-51	-46
60	-15	-10	-5	-34	-29	-24	-59	-54	-49
55	-17	-12	-7	-37	-32	-27	-63	-58	-53
50	-18	-13	-8	-40	-35	-30	-66	-61	-56
45	-20	-15	-10	-43	-38	-33	-70	-65	-60
40	-22	-17	-12	-46	-41	-36	-74	-69	-64

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 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
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 and engine 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

%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	172	172	174												
85	166	167	170	159	160	163									
80	160	162	166	154	155	159									
75	155	156	161	149	150	155	148	148	153	145	145	150	142	142	148
70	149	150	157	143	144	151	142	143	149	139	140	146	137	137	144
65	143	144	152	137	138	147	136	137	145	133	134	142	131	131	139
60	137	138	147	131	132	142	130	131	140	127	128	137	125	125	135
55	130	131	142	124	125	136	123	124	135	121	121	132	118	119	130
50	122	123	136	118	118	131	116	117	129	114	115	127	112	112	125
45	115	116	130	110	111	125	109	110	124	107	107	121	105	105	119
40	107	108	124	103	103	119	102	102	118	99	100	116	97	98	114

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						5	5						-3	-4					
60	140	4	5	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	-4	-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	3	4	5	6	0	0	1	2	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
84	-3	-2	0	1	1	-1	-1	0	0	0	1	1	1
76	-3	-1	0	1	1	-1	-1	0	0	0	1	1	1
68	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
60	-1	-1	0	1	1	-1	-1	0	0	0	1	1	1
52	-1	0	0	1	1	-1	-1	0	0	0	1	1	1
44	0	0	0	0	1	-2	-1	0	0	0	0	1	1

***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)	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	172	174												
85	161	167	170	154	160	163									
80	155	162	166	148	155	159									
75	149	156	161	142	150	155	142	148	153	139	145	150	137	142	148
70	142	150	157	136	144	151	136	143	149	133	140	146	131	137	144
65	136	144	152	130	138	147	129	137	145	127	134	142	125	131	139
60	129	138	147	123	132	142	123	131	140	120	128	137	118	125	135
55	122	131	142	116	125	136	116	124	135	113	121	132	111	119	130
50	114	123	136	109	118	131	109	117	129	106	115	127	104	112	125
45	107	116	130	102	111	125	101	110	124	99	107	121	97	105	119
40	98	108	124	94	103	119	93	102	118	92	100	115	90	98	114

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	8						5	5						-3	-4					
60	140	5	6	8	9				3	4	5	6				-2	-3	-3	-4			
50	122	3	4	5	7	8	10	11	2	3	4	5	6	7	8	-2	-2	-3	-3	-4	-4	-5
40	104	1	2	3	5	6	7	9	1	2	3	4	5	6	7	-1	-1	-2	-2	-3	-4	-4
30	86	0	0	1	3	4	6	7	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 Adjustment*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
84	-5	-3	0	3	6	-3	-2	-1	0	1	1	2	2
76	-4	-2	0	2	5	-3	-2	-1	0	1	1	2	3
68	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
60	-3	-1	0	2	3	-4	-2	-1	0	1	1	2	3
52	-2	-1	0	1	3	-4	-3	-1	0	1	2	3	3
44	-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

Maximum Allowable Clearway (24K Derate)

FIELD LENGTH (M)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1200	150
1600	180
2000	210
2400	240
2800	270
3200	290

Clearway and Stopway V1 Adjustments (24K Derate)

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
200	-5	-4	-3	-3				
100	-3	-2	-2	-2				
0	0	0	0	0	0	0	0	0
-100	1	1	1	1	3	2	1	1
-200	1	1	1	1	6	4	2	1
-300	1	1	1	1	7	6	3	1

Use of clearway not allowed on wet runway.

Stab Trim Setting (24K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)									
	6	8	10	16	21	26	30	32	34	36
85	8 1/2	8 1/2	8 1/4	7 1/2	6 1/2	5 3/4	5	4 1/2	4 1/4	3 3/4
80	8 1/2	8 1/4	8	7	6 1/4	5 1/2	4 3/4	4 1/2	4	3 3/4
75	8 1/4	8	7 3/4	6 3/4	6	5 1/4	4 1/2	4 1/4	4	3 1/2
70	8	7 3/4	7 1/2	6 1/2	5 3/4	5	4 1/2	4	3 3/4	3 1/4
65	7 3/4	7 1/2	7 1/4	6 1/4	5 1/2	4 3/4	4 1/4	4	3 1/2	3 1/4
60	7 1/2	7 1/4	7	6	5 1/2	4 3/4	4	3 3/4	3 1/4	3
55	7 1/4	7	6 3/4	5 3/4	5 1/4	4 1/2	3 3/4	3 1/2	3 1/4	2 3/4
50	6 3/4	6 1/2	6 1/4	5 1/2	4 3/4	4	3 1/2	3 1/4	2 3/4	2 1/2
45	6 1/2	6 1/4	6	5	4 1/2	3 3/4	3	2 3/4	2 1/2	2 1/4
40	6 1/2	6 1/4	6	5	4 1/2	3 3/4	3	2 3/4	2 1/2	2 1/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)									
	6	8	10	16	21	26	30	32	34	36
85	8 1/2	8 1/2	8 1/2	6 3/4	5 1/2	4 1/2	3 3/4	3 1/4	2 3/4	2 1/2
80	8 1/2	8 1/2	8 1/2	6 1/2	5 1/2	4 1/2	3 1/2	3 1/4	2 3/4	2 1/4
75	8 1/2	8 1/2	8 1/4	6 1/4	5 1/4	4 1/4	3 1/2	3	2 1/2	2 1/4
70	8 1/2	8 1/4	7 3/4	6	5	4	3 1/4	2 3/4	2 1/4	2 1/4
65	8 1/4	7 3/4	7 1/4	5 1/2	4 3/4	3 3/4	3	2 1/2	2 1/4	2 1/4
60	7 3/4	7 1/4	6 3/4	5 1/4	4 1/4	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4
55	7	6 3/4	6 1/4	5	4	3 1/4	2 1/2	2 1/4	2 1/4	2 1/4
50	6 1/2	6	5 3/4	4 1/2	3 3/4	3	2 1/4	2 1/4	2 1/4	2 1/4
45	5 3/4	5 1/2	5	4 1/4	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4
40	5 3/4	5 1/2	5	4 1/4	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4

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	-12.8	-15.3	-17.8	-16.4	-18.9	-21.4	-25.3	-27.8	-30.3
90	-11.8	-14.3	-16.8	-14.8	-17.3	-19.8	-22.4	-24.9	-27.4
85	-10.9	-13.4	-15.9	-13.3	-15.8	-18.3	-19.5	-22.0	-24.5
80	-9.9	-12.4	-14.9	-11.9	-14.4	-16.9	-16.8	-19.3	-21.8
75	-9.0	-11.4	-13.9	-10.6	-13.1	-15.6	-14.4	-16.9	-19.4
70	-8.0	-10.5	-13.0	-9.3	-11.8	-14.3	-12.2	-14.7	-17.2
65	-7.1	-9.6	-12.1	-8.2	-10.6	-13.1	-10.2	-12.7	-15.2
60	-6.2	-8.7	-11.2	-7.1	-9.6	-12.0	-8.5	-11.0	-13.5
55	-5.4	-7.9	-10.4	-6.0	-8.5	-11.0	-7.1	-9.6	-12.1
50	-4.5	-7.0	-9.5	-4.9	-7.4	-9.9	-5.9	-8.4	-10.9
45	-3.6	-6.1	-8.6	-3.8	-6.3	-8.8	-4.9	-7.4	-9.9
40	-2.7	-5.2	-7.7	-2.7	-5.2	-7.7	-4.2	-6.7	-9.2

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	30.2			33.6			39.3		
1400	50.4	34.9		53.6	38.2		58.9	43.8	
1600	72.3	55.4	39.7	75.3	58.6	42.9	80.6	63.8	48.4
1800	96.2	77.8	60.6	99.0	80.8	63.7	104.3	86.2	68.9
2000		102.0	83.4		104.7	86.4			91.8

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 -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	-13	-11	-8	-7	-5	-2	0	0	0
85	-14	-12	-9	-8	-6	-3	0	0	0
80	-15	-13	-10	-9	-7	-4	0	0	0
75	-17	-14	-12	-11	-8	-6	0	0	0
70	-18	-15	-13	-12	-10	-7	0	0	0
65	-19	-16	-14	-14	-12	-9	-3	-1	0
60	-20	-18	-15	-16	-14	-11	-7	-5	-2
55	-22	-19	-17	-19	-16	-14	-11	-9	-6
50	-22	-20	-17	-20	-18	-15	-14	-12	-9
45	-23	-20	-18	-21	-18	-16	-17	-14	-12
40	-23	-20	-18	-21	-18	-16	-18	-15	-13

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	-15.9	-19.1	-22.3	-19.6	-22.8	-25.9	-27.0	-30.1	-33.3
90	-14.6	-17.8	-21.0	-17.8	-20.9	-24.1	-24.1	-27.3	-30.5
85	-13.3	-16.5	-19.7	-15.9	-19.1	-22.3	-21.2	-24.4	-27.6
80	-12.1	-15.2	-18.4	-14.2	-17.4	-20.5	-18.5	-21.7	-24.9
75	-10.9	-14.0	-17.2	-12.5	-15.7	-18.9	-16.1	-19.3	-22.4
70	-9.7	-12.9	-16.1	-11.0	-14.2	-17.4	-13.8	-17.0	-20.2
65	-8.6	-11.8	-15.0	-9.6	-12.8	-16.0	-11.8	-15.0	-18.2
60	-7.6	-10.8	-13.9	-8.4	-11.5	-14.7	-10.1	-13.2	-16.4
55	-6.6	-9.8	-12.9	-7.2	-10.4	-13.5	-8.5	-11.7	-14.9
50	-5.7	-8.8	-12.0	-6.1	-9.3	-12.5	-7.1	-10.3	-13.5
45	-4.7	-7.9	-11.1	-5.1	-8.3	-11.4	-5.8	-9.0	-12.2
40	-3.8	-7.0	-10.1	-4.0	-7.2	-10.4	-4.5	-7.6	-10.8

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
1400							36.6		
1600	37.6			45.5			58.9	39.9	
1800	65.4	42.0		72.4	49.7		87.6	63.0	43.4
2000	93.9	70.0	46.5	102.0	77.0	53.9		93.0	67.3
2200		98.5	74.5			81.7			98.4
2400			103.1						

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/+30 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for available 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
95	-14	-12	-9	-2	0	0	0	0	0
90	-16	-14	-11	-5	-3	0	0	0	0
85	-19	-16	-14	-9	-6	-4	0	0	0
80	-21	-18	-16	-12	-9	-7	0	0	0
75	-22	-20	-17	-15	-12	-10	0	0	0
70	-24	-22	-19	-17	-15	-12	0	0	0
65	-25	-23	-20	-20	-17	-15	-4	-2	0
60	-27	-24	-22	-22	-20	-17	-11	-8	-6
55	-28	-25	-23	-24	-21	-19	-15	-13	-10
50	-29	-26	-24	-26	-23	-21	-19	-17	-14
45	-29	-27	-24	-27	-25	-22	-22	-20	-17
40	-30	-27	-25	-28	-26	-23	-24	-21	-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	-0.3	-0.3	-0.3	-5.8	-5.8	-5.8	-10.7	-10.7	-10.7
90	-0.6	-0.6	-0.6	-5.8	-5.8	-5.8	-10.5	-10.5	-10.5
85	-1.0	-1.0	-1.0	-5.9	-5.9	-5.9	-10.2	-10.2	-10.2
80	-1.3	-1.3	-1.3	-5.9	-5.9	-5.9	-9.9	-9.9	-9.9
75	-1.4	-1.4	-1.4	-5.8	-5.8	-5.8	-9.5	-9.5	-9.5
70	-1.5	-1.5	-1.5	-5.6	-5.6	-5.6	-9.0	-9.0	-9.0
65	-1.6	-1.6	-1.6	-5.3	-5.3	-5.3	-8.4	-8.4	-8.4
60	-1.5	-1.5	-1.5	-5.0	-5.0	-5.0	-7.7	-7.7	-7.7
55	-1.4	-1.4	-1.4	-4.6	-4.6	-4.6	-7.0	-7.0	-7.0
50	-1.2	-1.2	-1.2	-4.1	-4.1	-4.1	-6.1	-6.1	-6.1
45	-0.9	-0.9	-0.9	-3.5	-3.5	-3.5	-5.2	-5.2	-5.2
40	-0.5	-0.5	-0.5	-2.9	-2.9	-2.9	-4.2	-4.2	-4.2

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	47.2								
1200	79.8	62.7	45.0	31.1					
1400		94.3	77.7	53.9	34.7				
1600				78.8	57.8	38.3	33.8		
1800					83.1	61.8	47.5	30.8	
2000						87.4	62.7	44.4	
2200							79.9	59.3	41.3
2400							99.7	75.9	55.9
2600								95.3	72.1
2800									90.8

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 -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 (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	-4	-3	-2	-13	-12	-10	-24	-23	-21
85	-5	-4	-3	-14	-12	-11	-25	-23	-22
80	-6	-5	-3	-15	-13	-12	-26	-25	-23
75	-7	-6	-4	-16	-15	-14	-28	-26	-25
70	-8	-6	-5	-18	-16	-15	-30	-28	-27
65	-9	-7	-6	-19	-18	-17	-32	-30	-29
60	-9	-8	-7	-21	-19	-18	-34	-33	-31
55	-10	-9	-8	-22	-21	-20	-36	-34	-33
50	-11	-10	-8	-23	-22	-21	-37	-36	-35
45	-12	-10	-9	-24	-23	-22	-39	-37	-36
40	-12	-11	-10	-25	-24	-22	-39	-38	-37

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	-1.4	-1.4	-1.4	-8.0	-8.0	-8.0	-14.2	-14.2	-14.2
90	-1.7	-1.7	-1.7	-7.9	-7.9	-7.9	-13.6	-13.6	-13.6
85	-1.9	-1.9	-1.9	-7.8	-7.8	-7.8	-13.1	-13.1	-13.1
80	-2.2	-2.2	-2.2	-7.7	-7.7	-7.7	-12.4	-12.4	-12.4
75	-2.3	-2.3	-2.3	-7.5	-7.5	-7.5	-11.8	-11.8	-11.8
70	-2.4	-2.4	-2.4	-7.2	-7.2	-7.2	-11.0	-11.0	-11.0
65	-2.4	-2.4	-2.4	-6.8	-6.8	-6.8	-10.3	-10.3	-10.3
60	-2.3	-2.3	-2.3	-6.4	-6.4	-6.4	-9.4	-9.4	-9.4
55	-2.1	-2.1	-2.1	-5.9	-5.9	-5.9	-8.5	-8.5	-8.5
50	-1.9	-1.9	-1.9	-5.3	-5.3	-5.3	-7.6	-7.6	-7.6
45	-1.7	-1.7	-1.7	-4.6	-4.6	-4.6	-6.6	-6.6	-6.6
40	-1.3	-1.3	-1.3	-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
1000	32.8								
1200	71.9	55.0	36.4						
1400		90.2	74.9						
1600				50.2					
1800				83.2	60.8	37.4			
2000					93.3	71.2			
2200						103.3			
2400							45.3		
2600							67.2	39.3	
2800							92.8	60.4	33.6
3000								84.8	53.9
3200									77.1
3400									103.8

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 -25 m/+20 m for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -25 m/+20 m for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -45 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
95	-4	-2	0	-15	-13	-10	-31	-28	-26
90	-5	-3	0	-16	-14	-11	-32	-30	-27
85	-6	-4	-1	-17	-15	-12	-34	-31	-29
80	-7	-5	-2	-19	-16	-14	-36	-33	-31
75	-8	-6	-3	-20	-18	-15	-38	-35	-33
70	-9	-7	-4	-22	-20	-17	-40	-38	-35
65	-11	-8	-6	-24	-22	-19	-43	-41	-38
60	-12	-9	-7	-26	-24	-21	-46	-43	-41
55	-13	-10	-8	-28	-26	-23	-48	-46	-43
50	-14	-11	-9	-30	-28	-25	-50	-48	-45
45	-15	-12	-10	-31	-29	-26	-52	-49	-47
40	-15	-13	-10	-32	-30	-27	-53	-50	-48

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 and engine 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.**

Takeoff Speeds - Dry Runway (22K 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
80	162	163	165	156	156	159									
76	158	158	162	152	152	156									
72	153	154	158	147	147	152	146	146	150	142	142	147			
68	148	149	155	142	143	149	141	141	147	138	138	144			
64	143	144	151	138	138	145	136	137	143	134	134	140	131	131	138
60	138	139	147	132	133	141	131	132	139	128	129	136	126	126	134
56	132	133	142	127	128	137	126	126	135	123	124	132	121	121	130
52	127	127	138	122	122	132	121	121	131	118	118	128	116	116	126
48	121	121	133	116	116	128	115	115	126	112	113	124	110	110	122
44	115	115	128	110	111	123	109	109	122	107	107	119	105	105	117
40	108	108	123	104	104	118	103	103	117	100	101	115	98	99	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	5						5	5						-3	-3					
60	140	4	4	5	6				4	4	5	6				-2	-3	-3	-4			
50	122	2	3	4	5	6	7	8	2	3	4	5	6	7	8	-1	-2	-2	-3	-3	-4	-5
40	104	1	2	3	4	5	6	7	1	2	3	4	5	6	7	-1	-1	-1	-2	-3	-3	-4
30	86	0	0	1	2	3	5	6	0	0	1	2	3	5	6	0	0	-1	-1	-2	-3	-3
20	68	0	0	0	1	2	3	5	0	0	1	1	2	3	5	0	0	0	-1	-1	-2	-3
-60	-76	0	0	0	1	2	2	3	0	0	1	1	2	3	3	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
80	-3	-2	0	1	1	-1	-1	0	0	0	1	1	1
76	-3	-1	0	1	1	-1	-1	0	0	0	1	1	1
72	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
68	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
64	-2	-1	0	1	1	-1	-1	0	0	0	1	1	1
60	-1	-1	0	1	1	-1	-1	0	0	0	1	1	1
56	-1	0	0	1	1	-1	-1	0	0	0	1	1	1
52	-1	0	0	1	1	-1	-1	0	0	0	1	1	1
48	-1	0	0	0	1	-1	-1	0	0	0	1	1	1
44	0	0	0	0	1	-1	-1	0	0	0	1	1	1
40	0	0	0	0	1	-1	-1	0	0	0	1	1	1

***V1 not to exceed VR**

Takeoff Speeds - Dry Runway (22K Derate)
V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	87	85					
60	140	87	85	84	83			
50	122	89	87	84	83	81	79	77
40	104	94	91	88	85	82	79	77
30	86	96	96	93	89	86	82	79
20	68	97	96	94	93	90	86	82
-60	-76	98	98	96	94	91	89	87

Takeoff Speeds - Wet Runway (22K 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
80	157	163	165	150	156	159									
76	152	158	162	146	152	156									
72	147	154	158	141	147	152	141	146	150	138	142	147			
68	142	149	155	136	143	149	136	141	147	133	138	144			
64	136	144	151	131	138	145	130	137	143	127	134	140	126	131	138
60	131	139	147	125	133	141	125	132	139	122	129	136	120	126	134
56	125	133	142	120	128	137	119	126	135	116	124	132	115	121	130
52	119	127	138	114	122	132	113	121	131	111	118	128	109	116	126
48	113	121	133	108	116	128	108	115	126	105	113	124	103	110	122
44	107	115	128	102	111	123	102	109	122	99	107	119	98	105	117
40	100	108	123	96	104	118	95	103	117	93	101	115	92	99	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	8	8						5	5						-3	-3					
60	140	6	6	7	9				4	4	5	6				-2	-3	-3	-4			
50	122	4	4	5	6	8	10	11	2	3	4	5	6	7	8	-1	-2	-2	-3	-3	-4	-5
40	104	1	2	3	4	6	8	9	1	2	3	4	5	6	7	-1	-1	-1	-2	-3	-3	-4
30	86	0	0	1	2	4	6	7	0	0	1	2	3	5	6	0	0	-1	-1	-2	-3	-3
20	68	0	0	0	1	2	4	5	0	0	1	1	2	3	5	0	0	0	-1	-1	-2	-3
-60	-76	0	0	0	1	2	3	4	0	0	1	1	2	3	3	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
80	-5	-3	0	3	5	-3	-2	-1	0	1	1	2	2
76	-5	-2	0	3	5	-3	-2	-1	0	1	1	2	2
72	-4	-2	0	2	5	-3	-2	-1	0	1	1	2	2
68	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
64	-3	-2	0	2	4	-3	-2	-1	0	1	1	2	3
60	-3	-2	0	2	4	-3	-2	-1	0	1	1	2	3
56	-3	-1	0	2	3	-4	-2	-1	0	1	2	2	3
52	-3	-1	0	1	3	-4	-3	-1	0	1	2	2	3
48	-2	-1	0	1	2	-4	-3	-1	0	1	2	2	3
44	-2	-1	0	1	2	-4	-3	-1	0	1	2	3	3
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	87	85					
60	140	87	85	84	83			
50	122	89	87	84	83	81	79	77
40	104	94	91	88	85	82	79	77
30	86	96	96	93	89	86	82	79
20	68	97	96	94	93	90	86	82
-60	-76	98	98	96	94	91	89	87

Maximum Allowable Clearway (22K Derate)

FIELD LENGTH (M)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1200	150
1600	180
2000	210
2400	240
2800	270
3200	290

Clearway and Stopway V1 Adjustments (22K Derate)

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
200	-3	-3	-3	-2				
100	-2	-2	-2	-1				
0	0	0	0	0	0	0	0	0
-100	1	1	1	1	3	2	1	1
-200	1	1	1	1	7	4	1	1
-300	1	1	1	1	9	4	2	1

Use of clearway not allowed on wet runways.

Stab Trim Setting (22K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)									
	6	8	10	16	21	26	30	33	35	36
85	8 1/2	8 1/2	8 1/2	7 1/2	6 3/4	6	5 1/2	5	4 3/4	4 1/2
80	8 1/2	8 1/2	8 1/4	7 1/4	6 1/2	5 3/4	5	4 3/4	4 1/4	4 1/4
75	8 1/4	8	7 3/4	7	6 1/4	5 1/2	4 3/4	4 1/4	4	3 3/4
70	8	7 3/4	7 1/2	6 3/4	6	5 1/4	4 1/2	4 1/4	3 3/4	3 3/4
65	7 3/4	7 1/2	7 1/4	6 1/2	5 3/4	5	4 1/2	4	3 3/4	3 1/2
60	7 1/2	7 1/4	7	6 1/4	5 1/2	5	4 1/4	3 3/4	3 1/2	3 1/4
55	7 1/4	7 1/4	6 3/4	6	5 1/2	4 3/4	4	3 1/2	3 1/4	3 1/4
50	7	6 3/4	6 1/2	5 3/4	5	4 1/4	3 3/4	3 1/4	3	3
45	6 3/4	6 1/2	6 1/4	5 1/2	4 3/4	4	3 1/2	3	2 3/4	2 3/4
40	6 3/4	6 1/2	6 1/4	5 1/2	4 3/4	4	3 1/2	3	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. %MAC									
	6	8	10	16	21	26	30	33	35	36
85	8 1/2	8 1/2	8 1/2	6 3/4	5 1/2	4 1/2	3 3/4	3 1/4	2 3/4	2 1/2
80	8 1/2	8 1/2	8 1/2	6 3/4	5 3/4	4 3/4	3 3/4	3 1/4	2 3/4	2 1/2
75	8 1/2	8 1/2	8 1/4	6 1/2	5 1/2	4 1/2	3 1/2	3	2 1/2	2 1/2
70	8 1/2	8 1/4	7 3/4	6 1/4	5 1/4	4 1/4	3 1/4	2 3/4	2 1/4	2 1/4
65	8 1/4	7 3/4	7 1/4	5 3/4	4 3/4	3 3/4	3	2 1/2	2 1/4	2 1/4
60	7 3/4	7 1/4	6 3/4	5 1/2	4 1/2	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4
55	7	6 3/4	6 1/4	5 1/4	4 1/4	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4
50	6 1/2	6 1/4	5 3/4	4 3/4	4	3	2 1/4	2 1/4	2 1/4	2 1/4
45	6	5 3/4	5 1/2	4 1/2	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4
40	6	5 3/4	5 1/2	4 1/2	3 1/2	2 3/4	2 1/4	2 1/4	2 1/4	2 1/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (22K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

22K 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	-12.9	-15.4	-17.9	-16.6	-19.1	-21.6	-31.8	-34.3	-36.8
90	-11.9	-14.4	-16.9	-15.2	-17.7	-20.2	-27.5	-30.0	-32.5
85	-10.9	-13.4	-15.9	-13.8	-16.3	-18.7	-23.3	-25.8	-28.3
80	-10.0	-12.5	-15.0	-12.3	-14.8	-17.3	-19.4	-21.9	-24.4
75	-9.0	-11.5	-14.0	-10.9	-13.4	-15.9	-16.0	-18.5	-21.0
70	-8.0	-10.5	-13.0	-9.5	-12.0	-14.5	-13.1	-15.6	-18.1
65	-7.1	-9.6	-12.1	-8.3	-10.8	-13.3	-10.7	-13.2	-15.7
60	-6.3	-8.8	-11.3	-7.2	-9.7	-12.2	-8.8	-11.3	-13.8
55	-5.5	-8.0	-10.5	-6.2	-8.7	-11.2	-7.4	-9.9	-12.4
50	-4.6	-7.1	-9.6	-5.1	-7.6	-10.1	-6.5	-9.0	-11.5
45	-3.8	-6.3	-8.8	-4.1	-6.6	-9.1	-6.1	-8.6	-11.1
40	-3.0	-5.5	-8.0	-3.0	-5.5	-8.0	-6.2	-8.7	-11.2

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	36.2			39.2			44.3		
1400	57.9	41.2		60.6	44.2		65.4	49.1	34.1
1600	81.4	63.3	46.3	84.0	66.0	49.2	89.5	70.8	54.0
1800		87.3	68.8		89.9	71.4		95.6	76.4
2000			93.3			95.8			101.7

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate 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	-12	-10	-7	-7	-4	-2	0	0	0
85	-13	-10	-8	-7	-4	-2	0	0	0
80	-14	-11	-9	-7	-5	-2	0	0	0
75	-15	-12	-10	-8	-6	-3	0	0	0
70	-16	-13	-11	-10	-7	-5	0	0	0
65	-17	-15	-12	-12	-9	-7	-1	0	0
60	-19	-16	-14	-14	-12	-9	-5	-2	0
55	-20	-18	-15	-17	-14	-12	-9	-6	-4
50	-21	-18	-16	-18	-16	-13	-12	-10	-7
45	-21	-19	-16	-19	-17	-14	-14	-12	-9
40	-21	-18	-16	-19	-17	-14	-16	-14	-11

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

22K 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	-16.1	-19.5	-22.9	-20.3	-23.7	-27.1	-33.9	-37.3	-40.7
90	-14.8	-18.2	-21.6	-18.4	-21.8	-25.2	-29.6	-33.0	-36.4
85	-13.4	-16.8	-20.2	-16.4	-19.8	-23.2	-25.2	-28.6	-32.0
80	-12.2	-15.6	-19.0	-14.6	-18.0	-21.4	-21.2	-24.6	-28.0
75	-10.9	-14.3	-17.7	-12.9	-16.3	-19.7	-17.7	-21.1	-24.5
70	-9.8	-13.2	-16.6	-11.3	-14.7	-18.1	-14.7	-18.1	-21.5
65	-8.7	-12.1	-15.5	-9.9	-13.3	-16.7	-12.2	-15.6	-19.0
60	-7.7	-11.1	-14.5	-8.6	-12.0	-15.4	-10.3	-13.7	-17.1
55	-6.8	-10.2	-13.6	-7.4	-10.8	-14.2	-8.8	-12.2	-15.6
50	-5.9	-9.3	-12.7	-6.4	-9.8	-13.2	-7.7	-11.1	-14.5
45	-5.0	-8.4	-11.8	-5.3	-8.7	-12.1	-6.7	-10.1	-13.5
40	-4.1	-7.5	-10.9	-4.3	-7.7	-11.1	-5.7	-9.1	-12.5

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
1400				30.9			44.3		
1600	51.3			57.8	35.1		70.0	48.0	
1800	80.5	56.1	31.5	87.3	62.4	39.4	103.8	74.9	51.9
2000		85.2	60.8		92.3	67.0			80.1
2200			89.9			97.3			

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -35 m/+30 m for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for available 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
95	-9	-7	-4	0	0	0	0	0	0
90	-12	-10	-7	0	0	0	0	0	0
85	-15	-12	-10	-3	-1	0	0	0	0
80	-17	-15	-12	-7	-5	-2	0	0	0
75	-19	-17	-14	-11	-8	-6	0	0	0
70	-21	-19	-16	-14	-11	-9	0	0	0
65	-23	-21	-18	-17	-14	-12	0	0	0
60	-25	-22	-20	-19	-17	-14	-6	-4	-1
55	-26	-23	-21	-22	-19	-17	-12	-10	-7
50	-27	-24	-22	-24	-21	-19	-16	-14	-11
45	-28	-25	-23	-25	-23	-20	-20	-17	-15
40	-28	-26	-23	-27	-24	-22	-22	-19	-17

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)
Maximum Reverse Thrust
Weight Adjustment (1000 KG)

22K 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	-4.5	-4.5	-4.5	-9.9	-9.9	-9.9
90	0.0	0.0	0.0	-4.8	-4.8	-4.8	-9.8	-9.8	-9.8
85	-0.3	-0.3	-0.3	-5.1	-5.1	-5.1	-9.6	-9.6	-9.6
80	-0.7	-0.7	-0.7	-5.3	-5.3	-5.3	-9.4	-9.4	-9.4
75	-1.1	-1.1	-1.1	-5.3	-5.3	-5.3	-9.1	-9.1	-9.1
70	-1.3	-1.3	-1.3	-5.3	-5.3	-5.3	-8.7	-8.7	-8.7
65	-1.4	-1.4	-1.4	-5.1	-5.1	-5.1	-8.2	-8.2	-8.2
60	-1.4	-1.4	-1.4	-4.9	-4.9	-4.9	-7.7	-7.7	-7.7
55	-1.4	-1.4	-1.4	-4.6	-4.6	-4.6	-7.1	-7.1	-7.1
50	-1.2	-1.2	-1.2	-4.1	-4.1	-4.1	-6.4	-6.4	-6.4
45	-0.9	-0.9	-0.9	-3.6	-3.6	-3.6	-5.6	-5.6	-5.6
40	-0.5	-0.5	-0.5	-2.9	-2.9	-2.9	-4.7	-4.7	-4.7

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	53.4	35.2							
1200	85.4	68.7	51.2	36.4					
1400		99.6	83.4	60.3	40.2				
1600				86.3	64.4	44.0	37.8		
1800					90.7	68.5	52.5	34.7	
2000						95.2	68.9	49.1	31.7
2200							87.9	65.1	45.8
2400								83.4	61.4
2600								104.4	79.2
2800									99.7

1. Enter Weight Adjustment table with reported braking action and 22K 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 (22K 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	-3	-2	-14	-13	-11	-24	-23	-22
85	-5	-4	-2	-13	-12	-11	-24	-22	-21
80	-5	-4	-3	-14	-12	-11	-24	-23	-21
75	-6	-5	-4	-15	-13	-12	-25	-24	-23
70	-7	-6	-5	-16	-15	-13	-27	-26	-24
65	-8	-7	-5	-17	-16	-15	-29	-28	-26
60	-9	-8	-6	-19	-18	-17	-31	-30	-29
55	-10	-8	-7	-21	-19	-18	-33	-32	-31
50	-10	-9	-8	-22	-21	-19	-35	-34	-33
45	-11	-10	-8	-23	-22	-20	-37	-35	-34
40	-11	-10	-8	-23	-22	-21	-37	-36	-35

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

22K 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	-7.7	-7.7	-7.7	-12.0	-12.0	-12.0
90	0.0	0.0	0.0	-7.8	-7.8	-7.8	-11.7	-11.7	-11.7
85	-0.4	-0.4	-0.4	-7.8	-7.8	-7.8	-11.5	-11.5	-11.5
80	-0.9	-0.9	-0.9	-7.8	-7.8	-7.8	-11.2	-11.2	-11.2
75	-1.3	-1.3	-1.3	-7.6	-7.6	-7.6	-10.8	-10.8	-10.8
70	-1.6	-1.6	-1.6	-7.4	-7.4	-7.4	-10.3	-10.3	-10.3
65	-1.8	-1.8	-1.8	-7.1	-7.1	-7.1	-9.8	-9.8	-9.8
60	-1.9	-1.9	-1.9	-6.7	-6.7	-6.7	-9.1	-9.1	-9.1
55	-1.9	-1.9	-1.9	-6.2	-6.2	-6.2	-8.3	-8.3	-8.3
50	-1.8	-1.8	-1.8	-5.6	-5.6	-5.6	-7.5	-7.5	-7.5
45	-1.5	-1.5	-1.5	-4.9	-4.9	-4.9	-6.5	-6.5	-6.5
40	-1.2	-1.2	-1.2	-4.1	-4.1	-4.1	-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
1000	41.9								
1200	78.9	60.2	39.1						
1400		94.1	76.7						
1600				62.1	35.7				
1800				94.5	70.0	44.1			
2000					102.0	77.8			
2200							35.6		
2400							57.1		
2600							82.0	48.8	
2800								72.2	40.9
3000								99.6	63.1
3200									89.2

1. **Enter Weight Adjustment table with reported braking action and 22K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -25 m/+20 m for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -25 m/+20 m for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -40 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 (22K 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
95	-5	-3	0	-17	-14	-12	-32	-30	-27
90	-6	-3	-1	-17	-14	-12	-32	-30	-27
85	-6	-4	-1	-17	-14	-12	-32	-30	-27
80	-7	-4	-2	-17	-15	-12	-33	-30	-28
75	-8	-5	-3	-18	-16	-13	-35	-32	-30
70	-9	-6	-4	-20	-18	-15	-37	-34	-32
65	-10	-7	-5	-22	-20	-17	-40	-37	-35
60	-11	-8	-6	-24	-22	-19	-43	-40	-38
55	-12	-9	-7	-26	-24	-21	-45	-43	-40
50	-13	-10	-8	-28	-26	-23	-48	-45	-43
45	-13	-11	-8	-30	-27	-25	-49	-47	-44
40	-14	-11	-9	-31	-28	-26	-50	-48	-45

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K 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	87.7	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	88.5	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.3	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.2	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.1	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	91.9	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	91.5	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	90.8	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	90.0	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	89.3	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	88.5	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
5	87.8	88.9	90.0	90.7	91.3	92.0	92.7	93.2	93.7	94.3	94.9	95.6	96.3
0	87.0	88.1	89.2	89.9	90.5	91.2	91.9	92.4	92.9	93.5	94.1	94.8	95.5
-5	86.2	87.3	88.4	89.1	89.7	90.4	91.1	91.6	92.1	92.7	93.3	94.0	94.7
-10	85.4	86.5	87.6	88.3	88.9	89.6	90.3	90.8	91.3	91.9	92.5	93.2	93.9
-15	84.6	85.7	86.8	87.5	88.1	88.8	89.4	90.0	90.5	91.1	91.7	92.4	93.1
-20	83.8	84.9	86.0	86.6	87.3	87.9	88.6	89.1	89.7	90.3	90.8	91.6	92.3
-25	83.0	84.1	85.2	85.8	86.4	87.1	87.8	88.3	88.8	89.4	90.0	90.7	91.5
-30	82.2	83.3	84.4	85.0	85.6	86.3	86.9	87.4	88.0	88.6	89.2	89.9	90.6
-35	81.4	82.4	83.5	84.1	84.7	85.4	86.1	86.6	87.1	87.7	88.3	89.0	89.8
-40	80.6	81.6	82.7	83.3	83.9	84.5	85.2	85.7	86.2	86.8	87.4	88.2	88.9
-45	79.7	80.7	81.8	82.4	83.0	83.7	84.3	84.8	85.3	86.0	86.6	87.3	88.0
-50	78.9	79.9	80.9	81.5	82.1	82.8	83.4	83.9	84.5	85.1	85.7	86.4	87.2

%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	0.9	0.9	0.9

Assumed Temperature Reduced Thrust (22K 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	72	71	69	67	65	63	61	59	57	55		
35	66	66	66	66	65	63	61	59	57	55	53	
30	63	61	61	61	61	61	61	59	57	55	53	51
25	63	61	59	57	56	56	56	56	56	55	53	51
20	63	61	59	57	55	53	51	51	51	50	50	50
15	63	61	59	57	55	53	51	50	47	45	45	45
10 & BELOW	63	61	59	57	55	53	51	50	47	45	43	41

Takeoff %N1 (Table 2 of 3)

Based on engine bleed for packs on and engine 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	85.7	86.0	86.7	87.4	88.2	88.9	89.5	90.1	90.2	90.2	90.6	91.1
70	86.6	87.0	87.1	87.1	87.5	88.3	88.9	89.4	89.5	89.6	90.0	90.4
65	87.4	87.8	88.0	88.0	88.2	88.3	88.3	88.8	88.9	88.9	89.4	89.8
60	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
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 0.9.

Assumed Temperature Reduced Thrust (22K 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	11.6													
100	10.3	7.9												
90	10.8	8.4												
80	12.2	7.1	5.0											
70	11.0	7.6	5.4	5.2	3.5									
60	9.6	9.0	4.1	4.0	3.9	3.8	2.1							
50	8.0	7.7	4.5	2.8	2.6	2.7	2.6	2.4	0.8					
40		6.2	5.9	4.7	3.0	2.6	2.7	2.8	2.6	2.5	2.9			
30		4.7	4.6	4.5	4.4	4.2	4.1	4.0	4.0	3.9	3.8	3.7	3.6	
20			3.1	3.0	3.0	3.0	2.9	2.8	2.7	2.7	2.6	2.6	2.5	2.4
10			1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	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**			
	V/S (FT/MIN)	1700	1000			
30000	PITCH ATT	**4.0**	**3.5**	**3.5**	**3.5**	**4.0**
	V/S (FT/MIN)	2500	1900	1400	1100	800
20000	PITCH ATT	**7.0**	**6.5**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	4200	3200	2600	2100	1700
10000	PITCH ATT	**10.5**	**9.0**	**8.5**	**8.0**	**7.5**
	V/S (FT/MIN)	5600	4400	3600	3000	2500
SEA LEVEL	PITCH ATT	**14.0**	**12.0**	**11.0**	**10.0**	**9.5**
	V/S (FT/MIN)	6700	5300	4300	3600	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	84	87	92		
35000	PITCH ATT	**1.0**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	82	83	86	89	94
30000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	81	82	83	85	87
25000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	77	78	80	81	83
20000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**	**3.5**
	%N1	74	74	76	77	79
15000	PITCH ATT	**1.0**	**1.5**	**2.0**	**2.5**	**3.5**
	%N1	70	71	72	73	75

Descent (.76/280)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
40000	PITCH ATT	**-2.0**	**-1.0**	**-0.5**	**0.0**	**0.0**
	V/S (FT/MIN)	-2900	-2600	-2600	-2900	-3400
30000	PITCH ATT	**-2.0**	**-1.0**	**0.0**	**1.0**	**1.5**
	V/S (FT/MIN)	-2400	-2100	-1900	-1800	-1900
20000	PITCH ATT	**-2.0**	**-1.0**	**0.0**	**1.0**	**2.0**
	V/S (FT/MIN)	-2200	-1900	-1700	-1700	-1700
10000	PITCH ATT	**-2.5**	**-1.0**	**0.0**	**1.0**	**2.0**
	V/S (FT/MIN	-2000	-1700	-1500	-1500	-1500
SEA LEVEL	PITCH ATT	**-2.5**	**-1.0**	**0.0**	**1.0**	**2.0**
	V/S (FT/MIN)	-1800	-1500	-1400	-1300	-1300

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
10000	PITCH ATT	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	53	58	63	67	70
5000	PITCH ATT	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	49	54	59	63	67

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

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 1 (GEAR UP) (VREF40 + 50)	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**5.5**	**6.0**
	%N1	52	57	61	65	69
FLAPS 5 (GEAR UP) (VREF40 + 30)	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.0**	**6.5**
	%N1	52	58	63	67	70
FLAPS 15 (GEAR DOWN) (VREF40 + 20)	**PITCH ATT**	**5.5**	**5.5**	**6.0**	**6.0**	**6.5**
	%N1	60	66	71	75	79

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG) 40	50	60	70	80
FLAPS 15 (VREF15 + 10)	**PITCH ATT**	**2.0**	**2.0**	**2.0**	**2.5**	**2.5**
	%N1	44	49	53	56	59
FLAPS 30 (VREF30 + 10)	**PITCH ATT**	**0.5**	**0.5**	**1.0**	**1.0**	**1.0**
	%N1	48	53	58	61	65
FLAPS 40 (VREF40 + 10)	**PITCH ATT**	**-0.5**	**-0.5**	**-0.5**	**-0.5**	**0.0**
	%N1	53	59	64	68	71

Intentionally
Blank

Performance Inflight — Chapter PI
All Engine — Section 31

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	30300	-5	32800*	32800*	32800*	32100	30700
80	31600	-8	34400*	34400*	34400*	33400	32000
75	33000	-11	35900*	35900*	35900*	34800	33400
70	34500	-15	37300*	37300*	37300*	36200	34900
65	36000	-18	38700*	38700*	38700*	37800	36400
60	37700	-18	40200*	40200*	40200*	39400	38100
55	39500	-18	41000	41000	41000	41000	39900
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	30300	0	30600*	30600*	30600*	30600*	30600*
80	31600	-3	32900*	32900*	32900*	32900*	32000
75	33000	-6	34800*	34800*	34800*	34800	33400
70	34500	-9	36300*	36300*	36300*	36200	34900
65	36000	-13	37800*	37800*	37800*	37800	36400
60	37700	-13	39200*	39200*	39200*	39200*	38100
55	39500	-13	40800*	40800*	40800*	40800*	39900
50	41000	-13	41000	41000	41000	41000	41000
45	41000	-13	41000	41000	41000	41000	41000
40	41000	-13	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	30300	6	27500*	27500*	27500*	27500*	27500*
80	31600	3	30000*	30000*	30000*	30000*	30000*
75	33000	0	32800*	32800*	32800*	32800*	32800*
70	34500	-3	34900*	34900*	34900*	34900*	34900
65	36000	-7	36500*	36500*	36500*	36500*	36400
60	37700	-7	38000*	38000*	38000*	38000*	38000*
55	39500	-7	39500*	39500*	39500*	39500*	39500*
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	86.2	87.5	88.6	90.0	92.6				
	MACH	.752	.771	.782	.792	.794				
	KIAS	316	311	303	294	282				
	FF/ENG	1625	1616	1597	1596	1623				
80	%N1	84.8	86.3	87.4	88.7	90.4	94.1			
	MACH	.732	.759	.774	.785	.794	.792			
	KIAS	307	306	300	291	282	269			
	FF/ENG	1526	1530	1516	1499	1507	1562			
75	%N1	83.2	84.9	86.2	87.4	88.7	90.8			
	MACH	.707	.741	.764	.778	.789	.795			
	KIAS	296	298	295	288	280	270			
	FF/ENG	1419	1437	1436	1414	1405	1419			
70	%N1	81.5	83.2	84.8	86.1	87.2	88.7	91.8		
	MACH	.682	.714	.747	.768	.781	.791	.795		
	KIAS	284	287	288	285	277	269	258		
	FF/ENG	1316	1331	1347	1338	1315	1313	1344		
65	%N1	79.7	81.3	83.0	84.6	85.9	87.1	89.1	93.4	
	MACH	.658	.687	.721	.752	.771	.783	.793	.793	
	KIAS	274	275	277	278	273	266	257	246	
	FF/ENG	1216	1227	1243	1252	1239	1218	1231	1284	
60	%N1	78.1	79.4	81.0	82.7	84.3	85.6	87.2	89.9	
	MACH	.639	.660	.690	.725	.755	.773	.785	.794	
	KIAS	265	263	265	267	267	262	254	246	
	FF/ENG	1130	1126	1138	1151	1156	1140	1135	1155	
55	%N1	76.4	77.6	78.9	80.6	82.3	83.9	85.5	87.6	90.5
	MACH	.621	.639	.661	.692	.727	.757	.774	.786	.795
	KIAS	257	255	252	254	256	256	250	243	235
	FF/ENG	1050	1040	1037	1046	1057	1060	1054	1055	1076
50	%N1	74.6	75.8	77.0	78.3	80.0	81.8	83.7	85.8	87.9
	MACH	.602	.619	.638	.659	.691	.727	.757	.774	.786
	KIAS	249	246	243	241	242	245	244	239	232
	FF/ENG	976	959	951	946	952	962	971	972	973
45	%N1	72.3	73.8	75.0	76.2	77.5	79.2	81.3	83.8	85.8
	MACH	.575	.597	.616	.635	.656	.687	.723	.755	.773
	KIAS	238	237	234	232	229	230	232	232	228
	FF/ENG	895	885	871	862	854	858	872	888	901
40	%N1	69.7	71.2	72.7	74.0	75.3	76.5	78.5	81.0	83.5
	MACH	.545	.567	.590	.611	.630	.650	.679	.714	.749
	KIAS	224	224	224	222	219	217	217	219	220
	FF/ENG	809	820	811	797	784	774	778	795	813

