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777-200/-200LR/-300/-300ER/
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Flight Crew Operations Manual

The Boeing Company

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Preface

Revision Notice

Chapter 0

Section RevNotice

PAPER manuals

This is a PARTIAL revision. Only revised pages and their associated backing pages are printed. Be careful not to discard unchanged pages from previous revisions, or bulletins you may have received while this revision was being printed and shipped.

DIGITAL data

For customers receiving digital data by way of CD or MyBoeingFleet, there are files of only revised pages and files of the complete manuals (volume 1, volume 2 and the QRH). During the assembly process, revision bars from previous revisions are removed from the pages of the complete manuals files. These pages are not reprinted and shipped with the paper manuals unless they contain new changes.

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Preface

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Preface**Model Identification****Chapter 0****Section 1****General**

The airplanes listed in the table below are covered in this manual. The numbers are used to distinguish data peculiar to one or more, but not all of the airplanes. Where data applies to all airplanes listed, no reference is made to individual airplane numbers.

The table permits flight crew correlation of configuration differences by Registry Number in alpha/numeric order within an operator's fleet for airplanes covered in this manual. Configuration data reflects the airplane as delivered configuration and is updated for service bulletin incorporations in conformance with the policy stated in the introduction section of this chapter.

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

Airplane Number	Registry Number	Serial Number	Tabulation Number
200	777-200	7200	WY200
200ER	777-200ER	7250	WY250
200F	777-200F	7270	WY270
200LR	777-200LR	7260	WY260
300	777-300	7300	WY300
300ER	777-300ER	7350	WY350

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Preface**Introduction****Chapter 0****Section 2****General**

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

- provide the operating limitations, procedures, performance, and systems information the flight crew needs to safely and efficiently operate the 777 airplane during all anticipated airline operations
- serve as a comprehensive reference for use during transition training for the 777 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.

The 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 manual 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:

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Seattle, Washington 98124-2207 USA
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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.
- Performance Inflight chapter contains performance information necessary for inflight use.

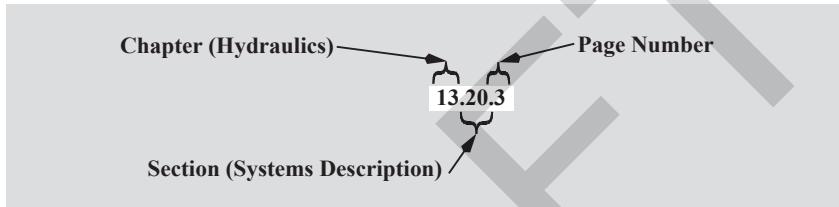
Volume 2 – Chapters 1 through 15 contain general airplane and systems information. These chapters are generally subdivided into sections covering controls and indicators and systems descriptions.

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

Page Numbering

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

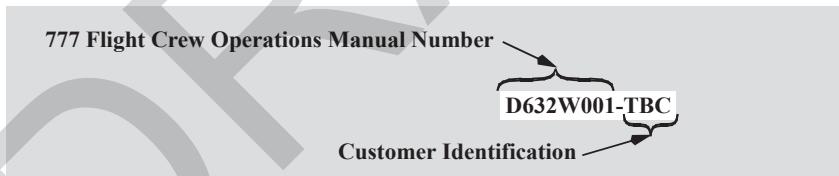
Example Page Number



Page Identification

Each page is identified by a customer document number and a page date. The customer document number is composed of the general 777 FCOM number, D632W001–, and is followed by the customer identification.

Example Page Identification



Warnings, Cautions, and Notes

The following levels of written advisories are used throughout the FCOM and are not to be confused with EICAS messages, which are separately identified in the text.

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.

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Flight Crew Operations Manual Configuration

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

Options

[TBC only]

The following terms, enclosed in brackets, are used in this manual:

- [Airline Selectable Option] – this indicates a system feature basic to an airplane system that can be activated or deactivated by an airline.
- [Option] – this indicates a system or certification option. This term will not usually appear in a manual unless the customer configuration information is incomplete when the manual goes to print.

Airplane Effectivities

Differences in airplane configuration are shown by use of airplane effectivities throughout Volumes 1 and 2, and the Quick Reference Handbook. The following rules are used to express airplane effectivities:

- Airplane effectivities are listed in alpha-numeric order. A range of airplanes is defined by a dash, e.g. N-MA - N-PQ includes all "M" series airplanes and all "P" series aircraft through N-PQ. A comma in the effectivity range indicates a break in the range, e.g. N-FA - N-FC, N-FE - N-FG; airplane N-FD is excluded from the range.
- Airplane effectivities apply only to the paragraph, illustration, operational note, procedural step, etc. and to subordinate items (if any).

Example (with subordinate items):

N-AA - N-BB
CABIN CREW COMMUNICATIONS.....ESTABLISH
Evacuate lower crew rest compartment and close hatches.

Plan to land at the nearest suitable airport

In this example, the effectivity N-AA - N-BB applies to the first procedural step (CABIN CREW....) and further indented/subordinate step (Evacuate....). The effectivity does not apply to the next equivalently indented step (Plan to land.....).

Example (without subordinate items):

**N-XX - N-YY**

NOTE: Slats will extend beyond midrange when airspeed is below 246 knots. For go-around, do not exceed 246 knots until slats retract to midrange.

NOTE: Use flaps 20 and VREF20 for landing.

In this example, the effectiveness N-XX - N-YY applies to the first operational note only. The effectiveness does not apply to the next equivalently indented note.

When airplane effectivities are centered immediately below a checklist title, the entire checklist applies to the listed airplanes. In the following example, the PACK L, R checklist is applicable to N-XX - N-YY only:

□ PACK L, R**N-XX - N-YY**

When Boeing has been notified airplanes are to be modified by service bulletin (SB), the effectiveness statement will include the range of airplanes being modified in parentheses. Depending upon the modification, there may be both a ‘before’ and ‘after’ version.

The text before the semicolon in the parentheses lists the range of airplanes being modified. The text after the semicolon indicates the ‘before’ or ‘after’ version and briefly describes what the SB does. The following examples illustrate this:

Example (‘before’ version):

(N-AA - N-BB ; before SB, ELMS software update not installed)

On the ground:

The C2 pump may be load shed by the electrical load management system.

“N-AA - N-BB” ; before SB,” means the incorporation of the SB (i.e. installation of ELMS software update in this example) is scheduled to begin for airplanes N-AA - N-BB. The words “before SB, SB ELMS software update not installed” indicate the associated content applies to N-AA - N-BB until the SB has been incorporated.

Example (‘after’ version):

N-XX - N-YY

(N-AA - N-BB ; SB installs ELMS software update)

On the ground:

With only a single ground power source, including the APU, the C2 pump will not run if the C1 pump is selected.

For airplanes N-XX - N-YY, the SB (i.e. installation of the ELMS software update in this example) has been incorporated. The associated content applies to N-XX - N-YY.

“N-AA - N-BB ; SB” means the incorporation of the SB (i.e. installation of ELMS software update in this example) is scheduled to begin for airplanes N-AA - N-BB. The words “installs ELMS software update” indicate the associated content will apply to N-AA - N-BB when the SB has been completed.

When Boeing is notified of SB status updates, the effectivity statements will be updated as appropriate in the next FCOM revision. When Boeing is notified the SB has been completed on all airplanes, the effectivity statement in parentheses and before SB content is removed.

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Preface
Abbreviations
Chapter 0
Section 3
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	
ABV	Above
AC	Alternating Current
ACARS	Aircraft Communications Addressing and Reporting System
ACP	Audio Control Panel
ACT	Active
ADC	Air Data Computer
ADF	Automatic Direction Finder
ADI	Attitude Director Indicator
ADIRS	Air Data Inertial Reference System
ADIRU	Air Data Inertial Reference Unit
AFDS	Autopilot Flight Director System
AFM	Airplane Flight Manual (FAA approved)
A/G	Air/Ground
AGL	Above Ground Level
AIL	Aileron
ALT	Altitude
ALTN	Alternate

AM	Amplitude Modulation
AMI	Airline Modifiable Information
ANP	Actual Navigational Performance
ANT	Antenna
AOA	Angle of Attack
A/P	Autopilot
APL	Airplane
APP	Approach
APU	Auxiliary Power Unit
ARINC	Aeronautical Radio, Incorporated
ARPT	Airport
ARR	Arrival
ASA	Autoland Status Annunciator
ASYM	Asymmetry
A/T	Autothrottle
ATA	Actual Time of Arrival
ATC	Air Traffic Control
ATT	Attitude
AUTO-THROT	Autothrottle
AUTO	Automatic

AUX	Auxiliary
AVAIL	Available
B	
BARO	Barometric
BAT	Battery
B/CRS	Back Course
BFO	Beat Frequency Oscillator
BKR	Breaker
BLD	Bleed
BLW	Below
BRG	Bearing
BRT	Bright
BTL	Bottle
C	
C	Captain Celsius Center Cool
CANC	Cancel
CAP	Capture
CAPT	Captain
CB	Circuit Breaker
CDU	Control Display Unit
CG	Center of Gravity
CHR	Chronograph
CKT	Circuit
CL	Close
CLB	Climb
CLR	Clear
CMD	Command

CO	Company
COMM	Communication
COMP	Comparator
COMPT	Compartment
CON	Continuous
CONFIG	Configuration
CONT	Control
COOL	Cooling
CRS	Course
CRT	Cathode Ray Tube
CRZ	Cruise
CTL	Control
CTR	Center
D	
DA(H)	Decision Altitude (Height)
DC	Direct Current
DDG	Dispatch Deviations Guide
DEL	Delete
DEP	Departure
DEPR	Depressurize
DES	Descent
DH	Decision Height
DIFF	Differential
DISC	Disconnect
DISCH	Discharge
DK	Deck
DME	Distance Measuring Equipment
DN	Down



DSPL	Display	FCOM	Flight Crew Operations Manual
	E	FD, F/D or FLT DIR	Flight Director
E/D	End of Descent	FF	Fuel Flow
E/E	Electrical/Electronic	FDEVSS	Flight Deck Entry Video Surveillance System
EEC	Electronic Engine Control	FILT	Filter
EFB	Electronic Flight Bag	FL CH or FLCH	Flight Level Change
EFI	Electronic Flight Instruments	FLT	Flight
EFIS	Electronic Flight Instrument System	FMA	Flight Mode Annunciations
EGT	Exhaust Gas Temperature	FMC	Flight Management Computer
EICAS	Engine Indication and Crew Alerting System	FMS	Flight Management System
ELEC	Electrical	F/O or F O	First Officer
ELEV	Elevator	FPA	Flight Path Angle
EMER	Emergency	FPM	Feet Per Minute
ENG	Engine	FPV	Flight Path Vector
ENT	Entry	FREQ	Frequency
EO	Engine Out	F/S	Fast/Slow
EPR	Engine Pressure Ratio	FT	Feet
EQPT or EQUIP	Equipment	FWD	Forward
ETOPS	Extended Operations	FWSOV	Fire Wall Shut Off Valve
EVAC	Evacuation		G
EXEC	Execute	GA	Go-Around
EXT	Extend or External	GEN	Generator
	F	GMT	Greenwich Mean Time
F	Fahrenheit	GND	Ground
FADEC	Full Authority Digital Engine Control	GPS	Global Positioning System
FCC	Flight Control Computer		

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GPWS	Ground Proximity Warning System
G/S	Glide Slope
GS	Ground Speed
H	
HDG	Heading
HF	High Frequency
HI	High
HLD	Hold
HPSOV	High Pressure Shut Off Valve
HSI	Horizontal Situation Indicator
HYD	Hydraulic
I	
IAS	Indicated Airspeed
IDENT	Identification
IGN	Ignition
IGS	Instrument Guidance System
IND LTS	Indicator Lights
INIT	Initialization
INSTR	Instrument
ILS	Instrument Landing System
INBD	Inboard
IND	Indicator
INOP	Inoperative
INT or INTPH	Interphone
INTC	Intercept
IRS	Inertial Reference System

ISA	International Standard Atmosphere
ISLN	Isolation
ISFD	Integrated Standby Flight Display
K	
K or KTS	Knots
KGS	Kilograms
L	
L	Left
LBS	Pounds
LD	Load
LDA	Localizer-type Directional Aid
LDG	Landing
LE	Leading Edge
LIM	Limit
LKD	Locked
L NAV or LNAV	Lateral Navigation
LOC	Localizer
LT	Light
M	
M	Mach
MAG	Magnetic
MAN	Manual
MAX	Maximum
MCP	Mode Control Panel
MDA(H)	Minimum Descent Altitude (Height)
MEL	Minimum Equipment List



MFD	Multifunction Display
MIC	Microphone
MIN	Minimum
MLS	Microwave Landing System
MMO	Maximum Mach Operating Speed
MOD	Modify
MSG	Message
N	
N	Normal
NAV	Navigation
ND	Navigation Display
NM	Nautical Miles
NORM	Normal
NPS	Navigation Performance Scales
N1	Low Pressure Rotor Speed
N2	High Pressure Rotor Speed (Pratt & Whitney engines) Intermediate Pressure Rotor Speed (Rolls-Royce engines)
N3	High Pressure Rotor Speed (Rolls-Royce engines)
O	
OAT	Outside Air Temperature
OFST	Offset
OP	Open
OVHT	Overheat
OVRD	Override

OVSPD	Overspeed
OXY or O2	Oxygen
P	
PA	Passenger Address
PASS	Passenger
PCP	Pilot Call Panel
PERF	Performance
PES	Pitch Enhancement System
PF	Pilot Flying
PFD	Primary Flight Display
PM	Pilot Monitoring
PNL	Panel
POS	Position
PPOS	Present Position
PRES or PRESS	Pressure
PREV	Previous
P/RST	Push To Reset
PROX	Proximity
PRV	Pressure Regulating Valve
PSI	Pounds Per Square Inch
PTH	Path
PTT	Push To Talk
PTU	Power Transfer Unit
PWR	Power
PWS	Predictive Windshear System
Q	
Q	Quantity

QFE	Local Station Pressure
QNH	Local Station Pressure corrected to MSL
QTY	Quantity
	R
R	Right
RA	Radio Altitude Resolution Advisory
RAAS	Runway Awareness and Advisory System
RAD	Radio
RAT	Ram Air Turbine
RDMI	Radio Distance Magnetic Indicator
REC	Recorder
RECIR or RECIRC	Recirculation
REF	Reference
REV	Reverse
RF	Refill
RMI	Radio Magnetic Indicator
RNP	Required Navigational Performance
RNV	Area Navigation (RNAV)
RPM	Revolutions Per Minute
RST	Reset
RSVR	Reservoir
R/T	Radio Transmit
RTE	Route
RTO	Rejected Takeoff
RUD	Rudder

RVSM	Reduced Vertical Separation Minimum
	S
SAAAR/AR	Special Aircraft and Aircrew Authorization Required/Approval Required
SAT	Static Air Temperature
SATCOM	Satellite Communication
SB	Service Bulletin
S/C	Step Climb
SEL	Select
SDF	Simplified Directional Facility
SELCAL	Selective Calling
SENS	Sensitivity
SERV	Service
SPD	Speed
SPDBRK	Speedbrake
STAB	Stabilizer
STBY	Standby
SYS	System
	T
T or TRU	True
T or TK or TRK	Track
TA	Traffic Advisory
TAI	Thermal Anti-Ice
TAT	Total Air Temperature
T/C	Top of Climb
TCAS	Traffic Alert and Collision Avoidance System



T/D	Top of Descent	VOR	VHF Omnidirectional Range
TE	Trailing Edge	VR	Rotation Speed
TEMP	Temperature	VREF	Reference Speed
TERR	Terrain	VSI	Vertical Speed Indicator
TFC	Traffic	V/S	Vertical Speed
TFR	Transfer	VTK	Vertical Track
THR	Throttle Thrust	V1	Takeoff Decision Speed
TO or T/O	Takeoff	V2	Takeoff Safety Speed
TO/GA	Takeoff/Go-Around	W	
TURB	Turbine Turbulence	W	Warm
U		WHL	Wheel
UNLKD	Unlocked	WPT	Waypoint
UNSCHD or UNSCHED	Unscheduled	WXR	Weather Radar
USB	Upper Side Band	X	
UTC	Universal Time Coordinated	X-FEED	Crossfeed
UTIL	Utility	XPDR or XPNDR	Transponder
V		XTK	Cross Track
VA	Design maneuvering Speed		
VAL	Valve		
VERT	Vertical		
VHF	Very High Frequency		
VIB	Vibration		
VLV	Valve		
VMO	Maximum Operating Speed		
V NAV or VNAV	Vertical Navigation		

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Preface
Revision Record
Chapter 0
Section 4
Revision Transmittal Letter

To: All holders of The Boeing Company 777 Flight Crew Operations Manual (FCOM), Boeing Document Number D632W001-TBC.

Subject: Flight Crew Operations Manual Revision.

This revision reflects the most current information available to The Boeing Company 45 days prior to the subject revision date.

General information below explains the use of revision bars to identify new or revised information. Highlights in the Revision Highlights section explain the revision bar changes in this revision.

Revision Record

No.	Revision Date	Date Filed
1	June 1, 1994	
3	October 17, 1994	
5	January 6, 1995	
7	April 10, 1995	
9	August 11, 1995	
11	November 28, 1995	
13	May 10, 1996	
15	November 7, 1996	
17	January 22, 1997	
19	August 18, 1997	
21	May 4, 1998	
23	December 18, 1998	
25	December 9, 1999	
27	December 11, 2000	
29	December 7, 2001	
31	December 16, 2002	

No.	Revision Date	Date Filed
2	September 1, 1994	
4	November 23, 1994	
6	February 10, 1995	
8	June 13, 1995	
10	September 15, 1995	
12	February 9, 1996	
14	August 12, 1996	
16	January 15, 1997	
18	March 11, 1997	
20	December 10, 1997	
22	August 10, 1998	
24	July 1, 1999	
26	June 26, 2000	
28	June 18, 2001	
30	June 17, 2002	
32	June 16, 2003	

No.	Revision Date	Date Filed
33	December 15, 2003	
35	December 13, 2004	
37	December 12, 2005	
39	December 11, 2006	
41	December 10, 2007	
43	December 15, 2008	
45	December 14, 2009	
47	December 13, 2010	
49	December 12, 2011	

General

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

The revision date is the approximate date the manual is mailed to the customer. 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 manual content.

Pages containing revised technical material have revision bars associated with the changed text or illustration. Highlights in the Revision Highlights section provide descriptions of the changes identified by the revision bars. Editorial revisions (for example, spelling corrections) may have revision bars with no associated highlight.

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.



After the revision has been filed into the manuals, the revision number, revision date and the date the revision was filed should be recorded in the Revision Record table above by the person that filed the revision.

Revision Highlights

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

Throughout the manual, airplane effectiveness may be updated to reflect coverage as listed on the Preface - Model Identification page, or to show service bulletin airplane effectiveness. Highlights for these airplane effectiveness updates 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 2 - Introduction

Airplane Effectivities

0.2.5-6 - Added service bulletin airplane effectiveness information to describe planned service bulletin incorporation.

Section 6 - Bulletin Record

0.6.1 - Deleted effectiveness sentence.

0.6.1 - Added effectiveness statements definitions to explain the new airplane effectiveness line added to the bulletins.

0.6.2-3,5 - Revised to reflect current bulletin status.

Chapter L - Limitations

Section 10 - Operating Limitations

Operational Information

L.10.1 - Revised title and added note to clarify content is provided for crew information.

Chapter NP - Normal Procedures

Section 21 - Amplified Procedures

Exterior Inspection

NP.21.6 - Revised exterior inspection route graphic to match order of preflight.

Takeoff Procedure

NP.21.37 - Revised the takeoff procedure to clarify that thrust must be set by 80 knots.

Takeoff Flap Retraction Speed Schedule

NP.21.39 - Revised formatting for standardization.

Landing Procedure - ILS

NP.21.43-44 - Revised glideslope to one word for standardization.

Landing Procedure - Instrument Approach Using VNAV

NP.21.45-46 - Revised glidepath to one word for standardization.

Landing Roll Procedure

NP.21.49 - Added missing word "to"; no technical change.

Shutdown Procedure

NP.21.54 - Deleted action line item that reflects enhanced flight deck security door not installed.

Chapter SP - Supplementary Procedures

Section 4 - Automatic Flight

Instrument Approach - RNAV (RNP) AR

SP.4.5 - Added missing space; no technical change.

SP.4.6 - Deleted step. AIMS V14 radio inhibiting not installed.

SP.4.9 - Added "Flight Pattern" to title.

Section 10 - Flight Instruments, Displays

Heading Reference Switch Operation

SP.10.1 - Added new supplementary procedure for using the heading reference switch.