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Ground to Air Miles Conversions

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
303	275	251	231	215	200	190	180	172	164	158
457	415	378	348	322	300	285	271	258	247	236
611	554	505	464	430	400	380	362	345	329	315
766	695	632	581	538	500	475	452	431	411	394
922	835	760	698	646	600	570	542	517	494	473
1078	976	887	815	754	700	665	632	603	576	552
1235	1118	1015	932	862	800	760	722	688	658	630
1392	1259	1144	1049	970	900	854	812	774	739	709
1550	1402	1272	1167	1078	1000	949	902	859	821	787
1709	1545	1401	1285	1186	1100	1044	992	945	903	865
1869	1688	1531	1402	1295	1200	1139	1082	1031	984	943
2029	1832	1661	1521	1403	1300	1234	1173	1117	1067	1022
2190	1976	1790	1639	1512	1400	1328	1263	1203	1148	1100
2352	2121	1920	1757	1620	1500	1423	1352	1288	1230	1178
2514	2266	2050	1875	1729	1600	1518	1442	1373	1311	1256
2677	2411	2181	1994	1837	1700	1612	1532	1459	1393	1333
2841	2558	2312	2112	1946	1800	1707	1622	1544	1474	1411
3006	2705	2443	2232	2055	1900	1802	1712	1629	1555	1489
3172	2852	2576	2351	2164	2000	1896	1801	1715	1637	1567

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	0:44	1.2	0:42	1.0	0:39	0.9	0:38	0.8	0:36
300	2.1	1:05	1.9	1:02	1.6	0:57	1.5	0:54	1.3	0:53
400	2.8	1:26	2.6	1:22	2.2	1:15	2.0	1:11	1.8	1:09
500	3.6	1:48	3.2	1:42	2.8	1:34	2.5	1:29	2.3	1:25
600	4.3	2:09	3.9	2:02	3.4	1:52	3.1	1:46	2.8	1:41
700	5.0	2:31	4.6	2:22	4.0	2:10	3.6	2:03	3.3	1:58
800	5.7	2:52	5.2	2:43	4.6	2:29	4.2	2:20	3.8	2:14
900	6.4	3:14	5.9	3:03	5.2	2:48	4.7	2:38	4.3	2:31
1000	7.1	3:36	6.5	3:24	5.7	3:06	5.2	2:55	4.8	2:47
1100	7.8	3:59	7.2	3:45	6.3	3:25	5.8	3:13	5.3	3:04
1200	8.5	4:21	7.8	4:06	6.9	3:44	6.3	3:31	5.8	3:20
1300	9.2	4:44	8.5	4:27	7.5	4:04	6.8	3:49	6.3	3:37
1400	9.9	5:06	9.1	4:48	8.0	4:23	7.3	4:07	6.8	3:54
1500	10.5	5:29	9.7	5:10	8.6	4:42	7.8	4:25	7.2	4:11
1600	11.2	5:52	10.4	5:32	9.1	5:02	8.4	4:43	7.7	4:28
1700	11.9	6:16	11.0	5:53	9.7	5:21	8.9	5:01	8.2	4:45
1800	12.6	6:39	11.6	6:15	10.3	5:41	9.4	5:19	8.7	5:02
1900	13.2	7:03	12.2	6:37	10.8	6:01	9.9	5:38	9.1	5:19
2000	13.9	7:27	12.8	7:00	11.4	6:21	10.4	5:57	9.6	5:36

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
2	-0.1	0.0	0.2	0.3	0.5
3	-0.2	0.0	0.3	0.5	0.8
4	-0.2	0.0	0.4	0.7	1.1
5	-0.3	0.0	0.5	0.9	1.4
6	-0.4	0.0	0.6	1.1	1.7
7	-0.5	0.0	0.7	1.3	2.0
8	-0.5	0.0	0.8	1.5	2.3
9	-0.6	0.0	0.8	1.7	2.6
10	-0.7	0.0	0.9	1.9	2.9
11	-0.7	0.0	1.0	2.1	3.2
12	-0.8	0.0	1.1	2.3	3.5
13	-0.8	0.0	1.2	2.5	3.8
14	-0.9	0.0	1.3	2.7	4.0

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
548	510	477	448	423	400	382	366	351	337	325
821	765	715	672	634	600	574	549	527	506	487
1094	1021	955	897	846	800	765	733	703	675	650
1369	1277	1194	1122	1058	1000	957	916	879	844	813
1645	1534	1434	1347	1270	1200	1148	1099	1054	1013	976
1921	1791	1674	1572	1482	1400	1339	1282	1230	1182	1139
2199	2049	1914	1797	1694	1600	1530	1465	1406	1351	1301
2476	2307	2154	2022	1906	1800	1721	1648	1581	1519	1463
2755	2565	2395	2248	2118	2000	1913	1831	1756	1688	1625
3034	2825	2636	2473	2330	2200	2103	2014	1931	1855	1786
3315	3085	2878	2700	2542	2400	2294	2196	2106	2023	1948
3597	3346	3121	2926	2755	2600	2485	2378	2280	2190	2108
3880	3608	3364	3153	2968	2800	2676	2560	2454	2357	2269
4165	3872	3608	3381	3181	3000	2866	2742	2628	2524	2429
4451	4135	3852	3608	3394	3200	3057	2924	2802	2690	2588
4739	4400	4097	3836	3607	3400	3247	3106	2975	2856	2747
5028	4666	4343	4064	3820	3600	3438	3287	3149	3022	2907
5318	4933	4589	4293	4034	3800	3628	3468	3321	3187	3065
5610	5202	4836	4523	4248	4000	3818	3649	3494	3352	3224
5903	5471	5084	4752	4462	4200	4008	3830	3666	3517	3382
6199	5741	5332	4982	4676	4400	4198	4011	3839	3682	3540
6496	6013	5582	5213	4890	4600	4388	4191	4011	3846	3698
6794	6286	5832	5443	5105	4800	4578	4372	4183	4011	3855
7095	6560	6083	5675	5320	5000	4768	4553	4355	4175	4012

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	1.8	1:08	1.7	1:07	1.7	1:05	1.6	1:03	1.6	1:01
600	2.8	1:40	2.7	1:38	2.6	1:36	2.5	1:32	2.4	1:29
800	3.8	2:13	3.6	2:10	3.5	2:07	3.4	2:02	3.3	1:58
1000	4.7	2:45	4.6	2:42	4.4	2:37	4.3	2:32	4.2	2:26
1200	5.7	3:18	5.5	3:14	5.3	3:09	5.1	3:02	5.0	2:55
1400	6.6	3:52	6.4	3:47	6.2	3:40	6.0	3:32	5.8	3:24
1600	7.6	4:25	7.3	4:19	7.1	4:12	6.9	4:03	6.7	3:53
1800	8.5	4:59	8.2	4:52	8.0	4:44	7.7	4:34	7.5	4:23
2000	9.4	5:32	9.1	5:25	8.9	5:16	8.6	5:05	8.3	4:52
2200	10.4	6:07	10.0	5:59	9.7	5:49	9.4	5:37	9.2	5:23
2400	11.3	6:41	10.9	6:32	10.6	6:22	10.3	6:09	10.0	5:53
2600	12.2	7:16	11.8	7:06	11.4	6:55	11.1	6:41	10.8	6:24
2800	13.1	7:52	12.7	7:40	12.3	7:28	11.9	7:14	11.6	6:55
3000	14.0	8:27	13.6	8:14	13.1	8:01	12.7	7:46	12.3	7:27
3200	14.9	9:04	14.4	8:49	14.0	8:35	13.5	8:19	13.1	7:59
3400	15.8	9:40	15.3	9:24	14.8	9:09	14.3	8:52	13.9	8:31
3600	16.7	10:17	16.1	10:00	15.6	9:43	15.1	9:25	14.6	9:03
3800	17.5	10:55	16.9	10:36	16.4	10:18	15.9	9:59	15.4	9:36
4000	18.4	11:32	17.8	11:12	17.2	10:53	16.6	10:33	16.2	10:08
4200	19.3	12:11	18.6	11:49	18.0	11:28	17.4	11:07	16.9	10:41
4400	20.1	12:50	19.4	12:26	18.8	12:04	18.2	11:41	17.6	11:15
4600	20.9	13:29	20.2	13:04	19.5	12:40	18.9	12:16	18.3	11:48
4800	21.8	14:09	21.0	13:42	20.3	13:17	19.6	12:51	19.1	12:22
5000	22.6	14:49	21.8	14:20	21.1	13:53	20.4	13:26	19.8	12:56

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	40	50	60	70	80
2	-0.1	0.0	0.3	0.8	1.9
4	-0.2	0.0	0.5	1.4	3.3
6	-0.4	0.0	0.7	2.1	4.5
8	-0.6	0.0	1.0	2.6	5.6
10	-0.7	0.0	1.2	3.2	6.6
12	-0.9	0.0	1.5	3.7	7.5
14	-1.1	0.0	1.7	4.1	8.2
16	-1.3	0.0	1.9	4.5	8.8
18	-1.5	0.0	2.1	4.9	9.3
20	-1.7	0.0	2.3	5.3	9.7
22	-1.9	0.0	2.5	5.6	9.9
24	-2.2	0.0	2.7	5.9	10.0

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						12	2	0	6	18
39				24	10	2	0	5	16	32
37			18	7	1	1	5	15	29	48
35	25	12	4	0	1	6	15	27	44	65
33	7	2	0	2	7	16	27	42	61	82
31	1	0	3	9	17	28	42	58	77	99
29	1	5	11	19	30	43	58	75	94	116
27	7	14	22	32	44	58	74	91	111	132
25	17	25	35	47	60	74	90	107	126	147

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	26	340	101	118	130	137
39000	25	330	96	112	124	132
37000	24	330	92	107	119	127
35000	24	320	88	102	113	121
33000	23	320	84	98	109	116
31000	22	310	80	93	103	110
29000	21	310	75	87	96	103
27000	20	300	70	82	90	96
25000	19	290	66	76	84	90
23000	18	280	61	71	78	83
21000	17	270	57	65	72	76
19000	16	260	52	60	66	70
17000	15	250	48	55	60	63
15000	14	240	43	49	54	57
10000	10	200	30	34	36	38
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	65.1	67.7	71.6	75.6	79.9	84.1	88.4		
	KIAS	252	253	254	255	257	259	263		
	FF/ENG	1540	1520	1510	1500	1480	1490	1540		
80	%N1	63.4	66.2	69.9	74.0	78.3	82.6	86.8	94.0	
	KIAS	244	245	246	247	249	251	254	250	
	FF/ENG	1460	1430	1420	1410	1390	1400	1430	1560	
75	%N1	61.6	64.7	68.3	72.5	76.5	81.0	85.1	90.2	
	KIAS	236	238	238	239	241	243	246	249	
	FF/ENG	1370	1350	1340	1330	1300	1300	1330	1400	
70	%N1	59.8	62.8	66.6	70.6	74.7	79.2	83.4	88.0	
	KIAS	229	229	230	231	233	234	236	240	
	FF/ENG	1290	1270	1250	1240	1220	1210	1230	1280	
65	%N1	58.1	60.7	64.9	68.6	72.9	77.3	81.5	85.9	
	KIAS	221	221	222	223	224	225	227	230	
	FF/ENG	1210	1190	1170	1150	1140	1120	1140	1170	
60	%N1	56.2	58.7	62.9	66.7	71.0	75.2	79.5	83.9	
	KIAS	211	212	213	214	215	216	218	220	
	FF/ENG	1130	1110	1090	1070	1050	1030	1050	1060	
55	%N1	54.2	56.7	60.5	64.6	68.7	73.0	77.4	81.7	89.8
	KIAS	202	203	203	204	205	207	208	210	214
	FF/ENG	1050	1030	1010	990	970	950	950	970	1050
50	%N1	52.0	54.5	58.1	62.4	66.2	70.7	75.0	79.4	86.9
	KIAS	192	193	194	195	195	197	198	200	203
	FF/ENG	970	950	920	910	890	870	880	890	940
45	%N1	49.6	52.1	55.7	59.6	63.8	68.0	72.2	76.8	84.0
	KIAS	185	185	185	185	185	186	187	189	192
	FF/ENG	900	870	840	840	820	810	790	800	840
40	%N1	47.1	49.5	53.0	56.7	61.1	65.0	69.4	73.9	81.1
	KIAS	178	178	178	178	178	178	178	178	180
	FF/ENG	840	810	780	760	740	730	720	710	740

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

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 15

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	945	70/-55	20/25	-35	115	10	-10	20	-20	65	20	40
MAX AUTO	1225	70/-70	25/35	-45	145	5	-5	30	-30	105	0	0
AUTOBRAKE 3	1745	120/-115	45/60	-75	250	5	-5	45	-45	175	0	0
AUTOBRAKE 2	2240	170/-170	65/85	-100	340	35	-40	65	-65	185	75	75
AUTOBRAKE 1	2465	200/-195	80/105	-115	400	65	-70	70	-70	175	240	325

Good Reported Braking Action

MAX MANUAL	1310	85/-80	35/45	-55	200	30	-25	30	-30	90	70	165
MAX AUTO	1445	90/-85	35/45	-60	205	30	-25	35	-35	100	75	175
AUTOBRAKE 3	1750	120/-115	45/60	-75	250	10	-10	45	-45	175	5	15
AUTOBRAKE 2	2240	170/-170	65/85	-100	340	35	-40	65	-65	185	75	75

Medium Reported Braking Action

MAX MANUAL	1800	135/-130	55/70	-90	330	75	-60	45	-45	120	200	490
MAX AUTO	1885	135/-130	55/75	-90	330	80	-60	45	-50	125	205	500
AUTOBRAKE 3	1935	140/-135	55/75	-95	340	60	-40	50	-50	175	135	425
AUTOBRAKE 2	2290	175/-170	70/90	-110	385	60	-55	65	-65	185	115	245

Poor Reported Braking Action

MAX MANUAL	2360	220/-180	75/105	-135	520	190	-125	65	-65	150	430	1185
MAX AUTO	2450	190/-180	75/105	-135	520	190	-125	65	-65	150	430	1185
AUTOBRAKE 3	2450	190/-180	75/105	-135	520	185	-120	65	-65	160	430	1185
AUTOBRAKE 2	2545	200/-195	80/110	-145	540	170	-110	70	-70	185	350	1040

Reference distance is for sea level, standard day, no wind or slope, VREF15 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 55 m.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 m of air distance).
***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 Distances

Flaps 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	900	60/-50	20/25	-35	110	10	-10	20	-20	65	15	35
MAX AUTO	1145	65/-60	25/30	-40	140	5	-5	25	-25	100	0	0
AUTOBRAKE 3	1610	105/-105	40/55	-70	235	5	-5	45	-45	165	0	0
AUTOBRAKE 2	2065	150/-150	60/80	-95	325	30	-35	55	-55	170	65	65
AUTOBRAKE 1	2270	175/-175	70/95	-110	385	60	-65	65	-65	160	200	280

Good Reported Braking Action

MAX MANUAL	1250	80/-75	30/40	-55	195	30	-25	30	-30	95	65	145
MAX AUTO	1370	80/-80	35/45	-55	200	30	-25	30	-30	100	70	160
AUTOBRAKE 3	1615	105/-105	40/55	-70	240	10	-10	45	-45	165	5	15
AUTOBRAKE 2	2065	150/-150	60/80	-95	325	30	-35	55	-55	170	65	65

Medium Reported Braking Action

MAX MANUAL	1695	120/-120	50/65	-90	320	75	-60	45	-45	120	175	425
MAX AUTO	1770	125/-120	50/65	-90	320	75	-60	45	-45	120	180	435
AUTOBRAKE 3	1810	125/-120	50/70	-90	330	60	-40	45	-50	165	130	385
AUTOBRAKE 2	2115	155/-155	60/80	-105	370	55	-55	55	-60	170	100	215

Poor Reported Braking Action

MAX MANUAL	2195	175/-165	70/95	-130	505	180	-115	60	-60	140	370	995
MAX AUTO	2280	175/-165	70/95	-130	505	180	-115	60	-60	140	370	1000
AUTOBRAKE 3	2280	175/-165	70/95	-130	505	180	-115	60	-60	150	375	1000
AUTOBRAKE 2	2360	185/-175	75/100	-135	520	160	-105	65	-65	170	305	880

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 55 m.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 m of air distance).
***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 Distances

Flaps 40

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (M)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV
MAX MANUAL	860	55/-45	15/25	-30	110	10	-10	15	-15	65	15	30
MAX AUTO	1070	60/-55	20/30	-40	135	5	-5	25	-25	95	0	0
AUTOBRAKE 3	1485	100/-95	35/50	-65	225	5	-5	40	-40	160	0	0
AUTOBRAKE 2	1910	140/-135	55/70	-90	315	25	-30	50	-50	175	35	35
AUTOBRAKE 1	2115	165/-160	65/85	-105	370	50	-60	60	-60	160	155	205

Good Reported Braking Action

MAX MANUAL	1195	75/-75	30/40	-55	190	30	-25	30	-30	95	60	135
MAX AUTO	1300	80/-75	30/40	-55	195	30	-25	30	-30	100	65	140
AUTOBRAKE 3	1490	100/-95	35/50	-65	230	10	-10	40	-40	160	5	15
AUTOBRAKE 2	1910	140/-135	55/70	-90	315	25	-30	50	-50	175	35	35

Medium Reported Braking Action

MAX MANUAL	1610	115/-110	45/60	-85	315	75	-55	40	-40	120	160	385
MAX AUTO	1675	115/-115	45/65	-85	315	75	-55	40	-40	120	160	385
AUTOBRAKE 3	1700	120/-115	45/65	-90	320	60	-40	45	-45	160	135	365
AUTOBRAKE 2	1960	145/-140	55/75	-100	355	50	-45	50	-55	175	75	185

Poor Reported Braking Action

MAX MANUAL	2080	165/-155	65/90	-130	495	175	-115	55	-55	140	335	885
MAX AUTO	2165	165/-155	65/90	-130	495	175	-115	55	-55	140	335	885
AUTOBRAKE 3	2165	165/-155	65/90	-130	495	175	-115	55	-55	145	335	890
AUTOBRAKE 2	2215	170/-165	65/90	-135	510	155	-100	60	-60	170	270	795

Reference distance is for sea level, standard day, no wind or slope, VREF40 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 55 m.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (305 m of air distance).
***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

Dry Runway

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	1225	170/-70	45/45	-45	205	20	-20	105
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1515	90/-95	40/55	-75	270	45	-40	115
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	1025	70/-55	25/30	-35	125	15	-15	85
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	990	65/-55	20/30	-35	125	15	-10	90
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	950	60/-50	20/25	-35	120	15	-10	90
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1065	55/-60	25/30	-40	140	15	-15	75
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1425	80/-85	35/45	-55	185	35	-30	145
LEADING EDGE FLAPS TRANSIT	VREF15+15	1060	75/-60	25/30	-35	125	10	-10	70
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	955	70/-55	20/25	-35	120	10	-10	65
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	910	60/-50	20/25	-35	115	10	-10	65

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	945	70/-55	20/25	-35	120	10	-10	65
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	945	70/-55	20/25	-35	120	10	-10	65
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	900	60/-50	20/25	-35	110	10	-10	65
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	945	70/-55	20/25	-35	120	10	-10	65
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1050	85/-60	25/30	-35	130	10	-10	70
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	900	60/-50	20/25	-35	110	10	-10	65
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	945	70/-55	20/25	-35	120	10	-10	65
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	1050	85/-60	25/30	-35	130	10	-10	70
TRAILING EDGE FLAPS UP	VREF40+40	1110	110/-65	30/30	-40	165	15	-10	70

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (M) REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APPROACH SPEED PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	1660	90/-95	45/60	-65	225	35	-30	85
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	1685	110/-110	45/60	-85	330	65	-55	125
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	1485	95/-100	40/55	-60	225	40	-35	130
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1410	90/-90	40/50	-60	220	40	-35	130
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1340	85/-85	35/50	-60	215	40	-35	130
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1350	85/-85	35/45	-60	205	30	-25	100
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	1760	105/-110	45/60	-75	250	55	-50	170
LEADING EDGE FLAPS TRANSIT	VREF15+15	1475	90/-90	40/55	-60	215	35	-30	95
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	1350	80/-85	35/45	-60	210	35	-30	100
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	1285	75/-80	30/45	-55	205	30	-30	100

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	1295	80/-80	35/45	-55	200	30	-25	90
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	1295	80/-80	35/45	-55	200	30	-25	90
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1250	80/-75	30/40	-55	195	30	-25	95
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1295	80/-80	35/45	-55	200	30	-25	90
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1435	80/-85	40/50	-60	210	30	-25	90
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1250	80/-75	30/40	-55	195	30	-25	95
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1295	80/-80	35/45	-55	200	30	-25	90
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	1435	80/-85	40/50	-60	210	30	-25	90
TRAILING EDGE FLAPS UP	VREF40+40	1510	80/-85	40/55	-60	215	30	-30	85

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	2340	150/-155	75/100	-100	375	85	-75	120
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	2130	155/-155	65/90	-130	515	150	-105	145
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	2030	155/-150	65/90	-100	365	95	-80	165
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	1905	140/-140	60/80	-95	355	90	-75	160
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	1795	130/-130	55/75	-95	345	85	-70	160
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	1845	135/-130	55/75	-90	340	80	-65	130
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	2425	170/-170	70/100	-115	395	120	-105	210
LEADING EDGE FLAPS TRANSIT	VREF15+15	2020	140/-140	60/85	-95	355	80	-70	125
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	1930	135/-140	55/75	-100	360	90	-75	135
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	1805	125/-130	50/70	-95	350	85	-70	135

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (M) REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APPROACH SPEED PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	1770	125/-125	50/75	-90	330	70	-60	120
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	1770	125/-125	50/75	-90	330	70	-60	120
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	1695	120/-120	50/65	-90	320	75	-60	120
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	1770	125/-125	50/75	-90	330	70	-60	120
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	1985	130/-135	60/80	-95	350	80	-65	120
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	1695	120/-120	50/65	-90	320	75	-60	120
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	1770	125/-125	50/75	-90	330	70	-60	120
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	1985	130/-135	60/80	-95	350	80	-65	120
TRAILING EDGE FLAPS UP	VREF40+40	2110	135/-140	65/85	-100	360	80	-70	115

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	3090	220/-225	110/150	-155	590	200	-150	150
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	2815	225/-215	85/130	-210	955	515	-245	160
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	2620	220/-210	90/130	-145	570	205	-150	190
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	2435	195/-190	80/115	-140	555	190	-140	180
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	2285	180/-175	75/105	-135	540	185	-135	175
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	2390	190/-185	80/115	-135	540	170	-130	155
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	3115	240/-235	105/145	-165	605	240	-185	235
LEADING EDGE FLAPS TRANSIT	VREF15+15	2615	200/-200	90/125	-140	555	180	-135	150
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	2635	205/-205	85/115	-155	595	225	-160	170
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	2430	185/-185	75/105	-145	575	210	-150	160

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (M)							
		REFERENCE DISTANCE FOR 60000 KG LANDING WEIGHT	WT ADJ PER 5000 KG ABOVE/ BELOW 60000 KG	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	2295	180/-175	75/105	-135	525	160	-120	140
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	2295	180/-175	75/105	-135	525	160	-120	140
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2195	175/-165	70/95	-130	505	180	-115	140
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	2295	180/-175	75/105	-135	525	160	-120	140
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	2595	190/-190	85/120	-140	555	175	-130	145
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2195	175/-165	70/95	-130	505	180	-115	140
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	2295	180/-175	75/105	-135	525	160	-120	140
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	2595	190/-190	85/120	-140	555	175	-130	145
TRAILING EDGE FLAPS UP	VREF40+40	2780	200/-200	95/130	-145	565	185	-140	145

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (305 m of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft 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		
		PRESSURE ALTITUDE (1000 FT)																	
WEIGHT (1000 KG)	OAT (°C)	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
80	0	15.1	16.9	19.1	22.3	25.3	29.0	30.7	35.1	40.4	40.1	46.0	53.1	50.4	57.8	66.7	60.5	69.2	79.9
	10	15.6	17.4	19.7	23.1	26.2	30.0	31.8	36.3	41.8	41.5	47.5	54.9	52.1	59.7	68.9	62.5	71.5	82.5
	15	15.8	17.7	20.0	23.4	26.6	30.4	32.3	36.9	42.5	42.2	48.3	55.8	53.0	60.7	70.1	63.5	72.7	83.8
	20	16.0	17.9	20.2	23.8	27.0	30.9	32.8	37.4	43.1	42.9	49.1	56.7	53.8	61.7	71.1	64.5	73.8	85.0
	30	16.3	18.3	20.7	24.3	27.6	31.7	33.6	38.4	44.3	44.0	50.4	58.2	55.2	63.3	73.1	66.2	75.8	87.4
	40	16.5	18.5	21.0	24.7	28.1	32.2	34.2	39.1	45.1	44.8	51.4	59.4	56.3	64.6	74.6	67.6	77.5	89.3
	50	16.6	18.7	21.2	24.9	28.3	32.5	34.5	39.5	45.6	45.3	52.0	60.2	57.1	65.6	75.9	68.7	78.8	91.0
70	0	13.7	15.3	17.2	20.1	22.7	26.0	27.5	31.4	36.1	35.8	41.0	47.3	44.9	51.4	59.4	54.3	62.2	71.8
	10	14.1	15.7	17.7	20.8	23.5	26.8	28.4	32.4	37.3	37.0	42.3	48.9	46.4	53.1	61.3	56.1	64.2	74.1
	15	14.3	16.0	17.9	21.1	23.9	27.3	28.9	32.9	37.9	37.6	43.1	49.7	47.1	54.0	62.4	57.0	65.3	75.3
	20	14.5	16.2	18.2	21.4	24.2	27.7	29.3	33.5	38.5	38.2	43.7	50.5	47.9	54.9	63.3	57.9	66.3	76.5
	30	14.8	16.5	18.6	21.9	24.8	28.3	30.0	34.3	39.5	39.2	44.9	51.8	49.1	56.3	65.0	59.5	68.1	78.6
	40	15.0	16.7	18.8	22.2	25.2	28.8	30.6	34.9	40.2	39.9	45.7	52.8	50.1	57.4	66.4	60.7	69.6	80.3
	50	15.1	16.8	19.0	22.4	25.4	29.1	30.8	35.3	40.6	40.3	46.3	53.5	50.7	58.2	67.4	61.5	70.6	81.7
60	0	12.4	13.7	15.3	17.9	20.2	22.9	24.3	27.6	31.7	31.4	35.9	41.4	39.2	44.9	51.8	47.6	54.6	63.1
	10	12.7	14.1	15.7	18.5	20.8	23.7	25.1	28.5	32.7	32.5	37.1	42.8	40.5	46.4	53.6	49.2	56.4	65.2
	15	12.9	14.3	16.0	18.8	21.1	24.1	25.5	29.0	33.3	33.0	37.7	43.5	41.2	47.2	54.5	50.1	57.4	66.2
	20	13.0	14.4	16.2	19.0	21.4	24.4	25.9	29.4	33.8	33.5	38.3	44.2	41.9	47.9	55.3	50.9	58.3	67.3
	30	13.3	14.7	16.5	19.4	21.9	25.0	26.5	30.2	34.6	34.4	39.3	45.3	42.9	49.2	56.8	52.2	59.8	69.1
	40	13.4	14.9	16.7	19.7	22.3	25.4	26.9	30.7	35.3	35.0	40.0	46.2	43.7	50.1	57.9	53.2	61.0	70.5
	50	13.5	15.0	16.8	19.9	22.4	25.6	27.2	31.0	35.6	35.3	40.5	46.7	44.3	50.8	58.8	53.9	61.9	71.7
50	0	11.0	12.1	13.4	15.7	17.6	19.9	21.1	23.9	27.3	27.0	30.8	35.4	33.5	38.3	44.2	40.6	46.5	53.7
	10	11.3	12.4	13.8	16.2	18.2	20.5	21.8	24.6	28.2	27.9	31.8	36.6	34.6	39.6	45.7	41.9	48.0	55.4
	15	11.5	12.6	14.0	16.4	18.4	20.9	22.1	25.0	28.6	28.4	32.3	37.2	35.2	40.3	46.4	42.6	48.8	56.4
	20	11.6	12.7	14.1	16.6	18.7	21.1	22.4	25.4	29.1	28.8	32.8	37.8	35.8	40.9	47.2	43.3	49.6	57.3
	30	11.8	13.0	14.4	17.0	19.1	21.6	22.9	26.0	29.8	29.5	33.7	38.7	36.7	42.0	48.4	44.4	50.9	58.8
	40	11.9	13.1	14.6	17.2	19.4	21.9	23.3	26.4	30.3	30.0	34.3	39.4	37.3	42.7	49.3	45.3	51.9	60.0
	50	12.0	13.2	14.7	17.3	19.5	22.1	23.5	26.7	30.6	30.3	34.6	39.9	37.7	43.2	50.0	45.8	52.6	60.8
40	0	9.7	10.5	11.6	13.5	15.0	16.9	17.8	20.1	22.8	22.6	25.6	29.4	27.7	31.6	36.3	33.1	37.8	43.6
	10	10.0	10.8	11.9	13.9	15.5	17.4	18.4	20.7	23.6	23.3	26.5	30.3	28.6	32.7	37.6	34.2	39.1	45.0
	15	10.1	11.0	12.0	14.1	15.7	17.7	18.7	21.0	23.9	23.7	26.9	30.8	29.1	33.2	38.2	34.7	39.7	45.8
	20	10.2	11.1	12.2	14.3	15.9	17.9	18.9	21.3	24.3	24.1	27.3	31.3	29.6	33.7	38.8	35.3	40.3	46.5
	30	10.3	11.2	12.4	14.6	16.2	18.3	19.3	21.8	24.9	24.6	28.0	32.1	30.3	34.6	39.8	36.2	41.4	47.7
	40	10.4	11.4	12.5	14.7	16.4	18.5	19.6	22.2	25.3	25.0	28.4	32.6	30.8	35.2	40.5	36.8	42.1	48.6
	50	10.5	11.4	12.6	14.8	16.6	18.7	19.8	22.3	25.5	25.2	28.7	33.0	31.1	35.5	41.0	37.2	42.6	49.3

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	5.5	15.6	25.4	35.0	44.6	54.6	64.9	75.7	86.9
	MAX AUTO	5.0	14.7	24.1	33.3	42.7	52.5	62.9	73.7	85.1
	AUTOBRAKE 3	4.3	13.4	21.8	29.7	37.7	46.6	56.4	67.1	78.7
	AUTOBRAKE 2	3.7	12.1	19.7	26.4	33.2	41.0	49.8	59.6	70.4
	AUTOBRAKE 1	3.1	10.9	17.8	23.6	29.2	35.8	43.1	51.2	60.2

Two Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	5.1	14.5	23.6	32.5	41.3	50.5	60.0	69.9	80.0
	MAX AUTO	3.7	11.9	20.0	28.1	36.4	45.5	55.3	65.8	77.0
	AUTOBRAKE 3	1.4	7.3	12.9	18.4	24.3	31.2	39.1	47.9	57.7
	AUTOBRAKE 2		4.0	7.8	11.3	15.1	19.9	25.7	32.5	40.3
	AUTOBRAKE 1		2.1	4.6	6.6	8.7	11.6	15.3	19.7	25.0

Cooling Time (Minutes)

	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		

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.

Intentionally
Blank

Performance Inflight — Chapter PI

Engine Inoperative — Section 33

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	-3.1	-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	81	270	17500	16200	15000
80	77	262	19200	18000	16700
75	72	255	20800	19800	18500
70	67	246	22300	21300	20300
65	62	238	23900	23000	22000
60	57	228	25800	24800	23900
55	53	219	28100	27100	26000
50	48	209	30300	29500	28500
45	43	198	32500	31800	30900
40	38	187	34900	34100	33300

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
139	129	120	113	106	100	95	90	86	82	78
277	257	240	225	212	200	189	180	171	164	156
416	386	360	338	318	300	284	270	257	245	235
554	515	480	450	424	400	379	360	343	327	313
693	643	600	563	529	500	474	450	428	409	391
831	772	720	675	635	600	568	540	514	491	469
969	900	840	788	741	700	663	630	600	573	548
1108	1029	960	900	847	800	758	720	686	655	626
1246	1157	1080	1012	953	900	853	810	771	736	704
1385	1286	1200	1125	1059	1000	947	900	857	818	783
1523	1414	1320	1237	1165	1100	1042	990	943	900	861
1662	1543	1440	1350	1271	1200	1137	1080	1029	982	939
1800	1672	1560	1463	1376	1300	1232	1170	1114	1064	1017
1939	1800	1680	1575	1482	1400	1326	1260	1200	1145	1095
2078	1929	1800	1688	1588	1500	1421	1350	1285	1227	1174
2217	2058	1921	1800	1694	1600	1516	1440	1371	1309	1252
2356	2187	2041	1913	1800	1700	1610	1530	1457	1390	1330
2496	2317	2161	2026	1906	1800	1705	1619	1542	1472	1408

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	0.5	0.5	0.5	0.5	0.6	0.6	0:17
200	0.8	0.8	0.9	1.0	1.0	1.1	1.1	1.2	1.3	1.3	0:34
300	1.3	1.3	1.4	1.6	1.7	1.7	1.9	2.0	2.1	2.2	0:50
400	1.7	1.8	2.0	2.2	2.3	2.4	2.6	2.8	2.9	3.1	1:07
500	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	1:24
600	2.5	2.8	3.0	3.3	3.5	3.7	4.0	4.2	4.5	4.7	1:40
700	2.9	3.2	3.5	3.8	4.1	4.3	4.6	4.9	5.2	5.5	1:57
800	3.4	3.7	4.0	4.3	4.7	5.0	5.3	5.6	6.0	6.3	2:14
900	3.8	4.1	4.5	4.9	5.3	5.6	6.0	6.4	6.7	7.1	2:30
1000	4.2	4.6	5.0	5.4	5.8	6.2	6.6	7.0	7.5	7.9	2:47
1100	4.6	5.0	5.5	5.9	6.4	6.8	7.3	7.7	8.2	8.7	3:04
1200	5.0	5.4	5.9	6.5	6.9	7.4	7.9	8.4	8.9	9.4	3:21
1300	5.3	5.9	6.4	7.0	7.5	8.0	8.6	9.1	9.7	10.2	3:37
1400	5.7	6.3	6.9	7.5	8.1	8.6	9.2	9.8	10.4	11.0	3:54
1500	6.1	6.7	7.3	8.0	8.6	9.2	9.8	10.4	11.1	11.7	4:11
1600	6.5	7.2	7.8	8.5	9.1	9.8	10.4	11.1	11.8	12.5	4:28
1700	6.9	7.6	8.3	9.0	9.7	10.3	11.1	11.8	12.5	13.2	4:45
1800	7.2	8.0	8.7	9.5	10.2	10.9	11.7	12.4	13.2	13.9	5:02

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	13800	11300	8900
80	16100	13700	11400
75	18100	16300	14000
70	20200	18500	16300
65	21800	20600	18600
60	23400	22300	20700
55	25300	24100	22700
50	28100	26700	24800
45	30700	29700	28100
40	33200	32300	31100

With engine anti-ice on, decrease altitude capability by 2100 ft.
With engine and wing anti-ice on, decrease altitude capability by 5700 ft (optional system).

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		10	14	18	22	25	27	29	31
85	%N1	92.5	95.7						
	MACH	.561	.593						
	KIAS	311	306						
	FF/ENG	3152	3144						
80	%N1	90.8	94.2	98.5					
	MACH	.545	.585	.612					
	KIAS	302	302	292					
	FF/ENG	2951	2983	2973					
75	%N1	89.0	92.4	96.2					
	MACH	.528	.569	.599					
	KIAS	293	293	286					
	FF/ENG	2751	2781	2756					
70	%N1	87.1	90.6	94.1					
	MACH	.510	.551	.589					
	KIAS	282	284	281					
	FF/ENG	2552	2581	2578					
65	%N1	85.1	88.5	92.0	96.3				
	MACH	.491	.532	.574	.604				
	KIAS	271	273	274	266				
	FF/ENG	2356	2381	2394	2388				
60	%N1	82.9	86.3	89.9	93.8				
	MACH	.471	.511	.553	.590				
	KIAS	261	262	263	260				
	FF/ENG	2168	2183	2196	2192				
55	%N1	80.7	83.9	87.5	91.2	94.5	97.7		
	MACH	.453	.488	.530	.574	.597	.614		
	KIAS	250	250	252	252	247	244		
	FF/ENG	1991	1987	1998	2009	2010	2060		
50	%N1	78.3	81.4	84.9	88.5	91.7	94.0	97.1	
	MACH	.434	.466	.505	.549	.583	.596	.613	
	KIAS	240	239	240	241	241	236	233	
	FF/ENG	1822	1803	1801	1811	1831	1829	1873	
45	%N1	75.9	78.8	82.0	85.7	88.4	90.6	93.2	96.2
	MACH	.415	.444	.478	.522	.556	.578	.593	.610
	KIAS	229	227	227	229	229	229	225	222
	FF/ENG	1661	1629	1608	1615	1627	1647	1649	1683
40	%N1	73.4	76.0	79.1	82.5	85.2	87.1	89.2	91.8
	MACH	.395	.422	.453	.491	.525	.548	.571	.589
	KIAS	218	216	215	215	216	216	216	214
	FF/ENG	1506	1466	1434	1422	1432	1445	1461	1470

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion 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
309	279	253	233	215	200	190	180	172	164	157
625	564	511	467	432	400	379	360	342	326	312
943	850	769	703	648	600	568	540	513	489	468
1263	1137	1028	939	865	800	758	719	683	652	623
1586	1426	1287	1175	1082	1000	947	898	853	813	778
1912	1717	1548	1412	1299	1200	1136	1076	1023	975	932
2240	2009	1810	1649	1517	1400	1324	1255	1192	1136	1086
2570	2304	2074	1888	1735	1600	1513	1434	1362	1297	1240
2903	2600	2337	2127	1953	1800	1702	1613	1531	1458	1393

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	1.3	0:46	1.1	0:43	1.0	0:41	0.9	0:39	0.8	0:38
400	2.7	1:30	2.4	1:25	2.2	1:20	2.0	1:15	1.9	1:12
600	4.0	2:14	3.7	2:07	3.4	2:00	3.1	1:52	2.9	1:46
800	5.3	3:00	4.9	2:50	4.5	2:40	4.2	2:29	4.0	2:21
1000	6.7	3:45	6.1	3:33	5.7	3:20	5.3	3:07	5.0	2:56
1200	8.0	4:32	7.3	4:17	6.8	4:01	6.3	3:45	6.0	3:31
1400	9.3	5:18	8.6	5:01	7.9	4:42	7.4	4:23	7.0	4:07
1600	10.5	6:06	9.7	5:45	9.0	5:24	8.4	5:02	7.9	4:43
1800	11.8	6:54	10.9	6:31	10.1	6:07	9.4	5:42	8.9	5:20

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	0.0	0.0	0.0	0.1	0.2	0.3	0.4	0.5
2	-0.1	-0.1	0.0	0.1	0.3	0.5	0.7	0.9	1.2
3	-0.2	-0.1	0.0	0.2	0.4	0.7	1.0	1.4	1.8
4	-0.3	-0.2	0.0	0.3	0.6	1.0	1.4	1.9	2.4
5	-0.4	-0.2	0.0	0.3	0.7	1.2	1.8	2.4	3.0
6	-0.5	-0.2	0.0	0.4	0.9	1.4	2.1	2.8	3.6
7	-0.6	-0.3	0.0	0.4	1.0	1.6	2.4	3.2	4.2
8	-0.6	-0.3	0.0	0.5	1.1	1.9	2.7	3.6	4.7
9	-0.7	-0.4	0.0	0.6	1.2	2.0	3.0	4.0	5.2
10	-0.8	-0.4	0.0	0.6	1.4	2.2	3.2	4.4	5.6
11	-0.9	-0.4	0.0	0.7	1.5	2.4	3.5	4.7	6.1
12	-1.0	-0.5	0.0	0.7	1.6	2.6	3.7	5.0	6.5
13	-1.0	-0.5	0.0	0.8	1.7	2.7	3.9	5.3	6.9
14	-1.1	-0.6	0.0	0.8	1.8	2.8	4.1	5.6	7.2

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)							
		1500	5000	10000	15000	20000	25000	30000	35000
85	%N1	82.0	84.9	89.2	94.1				
	KIAS	252	253	254	255				
	FF/ENG	2820	2830	2850	2920				
80	%N1	80.3	83.2	87.5	92.0				
	KIAS	244	245	246	247				
	FF/ENG	2650	2650	2660	2710				
75	%N1	78.6	81.4	85.6	90.1	96.9			
	KIAS	236	238	238	239	241			
	FF/ENG	2490	2480	2480	2520	2620			
70	%N1	76.7	79.4	83.7	88.1	93.6			
	KIAS	229	229	230	231	233			
	FF/ENG	2330	2310	2310	2330	2380			
65	%N1	74.7	77.5	81.6	85.9	90.7			
	KIAS	221	221	222	223	224			
	FF/ENG	2160	2150	2130	2150	2170			
60	%N1	72.5	75.4	79.4	83.7	88.3	95.6		
	KIAS	211	212	213	214	215	216		
	FF/ENG	2000	1980	1970	1970	1980	2080		
55	%N1	70.1	73.0	77.0	81.3	85.8	91.4		
	KIAS	202	203	203	204	205	207		
	FF/ENG	1850	1820	1800	1790	1790	1840		
50	%N1	67.7	70.4	74.5	78.7	83.2	87.9	96.7	
	KIAS	192	193	194	195	195	197	198	
	FF/ENG	1690	1660	1640	1630	1620	1630	1780	
45	%N1	64.9	67.6	71.7	75.8	80.3	84.9	91.2	
	KIAS	185	185	185	185	185	186	187	
	FF/ENG	1540	1510	1480	1470	1450	1450	1510	
40	%N1	61.8	64.6	68.5	72.8	77.0	81.6	86.5	96.3
	KIAS	178	178	178	178	178	178	178	178
	FF/ENG	1380	1360	1330	1310	1280	1280	1310	1440

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

Intentionally
Blank

ALTERNATE MODE EEC

Alternate Mode EEC Limit Weight

PERFORMANCE LIMIT	NORMAL MODE PERFORMANCE LIMIT WEIGHT (1000 KG)										
	44	48	52	56	60	64	68	72	76	80	84
FIELD	41.8	45.6	49.5	53.3	57.0	60.8	64.2	68.4	72.2	75.9	79.8
CLIMB	41.1	44.9	48.6	52.4	56.1	60.0	63.6	67.3	71.1	74.3	78.6
OBSTACLE	41.3	45.1	48.8	52.6	56.3	60.1	63.7	67.4	71.1	74.7	78.6

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	0	1000	2000	3000	4000	5000	6000	7000	8000	9000
60	140	92.6	93.6	93.7	93.8	93.9	94.0	94.1	94.0	93.7	93.6	93.5
55	131	93.2	94.3	94.4	94.5	94.6	94.7	94.9	94.7	94.4	94.1	93.7
50	122	93.8	95.0	95.1	95.2	95.4	95.5	95.6	95.5	95.2	94.9	94.4
45	113	94.5	95.7	95.8	95.9	96.1	96.2	96.3	96.2	95.9	95.6	95.3
40	104	95.2	96.4	96.5	96.6	96.7	96.8	97.0	96.8	96.6	96.3	96.2
35	95	95.7	97.2	97.3	97.4	97.5	97.6	97.7	97.6	97.3	97.0	96.9
30	86	95.4	97.7	98.0	98.2	98.1	98.3	98.2	98.2	98.0	97.8	97.7
25	77	94.6	97.3	97.9	98.3	98.3	98.5	98.5	98.5	98.5	98.3	98.3
20	68	93.8	96.6	97.1	97.7	98.0	98.3	98.5	98.6	98.7	98.6	98.6
15	59	93.0	95.8	96.4	97.0	97.3	97.6	97.9	98.3	98.7	98.8	98.8
10	50	92.3	95.0	95.6	96.2	96.5	96.8	97.2	97.5	97.9	98.3	98.8
5	41	91.5	94.2	94.8	95.4	95.8	96.1	96.4	96.8	97.2	97.6	98.1
0	32	90.7	93.4	94.1	94.7	95.0	95.3	95.7	96.0	96.4	96.8	97.3
-5	23	89.8	92.6	93.3	93.9	94.2	94.5	94.9	95.3	95.7	96.1	96.5
-10	14	89.0	91.8	92.5	93.1	93.4	93.7	94.1	94.5	94.9	95.3	95.8
-15	5	88.2	91.0	91.7	92.3	92.6	93.0	93.4	93.7	94.1	94.5	95.0
-20	-4	87.4	90.2	90.8	91.5	91.8	92.2	92.6	93.0	93.4	93.7	94.2
-25	-13	86.5	89.4	90.0	90.7	91.0	91.4	91.8	92.2	92.6	93.0	93.4
-30	-22	85.7	88.5	89.2	89.8	90.2	90.6	91.0	91.4	91.8	92.2	92.6
-35	-31	84.8	87.7	88.3	89.0	89.4	89.7	90.2	90.6	90.9	91.3	91.8
-40	-40	83.9	86.8	87.5	88.1	88.5	88.9	89.3	89.7	90.1	90.5	90.9
-45	-49	83.1	86.0	86.6	87.3	87.7	88.1	88.5	88.9	89.3	89.7	90.1
-50	-58	82.2	86.0	85.7	86.4	86.8	87.2	87.7	88.1	88.5	88.8	89.3
-55	-67	81.3	86.0	84.9	85.6	86.0	86.4	86.8	87.2	87.6	88.0	88.4

%N1 Adjustments for Engine Bleed

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

Intentionally
Blank

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	14600	11500	8500
80	17400	14600	11700
75	20300	17600	14900
70	22800	20500	17800
65	25400	23500	20900
60	27800	26300	24400
55	30200	29000	27300
50	32300	31300	30100
45	34500	33500	32400
40	36900	36000	34900

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	21	23	25	27	29	31	33	35	37
80	%N1	84.8									
	MACH	.468									
	KIAS	259									
	FF/ENG	2313									
70	%N1	81.1	90.4	92.6							
	MACH	.440	.541	.557							
	KIAS	243	242	240							
	FF/ENG	2010	2004	2002							
60	%N1	76.9	86.2	88.0	89.8	92.3	95.7				
	MACH	.409	.504	.525	.544	.562	.580				
	KIAS	226	225	225	224	222	220				
	FF/ENG	1722	1694	1696	1697	1709	1756				
50	%N1	72.3	81.2	83.0	84.8	86.6	88.5	91.1	94.7		
	MACH	.376	.463	.482	.502	.523	.544	.561	.580		
	KIAS	207	206	206	206	206	205	203	201		
	FF/ENG	1443	1395	1392	1394	1403	1409	1418	1461		
40	%N1	66.6	75.3	77.0	78.8	80.5	82.3	84.2	86.1	88.6	92.5
	MACH	.340	.417	.434	.452	.471	.491	.513	.535	.554	.573
	KIAS	187	185	185	185	185	185	185	185	183	181
	FF/ENG	1184	1114	1102	1102	1108	1112	1115	1119	1125	1160

GEAR DOWN

Long Range Cruise Enroute 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
327	291	260	236	217	200	188	177	167	159	152
657	585	524	475	435	400	377	356	337	320	305
992	882	788	714	653	600	565	534	505	480	458
1331	1182	1055	954	872	800	754	712	674	640	610
1676	1486	1323	1195	1091	1000	942	889	842	799	762
2026	1792	1593	1436	1310	1200	1130	1066	1009	958	913
2382	2103	1865	1680	1530	1400	1318	1244	1176	1116	1064
2744	2418	2140	1924	1751	1600	1506	1420	1342	1274	1214
3112	2737	2418	2171	1972	1800	1694	1597	1510	1432	1364

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT) 10 FUEL (1000 KG)	10 TIME (HR:MIN)	14 FUEL (1000 KG)	14 TIME (HR:MIN)	20 FUEL (1000 KG)	20 TIME (HR:MIN)	24 FUEL (1000 KG)	24 TIME (HR:MIN)	28 FUEL (1000 KG)	28 TIME (HR:MIN)
200	2.4	0:49	2.2	0:47	1.9	0:44	1.8	0:42	1.6	0:41
400	5.0	1:36	4.6	1:31	4.1	1:24	3.8	1:20	3.6	1:17
600	7.5	2:25	7.0	2:17	6.2	2:06	5.8	1:59	5.5	1:54
800	9.9	3:14	9.2	3:03	8.3	2:48	7.7	2:38	7.4	2:31
1000	12.3	4:05	11.5	3:51	10.3	3:31	9.7	3:18	9.2	3:08
1200	14.6	4:56	13.7	4:39	12.3	4:14	11.5	3:59	11.0	3:46
1400	16.9	5:49	15.8	5:28	14.2	4:59	13.3	4:40	12.7	4:24
1600	19.1	6:43	17.9	6:19	16.1	5:44	15.1	5:22	14.4	5:04
1800	21.3	7:39	19.9	7:11	18.0	6:30	16.9	6:05	16.1	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	0.7	1.5
6	-1.0	-0.5	0.0	1.0	2.2
8	-1.4	-0.7	0.0	1.2	2.8
10	-1.7	-0.9	0.0	1.5	3.4
12	-2.0	-1.0	0.0	1.8	4.0
14	-2.4	-1.2	0.0	2.0	4.5
16	-2.7	-1.4	0.0	2.2	4.9
18	-3.1	-1.5	0.0	2.4	5.3
20	-3.4	-1.7	0.0	2.5	5.7
22	-3.8	-1.9	0.0	2.6	6.0

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM)
41000	20	270	88
39000	20	270	84
37000	19	260	79
35000	18	260	75
33000	18	250	71
31000	17	250	67
29000	16	240	63
27000	15	240	59
25000	15	230	55
23000	14	220	51
21000	13	220	47
19000	12	210	43
17000	11	200	39
15000	11	190	35
10000	8	170	25
5000	6	130	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
80	%N1	74.8	77.5	81.8	86.1	90.8			
	KIAS	225	225	225	225	225			
	FF/ENG	2160	2150	2140	2160	2170			
75	%N1	73.1	76.0	80.0	84.4	89.0			
	KIAS	220	220	220	220	220			
	FF/ENG	2040	2030	2010	2020	2030			
70	%N1	71.3	74.3	78.2	82.5	87.1	93.1		
	KIAS	216	216	216	216	216	216		
	FF/ENG	1920	1900	1890	1890	1890	1940		
65	%N1	69.5	72.4	76.4	80.7	85.1	90.2		
	KIAS	211	211	211	211	211	211		
	FF/ENG	1800	1780	1770	1760	1750	1780		
60	%N1	67.5	70.3	74.5	78.6	83.1	87.7	95.7	
	KIAS	204	204	204	204	204	204	204	
	FF/ENG	1680	1660	1640	1630	1620	1630	1740	
55	%N1	65.5	68.2	72.4	76.4	80.9	85.5	91.6	
	KIAS	198	198	198	198	198	198	198	
	FF/ENG	1570	1540	1520	1500	1490	1490	1550	
50	%N1	63.3	66.0	70.0	74.2	78.5	83.0	87.9	
	KIAS	192	192	192	192	192	192	192	
	FF/ENG	1450	1430	1400	1380	1360	1360	1390	
45	%N1	60.8	63.7	67.6	71.8	76.0	80.5	85.1	92.6
	KIAS	185	185	185	185	185	185	185	185
	FF/ENG	1330	1310	1290	1270	1240	1230	1250	1320
40	%N1	58.2	61.0	65.0	69.1	73.4	77.7	82.2	87.7
	KIAS	178	178	178	178	178	178	178	178
	FF/ENG	1220	1200	1170	1150	1130	1110	1120	1140

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

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Gear Down, Engine Inop — Section 36

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
80	76	224	3000	1300	
75	71	219	5400	4000	2000
70	67	215	7800	6400	4600
65	62	210	10200	9000	7300
60	57	204	12500	11600	10200
55	53	198	15000	14100	13200
50	48	192	17500	16700	15900
45	43	185	20100	19300	18400
40	38	178	22600	21800	21000

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	700		
70	3800	1600	
65	6800	5200	2600
60	10000	8400	6200
55	12700	11600	9800
50	15600	14800	13700
45	18700	17800	17000
40	21800	20900	20000

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)								
		5	7	9	11	13	15	17	19	21
70	%N1	95.5								
	MACH	.389								
	KIAS	235								
	FF/ENG	3850								
65	%N1	93.1	95.0							
	MACH	.376	.389							
	KIAS	228	227							
	FF/ENG	3544	3556							
60	%N1	90.7	92.4	94.3	97.3					
	MACH	.364	.375	.388	.402					
	KIAS	220	219	218	218					
	FF/ENG	3250	3252	3263	3326					
55	%N1	88.2	89.8	91.6	93.5	96.4				
	MACH	.351	.362	.374	.387	.400				
	KIAS	212	211	210	209	209				
	FF/ENG	2973	2961	2961	2971	3027				
50	%N1	85.7	87.2	88.7	90.5	92.3	95.1	99.5		
	MACH	.338	.348	.359	.371	.384	.398	.412		
	KIAS	204	203	202	201	200	199	198		
	FF/ENG	2714	2691	2676	2674	2684	2722	2824		
45	%N1	83.1	84.4	85.9	87.4	89.1	90.9	93.5	97.7	
	MACH	.325	.334	.344	.355	.367	.380	.393	.408	
	KIAS	196	195	193	192	191	190	189	189	
	FF/ENG	2468	2437	2412	2396	2393	2396	2411	2489	
40	%N1	80.2	81.5	82.9	84.3	85.8	87.5	89.3	91.5	95.1
	MACH	.311	.320	.329	.339	.349	.361	.374	.387	.402
	KIAS	188	186	184	183	182	181	180	179	179
	FF/ENG	2234	2196	2164	2139	2122	2113	2106	2107	2160

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)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
167	148	132	119	109	100	94	88	82	78	74
341	300	266	239	218	200	187	174	164	155	147
516	454	402	361	328	300	280	261	245	231	219
692	608	537	482	438	400	373	348	326	307	291
869	763	673	603	548	500	465	434	407	383	363
1048	919	809	725	658	600	558	521	488	459	434
1228	1076	947	847	768	700	651	607	568	535	506
1410	1234	1084	970	879	800	744	693	648	610	577
1593	1392	1222	1092	989	900	836	779	729	685	648
1778	1552	1361	1215	1100	1000	929	865	809	760	719

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	1.1	0:26
200	2.6	0:53	2.4	0:50	2.4	0:48
300	4.0	1:18	3.7	1:15	3.7	1:11
400	5.3	1:44	5.0	1:39	4.9	1:35
500	6.6	2:10	6.2	2:04	6.1	1:58
600	7.9	2:37	7.5	2:29	7.3	2:22
700	9.2	3:04	8.7	2:55	8.5	2:46
800	10.5	3:31	9.9	3:20	9.7	3:10
900	11.7	3:58	11.1	3:46	10.8	3:35
1000	13.0	4:25	12.2	4:12	11.9	4:00

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	-0.4	-0.2	0.0	0.3	0.6
3	-0.5	-0.3	0.0	0.5	1.0
4	-0.7	-0.4	0.0	0.7	1.3
5	-0.9	-0.5	0.0	0.9	1.7
6	-1.1	-0.6	0.0	1.1	2.0
7	-1.3	-0.7	0.0	1.2	2.4
8	-1.4	-0.7	0.0	1.4	2.7
9	-1.6	-0.8	0.0	1.6	3.1
10	-1.8	-0.9	0.0	1.8	3.4
11	-2.0	-1.0	0.0	1.9	3.8
12	-2.2	-1.1	0.0	2.1	4.1
13	-2.3	-1.2	0.0	2.2	4.5

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
80	%N1	94.1			
	KIAS	225			
	FF/ENG	4240			
75	%N1	92.1	95.5		
	KIAS	220	220		
	FF/ENG	3960	4010		
70	%N1	90.0	93.3		
	KIAS	216	216		
	FF/ENG	3680	3730		
65	%N1	88.0	91.1	97.0	
	KIAS	211	211	211	
	FF/ENG	3430	3450	3560	
60	%N1	85.8	88.8	93.6	
	KIAS	204	204	204	
	FF/ENG	3170	3180	3230	
55	%N1	83.5	86.4	91.0	98.4
	KIAS	198	198	198	198
	FF/ENG	2920	2920	2940	3110
50	%N1	80.9	83.9	88.3	93.6
	KIAS	192	192	192	192
	FF/ENG	2670	2660	2670	2730
45	%N1	78.3	81.2	85.5	90.2
	KIAS	185	185	185	185
	FF/ENG	2440	2420	2420	2450
40	%N1	75.6	78.3	82.6	87.1
	KIAS	178	178	178	178
	FF/ENG	2210	2190	2170	2180

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

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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 provided that adjustments are made to V1 for clearway, stopway, anti-skid inoperative, thrust reversers inoperative, improved climb, contaminated runway situations or brake energy limits. These speeds may be used for weights less than or equal to the performance limited weight.

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. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (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.

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.

Clearway and Stopway V1 Adjustments

Maximum allowable clearway limits are provided for guidance when more precise data is not available. Use of clearway is not allowed on wet runways.

Takeoff speed adjustments are to be applied to V1 speed when using takeoff weights based on the use of clearway and stopway.

Adjust V1 speed by the amount shown in the table. The adjusted V1 speed must not exceed VR. If the adjusted V1 speed is greater than VR, reduce V1 to equal VR.

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.

With autothrottles disengaged an approach speed wind correction (max 20 knots) of 1/2 steady headwind component + gust increment above steady wind is recommended. Do not apply a wind correction for tailwinds. The maximum command speed should not exceed landing flap placard speed minus 5 knots.

Flap Maneuver Speeds

This table provides the flap speed schedule for recommended maneuver speeds. Using VREF as the basis for the schedule makes it variable as a function of weight and will provide adequate maneuver margin above stall at all weights.

During flap retraction/extension, movement of the flap to the next position should be initiated when within 20 knots of the recommended speed for that position.

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 depths greater than 13 mm (0.5 inches) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. The use of assumed temperature for reduced thrust is not allowed on contaminated runways. Interpolation for slush/standing water depths between the values shown is permitted.

Takeoff weight 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 8500 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	-14
3500	-12
4000	-11

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 field/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/field/obstacle limited weight by 1050 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. For packs off operation, apply the %N1 adjustment shown below the table. No takeoff %N1 adjustment is required for engine and wing anti-ice.

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.

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

Normal Configuration Landing Distance

The normal configuration distance tables are provided as advisory information to help determine the actual landing distance performance of the airplane for different runway surface conditions and brake configurations.

Flaps 15, 30, and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking action, which are commonly referred to as slippery runway conditions.

If the surface is affected by water, snow or ice, and the 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 landing. 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 "poor" data reflects runways covered with wet ice.

Dry runway landing performance is shown for max manual braking configuration and autobrake settings max, 3, 2, and 1. Use of autobrake setting 1 is not recommended for landings on slippery runways, and is therefore not provided for these conditions. The autobrake performance may be used to assist in the selection of the most desirable autobrake setting for a given field length. Selection of an autobrake setting results in a constant rate of deceleration. Maximum effort manual braking should achieve shorter landing distance than the max autobrake setting. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and normal approach speed for the selected landing flap at sea level, zero wind, zero slope, and two engine detent reverse thrust. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, temperature, speed, and reverse thrust. Each adjustment is independently added to the reference landing distance.

Non-normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect the landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, and speed conditions. Each adjustment is independently added to the reference landing distance. Landing distance includes the effect of max manual braking and reverse thrust.

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 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.

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, and obstacle limit weights. To determine limit weights for operations with the EEC in 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.

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

WEIGHT (1000 LB)	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
190	171	173	179	163	166	172	163	164	168						
180	166	168	175	158	161	168	158	159	164	154	156	161	152	152	158
170	161	163	171	153	156	164	153	154	161	149	151	157	147	148	154
160	155	158	166	148	150	160	148	149	157	144	146	153	142	143	150
150	150	152	162	143	145	155	142	144	152	139	140	149	136	137	146
140	144	146	157	137	139	151	136	138	148	133	135	145	131	132	142
130	138	139	152	131	133	146	130	131	143	127	128	140	125	126	138
120	131	132	146	125	126	141	124	125	138	121	122	135	119	120	133
110	124	125	141	118	119	135	117	118	133	114	116	130	112	113	128
100	117	118	135	112	112	129	111	111	128	108	109	125	106	106	122

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						5	6						-2	-3					
60	140	4	5	6	7				3	4	5	6				-2	-2	-2	-3			
50	122	2	3	4	5	6	8	9	2	3	4	5	6	8	9	-1	-1	-2	-2	-3	-3	-4
40	104	1	2	3	4	5	6	7	1	2	3	4	5	6	8	-1	-1	-1	-2	-2	-3	-3
30	86	0	0	1	3	4	5	6	0	0	1	3	4	5	7	0	0	-1	-1	-2	-2	-3
20	68	0	0	1	2	3	4	5	0	0	1	2	3	4	6	0	0	0	-1	-1	-2	-2
-60	-76	0	0	1	2	3	4	5	0	0	1	2	3	4	5	0	0	0	-1	-1	-2	-2

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
190	-4	-2	0	1	0	-2	-1	-1	0	0	0	1	1
170	-3	-2	0	1	1	-2	-1	-1	0	0	1	1	1
150	-2	-1	0	1	1	-2	-1	-1	0	0	1	1	1
130	-1	-1	0	1	1	-2	-1	-1	0	0	1	1	1
110	-1	0	0	0	1	-2	-1	0	0	0	0	1	1
100	0	0	0	0	0	-2	-1	0	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	93	91					
60	140	93	91	89	88			
50	122	95	93	90	88	86	83	81
40	104	99	97	94	90	87	83	81
30	86	102	101	98	94	90	86	83
20	68	102	102	99	95	92	88	84
-60	-76	104	103	100	96	93	90	87

Takeoff Speeds - Wet Runway

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 LB)	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
190	165	173	179	157	166	172	158	164	168						
180	159	168	175	151	161	168	152	159	164	148	156	161	145	152	158
170	154	163	171	146	156	164	146	154	161	142	151	157	140	148	154
160	148	158	166	140	150	160	140	149	157	136	146	153	134	143	150
150	141	152	162	134	145	155	134	144	152	131	140	149	128	137	146
140	135	146	157	128	139	151	128	138	148	125	135	145	123	132	142
130	128	139	152	122	133	146	121	131	143	119	128	140	116	126	138
120	121	132	146	115	126	141	115	125	138	112	122	135	110	120	133
110	114	125	141	108	119	135	108	118	133	105	116	130	103	113	128
100	107	118	135	101	112	129	101	111	128	98	109	125	96	106	122

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	6						-2	-3					
60	140	6	7	8	10				3	4	5	6				-2	-2	-2	-3			
50	122	4	4	6	7	9	11	13	2	3	4	5	6	8	9	-1	-1	-2	-2	-3	-3	-4
40	104	1	2	3	5	6	8	10	1	2	3	4	5	6	8	-1	-1	-1	-2	-2	-3	-3
30	86	0	0	2	3	5	6	8	0	0	1	3	4	5	7	0	0	-1	-1	-2	-2	-3
20	68	0	0	1	2	4	6	7	0	0	1	2	3	4	6	0	0	0	-1	-1	-2	-2
-60	-76	0	0	1	2	4	6	7	0	0	1	2	3	4	5	0	0	0	-1	-1	-2	-2

Slope and Wind V1 Adjustment*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
190	-5	-3	0	3	6	-4	-2	-1	0	1	2	2	3
180	-5	-2	0	3	6	-4	-2	-1	0	1	1	2	3
170	-5	-2	0	3	5	-4	-2	-1	0	1	1	2	3
160	-4	-2	0	2	5	-4	-2	-1	0	1	1	2	3
150	-4	-2	0	2	4	-4	-2	-1	0	1	2	2	3
140	-4	-2	0	2	4	-4	-3	-1	0	1	2	2	3
130	-3	-2	0	2	3	-4	-3	-1	0	1	2	2	3
120	-3	-1	0	2	3	-4	-3	-1	0	1	2	3	3
110	-2	-1	0	1	3	-5	-3	-1	0	1	2	3	4
100	-2	-1	0	1	2	-5	-3	-1	0	1	2	3	4

***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	93	91					
60	140	93	91	89	88			
50	122	95	93	90	88	86	83	81
40	104	99	97	94	90	87	83	81
30	86	102	101	98	94	90	86	83
20	68	102	102	99	95	92	88	84
-60	-76	104	103	100	96	93	90	87

Maximum Allowable Clearway

FIELD LENGTH (FT)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	530
6000	650
8000	770
10000	900
12000	1020

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
800	-5	-4	-4	-3				
600	-5	-4	-3	-3				
400	-3	-3	-2	-2				
200	-2	-1	-1	-1				
0	0	0	0	0	0	0	0	0
-200	1	1	1	0	2	1	1	0
-400	1	1	1	0	4	3	2	1
-600	0	1	1	0	6	4	3	1
-800	0	1	1	0	7	6	4	2

Use of clearway not allowed on wet runway.

Stab Trim Setting

Max Takeoff Thrust

Flaps 1 and 5

WEIGHT (1000 LB)	C.G. (%MAC)										
	6	8	12	16	20	24	28	31	33	35	36
180	8 1/4	8	7 1/2	6 3/4	6 1/4	5 1/2	5	4 1/2	4 1/4	4	3 3/4
160	7 3/4	7 1/2	7	6 1/4	5 3/4	5 1/4	4 1/2	4 1/4	3 3/4	3 1/2	3 1/2
140	7 1/4	7	6 1/4	5 3/4	5 1/4	4 3/4	4	3 3/4	3 1/2	3 1/4	3
120	6 1/2	6 1/4	5 3/4	5 1/4	4 3/4	4 1/4	3 3/4	3 1/4	3	2 3/4	2 3/4
100	5 3/4	5 1/2	5	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4
70	5 3/4	5 1/2	5	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 LB)	C.G. (%MAC)											
	6	8	12	16	20	24	25	28	31	33	35	36
180	8	7 1/2	6 3/4	6 1/4	5 1/2	4 3/4	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4
160	7 1/4	7	6 1/4	5 3/4	5	4 1/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4
140	6 3/4	6 1/2	5 3/4	5 1/4	4 1/2	4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4
120	6	5 3/4	5 1/4	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
100	5 1/2	5 1/4	4 1/2	4	3 1/2	3	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
70	5 1/2	5 1/4	4 1/2	4	3 1/2	3	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4

VREF

WEIGHT (1000 LB)	FLAPS		
	40	30	15
180	155	166	177
170	151	161	171
160	146	156	166
150	141	151	161
140	139	149	159
130	134	144	153
120	129	138	147
110	123	132	140
100	117	126	134
90	111	119	127

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 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
190	-23.8	-28.8	-33.8	-29.3	-34.3	-39.3	-40.3	-45.3	-50.3
180	-22.1	-27.1	-32.1	-26.7	-31.7	-36.7	-36.0	-41.0	-46.0
170	-20.4	-25.4	-30.4	-24.0	-29.0	-34.0	-31.9	-36.9	-41.9
160	-18.5	-23.5	-28.5	-21.5	-26.5	-31.5	-28.0	-33.0	-38.0
150	-16.5	-21.5	-26.5	-18.9	-23.9	-28.9	-24.3	-29.3	-34.3
140	-14.5	-19.5	-24.5	-16.5	-21.5	-26.5	-20.8	-25.8	-30.8
130	-12.3	-17.3	-22.3	-14.0	-19.0	-24.0	-17.5	-22.5	-27.5
120	-10.0	-15.0	-20.0	-11.7	-16.7	-21.7	-14.4	-19.4	-24.4
110	-7.7	-12.7	-17.7	-9.3	-14.3	-19.3	-11.4	-16.4	-21.4
100	-5.3	-10.3	-15.3	-7.0	-12.0	-17.0	-8.5	-13.5	-18.5
90	-3.0	-8.0	-13.0	-4.7	-9.7	-14.7	-5.5	-10.5	-15.5

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
4200				76.3			90.1		
4600	93.6			101.7	70.0		115.2	84.0	
5000	120.2	87.2		128.2	95.2		141.3	108.9	77.9
5400	148.3	113.5	80.8	156.1	121.4	88.8	168.3	134.7	102.6
5800	177.9	141.1	106.8	185.6	149.0	114.8	196.4	161.4	128.1
6200	209.1	170.3	134.1		178.0	142.0		189.3	154.6
6600		201.3	162.9		208.5	170.6			182.2
7000			193.4			200.8			

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 -110 ft/+100 ft 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
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
190	-17	-12	-7	-11	-6	-1	-2	0	0
180	-18	-13	-8	-12	-7	-2	-2	0	0
170	-19	-14	-9	-13	-8	-3	-2	0	0
160	-20	-15	-10	-15	-10	-5	-3	0	0
150	-22	-17	-12	-16	-11	-6	-5	0	0
140	-23	-18	-13	-18	-13	-8	-7	-2	0
130	-24	-19	-14	-20	-15	-10	-10	-5	0
120	-25	-20	-15	-22	-17	-12	-14	-9	-4
110	-26	-21	-16	-23	-18	-13	-18	-13	-8
100	-26	-21	-16	-24	-19	-14	-20	-15	-10
90	-26	-21	-16	-24	-19	-14	-21	-16	-11

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 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
190	-29.4	-35.9	-42.4	-34.6	-41.1	-47.6	-45.8	-52.3	-58.8
180	-26.9	-33.4	-39.9	-31.4	-37.9	-44.4	-40.9	-47.4	-53.9
170	-24.6	-31.1	-37.6	-28.3	-34.8	-41.3	-36.3	-42.8	-49.3
160	-22.2	-28.7	-35.2	-25.4	-31.9	-38.4	-31.9	-38.4	-44.9
150	-19.9	-26.4	-32.9	-22.5	-29.0	-35.5	-27.8	-34.3	-40.8
140	-17.6	-24.1	-30.6	-19.7	-26.2	-32.7	-24.0	-30.5	-37.0
130	-15.4	-21.9	-28.4	-17.0	-23.5	-30.0	-20.5	-27.0	-33.5
120	-13.1	-19.6	-26.1	-14.4	-20.9	-27.4	-17.3	-23.8	-30.3
110	-11.0	-17.5	-24.0	-11.9	-18.4	-24.9	-14.3	-20.8	-27.3
100	-8.8	-15.3	-21.8	-9.5	-16.0	-22.5	-11.7	-18.2	-24.7
90	-6.6	-13.1	-19.6	-7.2	-13.7	-20.2	-9.3	-15.8	-22.3

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
5000							88.2		
5400				84.9			117.5	80.9	
5800	96.5			117.8	76.8		146.9	110.2	73.5
6200	132.5	87.7		151.7	109.5		176.2	139.5	102.9
6600	169.4	123.4	78.9	186.7	143.1	101.2	205.5	168.8	132.2
7000	207.5	160.1	114.4		177.8	134.6		198.2	161.5
7400		197.9	150.8			169.0			190.8
7800			188.4			204.6			

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 -130 ft/+120 ft 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

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
190	-23	-16	-8	-15	-7	0	-2	0	0
180	-25	-17	-10	-16	-9	-1	-2	0	0
170	-26	-19	-11	-18	-11	-3	-3	0	0
160	-27	-20	-12	-20	-13	-5	-5	0	0
150	-29	-21	-14	-22	-15	-7	-7	0	0
140	-30	-22	-15	-24	-17	-9	-10	-3	0
130	-31	-24	-16	-26	-19	-11	-14	-7	0
120	-32	-25	-17	-29	-21	-14	-19	-12	-4
110	-33	-26	-18	-30	-23	-15	-24	-16	-9
100	-33	-26	-18	-31	-24	-16	-26	-19	-11
90	-33	-26	-18	-31	-24	-16	-27	-20	-12

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 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-1.8	-1.8	-1.8	-13.0	-13.0	-13.0	-22.8	-22.8	-22.8
180	-2.5	-2.5	-2.5	-13.0	-13.0	-13.0	-22.1	-22.1	-22.1
170	-3.1	-3.1	-3.1	-12.8	-12.8	-12.8	-21.3	-21.3	-21.3
160	-3.4	-3.4	-3.4	-12.5	-12.5	-12.5	-20.3	-20.3	-20.3
150	-3.6	-3.6	-3.6	-12.0	-12.0	-12.0	-19.1	-19.1	-19.1
140	-3.5	-3.5	-3.5	-11.4	-11.4	-11.4	-17.9	-17.9	-17.9
130	-3.3	-3.3	-3.3	-10.6	-10.6	-10.6	-16.4	-16.4	-16.4
120	-2.9	-2.9	-2.9	-9.6	-9.6	-9.6	-14.9	-14.9	-14.9
110	-2.5	-2.5	-2.5	-8.7	-8.7	-8.7	-13.3	-13.3	-13.3
100	-2.1	-2.1	-2.1	-7.7	-7.7	-7.7	-11.7	-11.7	-11.7
90	-1.6	-1.6	-1.6	-6.7	-6.7	-6.7	-10.2	-10.2	-10.2

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	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
3400	99.9								
3800	143.8	111.0	77.5						
4200	186.8	154.7	122.0	72.7					
4600		197.4	165.4	102.3					
5000			208.0	133.1	98.5				
5400				165.9	129.2	94.8			
5800				201.1	161.7	125.3	87.1		
6200					196.6	157.5	105.3	73.7	
6600						192.1	124.5	91.6	
7000							145.0	110.0	78.2
7400							167.1	129.5	96.1
7800							191.1	150.4	114.8
8200								172.9	134.6
8600								197.5	155.8
9000									178.8
9400									203.9

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 -80 ft/+70 ft for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -80 ft/+70 ft for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -120 ft/+110 ft 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 LB)	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
190	-6	-3	-1	-15	-13	-10	-27	-25	-22
180	-7	-4	-2	-17	-14	-12	-29	-27	-24
170	-8	-5	-3	-18	-16	-13	-31	-28	-26
160	-8	-6	-3	-20	-17	-15	-33	-30	-28
150	-9	-7	-4	-21	-19	-16	-35	-32	-30
140	-10	-8	-5	-23	-20	-18	-37	-34	-32
130	-11	-9	-6	-24	-21	-19	-39	-36	-34
120	-12	-10	-7	-25	-23	-20	-40	-38	-35
110	-13	-10	-8	-27	-24	-22	-42	-39	-37
100	-14	-11	-9	-28	-25	-23	-43	-40	-38
90	-15	-12	-10	-29	-26	-24	-44	-41	-39

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 LB)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-3.7	-3.7	-3.7	-17.2	-17.2	-17.2	-28.7	-28.7	-28.7
180	-4.3	-4.3	-4.3	-16.9	-16.9	-16.9	-27.7	-27.7	-27.7
170	-4.8	-4.8	-4.8	-16.5	-16.5	-16.5	-26.5	-26.5	-26.5
160	-5.1	-5.1	-5.1	-15.9	-15.9	-15.9	-25.2	-25.2	-25.2
150	-5.2	-5.2	-5.2	-15.3	-15.3	-15.3	-23.8	-23.8	-23.8
140	-5.2	-5.2	-5.2	-14.5	-14.5	-14.5	-22.2	-22.2	-22.2
130	-5.0	-5.0	-5.0	-13.6	-13.6	-13.6	-20.6	-20.6	-20.6
120	-4.6	-4.6	-4.6	-12.6	-12.6	-12.6	-18.8	-18.8	-18.8
110	-4.2	-4.2	-4.2	-11.5	-11.5	-11.5	-17.0	-17.0	-17.0
100	-3.8	-3.8	-3.8	-10.5	-10.5	-10.5	-15.3	-15.3	-15.3
90	-3.4	-3.4	-3.4	-9.5	-9.5	-9.5	-13.5	-13.5	-13.5

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	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
3800	118.4	78.2							
4200	167.8	131.2	91.8						
4600		179.5	143.7						
5000			191.0						
5400				93.8					
5800				138.3	88.1				
6200				182.0	132.8	82.5			
6600					176.6	127.2			
7000						171.2			
8200							90.7		
8600							117.9	70.7	
9000							147.1	97.3	
9400							178.5	125.0	77.4
9800								154.7	104.1
10200								186.8	132.3
10600									162.5
11000									195.3

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 -90 ft/+80 ft for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -90 ft/+80 ft for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -160 ft/+150 ft 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 LB)	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
190	-7	-2	0	-20	-15	-10	-37	-32	-27
180	-8	-3	0	-21	-16	-11	-40	-35	-30
170	-9	-4	0	-23	-18	-13	-42	-37	-32
160	-10	-5	0	-25	-20	-15	-45	-40	-35
150	-12	-7	-2	-27	-22	-17	-47	-42	-37
140	-13	-8	-3	-29	-24	-19	-50	-45	-40
130	-14	-9	-4	-31	-26	-21	-52	-47	-42
120	-15	-10	-5	-32	-27	-22	-54	-49	-44
110	-16	-11	-6	-34	-29	-24	-56	-51	-46
100	-17	-12	-7	-36	-31	-26	-57	-52	-47
90	-18	-13	-8	-37	-32	-27	-58	-53	-48

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 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

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 and engine 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
%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 for Max Takeoff Thrust

WEIGHT (1000 LB)	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
190	174	174	178	165	167	171									
180	168	170	174	161	162	167									
170	163	164	170	156	157	163	155	155	160						
160	158	159	166	151	152	159	150	150	156	146	147	152	144	144	149
150	152	153	161	145	146	155	144	145	152	141	142	148	138	139	145
140	146	147	156	139	141	150	138	139	147	135	136	144	133	133	141
130	140	141	151	133	134	145	132	133	143	129	130	139	127	127	137
120	133	134	146	127	128	140	126	127	138	123	124	135	121	121	132
110	126	127	140	120	121	134	119	120	132	116	117	129	114	115	127
100	119	119	134	113	114	128	112	113	127	110	110	124	107	108	122
90	111	112	128	106	106	123	105	105	121	103	103	118	100	101	116

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						5	6						-2	-3					
60	140	4	5	6	7				4	4	6	7				-2	-2	-2	-3			
50	122	3	3	4	5	6	8	9	2	3	4	5	6	8	9	-1	-1	-2	-2	-3	-3	-4
40	104	1	2	3	4	5	6	7	1	2	3	4	5	6	8	0	-1	-1	-2	-2	-3	-3
30	86	0	0	1	3	4	5	6	0	0	1	3	4	5	6	0	0	-1	-1	-2	-2	-2
20	68	0	0	1	1	2	4	5	0	0	1	1	2	4	5	0	0	0	0	-1	-1	-2
-60	-76	0	0	1	1	2	3	4	0	0	1	1	2	3	4	0	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
190	-4	-2	0	0	0	-2	-1	-1	0	0	0	0	0
170	-3	-2	0	0	1	-2	-1	-1	0	0	0	1	1
150	-2	-1	0	1	1	-2	-1	0	0	0	1	1	1
130	-1	-1	0	1	1	-1	-1	0	0	0	1	1	1
110	-1	0	0	1	1	-1	-1	0	0	0	0	0	1
90	0	0	0	0	0	-1	-1	0	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	88	86					
60	140	88	86	84	83			
50	122	90	88	84	83	81	79	77
40	104	94	92	89	85	82	79	77
30	86	97	97	93	89	86	82	79
20	68	98	97	95	93	90	86	82
-60	-76	99	99	96	94	91	89	86

Takeoff Speeds - Wet Runway (24K Derate)

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 LB)	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
190	169	175	178	160	167	171									
180	163	170	174	155	162	167									
170	157	164	170	149	157	163	149	155	160						
160	151	159	166	143	152	159	143	150	156	140	147	152	138	144	149
150	145	153	161	137	146	155	137	145	152	134	142	148	132	139	145
140	138	147	156	131	141	150	131	139	147	128	136	144	126	133	141
130	131	141	151	125	134	145	124	133	143	122	130	139	119	127	137
120	124	134	146	118	128	140	118	127	138	115	124	135	113	121	132
110	117	127	140	111	121	134	111	120	132	108	117	129	106	115	127
100	109	119	134	104	114	128	103	113	127	101	110	124	99	108	122
90	102	112	128	96	106	123	96	105	121	94	103	118	92	101	116

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	6						-2	-3					
60	140	6	7	8	10				4	4	6	7				-2	-2	-2	-3			
50	122	4	5	6	8	9	11	13	2	3	4	5	6	8	9	-1	-1	-2	-2	-3	-3	-4
40	104	1	2	4	5	7	8	10	1	2	3	4	5	6	8	0	-1	-1	-2	-2	-3	-3
30	86	0	0	2	3	5	6	8	0	0	1	3	4	5	6	0	0	-1	-1	-2	-2	-2
20	68	0	0	1	2	3	4	6	0	0	1	1	2	4	5	0	0	0	0	-1	-1	-2
-60	-76	0	0	1	2	2	4	5	0	0	1	1	2	3	4	0	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustment*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
190	-6	-3	0	3	6	-3	-2	-1	0	0	1	2	2
180	-5	-3	0	3	5	-3	-2	-1	0	0	1	2	2
170	-5	-3	0	3	5	-3	-2	-1	0	1	1	2	2
160	-5	-2	0	2	5	-3	-2	-1	0	1	1	2	2
150	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
140	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
130	-3	-2	0	2	4	-4	-2	-1	0	1	2	2	3
120	-3	-1	0	2	3	-4	-3	-1	0	1	2	2	3
110	-3	-1	0	1	3	-4	-3	-1	0	1	2	3	3
100	-2	-1	0	1	2	-4	-3	-1	0	1	2	3	4
90	-2	-1	0	1	2	-5	-3	-1	0	1	2	3	4

***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	88	86					
60	140	88	86	84	83			
50	122	90	88	84	83	81	79	77
40	104	94	92	89	85	82	79	77
30	86	97	97	93	89	86	82	79
20	68	98	97	95	93	90	86	82
-60	-76	99	99	96	94	91	89	86

Maximum Allowable Clearway (24K Derate)

FIELD LENGTH (FT)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
6000	650
8000	800
10000	950
12000	1050

Clearway and Stopway V1 Adjustments (24K Derate)

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
800	-5	-4	-4	-3				
600	-5	-4	-3	-2				
400	-4	-3	-2	-2				
200	-1	-1	-1	-1				
0	0	0	0	0	0	0	0	0
-200	0	0	1	1	2	1	1	1
-400	0	0	1	1	4	3	2	1
-600	0	0	1	1	6	3	3	2
-800	0	0	1	1	7	4	3	2

Use of clearway not allowed on wet runway.

Stab Trim Setting (24K Derate)

Flaps 1 and 5

WEIGHT (1000 LB)	C.G. (%MAC)									
	6	8	12	16	20	24	28	30	33	36
180	8 1/2	8 1/4	7 1/2	7	6 1/4	5 1/2	5	4 3/4	4 1/4	3 3/4
160	8	7 3/4	7	6 1/2	6	5 1/4	4 3/4	4 1/2	4	3 1/2
140	7 1/2	7 1/4	6 3/4	6	5 1/2	5	4 1/4	4	3 3/4	3 1/4
120	7	6 3/4	6	5 1/2	5	4 1/2	4	3 3/4	3 1/4	3
100	6 1/4	6	5 1/2	5	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4
70	6 1/4	6	5 1/2	5	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 LB)	C.G. (%MAC)										
	6	8	12	16	20	24	27	30	33	35	36
180	8	7 3/4	7	6 1/4	5 3/4	5	4 1/2	4	3 1/2	3 1/4	3
160	7 1/2	7 1/4	6 1/2	6	5 1/4	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4
140	7	6 1/2	6	5 1/2	4 3/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4
120	6 1/4	6	5 1/2	4 3/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4
100	5 3/4	5 1/2	4 3/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
70	5 3/4	5 1/2	4 3/4	4 1/4	3 3/4	3 1/4	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 LB)

24K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
190	-25.2	-29.7	-34.2	-31.1	-35.6	-40.1	-44.6	-49.1	-53.6
180	-23.2	-27.7	-32.2	-28.2	-32.7	-37.2	-39.5	-44.0	-48.5
170	-21.2	-25.7	-30.2	-25.4	-29.9	-34.4	-34.8	-39.3	-43.8
160	-19.1	-23.6	-28.1	-22.6	-27.1	-31.6	-30.3	-34.8	-39.3
150	-17.1	-21.6	-26.1	-20.0	-24.5	-29.0	-26.2	-30.7	-35.2
140	-15.1	-19.6	-24.1	-17.4	-21.9	-26.4	-22.3	-26.8	-31.3
130	-13.1	-17.6	-22.1	-14.9	-19.4	-23.9	-18.8	-23.3	-27.8
120	-11.1	-15.6	-20.1	-12.5	-17.0	-21.5	-15.6	-20.1	-24.6
110	-9.0	-13.5	-18.0	-10.1	-14.6	-19.1	-12.6	-17.1	-21.6
100	-7.0	-11.5	-16.0	-7.8	-12.3	-16.8	-9.6	-14.1	-18.6
90	-5.0	-9.5	-14.0	-5.4	-9.9	-14.4	-6.7	-11.2	-15.7

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3800							79.1		
4200	85.4			92.5			104.6	72.9	
4600	113.1	78.7		120.0	85.9		131.6	98.1	
5000	142.3	106.0	72.0	149.1	113.0	79.3	160.5	124.7	91.7
5400	173.3	134.8	99.1	180.0	141.6	106.1	191.7	153.1	117.9
5800	206.1	165.3	127.5		172.1	134.3		183.6	145.8
6200		197.9	157.5		204.4	164.3			175.8
6600			189.6			196.2			207.8

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 -90 ft/+90 ft 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 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
190	-14	-9	-4	-8	-3	0	0	0	0
180	-15	-10	-5	-9	-4	0	0	0	0
170	-17	-12	-7	-10	-5	0	0	0	0
160	-18	-13	-8	-12	-7	-2	0	0	0
150	-19	-14	-9	-13	-8	-3	0	0	0
140	-20	-15	-10	-15	-10	-5	-2	0	0
130	-21	-16	-11	-17	-12	-7	-7	-2	0
120	-23	-18	-13	-19	-14	-9	-11	-6	-1
110	-24	-19	-14	-21	-16	-11	-14	-9	-4
100	-24	-19	-14	-22	-17	-12	-17	-12	-7
90	-24	-19	-14	-22	-17	-12	-18	-13	-8

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 LB)

24K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
190	-30.9	-36.9	-42.9	-37.2	-43.2	-49.2	-51.3	-57.3	-63.3
180	-28.2	-34.2	-40.2	-33.5	-39.5	-45.5	-45.2	-51.2	-57.2
170	-25.6	-31.6	-37.6	-30.0	-36.0	-42.0	-39.6	-45.6	-51.6
160	-23.1	-29.1	-35.1	-26.7	-32.7	-38.7	-34.5	-40.5	-46.5
150	-20.7	-26.7	-32.7	-23.6	-29.6	-35.6	-29.8	-35.8	-41.8
140	-18.4	-24.4	-30.4	-20.7	-26.7	-32.7	-25.5	-31.5	-37.5
130	-16.1	-22.1	-28.1	-17.9	-23.9	-29.9	-21.8	-27.8	-33.8
120	-13.8	-19.8	-25.8	-15.3	-21.3	-27.3	-18.4	-24.4	-30.4
110	-11.7	-17.7	-23.7	-12.8	-18.8	-24.8	-15.4	-21.4	-27.4
100	-9.5	-15.5	-21.5	-10.4	-16.4	-22.4	-12.5	-18.5	-24.5
90	-7.3	-13.3	-19.3	-7.9	-13.9	-19.9	-9.5	-15.5	-21.5

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
4600							82.1		
5000				83.3			112.0		
5400	99.4			117.7			143.8	93.2	
5800	137.4	76.2		153.7	96.0		178.0	123.7	74.9
6200	176.6	113.5		191.7	131.0	74.9		156.4	104.4
6600		151.9	90.0		167.7	108.9		191.5	135.7
7000		191.7	127.7		206.3	144.5			169.2
7400			166.7			182.0			205.2
7800			206.9						

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 -120 ft/+110 ft 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 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
190	-21	-16	-11	-15	-10	-5	0	0	0
180	-21	-16	-11	-14	-9	-4	0	0	0
170	-22	-17	-12	-14	-9	-4	0	0	0
160	-24	-19	-14	-15	-10	-5	0	0	0
150	-25	-20	-15	-17	-12	-7	-1	0	0
140	-27	-22	-17	-20	-15	-10	-5	0	0
130	-29	-24	-19	-23	-18	-13	-10	-5	0
120	-30	-25	-20	-25	-20	-15	-15	-10	-5
110	-31	-26	-21	-27	-22	-17	-19	-14	-9
100	-31	-26	-21	-29	-24	-19	-23	-18	-13
90	-31	-26	-21	-29	-24	-19	-25	-20	-15

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 LB)

24K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-1.6	-1.6	-1.6	-12.5	-12.5	-12.5	-22.5	-22.5	-22.5
180	-2.4	-2.4	-2.4	-12.7	-12.7	-12.7	-21.9	-21.9	-21.9
170	-3.0	-3.0	-3.0	-12.7	-12.7	-12.7	-21.1	-21.1	-21.1
160	-3.4	-3.4	-3.4	-12.4	-12.4	-12.4	-20.2	-20.2	-20.2
150	-3.6	-3.6	-3.6	-12.0	-12.0	-12.0	-19.2	-19.2	-19.2
140	-3.6	-3.6	-3.6	-11.4	-11.4	-11.4	-17.9	-17.9	-17.9
130	-3.4	-3.4	-3.4	-10.6	-10.6	-10.6	-16.6	-16.6	-16.6
120	-3.0	-3.0	-3.0	-9.7	-9.7	-9.7	-15.0	-15.0	-15.0
110	-2.6	-2.6	-2.6	-8.7	-8.7	-8.7	-13.5	-13.5	-13.5
100	-2.1	-2.1	-2.1	-7.7	-7.7	-7.7	-11.9	-11.9	-11.9
90	-1.7	-1.7	-1.7	-6.7	-6.7	-6.7	-10.4	-10.4	-10.4

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	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
3000	71.4								
3400	117.4	77.2							
3800	161.1	123.0	83.0						
4200	202.6	166.4	128.5	88.1					
4600		207.7	171.7	119.4	80.4				
5000				152.2	111.4	72.7			
5400				186.8	143.8	103.5	81.0		
5800					178.0	135.6	99.6		
6200						169.3	119.2	81.0	
6600						204.9	140.2	99.6	
7000							163.0	119.2	81.0
7400							188.0	140.2	99.6
7800								163.0	119.2
8200								188.0	140.2
8600									163.0
9000									188.0