Section 16 - Adverse Weather

Cold Weather Operations

SP.16.4 - Corrected spelling error.



SP.16.8 - Added run up information for GE engines.

SP.16.8 - Note added to include the possibility of high vibration and multiple run-ups for ice shedding.

Ice Crystal Icing

SP.16.22 - Added new Ice Crystal Icing supplementary procedure.

Chapter PD - Performance Dispatch

Section 32 - Landing

Quick Turnaround Limit Weight

PD.32.5 - Revised note for the Quick Turnaround Limit Weight to add information regarding the use of BTMS as described in the AFM.

Section 42 - Landing

Quick Turnaround Limit Weight

PD.42.5 - Revised note for the Quick Turnaround Limit Weight to add information regarding the use of BTMS as described in the AFM.

Section 62 - Landing

Quick Turnaround Limit Weight

PD.62.6 - Revised note for the Quick Turnaround Limit Weight to add information regarding the use of BTMS as described in the AFM.

Chapter PI - Performance Inflight

Section 12 - Advisory Information

Normal Configuration Landing Distance

PI.12.2 - Corrected tables for Good and Medium Reported Braking Action, which had been inadvertently swapped during the last revision of this data.

Section 14 - Gear Down

Long Range Cruise Enroute Fuel and Time

PI.14.3 - Added information for the calculation conditions.

Section 15 - Gear Down, Engine INOP

Long Range Cruise Diversion Fuel and Time

PI.15.3 - Added information for the calculation conditions.

Section 26 - Gear Down

Long Range Cruise Enroute Fuel and Time

PI.26.4 - Added information for the calculation conditions.

Section 27 - Gear Down, Engine INOP

Long Range Cruise Diversion Fuel and Time

PI.27.4 - Added information for the calculation conditions.

Section 35 - Gear Down

Long Range Cruise Enroute Fuel and Time

PI.35.5 - Added information for the calculation conditions.

Section 36 - Gear Down, Engine INOP

Long Range Cruise Diversion Fuel and Time

PI.36.3 - Added information for the calculation conditions.

Section 45 - Gear Down

Long Range Cruise Enroute Fuel and Time

PI.45.5 - Added information for the calculation conditions.

Section 46 - Gear Down, Engine INOP

Long Range Cruise Diversion Fuel and Time

PI.46.3 - Added information for the calculation conditions.

Section 56 - Gear Down

Long Range Cruise Enroute Fuel and Time

PI.56.4 - Added information for the calculation conditions.

Section 65 - Gear Down

Long Range Cruise Enroute Fuel and Time

PI.65.5 - Added information for the calculation conditions.

Section 66 - Gear Down, Engine INOP

Long Range Cruise Diversion Fuel and Time

PI.66.4 - Added information for the calculation conditions.

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

Section 40 - Systems Description

Passenger Oxygen System

1.40.12 - Added passenger oxygen paragraph to reflect to fleet configuration.

Section 45 - Emergency Equipment

Freighter Airplane

1.45.2 - Added flashlights for freighter coverage.



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

Section 46 - Flight Crew Rest

Introduction

1.46.1 - Added bullet to reflect section coverage.

Flight Crew Rest (FCR)

1.46.2 - Added bullet to correct location of area smoke detector in the flight crew rest area.

1.46.2 - Added information covering bunk contents.

1.46.2 - Deleted redundant smoke detector bullet.

Decompression

1.46.10 - Added coverage for decompression event.

Section 47 - FC Rest/Supernumerary

Introduction

1.47.1 - Added bullet to reflect section coverage.

Flight Crew Rest (FCR)

1.47.2 - Added bullet to correct location of area smoke detector in the flight crew rest area.

1.47.2 - Deleted redundant smoke detector bullet.

Decompression

1.47.10 - Added coverage for decompression event.

Section 48 - Overhead Crew Rest

Decompression

1.48.56 - Corrected door nomenclature to door 5 upper crew rest: was door 4 upper crew rest.

Chapter 2 - Air Systems

Section 10 - Controls and Indicators

Air Conditioning Panel

2.10.3 - Corrected text.

2.10.5 - Corrected spelling.

Bleed Air Control

2.10.12 - Corrected spelling.

Air Synoptic Display

2.10.17 - Corrected spelling.

Section 40 - Bleed Air System Description

Introduction

2.40.1 - Corrected text.

Section 50 - Air Systems EICAS Messages

Air Systems EICAS Alert Messages

2.50.1-3 - Editorial revision.

2.50.3 - Corrected spelling.

EICAS Memo Messages

2.50.3 - Editorial revision.

Chapter 3 - Anti-Ice, Rain

Section 10 - Controls and Indicators

Anti-Ice Panel

3.10.1 - Corrected spelling.

Window Heat Panel

3.10.3 - Corrected spelling.

Section 20 - System Description

Engine Anti-Icing

3.20.1 - Deleted space.

3.20.1 - Corrected spelling.

Wing Anti-Icing

3.20.2 - Corrected spelling.

3.20.2 - Editorial revision.

Anti-Icing System Schematic

3.20.3 - Corrected spelling.

Windshield Wipers

3.20.4 - Deleted space.

Section 30 - EICAS Messages

Anti-Ice, Rain System EICAS Messages

3.30.1 - Editorial revision.



Chapter 4 - Automatic Flight

Section 10 - Controls and Indicators

Autopilot Flight Director Altitude Controls

4.10.13 - Revised for clarity; sentence in FCOM only when Eurocontrol-compliant transponder installed.

Section 20 - System Description

Introduction

4.20.1 - Corrected spelling error.

Autopilot Disengagement

4.20.2 - Corrected error; changed "engagement" to "disengagement".

AFDS Flight Mode Annunciations

4.20.6 - Corrected spelling error.

Automatic Flight - Takeoff and Climb

4.20.10 - Changed, "activation" to "annunciation".

4.20.11 - Revised for consistency and clarity.

Go-Around

4.20.16 - Added information about changes of reference thrust limits.

Chapter 5 - Communications

Section 10 - Controls and Indicators

Radio Tuning Panel

5.10.4 - Added information to reflect radio tuning panel with squelch break feature installed.

Hand Microphone [Typical]

5.10.7 - Revised description to clarify First Observer hand mic is optional.

Section 20 - System Description

HF Communication System

5.20.4 - Revised text for consistency with no change to technical content.

Section 40 - MFD Communications Functions

Command Key Functions

5.40.6-8 - Revised table for administrative reasons with no change to technical content.

Communications Information Messages

5.40.15 - Revised table for administrative reasons with no change to technical content.

Position Report

5.40.36 - Corrected ALTITUDE field to display altitude in Flight Level format.

5.40.36-37 - Revised text for consistency with no change to technical content.

5.40.36 - Added sentence to clarify ALTITUDE field displays all asterisks when no FMC data is available.

5.40.36-37 - Revised description for consistency and to clarify entry of waypoint not in active route triggers INVALID ENTRY message.

5.40.37 - Deleted text to clarify all asterisks do not display in SPEED window when no FMC data available.

5.40.37 - Revised description to reflect ETA is related to the EST waypoint.

5.40.37 - Revised description to reflect DEST ETA is related to the destination airport.

Manager Messages

5.40.57 - Revised table for administrative reasons with no change to technical content.

Chapter 6 - Electrical

Section 10 - Controls and Indicators

Electrical Panel

6.10.2-3,6 - Editorial revision.

6.10.2 - Added description to reflect airplane configuration.

Section 20 - System Description

AC Electrical System Power Sources

6.20.3 - Corrected text.

Backup Generators

6.20.8 - Corrected spelling error.

Main Battery

6.20.14 - Deleted redundant following.

6.20.15 - Added capacity of main battery for standby system operation.



Cabin and Utility Systems

6.20.16 - Corrected spelling error.

6.20.16 - Deleted description. Flight deck video system power is included in section 6.10.

Section 30 - EICAS Messages

Electrical EICAS Alert Messages

6.30.1 - Editorial revision.

6.30.2 - Added capacity of main battery for standby system operation.

Chapter 7 - Engines, APU

Section 10 - Controls and Indicators

Secondary Engine Display

7.10.13-14 - Revised oil quantity window to display realistic values with engines running.

Oil Quantity Indications

7.10.20 - Revised left oil quantity window to display realistic value applicable to all engine types.

7.10.21 - Revised oil quantity window for consistency and display of realistic values applicable to all engine types.

Compact Engine Indications

7.10.23,25 - Revised oil quantity window for consistency and display of realistic values with engines running.

7.10.24 - Revised left oil quantity window for consistency and display of fully serviced value with engine running.

Engine Control Panel

7.10.30 - Revised description of CON position for clarity.

Section 20 - Engine System Description

Thrust Control Malfunction Protection

7.20.10 - Added description of EEC protection against a thrust control malfunction on ground.

Chapter 9 - Flight Controls

Section 20 - System Description

Pitch Envelope Protection

9.20.12 - Deleted invalid note.

Chapter 10 - Flight Instruments, Displays

Section 10 - Controls and Indicators

PFD Navigation Performance Indications

- 10.10.14 - Added information about navigation performance scales.
- 10.10.14 - Revised navigation source reference for accuracy.
- 10.10.15 - Added, "when VNAV is in descent." for clarity.
- 10.10.15 - Revised to clarify condition for pointer flashing.

PFD Barometric Indications

- 10.10.22 - Changed, "transition altitude" to "transition flight level" for consistency.

Section 65 - Electronic Flight Bag (EFB)

Performance (Typical)

- 10.65.23 - Added COPY FMC DATA selection to reflect updated software.
- 10.65.24 - Added callout description for COPY FMC DATA; renumbered following callouts.

Chapter 11 - Flight Management, Navigation

Section 10 - Controls and Indicators

CDU Page Components

- 11.10.6 - Added, "Data" for consistency with other Boeing model airplanes.

Air Data Inertial Reference System (ADIRU)

- 11.10.10 - Added condition for ON BAT light to illuminate.

Weather Radar Panels

- 11.10.21 - Added missing space between ONLY and (amber).

Section 31 - Flight Management System Operation

ND Map Displays

- 11.31.18 - Revised for clarity.

Section 40 - FMC Preflight

Position Initialization Page 1/3

- 11.40.9 - Corrected spelling of Inertial.

Position Reference Page 2/3

- 11.40.13 - Added "for the time specified in the AMI" to clarify when the message displays.



Section 42 - FMC Cruise

All Engine Cruise

11.42.17 - Removed extra space after PW.

Calculated Step Climb

11.42.25 - Added information to clarify display of line title, STEP TO.

Section 43 - FMC Descent and Approach

Early Descent

11.43.1 - Changed, "FMC Cruise" to "VNAV Modifications" for clarity.

Chapter 12 - Fuel

Section 10 - Controls and Indicators

Fuel Synoptic Indications

12.10.18 - Revised fuel quantity indication to 1.9 units for applicability to airplanes configured with english or metric units.

Section 30 - EICAS Messages

FMS Fuel Messages

12.30.1 - Revised section title and format for consistency.

12.30.1 - Revised INSUFFICIENT FUEL message description for consistency.

12.30.1 - Added paragraph to reference Chapter 11 for additional information on FMS fuel messages.

Chapter 15 - Warning Systems

Section 10 - Controls and Indicators

EICAS Messages

15.10.3 - Corrected spelling.

Master WARNING/CAUTION Reset Switches and Lights

15.10.5 - Added message previously omitted.

TCAS Controls (Transponder Panel)

15.10.6 - Deleted space.

TCAS Controls (EFIS Control Panel)

15.10.8 - Corrected spelling error.

GPWS Look-Ahead Terrain Alerting Display and Annunciations

15.10.17-18 - Corrected spelling error.

Section 20 - System Description

Aurals, Master WARNING/CAUTION Switches and Lights, and GND PROX Light

15.20.4 - Corrected text.

15.20.5 - Added message previously omitted.

15.20.8 - Corrected spelling error.

TCAS Non-Normal Operation

15.20.18 - Corrected spelling error.

Runway Awareness and Advisory System (RAAS)

15.20.19 - Corrected spelling error.

GPWS Non-Normal Operation

15.20.29 - Removed extra period.

DRAFT

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Preface

Bulletin Record

Chapter 0

Section 6

General

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

Bulletins are dated and numbered sequentially. When appropriate, the next formal Flight Crew Operations Manual revision will include an updated bulletin record page to reflect current bulletin status.

Each bulletin identifies airplanes affected by the bulletin. The airplane effectiveness is defined as follows:

- Effectivity range - effectivities in parentheses indicate the corrective service bulletin is planned to be accomplished and some airplanes may be complete
- All Airplanes - the bulletin applies to all airplanes in an Operator's fleet
- Descriptive statement - the bulletin applies to airplanes with specific equipment

Bulletin status is defined as follows:

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

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

Number	Subject	Date	Status
TBC-28 R1	Engine Anti-Ice Operation/Failure Annunciations on the Ground	October 7, 1996	IE
TBC-50 R2	Predictive Windshear Warnings at Kansai Airport, Osaka, Japan	January 19, 2001	IE
TBC-52 R1	ILS/GPS Multi-Mode Receiver (MMR) Failure	April 23, 1999	IE
TBC-55 R2	777 Fuel Quantity Indicating System Fluctuations.	April 15, 2002	CANC
TBC-56 R1	Cabin Pressure Control System Outflow Valve (OFV) Manual Operation	June 14, 2001	IE
TBC-58	Nuisance EICAS Message WINDSHEAR SYS	April 29, 1999	IE
TBC-62 R2	Uncommanded Weather Radar Activation	June 30, 2006	INC
TBC-63 R1	VNAV Altitude Capture Anomaly	June 30, 2006	CANC
TBC-64 R1	FMC Reset Following Intercept Course to a Waypoint or Approach Intercept	November 3, 2003	CANC
TBC-65 R1	Loss of Engine Response to Thrust Lever Commands on GE90 Engines	September 7, 2001	IE
TBC-66 R1	Door Armed Memo Messages Anomaly	June 30, 2006	CANC
TBC-68 R2	GPWS Voice Callouts	December 13, 2010	IE
TBC-72 R1	Uncommanded Movement of Cargo Containers During Power Switching	April 20, 2001	IE
TBC-73 R4	STABILIZER GREENBAND Nuisance EICAS Message	June 15, 2009	IE
TBC-75 R1	Electronic Checklist (ECL) Line Items not Completing Correctly	June 30, 2006	IE
TBC-76 R2	FMC VNAV Anomaly During Intermediate Level Off	June 30, 2006	IE



Number	Subject	Date	Status
TBC-77 R2	Takeoff Thrust Shortfall for Airplanes with Pratt and Whitney PW4090-3 and PW4098 Engines	April 25, 2002	CANC
TBC-78 R1	Incorrect Performance Predictions during Polar Operations	June 30, 2006	CANC
TBC-79 R1	APU Start Failures Due to APU Start Switch	July 1, 2002	IE
TBC-80 R2	NO LAND 3 EICAS Advisory Messages During Cruise Operations	December 13, 2010	IE
TBC-81 R3	ADIRU Heading Error Anomaly	January 9, 2006	IE
TBC-82 R4	Incorrect Display of Drift Angle	February 13, 2006	IE
TBC-83 R2	Electrical Load Management System (ELMS) ARINC Communication Faults	September 15, 2003	IE
TBC-85	777 FMC Calculation of Reduced Thrust Takeoff Anomaly	June 20, 2003	IE
TBC-87 R3	777 Fuel Quantity Indicating System Fluctuations	July 10, 2006	IE
TBC-88 R1	ENGINE SHUTDOWN L or R EICAS Message Anomaly	June 30, 2006	IE
TBC-90 R1	FMC Departure Routing Anomaly	March 27, 2006	IE
TBC-91 R1	FMC RUNWAY DISAGREE message display anomaly.	March 27, 2006	CANC
TBC-92 R2	Fuel Temperature Blanking Indication	August 31, 2006	IE
TBC-93 R2	Incorrect turn direction during a Standard Instrument Departure (SID)	March 27, 2006	IE
TBC-95 R2	New Ice Shedding Procedures for Airplanes with Trent 800 Engines in Freezing Fog	September 25, 2006	IE
TBC-96 R1	False Engine-Out Indication	December 10, 2007	IE

Number	Subject	Date	Status
TBC-97 R1	Automatic Re-Boot of Electronic Flight Bag (EFB)	June 30, 2006	IE
TBC-99	GE90-94B Autostart Logic During High Altitude Ground Starts	July 11, 2005	IE
TBC-100 R1	Flight Control Anomaly	January 9, 2006	IE
TBC-101 R2	FMC Performance Predictions Anomaly	June 13, 2011	IE
TBC-102 R2	Fuel Quantity Blanking on the Progress 2/3 Page of the Control Display Unit (CDU)	January 9, 2006	IE
TBC-103	Fuel Flow Blanking with GE90-100 Series Engines)	February 3, 2006	IE
TBC-104	Generator OFF Light ON After Engine Start With No EICAS Message	September 29, 2006	IE
TBC-105 R3	Incorrect TAKEOFF REF data following a TAKEOFF REF Uplink	June 13, 2011	IE
TBC-107 R3	FMC Minimum V1, VR, V2 Speed Entry Limits for 777-200LR and 777-300ER Models	June 13, 2011	IE
TBC-108 R3	Honeywell Flight Management Computer Anomaly.	June 13, 2011	IE
TBC-114 R2	FMC Failure When Programming a "step-down" Descent	June 13, 2011	IE
TBC-115 R3	Uncommanded Autothrottle Movement During Cruise Flight	June 13, 2011	IE
TBC-116 R2	Incorrect Display of Crossbleed (X-BLD) Start Indication	June 13, 2011	IE
TBC-117 R1	Loss of Datalink Function on the Primary VHF Data Radio	December 13, 2010	IE
TBC-118	Uncommanded Turns When LNAV is in Use	December 13, 2010	IE
TBC-119	777 Fuel Quantity Indicating System Fluctuations or Blanking Due to Wiring Harness Problem	December 24, 2010	IE



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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-28 R1

Issue Date: October 7, 1996

Airplane Effectivity: 777-200ER, 777-300

Subject: Engine Anti-Ice Operation/Failure Annunciations on the Ground

Reason: To inform pilots that engine anti-ice system operation on the ground may not be indicated by EICAS with engines at idle thrust.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

On the ground, if engine anti-ice selectors are positioned to ON, an EAI annunciation is normally displayed above the EICAS N1 indication for each engine, indicating that the respective engine anti-ice valve is open. At idle thrust, the indicating system may not properly sense the actual valve position.

For this condition, it is necessary for engine thrust to be advanced above idle before valve position information can be sensed and proper annunciations displayed.

Operating Instructions

This bulletin applies to airplanes not modified by PRR 61650 or Service Bulletin 777-30-0004.

Operations Manual Information

On the ground, verify proper operation of the engine anti-ice valves by referring to the EAI annunciations above the EICAS N1 indications. If engine anti-ice is selected ON and the EICAS EAI annunciations are not displayed, increase N1 a minimum of 3% above idle. The EICAS EAI annunciation will be displayed for valves that are open. If a valve fails closed, the EICAS advisory message ANTI-ICE ENG L or ANTI-ICE ENG R will be displayed. After confirming valve operation, engine power can be set as required. Properly operating valves will remain open, even though the EAI annunciation may again be blank at idle thrust.

Administrative Information

This bulletin replaces bulletin TBC-28 dated October 7, 1996. Discard TBC-28. Revise the Bulletin Record to show TBC-28 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-28 R1 as "In Effect" (IE) .

This bulletin will be cancelled after Boeing is notified that all affected airplanes in your fleet have been modified by Service Bulletin 777-30-0004. If you do not plan to modify all your airplanes and would like to have the contents of this bulletin incorporated in your Operations Manual, please advise Boeing accordingly.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-50 R2

Issue Date: January 19, 2001

Airplane Effectivity: 777 Airplanes with Allied Signal PWS 066-50008-0405,
Rockwell Collins PWS 622-5132-631, or Rockwell
Collins PWS 622-5132-633 installed

Subject: Predictive Windshear Warnings at Kansai Airport, Osaka, Japan

Reason: To inform flight crews of false PWS warnings

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received reports that the Allied Signal Predictive Windshear System (PWS) Part Number 066-50008-0405 and the Rockwell Collins PWS Part Numbers 622-5132-631 and 622-5132-633 delivered on some 777 airplanes, have produced nuisance alerts at Kansai Airport (RJBB), Osaka, Japan. These nuisance alerts may occur during takeoff on RW06 and approach to RW24, and may include the PWS caution (MONITOR RADAR DISPLAY audio alert – approach and takeoff) and the PWS warning (GO AROUND WINDSHEAR AHEAD audio alert – approach, WINDSHEAR AHEAD WINDSHEAR AHEAD audio alert – takeoff). The GPWC Mode 7 reactive windshear system (RWS) warning (WINDSHEAR WINDSHEAR WINDSHEAR audio alert) is not affected by this nuisance condition.

Operating Instructions

Boeing recommends continued use of the PWS. When crews experience a PWS caution or warning alert at Kansai as described above, the alert should be regarded as false and should be ignored by the crew as long as there are no other signs of possible windshear conditions and the reactive windshear system is operational. If in doubt, the crew should treat all predictive windshear warnings as valid. All reactive windshear system warnings should always be treated as valid.

Administrative Information

This bulletin replaces bulletin TBC-50 R1 dated January 19, 2001. Discard TBC-50 R1. Revise the Bulletin Record to show TBC-50 R1 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-50 R2 as "In Effect" (IE) .

For Allied Signal PWS Part Number 066-5008-0405, this condition is corrected by incorporation of Allied Signal Service Bulletin M-4469 (RTA-4B-34-16) which provides a revised PWS database, or Allied Signal Service Bulletin M-4508 (RTA-4B-34-97) which converts the part number from 066-5008-0405 to 066-5008-0406.

For the Rockwell Collins PWS Part Number 622-5132-631, this condition is corrected by incorporation of Rockwell Collins Service Bulletins BH and 217 which install PWS Part Number 622-5132-633 Mod SB217. For the Rockwell Collins PWS Part Number 622-5132-633, this condition is corrected by incorporation of Rockwell Collins Service Bulletin 217 which installs PWS Part Number 622-5132-633 Mod SB217.

This bulletin will be cancelled after Boeing is notified that all affected airplanes have been modified.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-52 R1

Issue Date: April 23, 1999

Airplane Effectivity: All Airplanes

Subject: ILS/GPS Multi-Mode Receiver (MMR) Failure

Reason: To inform the flight crew of the lack of failure indications associated with a Multi-Mode Receiver (MMR) system processor card failure

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

The Collins MMR combines ILS and GPS functions in a single electronic component. Flight testing has shown certain internal MMR failures can occur leaving the associated ILS and/or GPS inoperative, but without specific MMR failure indications. When this occurs, the approach reference on the PFD (ILS station identifier, or frequency and DME, as appropriate), and localizer/glideslope deviation indicators and scales will not display. The MMR failure may result in a GPS L or GPS R status message. (Status messages are checked prior to flight to determine dispatchability of the airplane and are checked after the flight for possible maintenance action.) The MMR failure may also be indicated by display of the GPS EICAS advisory message. However, this failure may occur and result in no EICAS messages (status or advisory) for the crew

Operating Instructions

If any of the following conditions are observed, the left and/or right ILS receiver(s) may be failed:

- the GPS L or GPS R EICAS status message is observed during preflight on the ground

- the GPS EICAS advisory message is displayed
- absence of the ILS station identifier or frequency and the absence of ILS deviation pointers and ILS scales when the ILS is tuned.

To verify ILS receiver operation:

- Enter an ILS frequency on the FMS-CDU NAV RADIO page (if a frequency is not already entered):
 - Place the captain's and first officer's navigation displays (NDs) in approach (APP) mode and verify the appropriate ILS frequency is displayed on the NDs.
 - If either the captain's or first officer's ILS receiver source is C (center), then the L or R ILS receiver is failed.
 - Failure flags will not be displayed.
 - The NO LAND 3 EICAS message will be displayed on approach.
 - If the captain's or first officer's ILS frequency is not displayed, then multiple ILS receivers are failed.
 - Failure flags will not be displayed
 - The NO AUTOLAND EICAS message will be displayed on approach.
- Once this test is complete, delete the manually entered ILS frequency, if necessary, to allow ILS autotuning.

If the approach reference is not displayed, assume ILS receiver failure. Triple channel autoland will not be available. Consider the effect on approach minimums and select an appropriate course of action.

Administrative Information

This bulletin replaces bulletin TBC-52 dated April 23, 1999. Discard TBC-52. Revise the Bulletin Record to show TBC-52 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-52 R1 as "In Effect" (IE) .

This condition is temporary until the system is modified. Incorporation of Collins GLU-920 Service Bulletin (8) and Service Bulletins (10 - 15) together constitute the terminating action for the MMR condition.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-56 R1

Issue Date: June 14, 2001

Airplane Effectivity: 777-200, 777-200ER, 777-300

Subject: Cabin Pressure Control System Outflow Valve (OFV) Manual Operation

Reason: To provide flight crews with additional information regarding outflow valve manual operation

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Based on two depressurization events, Boeing feels additional information regarding manual mode operations is warranted.

There is a failure mode that can cause an outflow valve to drive in the direction opposite to the command. The incorrect valve movement is detected and stopped in less than one second. However, cycling between auto and manual mode will reset the fault and allow the outflow valve to drive in the wrong direction each time (automatically in auto and when commanded in manual). Repeated resets could drive an outflow valve progressively further open until airplane pressurization could no longer be maintained

Operating Instructions

If the EICAS advisory message OUTFLOW VALVE AFT or OUTFLOW VALVE FWD is displayed follow the non-normal checklist and close the affected outflow valve in manual mode. If the valve moves in the wrong direction, or does not move after six seconds of switch activation, leave the affected valve in manual mode and do not make any further attempt to drive the valve in either direction. Depending on the position of the affected outflow valve, the other outflow valve may not be able to maintain cabin pressurization.

Administrative Information

This bulletin replaces bulletin TBC-56 dated June 14, 2001. Discard TBC-56. Revise the Bulletin Record to show TBC-56 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-56 R1 as "In Effect" (IE) .

This bulletin will be cancelled after Boeing is notified that all affected airplanes have been modified by PRR 61777-105 (Parts A & B) or Service Bulletin 777-21A0041.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-58

Issue Date: April 29, 1999

Airplane Effectivity: All Airplanes

Subject: Nuisance EICAS Message WINDSHEAR SYS

Reason: To inform flight crews of predictive windshear system operational conditions that can cause the subject message to be displayed for airplanes with the Allied Signal/Bendix weather radar system receiver-transmitter part number 066-50008-0405 installed.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

This bulletin applies to the Allied Signal weather radar system with the Predictive Windshear function activated (Allied Signal/Bendix weather radar system receiver-transmitter part number 066-50008-0405).

Flight testing and customer reports have confirmed that a nuisance WINDSHEAR SYS EICAS advisory message will occur for approximately 30 seconds under the following conditions:

- WXR has not been selected ON at any time since electrical power up, and
- one or both engines are above 60% N1 and the indicated airspeed is increasing.

The WINDSHEAR SYS message will annunciate prior to 80 KIAS or after 400 feet AGL. The message will extinguish approximately 30 seconds after appearing.

Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-58 as "In Effect" (IE) .

This bulletin will be cancelled after Boeing is notified that all affected airplanes in your fleet have been modified by Allied Signal/Bendix Service Bulletin RTA-4B-34-97 (M4508). This service bulletin converts the weather radar RT unit part number from 066-50008-0405 to 066-50008-0406.

If you modify your fleet using a different Allied Signal/Bendix service bulletin (for example, the RT units are converted from the -405 to the -407 or later configuration), please advise Boeing so this operations manual bulletin can be cancelled.

If you do not plan to modify all your airplanes and would like to have the contents of this operations manual bulletin incorporated in your Operations Manual, please advise Boeing accordingly.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-62 R2

Issue Date: June 30, 2006

Airplane Effectivity: All Airplanes

Subject: Uncommanded Weather Radar Activation

Reason: To inform flight crews of a condition in which the weather radar transmitter may turn on without crew input following an electrical power interrupt.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

A system anomaly has been found where the weather radar may automatically start transmitting following a power interrupt. This may occur in flight or on the ground. This anomaly only occurs with Allied Signal/Bendix weather radar with predictive windshear system.

Operating Instructions

To prevent the weather radar from automatically transmitting following a power interrupt on ground, leave the weather radar mode selector in TEST until after engine start. Also, position the weather radar mode selector to TEST after landing.

These procedures have been incorporated into the Normal Procedures chapter.

Administrative Information

This bulletin replaces bulletin TBC-62 R1 dated June 30, 2006. Discard TBC-62 R1. Revise the Bulletin Record to show TBC-62 R1 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-62 R2 as "In Effect" (IE) .

This condition is corrected with installation of Boeing Service Bulletin SB 777-23-0145. This bulletin will be cancelled when Boeing is notified that all affected airplanes in the customer fleet have been modified.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-65 R1

Issue Date: September 7, 2001

Airplane Effectivity: 777-200, 777-300

Subject: Loss of Engine Response to Thrust Lever Commands on GE90 Engines

Reason: To inform flight crews of the possibility of temporary loss of engine response to thrust lever commands due to an engine sensor problem on GE90 engines, and to provide recommendations to the crew if engine thrust control is not regained prior to landing

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received reports of temporary loss of engine response to thrust lever commands resulting from a loss of the combustion chamber burner pressure signal to the EECs. The loss of the burner pressure signal is due to accumulated moisture freezing in the sensing line to the EEC. When this happens, the engine may not respond to thrust lever commands, may only partially respond to thrust lever commands, or may be limited to idle thrust.

To date, there have been six reported events in the 777 GE90 fleet. Four of the six reported events occurred in flight. In each of the four in-flight events, the engine self-recovered during cruise or descent when the accumulated ice in the burner pressure sensing line subsequently thawed. In three of these four in-flight events, engine thrust control restored when the airplane descended to a lower altitude.

There is no direct action the flight crew can take (such as selecting the EEC mode switch to ALTN) that can cause the engine to recover.

Operating Instructions

If loss of thrust lever response is observed on the ground following engine start or if autostart fails to start the engine, do not dispatch. Maintenance action is necessary to purge the burner pressure sensing line of moisture and ice.

If loss of thrust lever response occurs in flight and EGT indications are normal and not increasing, disconnect the autothrottle on the affected engine. Do not retard the thrust lever or shut down the engine as long as thrust levels are acceptable.

If thrust levels become unacceptable, consider a diversion and landing at the nearest suitable airport.

If high engine thrust levels interfere with airspeed control during descent, use speedbrakes and/or landing gear. If engine thrust cannot be reduced to idle prior to landing, the engine should be shutdown. If the engine is above ground idle after landing, the engine should be shutdown.

Administrative Information

This bulletin replaces bulletin TBC-65 dated September 7, 2001. Discard TBC-65. Revise the Bulletin Record to show TBC-65 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-65 R1 as "In Effect" (IE) .

This bulletin will be cancelled after Boeing is notified that all affected airplanes in your fleet have been modified by Service Bulletin number 777-73A0006.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-68 R2

Issue Date: December 13, 2010

Airplane Effectivity: Airplanes with Faulty Radio Altimeters

Subject: GPWS Voice Callouts

Reason: To inform flight crews of the possibility of missing the 2500 foot radio altitude voice callout.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

During an approach over water the voice callout TWENTY FIVE HUNDRED (or RADIO ALTIMETER) may not occur. This callout normally occurs at 2500 feet. However a recent change in the Collins LRA 900 radio altimeter resulted in the unit not reporting 2500 feet to GPWS when over water.

Not all Collins LRA 900 radio altimeters are affected by this problem. For airplanes equipped with Collins LRA 900 radio altimeters not affected by the problem, the voice callout TWENTY FIVE HUNDRED (or RADIO ALTIMETER) will occur correctly at 2500 feet.

Operating Instructions

Do not rely on the voice callout TWENTY FIVE HUNDRED (or RADIO ALTIMETER) during an approach over water.

This bulletin applies to airplanes Boeing delivered with faulty radio altimeters. Airlines may also want to apply this bulletin if they have installed any Collins LRA-900 radio altimeters Part Number 822-0334-002 with serial numbers prior to 780W.

Administrative Information

This bulletin replaces bulletin TBC-68 R1 dated August 31, 2001. Discard TBC-68 R1. Revise the Bulletin Record to show TBC-68 R1 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-68 R2 as "In Effect" (IE) .

This bulletin will be cancelled after Boeing is notified that all affected airplanes in your fleet have been modified by Collins LRA-900 Service Bulletin No. 3 titled "Strong Signal Processing Improvement", dated 7 April 2000. If you do not plan to modify all your airplanes and would like to have the contents of this bulletin incorporated in your Operations Manual, please advise Boeing accordingly.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-72 R1

Issue Date: April 20, 2001

Airplane Effectivity: 777-200, 777-200ER, 777-300

Subject: Uncommanded Movement of Cargo Containers During Power Switching

Reason: To inform flight crews of possible uncommanded cargo container movement when switching between ground electrical power and airplane electrical power.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

One operator has reported cases of uncommanded cargo movement when the airplane electrical power was switched from ground power to airplane power during cargo loading operations. Switching power during cargo loading or unloading may cause the Power Drive Units (PDUs) to retract and allow cargo that has not been restrained to move forward causing a hazard to personnel in the cargo compartment.

Operating Instructions

Do not switch power sources between ground power and airplane power (APU) during cargo loading or unloading without coordinating with ground personnel.

Administrative Information

This bulletin replaces bulletin TBC-72 dated April 20, 2001. Discard TBC-72. Revise the Bulletin Record to show TBC-72 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-72 R1 as "In Effect" (IE) .

This condition is temporary until Service Bulletin 777-25-0181 or production equivalent is installed. This Service Bulletin is expected to be available in the first quarter of 2002.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-73 R4

Issue Date: June 15, 2009

Airplane Effectivity: All Airplanes

Subject: STABILIZER GREENBAND Nuisance EICAS Message

Reason: To inform flight crews of nuisance STAB GREENBAND alerts.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received reports of nuisance STAB GREENBAND advisory alerts on 777 airplanes. These nuisance alerts occur prior to departure (at the gate or during taxi for takeoff) after FMC gross weight (GW) and center of gravity (CG) data are entered which result in a nose down forward greenband stabilizer trim calculation. Dispatch delays have resulted.

Preliminary investigation indicates that STAB GREENBAND nuisance alerts occur in a small region of the GW and CG envelope where the greenband system has the least margin against nuisance alerts. Boeing has determined that many nuisance messages in the nose down forward greenband can be eliminated by using a fixed and/or assumed temperature derate greater than 15%. Alternatively, the airplane would still be safe to takeoff in this region should the STAB GREENBAND alert be accurate and a real mistrim result. Should a worst case mistrim occur in this range, the column rotation force would be approximately 30-35 pounds. Normal column rotation force is approximately 20-25 pounds.

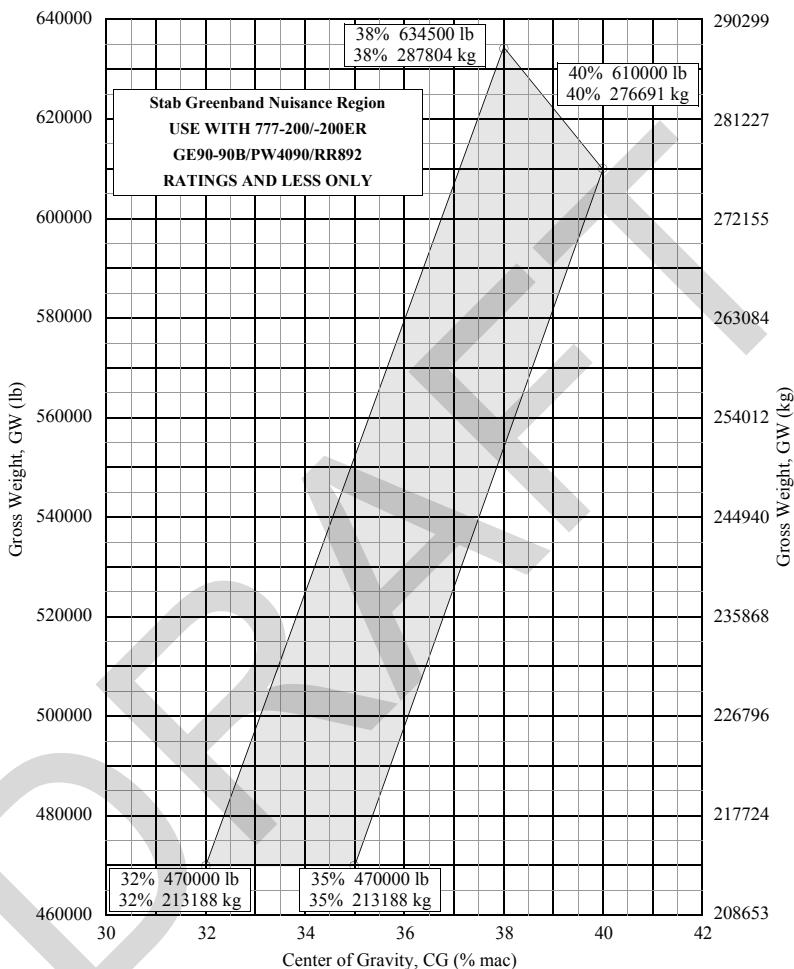
Operating Instructions

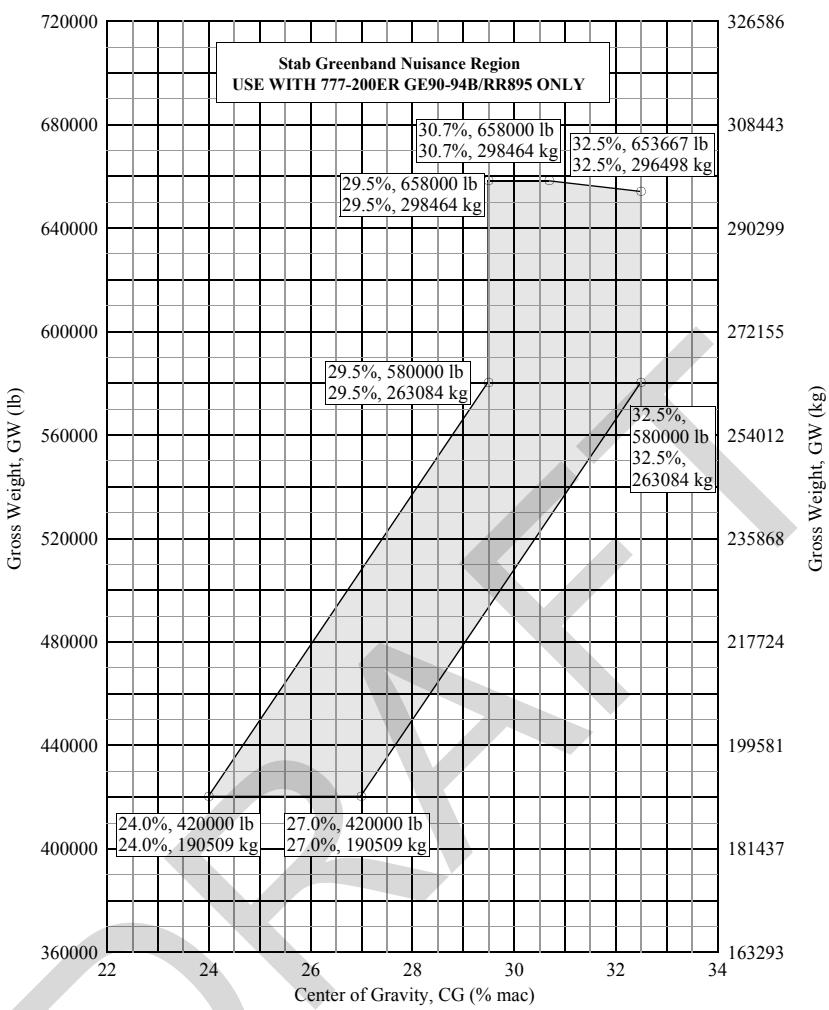
Boeing recommends continued use of the stabilizer greenband monitor and alert. When crews experience a STAB GREENBAND alert after loading is complete:

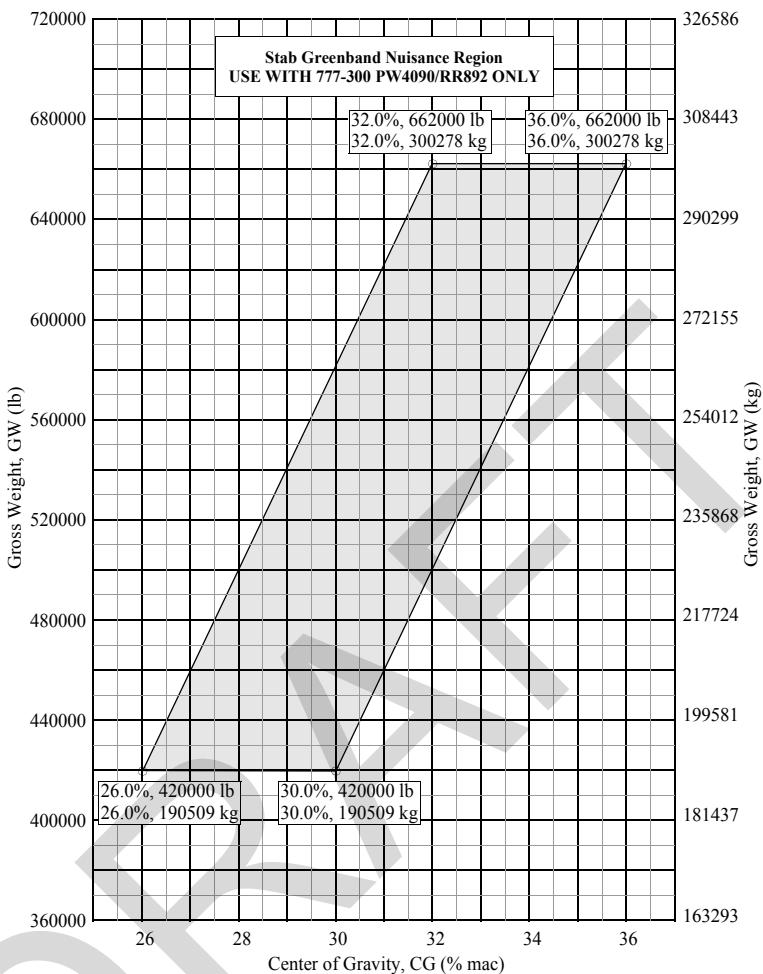
- verify the FMC takeoff data has been correctly entered (takeoff thrust, takeoff flaps, gross weight, and center of gravity)
- verify the stabilizer trim is properly set

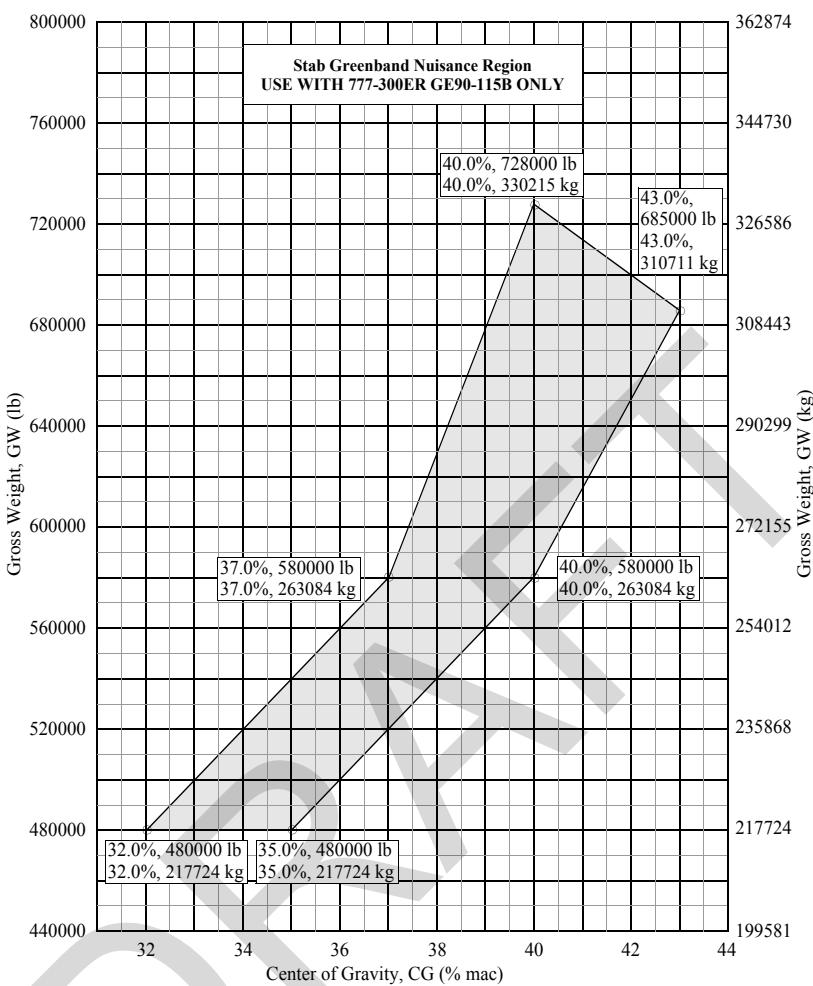
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If the aircraft GW and CG fall within the Stab Greenband Known Nuisance Region on the following GW-CG charts, the STAB GREENBAND advisory alert may be considered a nuisance and takeoff may be safely conducted. Otherwise, or if in doubt, the alert should be considered valid and the actual loading of the airplane should be verified.









Administrative Information

This bulletin replaces bulletin TBC-73 R3 dated March 6, 2006. Discard TBC-73 R3. Revise the Bulletin Record to show TBC-73 R3 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-73 R4 as "In Effect" (IE).

For airplanes with Nose Gear Pressure Transducers (NGPT), the condition in this bulletin is corrected when SB 777-31-0106 has been incorporated. For airplanes with Nose Gear Pressure Switches (NGPS), the condition in this bulletin is corrected when both SB 777-31-0106 and SB 777-27-0075 have been incorporated. This OMB will be cancelled when Boeing is notified that all airplanes in the customer fleet have the appropriate Service Bulletins incorporated.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-75 R1

Issue Date: June 30, 2006

Airplane Effectivity: All Airplanes

Subject: Electronic Checklist (ECL) Line Items not Completing Correctly

Reason: To inform flight crews of a problem with ECL line items not completing correctly and appropriate crew response

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received reports from operators of ECL closed loop line items not completing correctly (not changing from white to green) when performing a normal checklist despite the respective switch being selected to the correct position and system operating normally. Boeing engineering has determined that the contacts within the switch which provide switch position to ECL may be intermittent. The affected contacts do not control the system component or function associated with the switch. Switch contact faults can cause ECL line item problems in both normal and non-normal checklists. However, they are most likely when several frequently-used switches must be correctly positioned for the line item to turn green. This occurs with the HYDRAULICS or FUEL items that some operators add to their customized normal checklists. The failure of a switch contact to close or open cannot complete an ECL closed loop line item.

Operating Instructions

If an ECL closed loop line item does not complete as expected, confirm that the switch is positioned correctly. If the system is functioning normally, or is otherwise operating as expected, override the line item and continue with the checklist. The failure of a line item to automatically complete is not indicative of an ECL fault. Therefore, the ECL should continue to be used for all checklists.

Administrative Information

This bulletin replaces bulletin TBC-75 dated June 30, 2006. Discard TBC-75. Revise the Bulletin Record to show TBC-75 "Cancelled" (CANC). 

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-75 R1 as "In Effect" (IE) .

A vendor design improvement of the push button switches has corrected the problem. Details may be found in Boeing Service Letter 777-SL-31-021. This bulletin will be cancelled when Boeing is notified that the push button switches have been replaced according to the service letter.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-76 R2

Issue Date: June 30, 2006

Airplane Effectivity: 777-200, 777-300

Subject: FMC VNAV Anomaly During Intermediate Level Off

Reason: To inform pilots of a VNAV anomaly which may result in a level-off altitude error.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received operator reports of VNAV overshooting the intended altitude following climb. This occurred at intermediate altitudes when the local barometric pressure was significantly lower than standard. Each event occurred when the level-off was initiated shortly after climbing through transition altitude.

The FMC uses a filter to smooth the computed aircraft altitude to compensate for a rapid adjustment to the barometric correction setting. This altitude smoothing function compensates for a barometric correction change at the rate of 1 inch mercury (33.9 hPa) or 1000 feet in two minutes. During climb, when a VNAV level-off is initiated shortly after passing transition altitude and the altimeter is reset from a very low pressure to QNE (29.92 or 1013), VNAV may overshoot the level-off. In descent, an undershoot condition may occur when a VNAV level-off is initiated shortly after passing the transition level and the altimeter has been reset from QNE to a very low pressure QNH setting. The amount of overshoot or undershoot depends on the amount of barometric correction, when the altimeter is reset, and the elapsed time from altimeter reset to level-off.

Operating Instructions

This condition is corrected with the installation of AIMS Blockpoint 2003A software (Boeing Service Bulletin SB 777-31-0087) or AIMS Blockpoint 2003B software (Boeing Service bulletin SB 777-31-0095). This bulletin will be cancelled when Boeing is notified that all airplanes in the customer fleet are modified with either SB 777-31-0087 or SB 777-31-0095.

Administrative Information

This bulletin replaces bulletin TBC-76 R1 dated June 30, 2006. Discard TBC-76 R1. Revise the Bulletin Record to show TBC-76 R1 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-76 R2 as "In Effect" (IE) .

This condition is corrected with the installation of AIMS Blockpoint 2003A software (Boeing Service Bulletin SB 777-31-0087) or AIMS Blockpoint 2003B software (Boeing Service bulletin SB 777-31-0095). This bulletin will be cancelled when Boeing is notified that all airplanes in the customer fleet are modified with either SB 777-31-0087 or SB 777-31-0095.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-79 R1

Issue Date: July 1, 2002

Airplane Effectivity: 777-200

Subject: APU Start Failures Due to APU Start Switch

Reason: To advise flight crew when starting the APU to manually position APU Start Switch to ON after selecting START.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

The APU Selector has caused failed APU starts on 777 airplanes. Testing of the APU selector has shown that the internal contacts may not make a proper connection when the selector is momentarily placed to the START position and allowed to spring back to the ON position. This condition can be avoided if the pilot manually places the APU Selector to ON after selecting START.

Operating Instructions

When starting the APU, position the APU selector to the START position and hold it there for one second. Then, position the APU selector to ON manually. Do not allow the APU selector to spring back to the ON position.

Administrative Information

This bulletin replaces bulletin TBC-79 dated July 1, 2002. Discard TBC-79. Revise the Bulletin Record to show TBC-79 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-79 R1 as "In Effect" (IE) .

Boeing Service Letter 777-SL-49-012, dated 22 May, 2002, "APU Start Failure due to APU Start Switch" provides instructions on how to replace the faulty switch. This bulletin will be cancelled when Boeing is notified that the switch has been replaced. A Service Bulletin will not be issued.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-80 R2

Issue Date: December 13, 2010

Airplane Effectivity: All Airplanes

Subject: NO LAND 3 EICAS Advisory Messages During Cruise Operations

Reason: To notify flight crews of nuisance NO LAND 3 EICAS alerts

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

There have been a number of reports of “NO LAND 3” EICAS advisory messages during cruise. The condition responsible for generating this message has been found to occur randomly, usually when the autopilot is engaged during LNAV or VNAV (or both) mode operation. It occurs when a single Primary Flight Computer (PFC) identifies a fault in an Autopilot Flight Director Computer (AFDC) and inhibits it from operation. This results in the “NO LAND 3” EICAS alert.

Boeing has not yet determined the root cause, however the anomaly is of a temporary nature, and of a magnitude which is not detectable by the self monitoring functions within the AFDCs themselves. Maintenance investigations performed after these events consistently show no faults in the affected AFDC. Boeing is actively cooperating with several airlines to capture data related to these occurrences to expedite addressing this problem.

Operating Instructions

If a NO LAND 3 alert occurs during flight, disengage and re-engage the autopilot. If the condition was caused by the fault described above, this procedure will restore LAND 3 autoland capability and eliminate the NO LAND 3 message. This procedure to restore autoland capability should only be attempted once during a flight.

If the “NO LAND 3” Advisory is caused by some other failure (sensor, LRU etc.), this procedure will not result in clearing the EICAS advisory or restoring Autoland capability.

Administrative Information

This bulletin replaces bulletin TBC-80 R1 dated April 15, 2002. Discard TBC-80 R1. Revise the Bulletin Record to show TBC-80 R1 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-80 R2 as "In Effect" (IE) .

This bulletin will be cancelled after Boeing is notified that all affected airplanes in your fleet have been modified by Service Bulletin 777-22-0013.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-81 R3

Issue Date: January 9, 2006

Airplane Effectivity: All Airplanes

Subject: ADIRU Heading Error Anomaly

Reason: To inform flight crews of possible heading errors following on-ground automatic realignment of the ADIRU.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

If the ADIRU is navigating and the airplane stops for a predetermined period of time (between 5 and 15 minutes depending on latitude), the ADIRU conducts an automatic realignment designed to remove navigation errors by updating attitude, heading, and velocity.

Analysis of a recent event has shown that if the airplane is moved precisely at the moment automatic realignment completes, the updated information will be saved and subsequently implemented if the airplane becomes motionless again for more than one minute. The heading update will be implemented regardless of the actual airplane heading at the time of update. Heading errors of up to 180 degrees may be introduced by the update. Smaller, less noticeable attitude and/or heading errors affecting navigation functions may also be introduced during the update.

However, ADIRU attitude outputs to the Primary Flight Displays will not be adversely affected.

The ADIRU heading error anomaly can only occur on the ground, and may be detected by comparing the airplane's heading with a known heading.

This anomaly has an extremely low probability of occurrence and has only been reported once in-flight.

In-flight, symptoms of this problem may include one or more of the following:

- Erroneous headings up to 180 degrees from actual heading
- NAV ADIRU INERTIAL caution alert, if the magnitude of the errors are large enough for the ADIRU to detect the fault
- if NAV ADIRU INERTIAL alert is displayed, passenger entry flight locks will disengage and the status message DOOR FLIGHT LOCK XX for each door will be set
- angular difference in the displayed airplane track and the active leg while in LNAV
- LNAV difficulty in precisely tracking the active leg, particularly during turns, resulting in cross-track errors
- ETA to the active waypoint may be inaccurate
- presence of an erroneous crosswind on the navigation display
- NO AUTOLAND (caution) or AUTOPILOT alert messages and/or absence of FLARE arm or ROLLOUT arm indications when an automatic approach is attempted. F/D operation will be similarly affected and may not display appropriate commands
- degraded or inoperative SATCOM, TCAS and ACARS may be affected. SATCOM, TCAS, and DATALINK LOST alerts may be displayed
- NO AUTOLAND (advisory), GROUND PROX SYS, ALT CALLOUTS, and WINDSHEAR SYS alerts may be displayed.

The magnitude and effect of the above symptoms may vary as the flight progresses.

ADIRU air data functions will not be affected. The FMC will use GPS position if it is available. ANP will not be affected and the LNAV path displayed on the ND will be accurate and reliable if GPS is the FMC update source.

Operating Instructions

Prior to takeoff, align the airplane with the runway and check the displayed heading is within +/- 10 degrees of the runway magnetic heading. If the heading is not within +/- 10 degrees of the runway magnetic heading exit the runway, set the parking brake and perform a complete ADIRU alignment.

If the problem is detected after airborne, LNAV may be used as long as course tracking is satisfactory. If autopilot course or heading control is unsatisfactory, disconnect the autopilot, turn off the F/Ds and fly the airplane manually with reference to the standby magnetic compass and the displayed course. If heading errors are significant, consider landing at the nearest suitable airport.

Accomplish the NAV ADIRU INERTIAL checklist as appropriate. Autoland should be monitored for proper operation. If autoland operation is not satisfactory, disconnect the autopilot, turn off the F/Ds and accomplish a manual approach using raw data.

Administrative Information

This bulletin replaces bulletin TBC-81 R2 dated January 9, 2006. Discard TBC-81 R2. Revise the Bulletin Record to show TBC-81 R2 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-81 R3 as "In Effect" (IE) .

This bulletin was previously cancelled with the incorporation of Service Bulletin 777-34-0082. However, bulletin TBC-100 identifies an anomaly that is corrected with the incorporation of Boeing Alert Service Bulletin SB 777-34A0137. When SB 777-34A0137 is incorporated, the anomaly described in this bulletin applies again. This bulletin is re-issued to cover those cases where SB 777-34A0137 has been incorporated.

Boeing Alert Service Bulletin SB 777-34A0138 corrects the anomaly associated with this bulletin and corrects for the impact of incorporating SB 777-34A0137. This bulletin will be cancelled when Boeing is notified that SB 777-34A0138 has been incorporated in the customer fleet.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

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December 15, 2008



Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-82 R4

Issue Date: February 13, 2006

Airplane Effectivity: 777-200, 777-300

Subject: Incorrect Display of Drift Angle

Reason: To inform pilots of potential drift angle discrepancies on the Primary Flight Display (PFD) and the Navigation Display (ND)

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

A difference in Magnetic Variation (MagVar) tables between the ADIRU and FMC has introduced a drift angle anomaly on the PFD and ND at some geographic locations. This anomaly is a result of installing ADIRU Operational Program Software version 3470-HNC-100-03 as required by Alert Service Bulletin 777-34A0137.

ADIRU software version -03 contains the year 1995 MagVar table while the FMC software version starting with AIMS BP03 contains the year 2005 MagVar table. The drift angle anomaly results from magnetic heading computations that use the ADIRU's 1995 MagVar table and magnetic track computations that use the FMC's newer 2005 MagVar table.

While on the ground a difference between the magnetic track and magnetic heading may be observed. The same anomaly may also be observed in flight.

Analysis has shown that the difference between track and heading varies (assuming zero wind) with geographic location. At latitudes between 50 degrees North and 50 degrees South, the maximum track/heading difference can reach 2.5 degrees, but is typically less than 1.8 degrees.

In the northern hemisphere above 50 degrees North latitude, the maximum difference can reach approximately 19 degrees (near N82 W130), however typical errors are less than 6.5 degrees. The greatest errors occur in the region surrounding the North magnetic pole. The specific areas include most of Alaska, the Canadian Provinces of the Yukon, NW Territories and Nunavut, and most of Greenland. In the southern hemisphere below 50 degrees South latitude, the maximum error can reach approximately 5.4 degrees, but is typically less than 1.9 degrees.

This discrepancy is not observed above 82 degrees North and South latitudes or in the vicinity of the magnetic poles because only true referenced heading and track are displayed in these areas. Drift angle is also correctly displayed when the Heading Reference switch is placed in TRUE. Magnetic referenced wind direction is calculated with the ADIRU MagVar so it will be represented correctly relative to the magnetic heading indication.

Operating Instructions

At lower latitudes an erroneous difference between track and heading will be imperceptible in flight. At higher latitudes, crews may be able to notice track and heading differences that are inconsistent with actual wind drift. If desired, correct drift angle can be verified by momentary selection of the HDG REF switch to the TRUE position. The autopilot uses FMC track during LNAV cruise and ADIRU track for approach and landing. Although at some locations, the displays may present an apparent large difference between magnetic track and heading, all FMC and autopilot functions will behave correctly including all selectable roll modes. LNAV course tracking is unaffected by this anomaly.

Administrative Information

This bulletin replaces bulletin TBC-82 R3 dated February 13, 2006. Discard TBC-82 R3. Revise the Bulletin Record to show TBC-82 R3 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-82 R4 as "In Effect" (IE).

This bulletin was previously cancelled with the incorporation of AIMS BP 2003 software. However, bulletin TBC-100 identifies an anomaly that is corrected with the incorporation of Boeing Alert Service Bulletin SB 777-34A0137. When SB 777-34A0137 is incorporated, the anomaly described in this bulletin applies again. This bulletin was previously re-issued to cover those cases where SB 777-34A0137 has been incorporated.

Boeing Alert Service Bulletin SB 777-34A0138 along with the appropriate AIMS software upgrade corrects the anomaly associated with this bulletin, and also corrects for prior incorporation of SB 777-34A0137.

This bulletin will be cancelled when Boeing is notified SB 777-34A0138 and one of the applicable AIMS software upgrade service bulletins listed below is also incorporated in all affected airplanes:

- For AIMS-1 operators - either SB 777-31-0087 or SB 777-31-0104
- For AIMS-2 operators - SB 777-31-0095.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-83 R2

Issue Date: September 15, 2003

Airplane Effectivity: All Airplanes

Subject: Electrical Load Management System (ELMS) ARINC Communication Faults

Reason: To inform flight crews of a problem where ELMS ARINC communication data is lost.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Operators have reported a significant increase in EICAS ELMS P110, P210 and P310 status messages. These messages display when ARINC 629 output data from the respective ELMS panel is lost. The ELMS panels continue to receive data over the ARINC 629 bus and are able to control their various systems even though the panel output is not being transmitted on the ARINC 629 bus. Because of the lack of output data on the bus, some airplane systems will appear faulted when they are not, and some airplane systems may not display EICAS alert or status messages when faults actually occur.

Operating Instructions

If the EICAS status message ELMS P110 PANEL displays:

The following EICAS messages will also display and should be considered valid messages:

EICAS ADVISORY message

- CARGO HEAT AFT
- EICAS STATUS messages

- AIR/GROUND L
- CARGO EXH FAN FWD
- EQUIP VENT FAN
- IFES COOLING FAN
- LAV-GALLEY FAN L
- RECIRC FAN
- SATCOM COOLING FAN L

Note: Some messages above may not apply depending on airplane configuration.