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 -80 ft/+70 ft for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -80 ft/+70 ft for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -110 ft/+100 ft 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 LB)	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
190	-5	-2	0	-13	-11	-8	-24	-22	-19
180	-6	-3	-1	-15	-12	-10	-26	-23	-21
170	-7	-4	-2	-16	-13	-11	-27	-25	-22
160	-8	-5	-3	-17	-15	-12	-29	-27	-24
150	-8	-6	-3	-19	-16	-14	-31	-29	-26
140	-9	-7	-4	-20	-18	-15	-33	-31	-28
130	-10	-8	-5	-22	-19	-17	-35	-33	-30
120	-11	-9	-6	-23	-21	-18	-37	-35	-32
110	-12	-9	-7	-25	-22	-20	-39	-36	-34
100	-13	-10	-8	-26	-23	-21	-40	-38	-35
90	-13	-11	-8	-26	-24	-21	-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 LB)

24K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-3.8	-3.8	-3.8	-17.0	-17.0	-17.0	-29.2	-29.2	-29.2
180	-4.5	-4.5	-4.5	-16.9	-16.9	-16.9	-27.9	-27.9	-27.9
170	-4.9	-4.9	-4.9	-16.6	-16.6	-16.6	-26.5	-26.5	-26.5
160	-5.2	-5.2	-5.2	-16.1	-16.1	-16.1	-25.0	-25.0	-25.0
150	-5.2	-5.2	-5.2	-15.3	-15.3	-15.3	-23.4	-23.4	-23.4
140	-5.0	-5.0	-5.0	-14.4	-14.4	-14.4	-21.6	-21.6	-21.6
130	-4.6	-4.6	-4.6	-13.2	-13.2	-13.2	-19.7	-19.7	-19.7
120	-4.0	-4.0	-4.0	-11.9	-11.9	-11.9	-17.7	-17.7	-17.7
110	-3.3	-3.3	-3.3	-10.5	-10.5	-10.5	-15.7	-15.7	-15.7
100	-2.6	-2.6	-2.6	-9.1	-9.1	-9.1	-13.7	-13.7	-13.7
90	-2.0	-2.0	-2.0	-7.7	-7.7	-7.7	-11.7	-11.7	-11.7

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	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
3400	89.0								
3800	141.8	96.0							
4200	187.9	147.8	102.9						
4600		193.3	153.8						
5000			198.7	81.7					
5400				127.7					
5800				171.9	110.7				
6200					155.5	93.4			
6600					198.6	138.9			
7000						182.6			
7800							95.0		
8200							123.1		
8600							153.9	85.0	
9000							188.3	112.3	
9400								142.0	75.0
9800								174.9	101.9
10200									130.5
10600									162.1
11000									197.7

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 -90 ft/+80 ft for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -90 ft/+80 ft for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -140 ft/+130 ft 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 LB)	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
190	-6	-4	-1	-17	-15	-12	-33	-31	-28
180	-7	-5	-2	-18	-16	-13	-35	-33	-30
170	-8	-6	-3	-20	-18	-15	-38	-35	-33
160	-9	-7	-4	-22	-19	-17	-40	-38	-35
150	-10	-8	-5	-24	-21	-19	-43	-40	-38
140	-11	-9	-6	-26	-23	-21	-45	-43	-40
130	-13	-10	-8	-28	-25	-23	-48	-46	-43
120	-14	-11	-9	-30	-27	-25	-50	-48	-45
110	-15	-12	-10	-32	-29	-27	-53	-50	-48
100	-16	-13	-11	-33	-31	-28	-54	-52	-49
90	-17	-14	-12	-34	-32	-29	-55	-53	-50

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 and engine 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.**

Takeoff Speeds - Dry Runway (22K Derate)

V1, VR, V2

WEIGHT (1000 LB)	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
180	170	171	174												
170	165	165	170	158	158	163									
160	159	160	165	152	153	158	151	151	155						
150	154	154	161	147	147	154	146	146	151	143	143	148	140	140	145
140	148	148	156	141	142	150	140	140	147	137	137	144	134	134	141
130	141	142	151	134	135	144	133	134	142	130	131	139	128	128	136
120	134	135	145	128	129	139	127	127	137	124	125	134	122	122	131
110	127	128	139	121	122	134	120	121	132	118	118	129	115	116	126
100	120	120	133	114	115	128	113	114	126	111	111	123	109	109	121
90	112	113	127	107	107	122	106	106	120	104	104	118	102	102	115

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						5	6						-2	-2					
60	140	4	4	5	6				4	4	5	6				-2	-2	-2	-3			
50	122	2	3	4	5	6	7	8	2	3	4	5	6	7	9	-1	-1	-2	-2	-2	-3	-3
40	104	1	2	3	4	5	6	7	1	2	3	4	5	6	7	0	-1	-1	-1	-2	-2	-3
30	86	0	0	1	2	4	5	6	0	0	1	2	4	5	6	0	0	0	-1	-1	-2	-2
20	68	0	0	0	1	2	4	5	0	0	1	1	2	4	5	0	0	0	0	-1	-1	-2
-60	-76	0	0	0	1	2	3	3	0	0	1	1	2	3	3	0	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
190	-4	-2	0	0	0	-1	-1	0	0	0	0	0	0
180	-4	-2	0	0	0	-1	-1	0	0	0	0	0	0
170	-3	-2	0	0	0	-1	-1	0	0	0	0	0	0
160	-3	-1	0	0	0	-1	-1	0	0	0	0	0	0
150	-2	-1	0	0	0	-1	-1	0	0	0	0	0	0
140	-2	-1	0	1	1	-1	-1	0	0	0	0	1	1
130	-1	-1	0	1	1	-1	-1	0	0	0	1	1	1
120	-1	0	0	0	1	-1	-1	0	0	0	0	0	1
110	-1	0	0	0	0	-1	-1	0	0	0	0	0	0
100	0	0	0	0	0	-1	-1	0	0	0	0	0	0
90	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	85	83					
60	140	85	83	82	80			
50	122	87	85	82	80	78	76	74
40	104	91	89	86	83	79	76	74
30	86	94	94	90	87	83	79	76
20	68	94	94	92	90	87	83	80
-60	-76	96	95	93	92	89	87	84

Takeoff Speeds - Wet Runway (22K Derate)

V1, VR, V2

WEIGHT (1000 LB)	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
180	166	171	174												
170	160	165	170	152	158	163									
160	153	160	165	146	153	158	146	151	155						
150	147	154	161	140	147	154	139	146	151	136	143	148	134	140	145
140	141	148	156	133	142	150	133	140	147	130	137	144	128	134	141
130	133	142	151	127	135	144	126	134	142	124	131	139	121	128	136
120	126	135	145	120	129	139	120	127	137	117	125	134	115	122	131
110	119	128	139	113	122	134	113	121	132	110	118	129	108	116	126
100	112	120	133	106	115	128	106	114	126	103	111	123	101	109	121
90	104	112	127	99	107	122	98	106	120	96	104	118	94	102	115

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	6						-2	-2					
60	140	6	7	8	9				4	4	5	6				-2	-2	-2	-3			
50	122	4	4	6	7	8	10	12	2	3	4	5	6	8	9	-1	-1	-2	-2	-2	-3	-3
40	104	1	2	3	5	6	8	10	1	2	3	4	5	6	7	0	-1	-1	-1	-2	-2	-3
30	86	0	0	1	3	4	6	7	0	0	1	2	4	5	6	0	0	0	-1	-1	-2	-2
20	68	0	0	0	1	2	4	6	0	0	1	1	2	4	5	0	0	0	0	-1	-1	-2
-60	-76	0	0	0	1	2	3	4	0	0	1	1	2	3	4	0	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustment*

WEIGHT (1000 LB)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
180	-6	-3	0	3	5	-3	-2	-1	0	0	1	1	2
170	-5	-3	0	3	5	-3	-2	-1	0	0	1	2	2
160	-5	-2	0	3	5	-3	-2	-1	0	1	1	2	2
150	-4	-2	0	2	5	-3	-2	-1	0	1	1	2	2
140	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
130	-4	-2	0	2	4	-4	-2	-1	0	1	1	2	3
120	-3	-2	0	2	3	-4	-2	-1	0	1	1	2	3
110	-3	-1	0	1	3	-4	-3	-1	0	1	2	2	3
100	-2	-1	0	1	2	-4	-3	-1	0	1	2	2	3
90	-2	-1	0	1	2	-5	-3	-2	0	1	2	3	3

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	85	83					
60	140	85	83	82	80			
50	122	87	85	82	80	78	76	74
40	104	91	89	86	83	79	76	74
30	86	94	94	90	87	83	79	76
20	68	94	94	92	90	87	83	80
-60	-76	96	95	93	92	89	87	84

Maximum Allowable Clearway (22K Derate)

FIELD LENGTH (FT)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
6000	300
8000	400
10000	450
12000	550
14000	600

Clearway and Stopway V1 Adjustments (22K Derate)

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
800	-5	-4	-3	-3				
600	-5	-4	-3	-2				
400	-3	-2	-2	-2				
200	-1	-1	-1	-1				
0	0	0	0	0	0	0	0	0
-200	0	0	1	0	2	1	1	1
-400	0	0	1	0	4	2	2	1
-600	0	0	1	0	5	3	2	2
-800	0	0	1	0	6	3	3	2

Use of clearway not allowed on wet runway.

Stab Trim Setting (22K Derate)

Flaps 1 and 5

WEIGHT (1000 LB)	C.G. (%MAC)										
	6	7	8	12	16	20	24	28	32	35	36
180	8 1/2	8 1/2	8 1/4	7 3/4	7	6 1/2	5 3/4	5 1/4	4 1/2	4	4
160	8 1/4	8	8	7 1/4	6 3/4	6	5 1/2	4 3/4	4 1/4	3 3/4	3 1/2
140	7 3/4	7 1/2	7 1/2	6 3/4	6 1/4	5 3/4	5	4 1/2	4	3 1/2	3 1/2
120	7 1/4	7	7	6 1/2	5 3/4	5 1/4	4 3/4	4 1/4	3 3/4	3 1/4	3
100	6 1/2	6 1/4	6 1/4	5 3/4	5 1/4	4 3/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4
70	6 1/2	6 1/4	6 1/4	5 3/4	5 1/4	4 3/4	4 1/4	3 3/4	3 1/4	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 LB)	C.G. (%MAC)										
	6	8	12	16	20	24	26	29	31	34	36
180	8	7 3/4	7 1/4	6 1/2	5 3/4	5 1/4	5	4 1/2	4	3 1/2	3 1/4
160	7 3/4	7 1/2	6 3/4	6	5 1/2	4 3/4	4 1/2	4	3 3/4	3 1/4	3
140	7	6 3/4	6 1/4	5 1/2	5	4 1/4	4	3 1/2	3 1/4	2 3/4	2 3/4
120	6 1/2	6 1/4	5 1/2	5	4 1/2	3 3/4	3 1/2	3	2 3/4	2 3/4	2 3/4
100	6	5 3/4	5 1/4	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4
70	6	5 3/4	5 1/4	4 1/2	4	3 1/2	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (22K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
190	-25.5	-30.5	-35.5	-31.7	-36.7	-41.7	-49.6	-54.6	-59.6
180	-23.5	-28.5	-33.5	-28.9	-33.9	-38.9	-43.5	-48.5	-53.5
170	-21.5	-26.5	-31.5	-26.1	-31.1	-36.1	-37.9	-42.9	-47.9
160	-19.5	-24.5	-29.5	-23.4	-28.4	-33.4	-32.7	-37.7	-42.7
150	-17.5	-22.5	-27.5	-20.7	-25.7	-30.7	-27.9	-32.9	-37.9
140	-15.5	-20.5	-25.5	-18.1	-23.1	-28.1	-23.7	-28.7	-33.7
130	-13.5	-18.5	-23.5	-15.6	-20.6	-25.6	-19.8	-24.8	-29.8
120	-11.5	-16.5	-21.5	-13.1	-18.1	-23.1	-16.5	-21.5	-26.5
110	-9.5	-14.5	-19.5	-10.7	-15.7	-20.7	-13.4	-18.4	-23.4
100	-7.5	-12.5	-17.5	-8.2	-13.2	-18.2	-10.4	-15.4	-20.4
90	-5.5	-10.5	-15.5	-5.8	-10.8	-15.8	-7.4	-12.4	-17.4

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3800	71.4			78.2			89.5		
4200	99.9			106.2	71.4		116.8	82.9	
4600	129.7	92.6		135.7	99.1		145.7	109.9	76.4
5000	161.3	122.1	85.5	167.1	128.2	92.1	176.5	138.3	103.0
5400	194.8	153.2	114.6	200.5	159.1	120.8	209.1	168.6	131.1
5800		186.2	145.2		192.0	151.2		200.9	160.8
6200			177.8			183.5			192.7

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -90 ft/+90 ft 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 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
190	-12	-10	-7	-7	-4	-2	0	0	0
180	-13	-11	-8	-7	-5	-2	0	0	0
170	-14	-12	-9	-8	-5	-3	0	0	0
160	-15	-13	-10	-9	-7	-4	0	0	0
150	-17	-14	-12	-11	-8	-6	0	0	0
140	-18	-15	-13	-12	-10	-7	0	0	0
130	-19	-17	-14	-15	-12	-10	-4	-1	0
120	-21	-18	-16	-17	-14	-12	-8	-5	-3
110	-22	-19	-17	-19	-17	-14	-12	-9	-7
100	-22	-20	-17	-20	-18	-15	-15	-12	-10
90	-22	-20	-17	-20	-18	-15	-16	-14	-11

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
190	-31.4	-37.4	-43.4	-38.2	-44.2	-50.2	-50.8	-56.8	-62.8
180	-28.8	-34.8	-40.8	-34.5	-40.5	-46.5	-45.6	-51.6	-57.6
170	-26.2	-32.2	-38.2	-31.0	-37.0	-43.0	-40.6	-46.6	-52.6
160	-23.7	-29.7	-35.7	-27.7	-33.7	-39.7	-35.9	-41.9	-47.9
150	-21.3	-27.3	-33.3	-24.5	-30.5	-36.5	-31.4	-37.4	-43.4
140	-18.9	-24.9	-30.9	-21.5	-27.5	-33.5	-27.1	-33.1	-39.1
130	-16.6	-22.6	-28.6	-18.6	-24.6	-30.6	-23.1	-29.1	-35.1
120	-14.3	-20.3	-26.3	-15.9	-21.9	-27.9	-19.4	-25.4	-31.4
110	-12.1	-18.1	-24.1	-13.3	-19.3	-25.3	-15.8	-21.8	-27.8
100	-9.9	-15.9	-21.9	-10.7	-16.7	-22.7	-12.2	-18.2	-24.2
90	-7.7	-13.7	-19.7	-8.1	-14.1	-20.1	-8.6	-14.6	-20.6

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
4600				72.2			100.0		
5000	91.2			108.4			132.5	80.5	
5400	131.1			145.7	85.7		167.0	112.0	
5800	171.6	106.1		184.4	122.2		203.7	145.2	92.1
6200		146.2	81.3		160.0	99.2		180.6	124.2
6600		187.1	121.0		199.3	136.2			158.2
7000			161.4			174.6			194.4
7400			202.6						

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -110 ft/+100 ft 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 (22K Derate)
No Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 LB)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
190	-21	-16	-11	-14	-9	-4	0	0	0
180	-20	-15	-10	-12	-7	-2	0	0	0
170	-20	-15	-10	-12	-7	-2	0	0	0
160	-21	-16	-11	-12	-7	-2	0	0	0
150	-22	-17	-12	-14	-9	-4	0	0	0
140	-24	-19	-14	-17	-12	-7	-2	0	0
130	-26	-21	-16	-20	-15	-10	-6	-1	0
120	-28	-23	-18	-22	-17	-12	-11	-6	-1
110	-29	-24	-19	-25	-20	-15	-16	-11	-6
100	-30	-25	-20	-26	-21	-16	-20	-15	-10
90	-29	-24	-19	-27	-22	-17	-22	-17	-12

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-1.5	-1.5	-1.5	-12.3	-12.3	-12.3	-22.4	-22.4	-22.4
180	-2.3	-2.3	-2.3	-12.5	-12.5	-12.5	-21.7	-21.7	-21.7
170	-2.9	-2.9	-2.9	-12.4	-12.4	-12.4	-20.9	-20.9	-20.9
160	-3.3	-3.3	-3.3	-12.2	-12.2	-12.2	-20.0	-20.0	-20.0
150	-3.5	-3.5	-3.5	-11.8	-11.8	-11.8	-19.0	-19.0	-19.0
140	-3.5	-3.5	-3.5	-11.3	-11.3	-11.3	-17.8	-17.8	-17.8
130	-3.4	-3.4	-3.4	-10.5	-10.5	-10.5	-16.5	-16.5	-16.5
120	-3.0	-3.0	-3.0	-9.7	-9.7	-9.7	-15.1	-15.1	-15.1
110	-2.6	-2.6	-2.6	-8.8	-8.8	-8.8	-13.7	-13.7	-13.7
100	-2.2	-2.2	-2.2	-7.9	-7.9	-7.9	-12.2	-12.2	-12.2
90	-1.8	-1.8	-1.8	-6.9	-6.9	-6.9	-10.8	-10.8	-10.8

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	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
3000	85.2								
3400	130.7	91.0							
3800	173.5	136.2	96.9						
4200		178.6	141.7	100.8					
4600			183.8	133.5	92.9				
5000				167.7	125.2	85.0	71.2		
5400				203.8	159.0	116.9	90.4		
5800					194.6	150.4	110.1	71.2	
6200						185.5	131.2	90.4	
6600							154.1	110.1	71.2
7000							179.3	131.2	90.4
7400							207.3	154.1	110.1
7800								179.3	131.2
8200								207.3	154.1
8600									179.3
9000									207.3

1. **Enter Weight Adjustment table with reported braking action and 22K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -70 ft/+60 ft for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -70 ft/+60 ft for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -100 ft/+90 ft 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 (22K Derate)

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
190	-4	-2	0	-13	-10	-8	-23	-20	-18
180	-5	-3	0	-13	-11	-8	-23	-21	-18
170	-6	-3	-1	-14	-12	-9	-25	-22	-20
160	-7	-4	-2	-15	-13	-10	-26	-24	-21
150	-8	-5	-3	-17	-14	-12	-28	-26	-23
140	-9	-6	-4	-19	-16	-14	-30	-28	-25
130	-9	-7	-4	-20	-18	-15	-33	-30	-28
120	-10	-8	-5	-22	-19	-17	-35	-32	-30
110	-11	-8	-6	-23	-20	-18	-37	-34	-32
100	-12	-9	-7	-24	-21	-19	-38	-36	-33
90	-12	-9	-7	-25	-22	-20	-39	-37	-34

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 LB)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	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
190	-3.2	-3.2	-3.2	-16.2	-16.2	-16.2	-28.6	-28.6	-28.6
180	-4.1	-4.1	-4.1	-16.3	-16.3	-16.3	-27.6	-27.6	-27.6
170	-4.6	-4.6	-4.6	-16.1	-16.1	-16.1	-26.4	-26.4	-26.4
160	-5.0	-5.0	-5.0	-15.8	-15.8	-15.8	-25.0	-25.0	-25.0
150	-5.1	-5.1	-5.1	-15.2	-15.2	-15.2	-23.5	-23.5	-23.5
140	-5.0	-5.0	-5.0	-14.3	-14.3	-14.3	-21.8	-21.8	-21.8
130	-4.6	-4.6	-4.6	-13.3	-13.3	-13.3	-20.0	-20.0	-20.0
120	-4.1	-4.1	-4.1	-12.0	-12.0	-12.0	-18.0	-18.0	-18.0
110	-3.4	-3.4	-3.4	-10.7	-10.7	-10.7	-16.0	-16.0	-16.0
100	-2.8	-2.8	-2.8	-9.4	-9.4	-9.4	-13.9	-13.9	-13.9
90	-2.2	-2.2	-2.2	-8.1	-8.1	-8.1	-11.9	-11.9	-11.9

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	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
3400	108.4								
3800	158.0	115.0							
4200	201.4	163.7	121.5						
4600		206.6	169.3						
5000				108.3					
5400				153.6	90.6				
5800				196.5	137.0	72.8			
6200					180.7	119.9			
6600						164.6			
7000						206.9			
7400							91.3		
7800							120.3		
8200							152.1	80.9	
8600							187.9	109.1	
9000								139.8	70.4
9400								173.9	98.3
9800									128.0
10200									160.7
10600									197.6

1. **Enter Weight Adjustment table with reported braking action and 22K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust “Good” field length available by -80 ft/+70 ft for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -80 ft/+70 ft for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -140 ft/+130 ft 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 (22K Derate)
No Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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
190	-6	-3	-1	-16	-14	-11	-31	-29	-26
180	-6	-4	-1	-17	-14	-12	-32	-30	-27
170	-7	-5	-2	-18	-16	-13	-34	-32	-29
160	-8	-6	-3	-20	-17	-15	-36	-34	-31
150	-9	-7	-4	-22	-19	-17	-39	-37	-34
140	-10	-8	-5	-24	-21	-19	-42	-39	-37
130	-11	-9	-6	-26	-23	-21	-45	-42	-40
120	-13	-10	-8	-28	-25	-23	-47	-45	-42
110	-13	-11	-8	-29	-27	-24	-50	-47	-45
100	-14	-12	-9	-31	-29	-26	-52	-49	-47
90	-15	-13	-10	-32	-30	-27	-53	-50	-48

1. Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K 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	87.7	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	88.5	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.3	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.2	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.1	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	91.9	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	91.5	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	90.8	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	90.0	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	89.3	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	88.5	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
5	87.8	88.9	90.0	90.7	91.3	92.0	92.7	93.2	93.7	94.3	94.9	95.6	96.3
0	87.0	88.1	89.2	89.9	90.5	91.2	91.9	92.4	92.9	93.5	94.1	94.8	95.5
-5	86.2	87.3	88.4	89.1	89.7	90.4	91.1	91.6	92.1	92.7	93.3	94.0	94.7
-10	85.4	86.5	87.6	88.3	88.9	89.6	90.3	90.8	91.3	91.9	92.5	93.2	93.9
-15	84.6	85.7	86.8	87.5	88.1	88.8	89.4	90.0	90.5	91.1	91.7	92.4	93.1
-20	83.8	84.9	86.0	86.6	87.3	87.9	88.6	89.1	89.7	90.3	90.8	91.6	92.3
-25	83.0	84.1	85.2	85.8	86.4	87.1	87.8	88.3	88.8	89.4	90.0	90.7	91.5
-30	82.2	83.3	84.4	85.0	85.6	86.3	86.9	87.4	88.0	88.6	89.2	89.9	90.6
-35	81.4	82.4	83.5	84.1	84.7	85.4	86.1	86.6	87.1	87.7	88.3	89.0	89.8
-40	80.6	81.6	82.7	83.3	83.9	84.5	85.2	85.7	86.2	86.8	87.4	88.2	88.9
-45	79.7	80.7	81.8	82.4	83.0	83.7	84.3	84.8	85.3	86.0	86.6	87.3	88.0
-50	78.9	79.9	80.9	81.5	82.1	82.8	83.4	83.9	84.5	85.1	85.7	86.4	87.2

%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	0.9	0.9	0.9

Assumed Temperature Reduced Thrust (22K 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	72	71	69	67	65	63	61	59	57	55		
35	66	66	66	66	65	63	61	59	57	55	53	
30	63	61	61	61	61	61	61	59	57	55	53	51
25	63	61	59	57	56	56	56	56	56	55	53	51
20	63	61	59	57	55	53	51	51	51	50	50	50
15	63	61	59	57	55	53	51	50	47	45	45	45
10 & BELOW	63	61	59	57	55	53	51	50	47	45	43	41

Takeoff %N1 (Table 2 of 3)

Based on engine bleed for packs on and engine 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	85.7	86.0	86.7	87.4	88.2	88.9	89.5	90.1	90.2	90.2	90.6	91.1
70	86.6	87.0	87.1	87.1	87.5	88.3	88.9	89.4	89.5	89.6	90.0	90.4
65	87.4	87.8	88.0	88.0	88.2	88.3	88.3	88.8	88.9	88.9	89.4	89.8
60	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
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 0.9.

Assumed Temperature Reduced Thrust (22K 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	11.6													
100	10.3	7.9												
90	10.8	8.4												
80	12.2	7.1	5.0											
70	11.0	7.6	5.4	5.2	3.5									
60	9.6	9.0	4.1	4.0	3.9	3.8	2.1							
50	8.0	7.7	4.5	2.8	2.6	2.7	2.6	2.4	0.8					
40		6.2	5.9	4.7	3.0	2.6	2.7	2.8	2.6	2.5	2.9			
30		4.7	4.6	4.5	4.4	4.2	4.1	4.0	4.0	3.9	3.8	3.7	3.6	
20			3.1	3.0	3.0	3.0	2.9	2.8	2.7	2.7	2.6	2.6	2.5	2.4
10			1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	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 LB) 80	100	120	140	160	180
40000	**PITCH ATT**	**4.0**	**4.0**	**4.0**	**4.0**		
	V/S (FT/MIN)	1900	1300	700	200		
30000	**PITCH ATT**	**4.0**	**4.0**	**3.5**	**3.5**	**3.5**	**4.0**
	V/S (FT/MIN)	2800	2100	1600	1300	1000	700
20000	**PITCH ATT**	**7.5**	**6.5**	**6.0**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	4600	3600	2900	2400	1900	1600
10000	**PITCH ATT**	**11.5**	**10.0**	**9.0**	**8.0**	**8.0**	**7.5**
	V/S (FT/MIN)	6100	4900	4000	3300	2800	2400
SEA LEVEL	**PITCH ATT**	**15.5**	**13.0**	**11.5**	**10.5**	**10.0**	**9.5**
	V/S (FT/MIN)	7400	5900	4800	4000	3400	3000

Cruise (.76/280)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB) 80	100	120	140	160	180
40000	**PITCH ATT**	**1.5**	**2.0**	**3.0**			
	%N1	83	85	88			
35000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	
	%N1	81	83	84	86	90	
30000	**PITCH ATT**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	81	82	83	84	86	88
25000	**PITCH ATT**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	77	78	79	80	82	84
20000	**PITCH ATT**	**0.5**	**1.0**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	74	74	75	77	78	80
15000	**PITCH ATT**	**0.5**	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**
	%N1	70	71	72	73	74	76

Descent (.76/280)

Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB) 80	100	120	140	160	180
40000	**PITCH ATT**	**-2.5**	**-1.0**	**-0.5**	**0.0**	**0.5**	**0.5**
	V/S (FT/MIN)	-3000	-2600	-2500	-2600	-2900	-3500
30000	**PITCH ATT**	**-4.0**	**-2.5**	**-1.5**	**-1.0**	**0.5**	**0.5**
	V/S (FT/MIN)	-3400	-2800	-2500	-2300	-2100	-2100
20000	**PITCH ATT**	**-4.0**	**-2.5**	**-1.5**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN)	-3100	-2600	-2200	-2000	-1900	-1800
10000	**PITCH ATT**	**-4.0**	**-3.0**	**-1.5**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN	-2800	-2300	-2000	-1800	-1700	-1600
SEA LEVEL	**PITCH ATT**	**-4.5**	**-3.0**	**-2.0**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN)	-2600	-2100	-1800	-1700	-1500	-1500

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB) 80	100	120	140	160	180
10000	**PITCH ATT**	**4.5**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	52	56	60	64	68	71
5000	**PITCH ATT**	**4.5**	**5.0**	**5.0**	**5.0**	**5.0**	**5.0**
	%N1	48	53	56	60	64	67

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

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)					
		80	100	120	140	160	180
FLAPS 1 (GEAR UP)	**PITCH ATT**	**3.5**	**4.0**	**4.0**	**4.5**	**5.0**	**5.5**
(VREF40 + 50)	%N1	50	55	59	63	67	70
FLAPS 5 (GEAR UP)	**PITCH ATT**	**4.0**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
(VREF40 + 30)	%N1	50	55	60	64	68	71
FLAPS 15 (GEAR DOWN)	**PITCH ATT**	**4.0**	**4.5**	**4.5**	**5.0**	**5.5**	**5.5**
(VREF40 + 20)	%N1	58	64	68	73	76	80

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)					
		80	100	120	140	160	180
FLAPS 15	**PITCH ATT**	**0.5**	**0.5**	**0.5**	**0.5**	**1.0**	**1.0**
(VREF15 + 10)	%N1	42	46	50	54	57	59
FLAPS 30	**PITCH ATT**	**-1.0**	**-1.0**	**-1.0**	**-0.5**	**0.0**	**0.0**
(VREF30 + 10)	%N1	46	51	55	59	62	65
FLAPS 40	**PITCH ATT**	**-1.5**	**-1.5**	**-1.5**	**-1.5**	**-1.5**	**-1.5**
(VREF40 + 10)	%N1	51	56	61	65	68	71

Intentionally
Blank

Performance Inflight — Chapter PI
All Engine — Section 41

Long Range Cruise Maximum Operating Altitude
Max Cruise Thrust
ISA + 10°C and Below

WEIGHT (1000 LB)	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°)
190	30000	-5	31900*	31900*	31900*	31500	30100
180	31200	-7	33500*	33500*	33500*	32600	31300
170	32400	-10	35000*	35000*	35000*	33900	32500
160	33700	-13	36300*	36300*	36300*	35100	33800
150	35100	-16	37600*	37600*	37600*	36500	35100
140	36500	-18	38900*	38900*	38900*	37900	36600
130	38100	-18	40300*	40300*	40300*	39500	38100
120	39700	-18	41000	41000	41000	41000	39800
110	41000	-18	41000	41000	41000	41000	41000
100	41000	-18	41000	41000	41000	41000	41000
90	41000	-18	41000	41000	41000	41000	41000

ISA + 15°C

WEIGHT (1000 LB)	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°)
190	30000	1	29300*	29300*	29300*	29300*	29300*
180	31200	-2	31500*	31500*	31500*	31500*	31300
170	32400	-4	33600*	33600*	33600*	33600*	32500
160	33700	-7	35300*	35300*	35300*	35100	33800
150	35100	-10	36700*	36700*	36700*	36500	35100
140	36500	-13	38000*	38000*	38000*	37900	36600
130	38100	-13	39300*	39300*	39300*	39300*	38100
120	39700	-13	40700*	40700*	40700*	40700*	39800
110	41000	-13	41000	41000	41000	41000	41000
100	41000	-13	41000	41000	41000	41000	41000
90	41000	-13	41000	41000	41000	41000	41000

ISA + 20°C

WEIGHT (1000 LB)	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°)
190	30000	7	26000*	26000*	26000*	26000*	26000*
180	31200	4	28200*	28200*	28200*	28200*	28200*
170	32400	1	30600*	30600*	30600*	30600*	30600*
160	33700	-2	33200*	33200*	33200*	33200*	33200*
150	35100	-5	35200*	35200*	35200*	35200*	35100
140	36500	-7	36600*	36600*	36600*	36600*	36600
130	38100	-7	38000*	38000*	38000*	38000*	38000*
120	39700	-7	39400*	39400*	39400*	39400*	39400*
110	41000	-7	40900*	40900*	40900*	40900*	40900*
100	41000	-7	41000	41000	41000	41000	41000
90	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 LB)		PRESSURE ALTITUDE (1000 FT)									
		23	25	27	29	31	33	35	37	39	41
180	%N1	84.6	85.9	87.1	88.3	89.5	91.5				
	MACH	.723	.744	.762	.778	.790	.796				
	KIAS	315	312	307	301	293	283				
	FF/ENG	3555	3520	3493	3465	3440	3458				
170	%N1	83.3	84.7	86.0	87.2	88.3	89.8	92.7			
	MACH	.704	.730	.751	.768	.783	.793	.796			
	KIAS	307	306	302	297	290	282	270			
	FF/ENG	3359	3343	3323	3294	3258	3252	3312			
160	%N1	81.8	83.4	84.7	86.0	87.2	88.4	90.2			
	MACH	.683	.713	.737	.756	.773	.787	.795			
	KIAS	297	298	296	292	287	280	270			
	FF/ENG	3150	3154	3147	3126	3088	3059	3064			
150	%N1	80.4	81.9	83.4	84.7	86.0	87.1	88.5	91.1		
	MACH	.664	.691	.720	.743	.762	.778	.790	.796		
	KIAS	288	288	289	286	282	276	268	258		
	FF/ENG	2954	2949	2965	2952	2923	2884	2866	2909		
140	%N1	78.9	80.3	81.8	83.3	84.6	85.9	87.0	89.0	92.9	
	MACH	.645	.669	.698	.726	.748	.766	.782	.793	.796	
	KIAS	280	279	279	280	276	271	265	257	246	
	FF/ENG	2761	2751	2765	2775	2754	2719	2684	2699	2786	
130	%N1	77.3	78.7	80.1	81.6	83.1	84.4	85.7	87.3	89.9	
	MACH	.626	.649	.673	.703	.730	.752	.770	.785	.794	
	KIAS	271	270	269	270	269	266	261	254	246	
	FF/ENG	2578	2558	2563	2579	2578	2554	2517	2513	2543	
120	%N1	75.6	77.0	78.3	79.8	81.3	82.8	84.1	85.7	87.8	90.6
	MACH	.607	.628	.651	.676	.707	.733	.754	.773	.787	.795
	KIAS	262	261	259	259	260	259	255	250	243	235
	FF/ENG	2407	2373	2369	2375	2387	2378	2355	2342	2350	2384
110	%N1	73.7	75.2	76.5	77.9	79.3	80.9	82.4	84.1	86.1	88.3
	MACH	.584	.607	.628	.651	.677	.709	.735	.756	.774	.788
	KIAS	252	251	250	249	248	249	248	244	239	233
	FF/ENG	2232	2202	2183	2182	2183	2191	2181	2174	2176	2185
100	%N1	71.6	73.1	74.6	75.9	77.3	78.7	80.4	82.2	84.4	86.4
	MACH	.559	.582	.605	.627	.650	.677	.708	.735	.756	.774
	KIAS	241	240	240	239	238	237	238	237	233	228
	FF/ENG	2058	2028	2011	1997	1992	1990	1995	1999	2006	2007
90	%N1	69.2	70.8	72.2	73.7	75.1	76.5	78.0	80.0	82.2	84.4
	MACH	.533	.555	.577	.601	.623	.647	.673	.705	.733	.755
	KIAS	229	229	228	228	227	226	225	226	225	222
	FF/ENG	1883	1856	1840	1826	1811	1827	1820	1833	1850	1858

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
291	267	246	229	214	200	190	181	173	166	159
438	402	370	344	321	300	285	272	260	249	240
585	537	494	458	427	400	381	363	347	333	320
732	672	618	573	534	500	476	454	434	416	400
880	807	742	688	641	600	572	545	521	500	480
1028	942	866	803	749	700	667	636	608	583	561
1177	1078	991	918	856	800	762	727	695	667	641
1326	1215	1116	1034	963	900	858	818	783	750	720
1476	1351	1241	1149	1070	1000	953	909	869	833	800
1626	1488	1367	1265	1178	1100	1048	1000	956	916	880
1777	1625	1492	1380	1285	1200	1143	1091	1043	999	960
1928	1763	1618	1496	1392	1300	1239	1182	1130	1082	1040
2080	1901	1744	1612	1500	1400	1334	1273	1217	1165	1119
2232	2040	1870	1729	1608	1500	1429	1363	1303	1248	1199
2385	2178	1997	1845	1715	1600	1524	1454	1390	1331	1278
2539	2318	2123	1961	1823	1700	1619	1545	1476	1414	1358
2693	2457	2250	2077	1931	1800	1714	1635	1563	1496	1437
2847	2597	2377	2194	2038	1900	1809	1726	1649	1579	1516
3002	2737	2504	2311	2146	2000	1905	1816	1735	1662	1595

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	3.3	0:41	2.9	0:40	2.5	0:37	2.2	0:36	2.0	0:35
300	5.0	1:01	4.5	0:58	3.9	0:54	3.5	0:52	3.2	0:50
400	6.7	1:20	6.1	1:16	5.3	1:11	4.8	1:08	4.5	1:05
500	8.5	1:39	7.7	1:34	6.8	1:27	6.1	1:23	5.7	1:20
600	10.2	1:59	9.3	1:53	8.2	1:44	7.4	1:39	6.9	1:35
700	11.9	2:19	10.9	2:11	9.6	2:01	8.7	1:55	8.2	1:50
800	13.6	2:38	12.5	2:30	11.0	2:18	10.0	2:11	9.4	2:05
900	15.2	2:58	14.1	2:49	12.4	2:35	11.3	2:27	10.6	2:20
1000	16.9	3:19	15.6	3:08	13.8	2:52	12.6	2:43	11.8	2:35
1100	18.6	3:39	17.2	3:27	15.2	3:10	13.8	3:00	13.0	2:50
1200	20.2	3:59	18.7	3:46	16.5	3:27	15.1	3:16	14.2	3:06
1300	21.9	4:20	20.2	4:05	17.9	3:45	16.3	3:32	15.3	3:21
1400	23.5	4:40	21.8	4:24	19.3	4:02	17.6	3:49	16.5	3:37
1500	25.2	5:01	23.3	4:44	20.6	4:20	18.8	4:05	17.7	3:52
1600	26.8	5:22	24.8	5:04	22.0	4:38	20.1	4:22	18.9	4:08
1700	28.4	5:43	26.3	5:23	23.3	4:55	21.3	4:39	20.0	4:24
1800	30.0	6:04	27.8	5:43	24.7	5:13	22.5	4:55	21.2	4:39
1900	31.6	6:26	29.3	6:03	26.0	5:32	23.8	5:12	22.3	4:55
2000	33.2	6:47	30.7	6:23	27.3	5:50	25.0	5:29	23.5	5:11

Long Range Cruise Enroute Fuel and Time - Low Altitudes

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
2	-0.2	-0.1	0.0	0.1	0.2
4	-0.4	-0.2	0.0	0.2	0.5
6	-0.7	-0.3	0.0	0.4	0.8
8	-0.9	-0.5	0.0	0.6	1.2
10	-1.2	-0.6	0.0	0.7	1.5
12	-1.4	-0.7	0.0	0.9	1.8
14	-1.7	-0.8	0.0	1.1	2.2
16	-1.9	-0.9	0.0	1.3	2.5
18	-2.2	-1.1	0.0	1.4	2.8
20	-2.4	-1.2	0.0	1.6	3.2
22	-2.7	-1.3	0.0	1.8	3.5
24	-2.9	-1.5	0.0	2.0	3.8
26	-3.1	-1.6	0.0	2.1	4.2
28	-3.4	-1.7	0.0	2.3	4.5
30	-3.6	-1.8	0.0	2.5	4.9
32	-3.8	-2.0	0.0	2.7	5.2
34	-4.0	-2.1	0.0	2.9	5.6

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
534	501	471	445	421	400	383	367	352	338	325
800	750	706	667	632	600	574	550	528	508	489
1066	1000	941	889	842	800	766	734	704	678	653
1332	1250	1176	1111	1053	1000	957	918	881	848	817
1599	1501	1411	1333	1264	1200	1149	1102	1058	1018	981
1867	1752	1647	1556	1474	1400	1341	1286	1235	1188	1145
2136	2004	1884	1779	1685	1600	1533	1470	1411	1358	1309
2406	2256	2121	2002	1897	1800	1724	1653	1588	1528	1473
2676	2509	2359	2226	2108	2000	1916	1837	1764	1698	1637
2947	2763	2596	2450	2319	2200	2107	2021	1941	1868	1801
3219	3017	2834	2673	2530	2400	2299	2204	2117	2038	1965
3492	3271	3072	2897	2742	2600	2490	2388	2294	2207	2129
3765	3527	3311	3122	2953	2800	2682	2572	2470	2377	2292
4040	3783	3550	3346	3165	3000	2873	2756	2647	2546	2455
4316	4039	3790	3571	3377	3200	3065	2940	2823	2716	2618
4592	4297	4030	3796	3589	3400	3257	3123	3000	2886	2781
4869	4554	4270	4021	3801	3600	3448	3306	3175	3055	2944
5148	4813	4511	4247	4013	3800	3639	3489	3351	3223	3107
5427	5072	4752	4473	4225	4000	3830	3672	3526	3392	3270
5708	5333	4994	4699	4438	4200	4022	3856	3703	3561	3432
5990	5594	5237	4926	4650	4400	4213	4039	3878	3730	3595
6274	5856	5480	5153	4863	4600	4405	4223	4054	3899	3757
6558	6119	5724	5380	5076	4800	4596	4405	4229	4067	3920
6844	6383	5968	5608	5289	5000	4786	4588	4404	4236	4082

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 & ABOVE	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
400	4.4	1:04	4.2	1:02	4.1	1:01	3.9	1:01	3.8	1:00
600	6.8	1:33	6.6	1:31	6.3	1:29	6.1	1:28	6.0	1:27
800	9.2	2:03	8.9	2:00	8.6	1:57	8.3	1:56	8.1	1:54
1000	11.6	2:33	11.2	2:28	10.9	2:25	10.5	2:23	10.3	2:21
1200	13.9	3:03	13.5	2:58	13.1	2:53	12.7	2:51	12.4	2:48
1400	16.3	3:34	15.8	3:27	15.3	3:22	14.8	3:18	14.5	3:15
1600	18.6	4:04	18.0	3:57	17.4	3:50	16.9	3:46	16.5	3:43
1800	20.8	4:35	20.2	4:27	19.6	4:19	19.0	4:14	18.6	4:10
2000	23.1	5:07	22.4	4:57	21.7	4:48	21.1	4:43	20.6	4:38
2200	25.3	5:38	24.6	5:27	23.8	5:18	23.1	5:11	22.6	5:05
2400	27.5	6:10	26.7	5:58	25.9	5:47	25.2	5:40	24.6	5:33
2600	29.7	6:42	28.9	6:29	28.0	6:17	27.2	6:09	26.5	6:01
2800	31.9	7:15	31.0	7:01	30.0	6:48	29.2	6:38	28.5	6:29
3000	34.0	7:47	33.1	7:32	32.1	7:18	31.1	7:07	30.4	6:57
3200	36.1	8:20	35.1	8:04	34.1	7:49	33.1	7:37	32.3	7:26
3400	38.2	8:53	37.1	8:36	36.0	8:20	35.0	8:06	34.2	7:55
3600	40.3	9:27	39.2	9:09	38.0	8:51	36.9	8:37	36.0	8:24
3800	42.4	10:01	41.1	9:42	40.0	9:23	38.8	9:07	37.9	8:53
4000	44.4	10:35	43.1	10:14	41.9	9:55	40.7	9:38	39.7	9:22
4200	46.4	11:10	45.1	10:48	43.8	10:27	42.6	10:09	41.5	9:52
4400	48.5	11:45	47.1	11:22	45.7	11:00	44.4	10:40	43.3	10:22
4600	50.5	12:20	49.0	11:56	47.6	11:33	46.2	11:12	45.1	10:52
4800	52.5	12:56	50.9	12:30	49.5	12:06	48.0	11:44	46.8	11:23
5000	54.5	13:32	52.9	13:04	51.3	12:39	49.9	12:16	48.6	11:53

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
5	-0.7	-0.4	0.0	2.0	4.7
10	-1.4	-0.8	0.0	3.1	7.8
15	-2.1	-1.2	0.0	4.1	10.6
20	-2.8	-1.6	0.0	5.0	12.9
25	-3.6	-2.0	0.0	5.7	14.8
30	-4.3	-2.4	0.0	6.4	16.3
35	-5.1	-2.7	0.0	6.8	17.3
40	-5.8	-3.1	0.0	7.2	18.0
45	-6.6	-3.4	0.0	7.4	18.2
50	-7.4	-3.7	0.0	7.5	18.0
55	-8.2	-4.0	0.0	7.4	17.3

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 LB)								
	180	170	160	150	140	130	120	110	100
41						16	3	0	7
39				31	11	1	1	7	19
37			20	6	0	1	8	19	32
35	28	11	3	0	3	10	20	32	46
33	5	0	1	5	12	22	34	46	58
31	0	2	8	15	25	35	47	58	68
29	5	11	19	28	38	48	58	68	76
27	15	23	31	41	50	59	68	76	83
25	27	35	44	53	61	69	76	82	87

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 (LB)	DISTANCE (NM)				
			LANDING WEIGHT (1000 LB)				
			90	110	130	150	170
41000	26	760	101	116	127	134	137
39000	25	750	96	110	121	129	132
37000	24	740	92	105	115	123	127
35000	24	730	87	100	110	118	122
33000	23	720	84	96	106	113	117
31000	22	710	79	91	100	107	111
29000	21	690	75	86	94	100	104
27000	20	680	70	80	88	93	97
25000	19	660	65	75	82	87	90
23000	18	640	61	69	76	81	83
21000	17	620	56	64	70	74	77
19000	16	590	52	59	64	68	70
17000	15	570	48	54	58	61	63
15000	14	540	43	48	52	55	57
10000	10	450	30	33	35	37	37
5000	7	350	18	19	20	20	21
1500	4	270	9	9	9	9	9

Allowances for a straight-in approach are included.