Should the associated system fault occur while the ELMS P110 PANEL status message is displayed, the following EICAS messages will NOT display because of the ELMS ARINC communication fault:

EICAS ADVISORY messages

- FUEL CROSSFEED FWD
- FUEL PUMP CENTER L
- FUEL PUMP L AFT
- FUEL PUMP R FWD

The electrical synoptic will indicate that the left and right main AC bus and left transfer bus are not powered even though they are powered.

The fuel synoptic indications and flow bars for the left aft fuel pump, right forward fuel pump, left center fuel pump and forward crossfeed valve will be blank.

During fuel jettison, the synoptic indications and flow bars for the left main jettison pump, the left jettison isolation valve, and the left jettison nozzle valve indications will be blank. Fuel jettison will be normal unless the system is not fully operational.

The fuel imbalance pointer will not flash if fuel balancing is going in the wrong direction.

On the overhead panel, the left aft, right forward and left center pump “PRESS” lights will not illuminate. The forward crossfeed and the left jettison nozzle valve “VALVE” lights will not illuminate.

If the EICAS status message ELMS P210 PANEL displays:

The following EICAS messages will also display and should be considered valid messages:

EICAS ADVISORY message

- CARGO HEAT BULK
- EICAS STATUS messages
- AIR/GROUND R
- CARGO VENT FAN BULK

- RAT GEN HEAT
- RECIRC FAN

Note: Some messages above may not apply depending on airplane configuration.

Should the associated system fault occur while the ELMS P210 PANEL status message is displayed, the following EICAS messages will NOT display because of the ELMS ARINC communication fault:

EICAS ADVISORY messages

- FUEL PUMP CENTER R
- FUEL PUMP R AFT

The electrical synoptic will indicate that the right main AC bus and right transfer bus are not powered even though they are powered.

The fuel synoptic indications and flow bars for the right aft fuel pump and right center fuel pump will be blank.

During fuel jettison, the synoptic indications and flow bars for the right main jettison pump, the right jettison isolation valve, and the right jettison nozzle valve indications will be blank.

The fuel imbalance pointer will not flash if fuel balancing is going in the wrong direction.

On the overhead panel, the right aft and right center pump “PRESS” lights will not illuminate. The right jettison nozzle valve “VALVE” light will not illuminate.

If the EICAS status message ELMS P310 PANEL displays:

The following EICAS messages will also display and should be considered valid messages:

EICAS ADVISORY message

- NO LAND 3

EICAS STATUS messages

- AIR/GROUND R
- NO LAND 3

Should the associated system fault occur while the ELMS P310 PANEL status message is displayed, the following EICAS messages will NOT display because of the ELMS ARINC communication fault:

EICAS ADVISORY messages

- ELEC BATTERY OFF
- ELEC STANDBY SYS
- FUEL CROSSFEED AFT
- FUEL PUMP L FWD

- FUEL VALVE APU
- MAIN BATTERY DISCH
- PASS OXYGEN ON

The electrical synoptic indication “CHG/DISCH” for the main battery will not display.

The fuel synoptic indications and flow bars for the left forward fuel pump and aft crossfeed valve will be blank.

The fuel imbalance pointer will not flash if fuel balancing is going in the wrong direction.

On the overhead panel, the left forward pump “PRESS” light will not illuminate. The aft crossfeed valve “VALVE” light will not illuminate. The passenger oxygen “ON” light will not illuminate.

Operating Instructions

If EICAS alert messages display, perform the associated non-normal checklist as required.

During fuel balancing, make sure fuel is being balanced in the correct direction.

Once fuel jettison is initiated, it must be terminated by manually turning off the fuel jettison nozzle valves if the EICAS status messages ELMS P110 PANEL or ELMS P210 PANEL display. Automatic shutoff of the fuel jettison system is inoperative.

Fuel jettison is not possible if both EICAS status messages ELMS P110 PANEL and ELMS P210 PANEL are displayed.

Do not use synoptic displays to perform procedures.

Administrative Information

This bulletin replaces bulletin TBC-83 R1 dated September 15, 2003. Discard TBC-83 R1. Revise the Bulletin Record to show TBC-83 R1 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-83 R2 as "In Effect" (IE) .

This bulletin will be cancelled after Boeing is notified that all affected airplanes have been modified by Service Bulletin 777-24-0087.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

email: flighttraining@boeing.com
Telephone: (206) 662-4000
Fax: (206) 662-4743

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-85

Issue Date: June 20, 2003

Airplane Effectivity: All Airplanes

Subject: 777 FMC Calculation of Reduced Thrust Takeoff Anomaly

Reason: To inform flight crews of a thrust setting anomaly associated with derated thrust takeoff selection.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received reports of anomalous FMC calculation of derate takeoff (TO 1 or TO 2) thrust settings. The percent thrust reduction associated with TO 1 and TO 2 on the FMC THRUST LIM page can display zero (0). This anomaly seems to occur at power up, after a data load, or after FMC reset. When this occurs, selection of TO 1 or TO 2 does not result in derated thrust. The Takeoff EPR/N1 Limit displayed on line 1R of the FMC THRUST LIM page is full rated thrust (TO); however, FMC V speeds may be based on the selected derate. If an assumed temperature has been entered, the resulting thrust reduction is relative to full rated thrust, not the intended derate.

Operating Instructions

Takeoffs using full rated thrust are not affected by this anomaly. If intending to use derates TO 1 or TO 2, verify the appropriate percentage thrust reduction displays under TO 1 or TO 2 on the FMC THRUST LIM page. If the displayed percentage thrust reduction associated with TO 1 and TO 2 is zero (0), FMC selection of derates is not available. Flight crew action should be based on airline policy; however, the following thrust setting options are available:

- Use full rated thrust (TO) with appropriate V speeds, if conditions permit.
 - Use the assumed temperature method with full rated thrust (TO) and appropriate V speeds, if conditions permit.
 - Set EPR/N1 manually for the intended derate. Derate thrust settings and appropriate V speeds can be obtained from company airport analysis or from the Flight Planning and Performance Manual, Section 1.3.

Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-85 as "In Effect" (IE) .

This condition is under investigation. This bulletin remains in effect until further notice.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-87 R3

Issue Date: July 10, 2006

Airplane Effectivity: All Airplanes

Subject: 777 Fuel Quantity Indicating System Fluctuations

Reason: To inform flight crews of fuel quantity indicating system fluctuations.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

777 operators report FUEL IMBALANCE EICAS advisory messages and/or FUEL DISAGREE-PROG 2/3 FMC messages in flight due to fluctuating fuel quantity indications. Fluctuating indications are due to an internal FQIS anomaly and will usually result in a constant rate decrease of approximately 600 lbs / 270 kgs per minute in the Left Main, Right Main, or Center fuel tank quantity. Typical cruise fuel flow is approximately 125 lbs / 55 kgs per minute per engine. The erroneous fuel indications and resultant messages have been observed to recover within several minutes, but may repeat throughout the flight.

Operating Instructions

If any of the following are observed, flight crews should accomplish the FUEL LEAK CHECKLIST:

- Visual observation of fuel spray from strut/engine
- Excessive engine fuel flow
- Control wheel deflection to maintain lateral trim

One or more of the following may also be evidence of a fuel leak or the FQIS anomaly described above:

- Total fuel quantity decreasing at an abnormal rate

- FUEL IMBALANCE message on EICAS
 - FUEL QTY LOW message on EICAS
 - FUEL DISAGREE –PROG 2/3 message on CDU scratchpad (pre-AIMS 05)
 - FUEL DISAGREE message on EICAS (AIMS 05 and later)
 - INSUFFICIENT FUEL message on CDU scratchpad

A fuel quantity decrease of approximately 600 lbs / 270 kgs per minute in one tank may be the result of the subject FQIS anomaly. This anomaly could trigger the FUEL IMBALANCE, FUEL DISAGREE, FUEL QTY LOW, and/or INSUFFICIENT FUEL messages. Allow 15 minutes for the FQIS to recover and display accurate fuel quantities. If the message(s) remain after this time, consider them valid and take appropriate action.

Note: Should fuel jettison be required with erroneous fuel indications, the fuel jettison system will use the indicated totalizer fuel to determine when to cease jettisoning at the fuel TO REMAIN value set by the crew. Therefore, if the indicated fuel quantity indications are in error, the crew should use the FMC calculated fuel value and determine the jettison time using the jettison rates of 5400 lbs / 2500 kgs per minute with fuel in the center tank, or 3100 lbs / 1400 kgs per minute with center tank empty.

Administrative Information

This bulletin replaces bulletin TBC-87 R2 dated July 10, 2006. Discard TBC-87 R2. Revise the Bulletin Record to show TBC-87 R2 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-87 R3 as "In Effect" (IE) .

This condition is corrected by Boeing Service Bulletin SB 777-28-0043.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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P.O. Box 3707 M/C 20-89
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-88 R1

Issue Date: June 30, 2006

Airplane Effectivity: 777-200, 777-300

Subject: ENGINE SHUTDOWN L or R EICAS Message Anomaly

Reason: To inform flight crews that the ENGINE SHUTDOWN L or ENGINE SHUTDOWN R caution message may display for approximately one second after selecting the Fuel Cutoff Switch to the RUN position when starting the second engine. This is a ground condition only.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

This bulletin applies to airplanes with AIMS Blockpoint 2003 Software installed. During flight testing, the EICAS caution message ENGINE SHUTDOWN L was observed for approximately one second after selecting the left Fuel Cutoff Switch to the RUN position. The right engine had already been started. During a subsequent test flight, the EICAS caution message ENGINE SHUTDOWN R was also observed under the same conditions during right engine start when the left engine had already been started.

The EICAS caution messages ENGINE SHUTDOWN L, R are not accompanied by the Master Caution Light annunciation or Caution aural sound.

This anomaly is due to a software timing issue within AIMS Blockpoint 2003 software. Boeing and Honeywell have determined the cause of this anomaly. It will be corrected in the next AIMS software revision.

Operating Instructions

The EICAS caution message ENGINE SHUTDOWN L or ENGINE SHUTDOWN R may display for approximately one second after the Fuel Cutoff Switch is moved to the RUN position during a normal start of the second engine. This is a nuisance message. No pilot action is required if the message clears within approximately one second and all other EICAS Engine parameters indicate a normal engine start.

Administrative Information

This bulletin replaces bulletin TBC-88 dated June 30, 2006. Discard TBC-88. Revise the Bulletin Record to show TBC-88 “Cancelled” (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-88 R1 as "In Effect" (IE) .

This condition is corrected with the installation of AIMS Blockpoint 2003B software (Boeing Service bulletin SB 777-31-0095). This bulletin will be cancelled when Boeing is notified that all affected airplanes in the customer fleet are modified with SB 777-31-0095.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-90 R1

Issue Date: March 27, 2006

Airplane Effectivity: 777-200, 777-200LR, 777-300

Subject: FMC Departure Routing Anomaly

Reason: To direct flight crews to use the LEGS page to remove discontinuities after entering departure procedures in the FMC.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

An operator recently reported the FMC changed waypoints on a selected departure procedure when the flight crew removed a discontinuity between the departure procedure and route using the RTE page. Engineering investigation by Boeing revealed an FMC software anomaly can cause substitution of waypoints when a departure procedure applies to multiple runways, and a RTE page entry modifies the departure routing. In this situation, the FMC can substitute the departure waypoints that apply to another runway at the origin airport. The change may not be noticed on the ND even though the magenta line and LEGS page waypoints display it. If not corrected prior to departure, the anomaly can result in the flight director commanding an immediate turn when LNAV engages after takeoff.

The only reported occurrence of this anomaly has been on the Narita Reversal Eight Departure, Kisarazu (KZE) Transition when departing runway 16R. However, the software anomaly could conceivably cause a similar problem at other airports.

This anomaly does not occur if departure routing discontinuities are removed on the LEGS page.

Operating Instructions

After selecting runway, SID and transition, verify SID and departure route are correct on the RTE page. Remove any discontinuities in departure routing on the LEGS page.

Administrative Information

This bulletin replaces bulletin TBC-90 dated March 27, 2006. Discard TBC-90. Revise the Bulletin Record to show TBC-90 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-90 R1 as "In Effect" (IE) .

This condition is corrected with the installation of AIMS BP05A software. The applicable Boeing service bulletin depends on the AIMS hardware installation:

- AIMS-1 hardware airplanes - SB 777-31-0098.
 - AIMS-2 hardware airplanes - SB 777-31-0097.

This bulletin will be cancelled when Boeing is notified that all affected airplanes in the customer fleet have the applicable service bulletin incorporated.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-92 R2

Issue Date: August 31, 2006

Airplane Effectivity: All Airplanes

Subject: Fuel temperature blanking indication.

Reason: To inform flight crews of a Fuel Quantity Processor Unit (FQPU) anomaly that may cause blanking of the fuel temperature indication.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

The fuel temperature indication may blank on certain 777 airplanes, accompanied by the EICAS status message FUEL TEMP INDICATION.

Smiths recently introduced new Fuel Quantity Processor Unit (FQPU) part numbers 0335KPU01 and 0330KPU01 and Boeing incorporated them in production at line positions 423, 429, 466, and 477 and on (refer to Service Letter 777-SL-28-016). The subject problem is associated with the new FQPUs.

Operating Instructions

In the event of inflight blanking of the fuel temperature indication, use Total Air Temperature (TAT) as a conservative indication of fuel temperature.

The FUEL TEMP LOW EICAS advisory message will not display when the fuel temperature indication is blank. Therefore, maintain TAT greater than 3 degrees C above the fuel freeze point.

Administrative Information

This bulletin replaces bulletin TBC-92 R1 dated August 31, 2006. Discard TBC-92 R1. Revise the Bulletin Record to show TBC-92 R1 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-92 R2 as "In Effect" (IE) .

This condition is corrected with FQPU modifications provided in Smiths Aerospace Service Bulletin 0330KPU01-28-0437 or 0335KPU01-28-438, depending on the installed FQPU part number. This bulletin will be cancelled when Boeing is notified all affected airplanes in the customer fleet are modified by appropriate Smiths Aerospace service bulletin.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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P.O. Box 3707 M/C 20-89
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-93 R2

Issue Date: March 27, 2006

Airplane Effectivity: All Airplanes

Subject: Incorrect turn direction during a Standard Instrument Departure (SID).

Reason: To inform pilots of a Flight Management Computer System anomaly.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

An operator has reported cases of the FMC commanding a turn opposite to that expected and displayed on the map during a SID. Each of the reported occurrences involves a SID with a course reversal shortly after takeoff. In these cases, a right turn was correctly displayed on the map but the FMC commanded a left turn when certain criteria existed. Specifically, when the airplane has a steep initial climb, the airplane may reach an altitude constraint with the airplane in a position to immediately sequence the next leg. For example, many SIDs are coded with an initial "runway heading" leg (VA leg type) that climbs to a specified altitude. In some procedures, the SID also has a "heading to an intercept" leg (VI leg type) with an associated turn direction following the VA leg. When this anomaly occurs, the airplane may reach the specified altitude in a position to immediately sequence the next (VI) leg. Should this simultaneous sequence occur, the VI leg with the turn direction is no longer in the route. Since the turn direction is no longer in the route, the FMC will revert to normal turn logic and command a turn in the shortest direction to the new course. The shortest turn direction may be in the opposite direction from that depicted for the departure. When this anomaly occurs, the map will continue to display the correct magenta path but the airplane may turn in the opposite direction.

The only reported occurrence of this anomaly has been on the RW34 departures at Fukuoka, Japan. However, the software anomaly could cause a similar problem at other airports.

Operating Instructions

During a SID, should the FD or autopilot begin a turn opposite to that displayed on the map or described in the SID description, use HDG SEL or TRK SEL to fly the correct chart course to complete the turn in the correct direction. Following completion of the turn, LNAV may be re-engaged and FD guidance may be followed or the autopilot may be engaged normally.

Administrative Information

This bulletin replaces bulletin TBC-93 R1 dated March 27, 2006. Discard TBC-93 R1. Revise the Bulletin Record to show TBC-93 R1 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-93 R2 as "In Effect" (IE) .

This condition is corrected with the installation of AIMS BP05A software. The applicable Boeing service bulletin depends on the AIMS hardware installation:

- AIMS-1 hardware airplanes - SB 777-31-0098.
 - AIMS-2 hardware airplanes - SB 777-31-0097.

This bulletin will be cancelled when Boeing is notified that all affected airplanes in the customer fleet have the applicable service bulletin incorporated.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-95 R2

Issue Date: September 25, 2006

Airplane Effectivity: 777-200ER

Subject: New Ice Shedding Procedures for Airplanes with Trent 800 Engines in Freezing Fog

Reason: To inform flight crews of the need to use special ice shedding procedures in freezing fog conditions.

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

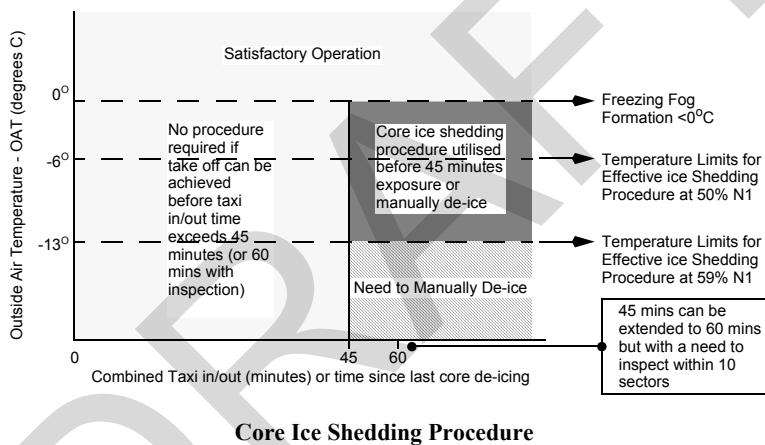
THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received reports of engine surges and internal damage on Trent 700 powered A330 airplanes. This damage was experienced following extended idle thrust operation in freezing fog. In freezing fog conditions, ice can build up in the core of the engine in addition to on the fan. Since the Trent 700 is very similar in design to the Trent 800 on the 777, Boeing and Rolls Royce have determined that a similar situation may occur with the Trent 800. Analysis shows the current Trent 800 ground engine ice shedding procedure, which requires momentary operation at 50% N1 every 60 minutes, is adequate for shedding fan ice accumulations but may not always shed core ice accumulations in freezing fog conditions. Analysis has also shown that extended exposure to freezing fog conditions below -13 degrees C may create ice accumulations that are impractical or impossible to shed using ground run-up procedures. Use of engine anti-ice on the ground will not prevent ice accumulations on the fan or in the core of the engine. An engine which experiences freezing fog on taxi in to the gate will not shed this ice while the engine is shut down in cold temperatures. For this reason, the total time of taxi in and taxi out in freezing fog must be considered.

This procedure is applicable whenever freezing fog with visibility 300 meters or less is reported. This procedure does not apply to operations in snow, hail, sleet, freezing rain, or freezing drizzle. These conditions have a larger water particle size that does not cause core icing. Boeing and Rolls Royce recommend accomplishing the new ice shedding procedure anytime total taxi time exceeds 45 minutes in the above freezing fog/visibility conditions. However, several customers have requested to be able to takeoff after up to 60 minutes of total taxi time without accomplishing the core ice shedding procedure. This is permitted, but the flight crew must make a log book entry of the number of total minutes of taxiing in freezing fog with visibility 300 meters or less. An engine borescope is required within ten flights. In all cases, accomplish the existing Engine Anti-Ice Use Supplementary Procedure prior to brake release for takeoff when the conditions in the procedure are applicable.

The ice shedding procedure in freezing fog conditions is summarized in the following table:



Operating Instructions

Flight crews are to use the following core ice shed procedures for Trent 800 engines when freezing fog with visibility 300 meters or less is reported.

If takeoff can be achieved within 45 minutes total taxi time, accomplish the existing Engine Anti-Ice Operation - On the Ground Supplementary Procedures prior to brake release for takeoff. The core ice shed procedure is not required.

If takeoff cannot be achieved within 45 minutes total taxi time, accomplish the following core ice shed procedure within 45 minutes total taxi time to clear the core ice from the engine. Accomplish the following core ice shed procedure at subsequent intervals no greater than every 45 minutes prior to takeoff.

If OAT is 0 degrees C to -6 degrees C, run-up the engines to 50% N1 for 60 seconds every 45 minutes.

If OAT is -7 degrees C to -13 degrees C, run-up the engines to 59% N1 for 60 seconds every 45 minutes.

Note: Setting run-up thrust at 59% N1 is recommended as the Takeoff Configuration Warning may be annunciated at 60% N1.

CAUTION: Precautions must be taken for:

- Jet blast up to 900 feet (300 meters) behind the aircraft.
- Snow and ice at the edge of the taxi way that can be ingested by the engines.
- Slippery taxi surfaces.
- Airport noise restrictions.
- If OAT is less than -13 degrees C, there is no effective run-up procedure and manual de-icing is required.

Regardless of temperature, if the core ice shedding procedure described above is not accomplished within 45 minutes total taxi time in freezing fog, but takeoff can be achieved within 60 minutes total taxi time in freezing fog, takeoff is permitted. A borescope inspection will be required within 10 flights. A note must be made in the log book of this condition.

Take off is not permitted if total taxi time in freezing fog with visibility 300 meters or less exceeds 60 minutes without having accomplished the above core ice shed procedure. The engine core must be manually de-iced.

Note: Crews must include taxi-in time from the previous flight if taxi-in occurred in freezing fog with visibility 300 meters or less and the temperature remains below freezing. The engine may be considered free of ice prior to engine start if:

- manually de-iced,
- visually inspected per the AMM, or
- the above core ice shed run-up procedure is conducted within 5 minutes before engine shutdown during taxi-in.

If the engine is considered free of ice prior to engine start, use only the total taxi-out time.

To avoid manual de-icing requirements, operators are encouraged to work with airport authorities to limit or eliminate exposure to extended taxi times when freezing fog conditions exist.

In all cases, accomplish the Engine Anti-Ice Use Supplementary Procedure, prior to brake release for takeoff when the conditions in the procedure are applicable.

This bulletin has been coordinated with Rolls Royce.

Administrative Information

This bulletin replaces bulletin TBC-95 R1 dated September 25, 2006. Discard TBC-95 R1. Revise the Bulletin Record to show TBC-95 R1 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-95 R2 as "In Effect" (IE) .

This bulletin will be incorporated in a future revision to the 777 FCOM for Trent 800 engines only.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-96 R1

Issue Date: December 10, 2007

Airplane Effectivity: 777-200ER

Subject: False Engine-Out Indication

Reason: To inform pilots of a Loss of N3 Indication (Dedicated Generator) anomaly on Rolls-Royce engines.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Operators have reported in-service events in which the N3 Engine Display are blanks and the digital N3 displays "0.0." No EICAS alert level messages are present, but several status level messages may result (ENG CONTROL, ENG EEC C1, ENG OPU and ENG TURB OVSP SYS, for example).

This condition is caused by a failure within the engine Dedicated Generator. The Dedicated Generator (DG) is a small generator on the engine gearbox which powers various engine components and provides the N3 signal to the EEC and airplane.

During a recent DG failure, the engine continued to provide normal thrust response. However, the FMC and Autopilot interpreted the N3 signal loss as an engine-out condition. When this condition exists, the Autothrottle may command slow thrust fluctuations to accommodate the false engine-out condition when above approximately FL200. These thrust fluctuations can cause the airspeed to vary between EO Speed and a protective margin below VMO/MMO. At lower altitudes or during climbs and descents at any altitude, autothrottle operation is normal. Additionally, the Autopilot may add a rudder input during LAND 2 / LAND 3 operations. However, because the engines are still operating normally and thrust is symmetrical, the rudder is compensated by aileron input and a slight "cross control" condition may occur when LAND 2 / LAND 3 is annunciated.

FMC performance predictions will approximate the all-engine performance. However, the FMC's CALCULATED fuel value on the PROGRESS 2/x page will lag the TOTALIZER until the FUEL DISAGREE EICAS message (AIMS BLOCK POINT 05) or the FUEL DISAGREE - PROG 2/3 CDU scratchpad message (AIMS BLOCK POINT 03 and earlier) is displayed. Selection of the TOTALIZER will ensure that fuel and ETA predictions reflect the all-engine configuration.

Additionally, the loss of N3 following a DG failure will inhibit an in-flight engine start should the respective engine fail. Crews should be aware that the combined probability of loss of N3 due to a DG failure and an engine failure is extremely remote.

Boeing and Rolls Royce are investigating an improved Dedicated Generator to resolve this issue.

Operating Instructions

If one of the N3 Engine Display arcs blank and the respective digital N3 value displays "0.0," but all other engine indications are normal:

1. Operations above approximately FL200: Climbs and descents are not affected. During cruise, disconnect the autothrottle and set power for the desired speed or Mach.
2. Approach to an Autoland (LAND 2 / LAND 3): The 777 Autopilot has been demonstrated to safely land and rollout with an engine out. Therefore, should an autoland be required and this false engine-out condition exists, continue the approach and landing. Manual landings are not affected.

Administrative Information

This bulletin replaces bulletin TBC-96 dated December 10, 2007. Discard TBC-96. Revise the Bulletin Record to show TBC-96 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-96 R1 as "In Effect" (IE).

An interim software update to improve the EEC response to this anomaly will be available in December 2005. However, the airplane level effects described in this bulletin will continue until new Dedicated Generator hardware is available.

This bulletin will be cancelled after Boeing is notified that all affected airplanes have been modified by vendor (RR) Service Bulletin RB.211-72-E845.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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D632W001-TBC

December 15, 2008



Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-97 R1

Issue Date: June 30, 2006

Airplane Effectivity: All Airplanes

Subject: Automatic Re-Boot of Electronic Flight Bag (EFB)

Reason: To inform flight crews that the First Officer's EFB system may re-boot when extending or raising the landing gear.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

The BP02 Electronic Flight Bag (EFB) system, has a known anomaly on the First Officer (FO) side installation which causes the entire FO EFB system to automatically re-boot during most gear extension and retraction cycles. This is caused by vibrations from the nose gear retraction and extension. The system normally re-boots successfully (approximately 3 mins), after which the EFB system may be used normally. For this condition, there is no need to record this anomaly in the Airplane Maintenance Log. No known issues have been identified with the Captain's side installations.

Operating Instructions

If the First Officer EFB system re-boots successfully during landing gear extension or retraction, no crew action is required. If the system does not regain normal operation automatically, an Airplane Maintenance Log entry should be made.

Administrative Information

This bulletin replaces bulletin TBC-97 dated June 30, 2006. Discard TBC-97. Revise the Bulletin Record to show TBC-97 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-97 R1 as "In Effect" (IE) .

This condition is corrected with the installation of Boeing Service Bulletin SB 777-46-0005. This bulletin will be cancelled when all affected airplanes in the customer fleet are modified.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

email: flighttraining@boeing.com
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-99

Issue Date: July 11, 2005

Airplane Effectivity: 777-200

Subject: GE90-94B Autostart Logic during High Altitude Ground Starts

Reason: To inform flight crews of the need to monitor, and take possible action, during engine ground autostarts at high altitude airports.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

This bulletin applies only to aircraft equipped with GE90-94B engines.

A GE90-94B powered 777 operator experienced several hot starts in Mexico City, a high altitude airport. These hot starts were a result of an engine that exceeded its serviceability limits (high cycle engine with high pressure compressor problems) combined with high altitude airport and high ambient temperature. Flight crews reported they manually interrupted the auto start sequence when EGT exceeded the ground start limit of 750 degrees C. In one case, EGT reached 770 degrees C by the time the flight crew manually aborted the autostart. QAR data revealed that the engine had stalled each time before exceeding the start EGT limit.

EGT in excess of 750 degrees C during an engine start is abnormal, regardless of cause, and must be investigated prior to flight. Normally, in case of a hot start, the autostart logic stops fuel to the engine if/when EGT exceeds 740 degrees C, so it automatically protects against exceedances of the 750 degrees C Start Redline limit. Therefore, the Engine Start procedure described in the Operations Manual does not require crew action during autostart (except for low oil pressure).

However, in the high-altitude conditions of the reported incidents, the autostart logic did not protect the start EGT limit. Analysis confirmed that at high airport altitudes the EEC logic may turn off the autostart EGT protection features prior to reaching idle. In these circumstances, the normal sub-idle stall logic will still protect against exceedances of 800 degrees C, but the control will not automatically protect against exceedance of the 750 deg C start EGT limit.

A future version of EEC software will contain logic changes to ensure that, for all conditions, the autostart EGT protection features remain active until the start is complete. Prior to the availability of this software, flight crews should monitor EGT during autostarts, and manually abort the start if EGT exceeds the Start Redline limit.

Operating Instructions

The flight crew should monitor EGT during an autostart with GE90-94B engines, and manually abort the start for any EGT exceedance of 750 degrees C or when EGT is observed rapidly approaching 750 degrees C.

Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-99 as "In Effect" (IE) .

This condition is temporary until the system is modified. This bulletin will be revised to include Service Bulletin information when available.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-100 R1

Issue Date: January 9, 2006

Airplane Effectivity: 777-200ER

Subject: Flight Control Anomaly

Reason: To inform flight crews of a pitch up anomaly during climb.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

A 777-200ER recently experienced a significant nose-up pitch event while climbing through FL360. The event was accompanied by: indication, warning, autopilot, autothrottle, and flight control anomalies. The flight crew disconnected the autopilot and autothrottle and stabilized the airplane using nose down control column force, during which time the airplane climbed above 41000 feet, decelerated to a minimum airspeed of 158 knots and activated the stick shaker.

During this flight, the flight crew observed the following anomalies:

- Airspeed indicator amber band displayed up to the MMO limit.
- Airspeed indicator trend vector displaying much greater than actual acceleration.
- Slip-skid indicator showing incorrect full scale deflection.
- Undesired autothrottle re-engagement due to high amber band indication.
- Control forces initially exceeding approximately 30 pounds, decreasing gradually to normal levels.
- Windshear warning.
- Position trend vector displaying an incorrect sharp turn on the navigation display.
- Erratic autobrake activity.

The flight returned safely to the origin airport. This is the first 777 airplane that has experienced this type of event. Investigations by Boeing and Honeywell have revealed the primary cause of the event to be a false acceleration signal from the ADIRU which caused both the autopilot (while engaged) and the primary flight control system to increase the airplane pitch attitude in response to the false acceleration signal. The SAARU, which was operating normally on the incident airplane, provided inputs to the flight control system that significantly reduced the severity of the event. Until corrective action is complete, crews should be aware of the following in the unlikely event this anomaly should reoccur:

- The airplane may pitch up or down depending on the nature of the false ADIRU signal.
- Pitch attitude can be controlled with enough force on the control column.
- The control forces will begin to decrease within approximately 10 seconds then gradually, over a period of approximately two minutes, decrease to near normal.
- The autothrottle may automatically re-engage if current speed is below the top of the amber band.
- The autopilot and flight director may provide erroneous guidance and control.
- Primary airspeed, altitude, vertical speed and attitude indications remain accurate.
- DIRECT control laws are not affected.

Boeing and Honeywell are aggressively developing an ADIRU software fix in coordination with the NTSB and the FAA.

Boeing is recommending operators not permit SAARU-inoperative dispatch until the ADIRU software fix is incorporated.

Operating Instructions

In the event that an airplane upset should occur, flight crews are advised to cross-check all available flight instruments and follow the published Upset Recovery procedure. If the upset is accompanied by the indications described above, flight crews should take the following additional actions if recovery is not immediate:

Apply as much control force as needed to establish a normal pitch attitude, to include both pilots pushing or pulling together. Although initial manual control forces may be high, the affects of the ADIRU anomaly on manual control forces are expected to diminish within 10 seconds and should be back to near normal within 2 minutes.

If undesired autothrottle behavior occurs:

A/T Arm switches ----- OFF

Do not attempt to re-engage the autopilot or autothrottle.

If recovery is not progressing satisfactorily:

PFC Disconnect Switch ----- DISCONNECT

Continue with the Upset Recovery procedure.

Plan to land at the nearest suitable airport.

Do not use Autobrakes for landing.

Administrative Information

This bulletin replaces bulletin TBC-100 dated January 9, 2006. Discard TBC-100. Revise the Bulletin Record to show TBC-100 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-100 R1 as "In Effect" (IE) .

This condition is temporary until the system is modified. This bulletin will be cancelled when Boeing alert service bulletin SB 777-34A0137 is incorporated.

While incorporation of SB 777-34A0137 corrects the anomaly associated with this bulletin, it also causes the anomalies associated with two previous bulletins "ADIRU Heading Error Anomaly" and "Incorrect Display of Drift Angle" to apply again. If SB 777-34A0137 has not been incorporated, it is recommended that SB 777-34A0138 be incorporated instead to correct the anomalies associated with all three bulletins. This bulletin, however, will be cancelled when Boeing is notified that either SB 777-34A0137 or SB 777-34A1038 is incorporated in the customer fleet.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

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Fax: (206) 662-4743

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-101 R2

Issue Date: June 13, 2011

Airplane Effectivity: All Airplanes

Subject: FMC Performance Predictions Anomaly

Reason: To inform flight crews of an FMC performance prediction anomaly following ABEAM PTS selection.

Revised to add service bulletin information about AIMS-2 BPV15.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Operators have reported erroneous FMC performance predictions following execution of the ABEAM PTS function on the LEGS page. When OAT values have been previously entered in LSK 5R on the WIND page, and the ABEAM PTS feature is then selected following a "direct-to" flight plan modification, the OAT value on the WIND page erroneously changes to "0" degrees. Subsequently, the fuel predictions are erroneously calculated based upon 0 degrees instead of the previously entered value for the respective cruise altitude. Operators have reported display of INSUFFICIENT FUEL FMC alert messages and fuel predictions much lower than planned. Additionally, there are no flight deck annunciations or alerts to the crew to indicate the OAT value on the WIND page has changed.

Operating Instructions

Following selection of the ABEAM PTS feature, review the ALT/OAT value on the respective WIND page. Re-enter the correct altitude and the indicated SAT (from PROGRESS page 2) on the ALT/OAT line for the next waypoint, if required. This data will propagate to all down track waypoints. Following reentry of OAT, FMC fuel predictions should be near those on the flight plan.

Administrative Information

This bulletin replaces bulletin TBC-101 R1 dated June 14, 2010. Discard TBC-101 R1. Revise the Bulletin Record to show TBC-101 R1 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-101 R2 as "In Effect" (IE) .

This condition exists on airplanes that do not have AIMS BPV14 software installed. This condition is corrected with the installation of AIMS BPV14 or AIMS BPV15 software. The applicable Boeing service bulletin depends on the AIMS hardware installation:

- AIMS-1 hardware airplanes - SB 777-31A0179.
 - AIMS-2 hardware airplanes - SB 777-31A0150.
 - AIMS-2 hardware airplanes - SB 777-31-0167 or 777-31-0183.

This bulletin will be cancelled when Boeing is notified that all affected airplanes in the customer fleet have the applicable service bulletin(s) incorporated.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-102 R2

Issue Date: January 9, 2006

Airplane Effectivity: All Airplanes

Subject: Fuel Quantity Blanking on the Progress 2/3 Page of the Control Display Unit (CDU)

Reason: To inform flight crews of an FMC fuel blanking anomaly.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Operators have reported no fuel quantity display on the Progress Page 2/3 during preflight checks. This can occur when the Fuel Quantity Processor Unit (FQPU) operates in Reversionary Mode. The FQIS still provides fuel quantity on Primary EICAS and the Fuel Synoptic but fuel quantity data is not displayed on the CDU for TOTALIZER and CALCULATED fuel quantity. All fuel quantity displays on primary EICAS and the fuel synoptic will be unaffected. Once the FQPU begins operating in reversionary mode, it will stay in this condition until FQPU power is cycled. If the FQPU begins operating in reversionary mode after engine start, only the TOTALIZER fuel quantity display will blank on the Progress Page 2/3 and the CALCULATED fuel quantity display will be unaffected.

Operating Instructions

If the TOTALIZER and CALCULATED fuel quantity displays are blank on the Progress 2/3 page of the CDU on the ground prior to engine start, and a box prompt exists below the Fuel header on the Perf Init page of the CDU, and the indicated fuel quantity on EICAS shows the correct quantity compared to airplane loading information, then flight crews should accomplish the following:

- Manually enter the fuel quantity from EICAS on the PERF INIT page of the CDU. MANUAL will be displayed next to the entered fuel quantity.
- Verify the fuel quantity entered above is displayed under the CALCULATED fuel quantity display on the Progress Page 2/3.

The FMC will now provide accurate fuel predictions. Once entered, the MANUAL fuel quantity cannot be deleted on the Perf Init page, Automatic jettison capability to a selected quantity remaining is inoperative. The flight crew must monitor the fuel quantity during jettison and terminate jettison manually by selecting the jettison nozzle switches OFF. The TOTALIZER display will remain blank on the Progress Page 2/3, and the FUEL DISAGREE message will be inhibited.

Note: The absence of a box prompt on the Perf Init page during the condition identified in this bulletin indicates a separate problem with the engine fuel flow meter system. This condition must be investigated by maintenance.

If jettison is required during this condition, the following procedure applies:

Fuel Jettison Arm Switch ----- ARMED

Note: The FUEL AUTO JETTISON message will display on EICAS.

Determine the fuel quantity to remain after jettison.

The crew can calculate the jettison time from the total fuel quantity using the jettison rates of 5400 lbs / 2500 kgs per minute with fuel in the center tank, or 3100 lbs / 1400 kgs per minute with center tank empty.

Note: VNAV is not available during jettison due to no fuel quantity being available - CALC fuel and TOTALIZER fuel already will not display in the FMC due to this condition.

Fuel Jettison Nozzle Switches (both) ----- ON

When the desired remaining fuel is reached:

Fuel Jettison Nozzle Switches (both) ----- OFF

(continued)

Fuel Jettison Arm Switch - - - - - OFF

Wait five minutes after fuel jettison arm switch was positioned OFF

[Manual entry of fuel quantity is not possible until 5 minutes after jettison is complete.]

Enter final post-jettison fuel quantity into the box prompt on the Perf Init page to re-initialize the CALCULATED fuel quantity display and enable VNAV to function again.

Administrative Information

This bulletin replaces bulletin TBC-102 R1 dated January 9, 2006. Discard TBC-102 R1. Revise the Bulletin Record to show TBC-102 R1 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-102 R2 as "In Effect" (IE) .

This condition will be corrected with new FQPU software expected to be released in May 2006. The FQPU software will be installed by Boeing Service Bulletin 777-28-0048. This operations manual bulletin will be cancelled when Boeing is notified that SB 777-28-0048 is installed on all airplanes in the customer fleet.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-103

Issue Date: February 3, 2006

Airplane Effectivity: 777-200F, 777-200LR, 777-300ER

Subject: Fuel Flow Blanking with GE90-100 Series Engines

Reason: To inform flight crews of fuel flow blanking at minimum idle during descent.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Note: This bulletin applies to 777 airplanes equipped with GE90-100 series engines only.

Boeing has received reports of fuel flow indications blanking on GE90-100 series engines at or near minimum idle during descent. If the fuel flow display returns to normal at thrust levels above minimum idle, these blanking events can be considered a nuisance fault. Blanking at thrust levels at or above approach idle should be considered a valid fault which requires maintenance action and/or MEL relief.

Operating Instructions

No flight crew action is required, provided the fuel flow indication blanking occurs only at or near minimum idle thrust.

Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-103 as "In Effect" (IE) .

This condition is temporary until the system is modified. This bulletin will be cancelled when GE service bulletins GE90-100 SB 73-0025 and GE90-100 SB 73-0026 are incorporated.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-104

Issue Date: September 29, 2006

Airplane Effectivity: All Airplanes

Subject: Generator OFF Light ON After Engine Start With No EICAS Message

Reason: To inform flight crews of potential generator off line with no alert message.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

In normal operation, if a main generator drops off line for any reason, the associated generator OFF light illuminates, and an EICAS Advisory message ELEC GEN OFF L, R is shown.

During an engine start if a generator does not reach a minimum frequency of 380 Hz the generator will not come on line and the generator OFF light will remain illuminated. However, the ELEC GEN OFF L, R EICAS message may not show. This lack of an EICAS message is known to have occurred on two or more occasions during engine starts only.

The Generator Control Unit supplier, Hamilton Sundstrand, is studying the feasibility of incorporating a change which will assure the ELEC GEN OFF L, R message is displayed on EICAS if the generator fails to come on line during engine start.

Operating Instructions

After engine start, flight crews should check that the generator OFF lights on the electrical panel are not illuminated. If a generator OFF light is illuminated, maintenance action is required.

Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-104 as "In Effect" (IE) .

This condition is temporary until the system is modified. This bulletin will be revised when service bulletin information is available.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-105 R3

Issue Date: June 13, 2011

Airplane Effectivity: All Airplanes

Subject: Incorrect TAKEOFF REF data following a TAKEOFF REF Uplink.

Reason: To inform pilots of an FMC Takeoff Datalink anomaly.