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	41000
190	%N1	65.6	68.0	72.0	76.0	80.4	84.8	89.3		
	KIAS	254	254	255	257	259	261	264		
	FF/ENG	3450	3400	3380	3360	3340	3380	3520		
180	%N1	64.1	66.8	70.5	74.6	79.0	83.4	87.7		
	KIAS	247	247	249	250	252	254	257		
	FF/ENG	3280	3230	3200	3190	3150	3180	3290		
170	%N1	62.5	65.5	69.0	73.2	77.5	81.9	86.2	92.5	
	KIAS	240	241	242	243	244	246	249	252	
	FF/ENG	3120	3060	3030	3010	2960	2980	3070	3320	
160	%N1	60.9	63.9	67.5	71.7	75.8	80.3	84.6	89.8	
	KIAS	232	233	234	235	237	239	241	244	
	FF/ENG	2960	2900	2860	2840	2790	2790	2870	3020	
150	%N1	59.3	62.1	66.0	69.9	74.1	78.6	83.0	87.8	
	KIAS	225	226	227	228	229	231	233	236	
	FF/ENG	2790	2740	2700	2670	2620	2600	2670	2770	
140	%N1	57.7	60.3	64.4	68.1	72.4	76.9	81.2	85.8	
	KIAS	218	218	219	220	221	223	225	227	
	FF/ENG	2630	2580	2530	2490	2460	2410	2470	2540	
130	%N1	56.0	58.5	62.6	66.3	70.6	74.9	79.3	83.8	94.2
	KIAS	209	210	211	212	213	214	216	218	222
	FF/ENG	2470	2420	2370	2330	2290	2240	2280	2330	2680
120	%N1	54.2	56.6	60.4	64.5	68.5	72.8	77.3	81.8	90.1
	KIAS	201	202	202	203	204	205	207	209	212
	FF/ENG	2310	2250	2210	2160	2120	2070	2100	2140	2350
110	%N1	52.2	54.6	58.2	62.5	66.2	70.7	75.1	79.6	87.3
	KIAS	193	193	194	194	195	196	198	200	203
	FF/ENG	2160	2090	2050	2000	1960	1910	1940	1970	2110
100	%N1	50.1	52.5	56.1	60.0	64.0	68.3	72.5	77.2	84.6
	KIAS	187	187	187	187	187	187	188	190	192
	FF/ENG	2010	1940	1890	1880	1830	1790	1770	1780	1890
90	%N1	48.0	50.4	53.9	57.5	61.8	65.6	70.0	74.6	81.9
	KIAS	181	181	181	181	181	181	181	181	182
	FF/ENG	1900	1840	1770	1720	1680	1640	1620	1610	1680

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

Performance Inflight — Chapter PI
Advisory Information — Section 42

ADVISORY INFORMATION

Normal Configuration Landing Distances
Flaps 15
Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	3170	210/-170	70	-110	390	40	-30	70	-70	220	70	150
MAX AUTO	4180	220/-220	100	-150	500	0	0	100	-100	390	0	10
AUTOBRAKE 3	5980	370/-370	160	-250	840	10	-10	170	-170	620	20	20
AUTOBRAKE 2	7610	520/-520	230	-340	1140	150	-170	220	-220	550	410	430
AUTOBRAKE 1	8290	600/-600	280	-390	1320	250	-260	240	-240	540	880	1360

Good Reported Braking Action

MAX MANUAL	4400	260/-250	120	-190	660	100	-90	110	-70	300	250	570
MAX AUTO	4880	280/-270	120	-200	690	90	-70	120	-100	380	280	640
AUTOBRAKE 3	5990	370/-370	160	-250	850	20	-20	170	-170	620	30	60
AUTOBRAKE 2	7610	520/-520	230	-340	1140	150	-170	220	-220	550	410	430

Medium Reported Braking Action

MAX MANUAL	6030	400/-390	180	-300	1100	260	-210	160	-160	400	680	1680
MAX AUTO	6350	410/-400	190	-300	1100	230	-180	160	-170	460	700	1710
AUTOBRAKE 3	6570	430/-420	190	-320	1140	180	-130	180	-180	620	460	1390
AUTOBRAKE 2	7770	530/-530	240	-360	1280	230	-220	220	-220	550	540	970

Poor Reported Braking Action

MAX MANUAL	7850	570/-550	260	-460	1730	630	-420	220	-220	480	1460	4000
MAX AUTO	8170	570/-550	260	-450	1710	620	-400	210	-220	500	1450	4010
AUTOBRAKE 3	8170	580/-550	260	-450	1720	580	-360	220	-230	600	1450	4020
AUTOBRAKE 2	8570	610/-600	280	-470	1780	590	-400	240	-240	550	1310	3530

Reference distance is for sea level, standard day, no wind or slope, VREF15 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 190 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	2990	180/-150	60	-110	370	30	-30	60	-60	220	60	130
MAX AUTO	3850	200/-200	90	-140	470	0	0	90	-90	370	0	0
AUTOBRAKE 3	5430	330/-330	150	-230	790	10	-10	150	-150	560	20	20
AUTOBRAKE 2	6910	450/-450	210	-320	1080	140	-150	190	-190	520	330	330
AUTOBRAKE 1	7530	530/-520	240	-370	1260	230	-230	220	-210	510	690	1110

Good Reported Braking Action

MAX MANUAL	4150	240/-230	110	-180	650	100	-90	100	-100	310	220	510
MAX AUTO	4580	250/-250	110	-190	670	80	-70	110	-110	360	250	570
AUTOBRAKE 3	5440	330/-330	150	-240	800	20	-20	150	-150	560	30	60
AUTOBRAKE 2	6910	450/-450	210	-320	1080	140	-150	190	-190	520	330	330

Medium Reported Braking Action

MAX MANUAL	5620	370/-360	170	-290	1060	250	-200	150	-150	390	600	1450
MAX AUTO	5900	380/-370	170	-290	1060	220	-170	150	-150	450	600	1460
AUTOBRAKE 3	6040	390/-380	170	-300	1100	180	-130	160	-160	560	430	1270
AUTOBRAKE 2	7070	470/-470	210	-340	1220	220	-200	190	-200	520	450	830

Poor Reported Braking Action

MAX MANUAL	7250	520/-500	240	-440	1670	590	-390	200	-200	460	1250	3340
MAX AUTO	7540	510/-500	240	-430	1660	580	-370	200	-200	490	1240	3350
AUTOBRAKE 3	7540	520/-500	240	-440	1670	560	-360	200	-200	540	1270	3390
AUTOBRAKE 2	7840	550/-530	250	-450	1710	560	-370	210	-220	520	1120	2980

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 190 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 40

Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	130000 LB LANDING WEIGHT	PER 10000 LB ABOVE/ BELOW 130000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV
MAX MANUAL	2820	160/-130	60	-100	360	30	-30	60	-60	220	50	110
MAX AUTO	3530	170/-180	80	-130	450	0	0	80	-80	350	0	0
AUTOBRAKE 3	4900	290/-290	130	-220	750	10	-10	130	-130	540	10	10
AUTOBRAKE 2	6280	400/-400	180	-300	1030	100	-120	170	-170	520	180	180
AUTOBRAKE 1	6940	470/-470	220	-350	1210	190	-210	200	-190	510	550	800

Good Reported Braking Action

MAX MANUAL	3920	220/-210	100	-180	630	100	-80	90	-90	310	200	450
MAX AUTO	4280	230/-230	110	-180	650	80	-70	100	-100	360	220	490
AUTOBRAKE 3	4910	290/-290	130	-220	760	20	-20	130	-130	540	20	60
AUTOBRAKE 2	6280	400/-400	180	-300	1030	100	-120	170	-170	520	180	180

Medium Reported Braking Action

MAX MANUAL	5270	340/-330	150	-280	1040	240	-190	140	-140	400	530	1270
MAX AUTO	5490	340/-340	160	-280	1030	210	-160	140	-140	460	530	1270
AUTOBRAKE 3	5580	350/-340	160	-290	1060	180	-130	150	-150	540	430	1210
AUTOBRAKE 2	6440	410/-410	190	-330	1170	190	-180	180	-180	520	300	660

Poor Reported Braking Action

MAX MANUAL	6790	470/-460	220	-420	1630	570	-380	180	-190	460	1110	2940
MAX AUTO	7070	470/-460	220	-420	1620	580	-360	180	-190	480	1120	2960
AUTOBRAKE 3	7070	480/-470	220	-420	1620	550	-350	180	-190	510	1130	2970
AUTOBRAKE 2	7250	500/-480	230	-440	1670	530	-360	190	-200	520	940	2650

Reference distance is for sea level, standard day, no wind or slope, VREF40 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 190 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT) REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APPROACH SPEED PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	3970	530/-210	100/240	-130	460	50	-40	280
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	4960	260/-280	130/180	-240	890	150	-130	380
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	3480	210/-170	80/110	-120	430	50	-40	290
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	3310	180/-160	80/100	-120	420	50	-40	300
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	3120	160/-150	70/90	-110	400	50	-40	310
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3580	170/-180	90/110	-130	470	50	-50	260
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4870	220/-260	120/170	-180	630	120	-100	490
LEADING EDGE FLAPS TRANSIT	VREF15+15	3550	230/-180	90/110	-120	430	40	-40	230
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	3200	210/-170	70/90	-110	410	40	-30	220
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	3020	170/-140	70/100	-110	390	40	-30	220

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	3160	210/-160	70/90	-110	400	40	-30	210
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	3160	210/-160	70/90	-110	400	40	-30	210
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2990	180/-150	60/TBS	-110	370	30	-30	220
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	3160	210/-160	70/90	-110	400	40	-30	210
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	3410	260/-180	90/100	-120	440	40	-30	230
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2990	180/-150	60/TBS	-110	370	30	-30	220
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	3160	210/-160	70/90	-110	400	40	-30	210
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	3410	260/-180	90/100	-120	440	40	-30	230
TRAILING EDGE FLAPS UP	VREF40+40	3600	340/-190	85/110	-120	430	40	-40	220

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT) REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS HEAD WIND	WIND ADJ PER 10 KTS TAIL WIND	SLOPE ADJ PER 1% DOWN HILL	SLOPE ADJ PER 1% UP HILL	APPROACH SPEED PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	5470	270/-280	160/200	-210	750	120	-100	290
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	5520	300/-330	150/210	-280	1080	210	-180	420
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	5040	270/-300	140/190	-210	750	140	-120	430
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	4720	250/-280	130/180	-200	730	130	-110	430
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	4410	230/-250	120/160	-190	700	130	-110	430
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	4550	240/-260	120/170	-190	690	110	-90	330
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	6010	300/-340	160/220	-240	840	200	-170	580
LEADING EDGE FLAPS TRANSIT	VREF15+15	4950	250/-280	140/180	-200	720	110	-100	320
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	4550	240/-260	120/160	-190	700	110	-100	320
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	4280	220/-240	110/150	-190	690	110	-90	330

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	4360	230/-250	120/160	-180	670	100	-80	300
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	4360	230/-250	120/160	-180	670	100	-80	300
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	4150	240/-230	110/TBS	-180	650	100	-90	310
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	4360	230/-250	120/160	-180	670	100	-80	300
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	4710	240/-250	130/170	-190	700	100	-90	290
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	4150	240/-230	110/TBS	-180	650	100	-90	310
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	4360	230/-250	120/160	-180	670	100	-80	300
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	4710	240/-250	130/170	-190	700	100	-90	290
TRAILING EDGE FLAPS UP	VREF40+40	4940	250/-260	140/180	-200	710	110	-90	280

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF				HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	7720	450/-460	250/340	-340	1240	290	-250	410
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	6950	430/-450	210/300	-420	1690	480	-350	480
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	6840	440/-460	220/310	-330	1210	320	-260	540
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	6340	390/-420	200/280	-320	1180	300	-250	530
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	5880	360/-380	180/250	-300	1140	290	-230	520
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	6190	380/-400	190/270	-300	1140	260	-210	430
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	8210	480/-520	260/350	-380	1330	420	-350	700
LEADING EDGE FLAPS TRANSIT	VREF15+15	6760	410/-430	210/290	-320	1180	270	-230	420
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	6480	390/-420	200/260	-320	1200	300	-250	450
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	6000	350/-380	180/240	-310	1160	290	-230	440

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
LANDING CONFIGURATION	VREF	REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	5930	360/-380	180/250	-290	1110	240	-200	390
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	5930	360/-380	180/250	-290	1110	240	-200	390
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	5620	370/-360	170/TBS	-290	1060	250	-200	390
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	5930	360/-380	180/250	-290	1110	240	-200	390
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	6490	390/-390	200/270	-310	1150	250	-210	390
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	5620	370/-360	170/TBS	-290	1060	250	-200	390
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	5930	360/-380	180/250	-290	1110	240	-200	390
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	6490	390/-390	200/270	-310	1150	250	-210	390
TRAILING EDGE FLAPS UP	VREF40+40	6890	400/-410	220/290	-320	1180	260	-220	390

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	10230	670/-670	370/500	-510	1970	660	-510	510
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	9150	630/-640	290/430	-690	3140	1650	-800	530
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	8780	630/-640	320/450	-490	1890	660	-500	620
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	8080	560/-570	280/400	-470	1840	620	-460	600
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	7480	510/-520	250/360	-450	1780	600	-440	580
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	7990	550/-560	270/380	-450	1790	560	-420	510
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	10450	690/-710	360/500	-550	2010	810	-620	770
LEADING EDGE FLAPS TRANSIT	VREF15+15	8710	590/-600	300/420	-470	1840	580	-440	500
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	8810	590/-620	290/390	-510	1970	740	-540	550
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	8040	530/-550	260/350	-480	1900	690	-490	530

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.
***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**
****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	LANDING DISTANCE AND ADJUSTMENT (FT)							
		REFERENCE DISTANCE FOR 130000 LB LANDING WEIGHT	WT ADJ PER 10000 LB ABOVE/ BELOW 130000 LB	ALT ADJ PER 1000 FT STD/HIGH*	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
					HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
STABILIZER TRIM INOPERATIVE	VREF15	7660	520/-530	260/360	-440	1750	520	-390	470
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	7660	520/-530	260/360	-440	1750	520	-390	470
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	7250	520/-500	240/TBS	-440	1670	590	-390	460
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	7660	520/-530	260/360	-440	1750	520	-390	470
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	8460	570/-560	290/400	-460	1820	570	-430	480
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	7250	520/-500	240/TBS	-440	1670	590	-390	460
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	7660	520/-530	260/360	-440	1750	520	-390	470
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	8460	570/-560	290/400	-460	1820	570	-430	480
TRAILING EDGE FLAPS UP	VREF40+40	9060	600/-590	310/430	-480	1870	590	-450	480

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft 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 LB)	OAT (°C)	PRESSURE ALTITUDE (1000 FT)																	
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
180	0	15.8	17.8	20.3	22.9	26.2	30.3	31.2	35.9	41.6	40.3	46.4	53.9	50.1	57.8	67.0	59.9	69.0	79.8
	10	16.2	18.3	20.9	23.7	27.1	31.3	32.2	37.1	43.0	41.6	48.0	55.8	51.8	59.7	69.2	61.9	71.3	82.3
	20	16.7	18.9	21.6	24.4	28.0	32.3	33.3	38.3	44.5	43.0	49.6	57.6	53.5	61.6	71.4	63.8	73.4	84.8
	30	17.1	19.3	22.1	25.0	28.7	33.1	34.1	39.3	45.6	44.2	50.9	59.1	54.9	63.3	73.3	65.6	75.5	87.1
	40	17.3	19.6	22.4	25.4	29.2	33.8	34.8	40.1	46.6	45.1	52.0	60.4	56.1	64.8	75.1	67.1	77.3	89.3
	50	17.4	19.8	22.6	25.7	29.5	34.2	35.2	40.6	47.3	45.7	52.8	61.5	57.0	65.9	76.6	68.4	78.9	91.4
160	0	14.4	16.2	18.4	20.8	23.8	27.4	28.2	32.4	37.5	36.3	41.8	48.6	45.1	52.0	60.4	54.2	62.5	72.4
	10	14.9	16.7	19.0	21.5	24.6	28.3	29.1	33.5	38.8	37.5	43.3	50.2	46.6	53.8	62.4	56.0	64.6	74.8
	20	15.3	17.2	19.6	22.2	25.3	29.2	30.1	34.6	40.1	38.8	44.7	51.9	48.1	55.5	64.3	57.8	66.6	77.0
	30	15.6	17.6	20.0	22.7	26.0	30.0	30.9	35.5	41.2	39.8	45.9	53.3	49.4	57.0	66.1	59.4	68.4	79.1
	40	15.8	17.8	20.3	23.1	26.4	30.5	31.4	36.2	42.0	40.6	46.8	54.4	50.5	58.3	67.6	60.7	70.0	81.1
	50	15.9	18.0	20.5	23.3	26.7	30.8	31.8	36.6	42.6	41.1	47.5	55.3	51.2	59.2	68.9	61.8	71.4	82.8
140	0	13.1	14.7	16.6	18.8	21.3	24.5	25.2	28.9	33.4	32.3	37.2	43.2	40.0	46.1	53.6	48.2	55.6	64.6
	10	13.5	15.1	17.1	19.4	22.0	25.3	26.1	29.9	34.6	33.4	38.5	44.6	41.3	47.7	55.4	49.9	57.5	66.7
	20	13.9	15.5	17.6	20.0	22.7	26.1	26.9	30.9	35.7	34.5	39.7	46.1	42.7	49.2	57.1	51.5	59.4	68.8
	30	14.2	15.9	18.0	20.4	23.3	26.8	27.6	31.6	36.7	35.4	40.8	47.4	43.8	50.6	58.7	52.9	61.0	70.7
	40	14.3	16.1	18.2	20.7	23.6	27.2	28.0	32.2	37.4	36.1	41.6	48.3	44.7	51.6	60.0	54.0	62.4	72.3
	50	14.4	16.2	18.4	20.9	23.9	27.5	28.3	32.6	37.8	36.5	42.1	49.1	45.4	52.4	61.0	54.9	63.5	73.8
120	0	11.8	13.1	14.7	16.7	18.9	21.6	22.2	25.4	29.3	28.3	32.5	37.7	34.8	40.1	46.6	42.0	48.4	56.2
	10	12.2	13.5	15.2	17.2	19.5	22.3	23.0	26.2	30.3	29.2	33.6	39.0	36.0	41.5	48.2	43.4	50.1	58.1
	20	12.5	13.9	15.6	17.7	20.1	23.0	23.7	27.1	31.3	30.2	34.7	40.3	37.2	42.9	49.8	44.8	51.7	60.0
	30	12.7	14.1	15.9	18.1	20.6	23.6	24.3	27.8	32.1	31.0	35.6	41.3	38.2	44.0	51.1	46.0	53.1	61.6
	40	12.9	14.3	16.2	18.4	20.9	23.9	24.7	28.3	32.7	31.5	36.3	42.1	38.9	44.9	52.2	47.0	54.2	63.0
	50	12.9	14.4	16.3	18.5	21.0	24.2	24.9	28.5	33.1	31.9	36.7	42.7	39.4	45.5	53.0	47.7	55.1	64.1
100	0	10.5	11.6	12.9	14.6	16.4	18.7	19.2	21.9	25.1	24.2	27.8	32.1	29.6	34.1	39.5	35.4	40.8	47.4
	10	10.8	11.9	13.3	15.1	17.0	19.3	19.9	22.6	26.0	25.0	28.7	33.2	30.6	35.2	40.9	36.6	42.2	49.0
	20	11.1	12.2	13.6	15.5	17.4	19.9	20.5	23.3	26.8	25.9	29.6	34.3	31.6	36.4	42.2	37.8	43.6	50.6
	30	11.3	12.4	13.9	15.8	17.8	20.3	20.9	23.9	27.5	26.5	30.4	35.2	32.4	37.4	43.3	38.8	44.8	52.0
	40	11.4	12.6	14.1	16.0	18.1	20.6	21.3	24.3	28.0	27.0	30.9	35.9	33.0	38.1	44.2	39.6	45.7	53.1
	50	11.5	12.7	14.2	16.2	18.2	20.8	21.4	24.5	28.3	27.2	31.3	36.3	33.4	38.5	44.8	40.1	46.3	54.0
90	0	9.9	10.8	12.0	13.6	15.2	17.2	17.7	20.1	23.0	22.2	25.4	29.3	27.0	31.0	35.9	32.0	36.9	42.8
	10	10.2	11.1	12.3	14.0	15.7	17.8	18.3	20.8	23.8	22.9	26.2	30.3	27.9	32.1	37.1	33.1	38.1	44.3
	20	10.4	11.4	12.6	14.4	16.1	18.3	18.8	21.4	24.6	23.7	27.1	31.3	28.8	33.1	38.4	34.2	39.4	45.7
	30	10.6	11.6	12.9	14.7	16.5	18.7	19.3	21.9	25.2	24.3	27.8	32.1	29.6	34.0	39.4	35.1	40.5	47.0
	40	10.7	11.7	13.0	14.9	16.7	19.0	19.6	22.3	25.6	24.7	28.2	32.7	30.1	34.6	40.2	35.8	41.3	47.9
	50	10.7	11.8	13.1	15.0	16.8	19.1	19.7	22.4	25.8	24.9	28.5	33.0	30.4	35.0	40.7	36.2	41.8	48.6

***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	5.9	15.9	25.9	35.7	45.7	55.8	66.2	76.8	87.5
	MAX AUTO	5.3	14.8	24.3	33.8	43.5	53.6	63.9	74.6	85.7
	AUTOBRAKE 3	4.7	13.4	21.8	29.8	38.1	47.3	57.2	68.0	79.6
	AUTOBRAKE 2	4.0	11.9	19.3	26.1	33.1	41.0	50.0	59.9	70.8
	AUTOBRAKE 1	3.3	10.4	16.8	22.5	28.3	34.9	42.2	50.4	59.3

Two Engine Detent Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
LANDING	MAX MAN	5.6	14.9	24.1	33.2	42.5	51.9	61.6	71.6	81.8
	MAX AUTO	4.0	12.1	20.3	28.7	37.4	46.9	56.9	67.6	78.8
	AUTOBRAKE 3	1.7	7.3	13.0	18.8	25.2	32.4	40.5	49.6	59.6
	AUTOBRAKE 2	0.1	3.9	7.7	11.5	15.7	20.8	27.0	34.1	42.1
	AUTOBRAKE 1		1.9	4.4	6.5	8.9	12.1	16.1	20.9	26.5

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
	16 & BELOW	17	20	23	26	29	32	33 TO 48	49 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS								
	UP TO 2.4	2.6	3.1	3.5	4.0	4.4	4.9	5.0 TO 7.8	7.8 & 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		

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.

Intentionally
Blank

Performance Inflight — Chapter PI
Engine Inoperative — Section 43

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	-3.1	-3.2

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
180	173	258	18300	17100	15900
170	164	251	19900	18700	17500
160	154	244	21200	20300	19100
150	145	236	22700	21700	20700
140	135	229	24200	23300	22400
130	125	220	26000	25000	24100
120	115	212	28000	27100	26100
110	106	203	30000	29200	28200
100	96	194	32000	31300	30400
90	87	184	34200	33500	32600

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
140	130	121	113	106	100	95	90	85	81	78
280	259	241	226	212	200	189	179	171	163	155
420	389	362	339	318	300	284	269	256	244	233
560	519	483	452	424	400	378	359	341	326	311
700	648	604	565	530	500	473	449	427	407	389
840	778	724	677	636	600	568	538	512	488	467
980	907	845	790	742	700	662	628	598	570	544
1120	1037	965	903	848	800	757	718	683	651	622
1260	1167	1086	1016	955	900	851	808	768	733	700
1400	1296	1207	1129	1061	1000	946	897	854	814	778
1540	1426	1327	1242	1167	1100	1041	987	939	895	856
1680	1555	1448	1355	1273	1200	1135	1077	1024	977	933
1820	1685	1569	1468	1379	1300	1230	1167	1110	1058	1011
1960	1815	1690	1581	1485	1400	1324	1256	1195	1139	1089
2101	1945	1811	1694	1591	1500	1419	1346	1280	1221	1166
2241	2075	1932	1807	1697	1600	1513	1436	1366	1302	1244
2382	2205	2053	1920	1803	1700	1608	1525	1451	1383	1322
2523	2335	2174	2033	1909	1800	1702	1615	1536	1464	1399

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 LB)										TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 LB)										
	90	100	110	120	130	140	150	160	170	180	
100	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.2	1.2	1.2	0:17
200	1.8	1.9	2.0	2.2	2.3	2.4	2.6	2.7	2.8	3.0	0:34
300	2.9	3.1	3.3	3.5	3.7	3.9	4.2	4.4	4.6	4.9	0:52
400	3.9	4.2	4.5	4.8	5.1	5.4	5.8	6.1	6.4	6.8	1:09
500	4.8	5.2	5.6	6.1	6.4	6.8	7.3	7.7	8.1	8.6	1:26
600	5.8	6.3	6.8	7.3	7.7	8.2	8.8	9.3	9.8	10.3	1:43
700	6.7	7.3	7.9	8.5	9.0	9.6	10.2	10.8	11.4	12.1	2:00
800	7.6	8.3	9.0	9.7	10.3	11.0	11.7	12.4	13.0	13.8	2:17
900	8.6	9.3	10.1	10.9	11.6	12.3	13.1	13.9	14.6	15.5	2:34
1000	9.5	10.3	11.1	12.0	12.8	13.7	14.5	15.4	16.2	17.1	2:51
1100	10.4	11.3	12.2	13.2	14.1	15.0	15.9	16.9	17.8	18.8	3:09
1200	11.3	12.3	13.3	14.3	15.3	16.3	17.3	18.4	19.4	20.5	3:26
1300	12.1	13.2	14.3	15.5	16.5	17.6	18.7	19.8	20.9	22.1	3:43
1400	13.0	14.2	15.4	16.6	17.7	18.9	20.1	21.3	22.4	23.7	4:00
1500	13.9	15.1	16.4	17.7	18.9	20.2	21.5	22.7	24.0	25.3	4:17
1600	14.7	16.1	17.4	18.8	20.1	21.4	22.8	24.2	25.5	27.0	4:35
1700	15.6	17.0	18.4	19.9	21.3	22.7	24.2	25.6	27.0	28.5	4:52
1800	16.4	17.9	19.4	21.0	22.4	24.0	25.5	27.0	28.5	30.1	5:09

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 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
190	13600	11200	8300
180	15600	13600	10800
170	17400	15700	13300
160	19300	17600	15700
150	20900	19600	17700
140	22300	21200	19800
130	23900	22800	21500
120	25800	24500	23300
110	28300	26900	25200
100	30600	29600	28100
90	32700	31900	30800

With engine anti-ice on, decrease altitude capability by 1100 ft.
With engine and wing anti-ice on, decrease altitude capability by 5100 ft (optional system).

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)										
		10	15	17	19	21	23	25	27	29	31	33
180	%N1	91.5	95.3	97.7								
	MACH	.542	.578	.593								
	KIAS	301	292	288								
	FF/ENG	6644	6551	6590								
170	%N1	90.1	93.7	95.7	98.5							
	MACH	.531	.569	.582	.597							
	KIAS	294	287	283	280							
	FF/ENG	6299	6201	6169	6249							
160	%N1	88.6	92.2	93.9	96.1							
	MACH	.519	.557	.572	.586							
	KIAS	287	281	278	274							
	FF/ENG	5951	5852	5803	5796							
150	%N1	87.1	90.6	92.1	94.0	96.5						
	MACH	.505	.545	.561	.575	.590						
	KIAS	280	275	272	269	265						
	FF/ENG	5602	5508	5455	5411	5446						
140	%N1	85.4	89.0	90.5	92.0	94.1	96.9					
	MACH	.492	.531	.547	.563	.577	.593					
	KIAS	272	268	266	263	259	256					
	FF/ENG	5256	5166	5114	5062	5034	5109					
130	%N1	83.6	87.2	88.7	90.2	91.9	94.1	97.1				
	MACH	.477	.517	.533	.549	.565	.579	.595				
	KIAS	264	260	258	256	253	250	246				
	FF/ENG	4911	4821	4774	4721	4681	4669	4772				
120	%N1	81.7	85.3	86.8	88.3	89.8	91.6	94.0	97.1			
	MACH	.461	.500	.517	.533	.550	.566	.580	.597			
	KIAS	255	252	250	249	246	244	240	237			
	FF/ENG	4565	4474	4430	4382	4337	4307	4313	4423			
110	%N1	79.7	83.2	84.7	86.2	87.8	89.3	91.2	93.7	96.9		
	MACH	.445	.483	.499	.516	.533	.549	.566	.580	.597		
	KIAS	246	243	242	240	238	236	234	230	227		
	FF/ENG	4223	4130	4085	4040	4000	3959	3945	3960	4067		
100	%N1	77.4	81.0	82.5	84.0	85.5	87.1	88.6	90.5	93.2	96.3	
	MACH	.428	.464	.480	.497	.514	.531	.548	.564	.579	.596	
	KIAS	237	233	232	231	230	228	226	223	220	217	
	FF/ENG	3890	3786	3743	3698	3660	3623	3595	3592	3604	3705	
90	%N1	75.2	78.6	80.0	81.5	83.0	84.6	86.1	87.6	89.5	92.3	95.4
	MACH	.410	.445	.460	.476	.492	.509	.527	.544	.561	.577	.594
	KIAS	227	223	222	221	220	218	217	215	213	209	206
	FF/ENG	3566	3446	3402	3358	3320	3286	3259	3244	3239	3246	3334

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion 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
296	270	248	230	214	200	190	180	172	164	157
596	544	498	461	429	400	379	360	343	327	314
898	819	750	692	644	600	569	540	514	491	470
1201	1095	1002	924	858	800	758	720	685	654	626
1506	1372	1255	1157	1074	1000	948	899	856	816	781
1813	1650	1508	1390	1289	1200	1137	1079	1026	979	937
2122	1930	1762	1623	1505	1400	1326	1259	1197	1141	1092
2433	2211	2017	1856	1720	1600	1516	1438	1368	1304	1247
2745	2493	2272	2090	1936	1800	1704	1617	1537	1466	1402

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	3.1	0:42	2.8	0:41	2.5	0:39	2.2	0:38	2.1	0:37
400	6.4	1:22	5.9	1:19	5.4	1:16	4.9	1:13	4.8	1:11
600	9.7	2:03	8.9	1:57	8.2	1:52	7.6	1:48	7.4	1:44
800	12.9	2:44	11.9	2:36	11.0	2:29	10.3	2:23	10.0	2:18
1000	16.1	3:25	14.9	3:15	13.8	3:06	12.9	2:58	12.5	2:52
1200	19.3	4:07	17.9	3:55	16.6	3:43	15.5	3:34	15.0	3:27
1400	22.4	4:49	20.8	4:35	19.3	4:21	18.0	4:10	17.5	4:01
1600	25.5	5:32	23.7	5:15	22.0	5:00	20.6	4:46	19.9	4:36
1800	28.5	6:15	26.5	5:56	24.7	5:38	23.0	5:23	22.2	5:11

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
2	-0.2	-0.1	0.0	0.2	0.5
4	-0.5	-0.3	0.0	0.6	1.2
6	-0.8	-0.4	0.0	0.9	1.9
8	-1.1	-0.5	0.0	1.2	2.6
10	-1.3	-0.7	0.0	1.6	3.3
12	-1.6	-0.8	0.0	1.9	4.0
14	-1.9	-1.0	0.0	2.2	4.6
16	-2.2	-1.1	0.0	2.5	5.3
18	-2.5	-1.2	0.0	2.7	5.9
20	-2.7	-1.4	0.0	3.0	6.5
22	-3.0	-1.5	0.0	3.3	7.1
24	-3.3	-1.7	0.0	3.5	7.7
26	-3.6	-1.8	0.0	3.8	8.2
28	-3.9	-1.9	0.0	4.0	8.8
30	-4.1	-2.1	0.0	4.2	9.3

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
190	%N1	82.6	85.4	89.7	94.9			
	KIAS	254	254	255	257			
	FF/ENG	6340	6340	6390	6580			
180	%N1	81.0	83.9	88.1	92.8			
	KIAS	247	247	249	250			
	FF/ENG	6000	5990	6020	6140			
170	%N1	79.4	82.3	86.5	91.0	98.7		
	KIAS	240	241	242	243	244		
	FF/ENG	5670	5640	5650	5740	6100		
160	%N1	77.8	80.6	84.8	89.2	95.5		
	KIAS	232	233	234	235	237		
	FF/ENG	5340	5310	5300	5360	5540		
150	%N1	76.2	78.8	83.0	87.3	92.6		
	KIAS	225	226	227	228	229		
	FF/ENG	5020	4980	4950	4990	5080		
140	%N1	74.3	77.0	81.1	85.4	90.1		
	KIAS	218	218	219	220	221		
	FF/ENG	4690	4650	4610	4620	4660		
130	%N1	72.2	75.1	79.0	83.3	87.9	95.0	
	KIAS	209	210	211	212	213	214	
	FF/ENG	4370	4320	4280	4270	4280	4500	
120	%N1	70.1	73.0	76.9	81.1	85.6	91.1	
	KIAS	201	202	202	203	204	205	
	FF/ENG	4060	4000	3960	3930	3920	4020	
110	%N1	67.8	70.5	74.7	78.8	83.2	88.0	96.9
	KIAS	193	193	194	194	195	196	198
	FF/ENG	3750	3680	3640	3600	3570	3610	3950
100	%N1	65.5	68.1	72.2	76.2	80.6	85.2	92.0
	KIAS	187	187	187	187	187	187	188
	FF/ENG	3450	3380	3320	3280	3230	3240	3400
90	%N1	62.9	65.6	69.5	73.6	77.9	82.3	87.3
	KIAS	181	181	181	181	181	181	181
	FF/ENG	3160	3100	3030	2980	2920	2910	2980

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

Intentionally
Blank

Performance Inflight — Chapter PI
Alternate Mode EEC — Section 44

ALTERNATE MODE EEC

Alternate Mode EEC Limit Weight

PERFORMANCE LIMIT	NORMAL MODE PERFORMANCE LIMIT WEIGHT (1000 LB)									
	100	110	120	130	140	150	160	170	180	190
FIELD	95.6	105.0	114.5	123.2	132.6	142.1	151.5	160.9	170.4	180.2
CLIMB	93.2	102.5	111.8	121.1	130.7	140.1	149.2	158.7	168.1	177.3
OBSTACLE	93.4	102.6	111.8	121.2	130.8	140.3	149.6	159.2	168.6	177.9

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

OAT		AIRPORT PRESSURE ALTITUDE (FT)												
°C	°F	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
60	140	92.6	93.2	93.6	93.7	93.8	93.9	94.0	94.1	94.0	93.7	93.6	93.5	93.5
55	131	93.2	93.8	94.3	94.4	94.5	94.6	94.7	94.9	94.7	94.4	94.1	93.5	92.8
50	122	93.8	94.4	94.9	95.1	95.2	95.4	95.5	95.6	95.5	95.2	94.9	94.4	93.9
45	113	94.6	95.2	95.6	95.8	95.9	96.1	96.2	96.3	96.2	95.9	95.6	95.3	94.9
40	104	95.2	95.9	96.4	96.5	96.6	96.7	96.8	97.0	96.9	96.6	96.3	96.2	95.9
35	95	95.8	96.5	97.2	97.3	97.4	97.5	97.6	97.7	97.6	97.3	97.0	96.9	96.8
30	86	95.4	96.6	98.1	98.1	98.2	98.2	98.3	98.3	98.2	98.1	97.8	97.7	97.7
25	77	94.6	95.9	97.3	97.9	98.5	98.6	98.5	98.5	98.5	98.5	98.4	98.4	98.5
20	68	93.8	95.1	96.6	97.1	97.7	98.0	98.3	98.6	98.6	98.7	98.6	98.6	98.6
15	59	93.0	94.3	95.8	96.4	97.0	97.3	97.6	97.9	98.3	98.7	98.9	98.9	98.9
10	50	92.3	93.6	95.0	95.6	96.2	96.5	96.8	97.2	97.5	97.9	98.3	98.8	99.3
5	41	91.5	92.8	94.2	94.8	95.4	95.8	96.1	96.4	96.8	97.2	97.6	98.1	98.5
0	32	90.7	92.0	93.4	94.1	94.7	95.0	95.3	95.7	96.0	96.4	96.8	97.3	97.8
-5	23	89.8	91.2	92.6	93.3	93.9	94.2	94.5	94.9	95.3	95.7	96.1	96.5	97.0
-10	14	89.0	90.4	91.8	92.5	93.1	93.4	93.8	94.1	94.5	94.9	95.3	95.8	96.2
-15	5	88.2	89.5	91.0	91.7	92.3	92.6	93.0	93.4	93.7	94.1	94.5	95.0	95.4
-20	-4	87.4	88.7	90.2	90.8	91.5	91.8	92.2	92.6	93.0	93.4	93.7	94.2	94.6
-25	-13	86.5	87.9	89.4	90.0	90.7	91.0	91.4	91.8	92.2	92.6	93.0	93.4	93.8
-30	-22	85.7	87.0	88.5	89.2	89.8	90.2	90.6	91.0	91.4	91.8	92.1	92.6	93.0
-35	-31	84.8	86.2	87.7	88.3	89.0	89.4	89.7	90.2	90.6	90.9	91.3	91.8	92.2
-40	-40	83.9	85.3	86.8	87.5	88.1	88.5	88.9	89.3	89.7	90.1	90.5	90.9	91.4
-45	-49	83.1	84.4	86.0	86.6	87.3	87.7	88.1	88.5	88.9	89.3	89.7	90.1	90.5
-50	-58	82.2	83.5	85.1	85.7	86.4	86.8	87.2	87.7	88.1	88.4	88.8	89.3	89.7

%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	0.7	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Intentionally
Blank

GEAR DOWN

Long Range Cruise Altitude Capability

Max Cruise Thrust, 100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
180	16100	13300	10100
170	18700	16000	13200
160	21200	18700	16000
150	23600	21300	18600
140	25900	24200	21600
130	28100	26600	24800
120	30200	29100	27400
110	32200	31200	29900
100	34200	33200	32100
90	36400	35400	34300

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	21	23	25	27	29	31	33	35	37
180	%N1	85.5									
	MACH	.473									
	KIAS	262									
	FF/ENG	5250									
170	%N1	84.0									
	MACH	.460									
	KIAS	254									
	FF/ENG	4943									
160	%N1	82.3	91.7								
	MACH	.447	.548								
	KIAS	247	245								
	FF/ENG	4639	4619								
150	%N1	80.5	89.9	91.9							
	MACH	.434	.535	.552							
	KIAS	240	239	237							
	FF/ENG	4341	4320	4308							
140	%N1	78.7	88.0	89.8	92.0	95.0					
	MACH	.420	.518	.538	.555	.573					
	KIAS	232	232	231	229	227					
	FF/ENG	4052	4008	4006	4011	4089					
130	%N1	76.7	85.9	87.7	89.6	91.9	95.2				
	MACH	.406	.500	.521	.541	.558	.576				
	KIAS	224	223	224	223	221	218				
	FF/ENG	3766	3695	3698	3705	3721	3810				
120	%N1	74.8	83.7	85.5	87.3	89.2	91.7	95.2			
	MACH	.391	.482	.501	.523	.543	.560	.579			
	KIAS	216	215	215	215	214	212	210			
	FF/ENG	3485	3390	3387	3397	3414	3432	3528			
110	%N1	72.5	81.4	83.1	84.9	86.7	88.7	91.3	94.9		
	MACH	.375	.462	.481	.501	.523	.543	.561	.580		
	KIAS	207	206	206	206	206	205	203	201		
	FF/ENG	3209	3092	3085	3090	3109	3124	3142	3241		
100	%N1	70.0	78.9	80.6	82.3	84.1	85.9	87.9	90.7	94.2	
	MACH	.359	.442	.460	.479	.499	.521	.542	.560	.580	
	KIAS	198	197	197	197	196	197	196	194	192	
	FF/ENG	2942	2803	2790	2793	2806	2821	2834	2850	2945	
90	%N1	67.4	76.1	77.8	79.5	81.3	83.0	84.9	87.0	89.7	93.7
	MACH	.343	.421	.438	.456	.475	.496	.518	.540	.558	.578
	KIAS	189	187	187	187	187	187	187	186	184	182
	FF/ENG	2685	2525	2502	2501	2515	2522	2532	2543	2557	2656

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
325	290	260	236	217	200	188	178	168	160	153
657	585	524	475	435	400	377	357	338	321	307
995	884	789	714	653	600	566	535	507	482	460
1337	1186	1056	955	872	800	755	713	676	642	613
1685	1491	1326	1196	1091	1000	943	891	844	802	765
2038	1801	1598	1440	1311	1200	1131	1068	1011	961	917
2398	2114	1872	1683	1532	1400	1319	1245	1179	1120	1068
2765	2432	2149	1929	1753	1600	1507	1422	1346	1278	1218
3139	2754	2428	2176	1974	1800	1694	1598	1512	1435	1368

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		20		24		28	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
200	5.4	0:49	4.9	0:47	4.2	0:44	3.9	0:42	3.6	0:41
400	11.0	1:37	10.2	1:32	9.0	1:25	8.4	1:21	7.9	1:18
600	16.5	2:26	15.3	2:18	13.7	2:07	12.7	2:00	12.1	1:54
800	21.9	3:16	20.4	3:05	18.2	2:49	17.0	2:39	16.2	2:31
1000	27.2	4:07	25.3	3:53	22.7	3:32	21.2	3:20	20.2	3:09
1200	32.3	4:59	30.1	4:41	27.0	4:16	25.3	4:01	24.1	3:47
1400	37.3	5:53	34.8	5:31	31.3	5:01	29.3	4:42	27.9	4:26
1600	42.2	6:47	39.4	6:23	35.4	5:47	33.2	5:25	31.6	5:06
1800	47.1	7:43	43.9	7:15	39.5	6:34	37.1	6:08	35.3	5:46

Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
5	-0.7	-0.4	0.0	0.7	1.6
10	-1.5	-0.8	0.0	1.4	3.2
15	-2.3	-1.2	0.0	2.1	4.7
20	-3.1	-1.5	0.0	2.7	6.1
25	-3.8	-1.9	0.0	3.3	7.4
30	-4.6	-2.3	0.0	3.8	8.5
35	-5.4	-2.7	0.0	4.2	9.5
40	-6.1	-3.1	0.0	4.6	10.4
45	-6.9	-3.5	0.0	5.0	11.1
50	-7.7	-3.8	0.0	5.3	11.8

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (LB)	DISTANCE (NM)
41000	20	600	87
39000	20	590	83
37000	19	580	79
35000	18	570	74
33000	18	560	70
31000	17	540	66
29000	16	530	62
27000	15	520	58
25000	15	510	54
23000	14	490	50
21000	13	480	46
19000	12	460	42
17000	11	440	39
15000	11	420	35
10000	8	360	25
5000	6	300	16
1500	4	240	9

Allowances for a straight-in approach are included.

GEAR DOWN

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)							
		1500	5000	10000	15000	20000	25000	30000	35000
190	%N1	77.0	79.8	84.1	88.5				
	KIAS	230	230	230	230				
	FF/ENG	5180	5150	5150	5210				
180	%N1	75.6	78.3	82.6	86.9	92.0			
	KIAS	225	225	225	225	225			
	FF/ENG	4910	4880	4870	4900	4970			
170	%N1	74.0	76.8	81.0	85.3	90.0			
	KIAS	221	221	221	221	221			
	FF/ENG	4650	4610	4590	4610	4640			
160	%N1	72.4	75.3	79.3	83.6	88.3			
	KIAS	216	216	216	216	216			
	FF/ENG	4390	4350	4320	4330	4340			
150	%N1	70.6	73.6	77.6	81.9	86.4	92.1		
	KIAS	211	211	211	211	211	211		
	FF/ENG	4140	4090	4060	4050	4050	4150		
140	%N1	69.2	72.0	76.1	80.3	84.7	89.6		
	KIAS	209	209	209	209	209	209		
	FF/ENG	3930	3880	3840	3820	3800	3850		
130	%N1	67.4	70.1	74.3	78.4	82.8	87.5	95.3	
	KIAS	204	204	204	204	204	204	204	
	FF/ENG	3690	3630	3590	3560	3540	3560	3800	
120	%N1	65.6	68.2	72.4	76.4	80.8	85.4	91.5	
	KIAS	199	199	199	199	199	199	199	
	FF/ENG	3460	3400	3340	3310	3270	3280	3400	
110	%N1	63.6	66.3	70.3	74.4	78.7	83.1	88.1	
	KIAS	193	193	193	193	193	193	193	
	FF/ENG	3230	3170	3110	3070	3020	3020	3080	
100	%N1	61.4	64.3	68.1	72.3	76.4	80.9	85.5	93.4
	KIAS	187	187	187	187	187	187	187	187
	FF/ENG	3000	2950	2890	2840	2780	2760	2810	2990
90	%N1	59.2	62.0	65.9	70.0	74.2	78.6	83.1	89.0
	KIAS	181	181	181	181	181	181	181	181
	FF/ENG	2780	2730	2680	2620	2560	2520	2560	2620

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

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GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude
100 ft/min residual rate of climb

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
180	170	223	2000		
170	161	218	4300	2600	
160	152	214	6500	5100	3000
150	142	210	8600	7200	5300
140	133	207	10700	9500	7700
130	124	202	12900	11900	10400
120	114	197	15100	14300	13300
110	105	191	17400	16600	15800
100	95	186	19700	18800	18000
90	86	180	21900	21000	20200

Includes APU fuel burn.