Revised to add service bulletin information about AIMS-2 BPV15.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

An operator reported events where old TAKEOFF REF page data (THRUST, RW, V speeds, etc.) appeared on the TAKEOFF REF page 1 following an updated TAKEOFF REF uplink just prior to takeoff. In each event, the flight crew reported that the incorrect data appeared to be from the previous leg. Boeing has replicated the behavior and discovered a software anomaly that allows old TAKEOFF REF uplinks to remain in memory between flights. When this anomaly occurs, the old data appears on the TAKEOFF REF page following a TAKEOFF REF uplink that contains only partial takeoff data (CG for example).

Operating Instructions

Do not accept partial TAKEOFF REF page uplinks (only an updated GC, for example) unless you have previously received and accepted a complete TAKEOFF REF page (all data fields contain data) for the intended flight leg. If a partial uplink is received and any fields on the TAKEOFF REF page are blank, dashes, or boxes, reject the uplink and select the REQUEST prompt on the TAKEOFF REF page to get a complete TAKEOFF REF uplink or enter the TAKEOFF REF data manually.

Administrative Information

This bulletin replaces bulletin TBC-105 R2 dated June 14, 2010. Discard TBC-105 R2. Revise the Bulletin Record to show TBC-105 R2 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-105 R3 as "In Effect" (IE) .

This condition is corrected with the installation of AIMS BPV14 or AIMS BPV15 software. The applicable Boeing service bulletin depends on the AIMS hardware installation:

- AIMS-1 hardware airplanes - SB 777-31A0179.
 - AIMS-2 hardware airplanes - SB 777-31A0150.
 - AIMS-2 hardware airplanes - SB 777-31-0167 or 777-31-0183.

This bulletin will be cancelled when Boeing is notified that all affected airplanes in the customer fleet have the applicable service bulletin(s) incorporated.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-107 R3

Issue Date: June 13, 2011

Airplane Effectivity: 777-200LR, 777-300ER

Subject: FMC Minimum V1, VR, V2 Speed Entry Limits for 777-200LR and 777-300ER Models

Reason: To inform flight crews of reduced FMC capability to detect erroneous manual and uplinked V1, VR and V2 entries.

Revised to add service bulletin information about AIMS-2 BPV15.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

This condition exists only on the 777-200LR and 777-300ER airplanes.

An AIMS OPC option is enabled for all 777-200LR and 777-300ER models which results in the deactivation of minimum value checking for uplinked or manually entered V1, VR and V2 speeds. Flight crews are advised that the FMC will accept uplinked or manually entered V-speeds as low as 80 knots. "MINV1", "MINVR", and "MINV2" do not display in the associated header lines, and the value of MINV1, MINVR, and MINV2 do not display in the data lines on the TAKEOFF REF page.

Operating Instructions

Flight crews should ensure that manually entered V speeds are entered correctly on the TAKEOFF REF page of the CDU.

Administrative Information

This bulletin replaces bulletin TBC-107 R2 dated June 14, 2010. Discard TBC-107 R2. Revise the Bulletin Record to show TBC-107 R2 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-107 R3 as "In Effect" (IE) .

This condition exists in 777-200LR and 777-300ER airplanes that do not have AIMS BPV14 or later software installed. This condition is corrected with the installation of AIMS BPV14 or AIMS BPV15 software. The applicable Boeing service bulletin depends on the AIMS hardware installation:

- AIMS-1 hardware airplanes - SB 777-31A0179.
 - AIMS-2 hardware airplanes - SB 777-31A0150.
 - AIMS-2 hardware airplanes - SB 777-31-0167 or 777-3100187.

This bulletin will be cancelled when Boeing is notified that all affected airplanes in the customer's fleet have the applicable service bulletin(s) incorporated.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-108 R3

Issue Date: June 13, 2011

Airplane Effectivity: All Airplanes

Subject: Honeywell Flight Management Computer Anomaly

Reason: To inform flight crews of a Honeywell FMC anomaly that incorrectly deletes a speed constraint. Revised to reflect AT-OR-BELOW is not a factor in this anomaly.

Revised to add service bulletin information about AIMS-2 BPV15.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has confirmed operator reports of a Honeywell FMC anomaly that incorrectly deletes a speed constraint. Some SIDs are designed to limit turn radius to maintain clearance with other traffic or restricted airspace. Some of these procedures also have an AT-OR-ABOVE altitude restriction in conjunction with the speed constraint. Typically, the airplane will be required to limit speed until passing the respective waypoint as well as climb above the altitude constraint. In these procedures, VNAV will incorrectly delete the speed constraint prior to reaching the waypoint if the altitude constraint has been satisfied. When this happens, VNAV will command speed to accelerate to ECON speed (or SEL speed) prior to reaching the constrained waypoint. This anomaly exists on all Boeing 747 / 757 / 767 / 777 airplanes equipped with the Honeywell FMC.

Honeywell is aware of this anomaly and has planned changes for the 777.

Operating Instructions

To prevent exceeding a speed restriction when accompanied by an AT-OR-ABOVE altitude constraint, use speed intervention (enter speed constraint in the MCP Speed Window) until the constrained waypoint is sequenced. After passing the waypoint, select VNAV as desired.

Administrative Information

This bulletin replaces bulletin TBC-108 R2 dated June 14, 2010. Discard TBC-108 R2. Revise the Bulletin Record to show TBC-108 R2 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-108 R3 as "In Effect" (IE) .

This condition exists on airplanes that do not have AIMS BPV14 or later software installed. This condition is corrected with the installation of AIMS BPV14 or AIMS BPV15 software. The applicable Boeing service bulletin depends on the AIMS hardware installation:

- AIMS-1 hardware airplanes - SB 777-31A0179.
 - AIMS-2 hardware airplanes - SB 777-31A0150.
 - AIMS-2 hardware airplanes - SB 777-31-0167 or 777-31-0183.

This bulletin will be cancelled when Boeing is notified that all affected airplanes in a customer's fleet have the applicable service bulletin(s) incorporated.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

email: flighttraining@boeing.com
Telephone: (206) 662-4000
Fax: (206) 662-4743



Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-114 R2

Issue Date: June 13, 2011

Airplane Effectivity: All Airplanes

Subject: FMC Failure When Programming a "step-down" Descent.

Reason: To inform flight crews of an FMC anomaly.

Revised to add second service bulletin number.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Operators have reported dual FMC failures when a "planned step" to a lower than current cruise altitude is entered and executed on the LEGS page. Frequently, the "planned step down" entry was followed by route changes executed on the RTE page. Boeing has confirmed that when a LEGS page entry such as "/FL230S" is executed, and that altitude is below the current cruise altitude displayed on the ACT CRZ page, both FMCs may momentarily reset to resolve the planned "step down" in the flight plan route.

Operating Instructions

Do not enter a planned step altitude (in the format FLxxxS) that is below the current cruise altitude. When a descent is required to a new cruise altitude, enter a new cruise altitude in line 1L on the CRZ page and perform a cruise descent.

Administrative Information

This bulletin replaces bulletin TBC-114 R1 dated December 13, 2010. Discard TBC-114 R1. Revise the Bulletin Record to show TBC-114 R1 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-114 R2 as "In Effect" (IE) .

The anomaly addressed in this bulletin is corrected with an AIMS upgrade. The AIMS upgrade version and associated service bulletin is dependant on the AIMS hardware installation:

- AIMS-1 hardware airplanes - BP V14 - SB 777-31A0179
 - AIMS-2 hardware airplanes - BP V15 - SB 777-31-0167 or 777-31-0183

This bulletin will be cancelled when Boeing is notified that all affected airplanes in a customer's fleet have the applicable service bulletin(s) incorporated.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status to:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
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P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

email: flighttraining@boeing.com
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Fax: (206) 662-4743



Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-115 R3

Issue Date: June 13, 2011

Airplane Effectivity: All Airplanes

Subject: Uncommanded Autothrottle Movement During Cruise Flight.

Reason: To inform flight crews of an autothrottle anomaly.

Revised to add second service bulletin number.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Operators have reported several instances of uncommanded autothrottle movement during the cruise phase of flight. Reports indicate that the autothrottle advanced the thrust levers to full climb thrust even though the speed of the airplane was at the desired speed. While the thrust levers were moving forward, the EICAS message FUEL TEMP LOW appeared for approximately 2 seconds in most of the reported cases. On each event, the thrust levers returned to normal with no action by the flight crew.

This condition was reported to happen multiple times during the same flight, each event lasting for approximately 3-10 seconds.

When investigating this condition, it was determined that a very short term data corruption between the two AIMS cabinets is the cause of the anomaly. Boeing and Honeywell plan to modify the AIMS OPS to resolve this condition and the condition of the display of the erroneous FUEL TEMP LOW advisory EICAS message.

Operating Instructions

To prevent the above described anomaly from occurring, before performing any preflight procedures, move the FMC selector switch to either L or R, then back to AUTO. Should cycling of the FMC selector switch be inadvertently overlooked prior to preflight, cycling of the switch inflight at any time will resolve or prevent the anomaly.

Administrative Information

This bulletin replaces bulletin TBC-115 R2 dated December 13, 2010. Discard TBC-115 R2. Revise the Bulletin Record to show TBC-115 R2 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-115 R3 as "In Effect" (IE) .

The condition of uncommanded autothrottle movement of the thrust levers is corrected with an AIMS upgrade. The AIMS upgrade version and associated service bulletin is dependant on the AIMS hardware installation:

- AIMS-1 hardware airplanes - BP V14 - SB 777-31A0179
 - AIMS-2 hardware airplanes - BP V15 - SB 777-31-0167 or 777-31-0183

The erroneous FUEL TEMP LOW advisory EICAS anomaly will be corrected in a succeeding AIMS OPS release.

This bulletin will be cancelled when Boeing is notified that all affected airplanes in a customer's fleet have the applicable service bulletin(s) incorporated.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status to:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

email: flighttraining@boeing.com
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Fax: (206) 662-4743



Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-116 R2

Issue Date: June 13, 2011

Airplane Effectivity: 777-200F, 777-200LR

Subject: Incorrect Display of Crossbleed (X-BLD) Start Indication for 777-200LR and 777F airplanes.

Reason: To inform flight crews that, when an engine is shut down in flight, the crossbleed start indication is not showing correctly.

Revised to add second service bulletin number.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

This condition exists only on 777-200LR and 777F airplanes.

When an engine is shut down in flight, the in-flight start envelope is shown on EICAS for the current flight level or the maximum flight level, whichever is less. The lowest airspeed for an in-flight windmill start is 270 knots. If the current airspeed is below 270 knots, X-BLD is displayed above the N2 display.

However, a software anomaly causes the X-BLD indication to be incorrectly removed at speeds greater than 260 knots, rather than 270 knots. Even though the X-BLD indication has been incorrectly removed, if the current airspeed is below 270 knots, a crossbleed start should be done. If the current airspeed is 270 knots or above, a windmill start should be done.

Operating Instructions

When operating 777-200LR and 777F airplanes, use the attached, revised ENG FAIL L, R; ENG IN-FLIGHT START L, R; ENG START VALVE L, R non-normal checklists as appropriate.

Operations Manual Information

Replace the affected pages in section 7 (Engines, APU) of the QRH with the associated attached pages. These pages may be reissued in the June 14, 2010 revision, at which time the EICAS Messages Index, Alphabetical Index and LEP will also be updated.

Administrative Information

This bulletin replaces bulletin TBC-116 R1 dated December 13, 2010. Discard TBC-116 R1. Revise the Bulletin Record to show TBC-116 R1 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-116 R2 as "In Effect" (IE) .

This anomaly is corrected in AIMS upgrade BP V15, installed with service bulletins 777-31-0167 or 777-31-0183. This bulletin will be cancelled when Boeing is notified that the applicable service bulletin(s) have been incorporated into the customer's fleet.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status to:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

email: flighttraining@boeing.com
Telephone: (206) 662-4000
Fax: (206) 662-4743



Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-117 R1

Issue Date: December 13, 2010

Airplane Effectivity: All Airplanes

Subject: Loss of VHF Datalink Function on the Primary VHF Data Radio

Reason: To advise flight crews of a condition where the primary VHF Data Radio loses DATA mode and latches into voice mode.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

A condition has been identified where the VHF datalink function can be lost on the primary VHF Data Radio (VDR). When this condition occurs, the primary VDR latches into voice mode, and DATA cannot be transferred from the STANDBY window to the ACTIVE window of the primary VDR's radio tuning panel. In addition, DATA mode cannot be selected for the primary VDR from the VHF page under the Flight Deck Communication Function (FDCF) MANAGER menu on the MFD.

Also, the EICAS advisory message VHF DATALINK appears, signifying VHF datalink is no longer available. If SATCOM is unavailable and HF datalink is not active, the EICAS advisory message DATALINK SYS appears instead.

This anomaly occurs only on 777 airplanes with AIMS-2 BP V14 and may be caused by a tuning mis-comparison between the Data Communications Management Function (DCMF) and the radio tuning panel, and a software error in the VHF sub-system in the DCMF.

This condition occurs most often during engine start, but also has been seen in other phases of flight.

Operating Instructions

Continue to perform datalink operations normally using SATCOM or HF (if HF datalink is activated) instead of VHF. This requires no pilot action because the DCMF will automatically use SATCOM as a backup air/ground medium as long as it is available. If SATCOM is unavailable and HF datalink is activated and available, the DCMF will use HF for datalink.

Alternately, it is possible to perform VHF datalink with the secondary VDR. This requires the following flight crew actions to switch to the alternate DCMF:

1. Select COMM on the DSP
2. Select MANAGER on the MFD
3. Select ACARS
4. Select PG 2
5. Deselect SATCOM
6. Deselect HF (if present)
7. Select RETURN
8. Select VHF
9. Select DEFAULT RADIO RIGHT (if switching from DCMF L to DCMF R) or DEFAULT RADIO CENTER (if switching from DCMF R to DCMF L)
10. Select DEFAULT RADIO MODE DATA
11. Select MANAGER
12. Select ACARS
13. Select PG 2
14. Reselect SATCOM
15. Reselect HF (if present)
16. Select RETURN

When the condition occurs on the ground, notify maintenance.

Administrative Information

This bulletin replaces bulletin TBC-117 dated January 20, 2010. Discard TBC-117. Revise the Bulletin Record to show TBC-117 "Cancelled" (CANC).

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-117 R1 as "In Effect" (IE).

The condition of the primary VDR losing DATA mode and latching into voice mode will be corrected in a future AIMS upgrade. The service bulletin information that resolves this bulletin anomaly will be incorporated into this operations manual bulletin at the time that information becomes available.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status to:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

email: flighttraining@boeing.com
Telephone: (206) 662-4000
Fax: (206) 662-4743

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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-118

Issue Date: December 13, 2010

Airplane Effectivity: All Airplanes

Subject: Uncommanded Turns When LNAV is in Use

Reason: To inform flight crews of the possibility of the airplane turning prior to the active waypoint when LNAV is in use.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received several reports of uncommanded turns when LNAV is in use. This condition has been reported on 757, 767, 747-400 and 777 airplanes. When an uncommanded turn occurs, the TO (active) waypoint was observed on the FMC CDU to have prematurely sequenced. In some cases, the ND correctly showed the TO waypoint in front of the airplane, but the waypoint symbol's color was white (indicating inactive) instead of magenta (indicating active). No inputs to the FMC were reported by the flight crews to have been in progress at the time of the turns. The condition was usually resolved by performing a DIRECT TO to the waypoint that had prematurely sequenced.

Boeing has been unable to identify the cause of this uncommanded turn condition. Attempts to duplicate it in the lab have so far been unsuccessful.

Operating Instructions

Should an uncommanded turn occur when using LNAV, select HDG SEL to follow the flight plan, then perform a DIRECT TO to the waypoint that had prematurely sequenced. Reengage LNAV as desired.

Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-118 as "In Effect" (IE) .

This condition is under investigation. This bulletin remains in effect until further notice.

This bulletin will be revised to include information about the service bulletin that resolves the condition when that information becomes available.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

email: flighttraining@boeing.com
Telephone: (206) 662-4000
Fax: (206) 662-4743



Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-119

Issue Date: December 24, 2010

Airplane Effectivity: All Airplanes

Subject: 777 Fuel Quantity Indicating System Fluctuations or Blanking Due to a
Wiring Harness Problem

Reason: To inform flight crews of fuel quantity indicating system fluctuations

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

777 operators report FUEL IMBALANCE EICAS advisory messages and/or the fuel quantity display blanking in flight due to fluctuating main and center tank fuel quantity indications. Fluctuating indications will usually result in a sudden fuel quantity increase or decrease of one main tank relative to the other main tank, but have occurred in the center tank also.

Erroneous fuel indications have been observed to either suddenly increase or decrease and recover within several minutes. The events can be a single occurrence or multiple events throughout the flight. To date, these occurrences have occurred during cruise flight, and with different fuel loads.

The condition normally does not result in any fuel system status messages and postflight troubleshooting does not reveal any discrepancies. Boeing and GE Aviation are currently in the process of formulating a retrofit program to replace discrepant FQIS wiring harnesses.

Operating Instructions

If the FUEL IMBALANCE EICAS advisory message occurs in flight, check fuel quantity readings to determine if the fuel quantity is fluctuating, or if a true imbalance or fuel leak exists.

If the fuel quantity fluctuates or suddenly increases or decreases and remains at a low level, and an imbalance or fuel leak is not suspected, consider the indications erroneous.

A steady increase in fuel imbalance or steadily increasing difference between fuel totalizer and calculated fuel quantities of approximately 1000 lbs / 500 kgs or more in 30 minutes should be considered a fuel leak.

To prevent unnecessary fuel balancing, do not accomplish the FUEL IMBALANCE checklist unless an actual fuel imbalance can be confirmed. An actual fuel imbalance can be confirmed by comparison of FMC calculated fuel used, comparison of respective engine fuel flows, or other evidence indicating a true imbalance exists.

Note: Should fuel jettison be required with erroneous fuel indications, the fuel jettison system will use the indicated totalizer fuel to determine when to cease jettisoning at the fuel TO REMAIN value set by the crew. Therefore, if the indicated fuel quantity indications are in error, the crew should use the FMC calculated fuel value and determine the jettison time using the jettison rates of 5400 lbs / 2500 kgs per minute with fuel in the center tank, or 3100 lbs / 1400 kgs per minute with center tank empty.

Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-119 as "In Effect" (IE) .

This bulletin will be revised to include information about the service bulletin that resolves the condition when that information becomes available.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

email: flighttraining@boeing.com
Telephone: (206) 662-4000
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Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-120

Issue Date: June 13, 2011

Airplane Effectivity: 777-200ER, 777-200F, 777-300ER

Subject: Nuisance Visual and Aural Smoke Alarm Annunciations in Lavatories, Crew Rest Compartments and Other Cabin Compartments

Reason: To identify the smoke alarm annunciations as erroneous and reset them to prevent dispatch delays and in-flight diversions.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

As a result of environmental regulations and parts obsolescence, ionization smoke detectors installed in the lavatories, crew rest compartments and other cabin compartments were replaced with photoelectric smoke detectors on all 777 airplanes beginning with L/N 923.

On production test flights of 777 airplanes with the new photoelectric smoke detectors, erroneous smoke detector activation occurred after ground or in-flight power transfers. All occurrences were accompanied with the associated cabin aural and visual indications. Upon inspection, the smoke alarm events were verified to be erroneous as no smoke source was identified.

These nuisance alarm indications have been identified as an effect of a break power transfer, but do not occur frequently.

Few of these occurrences have been experienced to date on 777 production test flights and Boeing has not received any in-service reports about this anomaly.

Operating Instructions

In the event that a smoke alarm occurs, the following indications may be present:

- Master Caution indication and aural alarm in the flight deck.
- EICAS caution level message (for example, SMOKE REST UPR DR 1) or advisory level message (for example, SMOKE LAVATORY).
- Steady red indicator LED on each smoke detector, indicating an alarm state.
- Pulsating aural alarm from individual smoke detectors
- Pulsating aural alarm from remote horns in the crew rest.
- Flashing amber button light near the top to the entrance door of the affected lavatory or crew rest.
- Cabin Services System (CSS) chimes sounding in the main passenger cabin speakers (locations dependant on configuration).
- Flight Attendant Master Call light flashes.
- Cabin Services Control Panel messages (for example, 1. DOOR 1 UPR REST or LAV 1F-2L SMOKE DETECTED).
- Crew rest ventilation, overhead crew rest ventilation and aft galley power is disabled.

If any of these indications occur, the cabin crew should follow standard procedures for smoke detection. If no smoke source is present and the alarm occurred immediately after a power transfer, consider the alarm a nuisance occurrence. Consult the appropriate information in the Flight Attendant Manual or Flight Crew Operations Manual to reset the crew rest smoke detector function, which will also restore aft galley power and crew rest ventilation.