Long Range Cruise Altitude Capability
100 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
160	1800		
150	4700	2600	
140	7500	5800	3200
130	10300	8900	6500
120	12800	11800	9900
110	15500	14700	13500
100	18300	17400	16600
90	21000	20200	19300

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)								
		5	7	9	11	13	15	17	19	21
150	%N1	94.7								
	MACH	.384								
	KIAS	232								
	FF/ENG	8277								
140	%N1	92.6	94.4	97.0						
	MACH	.372	.385	.398						
	KIAS	225	225	224						
	FF/ENG	7681	7688	7778						
130	%N1	90.5	92.1	94.0	96.7					
	MACH	.361	.373	.385	.399					
	KIAS	218	217	217	216					
	FF/ENG	7104	7094	7101	7204					
120	%N1	88.2	89.8	91.5	93.3	96.1				
	MACH	.349	.360	.372	.385	.399				
	KIAS	211	210	209	208	208				
	FF/ENG	6559	6523	6509	6521	6625				
110	%N1	86.0	87.4	89.0	90.7	92.5	95.3			
	MACH	.337	.348	.359	.371	.383	.397			
	KIAS	204	203	201	200	200	199			
	FF/ENG	6045	5985	5946	5934	5947	6029			
100	%N1	83.6	85.0	86.4	87.9	89.6	91.4	94.2	98.5	
	MACH	.325	.335	.345	.356	.368	.381	.395	.409	
	KIAS	197	195	194	193	192	191	190	189	
	FF/ENG	5552	5479	5419	5380	5368	5369	5413	5600	
90	%N1	81.1	82.4	83.8	85.2	86.7	88.3	90.1	92.8	96.9
	MACH	.313	.322	.331	.341	.352	.364	.377	.392	.408
	KIAS	189	188	186	184	183	182	181	181	181
	FF/ENG	5082	4994	4922	4863	4824	4803	4785	4815	5003

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)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
173	152	134	120	109	100	93	88	83	78	75
354	309	271	242	220	200	187	174	164	155	147
536	467	409	365	330	300	280	262	246	232	220
720	627	548	488	441	400	373	349	328	308	292
906	787	687	611	551	500	466	435	408	385	365
1093	948	826	734	662	600	559	522	489	461	437
1282	1111	967	858	773	700	652	609	570	537	508
1472	1274	1107	982	884	800	744	695	651	612	580
1664	1438	1248	1106	995	900	838	782	732	688	651
1858	1603	1390	1230	1106	1000	930	868	812	764	723

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)					
	6		10		14	
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)
100	2.8	0:27	2.5	0:26	2.3	0:26
200	5.8	0:53	5.4	0:51	5.2	0:49
300	8.8	1:19	8.2	1:15	8.0	1:12
400	11.7	1:45	11.0	1:40	10.7	1:35
500	14.6	2:11	13.7	2:05	13.4	1:59
600	17.5	2:38	16.4	2:30	16.0	2:23
700	20.3	3:05	19.1	2:56	18.6	2:47
800	23.1	3:32	21.7	3:22	21.1	3:12
900	25.9	4:00	24.3	3:48	23.5	3:36
1000	28.6	4:27	26.9	4:14	26.0	4:01

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time
Fuel Required Adjustments (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)				
	90	110	130	150	170
2	-0.3	-0.2	0.0	0.3	0.5
4	-0.6	-0.3	0.0	0.6	1.2
6	-0.9	-0.5	0.0	0.9	1.8
8	-1.2	-0.6	0.0	1.3	2.5
10	-1.5	-0.8	0.0	1.6	3.1
12	-1.8	-0.9	0.0	1.9	3.8
14	-2.1	-1.1	0.0	2.3	4.4
16	-2.4	-1.2	0.0	2.6	5.1
18	-2.7	-1.4	0.0	2.9	5.7
20	-3.0	-1.5	0.0	3.2	6.4
22	-3.3	-1.7	0.0	3.6	7.0
24	-3.6	-1.8	0.0	3.9	7.7
26	-3.9	-2.0	0.0	4.2	8.4
28	-4.2	-2.1	0.0	4.6	9.0
30	-4.5	-2.2	0.0	4.9	9.7
32	-4.8	-2.4	0.0	5.2	10.4

Includes APU fuel burn.

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
170	%N1	93.2			
	KIAS	221			
	FF/ENG	9060			
160	%N1	91.3	94.6		
	KIAS	216	216		
	FF/ENG	8480	8580		
150	%N1	89.4	92.6		
	KIAS	211	211		
	FF/ENG	7920	7990		
140	%N1	87.7	90.7	96.3	
	KIAS	209	209	209	
	FF/ENG	7460	7500	7690	
130	%N1	85.6	88.6	93.3	
	KIAS	204	204	204	
	FF/ENG	6940	6950	7050	
120	%N1	83.5	86.4	90.9	98.2
	KIAS	199	199	199	199
	FF/ENG	6430	6430	6480	6820
110	%N1	81.2	84.2	88.5	93.9
	KIAS	193	193	193	193
	FF/ENG	5960	5930	5950	6070
100	%N1	78.9	81.9	86.1	90.8
	KIAS	187	187	187	187
	FF/ENG	5510	5460	5450	5510
90	%N1	76.6	79.4	83.6	88.1
	KIAS	181	181	181	181
	FF/ENG	5070	5020	4980	5000

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

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Performance Inflight — Chapter PI
Text — Section 47

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 provided that adjustments are made to V1 for clearway, stopway, anti-skid inoperative, thrust reversers inoperative, improved climb, contaminated runway situations or brake energy limits. These speeds may be used for weights less than or equal to the performance limited weight.

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. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (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.

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.

Clearway and Stopway V1 Adjustments

Maximum allowable clearway limits are provided for guidance when more precise data is not available. Use of clearway is not allowed on wet runways.

Takeoff speed adjustments are to be applied to V1 speed when using takeoff weights based on the use of clearway and stopway.

Adjust V1 speed by the amount shown in the table. The adjusted V1 speed must not exceed VR. If the adjusted V1 speed is greater than VR, reduce V1 to equal VR.

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.

With autothrottles disengaged an approach speed wind correction (max 20 knots) of 1/2 steady headwind component + gust increment above steady wind is recommended. Do not apply a wind correction for tailwinds. The maximum command speed should not exceed landing flap placard speed minus 5 knots.

Flap Maneuver Speeds

This table provides the flap speed schedule for recommended maneuver speeds. Using VREF as the basis for the schedule makes it variable as a function of weight and will provide adequate maneuver margin above stall at all weights.

During flap retraction/extension, movement of the flap to the next position should be initiated when within 20 knots of the recommended speed for that position.

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 depths greater than 0.5 inches (13 mm) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. The use of assumed temperature for reduced thrust is not allowed on contaminated runways. Interpolation for slush/standing water depths between the values shown is permitted.

Takeoff weight 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 18100 lb and the V1 associated with the reduced weight by the amount shown in the table below.

ANTI-SKID INOPERATIVE V1 ADJUSTMENTS	
FIELD LENGTH (FT)	V1 ADJUSTMENT (KIAS)
6000	-22
8000	-18
10000	-15
12000	-13
14000	-11

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 5800 ft.

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 field/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/field/obstacle limited weight by 2300 lb 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 4000 ft.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

Takeoff %N1

To find Max Takeoff %N1 based on normal engine bleed for air conditioning packs on, enter Takeoff %N1 table with airport pressure altitude and airport OAT and read %N1. For packs off operation, apply the %N1 adjustment shown below the table. No takeoff %N1 adjustment is required for engine and wing anti-ice.

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.

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

Normal Configuration Landing Distance

The normal configuration distance tables are provided as advisory information to help determine the actual landing distance performance of the airplane for different runway surface conditions and brake configurations.

Flaps 15, 30, and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking action, which are commonly referred to as slippery runway conditions.

If the surface is affected by water, snow or ice, and the 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 landing. 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 "poor" data reflects runways covered with wet ice.

Dry runway landing performance is shown for max manual braking configuration and autobrake settings max, 3, 2, and 1. Use of autobrake setting 1 is not recommended for landings on slippery runways, and is therefore not provided for these conditions. The autobrake performance may be used to assist in the selection of the most desirable autobrake setting for a given field length. Selection of an autobrake setting results in a constant rate of deceleration. Maximum effort manual braking should achieve shorter landing distance than the max autobrake setting. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and normal approach speed for the selected landing flap at sea level, zero wind, zero slope, and two engine detent reverse thrust. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, temperature, speed, and reverse thrust. Each adjustment is independently added to the reference landing distance.

Non-normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect the landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, and speed conditions. Each adjustment is independently added to the reference landing distance. Landing distance includes the effect of max manual braking and reverse thrust.

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 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 (LB/HR)
39	100
35	100
31	110
25	130
20	150
15	160
10	180
5	200

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.

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, and obstacle limit weights. To determine limit weights for operations with the EEC in 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.

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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	174	175	181	165	168	173									
85	168	170	177	160	163	169									
80	163	165	172	155	157	165	147	149	156	145	147	154	142	142	149
75	157	159	167	150	152	160	142	143	151	140	141	149	137	137	145
70	151	153	162	144	146	155	136	138	147	134	136	145	131	132	141
65	145	147	157	138	140	150	131	132	142	129	130	140	126	127	136
60	139	140	152	132	133	145	124	126	137	123	124	135	120	121	132
55	131	132	146	125	126	139	118	119	132	116	118	130	114	114	127
50	124	125	139	118	119	133	111	112	126	110	111	125	107	108	121
45	116	117	133	111	111	127	105	105	120	103	103	119	100	101	116
40	108	108	126	103	103	121	97	97	114	96	96	113	92	93	110

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						4	5						-2	-2					
60	140	4	4	5	6				3	4	5	6				-2	-2	-2	-3			
50	122	2	3	4	5	6	7	8	2	3	4	5	6	7	8	-1	-1	-2	-2	-2	-3	-4
40	104	1	1	2	3	4	5	7	1	1	2	3	4	6	7	0	-1	-1	-1	-2	-2	-3
30	86	0	0	1	2	3	5	6	0	0	1	2	4	5	6	0	0	-1	-1	-1	-2	-2
20	68	0	0	1	2	3	4	5	0	0	1	2	3	4	5	0	0	0	-1	-1	-2	-2
-60	-76	0	0	1	2	3	4	5	0	0	1	2	3	4	5	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	2	2	-2	-1	-1	0	0	0	1	1
80	-3	-2	0	1	2	-2	-1	-1	0	0	1	1	1
70	-2	-1	0	1	1	-2	-1	0	0	0	1	1	1
60	-1	0	0	1	1	-2	-1	0	0	0	1	1	1
50	-1	0	0	0	0	-1	-1	0	0	0	0	0	0
40	0	0	0	0	0	-1	-1	0	0	0	0	0	0

***V1 not to exceed VR**

Takeoff Speeds - Dry Runway
V1(MCG)
Max Takeoff Thrust

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	93	91					
60	140	93	91	89	88			
50	122	95	93	90	88	86	83	81
40	104	99	97	94	90	87	83	81
30	86	102	101	98	94	90	86	83
20	68	102	102	99	95	92	88	85
-60	-76	104	103	100	96	93	90	87

Takeoff Speeds - Wet Runway

V1, VR, V2 for Max Takeoff Thrust

WEIGHT (1000 KG)	FLAPS1			FLAPS5			FLAPS10			FLAPS15			FLAPS25		
	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
90	169	175	181	160	168	173									
85	163	170	177	155	163	169									
80	157	165	172	149	157	165	140	149	156	138	147	154	134	142	149
75	150	159	167	143	152	160	135	143	151	133	141	149	129	137	145
70	144	153	162	136	146	155	129	138	147	127	136	145	123	132	141
65	137	147	157	130	140	150	123	132	142	121	130	140	118	127	136
60	130	140	152	123	133	145	117	126	137	115	124	135	112	121	132
55	122	132	146	116	126	139	110	119	132	108	118	130	105	114	127
50	115	125	139	109	119	133	103	112	126	101	111	125	98	108	121
45	107	117	133	101	111	127	95	105	120	94	103	119	91	101	116
40	98	108	126	93	103	121	88	97	114	86	96	113	83	93	110

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	8						4	5						-2	-2					
60	140	5	6	7	9				3	4	5	6				-2	-2	-2	-3			
50	122	3	4	5	6	7	9	12	2	3	4	5	6	7	8	-1	-1	-2	-2	-2	-3	-4
40	104	1	2	3	4	5	7	9	1	1	2	3	5	6	7	0	-1	-1	-1	-2	-2	-3
30	86	0	0	1	3	4	5	7	0	0	1	2	4	5	6	0	0	-1	-1	-1	-2	-2
20	68	0	0	1	2	4	5	6	0	0	1	2	3	4	5	0	0	0	-1	-1	-2	-2
-60	-76	0	0	1	2	4	5	6	0	0	1	2	3	4	5	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	-5	-3	0	3	6	-4	-2	-1	0	1	1	2	3
80	-4	-2	0	3	5	-4	-2	-1	0	1	1	2	3
70	-4	-2	0	2	4	-4	-2	-1	0	1	2	2	3
60	-3	-1	0	2	3	-4	-3	-1	0	1	2	2	3
50	-2	-1	0	1	2	-5	-3	-1	0	1	2	3	4
40	-2	-1	0	1	1	-5	-4	-2	0	1	2	3	4

***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	93	91					
60	140	93	91	89	88			
50	122	95	93	90	88	86	83	81
40	104	99	97	94	90	87	83	81
30	86	102	101	98	94	90	86	83
20	68	102	102	99	95	92	88	85
-60	-76	104	103	100	96	93	90	87

Maximum Allowable Clearway

FIELD LENGTH (FT)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	650
5000	700
6000	750
7000	850
8000	950
9000	1000
10000	1100

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)									
	DRY RUNWAY					WET RUNWAY				
	100	120	140	160	180	100	120	140	160	180
1000	-6	-5	-4	-4	-3					
800	-6	-5	-4	-3	-2					
600	-5	-4	-3	-3	-2					
400	-4	-3	-2	-2	-1					
200	-1	-1	-1	-1	-1					
0	0	0	0	0	0	0	0	0	0	0
-200	0	1	1	1	1	1	1	1	1	1
-400	0	1	1	2	2	3	3	2	2	1
-600	0	1	1	2	2	6	4	3	2	1
-800	0	1	1	2	2	7	5	3	2	1
-1000	0	1	1	2	2	8	5	4	3	2

Use of clearway not allowed on wet runways.

Stab Trim Setting

Max Takeoff Thrust

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)										
	6	8	9	20	25	26	28	30	32	34	36
85	8 1/2	8 1/4	8 1/4	6 1/2	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4
80	8 1/2	8	8	6 1/4	5 1/2	5 1/2	5	4 3/4	4 1/2	4 1/4	4
70	7 3/4	7 1/2	7 1/2	5 3/4	5	5	4 3/4	4 1/4	4	3 3/4	3 1/2
60	7 1/4	7	6 3/4	5 1/4	4 1/2	4 1/2	4 1/4	4	3 1/2	3 1/4	3
50	6 1/2	6 1/4	6	4 3/4	4	4	3 3/4	3 1/4	3	3	2 3/4
40	6	5 3/4	5 3/4	4 1/4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)										
	6	8	9	20	25	26	28	30	32	34	36
85	8 1/2	8 1/4	8	5 3/4	4 3/4	4 1/2	4 1/4	3 3/4	3 1/2	3	2 3/4
80	8 1/2	8 1/4	8	5 1/2	4 1/2	4 1/2	4	3 3/4	3 1/4	3	2 3/4
70	8	7 1/2	7 1/4	5	4	4	3 1/2	3 1/4	3	2 3/4	2 3/4
60	7 1/4	6 3/4	6 3/4	4 1/2	3 3/4	3 1/2	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4
50	6 1/2	6 1/4	6	4	3	3	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4
40	6 1/4	5 3/4	5 1/2	3 3/4	3	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	158	161	171
80	153	157	166
75	148	152	160
70	143	147	155
65	137	142	149
60	131	136	143
55	125	130	137
50	119	124	130
45	112	118	123
40	105	111	116

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								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-10.3	-12.3	-14.3	-12.8	-14.8	-16.8	-18.3	-21.3	-24.3
85	-9.7	-11.7	-13.7	-11.9	-13.9	-15.9	-16.4	-19.4	-22.4
80	-9.1	-11.1	-13.1	-10.8	-12.8	-14.8	-14.6	-17.6	-20.6
75	-8.3	-10.3	-12.3	-9.7	-11.7	-13.7	-12.8	-15.8	-18.8
70	-7.4	-9.4	-11.4	-8.6	-10.6	-12.6	-11.0	-14.0	-17.0
65	-6.5	-8.5	-10.5	-7.4	-9.4	-11.4	-9.3	-12.3	-15.3
60	-5.5	-7.5	-9.5	-6.2	-8.2	-10.2	-7.7	-10.7	-13.7
55	-4.5	-6.5	-8.5	-5.0	-7.0	-9.0	-6.2	-9.2	-12.2
50	-3.6	-5.6	-7.6	-4.0	-6.0	-8.0	-4.8	-7.8	-10.8
45	-2.7	-4.7	-6.7	-3.0	-5.0	-7.0	-3.5	-6.5	-9.5
40	-1.9	-3.9	-5.9	-2.1	-4.1	-6.1	-2.4	-5.4	-8.4

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3800							32.8		
4200	34.9			38.0			43.3		
4600	46.2	30.8		49.3	33.8		54.6	39.4	
5000	58.1	41.9		61.2	45.0		66.5	50.2	35.4
5400	70.8	53.5	37.7	73.9	56.6	40.8	78.0	62.0	46.0
5800	84.4	66.0	49.1	87.3	69.1	52.2	88.5	73.8	57.5
6200	98.4	79.2	61.2		82.2	64.3	98.7	84.7	69.5
6600		93.1	74.2		95.8	77.2		94.9	80.8
7000			87.9			90.7			91.1

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 -80 ft/+80 ft 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
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-15	-10	-5	-6	-1	0	0	0	0
85	-16	-11	-6	-9	-4	0	0	0	0
80	-18	-13	-8	-11	-6	-1	0	0	0
75	-19	-14	-9	-14	-9	-4	-1	0	0
70	-21	-16	-11	-16	-11	-6	-5	0	0
65	-22	-17	-12	-18	-13	-8	-8	-3	0
60	-23	-18	-13	-20	-15	-10	-12	-7	-2
55	-24	-19	-14	-22	-17	-12	-15	-10	-5
50	-25	-20	-15	-23	-18	-13	-18	-13	-8
45	-26	-21	-16	-25	-20	-15	-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 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								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-13.7	-16.2	-18.7	-16.3	-18.8	-21.3	-21.9	-25.9	-29.9
85	-13.0	-15.5	-18.0	-15.2	-17.7	-20.2	-19.7	-23.7	-27.7
80	-12.1	-14.6	-17.1	-13.9	-16.4	-18.9	-17.6	-21.6	-25.6
75	-11.2	-13.7	-16.2	-12.6	-15.1	-17.6	-15.6	-19.6	-23.6
70	-10.2	-12.7	-15.2	-11.3	-13.8	-16.3	-13.7	-17.7	-21.7
65	-9.1	-11.6	-14.1	-10.0	-12.5	-15.0	-11.9	-15.9	-19.9
60	-7.9	-10.4	-12.9	-8.6	-11.1	-13.6	-10.2	-14.2	-18.2
55	-6.8	-9.3	-11.8	-7.4	-9.9	-12.4	-8.5	-12.5	-16.5
50	-5.8	-8.3	-10.8	-6.2	-8.7	-11.2	-7.0	-11.0	-15.0
45	-4.8	-7.3	-9.8	-5.0	-7.5	-10.0	-5.5	-9.5	-13.5
40	-3.9	-6.4	-8.9	-4.1	-6.6	-9.1	-4.0	-8.0	-12.0

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
5400							34.3		
5800							48.1		
6200				42.6			63.3	42.8	
6600	45.8			60.5	36.4		78.1	57.5	37.7
7000	66.0	39.1		78.9	53.6	30.2	91.0	72.7	51.8
7400	88.0	58.0	32.6	95.8	72.1	46.9		86.3	67.1
7800		79.8	50.5		89.6	65.2		98.8	81.5
8200			71.5			83.3			94.1
8600			93.5			100.0			

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 -140 ft/+140 ft 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

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-23	-13	-3	-11	-1	0	0	0	0
85	-25	-15	-5	-15	-5	0	0	0	0
80	-27	-17	-7	-18	-8	0	0	0	0
75	-29	-19	-9	-22	-12	-2	-3	0	0
70	-31	-21	-11	-25	-15	-5	-8	0	0
65	-34	-24	-14	-28	-18	-8	-14	-4	0
60	-36	-26	-16	-31	-21	-11	-19	-9	0
55	-38	-28	-18	-34	-24	-14	-24	-14	-4
50	-39	-29	-19	-37	-27	-17	-29	-19	-9
45	-41	-31	-21	-39	-29	-19	-34	-24	-14
40	-43	-33	-23	-42	-32	-22	-38	-28	-18

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
90	-0.2	-0.9	-1.6	-5.4	-6.1	-6.8	-10.4	-11.1	-11.8
85	-0.6	-1.3	-2.0	-5.5	-6.2	-6.9	-10.1	-10.8	-11.5
80	-0.9	-1.6	-2.3	-5.6	-6.3	-7.0	-9.7	-10.4	-11.1
75	-1.1	-1.8	-2.5	-5.5	-6.2	-6.9	-9.3	-10.0	-10.7
70	-1.2	-1.9	-2.6	-5.3	-6.0	-6.7	-8.7	-9.4	-10.1
65	-1.2	-1.9	-2.6	-5.0	-5.7	-6.4	-8.0	-8.7	-9.4
60	-1.1	-1.8	-2.5	-4.5	-5.2	-5.9	-7.2	-7.9	-8.6
55	-0.8	-1.5	-2.2	-3.9	-4.6	-5.3	-6.4	-7.1	-7.8
50	-0.4	-1.1	-1.8	-3.3	-4.0	-4.7	-5.4	-6.1	-6.8
45	0.0	-0.6	-1.3	-2.4	-3.1	-3.8	-4.3	-5.0	-5.7
40	0.0	0.0	-0.7	-1.5	-2.2	-2.9	-3.0	-3.7	-4.4

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3400	47.6								
3800	67.0	42.6							
4200	85.6	62.2	37.5	36.5					
4600		81.0	57.4	49.6	30.1				
5000		99.2	76.4	63.4	43.0				
5400			94.7	78.1	56.4	36.5	35.2		
5800				93.7	70.6	49.6	43.1		
6200					85.9	63.4	51.3	34.2	
6600						78.1	60.0	42.1	
7000						93.7	69.4	50.2	33.2
7400							79.6	58.9	41.1
7800							90.8	68.2	49.2
8200								78.3	57.8
8600								89.4	67.0
9000									77.0
9400									88.0
9800									99.3

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 -70 ft/+70 ft for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -70 ft/+70 ft for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -120 ft/+120 ft 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	-5	0	0	-14	-9	-4	-25	-20	-15
85	-6	-1	0	-16	-11	-6	-27	-22	-17
80	-7	-2	0	-17	-12	-7	-29	-24	-19
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	-36	-31	-26
60	-11	-6	-1	-23	-18	-13	-38	-33	-28
55	-12	-7	-2	-25	-20	-15	-39	-34	-29
50	-13	-8	-3	-26	-21	-16	-41	-36	-31
45	-15	-10	-5	-28	-23	-18	-43	-38	-33
40	-16	-11	-6	-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
90	-1.5	-2.3	-3.1	-8.2	-8.9	-9.7	-13.9	-14.7	-15.4
85	-2.0	-2.7	-3.5	-8.3	-9.0	-9.8	-13.6	-14.4	-15.2
80	-2.3	-3.1	-3.9	-8.3	-9.1	-9.8	-13.3	-14.1	-14.8
75	-2.6	-3.4	-4.1	-8.2	-8.9	-9.7	-12.8	-13.5	-14.3
70	-2.7	-3.5	-4.3	-7.9	-8.7	-9.5	-12.0	-12.8	-13.6
65	-2.7	-3.5	-4.3	-7.5	-8.3	-9.1	-11.2	-11.9	-12.7
60	-2.6	-3.4	-4.2	-7.0	-7.8	-8.5	-10.1	-10.9	-11.6
55	-2.4	-3.1	-3.9	-6.3	-7.1	-7.9	-8.8	-9.6	-10.4
50	-2.0	-2.8	-3.5	-5.5	-6.3	-7.1	-7.4	-8.2	-9.0
45	-1.5	-2.3	-3.0	-4.6	-5.4	-6.1	-5.8	-6.6	-7.4
40	-0.9	-1.7	-2.4	-3.5	-4.3	-5.1	-4.1	-4.8	-5.6

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3800	33.0								
4200	65.4								
4600	87.5	58.7							
5000		82.5	51.2						
5400		102.3	77.2						
5800			97.4	31.0					
6200				59.4					
6600				84.4	45.6				
7000				107.7	72.3	31.0			
7400					96.1	59.4			
7800						84.4			
8200						107.7			
9400							41.3		
9800							60.5		
10200							80.4	36.6	
10600							100.6	55.6	
11000								75.3	31.8
11400								95.6	50.8
11800									70.4
12200									90.5

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 -80 ft/+80 ft for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -80 ft/+80 ft for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -160 ft/+160 ft 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	-7	-2	0	-20	-15	-10	-39	-34	-29
85	-8	-3	0	-22	-17	-12	-42	-37	-32
80	-10	-5	0	-24	-19	-14	-45	-40	-35
75	-11	-6	-1	-26	-21	-16	-49	-44	-39
70	-12	-7	-2	-29	-24	-19	-52	-47	-42
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	-64	-59	-54
50	-20	-15	-10	-41	-36	-31	-68	-63	-58
45	-22	-17	-12	-44	-39	-34	-73	-68	-63
40	-24	-19	-14	-48	-43	-38	-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 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

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 and engine 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
%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
85	171	172	176												
80	165	166	171	157	158	164	149	150	155	147	147	153			
75	159	160	167	152	153	159	144	145	151	142	142	149	138	138	144
70	153	154	162	146	147	155	138	139	146	136	137	144	133	133	140
65	147	148	157	140	141	150	132	133	142	131	132	140	128	128	136
60	140	141	151	133	134	144	126	127	137	124	125	135	122	122	131
55	133	134	145	126	127	139	120	121	131	118	119	129	115	116	126
50	126	126	139	120	120	133	113	114	126	111	112	124	109	109	120
45	118	118	132	112	112	127	106	106	120	104	105	118	102	102	115
40	110	110	125	104	104	120	98	99	113	97	97	112	94	95	109

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	4	5						4	5						-2	-2					
60	140	3	4	5	6				3	4	5	6				-2	-2	-2	-3			
50	122	2	3	4	5	6	6	8	2	3	4	5	6	7	8	-1	-1	-2	-2	-2	-3	-3
40	104	1	1	2	3	4	5	6	1	1	3	4	5	6	7	0	-1	-1	-2	-2	-2	-3
30	86	0	0	1	2	3	4	5	0	0	1	2	3	5	6	0	0	-1	-1	-1	-2	-2
20	68	0	0	0	1	2	3	4	0	0	1	1	2	3	4	0	0	0	0	-1	-1	-2
-60	-76	0	0	0	1	2	2	3	0	0	1	1	2	3	3	0	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
85	-4	-2	0	1	1	-1	-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	0	0	1	1	-1	-1	0	0	0	1	1	1
50	0	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	88	86					
60	140	88	86	84	83			
50	122	90	88	84	83	81	79	77
40	104	94	92	89	85	82	79	77
30	86	97	97	93	89	86	82	79
20	68	98	97	95	93	90	86	82
-60	-76	99	99	96	94	91	89	86

Takeoff Speeds - Wet 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
85	166	172	176												
80	160	166	171	152	158	164	144	150	155	143	147	153			
75	153	160	167	146	153	159	137	145	151	136	142	149	131	138	144
70	147	154	162	139	147	155	131	139	146	130	137	144	126	133	140
65	140	148	157	133	141	150	125	133	142	124	132	140	120	128	136
60	133	141	151	126	134	144	119	127	137	117	125	135	114	122	131
55	125	134	145	119	127	139	112	121	131	111	119	129	108	116	126
50	117	126	139	111	120	133	105	114	126	104	112	124	101	109	120
45	109	118	132	104	112	127	98	106	120	97	105	118	94	102	115
40	101	110	125	96	104	120	90	99	113	89	97	112	86	95	109

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	8						4	5						-2	-2					
60	140	5	6	7	9				3	4	5	6				-2	-2	-2	-3			
50	122	3	4	5	6	8	9	12	2	3	4	5	6	7	8	-1	-1	-2	-2	-2	-3	-3
40	104	1	2	3	4	6	7	9	1	1	3	4	5	6	7	0	-1	-1	-2	-2	-2	-3
30	86	0	0	1	3	4	5	7	0	0	1	2	3	5	6	0	0	-1	-1	-1	-2	-2
20	68	0	0	1	1	2	4	5	0	0	1	1	2	3	4	0	0	0	0	-1	-1	-2
-60	-76	0	0	1	1	2	3	4	0	0	1	1	2	3	3	0	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustment*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
85	-5	-3	0	3	6	-3	-2	-1	0	1	1	2	2
80	-5	-2	0	3	6	-3	-2	-1	0	1	1	2	2
70	-4	-2	0	2	4	-3	-2	-1	0	1	1	2	3
60	-3	-2	0	2	3	-4	-2	-1	0	1	2	2	3
50	-2	-1	0	1	3	-4	-3	-1	0	1	2	3	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	88	86					
60	140	88	86	84	83			
50	122	90	88	84	83	81	79	77
40	104	94	92	89	85	82	79	77
30	86	97	97	93	89	86	82	79
20	68	98	97	95	93	90	86	82
-60	-76	99	99	96	94	91	89	86

Maximum Allowable Clearway (24K Derate)

FIELD LENGTH (FT)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	600
5000	700
6000	800
7000	850
8000	950
9000	1050
10000	1150

Clearway and Stopway V1 Adjustments (24K Derate)

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)								
	DRY RUNWAY					WET RUNWAY			
	100	120	140	160	180	100	120	140	160
1000	-5	-4	-4	-3	-2				
800	-5	-4	-4	-3	-2				
600	-5	-4	-3	-2	-1				
400	-2	-2	-2	-2	-2				
200	-1	-1	-1	-1	-1				
0	0	0	0	0	0	0	0	0	0
-200	0	0	1	1	1	1	1	2	2
-400	0	0	1	1	1	1	2	3	4
-600	0	0	1	1	1	1	2	4	5
-800	0	0	1	1	1	1	2	4	7

Use of clearway not allowed on wet runways.

Stab Trim Setting (24K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)										
	6	8	9	20	25	26	28	30	32	34	36
85	8 1/2	8 1/2	8 1/4	6 1/2	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/4	4
80	8 1/2	8 1/4	8 1/4	6 1/2	5 1/2	5 1/2	5 1/4	4 3/4	4 1/2	4 1/4	3 3/4
70	8	7 3/4	7 1/2	6	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 1/2
60	7 1/2	7 1/4	7	5 1/2	4 3/4	4 3/4	4 1/2	4	3 3/4	3 1/2	3 1/4
50	6 3/4	6 1/2	6 1/4	5	4 1/4	4 1/4	4	3 3/4	3 1/4	3	3
40	6 1/2	6 1/4	6	4 3/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)										
	6	8	9	20	25	26	28	30	32	34	36
85	8 1/2	8 1/4	8	6	5	4 3/4	4 1/2	4 1/4	3 3/4	3 1/2	3
80	8 1/2	8	8	5 3/4	4 3/4	4 3/4	4 1/4	4	3 1/2	3 1/4	3
70	8	7 1/2	7 1/4	5 1/4	4 1/2	4 1/4	4	3 1/2	3 1/4	3	2 3/4
60	7 1/4	7	6 3/4	4 3/4	4	3 3/4	3 1/2	3	2 3/4	2 3/4	2 3/4
50	6 1/2	6 1/4	6	4 1/4	3 1/2	3 1/4	3	2 3/4	2 3/4	2 3/4	2 3/4
40	6 1/4	6	5 3/4	4	3 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)

24 DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-11.3	-12.8	-14.3	-14.5	-16.0	-17.5	-18.0	-20.3	-22.5
85	-10.3	-11.8	-13.3	-12.9	-14.4	-15.9	-16.5	-18.8	-21.0
80	-9.4	-10.9	-12.4	-11.5	-13.0	-14.5	-14.9	-17.2	-19.4
75	-8.5	-10.0	-11.5	-10.1	-11.6	-13.1	-13.3	-15.6	-17.8
70	-7.6	-9.1	-10.6	-8.9	-10.4	-11.9	-11.7	-13.9	-16.2
65	-6.7	-8.2	-9.7	-7.7	-9.2	-10.7	-10.0	-12.2	-14.5
60	-5.8	-7.3	-8.8	-6.6	-8.1	-9.6	-8.3	-10.6	-12.8
55	-4.9	-6.4	-7.9	-5.5	-7.0	-8.5	-6.7	-9.0	-11.2
50	-3.9	-5.4	-6.9	-4.3	-5.8	-7.3	-5.2	-7.5	-9.7
45	-2.8	-4.3	-5.8	-3.1	-4.6	-6.1	-3.8	-6.0	-8.3
40	-1.7	-3.2	-4.7	-1.8	-3.3	-4.8	-2.5	-4.7	-7.0

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3800	30.2			33.0			37.9		
4200	42.1			44.9			49.7	30.5	
4600	54.5	34.6		57.3	37.4		61.7	42.3	
5000	67.8	46.7		70.4	49.4	30.1	73.9	54.2	34.9
5400	82.1	59.4	39.1	84.6	62.1	41.9	86.2	66.2	46.7
5800	97.6	73.0	51.3	99.6	75.6	54.1	98.6	78.5	58.7
6200		87.8	64.4		90.1	67.1		90.8	70.8
6600			78.4			80.9			83.1
7000			93.7			95.8			95.5

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 -80 ft/+80 ft 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								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-11	-6	-1	-3	0	0	0	0	0
85	-13	-8	-3	-5	0	0	0	0	0
80	-15	-10	-5	-8	-3	0	0	0	0
75	-17	-12	-7	-11	-6	-1	0	0	0
70	-18	-13	-8	-13	-8	-3	-3	0	0
65	-20	-15	-10	-15	-10	-5	-6	-1	0
60	-21	-16	-11	-17	-12	-7	-9	-4	0
55	-22	-17	-12	-19	-14	-9	-12	-7	-2
50	-23	-18	-13	-21	-16	-11	-15	-10	-5
45	-24	-19	-14	-23	-18	-13	-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)

24 DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-15.0	-17.2	-19.5	-18.3	-20.6	-22.8	-23.6	-26.6	-29.6
85	-13.7	-15.9	-18.2	-16.3	-18.6	-20.8	-20.9	-23.9	-26.9
80	-12.4	-14.7	-16.9	-14.6	-16.8	-19.1	-18.5	-21.5	-24.5
75	-11.3	-13.6	-15.8	-13.0	-15.2	-17.5	-16.3	-19.3	-22.3
70	-10.3	-12.5	-14.8	-11.6	-13.8	-16.1	-14.3	-17.3	-20.3
65	-9.3	-11.5	-13.8	-10.3	-12.5	-14.8	-12.5	-15.5	-18.5
60	-8.2	-10.5	-12.7	-9.0	-11.3	-13.5	-10.8	-13.8	-16.8
55	-7.1	-9.4	-11.6	-7.8	-10.0	-12.3	-9.1	-12.1	-15.1
50	-6.0	-8.2	-10.5	-6.4	-8.7	-10.9	-7.4	-10.4	-13.4
45	-4.7	-6.9	-9.2	-5.0	-7.3	-9.5	-5.6	-8.6	-11.6
40	-3.2	-5.5	-7.7	-3.4	-5.7	-7.9	-3.8	-6.8	-9.8

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
5000							32.3		
5400							47.2		
5800				45.2			63.2	34.1	
6200	52.1			64.4			77.8	49.2	
6600	74.4	32.5		84.4	47.6		89.9	65.1	36.0
7000	95.5	54.9			66.8	30.6		79.4	51.2
7400		77.1	35.3		87.1	50.0		91.4	67.0
7800		98.1	57.7			69.2			81.0
8200			79.8			89.8			92.8

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 -120 ft/+120 ft 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								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-18	-8	0	-5	0	0	0	0	0
85	-20	-10	0	-9	0	0	0	0	0
80	-23	-13	-3	-13	-3	0	0	0	0
75	-25	-15	-5	-16	-6	0	0	0	0
70	-28	-18	-8	-20	-10	0	-4	0	0
65	-30	-20	-10	-24	-14	-4	-9	0	0
60	-32	-22	-12	-27	-17	-7	-14	-4	0
55	-34	-24	-14	-30	-20	-10	-19	-9	0
50	-36	-26	-16	-33	-23	-13	-25	-15	-5
45	-38	-28	-18	-36	-26	-16	-29	-19	-9
40	-40	-30	-20	-38	-28	-18	-34	-24	-14

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
90	-0.2	-0.9	-1.7	-5.1	-5.9	-6.6	-9.8	-10.5	-11.3
85	-0.5	-1.3	-2.0	-5.2	-6.0	-6.7	-9.6	-10.4	-11.1
80	-0.9	-1.6	-2.4	-5.3	-6.1	-6.8	-9.4	-10.2	-10.9
75	-1.1	-1.9	-2.6	-5.4	-6.1	-6.9	-9.1	-9.9	-10.6
70	-1.2	-2.0	-2.7	-5.2	-6.0	-6.7	-8.6	-9.4	-10.1
65	-1.2	-2.0	-2.7	-5.0	-5.7	-6.5	-8.1	-8.8	-9.6
60	-1.1	-1.9	-2.6	-4.6	-5.3	-6.1	-7.3	-8.1	-8.8
55	-0.9	-1.6	-2.4	-4.0	-4.8	-5.5	-6.5	-7.3	-8.0
50	-0.6	-1.3	-2.1	-3.4	-4.1	-4.9	-5.5	-6.3	-7.0
45	-0.1	-0.9	-1.6	-2.6	-3.4	-4.1	-4.5	-5.2	-6.0
40	0.0	-0.3	-1.1	-1.7	-2.5	-3.2	-3.2	-4.0	-4.7

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3000	34.9								
3400	55.1								
3800	74.4	45.1							
4200	93.1	64.9	34.9	43.1					
4600		83.8	55.1	56.9	31.2				
5000		102.3	74.4	71.6	44.8		31.6		
5400			93.1	87.3	58.7	32.9	39.9		
5800					73.5	46.5	48.4		
6200					89.3	60.5	57.4	35.8	
6600						75.5	67.0	44.1	
7000						91.3	77.4	52.8	31.6
7400							88.8	62.1	39.9
7800								72.1	48.4
8200								83.0	57.4
8600								94.6	67.0
9000									77.4
9400									88.8

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 -70 ft/+70 ft for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -70 ft/+70 ft for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -110 ft/+110 ft 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	-4	0	0	-11	-6	-1	-21	-16	-11
85	-5	0	0	-13	-8	-3	-23	-18	-13
80	-6	-1	0	-15	-10	-5	-26	-21	-16
75	-7	-2	0	-16	-11	-6	-28	-23	-18
70	-8	-3	0	-18	-13	-8	-30	-25	-20
65	-9	-4	0	-20	-15	-10	-33	-28	-23
60	-10	-5	0	-21	-16	-11	-35	-30	-25
55	-11	-6	-1	-23	-18	-13	-37	-32	-27
50	-12	-7	-2	-25	-20	-15	-39	-34	-29
45	-13	-8	-3	-26	-21	-16	-40	-35	-30
40	-14	-9	-4	-28	-23	-18	-42	-37	-32

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
90	-1.2	-1.9	-2.6	-7.6	-8.3	-9.0	-13.8	-14.5	-15.2
85	-1.7	-2.4	-3.1	-7.8	-8.5	-9.2	-13.5	-14.2	-14.9
80	-2.1	-2.8	-3.5	-7.9	-8.6	-9.3	-13.1	-13.8	-14.5
75	-2.4	-3.1	-3.8	-7.9	-8.6	-9.3	-12.6	-13.3	-14.0
70	-2.6	-3.3	-4.0	-7.8	-8.5	-9.2	-12.0	-12.7	-13.4
65	-2.6	-3.3	-4.0	-7.4	-8.1	-8.8	-11.2	-11.9	-12.6
60	-2.6	-3.3	-4.0	-7.0	-7.7	-8.4	-10.3	-11.0	-11.7
55	-2.4	-3.1	-3.8	-6.4	-7.1	-7.8	-9.2	-9.9	-10.6
50	-2.0	-2.7	-3.4	-5.6	-6.3	-7.0	-8.0	-8.7	-9.4
45	-1.6	-2.3	-3.0	-4.7	-5.4	-6.1	-6.7	-7.4	-8.1
40	-1.0	-1.7	-2.4	-3.6	-4.3	-5.0	-5.2	-5.9	-6.6

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	50000	10000
3800	51.9								
4200	77.5	38.8							
4600	97.7	69.0							
5000		90.3	59.2						
5400			82.8						
5800			102.6	56.0					
6200				81.1	33.5				
6600				103.8	62.7				
7000					86.8	41.3			
7400						69.1			
7800						92.5			
9000							49.6		
9400							69.6		
9800							88.9	31.6	
10200								52.2	
10600								72.0	
11000								91.3	34.2
11400									54.7
11800									74.5
12200									93.8

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 -70 ft/+70 ft for every 5°C above/below 4°C.
Adjust "Medium" field length available by -70 ft/+70 ft for every 5°C above/below 4°C.
Adjust "Poor" field length available by -140 ft/+140 ft 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	-18	-13	-8	-36	-31	-26
80	-8	-3	0	-20	-15	-10	-39	-34	-29
75	-9	-4	0	-23	-18	-13	-43	-38	-33
70	-11	-6	-1	-26	-21	-16	-47	-42	-37
65	-13	-8	-3	-28	-23	-18	-51	-46	-41
60	-14	-9	-4	-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	-67	-62	-57
40	-22	-17	-12	-44	-39	-34	-71	-66	-61

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 and engine 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.**

Takeoff Speeds - Dry Runway (22K 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
80	167	167	171	159	159	163									
75	161	161	166	153	154	159	145	145	150	142	143	148			
70	155	155	161	148	148	154	139	140	146	138	138	144	134	134	140
65	149	149	156	141	142	149	134	134	141	132	132	139	129	129	136
60	142	142	150	135	135	144	127	128	136	126	126	134	123	123	131
55	134	135	144	128	128	138	121	121	131	119	120	129	116	117	125
50	127	127	138	121	121	132	114	115	125	113	113	123	110	110	120
45	119	119	132	113	113	126	107	107	119	106	106	118	103	103	114
40	111	111	125	105	105	119	99	99	113	98	98	112	95	96	108

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	4	5						4	5						-2	-2					
60	140	3	4	4	5				3	4	5	5				-2	-2	-2	-2			
50	122	2	3	3	4	5	6	7	2	3	4	4	5	6	7	-1	-1	-2	-2	-2	-3	-3
40	104	1	1	2	3	4	5	6	1	1	2	3	4	5	6	0	-1	-1	-1	-2	-2	-2
30	86	0	0	1	2	3	4	5	0	0	1	2	3	4	5	0	0	0	-1	-1	-2	-2
20	68	0	0	0	1	2	3	4	0	0	1	1	2	3	4	0	0	0	0	-1	-1	-2
-60	-76	0	0	0	1	1	2	3	0	0	1	1	2	2	3	0	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
80	-3	-2	0	0	0	-1	-1	0	0	0	0	0	0
70	-2	-1	0	0	0	-1	-1	0	0	0	0	0	0
60	-1	0	0	0	0	-1	-1	0	0	0	0	0	0
50	0	0	0	0	0	-1	0	0	0	0	0	0	0
40	0	0	0	0	0	0	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	85	83					
60	140	85	83	82	80			
50	122	87	85	82	80	78	76	74
40	104	91	89	86	83	80	76	74
30	86	94	94	90	87	83	79	76
20	68	94	94	92	90	87	83	80
-60	-76	96	95	93	92	89	87	84

Takeoff Speeds - Wet Runway (22K 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
80	162	167	171	154	159	163									
75	156	161	166	148	154	159	139	145	150	139	143	148			
70	149	155	161	141	148	154	133	140	146	132	138	144	128	134	140
65	142	149	156	135	142	149	127	134	141	126	132	139	122	129	136
60	135	142	150	128	135	144	121	128	136	119	126	134	116	123	131
55	127	135	144	121	128	138	114	121	131	113	120	129	109	117	125
50	119	127	138	113	121	132	107	115	125	106	113	123	103	110	120
45	111	119	132	106	113	126	100	107	119	98	106	118	96	103	114
40	103	111	125	98	105	119	92	99	113	91	98	112	88	96	108

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	7	8						4	5						-2	-2					
60	140	5	6	7	8				3	4	5	5				-2	-2	-2	-2			
50	122	3	4	5	6	7	9	12	2	3	4	4	5	6	7	-1	-1	-2	-2	-2	-3	-3
40	104	1	2	3	4	5	7	9	1	1	2	3	4	5	6	0	-1	-1	-1	-2	-2	-2
30	86	0	0	1	2	3	5	7	0	0	1	2	3	4	5	0	0	0	-1	-1	-2	-2
20	68	0	0	0	1	2	3	5	0	0	1	1	2	3	4	0	0	0	0	-1	-1	-2
-60	-76	0	0	0	1	2	2	3	0	0	1	1	2	2	3	0	0	0	0	-1	-1	-1

Slope and Wind V1 Adjustments*

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

***V1 not to exceed VR**

V1(MCG)

TEMP		PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	10000
70	158	85	83					
60	140	85	83	82	80			
50	122	87	85	82	80	78	76	74
40	104	91	89	86	83	80	76	74
30	86	94	94	90	87	83	79	76
20	68	94	94	92	90	87	83	80
-60	-76	96	95	93	92	89	87	84

Maximum Allowable Clearway (22K Derate)

FIELD LENGTH (FT)	DRY RUNWAY MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	600
5000	700
6000	800
7000	850
8000	950
9000	1050
10000	1150

Clearway and Stopway V1 Adjustments (22K Derate)

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
1000	-5	-4	-4	-3				
800	-5	-4	-3	-2				
600	-4	-3	-2	-1				
400	-3	-2	-1	-1				
200	-1	-1	-1	-1				
0	0	0	0	0	0	0	0	0
-200	0	0	1	1	3	1	1	1
-400	0	0	1	1	5	2	2	1
-600	0	0	1	1	6	3	2	2
-800	0	0	1	1	7	3	2	2

Use of clearway not allowed on wet runways.

Stab Trim Setting (22K Derate)

Flaps 1 and 5

WEIGHT (1000 KG)	C.G. (%MAC)										
	6	8	9	20	25	26	28	30	32	34	36
85	8 1/2	8 1/2	8 1/2	6 3/4	6	5 3/4	5 1/2	5 1/4	4 3/4	4 1/2	4 1/4
80	8 1/2	8 1/2	8 1/4	6 1/2	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/4	4
70	8 1/4	8	7 3/4	6 1/4	5 1/2	5 1/4	5	4 3/4	4 1/4	4	3 3/4
60	7 3/4	7 1/2	7 1/4	5 3/4	5	5	4 1/2	4 1/4	4	3 3/4	3 1/2
50	7	6 3/4	6 3/4	5 1/4	4 1/2	4 1/2	4 1/4	4	3 1/2	3 1/4	3
40	6 3/4	6 1/2	6 1/4	5	4 1/4	4 1/4	4	3 1/2	3 1/4	3	2 3/4

Flaps 10, 15 and 25

WEIGHT (1000 KG)	C.G. (%MAC)										
	6	8	9	20	25	26	28	30	32	34	36
85	8 1/2	8 1/4	8	6	5 1/4	5	4 3/4	4 1/2	4	3 3/4	3 1/2
80	8 1/2	8	8	6	5	5	4 1/2	4 1/4	3 3/4	3 1/2	3 1/4
70	8	7 1/2	7 1/2	5 1/2	4 1/2	4 1/2	4	3 3/4	3 1/2	3	2 3/4
60	7 1/4	7	6 3/4	5	4	4	3 1/2	3 1/4	3	2 3/4	2 3/4
50	6 3/4	6 1/4	6 1/4	4 1/2	3 1/2	3 1/2	3 1/4	2 3/4	2 3/4	2 3/4	2 3/4
40	6 1/2	6	6	4 1/4	3 1/2	3 1/4	3	2 3/4	2 3/4	2 3/4	2 3/4

ADVISORY INFORMATION

Slush/Standing Water Takeoff (22K Derate)

Maximum Reverse Thrust

Weight Adjustments (1000 KG)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-11.5	-13.0	-14.5	-15.0	-16.5	-18.0	-20.1	-22.4	-24.6
85	-10.6	-12.1	-13.6	-13.5	-15.0	-16.5	-18.1	-20.3	-22.6
80	-9.7	-11.2	-12.7	-12.1	-13.6	-15.1	-16.1	-18.3	-20.6
75	-8.8	-10.3	-11.8	-10.7	-12.2	-13.7	-14.2	-16.4	-18.7
70	-7.8	-9.3	-10.8	-9.3	-10.8	-12.3	-12.3	-14.5	-16.8
65	-6.9	-8.4	-9.9	-8.0	-9.5	-11.0	-10.5	-12.8	-15.0
60	-5.9	-7.4	-8.9	-6.8	-8.3	-9.8	-8.8	-11.0	-13.3
55	-4.9	-6.4	-7.9	-5.6	-7.1	-8.6	-7.1	-9.4	-11.6
50	-4.0	-5.5	-7.0	-4.4	-5.9	-7.4	-5.5	-7.8	-10.0
45	-3.0	-4.5	-6.0	-3.3	-4.8	-6.3	-4.0	-6.3	-8.5
40	-2.0	-3.5	-5.0	-2.2	-3.7	-5.2	-2.6	-4.8	-7.1

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3400							30.1		
3800	35.2			38.0			42.5		
4200	48.2			50.7	30.1		54.8	34.8	
4600	61.6	40.0		63.9	42.7		67.1	47.1	
5000	75.7	53.1	32.0	77.9	55.6	34.8	79.2	59.4	39.4
5400	90.4	66.8	44.9	92.5	69.1	47.4	91.4	71.7	51.8
5800		81.1	58.2		83.3	60.5		83.8	64.0
6200		96.1	72.1		98.1	74.3		95.9	76.2
6600			86.7			88.8			88.3

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -80 ft/+80 ft 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 (22K Derate)

Maximum Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	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	0	0	0	0	0	0
85	-10	-5	0	-2	0	0	0	0	0
80	-12	-7	-2	-5	0	0	0	0	0
75	-14	-9	-4	-8	-3	0	0	0	0
70	-16	-11	-6	-11	-6	-1	0	0	0
65	-18	-13	-8	-13	-8	-3	-3	0	0
60	-19	-14	-9	-15	-10	-5	-6	-1	0
55	-21	-16	-11	-17	-12	-7	-10	-5	0
50	-22	-17	-12	-19	-14	-9	-13	-8	-3
45	-23	-18	-13	-21	-16	-11	-16	-11	-6
40	-24	-19	-14	-23	-18	-13	-19	-14	-9

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

22K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-15.1	-17.4	-19.6	-18.9	-21.1	-23.4	-26.2	-28.9	-31.7
85	-14.0	-16.2	-18.5	-17.0	-19.3	-21.5	-23.1	-25.9	-28.6
80	-12.8	-15.0	-17.3	-15.2	-17.5	-19.7	-20.2	-23.0	-25.7
75	-11.6	-13.9	-16.1	-13.5	-15.8	-18.0	-17.6	-20.3	-23.1
70	-10.5	-12.7	-15.0	-12.0	-14.2	-16.5	-15.1	-17.9	-20.6
65	-9.4	-11.6	-13.9	-10.5	-12.7	-15.0	-13.0	-15.7	-18.5
60	-8.3	-10.5	-12.8	-9.1	-11.4	-13.6	-11.0	-13.7	-16.5
55	-7.2	-9.4	-11.7	-7.8	-10.1	-12.3	-9.3	-12.0	-14.8
50	-6.1	-8.3	-10.6	-6.7	-8.9	-11.2	-7.8	-10.6	-13.3
45	-5.0	-7.3	-9.5	-5.6	-7.9	-10.1	-6.6	-9.3	-12.1
40	-4.0	-6.2	-8.5	-4.6	-6.9	-9.1	-5.5	-8.3	-11.0

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
5000							42.2		
5400				41.8			58.7		
5800	50.9			62.0			74.5	42.2	
6200	73.8			82.8	41.8		89.6	58.7	
6600	95.9	50.9			62.0			74.5	42.2
7000		73.8			82.8	41.8		89.6	58.7
7400		95.9	50.9			62.0			74.5
7800			73.8			82.8			89.6
8200			95.9						

1. **Enter Weight Adjustment table with slush/standing water depth and 22K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -100 ft/+100 ft 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 (22K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
90	-12	-2	0	0	0	0	0	0	0
85	-15	-5	0	-4	0	0	0	0	0
80	-18	-8	0	-8	0	0	0	0	0
75	-21	-11	-1	-12	-2	0	0	0	0
70	-24	-14	-4	-16	-6	0	0	0	0
65	-27	-17	-7	-20	-10	0	-4	0	0
60	-29	-19	-9	-23	-13	-3	-10	0	0
55	-32	-22	-12	-27	-17	-7	-15	-5	0
50	-34	-24	-14	-30	-20	-10	-20	-10	0
45	-36	-26	-16	-33	-23	-13	-26	-16	-6
40	-38	-28	-18	-36	-26	-16	-31	-21	-11

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

Maximum Reverse Thrust

Weight Adjustment (1000 KG)

22K 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
90	-0.1	-0.9	-1.6	-4.8	-5.5	-6.3	-9.4	-10.2	-10.9
85	-0.5	-1.3	-2.0	-5.0	-5.8	-6.5	-9.4	-10.1	-10.9
80	-0.8	-1.6	-2.3	-5.2	-5.9	-6.7	-9.2	-10.0	-10.7
75	-1.1	-1.8	-2.6	-5.2	-6.0	-6.7	-9.0	-9.7	-10.5
70	-1.2	-1.9	-2.7	-5.1	-5.9	-6.6	-8.6	-9.3	-10.1
65	-1.2	-1.9	-2.7	-4.9	-5.6	-6.4	-8.0	-8.8	-9.5
60	-1.1	-1.9	-2.6	-4.5	-5.3	-6.0	-7.4	-8.1	-8.9
55	-0.9	-1.6	-2.4	-4.1	-4.8	-5.6	-6.6	-7.3	-8.1
50	-0.6	-1.3	-2.1	-3.4	-4.2	-4.9	-5.7	-6.4	-7.2
45	-0.2	-0.9	-1.7	-2.7	-3.4	-4.2	-4.6	-5.3	-6.1
40	0.0	-0.4	-1.2	-1.8	-2.6	-3.3	-3.4	-4.2	-4.9

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3000	40.8								
3400	60.6	31.0							
3800	80.1	50.8		34.6					
4200	99.0	70.4	40.8	48.5					
4600		89.6	60.6	63.1	36.3				
5000			80.1	78.4	50.3		35.3		
5400			99.0	94.3	64.9	38.0	44.0		
5800					80.3	52.1	53.1	30.9	
6200					96.3	66.8	62.8	39.6	
6600						82.3	73.1	48.5	
7000						98.2	84.5	57.8	35.3
7400							96.4	67.8	44.0
7800								78.7	53.1
8200								90.4	62.8
8600									73.1
9000									84.5

1. **Enter Weight Adjustment table with reported braking action and 22K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust “Good” field length available by -70 ft/+70 ft for every 5°C above/below 4°C.**
   Adjust “Medium” field length available by -70 ft/+70 ft for every 5°C above/below 4°C.
   Adjust “Poor” field length available by -110 ft/+110 ft 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 (22K 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	-3	0	0	-9	-4	0	-17	-12	-7
85	-4	0	0	-11	-6	-1	-19	-14	-9
80	-5	0	0	-13	-8	-3	-22	-17	-12
75	-6	-1	0	-15	-10	-5	-25	-20	-15
70	-7	-2	0	-16	-11	-6	-28	-23	-18
65	-8	-3	0	-18	-13	-8	-30	-25	-20
60	-9	-4	0	-20	-15	-10	-32	-27	-22
55	-10	-5	0	-22	-17	-12	-34	-29	-24
50	-11	-6	-1	-23	-18	-13	-37	-32	-27
45	-13	-8	-3	-25	-20	-15	-38	-33	-28
40	-13	-8	-3	-26	-21	-16	-40	-35	-30

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K Derate)

No Reverse Thrust

Weight Adjustments (1000 KG)

22K 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
90	-1.0	-1.8	-2.6	-7.0	-7.8	-8.6	-13.3	-14.1	-14.9
85	-1.5	-2.3	-3.1	-7.3	-8.1	-8.9	-13.1	-13.9	-14.7
80	-1.9	-2.7	-3.5	-7.6	-8.4	-9.2	-12.9	-13.7	-14.5
75	-2.2	-3.0	-3.8	-7.6	-8.4	-9.2	-12.5	-13.3	-14.1
70	-2.4	-3.2	-4.0	-7.5	-8.3	-9.1	-11.9	-12.7	-13.5
65	-2.5	-3.3	-4.1	-7.3	-8.1	-8.9	-11.1	-11.9	-12.7
60	-2.4	-3.2	-4.0	-6.9	-7.7	-8.5	-10.1	-10.9	-11.7
55	-2.3	-3.1	-3.9	-6.3	-7.1	-7.9	-9.0	-9.8	-10.6
50	-2.0	-2.8	-3.6	-5.6	-6.4	-7.2	-7.7	-8.5	-9.3
45	-1.6	-2.4	-3.2	-4.7	-5.5	-6.3	-6.2	-7.0	-7.8
40	-1.1	-1.9	-2.7	-3.7	-4.5	-5.3	-4.6	-5.4	-6.2

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	5000	10000	S.L.	5000	10000	S.L.	5000	10000
3400	32.1								
3800	62.8								
4200	85.8	48.6							
4600	106.9	75.0	32.1						
5000		96.4	62.8						
5400			85.8	46.3					
5800			106.9	73.1					
6200				95.5	50.0				
6600					76.0				
7000					98.3	53.6			
7400						78.9			
7800						101.1			
8200							30.5		
8600							51.6		
9000							71.8		
9400							91.0	30.5	
9800								51.6	
10200								71.8	
10600								91.0	30.5
11000									51.6
11400									71.8
11800									91.0

1. **Enter Weight Adjustment table with reported braking action and 22K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -70 ft/+70 ft for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -70 ft/+70 ft for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -140 ft/+140 ft 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 (22K Derate)

No Reverse Thrust

V1 Adjustment (KIAS)

WEIGHT (1000 LB)	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	-4	0	0	-12	-7	-2	-26	-21	-16
85	-5	0	0	-15	-10	-5	-30	-25	-20
80	-7	-2	0	-17	-12	-7	-34	-29	-24
75	-8	-3	0	-20	-15	-10	-38	-33	-28
70	-10	-5	0	-23	-18	-13	-42	-37	-32
65	-11	-6	-1	-26	-21	-16	-47	-42	-37
60	-13	-8	-3	-29	-24	-19	-51	-46	-41
55	-15	-10	-5	-32	-27	-22	-55	-50	-45
50	-17	-12	-7	-35	-30	-25	-59	-54	-49
45	-18	-13	-8	-38	-33	-28	-63	-58	-53
40	-20	-15	-10	-41	-36	-31	-67	-62	-57

1. **Obtain V1, VR and V2 for the actual weight using the 22K 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 (22K 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	87.7	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	88.5	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.3	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.2	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.1	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	91.9	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	91.5	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	90.8	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	90.0	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	89.3	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	88.5	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
5	87.8	88.9	90.0	90.7	91.3	92.0	92.7	93.2	93.7	94.3	94.9	95.6	96.3
0	87.0	88.1	89.2	89.9	90.5	91.2	91.9	92.4	92.9	93.5	94.1	94.8	95.5
-5	86.2	87.3	88.4	89.1	89.7	90.4	91.1	91.6	92.1	92.7	93.3	94.0	94.7
-10	85.4	86.5	87.6	88.3	88.9	89.6	90.3	90.8	91.3	91.9	92.5	93.2	93.9
-15	84.6	85.7	86.8	87.5	88.1	88.8	89.4	90.0	90.5	91.1	91.7	92.4	93.1
-20	83.8	84.9	86.0	86.6	87.3	87.9	88.6	89.1	89.7	90.3	90.8	91.6	92.3
-25	83.0	84.1	85.2	85.8	86.4	87.1	87.8	88.3	88.8	89.4	90.0	90.7	91.5
-30	82.2	83.3	84.4	85.0	85.6	86.3	86.9	87.4	88.0	88.6	89.2	89.9	90.6
-35	81.4	82.4	83.5	84.1	84.7	85.4	86.1	86.6	87.1	87.7	88.3	89.0	89.8
-40	80.6	81.6	82.7	83.3	83.9	84.5	85.2	85.7	86.2	86.8	87.4	88.2	88.9
-45	79.7	80.7	81.8	82.4	83.0	83.7	84.3	84.8	85.3	86.0	86.6	87.3	88.0
-50	78.9	79.9	80.9	81.5	82.1	82.8	83.4	83.9	84.5	85.1	85.7	86.4	87.2

%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	0.9	0.9	0.9

Assumed Temperature Reduced Thrust (22K 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	72	71	69	67	65	63	61	59	57	55		
35	66	66	66	66	65	63	61	59	57	55	53	
30	63	61	61	61	61	61	61	59	57	55	53	51
25	63	61	59	57	56	56	56	56	56	55	53	51
20	63	61	59	57	55	53	51	51	51	50	50	50
15	63	61	59	57	55	53	51	50	47	45	45	45
10 & BELOW	63	61	59	57	55	53	51	50	47	45	43	41

Takeoff %N1 (Table 2 of 3)

Based on engine bleed for packs on and engine 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	85.7	86.0	86.7	87.4	88.2	88.9	89.5	90.1	90.2	90.2	90.6	91.1
70	86.6	87.0	87.1	87.1	87.5	88.3	88.9	89.4	89.5	89.6	90.0	90.4
65	87.4	87.8	88.0	88.0	88.2	88.3	88.3	88.8	88.9	88.9	89.4	89.8
60	88.3	88.7	88.8	88.9	89.1	89.2	89.2	89.1	88.6	88.3	88.7	89.2
55	89.1	89.5	89.7	89.8	89.9	90.0	90.0	90.0	89.5	89.0	88.8	88.6
50	89.8	90.4	90.5	90.6	90.7	90.9	90.8	90.8	90.4	89.9	89.7	89.6
45	90.7	91.2	91.3	91.4	91.5	91.7	91.6	91.6	91.2	90.8	90.7	90.5
40	91.6	92.1	92.2	92.3	92.4	92.5	92.4	92.4	92.1	91.7	91.6	91.5
35	92.5	93.0	93.1	93.2	93.2	93.3	93.3	93.2	92.9	92.5	92.5	92.4
30	92.6	93.8	93.9	94.0	94.0	94.1	94.0	93.9	93.7	93.4	93.3	93.2
25	91.9	93.1	93.7	94.4	94.8	94.9	94.8	94.8	94.4	94.0	94.0	94.0
20	91.1	92.3	93.0	93.6	94.3	95.0	95.6	95.6	95.3	94.9	94.8	94.7
15	90.4	91.6	92.2	92.8	93.6	94.3	94.8	95.3	95.9	96.1	95.9	95.5
10	89.6	90.8	91.4	92.1	92.8	93.5	94.0	94.5	95.1	95.7	96.4	97.1
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 0.9.

Assumed Temperature Reduced Thrust (22K 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	11.6													
100	10.3	7.9												
90	10.8	8.4												
80	12.2	7.1	5.0											
70	11.0	7.6	5.4	5.2	3.5									
60	9.6	9.0	4.1	4.0	3.9	3.8	2.1							
50	8.0	7.7	4.5	2.8	2.6	2.7	2.6	2.4	0.8					
40		6.2	5.9	4.7	3.0	2.6	2.7	2.8	2.6	2.5	2.9			
30		4.7	4.6	4.5	4.4	4.2	4.1	4.0	4.0	3.9	3.8	3.7	3.6	
20			3.1	3.0	3.0	3.0	2.9	2.8	2.7	2.7	2.6	2.6	2.5	2.4
10			1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.3	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	500		
30000	**PITCH ATT**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**
	V/S (FT/MIN)	2500	1900	1400	1100	800
20000	**PITCH ATT**	**7.0**	**6.5**	**6.0**	**6.0**	**6.0**
	V/S (FT/MIN)	4100	3200	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	4300	3600	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	83	86	90		
35000	**PITCH ATT**	**1.0**	**2.0**	**2.5**	**3.0**	**4.0**
	%N1	82	83	85	88	92
30000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**
	%N1	81	82	83	85	87
25000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**2.5**	**3.5**
	%N1	77	78	79	81	83
20000	**PITCH ATT**	**1.0**	**1.5**	**2.0**	**3.0**	**3.5**
	%N1	74	75	76	77	79
15000	**PITCH ATT**	**1.0**	**1.5**	**2.5**	**3.0**	**3.5**
	%N1	70	71	72	73	75

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	-2500	-2400	-2700	-3000
30000	**PITCH ATT**	**-3.0**	**-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	-2400	-2100	-1900	-1800
10000	**PITCH ATT**	**-3.5**	**-2.0**	**-1.0**	**0.0**	**0.5**
	V/S (FT/MIN)	-2600	-2100	-1900	-1700	-1600
SEA LEVEL	**PITCH ATT**	**-4.0**	**-2.5**	**-1.0**	**-0.5**	**0.5**
	V/S (FT/MIN)	-2400	-1900	-1700	-1500	-1400

Flight With Unreliable Airspeed/ Turbulent Air Penetration

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

Holding (VREF40 + 70)

Flaps Up, %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		40	50	60	70	80
10000	**PITCH ATT**	**5.0**	**5.5**	**5.0**	**5.0**	**5.0**
	%N1	53	58	62	66	69
	KIAS	175	192	211	228	244
5000	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**5.5**	**5.0**
	%N1	49	54	58	62	66
	KIAS	175	191	210	227	243

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION (VREF+INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS 1 (GEAR UP) (VREF40+50)	**PITCH ATT**	**5.0**	**5.5**	**5.5**	**6.0**	**6.0**
	%N1	51	56	61	65	68
FLAPS 5 (GEAR UP) (VREF40+30)	**PITCH ATT**	**5.5**	**6.0**	**6.5**	**6.5**	**7.0**
	%N1	52	57	62	66	69
FLAPS 15 (GEAR DOWN) (VREF40+20)	**PITCH ATT**	**4.5**	**5.0**	**5.5**	**5.5**	**5.5**
	%N1	59	64	69	74	77

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF+INCREMENT)		WEIGHT (1000 KG)				
		40	50	60	70	80
FLAPS 15 (VREF15+10)	**PITCH ATT**	**1.5**	**1.5**	**2.0**	**2.0**	**2.0**
	%N1	41	46	49	53	56
FLAPS 30 (VREF30+10)	**PITCH ATT**	**0.5**	**1.0**	**1.0**	**1.0**	**1.5**
	%N1	47	52	56	60	63
FLAPS 40 (VREF40+10)	**PITCH ATT**	**0.0**	**0.0**	**0.5**	**0.5**	**0.5**
	%N	51	56	61	65	68

Intentionally
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Performance Inflight — Chapter PI
All Engine — Section 51

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	31100	-7	33400*	33400*	33400	31800	30400
80	32400	-10	35000*	35000*	34700	33100	31700
75	33800	-13	36400*	36400*	36100	34500	33100
70	35200	-16	37800*	37800*	37500	36000	34600
65	36800	-18	39200*	39200*	39000	37500	36100
60	38500	-18	40700*	40700*	40700	39200	37800
55	40300	-18	41000	41000	41000	41000	39600
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	31100	-1	31400*	31400*	31400*	31400*	30400
80	32400	-4	33600*	33600*	33600*	33100	31700
75	33800	-7	35400*	35400*	35400*	34500	33100
70	35200	-11	36800*	36800*	36800*	36000	34600
65	36800	-12	38200*	38200*	38200*	37500	36100
60	38500	-12	39600*	39600*	39600*	39200	37800
55	40300	-12	41000	41000	41000	41000	39600
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	31100	4	27900*	27900*	27900*	27900*	27900*
80	32400	1	30400*	30400*	30400*	30400*	30400*
75	33800	-2	33200*	33200*	33200*	33200*	33100
70	35200	-5	35400*	35400*	35400*	35400*	34600
65	36800	-7	36900*	36900*	36900*	36900*	36100
60	38500	-7	38300*	38300*	38300*	38300*	37800
55	40300	-7	39800*	39800*	39800*	39800*	39600
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)									
		23	25	27	29	31	33	35	37	39	41
85	%N1	84.5	85.8	87.1	88.3	89.7	91.6				
	MACH	.722	.743	.764	.782	.792	.793				
	KIAS	315	312	308	303	294	282				
	FF/ENG	1608	1591	1585	1581	1570	1571				
80	%N1	83.2	84.6	85.8	87.1	88.4	89.8	92.7			
	MACH	.706	.728	.750	.771	.786	.793	.792			
	KIAS	307	305	302	298	292	282	269			
	FF/ENG	1518	1506	1499	1495	1483	1475	1495			
75	%N1	81.6	83.2	84.5	85.8	87.1	88.4	90.1	94.6		
	MACH	.682	.713	.734	.756	.776	.790	.793	.790		
	KIAS	297	298	295	292	288	280	269	256		
	FF/ENG	1414	1421	1413	1407	1398	1388	1382	1452		
70	%N1	79.9	81.5	83.1	84.3	85.7	87.0	88.3	90.8		
	MACH	.659	.689	.718	.739	.761	.781	.792	.793		
	KIAS	286	288	288	285	281	277	269	257		
	FF/ENG	1313	1320	1329	1320	1312	1303	1294	1303		
65	%N1	78.3	79.7	81.4	82.8	84.1	85.5	86.8	88.7	92.1	
	MACH	.638	.663	.694	.721	.743	.765	.784	.792	.793	
	KIAS	276	276	278	277	274	271	266	257	245	
	FF/ENG	1221	1217	1232	1236	1227	1217	1207	1209	1233	
60	%N1	76.7	78.0	79.4	81.1	82.5	83.9	85.3	86.9	89.4	93.3
	MACH	.620	.640	.665	.698	.724	.746	.769	.786	.793	.792
	KIAS	268	266	266	268	267	264	260	255	245	234
	FF/ENG	1140	1124	1128	1142	1142	1132	1123	1124	1131	1165
55	%N1	75.1	76.2	77.5	78.9	80.6	82.1	83.5	85.2	87.4	89.9
	MACH	.604	.620	.640	.666	.699	.725	.748	.771	.787	.793
	KIAS	261	257	255	255	257	256	253	249	243	234
	FF/ENG	1072	1043	1035	1038	1050	1047	1038	1039	1044	1052
50	%N1	73.2	74.5	75.6	76.9	78.3	80.1	81.5	83.3	85.5	87.6
	MACH	.581	.602	.618	.639	.665	.698	.725	.748	.771	.787
	KIAS	250	249	246	244	243	245	244	241	238	232
	FF/ENG	993	974	954	946	947	956	953	951	959	964
45	%N1	70.9	72.4	73.7	74.9	76.1	77.5	79.3	81.2	83.3	85.5
	MACH	.555	.577	.598	.615	.635	.661	.694	.723	.746	.769
	KIAS	239	238	237	234	232	231	233	232	229	226
	FF/ENG	909	895	884	867	856	855	862	866	880	887
40	%N1	68.1	69.8	71.3	72.7	73.9	75.1	76.5	78.5	80.9	83.1
	MACH	.525	.547	.569	.591	.610	.629	.654	.686	.718	.740
	KIAS	225	225	225	224	222	219	218	219	220	217
	FF/ENG	821	812	821	810	794	779	774	782	794	797

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
293	268	247	229	214	200	190	181	173	166	159
440	403	371	344	321	300	286	272	260	249	239
588	539	496	459	428	400	381	363	347	332	319
736	675	620	574	535	500	476	454	434	415	399
885	810	745	689	642	600	571	544	520	498	479
1034	946	869	804	749	700	667	636	607	582	558
1184	1083	994	920	856	800	762	727	694	665	638
1334	1220	1120	1036	964	900	857	817	781	748	718
1484	1357	1245	1152	1071	1000	952	908	867	831	798
1635	1494	1370	1267	1179	1100	1047	998	954	913	877
1787	1632	1496	1383	1286	1200	1142	1089	1040	996	956
1939	1771	1622	1499	1394	1300	1237	1180	1127	1079	1036
2092	1909	1749	1615	1501	1400	1332	1270	1213	1161	1115
2245	2048	1875	1732	1609	1500	1428	1361	1300	1244	1194
2399	2188	2002	1848	1717	1600	1523	1451	1386	1327	1273
2553	2327	2129	1965	1824	1700	1618	1542	1473	1409	1352
2708	2468	2256	2081	1932	1800	1713	1633	1559	1492	1431
2863	2608	2384	2198	2040	1900	1808	1723	1645	1574	1510
3019	2749	2512	2315	2148	2000	1903	1813	1731	1656	1589

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	1.5	0:41	1.3	0:40	1.1	0:37	1.0	0:36	0.9	0:35
300	2.3	1:01	2.0	0:58	1.7	0:54	1.6	0:52	1.4	0:50
400	3.0	1:20	2.8	1:16	2.4	1:11	2.1	1:08	2.0	1:05
500	3.8	1:40	3.5	1:34	3.0	1:27	2.7	1:24	2.5	1:20
600	4.6	1:59	4.2	1:53	3.7	1:44	3.3	1:40	3.1	1:36
700	5.3	2:19	4.9	2:11	4.3	2:01	3.9	1:56	3.6	1:51
800	6.1	2:39	5.6	2:30	4.9	2:18	4.5	2:12	4.2	2:06
900	6.9	2:59	6.3	2:49	5.6	2:35	5.0	2:29	4.7	2:21
1000	7.6	3:19	7.0	3:08	6.2	2:52	5.6	2:45	5.3	2:37
1100	8.4	3:40	7.7	3:27	6.8	3:09	6.2	3:01	5.8	2:52
1200	9.1	4:00	8.4	3:46	7.4	3:27	6.8	3:17	6.3	3:08
1300	9.9	4:21	9.1	4:05	8.1	3:44	7.3	3:34	6.8	3:23
1400	10.6	4:41	9.8	4:25	8.7	4:01	7.9	3:50	7.4	3:39
1500	11.3	5:02	10.5	4:44	9.3	4:19	8.4	4:07	7.9	3:55
1600	12.1	5:23	11.2	5:04	9.9	4:37	9.0	4:23	8.4	4:11
1700	12.8	5:44	11.8	5:24	10.5	4:54	9.6	4:40	8.9	4:27
1800	13.5	6:05	12.5	5:44	11.1	5:12	10.1	4:57	9.4	4:42
1900	14.2	6:27	13.2	6:04	11.7	5:30	10.7	5:14	10.0	4:59
2000	15.0	6:48	13.8	6:24	12.3	5:48	11.2	5:30	10.5	5:15

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	-0.8	-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	-1.3	-0.6	0.0	0.9	1.7
11	-1.4	-0.7	0.0	1.0	1.9
12	-1.5	-0.8	0.0	1.1	2.1
13	-1.6	-0.8	0.0	1.2	2.3
14	-1.7	-0.9	0.0	1.3	2.5
15	-1.9	-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)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
537	503	472	445	422	400	382	365	350	337	325
802	752	707	667	632	600	574	550	527	507	489
1068	1002	942	889	843	800	766	734	704	677	653
1335	1252	1177	1112	1053	1000	957	918	881	848	817
1603	1504	1414	1335	1264	1200	1149	1102	1058	1018	981
1872	1756	1651	1558	1475	1400	1341	1286	1235	1188	1145
2142	2009	1888	1781	1686	1600	1533	1470	1411	1358	1309
2413	2262	2125	2005	1898	1800	1724	1653	1588	1528	1473
2684	2515	2362	2228	2109	2000	1916	1837	1764	1698	1637
2956	2769	2600	2452	2320	2200	2107	2021	1941	1867	1801
3229	3024	2839	2676	2532	2400	2299	2204	2117	2037	1964
3503	3280	3078	2901	2743	2600	2490	2388	2294	2207	2128
3778	3536	3317	3125	2955	2800	2682	2572	2470	2377	2292
4053	3792	3556	3350	3167	3000	2873	2756	2647	2546	2455
4329	4049	3796	3575	3379	3200	3065	2939	2823	2716	2618
4605	4306	4036	3800	3590	3400	3256	3122	2999	2885	2781
4883	4564	4276	4025	3802	3600	3448	3306	3175	3054	2944
5161	4823	4517	4251	4015	3800	3639	3489	3351	3223	3107
5440	5082	4758	4477	4227	4000	3830	3672	3526	3392	3270
5719	5341	5000	4702	4439	4200	4022	3856	3702	3561	3433
6000	5601	5242	4929	4652	4400	4213	4039	3878	3730	3595
6282	5863	5485	5155	4864	4600	4404	4222	4053	3898	3757
6566	6125	5728	5383	5077	4800	4595	4405	4229	4067	3919
6851	6388	5972	5610	5290	5000	4786	4588	4404	4235	4081

Reference Fuel And Time Required at Check Point

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECKPOINT (1000 KG)				
	40	50	60	70	80
2	-0.3	-0.2	0.0	0.8	1.8
4	-0.6	-0.3	0.0	1.3	3.2
6	-0.8	-0.5	0.0	1.8	4.4
8	-1.1	-0.7	0.0	2.2	5.5
10	-1.5	-0.8	0.0	2.5	6.4
12	-1.8	-1.0	0.0	2.8	7.2
14	-2.1	-1.1	0.0	3.1	7.8
16	-2.4	-1.3	0.0	3.3	8.3
18	-2.7	-1.4	0.0	3.4	8.6
20	-3.1	-1.6	0.0	3.5	8.7
22	-3.4	-1.7	0.0	3.6	8.7
24	-3.7	-1.8	0.0	3.6	8.5
26	-4.1	-2.0	0.0	3.6	8.2

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)								
	85	80	75	70	65	60	55	50	45
41					39	13	1	1	10
39				30	10	1	1	9	22
37		46	21	6	0	2	9	21	36
35	31	13	3	0	2	10	21	35	50
33	7	1	0	4	11	22	34	48	62
31	0	1	6	14	24	35	48	61	74
29	3	9	17	26	37	48	60	72	83
27	12	20	29	39	50	61	71	82	91

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	80
41000	26	360	100	117	130	138	142
39000	26	350	95	112	124	133	137
37000	25	350	91	106	119	127	132
35000	25	340	87	102	113	122	127
33000	24	340	83	97	109	117	122
31000	23	330	79	92	103	110	115
29000	22	330	74	87	96	103	108
27000	21	320	69	81	90	97	100
25000	20	310	65	76	84	90	93
23000	19	300	60	70	78	83	86
21000	18	290	56	65	72	76	79
19000	17	280	51	60	66	70	72
17000	15	270	47	54	60	63	65
15000	14	250	43	49	54	57	59
10000	11	210	30	34	36	38	38
5000	7	160	18	19	20	21	21
1500	4	130	9	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
90	%N1	65.9	68.3	72.3	76.2	80.6	84.9	89.3		
	KIAS	257	258	259	261	263	265	268		
	FF/ENG	1580	1560	1550	1540	1530	1540	1600		
85	%N1	64.4	67.0	70.7	74.8	79.1	83.4	87.7		
	KIAS	250	251	252	253	255	257	260		
	FF/ENG	1500	1480	1460	1460	1440	1450	1490		
80	%N1	62.7	65.6	69.1	73.3	77.5	81.9	86.1		
	KIAS	242	243	244	245	247	249	252		
	FF/ENG	1420	1400	1380	1370	1350	1360	1390		
75	%N1	61.0	64.0	67.5	71.7	75.8	80.2	84.4	89.4	
	KIAS	234	236	236	238	239	241	243	247	
	FF/ENG	1340	1320	1300	1290	1260	1260	1300	1360	
70	%N1	59.3	62.0	66.0	69.8	74.0	78.5	82.7	87.3	
	KIAS	227	227	228	229	231	232	235	238	
	FF/ENG	1270	1240	1220	1200	1180	1170	1200	1240	
65	%N1	57.6	60.1	64.3	67.9	72.2	76.5	80.9	85.3	
	KIAS	219	219	220	221	222	224	226	228	
	FF/ENG	1190	1160	1140	1120	1100	1080	1110	1130	
60	%N1	55.7	58.2	62.2	66.0	70.2	74.4	78.8	83.2	
	KIAS	210	210	211	212	213	214	216	219	
	FF/ENG	1110	1080	1060	1040	1020	1000	1020	1040	
55	%N1	53.7	56.2	59.9	64.0	67.9	72.2	76.6	81.1	89.0
	KIAS	200	201	202	203	204	205	207	209	212
	FF/ENG	1030	1010	980	960	940	920	930	940	1020
50	%N1	51.6	54.0	57.6	61.8	65.5	69.9	74.2	78.7	86.2
	KIAS	191	191	192	193	194	195	196	198	201
	FF/ENG	960	930	910	890	860	860	850	860	920
45	%N1	49.2	51.7	55.2	59.0	63.2	67.2	71.5	76.1	83.4
	KIAS	182	182	182	183	184	185	186	187	190
	FF/ENG	880	850	840	820	800	790	770	770	820
40	%N1	46.8	49.1	52.6	56.2	60.5	64.3	68.7	73.2	80.4
	KIAS	175	175	175	175	175	175	175	176	178
	FF/ENG	830	800	770	740	730	710	700	690	720

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

Intentionally
Blank

ADVISORY INFORMATION

Normal Configuration Landing Distances

Flaps 15

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	2950	210/-160	70/80	-100	360	30	-30	70	-70	200	70	110
MAX AUTO	3820	210/-210	100/130	-150	480	0	0	80	-80	360	0	0
AUTOBRAKE 3	5380	330/-360	160/210	-230	790	0	-20	150	-150	570	0	0
AUTOBRAKE 2	6890	480/-490	230/300	-310	1070	110	-150	200	-200	520	0	260
AUTOBRAKE 1	7580	560/-570	260/360	-360	1250	210	-230	210	-210	510	330	1030

Good Reported Braking Action

MAX MANUAL	4050	230/-250	110/150	-180	620	100	-80	100	-100	280	250	440
MAX AUTO	4480	260/-260	110/160	-180	660	80	-70	100	-100	340	300	520
AUTOBRAKE 3	5400	330/-360	160/210	-230	790	20	-20	150	-150	570	30	50
AUTOBRAKE 2	6890	480/-490	230/300	-310	1070	110	-150	200	-200	520	0	260

Medium Reported Braking Action

MAX MANUAL	5560	380/-380	180/250	-280	1030	230	-180	150	-150	380	820	1380
MAX AUTO	5760	390/-390	180/250	-280	1030	210	-160	150	-150	440	840	1410
AUTOBRAKE 3	5890	390/-410	200/260	-300	1080	160	-110	160	-160	570	790	1180
AUTOBRAKE 2	6960	490/-510	230/310	-340	1210	200	-200	200	-200	520	360	740

Poor Reported Braking Action

MAX MANUAL	7250	560/-540	260/380	-430	1660	590	-380	200	-210	460	2120	3360
MAX AUTO	7550	540/-540	260/380	-430	1640	570	-380	200	-210	480	2150	3380
AUTOBRAKE 3	7550	560/-540	260/380	-430	1640	540	-340	200	-210	560	2150	3400
AUTOBRAKE 2	7860	570/-570	280/390	-440	1710	540	-360	210	-230	520	1900	2970

Reference distance is for sea level, standard day, no wind or slope, VREF15 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 245 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).
***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 Distances

Flaps 30

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV
MAX MANUAL	2810	180/-150	70/80	-100	360	30	-30	50	-50	200	50	100
MAX AUTO	3590	180/-200	80/110	-130	440	0	0	80	-80	340	0	0
AUTOBRAKE 3	5020	300/-330	150/180	-210	750	0	-30	130	-130	510	0	20
AUTOBRAKE 2	6380	430/-440	200/260	-300	1020	110	-130	160	-160	490	0	250
AUTOBRAKE 1	6970	510/-510	230/310	-340	1200	200	-200	200	-200	480	340	900

Good Reported Braking Action

MAX MANUAL	3840	210/-230	100/130	-160	610	80	-80	80	-100	280	210	390
MAX AUTO	4250	230/-250	110/150	-180	640	70	-70	100	-100	330	250	440
AUTOBRAKE 3	5020	300/-330	150/180	-230	750	20	-30	130	-130	510	30	50
AUTOBRAKE 2	6380	430/-440	200/260	-300	1020	110	-130	160	-160	490	0	250

Medium Reported Braking Action

MAX MANUAL	5230	340/-340	160/230	-280	1020	230	-180	130	-150	360	690	1180
MAX AUTO	5400	360/-360	160/230	-280	1020	200	-150	130	-150	430	710	1200
AUTOBRAKE 3	5500	360/-380	180/230	-280	1050	160	-130	150	-150	510	670	1030
AUTOBRAKE 2	6450	440/-460	210/280	-330	1160	200	-180	180	-180	490	310	670

Poor Reported Braking Action

MAX MANUAL	6760	490/-490	250/330	-410	1590	540	-360	180	-200	430	1740	2790
MAX AUTO	7000	490/-490	250/330	-410	1590	540	-330	180	-200	480	1760	2810
AUTOBRAKE 3	7000	510/-490	250/330	-410	1590	520	-330	180	-200	490	1770	2850
AUTOBRAKE 2	7280	520/-520	250/340	-430	1640	510	-340	200	-210	490	1540	2480

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 230 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).
***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 Distances

Flaps 40

Dry Runway

	LANDING DISTANCE AND ADJUSTMENTS (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°C		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV
MAX MANUAL	2690	180/-130	70/80	-100	340	30	-30	50	-50	200	50	80
MAX AUTO	3380	200/-180	80/110	-130	430	0	0	70	-70	330	0	0
AUTOBRAKE 3	4660	310/-300	150/200	-210	720	0	-20	110	-110	510	0	0
AUTOBRAKE 2	5950	430/-410	200/260	-280	980	80	-110	160	-160	490	0	130
AUTOBRAKE 1	6580	490/-480	230/310	-330	1160	160	-200	180	-180	480	230	690

Good Reported Braking Action

MAX MANUAL	3690	230/-210	100/150	-160	590	80	-80	80	-80	280	200	360
MAX AUTO	4040	250/-230	110/150	-180	620	70	-70	80	-100	340	230	410
AUTOBRAKE 3	4660	310/-300	150/200	-210	720	20	-20	110	-110	510	30	50
AUTOBRAKE 2	5950	430/-410	200/260	-280	980	80	-110	160	-160	490	0	130

Medium Reported Braking Action

MAX MANUAL	4990	360/-330	160/230	-260	980	210	-180	130	-130	380	620	1070
MAX AUTO	5120	360/-340	160/230	-260	980	200	-150	130	-130	430	620	1080
AUTOBRAKE 3	5200	380/-340	180/250	-280	1020	160	-110	130	-150	510	640	1000
AUTOBRAKE 2	6000	440/-430	200/280	-310	1120	160	-160	160	-160	490	300	560

Poor Reported Braking Action

MAX MANUAL	6450	510/-460	230/330	-410	1570	540	-340	160	-180	440	1570	2540
MAX AUTO	6710	510/-460	230/330	-410	1560	540	-340	160	-180	460	1590	2580
AUTOBRAKE 3	6710	510/-480	250/330	-410	1560	510	-330	160	-200	480	1590	2590
AUTOBRAKE 2	6870	520/-490	250/340	-410	1610	490	-330	180	-200	490	1460	2280

Reference distance is for sea level, standard day, no wind or slope, VREF40 approach speed and two engine detent reverse thrust.
Max manual braking data valid for auto speedbrakes. Autobrake data valid for both auto and manual speedbrakes.
For max manual braking and manual speedbrakes, increase reference landing distance by 220 ft.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).
***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

Dry Runway

		LANDING DISTANCE AND ADJUSTMENTS (FT)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APPROACH SPEED ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
ALL FLAPS UP	VREF40+55	3900	520/-230	100/210	-130/440	50/-30	80/-80	260
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	4690	300/-280	130/180	-230/840	130/-110	110/-110	360
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	3250	210/-160	70/100	-110/390	30/-30	70/-70	300
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	3080	200/-160	70/80	-110/380	30/-30	70/-70	280
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	2950	200/-150	70/100	-110/380	30/-30	70/-70	280
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	3310	160/-180	80/100	-130/440	50/-50	80/-80	250
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	4540	250/-260	110/150	-180/610	110/-100	110/-110	510
LEADING EDGE FLAPS TRANSIT	VREF15+15	3300	230/-180	70/100	-110/390	30/-30	70/-70	210
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	2970	210/-180	70/80	-110/380	30/-30	70/-70	210
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	2820	180/-150	50/80	-100/360	30/-30	50/-50	200

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Dry Runway

		LANDING DISTANCE AND ADJUSTMENTS (FT)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APPROACH SPEED ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	2940	210/-160	70/80	-100/380	30/-30	70/-70	200
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	2940	210/-160	70/80	-100/380	30/-30	70/-70	200
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	2810	180/-150	50/80	-100/360	30/-30	50/-50	200
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	2940	210/-160	70/80	-100/380	30/-30	70/-70	200
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	3260	300/-180	80/100	-110/390	30/-30	70/-70	200
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	2810	180/-150	50/80	-100/360	30/-30	50/-50	200
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	2940	210/-160	70/80	-100/380	30/-30	70/-70	200
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	3260	300/-180	80/100	-110/390	30/-30	70/-70	200
TRAILING EDGE FLAPS UP	VREF40+40	3490	360/-200	80/110	-110/410	30/-30	80/-80	200

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENTS (FT)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APPROACH SPEED ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
ALL FLAPS UP	VREF40+55	5220	300/-300	150/200	-200/710	100/-100	130/-130	280
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	5230	360/-330	150/200	-280/1020	200/-160	130/-130	390
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	4690	300/-300	130/180	-200/710	130/-110	110/-110	430
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	4380	260/-280	110/150	-200/670	110/-100	110/-110	410
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	4150	280/-250	110/160	-200/660	110/-100	100/-100	410
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	4200	250/-260	110/150	-180/640	100/-80	100/-100	310
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	5610	330/-340	150/200	-230/800	180/-160	150/-150	590
LEADING EDGE FLAPS TRANSIT	VREF15+15	4530	260/-260	110/160	-200/670	100/-80	110/-110	300
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	4170	250/-250	100/150	-180/660	100/-80	100/-100	310
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	3950	230/-230	100/130	-180/640	100/-80	100/-100	300

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Good Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENTS (M)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APPROACH SPEED ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	4020	230/-250	100/150	-180/620	80/-80	100/-100	280
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	4020	230/-250	100/150	-180/620	80/-80	100/-100	280
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	3820	210/-210	100/130	-160/610	80/-80	80/-80	280
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	4020	230/-250	100/150	-180/620	80/-80	100/-100	280
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	4430	250/-250	110/160	-180/660	80/-80	110/-110	260
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	3820	210/-210	100/130	-160/610	80/-80	80/-80	280
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	4020	230/-250	100/150	-180/620	80/-80	100/-100	280
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	4430	250/-250	110/160	-180/660	80/-80	110/-110	260
TRAILING EDGE FLAPS UP	VREF40+40	4720	260/-260	130/180	-200/670	100/-80	110/-110	260

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENTS (FT)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APPROACH SPEED ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
ALL FLAPS UP	VREF40+55	7370	490/-480	250/330	-330/1180	260/-230	210/-210	380
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	6610	510/-460	210/300	-410/1590	440/-330	160/-180	460
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	6380	480/-460	200/280	-330/1150	300/-250	180/-180	540
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	5920	430/-430	180/250	-310/1100	260/-230	160/-160	510
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	5590	430/-390	180/260	-300/1080	260/-210	150/-150	490
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	5730	390/-390	180/250	-300/1070	230/-200	150/-150	410
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	7710	520/-520	230/330	-360/1300	390/-340	200/-210	720
LEADING EDGE FLAPS TRANSIT	VREF15+15	6140	410/-410	200/260	-300/1080	230/-200	160/-160	380
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	5920	410/-410	180/230	-310/1120	260/-230	160/-160	430
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	5510	380/-380	160/210	-300/1080	250/-210	150/-150	410

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENTS (FT)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APPROACH SPEED ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	5460	380/-380	160/230	-280/1030	210/-180	150/-150	380
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	5460	380/-380	160/230	-280/1030	210/-180	150/-150	380
TRAILING EDGE FLAP ASYMMETRY (30 ≤ FLAPS < 40)	VREF30	5130	340/-340	150/200	-260/1000	200/-160	130/-130	360
TRAILING EDGE FLAP ASYMMETRY (15 ≤ FLAPS < 30)	VREF15	5460	380/-380	160/230	-280/1030	210/-180	150/-150	380
TRAILING EDGE FLAP ASYMMETRY (1 ≤ FLAPS < 15)	VREF40+30	6100	410/-390	200/260	-300/1080	230/-200	160/-160	360
TRAILING EDGE FLAP DISAGREE (30 ≤ FLAPS < 40)	VREF30	5130	340/-340	150/200	-260/1000	200/-160	130/-130	360
TRAILING EDGE FLAP DISAGREE (15 ≤ FLAPS < 30)	VREF15	5460	380/-380	160/230	-280/1030	210/-180	150/-150	380
TRAILING EDGE FLAP DISAGREE (1 ≤ FLAPS < 15)	VREF40+30	6100	410/-390	200/260	-300/1080	230/-200	160/-160	360
TRAILING EDGE FLAPS UP	VREF40+40	6580	440/-430	210/300	-310/1120	250/-210	180/-180	380

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

LANDING CONFIGURATION	VREF	REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APPROACH SPEED ADJ
		LANDING DISTANCE AND ADJUSTMENTS (FT)						
		60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
ALL FLAPS UP	VREF40+55	9760	720/-690	360/490	-490/1850	610/-480	300/-300	490
ANTI SKID INOPERATIVE (FLAPS 40)	VREF40	8780	720/-660	310/440	-670/2940	1570/-750	230/-260	510
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 15)	VREF15	8230	210/-210	300/430	-480/1790	640/-480	230/-250	620
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 30)	VREF30	7600	590/-570	260/380	-460/1720	590/-440	210/-230	570
HYDRAULICS - LOSS OF SYSTEM A (FLAPS 40)	VREF40	7170	610/-540	260/360	-440/1690	560/-430	200/-210	560
HYDRAULICS - LOSS OF SYSTEM B (FLAPS 15)	VREF15	7410	570/-560	260/360	-440/1670	520/-390	200/-210	490
HYDRAULICS - MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	9860	750/-720	340/480	-540/1970	790/-610	260/-280	790
LEADING EDGE FLAPS TRANSIT	VREF15+15	7870	590/-570	260/380	-440/1710	520/-390	210/-230	440
ONE ENGINE INOPERATIVE (FLAPS 15)	VREF15	8070	610/-610	260/360	-490/1840	670/-490	230/-250	520
ONE ENGINE INOPERATIVE (FLAPS 30)**	VREF30	7410	540/-540	230/310	-460/1760	610/-440	210/-210	490

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft to this new reference distance.**

****ONE ENGINE INOPERATIVE (FLAPS 30) data are only applicable to Fail Operational airplanes.**

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

Poor Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENTS (FT)						
		REF DIST	WEIGHT ADJ	ALTITUDE ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APPROACH SPEED ADJ
LANDING CONFIGURATION	VREF	60000 KG LANDING WEIGHT	PER 5000 KG ABOVE/ BELOW 60000 KG	PER 1000 FT STD/ HIGH*	HEAD/ TAIL	DOWN HILL/ UP HILL	ABV ISA/ BLW ISA	PER 10 KTS ABV VREF
STABILIZER TRIM INOPERATIVE	VREF15	7090	540/-520	250/330	-430/1620	490/-360	200/-200	440
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	7090	540/-520	250/330	-430/1620	490/-360	200/-200	440
TRAILING EDGE FLAP ASYMMETRY (30 FLAPS < 40)	VREF30	6590	490/-480	210/300	-410/1570	460/-340	180/-200	430
TRAILING EDGE FLAP ASYMMETRY (15 FLAPS < 30)	VREF15	7090	540/-520	250/330	-430/1620	490/-360	200/-200	440
TRAILING EDGE FLAP ASYMMETRY (1 FLAPS < 15)	VREF40+30	7960	610/-560	280/390	-440/1710	510/-390	230/-230	440
TRAILING EDGE FLAP DISAGREE (30 FLAPS < 40)	VREF30	6590	490/-480	210/300	-410/1570	460/-340	180/-200	430
TRAILING EDGE FLAP DISAGREE (15 FLAPS < 30)	VREF15	7090	540/-520	250/330	-430/1620	490/-360	200/-200	440
TRAILING EDGE FLAP DISAGREE (1 FLAPS < 15)	VREF40+30	7960	610/-560	280/390	-440/1710	510/-390	230/-230	440
TRAILING EDGE FLAPS UP	VREF40+40	8680	640/-610	310/430	-480/1770	560/-430	250/-260	460

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).
Altitude adjustment for STD altitudes valid up to 8000 ft pressure altitude.
Altitude adjustment for HIGH altitudes valid for altitudes above 8000 ft up to 14000 ft.

***For landing distance above 8000 ft pressure altitude, first apply the STD altitude adjustment to derive new reference landing distance for 8000 ft, then apply applicable HIGH altitude adjustment between 8000 ft and 14000 ft 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)	PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT		
		0	5	10	0	5	10	0	5	10	0	5	10	0	5	10	0	5	10
80	0	15.9	17.8	20.2	23.1	26.2	30.1	31.4	35.8	41.3	40.6	46.3	53.5	50.4	57.5	66.3	59.9	68.2	78.5
	10	16.3	18.3	20.8	23.8	27.0	31.0	32.4	37.0	42.6	41.9	47.8	55.1	52.0	59.2	68.2	61.7	70.2	80.6
	15	16.6	18.6	21.1	24.2	27.5	31.5	32.9	37.5	43.3	42.5	48.5	56.0	52.8	60.1	69.2	62.6	71.2	81.7
	20	16.8	18.8	21.4	24.5	27.8	32.0	33.4	38.1	43.9	43.1	49.2	56.7	53.5	60.9	70.1	63.5	72.1	82.7
	30	17.1	19.2	21.9	25.1	28.5	32.7	34.2	39.0	44.9	44.1	50.4	58.1	54.8	62.4	71.8	65.0	73.8	84.6
	40	17.4	19.5	22.2	25.5	28.9	33.3	34.7	39.6	45.7	44.9	51.3	59.1	55.8	63.5	73.1	66.2	75.2	86.3
	50	17.5	19.6	22.3	25.7	29.2	33.6	35.1	40.1	46.3	45.4	51.9	59.9	56.5	64.4	74.3	67.1	76.4	87.8
70	0	14.4	16.1	18.1	20.8	23.5	26.9	28.1	32.0	36.9	36.2	41.3	47.7	44.9	51.2	59.2	53.9	61.4	70.8
	10	14.8	16.5	18.7	21.4	24.3	27.8	29.0	33.0	38.1	37.3	42.6	49.2	46.3	52.9	61.0	55.6	63.3	72.8
	15	15.0	16.8	19.0	21.8	24.6	28.2	29.5	33.6	38.7	37.9	43.3	49.9	47.0	53.7	61.9	56.4	64.2	73.9
	20	15.2	17.0	19.2	22.1	25.0	28.6	29.9	34.0	39.2	38.5	43.9	50.6	47.7	54.4	62.7	57.2	65.1	74.8
	30	15.5	17.3	19.6	22.5	25.5	29.3	30.6	34.8	40.1	39.4	44.9	51.8	48.8	55.7	64.2	58.5	66.6	76.5
	40	15.7	17.6	19.9	22.9	25.9	29.7	31.1	35.4	40.8	40.1	45.7	52.8	49.7	56.7	65.4	59.6	67.9	78.0
	50	15.8	17.7	20.0	23.1	26.2	30.0	31.4	35.8	41.3	40.5	46.3	53.4	50.3	57.5	66.3	60.4	68.8	79.3
60	0	12.9	14.3	16.1	18.5	20.8	23.7	24.8	28.2	32.4	31.8	36.2	41.8	39.3	44.9	51.8	47.4	54.1	62.4
	10	13.3	14.8	16.6	19.1	21.5	24.5	25.6	29.1	33.4	32.8	37.4	43.1	40.6	46.3	53.4	48.9	55.8	64.3
	15	13.5	15.0	16.8	19.3	21.8	24.9	26.0	29.5	34.0	33.3	38.0	43.8	41.2	47.0	54.2	49.6	56.6	65.2
	20	13.6	15.1	17.0	19.6	22.1	25.2	26.4	30.0	34.5	33.8	38.5	44.4	41.8	47.7	55.0	50.3	57.4	66.1
	30	13.9	15.4	17.4	20.0	22.6	25.8	27.0	30.7	35.3	34.6	39.4	45.5	42.8	48.8	56.3	51.5	58.7	67.6
	40	14.0	15.6	17.6	20.3	22.9	26.2	27.4	31.2	35.9	35.1	40.1	46.3	43.5	49.7	57.3	52.5	59.8	68.9
	50	14.1	15.7	17.7	20.4	23.1	26.4	27.6	31.4	36.2	35.5	40.5	46.8	44.0	50.3	58.1	53.1	60.6	69.9
50	0	11.5	12.6	14.1	16.2	18.1	20.6	21.5	24.3	27.9	27.3	31.0	35.8	33.6	38.3	44.2	40.4	46.1	53.2
	10	11.8	13.0	14.5	16.7	18.7	21.2	22.2	25.1	28.8	28.2	32.1	36.9	34.7	39.5	45.6	41.7	47.6	54.9
	15	12.0	13.2	14.7	16.9	19.0	21.5	22.5	25.5	29.2	28.6	32.6	37.5	35.2	40.2	46.3	42.3	48.3	55.7
	20	12.1	13.3	14.9	17.1	19.2	21.8	22.8	25.8	29.6	29.0	33.0	38.0	35.7	40.7	47.0	42.9	49.0	56.5
	30	12.3	13.6	15.1	17.5	19.6	22.3	23.3	26.4	30.3	29.7	33.8	38.9	36.5	41.7	48.1	44.0	50.2	57.8
	40	12.4	13.7	15.3	17.7	19.9	22.6	23.7	26.8	30.8	30.2	34.4	39.6	37.2	42.4	48.9	44.7	51.1	58.9
	50	12.5	13.8	15.4	17.8	20.0	22.8	23.8	27.1	31.1	30.4	34.7	40.0	37.5	42.9	49.5	45.2	51.7	59.7
40	0	10.1	11.0	12.1	13.9	15.4	17.4	18.1	20.4	23.3	22.8	25.8	29.6	27.7	31.6	36.3	32.9	37.5	43.3
	10	10.3	11.3	12.4	14.3	15.9	17.9	18.7	21.1	24.0	23.5	26.6	30.6	28.6	32.6	37.5	34.0	38.7	44.7
	15	10.4	11.4	12.6	14.5	16.1	18.2	19.0	21.4	24.4	23.9	27.1	31.1	29.1	33.1	38.1	34.5	39.4	45.4
	20	10.5	11.5	12.7	14.6	16.3	18.4	19.2	21.7	24.7	24.2	27.4	31.5	29.5	33.6	38.7	35.0	39.9	46.0
	30	10.7	11.7	12.9	14.9	16.6	18.8	19.6	22.2	25.3	24.7	28.1	32.2	30.2	34.4	39.6	35.8	40.9	47.1
	40	10.8	11.8	13.1	15.1	16.9	19.1	19.9	22.5	25.7	25.1	28.5	32.8	30.6	34.9	40.2	36.4	41.6	48.0
	50	10.9	11.9	13.2	15.2	17.0	19.2	20.1	22.7	25.9	25.3	28.8	33.1	30.9	35.3	40.7	36.8	42.0	48.5

***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		10.0	20.0	30.0	40.0	50.0	60.0
RTO MAX MAN		10.0	20.0	30.0	40.0	50.0	60.0
LANDING	MAX MAN	5.4	15.3	25.0	34.7	44.4	54.4
	MAX AUTO	4.5	13.5	22.6	31.6	40.9	50.5
	AUTOBRAKE 3	4.0	12.4	20.4	28.2	36.2	45.0
	AUTOBRAKE 2	3.5	11.2	18.4	25.0	31.8	39.4
	AUTOBRAKE 1	2.9	10.0	16.3	22.1	27.7	34.0

Two Engine Detent Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)					
EVENT		10.0	20.0	30.0	40.0	50.0	60.0
RTO MAX MAN		10.0	20.0	30.0	40.0	50.0	60.0
LANDING	MAX MAN	5.1	14.4	23.5	32.7	41.9	51.1
	MAX AUTO	3.3	10.9	18.7	26.7	35.1	44.0
	AUTOBRAKE 3	1.4	7.0	12.6	18.3	24.4	31.3
	AUTOBRAKE 2	0.0	4.1	8.0	11.9	16.1	21.1
	AUTOBRAKE 1		2.2	5.0	7.4	10.0	13.2

Cooling Time (Minutes)

	EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
	16 & BELOW	17	20	23	26	29	32	33 TO 48	49 & ABOVE
	BRAKE TEMPERATURE MONITOR SYSTEM INDICATION ON CDS								
	UP TO 2.4	2.6	3.1	3.5	4.0	4.4	4.9	5.0 TO 7.8	7.8 & 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		

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.

Intentionally
Blank

Performance Inflight — Chapter PI
Engine Inoperative — Section 53

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 ON	-1.2	-1.1	-1.0	-0.9	-0.8	-0.8	-0.8	-0.8	-0.8
ENGINE & WING ANTI-ICE ON	-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	-3.1	-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	256	18200	17000	15800
80	77	249	19800	18700	17400
75	72	241	21300	20400	19200
70	67	233	22800	21900	20900
65	62	225	24500	23600	22600
60	57	216	26500	25500	24500
55	53	207	28600	27700	26700
50	48	198	30700	30000	29000
45	43	188	32900	32200	31300
40	38	179	35300	34600	33700

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)				
HEAD WIND COMPONENT (KTS)						TAIL WIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
141	130	121	113	106	100	94	89	85	81	77
282	260	242	226	212	200	188	179	170	162	154
422	390	363	339	318	300	283	268	255	243	232
563	520	484	452	424	400	378	358	340	324	310
703	650	604	565	530	500	472	448	426	406	387
843	779	725	678	636	600	567	537	511	487	465
982	909	846	791	742	700	661	627	596	569	543
1122	1038	966	903	848	800	756	717	682	650	621
1262	1168	1087	1016	954	900	851	807	767	732	699
1401	1297	1207	1129	1060	1000	945	897	853	813	777
1541	1426	1328	1242	1166	1100	1040	986	938	895	855
1680	1556	1448	1355	1272	1200	1135	1076	1024	976	933
1820	1685	1569	1467	1378	1300	1229	1166	1109	1057	1010
1960	1815	1689	1580	1484	1400	1324	1256	1195	1139	1088
2100	1944	1810	1693	1590	1500	1418	1346	1280	1220	1166
2240	2074	1931	1806	1697	1600	1513	1435	1365	1302	1244
2381	2204	2052	1919	1803	1700	1607	1525	1450	1383	1321
2522	2334	2173	2032	1909	1800	1702	1615	1536	1464	1399

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	0.6	0:18
200	0.8	0.9	0.9	0.9	1.0	1.1	1.2	1.2	1.3	1.3	0:35
300	1.3	1.4	1.5	1.5	1.7	1.8	1.9	2.0	2.1	2.2	0:52
400	1.7	1.8	2.0	2.1	2.3	2.5	2.6	2.8	2.9	3.1	1:10
500	2.1	2.3	2.5	2.7	2.9	3.1	3.3	3.5	3.7	3.9	1:27
600	2.5	2.8	3.0	3.2	3.5	3.7	4.0	4.2	4.4	4.7	1:44
700	2.9	3.2	3.5	3.8	4.0	4.3	4.6	4.9	5.2	5.5	2:01
800	3.3	3.6	4.0	4.3	4.6	4.9	5.3	5.6	5.9	6.3	2:18
900	3.7	4.1	4.4	4.8	5.2	5.5	5.9	6.3	6.6	7.0	2:35
1000	4.1	4.5	4.9	5.3	5.7	6.1	6.6	7.0	7.4	7.8	2:52
1100	4.5	4.9	5.4	5.8	6.3	6.7	7.2	7.6	8.1	8.6	3:09
1200	4.9	5.4	5.9	6.3	6.8	7.3	7.8	8.3	8.8	9.3	3:26
1300	5.3	5.8	6.3	6.8	7.4	7.9	8.4	9.0	9.5	10.1	3:43
1400	5.6	6.2	6.8	7.3	7.9	8.5	9.1	9.6	10.2	10.8	4:00
1500	6.0	6.6	7.2	7.8	8.5	9.1	9.7	10.3	10.9	11.5	4:17
1600	6.4	7.0	7.7	8.3	9.0	9.6	10.3	10.9	11.6	12.3	4:35
1700	6.8	7.4	8.1	8.8	9.5	10.2	10.9	11.6	12.3	13.0	4:52
1800	7.1	7.9	8.6	9.3	10.0	10.8	11.5	12.2	12.9	13.7	5:09

Includes APU fuel burn.
Driftdown at optimum driftdown speed and cruise at LRC 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	15400	13200	10200
80	17300	15600	13000
75	19300	17700	15600
70	21000	19800	17800
65	22600	21500	20100
60	24200	23200	21900
55	26500	25000	23800
50	29200	27900	26200
45	31500	30600	29300
40	33900	33000	31900

With engine anti-ice on, decrease altitude capability by 1300 ft.
With engine and wing anti-ice on, decrease altitude capability by 5900 ft.

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)										
		10	15	17	19	21	23	25	27	29	31	33
85	%N1	91.7	95.4	97.8								
	MACH	.548	.582	.597								
	KIAS	304	294	291								
	FF/ENG	3048	2989	3006								
80	%N1	90.3	93.7	95.7	98.5							
	MACH	.536	.572	.586	.601							
	KIAS	297	289	285	281							
	FF/ENG	2883	2820	2805	2840							
75	%N1	88.7	92.2	93.8	96.0							
	MACH	.524	.562	.575	.589							
	KIAS	290	284	279	276							
	FF/ENG	2718	2662	2629	2625							
70	%N1	87.1	90.6	92.0	93.8	96.2						
	MACH	.510	.549	.564	.577	.592						
	KIAS	283	277	274	270	266						
	FF/ENG	2553	2499	2471	2440	2452						
65	%N1	85.4	88.9	90.3	91.8	93.7	96.4					
	MACH	.496	.534	.550	.565	.579	.594					
	KIAS	274	269	267	264	260	256					
	FF/ENG	2390	2336	2310	2281	2258	2283					
60	%N1	83.6	87.0	88.5	89.9	91.5	93.5	96.3				
	MACH	.480	.519	.535	.550	.566	.579	.595				
	KIAS	266	261	259	257	254	250	246				
	FF/ENG	2226	2172	2146	2120	2096	2080	2113				
55	%N1	81.5	85.0	86.4	87.9	89.4	91.0	93.1	96.0			
	MACH	.464	.502	.518	.534	.550	.566	.579	.595			
	KIAS	256	253	251	249	246	244	239	236			
	FF/ENG	2059	2008	1983	1958	1936	1916	1906	1941			
50	%N1	79.3	82.8	84.3	85.7	87.2	88.7	90.3	92.5	95.5		
	MACH	.446	.483	.499	.515	.531	.548	.564	.578	.594		
	KIAS	246	243	242	240	238	236	233	229	226		
	FF/ENG	1894	1845	1821	1796	1774	1754	1740	1735	1765		
45	%N1	76.9	80.4	81.8	83.3	84.7	86.2	87.7	89.3	91.6	94.6	
	MACH	.427	.463	.479	.495	.511	.528	.544	.561	.576	.592	
	KIAS	236	233	231	230	228	226	224	222	218	215	
	FF/ENG	1733	1680	1658	1635	1613	1593	1578	1570	1564	1589	
40	%N1	74.5	77.7	79.2	80.6	82.1	83.5	85.0	86.5	88.1	90.3	93.2
	MACH	.407	.441	.456	.472	.488	.505	.521	.539	.556	.571	.587
	KIAS	225	222	220	219	218	216	214	213	210	207	204
	FF/ENG	1575	1516	1494	1473	1453	1434	1419	1409	1401	1395	1409

ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (KTS)	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	180	172	164	158
594	543	498	461	429	400	379	361	344	328	315
895	817	749	692	643	600	569	541	516	492	472
1196	1091	999	923	858	800	759	722	687	656	629
1500	1368	1252	1155	1073	1000	949	902	859	820	785
1805	1645	1504	1387	1288	1200	1138	1081	1030	983	942
2113	1924	1758	1621	1504	1400	1327	1261	1201	1146	1098
2422	2204	2013	1854	1719	1600	1517	1442	1372	1309	1253
2733	2485	2267	2087	1935	1800	1707	1621	1543	1472	1409

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	0:42	1.2	0:41	1.1	0:39	1.0	0:38	0.9	0:37
400	2.9	1:22	2.6	1:18	2.4	1:15	2.2	1:13	2.1	1:11
600	4.4	2:02	4.0	1:57	3.7	1:52	3.4	1:48	3.3	1:44
800	5.8	2:42	5.4	2:35	5.0	2:28	4.6	2:23	4.4	2:18
1000	7.3	3:23	6.7	3:14	6.2	3:05	5.8	2:58	5.6	2:52
1200	8.7	4:05	8.0	3:53	7.4	3:43	6.9	3:33	6.7	3:26
1400	10.1	4:47	9.4	4:33	8.7	4:20	8.1	4:09	7.8	4:01
1600	11.5	5:29	10.7	5:13	9.9	4:58	9.2	4:45	8.8	4:36
1800	12.9	6:12	11.9	5:53	11.1	5:36	10.3	5:22	9.9	5:10

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	40	50	60	70	80
1	-0.1	-0.1	0.0	0.1	0.2
2	-0.3	-0.1	0.0	0.3	0.6
3	-0.4	-0.2	0.0	0.5	1.0
4	-0.6	-0.3	0.0	0.7	1.4
5	-0.7	-0.4	0.0	0.9	1.8
6	-0.9	-0.4	0.0	1.1	2.2
7	-1.0	-0.5	0.0	1.3	2.6
8	-1.2	-0.6	0.0	1.5	2.9
9	-1.3	-0.7	0.0	1.6	3.3
10	-1.5	-0.7	0.0	1.8	3.7
11	-1.6	-0.8	0.0	2.0	4.1
12	-1.8	-0.9	0.0	2.1	4.4
13	-1.9	-1.0	0.0	2.3	4.8
14	-2.0	-1.0	0.0	2.4	5.2

Includes APU fuel burn.

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT) 1500	5000	10000	15000	20000	25000	30000	35000
90	%N1	82.9	85.7	90.0	95.1				
	KIAS	257	258	259	261				
	FF/ENG	2910	2910	2930	3020				
85	%N1	81.2	84.1	88.3	92.9				
	KIAS	250	251	252	253				
	FF/ENG	2740	2740	2750	2810				
80	%N1	79.6	82.4	86.6	91.0	98.6			
	KIAS	242	243	244	245	247			
	FF/ENG	2590	2570	2570	2610	2770			
75	%N1	77.9	80.6	84.8	89.2	95.3			
	KIAS	234	236	236	238	239			
	FF/ENG	2430	2410	2400	2430	2500			
70	%N1	76.1	78.7	82.9	87.1	92.3			
	KIAS	227	227	228	229	231			
	FF/ENG	2270	2250	2240	2250	2280			
65	%N1	74.1	76.8	80.8	85.1	89.7	98.0		
	KIAS	219	219	220	221	222	224		
	FF/ENG	2110	2090	2070	2080	2090	2260		
60	%N1	71.9	74.8	78.6	82.9	87.4	94.0		
	KIAS	210	210	211	212	213	214		
	FF/ENG	1960	1940	1910	1910	1910	1980		
55	%N1	69.6	72.4	76.3	80.5	84.9	90.1		
	KIAS	200	201	202	203	204	205		
	FF/ENG	1810	1780	1760	1740	1740	1770		
50	%N1	67.1	69.8	73.9	77.9	82.3	87.0	95.2	
	KIAS	191	191	192	193	194	195	196	
	FF/ENG	1660	1630	1610	1580	1570	1580	1700	
45	%N1	64.5	67.1	71.2	75.2	79.5	84.0	89.8	
	KIAS	182	182	182	183	184	185	186	
	FF/ENG	1510	1480	1450	1430	1410	1410	1460	
40	%N1	61.4	64.3	68.1	72.3	76.3	80.8	85.6	94.5
	KIAS	175	175	175	175	175	175	175	176
	FF/ENG	1360	1340	1310	1280	1250	1240	1270	1370

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

Intentionally
Blank

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	43.8	47.6	51.4	55.2	58.9	62.7	66.5	70.2	74.0	77.8	81.6
CLIMB	43.0	46.7	50.5	54.2	58.0	61.7	65.5	69.2	73.0	76.7	80.5
OBSTACLE	43.0	46.7	50.5	54.3	58.0	61.8	65.5	69.3	73.0	76.8	80.5
TIRE	45.8	49.8	53.8	57.8	61.8	65.8	69.8	73.8	77.8	81.8	85.8
BRAKE	45.3	49.3	53.3	57.3	61.3	65.3	69.3	73.3	77.3	81.3	85.3

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

OAT		AIRPORT PRESSURE ALTITUDE (FT)												
°C	°F	-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
60	140	92.6	93.2	93.6	93.7	93.8	93.9	94.0	94.1	94.0	93.7	93.6	93.5	93.5
55	131	93.2	93.8	94.3	94.4	94.5	94.6	94.7	94.9	94.7	94.4	94.1	93.5	92.8
50	122	93.8	94.4	94.9	95.1	95.2	95.4	95.5	95.6	95.5	95.2	94.9	94.4	93.9
45	113	94.6	95.2	95.6	95.8	95.9	96.1	96.2	96.3	96.2	95.9	95.6	95.3	94.9
40	104	95.2	95.9	96.4	96.5	96.6	96.7	96.8	97.0	96.9	96.6	96.3	96.2	95.9
35	95	95.8	96.5	97.2	97.3	97.4	97.5	97.6	97.7	97.6	97.3	97.0	96.9	96.8
30	86	95.4	96.6	98.1	98.1	98.2	98.2	98.3	98.3	98.2	98.1	97.8	97.7	97.7
25	77	94.6	95.9	97.3	97.9	98.5	98.6	98.5	98.5	98.5	98.5	98.4	98.4	98.5
20	68	93.8	95.1	96.6	97.1	97.7	98.0	98.3	98.6	98.6	98.7	98.6	98.6	98.6
15	59	93.0	94.3	95.8	96.4	97.0	97.3	97.6	97.9	98.3	98.7	98.9	98.9	98.9
10	50	92.3	93.6	95.0	95.6	96.2	96.5	96.8	97.2	97.5	97.9	98.3	98.8	99.3
5	41	91.5	92.8	94.2	94.8	95.4	95.8	96.1	96.4	96.8	97.2	97.6	98.1	98.5
0	32	90.7	92.0	93.4	94.1	94.7	95.0	95.3	95.7	96.0	96.4	96.8	97.3	97.8
-5	23	89.8	91.2	92.6	93.3	93.9	94.2	94.5	94.9	95.3	95.7	96.1	96.5	97.0
-10	14	89.0	90.4	91.8	92.5	93.1	93.4	93.8	94.1	94.5	94.9	95.3	95.8	96.2
-15	5	88.2	89.5	91.0	91.7	92.3	92.6	93.0	93.4	93.7	94.1	94.5	95.0	95.4
-20	-4	87.4	88.7	90.2	90.8	91.5	91.8	92.2	92.6	93.0	93.4	93.7	94.2	94.6
-25	-13	86.5	87.9	89.4	90.0	90.7	91.0	91.4	91.8	92.2	92.6	93.0	93.4	93.8
-30	-22	85.7	87.0	88.5	89.2	89.8	90.2	90.6	91.0	91.4	91.8	92.1	92.6	93.0
-35	-31	84.8	86.2	87.7	88.3	89.0	89.4	89.7	90.2	90.6	90.9	91.3	91.8	92.2
-40	-40	83.9	85.3	86.8	87.5	88.1	88.5	88.9	89.3	89.7	90.1	90.5	90.9	91.4
-45	-49	83.1	84.4	86.0	86.6	87.3	87.7	88.1	88.5	88.9	89.3	89.7	90.1	90.5
-50	-58	82.2	83.5	85.1	85.7	86.4	86.8	87.2	87.7	88.1	88.4	88.8	89.3	89.7

%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	0.7	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 55

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	15100	12000	8900
80	17900	15100	12100
75	20800	18000	15300
70	23300	20900	18200
65	25800	24000	21300
60	28300	26800	24900
55	30600	29400	27800
50	32700	31700	30400
45	34900	33900	32700
40	37300	36300	35200

GEAR DOWN

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	21	23	25	27	29	31	33	35	37
85	%N1	86.2									
	MACH	.482									
	KIAS	267									
	FF/ENG	2446									
80	%N1	84.5									
	MACH	.468									
	KIAS	259									
	FF/ENG	2294									
75	%N1	82.8	92.1								
	MACH	.454	.554								
	KIAS	251	248								
	FF/ENG	2145	2123								
70	%N1	80.9	90.1	92.1							
	MACH	.440	.541	.557							
	KIAS	243	242	240							
	FF/ENG	1998	1981	1971							
65	%N1	78.9	88.2	89.8	92.0	95.0					
	MACH	.425	.524	.543	.560	.578					
	KIAS	235	234	233	231	229					
	FF/ENG	1855	1832	1825	1824	1858					
60	%N1	76.8	85.9	87.7	89.4	91.7	94.9				
	MACH	.409	.504	.525	.544	.562	.580				
	KIAS	226	225	225	224	222	220				
	FF/ENG	1716	1678	1679	1676	1681	1716				
55	%N1	74.7	83.6	85.3	87.1	88.9	91.3	94.6			
	MACH	.393	.484	.504	.525	.545	.562	.581			
	KIAS	217	216	216	216	215	213	211			
	FF/ENG	1577	1530	1527	1531	1534	1539	1573			
50	%N1	72.2	81.0	82.7	84.5	86.3	88.1	90.6	93.9		
	MACH	.376	.463	.482	.502	.523	.544	.561	.580		
	KIAS	207	206	206	206	206	205	203	201		
	FF/ENG	1442	1385	1381	1381	1389	1392	1395	1429		
45	%N1	69.5	78.3	80.0	81.7	83.4	85.2	87.1	89.5	92.9	
	MACH	.358	.441	.458	.477	.498	.520	.541	.559	.578	
	KIAS	197	196	196	196	196	196	195	193	191	
	FF/ENG	1311	1244	1237	1237	1242	1247	1251	1252	1280	
40	%N1	66.6	75.2	76.9	78.6	80.3	82.0	83.9	85.8	88.0	91.8
	MACH	.340	.417	.434	.452	.471	.491	.513	.535	.554	.573
	KIAS	187	185	185	185	185	185	185	185	183	181
	FF/ENG	1186	1109	1097	1095	1100	1103	1105	1108	1109	1136

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
655	584	523	474	435	400	377	357	338	321	307
990	881	787	713	653	600	566	535	507	482	460
1330	1181	1054	953	871	800	755	713	676	642	613
1675	1485	1323	1195	1091	1000	943	891	844	803	766
2026	1792	1593	1436	1310	1200	1131	1069	1013	962	918
2383	2104	1866	1680	1530	1400	1319	1246	1180	1121	1069
2746	2420	2142	1925	1751	1600	1507	1423	1347	1279	1220
3116	2740	2420	2171	1972	1800	1695	1600	1514	1437	1370

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	5.0	1:36	4.6	1:32	4.1	1:25	3.8	1:20	3.5	1:17
600	7.5	2:25	6.9	2:17	6.2	2:06	5.7	1:59	5.4	1:54
800	9.9	3:14	9.2	3:03	8.2	2:48	7.7	2:38	7.3	2:31
1000	12.3	4:05	11.4	3:51	10.2	3:31	9.6	3:18	9.1	3:08
1200	14.6	4:56	13.6	4:39	12.2	4:14	11.4	3:59	10.8	3:46
1400	16.9	5:49	15.7	5:28	14.1	4:59	13.2	4:40	12.6	4:25
1600	19.1	6:43	17.8	6:19	16.0	5:44	15.0	5:22	14.2	5:04
1800	21.3	7:39	19.9	7:11	17.9	6:30	16.7	6:05	15.9	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	-0.6	-0.3	0.0	0.6	1.4
6	-1.0	-0.5	0.0	0.9	2.0
8	-1.3	-0.7	0.0	1.2	2.6
10	-1.6	-0.8	0.0	1.4	3.2
12	-2.0	-1.0	0.0	1.6	3.7
14	-2.3	-1.2	0.0	1.9	4.2
16	-2.7	-1.3	0.0	2.1	4.6
18	-3.0	-1.5	0.0	2.2	5.0
20	-3.3	-1.7	0.0	2.4	5.4
22	-3.7	-1.8	0.0	2.5	5.7

GEAR DOWN

Descent
VREF40 + 70 KIAS

PRESSURE ALTITUDE (FT)	TIME (MIN)	FUEL (KG)	DISTANCE (NM)
41000	21	280	90
39000	20	280	86
37000	19	270	81
35000	19	270	77
33000	18	260	72
31000	17	260	68
29000	16	250	64
27000	16	240	60
25000	15	240	56
23000	14	230	52
21000	13	220	48
19000	12	220	44
17000	12	210	40
15000	11	200	36
10000	8	170	26
5000	6	140	16
1500	4	120	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
90	%N1	77.5	80.2	84.5	89.0				
	KIAS	233	233	233	233				
	FF/ENG	2390	2380	2380	2400				
85	%N1	76.0	78.7	82.9	87.3				
	KIAS	228	228	228	228				
	FF/ENG	2260	2250	2240	2260				
80	%N1	74.4	77.1	81.3	85.6	90.2			
	KIAS	223	223	223	223	223			
	FF/ENG	2130	2120	2100	2110	2130			
75	%N1	72.6	75.5	79.5	83.8	88.4			
	KIAS	218	218	218	218	218			
	FF/ENG	2010	1990	1970	1980	1980			
70	%N1	70.7	73.7	77.6	81.9	86.4	92.0		
	KIAS	213	213	213	213	213	213		
	FF/ENG	1880	1860	1850	1840	1840	1880		
65	%N1	68.9	71.7	75.8	80.0	84.4	89.2		
	KIAS	207	207	207	207	207	207		
	FF/ENG	1770	1740	1720	1710	1700	1720		
60	%N1	67.0	69.7	73.9	77.9	82.3	86.9	94.4	
	KIAS	201	201	201	201	201	201	201	
	FF/ENG	1650	1620	1600	1580	1570	1580	1670	
55	%N1	64.9	67.6	71.7	75.7	80.1	84.6	90.2	
	KIAS	195	195	195	195	195	195	195	
	FF/ENG	1530	1510	1480	1460	1440	1440	1490	
50	%N1	62.5	65.4	69.3	73.5	77.7	82.2	86.9	
	KIAS	189	189	189	189	189	189	189	
	FF/ENG	1420	1390	1360	1340	1320	1320	1340	
45	%N1	60.0	63.0	66.8	71.0	75.1	79.6	84.2	91.2
	KIAS	182	182	182	182	182	182	182	182
	FF/ENG	1300	1280	1250	1230	1200	1190	1210	1260
40	%N1	57.7	60.3	64.4	68.3	72.6	76.9	81.3	86.5
	KIAS	175	175	175	175	175	175	175	175
	FF/ENG	1190	1170	1150	1120	1090	1070	1090	1100

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

Intentionally
Blank

Performance Inflight — Chapter PI
Gear Down, Engine Inop — Section 56

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 DRIFTOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
80	76	222	3800	2100	
75	71	217	6200	4700	2600
70	66	212	8600	7300	5300
65	62	207	11000	9800	8000
60	57	201	13300	12400	11000
55	52	195	15800	15000	14000
50	47	189	18400	17500	16700
45	43	182	20900	20100	19200
40	38	176	23300	22500	21700

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	1100		
70	4200	2000	
65	7300	5600	2900
60	10400	8900	6500
55	13100	12100	10300
50	16000	15200	14200
45	19100	18200	17300
40	22100	21300	20300

GEAR DOWN
ENGINE INOP

MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)								
		5	7	9	11	13	15	17	19	21
70	%N1	95.1								
	MACH	.389								
	KIAS	235								
	FF/ENG	3802								
65	%N1	92.8	94.6	97.2						
	MACH	.376	.389	.402						
	KIAS	228	227	226						
	FF/ENG	3509	3512	3554						
60	%N1	90.5	92.1	93.9	96.6					
	MACH	.364	.375	.388	.402					
	KIAS	220	219	218	218					
	FF/ENG	3226	3220	3222	3266					
55	%N1	88.1	89.6	91.3	93.1	95.7				
	MACH	.351	.362	.374	.387	.400				
	KIAS	212	211	210	209	209				
	FF/ENG	2960	2941	2933	2936	2974				
50	%N1	85.7	87.1	88.6	90.2	91.9	94.5	98.5		
	MACH	.338	.348	.359	.371	.384	.398	.412		
	KIAS	204	203	202	201	200	199	198		
	FF/ENG	2710	2680	2660	2651	2654	2677	2758		
45	%N1	83.1	84.4	85.8	87.3	88.9	90.6	93.0	96.8	
	MACH	.325	.334	.344	.355	.367	.380	.393	.408	
	KIAS	196	195	193	192	191	190	189	189	
	FF/ENG	2471	2435	2405	2384	2375	2372	2377	2436	
40	%N1	80.3	81.6	82.9	84.3	85.7	87.3	89.1	91.1	94.4
	MACH	.311	.320	.329	.339	.349	.361	.374	.387	.402
	KIAS	188	186	184	183	182	181	180	179	179
	FF/ENG	2244	2201	2165	2136	2114	2099	2088	2082	2119

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)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
167	148	132	119	109	100	94	88	82	78	74
341	300	266	239	218	200	187	174	164	155	147
516	454	402	361	328	300	280	261	245	231	219
692	608	537	482	438	400	373	348	326	307	291
869	763	673	603	548	500	465	434	407	383	363
1048	919	809	725	658	600	558	521	488	459	434
1228	1076	947	847	768	700	651	607	568	535	506
1410	1234	1084	970	879	800	744	693	648	610	577
1593	1392	1222	1092	989	900	836	779	729	685	648
1778	1552	1361	1215	1100	1000	929	865	809	760	719

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	4.0	1:18	3.7	1:15	3.6	1:12
400	5.3	1:44	4.9	1:39	4.8	1:35
500	6.6	2:10	6.2	2:04	6.0	1:58
600	7.9	2:37	7.4	2:29	7.2	2:22
700	9.2	3:04	8.6	2:55	8.3	2:46
800	10.4	3:31	9.8	3:20	9.5	3:10
900	11.7	3:58	11.0	3:46	10.6	3:35
1000	12.9	4:25	12.1	4:12	11.7	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	-0.7	-0.4	0.0	0.7	1.3
5	-0.9	-0.4	0.0	0.9	1.7
6	-1.0	-0.5	0.0	1.0	2.0
7	-1.2	-0.6	0.0	1.2	2.4
8	-1.4	-0.7	0.0	1.4	2.7
9	-1.5	-0.8	0.0	1.5	3.0
10	-1.7	-0.9	0.0	1.7	3.4
11	-1.9	-1.0	0.0	1.9	3.7
12	-2.1	-1.1	0.0	2.0	4.0
13	-2.2	-1.1	0.0	2.2	4.4

Includes APU fuel burn.

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Holding

Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
80	%N1	93.6				
	KIAS	223				
	FF/ENG	4160				
75	%N1	91.5	94.8			
	KIAS	218	218			
	FF/ENG	3880	3920			
70	%N1	89.4	92.6			
	KIAS	213	213			
	FF/ENG	3600	3640			
65	%N1	87.4	90.4	95.7		
	KIAS	207	207	207		
	FF/ENG	3340	3360	3430		
60	%N1	85.1	88.1	92.7		
	KIAS	201	201	201		
	FF/ENG	3090	3090	3130		
55	%N1	82.7	85.7	90.2	96.9	
	KIAS	195	195	195	195	
	FF/ENG	2840	2840	2850	2970	
50	%N1	80.1	83.1	87.4	92.4	
	KIAS	189	189	189	189	
	FF/ENG	2600	2590	2590	2630	
45	%N1	77.5	80.4	84.7	89.3	97.1
	KIAS	182	182	182	182	182
	FF/ENG	2380	2360	2340	2360	2470
40	%N1	74.9	77.6	81.9	86.2	91.6
	KIAS	175	175	175	175	175
	FF/ENG	2160	2140	2120	2120	2130

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

Performance Inflight — Chapter PI
Text — Section 57

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 provided that adjustments are made to V1 for clearway, stopway, anti-skid inoperative, thrust reversers inoperative, improved climb, contaminated runway situations or brake energy limits. These speeds may be used for weights less than or equal to the performance limited weight.

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. Takeoff is not permitted in this condition as certified limits have been exceeded. The options are to select a smaller flap setting, select derate thrust and/or add weight (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.

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.

Clearway and Stopway V1 Adjustments

Maximum allowable clearway limits are provided for guidance when more precise data is not available. Use of clearway is not allowed on wet runways.

Takeoff speed adjustments are to be applied to V1 speed when using takeoff weights based on the use of clearway and stopway.

Adjust V1 speed by the amount shown in the table. The adjusted V1 speed must not exceed VR. If the adjusted V1 speed is greater than VR, reduce V1 to equal VR.

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.

With autothrottles disengaged an approach speed wind correction (max 20 knots) of 1/2 steady headwind component + gust increment above steady wind is recommended. Do not apply a wind correction for tailwinds. The maximum command speed should not exceed landing flap placard speed minus 5 knots.

Flap Maneuver Speeds

This table provides the flap speed schedule for recommended maneuver speeds. Using VREF as the basis for the schedule makes it variable as a function of weight and will provide adequate maneuver margin above stall at all weights.

During flap retraction/extension, movement of the flap to the next position should be initiated when within 20 knots of the recommended speed for that position.

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 depths greater than 0.5 inches (13 mm) are not recommended because of possible airplane damage as a result of slush impingement on the airplane structure. The use of assumed temperature for reduced thrust is not allowed on contaminated runways. Interpolation for slush/standing water depths between the values shown is permitted.

Takeoff weight 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 8200 kg and the V1 associated with the reduced weight by the amount shown in the table below.

ANTI-SKID INOPERATIVE V1 ADJUSTMENTS	
FIELD LENGTH (FT)	V1 ADJUSTMENT (KIAS)
6000	-21
8000	-17
10000	-14
12000	-11
14000	-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 5800 ft.

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 field/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/field/obstacle limited weight by 900 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 4000 ft.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

Takeoff %N1

To find Max Takeoff %N1 based on normal engine bleed for air conditioning packs on, enter Takeoff %N1 table with airport pressure altitude and airport OAT and read %N1. For packs off operation, apply the %N1 adjustment shown below the table. No takeoff %N1 adjustment is required for engine and wing anti-ice.

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.

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

Normal Configuration Landing Distance

The normal configuration distance tables are provided as advisory information to help determine the actual landing distance performance of the airplane for different runway surface conditions and brake configurations.

Flaps 15, 30, and 40 landing distances and adjustments are provided for dry runways as well as runways with good, medium, and poor reported braking action, which are commonly referred to as slippery runway conditions.

If the surface is affected by water, snow or ice, and the 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 landing. 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 "poor" data reflects runways covered with wet ice.

Dry runway landing performance is shown for max manual braking configuration and autobrake settings max, 3, 2, and 1. Use of autobrake setting 1 is not recommended for landings on slippery runways, and is therefore not provided for these conditions. The autobrake performance may be used to assist in the selection of the most desirable autobrake setting for a given field length. Selection of an autobrake setting results in a constant rate of deceleration. Maximum effort manual braking should achieve shorter landing distance than the max autobrake setting. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and normal approach speed for the selected landing flap at sea level, zero wind, zero slope, and two engine detent reverse thrust. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, temperature, speed, and reverse thrust. Each adjustment is independently added to the reference landing distance.

Non-normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect the landing performance of the airplane. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, and speed conditions. Each adjustment is independently added to the reference landing distance. Landing distance includes the effect of max manual braking and reverse thrust.

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 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.

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.