The ability of the detectors to sense smoke is not affected before or after a nuisance alarm. Nuisance alarms are not considered a safety-of-flight issue and do not require maintenance or MEL/DDG action. Such nuisance alarms are not considered reason to return to the gate, nor are they considered a reason to divert if the indications have been verified as a false alarm.

Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual. Amend the Bulletin Record to show bulletin TBC-120 as "In Effect" (IE) .

This bulletin remains in effect until further notice.

This condition is under investigation. Boeing is working aggressively with its suppliers to identify the cause of the nuisance alarm and a solution. When a solution is identified, this bulletin will be revised to include information about the service bulletin that resolves the condition.

Please send all correspondence regarding Flight Crew Operations Manual Bulletin status to:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

email: flighttraining@boeing.com
Telephone: (206) 662-4000
Fax: (206) 662-4743

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Flight Crew Operations Manual Bulletin for The Boeing Company

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



Number: TBC-121

IssueDate: August 31, 2011

Airplane Effectivity: All Airplanes

Subject: Nuisance EICAS Message: SMOKE BBAND UPR DR2

Reason: To inform flight crews of nuisance SMOKE BBAND UPR DR2 cautions.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received reports of nuisance SMOKE BBAND UPR DR2 caution messages on 777 airplanes. The original purpose of this EICAS message was to alert the flight crew that a smoke detector installed above the Connexion LRU's detected smoke in the area.

Operating Instructions

The EICAS message SMOKE BBAND UPR DR2 may display even when no Connexion LRU's are installed on the airplane. This is a nuisance message. No flight crew action is required.

Operations Manual Information

The SMOKE BBAND UPR DR2 message is not referenced in the Flight Crew Operations Manual.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin TBC-121 "In Effect" (IE).

The SMOKE BBAND UPR DR2 EICAS message will be removed in the AIMS-1 BPV16 and AIMS-2 BP V17 software updates. This bulletin will be revised to include Service Bulletin information when available.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Manager, Flight Training and Technical Data
777 Model
Boeing Commercial Airplane Group
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207
USA

Fax: (206) 662-7812
Telex: 32-9430 Station 627
SITA: SEABO7X



Flight Crew Operations Manual Bulletin for The Boeing Company

The Boeing Company
Seattle, Washington 98124-2207



Number: TBC-122

Issue Date: September 8, 2011

Airplane Effectivity: All Airplanes

Subject: Setting STEP Size to Zero When No Further Step Climbs Are Planned.

Reason: Inaccurate FMC FUEL and ETA predictions.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Fuel and ETA predictions assume the airplane climbs at each predicted optimum step climb point as airplane weight decreases. FMC-predicted step climb increments are based on the default STEP size shown on the VNAV CRZ page. Entering a STEP size of zero causes the FMC to assume a constant altitude cruise.

Operating Instructions

When required to cruise at an altitude below optimum due to air traffic, atmospheric conditions, or non-normal procedures, and no further step climbs are planned, set the STEP (L4) size to zero on the ACT ECON CRZ page. This ensures best available FMC FUEL and ETA predictions.

Administrative Information

Insert this bulletin behind the Operations Manual Bulletin Record page in Volume 1 of your Operations Manual. Amend the Operations Manual Bulletin Record to show bulletin TBC-122 "In Effect" (IE).

This bulletin will be cancelled in a future revision when checklists are developed and incorporated into the QRH.

Please send all correspondence regarding Operations Manual Bulletins status to one of the following addresses:

Mailing Address: Boeing Commercial Airplanes
Commercial Aviation Services
Attn: 777 Manager, Flight Technical Data
P.O. Box 3707 M/C 20-89
Seattle, WA 98124-2207 USA

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Limitations

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Limitations

Operating Limitations

Chapter L

Section 10

General

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

Note: Information referring to airplane options and configuration differences is shown in [brackets]. These items are applicable to the –TBC operations manual only, and do not appear in customer Operations Manuals.

Airplane General

Operational Limitations

[Takeoff and Landing Tailwind Component - 10 knots basic, 15 knots option
Maximum Takeoff and Landing Altitude - 8,400 feet basic, 9,800 feet option.]

Runway slope	+/- 2%
Maximum Takeoff and Landing Tailwind Component	15 knots
Maximum Operating Altitude	43,100 feet pressure altitude
Maximum Takeoff and Landing Altitude	8,400 feet pressure altitude

Note: The capability of the airplane has been satisfactorily demonstrated for takeoff and landings with tailwinds up to 15 knots. This does not constitute operational approval to conduct takeoffs and landings with tailwind components in excess of 10 knots.

Turbulent Air Penetration Speed

The turbulent air penetration speed (in severe turbulence) is defined as: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above. Maintain a minimum speed of 15 knots above the minimum maneuvering speed at all altitudes when airspeed is below 0.82 Mach.

Operational Information

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

The maximum demonstrated takeoff and landing crosswind is 38 knots.

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Do not operate HF radios during refueling operations.

Do not operate the weather radar in a hangar or within 50 feet (15.25 meters) of any fuel spill.

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

RVSM Operations

Non-AFM Operational Information

Prior to takeoff the maximum allowable difference between Captain's or First Officer's altitude display and field elevation is 75 feet.

The standby altimeter does not meet altimeter accuracy requirements of RVSM airspace.

Door Mounted Power Assists and Escape Slides

[Option – Door Marker ARMED/DISARMED]

Main door emergency power assists and evacuation slide systems must be armed with the mode select handle in the ARMED position prior to taxi, takeoff and landing whenever passengers are carried.

Flight Deck Security Door

[Passenger]

Verify that an operational check of the Flight Deck Access System has been accomplished according to approved procedures once each flight day.

Lower Crew Rest Compartment

[Option]

The lower crew rest compartment may not be occupied, and the main entry hatch must be closed during taxi, takeoff, or landing.

Weight Limitations

Maximum Taxi Weight

[777-200]

547,000 Pounds

248,115 Kilograms

[777-200ER]

652,000 Pounds

295,742 Kilograms



Maximum Taxi Weight

[777-200LR]

768,000 Pounds	348,358 Kilograms
----------------	-------------------

[777F]

768,800 Pounds	348,721 Kilograms
----------------	-------------------

[777-300]

662,000 Pounds	300,278 Kilograms
----------------	-------------------

[777-300ER]

777,000 Pounds	352,441 Kilograms
----------------	-------------------

Maximum Takeoff Weight

[777-200]

545,000 Pounds	247,208 Kilograms
----------------	-------------------

[777-200ER]

650,000 Pounds	294,835 Kilograms
----------------	-------------------

[777-200LR]

766,000 Pounds	347,451 Kilograms
----------------	-------------------

[777F]

766,800 Pounds	347,814 Kilograms
----------------	-------------------

[777-300]

660,000 Pounds	299,371 Kilograms
----------------	-------------------

Maximum Takeoff Weight

[777-300ER]

775,000 Pounds	351,534 Kilograms
----------------	-------------------

Maximum Landing Weight

[777-200]

445,000 Pounds	201,849 Kilograms
----------------	-------------------

[777-200ER]

470,000 Pounds	213,188 Kilograms
----------------	-------------------

[777-200LR]

492,000 Pounds	223,167 Kilograms
----------------	-------------------

[777F]

575,000 Pounds	260,815 Kilograms
----------------	-------------------

[777-300]

524,000 Pounds	237,682 Kilograms
----------------	-------------------

[777-300ER]

554,000 Pounds	251,290 Kilograms
----------------	-------------------

Maximum Zero Fuel Weight

[777-200]

420,000 Pounds	190,509 Kilograms
----------------	-------------------

[777-200ER]

440,000 Pounds	199,581 Kilograms
----------------	-------------------

Maximum Zero Fuel Weight

[777-200LR]

461,000 Pounds	209,106 Kilograms
----------------	-------------------

[777F]

547,000 Pounds	248,115 Kilograms
----------------	-------------------

[777-300]

495,000 Pounds	224,528 Kilograms
----------------	-------------------

[777-300ER]

529,000 Pounds	239,950 Kilograms
----------------	-------------------

Air Systems

Cabin Pressurization

Maximum differential pressure (relief valves)	9.1 psi
Maximum allowable cabin pressure differential for takeoff and landing	0.11 psi

Autoflight

Autopilot/Flight Director System

[Option - Passenger airplanes with high altitude takeoff/landing capability]
Do not use the autopilot below 100 feet RA at airport pressure altitudes above 8,400 feet.

The autopilot must not be engaged below a minimum engage altitude of 200 feet AGL after takeoff.

The autopilot must be disengaged before the airplane descends more than 50 feet below the MDA unless it is coupled to an ILS glideslope and localizer or in the go-around mode.

Without LAND 2 or LAND 3 annunciated, the autopilot must be disengaged below 200 feet AGL.

Automatic Landing

When landing weather minima are predicated on autoland operations the following limits apply:

[Autoland tailwind limitation - 10 knots basic, 15 knots option]

Maximum Allowable Wind Speeds	
Headwind	25 knots
Tailwind	15 knots
Crosswind	25 knots

The maximum glideslope angle is 3.25 degrees.

The minimum glideslope angle is 2.5 degrees.

Automatic landings can be made using flaps 20 or 30, with both engines operative or one engine inoperative. The autopilot flight director system (AFDS) autoland status annunciation must display LAND 2 or LAND 3.

Communications

Flight Deck Communications Systems (Datalink)

The datalink from the COMPANY format is limited to the transmission and receipt of messages, which 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 & Balance, and Takeoff Data messages can be transmitted and received via the COMPANY format if they are verified per approved operational procedures.

Engines

Engine Configuration

[Representative engines for each model variant]

777-200

Pratt & Whitney Model PW 4074 or 4077

General Electric Model GE90-76B

Rolls Royce Model Trent 875 or 877

777-200ER

Pratt & Whitney Model PW4090

General Electric Model GE90-85B, -90B or -94B

Rolls Royce Model Trent 884, 892 or 895

777-200LR

General Electric Model GE90-110B1

777-300

Pratt & Whitney Model PW4090 or 4098

Rolls Royce Model Trent 884 or 892

777-300ER and 777F

General Electric Model GE90-115B

Engine Limit Display Markings

Maximum and minimum limits are red.

Caution limits are amber.

Engine Oil System

[PW Engines]

Oil temperature must be greater than 50 degrees C before advancing thrust levers to takeoff power.

[RR Engines]

Oil temperature must be greater than -40 degrees C for engine start and 50 degrees C before advancing thrust levers to takeoff power.

Engine Fuel System

The maximum tank fuel temperature is 49 degrees C.

After refueling and prior to takeoff, if fuel temperature is 0 degrees C or colder or if fuel temperature indication is inoperative, verify the approved fuel circulation procedure was performed.

Tank fuel temperature prior to takeoff must not be less than -40 degrees C or 3 degrees C above the fuel freezing point, whichever is higher. In-flight tank fuel temperature must be maintained at least 3 degrees C above the freezing point of the fuel being used. The use of Fuel System Icing Inhibitor additives does not change the minimum fuel tank temperature limit.

Reverse Thrust

Intentional selection of reverse thrust in flight is prohibited.

Backing the airplane with use of reverse thrust is prohibited.

Non-AFM Operational Information

[GE90-115B, -115BL, or -110B engines]

For ground operation (exclusive of takeoff) in tailwinds and crosswinds between 30 and 45 knots, engine power should be limited to a maximum of 70% N1. Avoid thrust levels above that required for normal taxi operation in all tailwinds and crosswinds greater than 45 knots.

Airplane Structure

Flight Controls

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 V_A .

Flight Instruments, Displays

Ground Maneuver Camera System

[777-300 and 777-300ER]

The ground maneuver cameras should not be used during takeoff, approach, and landing.

Electronic Flight Bag (EFB)

[Option]

The EFB portable keyboard and attaching cable must be stowed during takeoff and landing.

Flight Management, Navigation

ADIRU

ADIRU alignment must not be attempted at latitudes greater than 78 degrees, 14.75 minutes.

QFE Selection

A QFE altitude reference for the primary flight displays must be selected in the flight management system whenever QFE is used instead of QNH.



Fuel System

Main tanks must be scheduled to be full if center tank fuel is loaded.

[Basic – English Units]

Note: The center tank may contain up to 3000 pounds of fuel with less than full main tanks provided center tank fuel weight plus actual zero fuel weight does not exceed the maximum zero fuel weight, and center of gravity limits are observed.

[Option – Metric Units]

Note: The center tank may contain up to 1360 kilograms of fuel with less than full main tanks provided center tank fuel weight plus actual zero fuel weight does not exceed the maximum zero fuel weight, and center of gravity limits are observed.

Warning Systems

GPWS - Look-Ahead Terrain Alerting

[Enhanced Ground Proximity Warning System with geometric altimetry. Geometric altimetry in the -212 EGPWC permits use of look-ahead terrain alerting during QFE operations]

Do not use the terrain display for navigation.

The use of look-ahead terrain alerting and terrain display functions is prohibited within 15 NM of takeoff, approach or landing at an airport or runway not contained in the GPWS terrain database. Refer to Honeywell Document 060-4267-000 for airports and runways contained in the installed GPWS database.

TCAS

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

Runway Awareness and Advisory System (RAAS)

[Option – with Runway Awareness and Advisory System]

Non-AM Operational Information

Do not use RAAS voice annunciations or alerts for navigation.

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

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Normal Procedures
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Normal Procedures

Introduction

Chapter NP

Section 11

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 required, 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 required.

Configuration Check

It is the crew member's responsibility to verify correct system response. Before engine start, use lights or indications to verify each system's condition or configuration.

If there is an incorrect configuration or response:

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

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Before engine start, review the EICAS alert messages and status display. If there are unexpected messages:

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

If, during or after engine start, there is an alert message:

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

After engine start, EICAS alert messages are the primary means of alerting the flight crew to non-normal conditions or incorrect configurations.

After engine start, there is no need to check status messages. Any message that has an adverse affect on safe continuation of the flight appears as an EICAS alert message.

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 illustration 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.

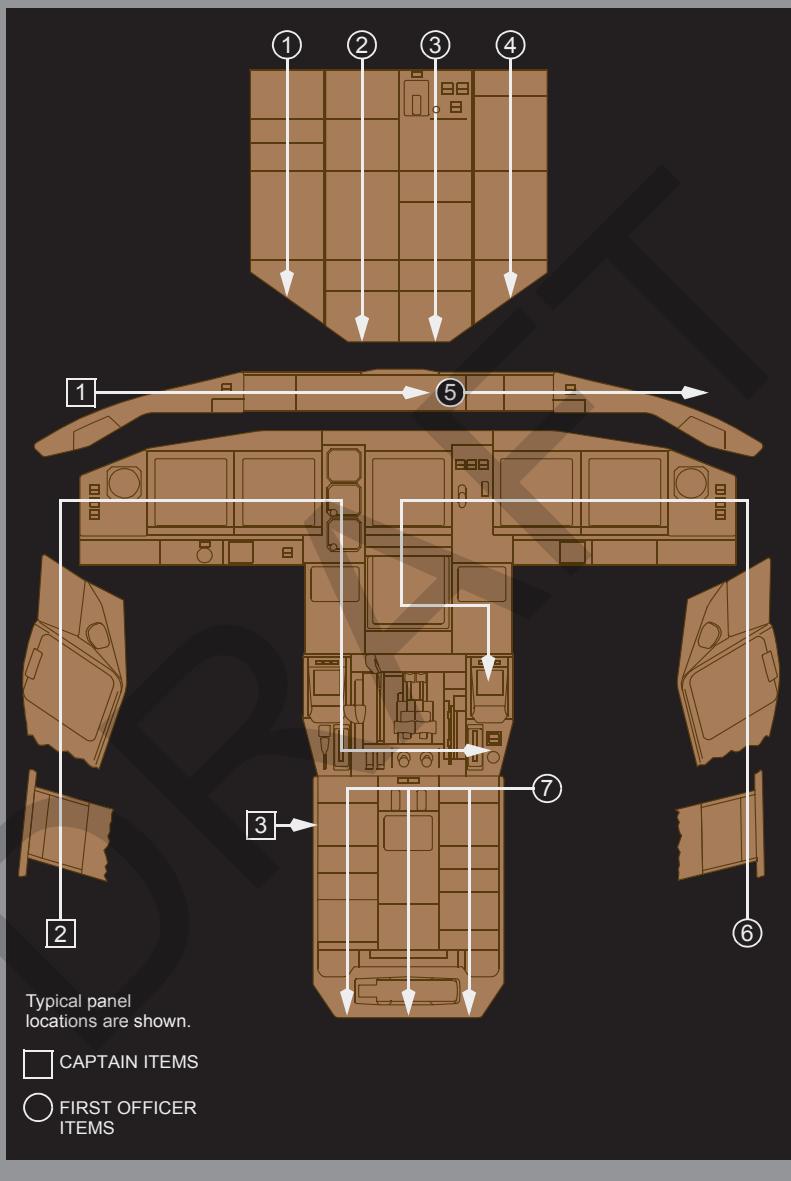
Preflight and Postflight Scan Flow

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

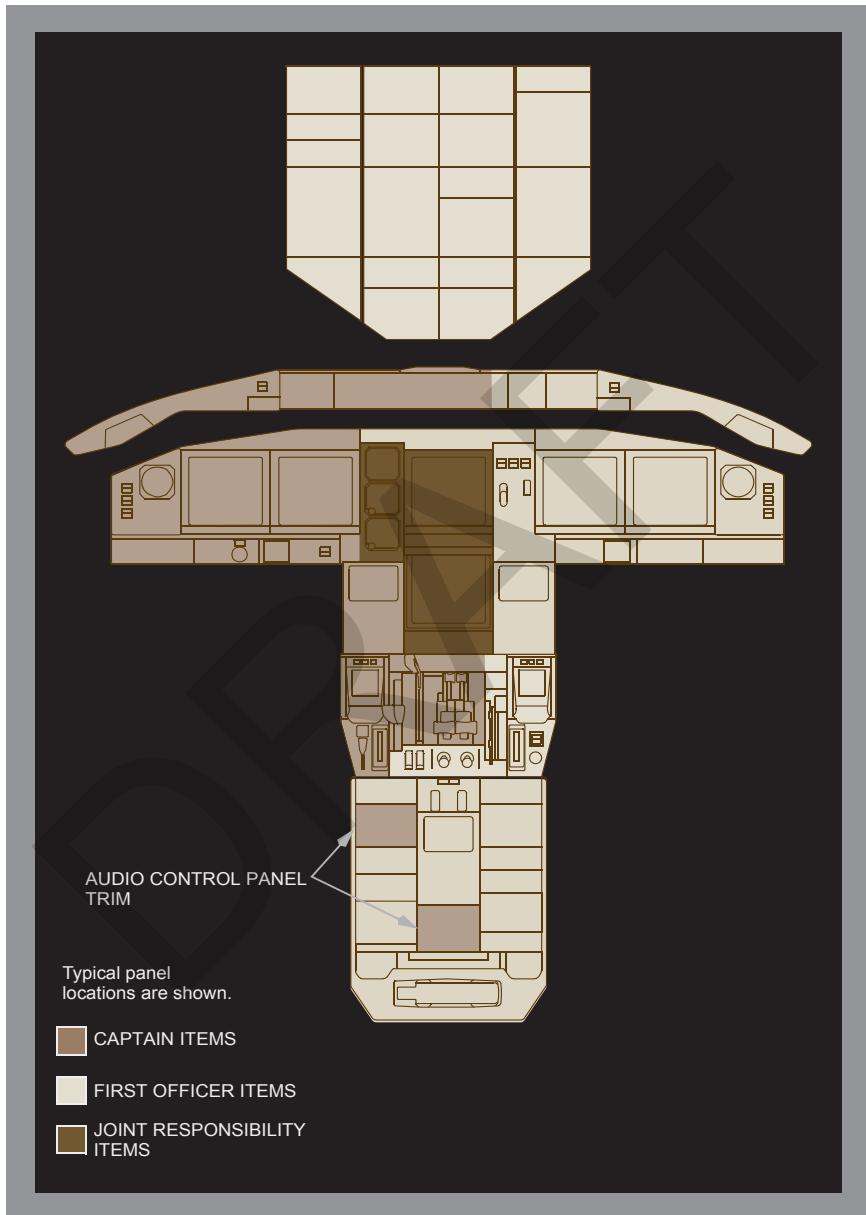
The scan flow diagram provides general guidance on the order each flight crew member should follow when doing the preflight and postflight procedures.

Specific guidance on the items to be checked are detailed in the amplified Normal Procedures. For example, preflight procedure details are in the Preflight Procedure - Captain and Preflight Procedure - First Officer.

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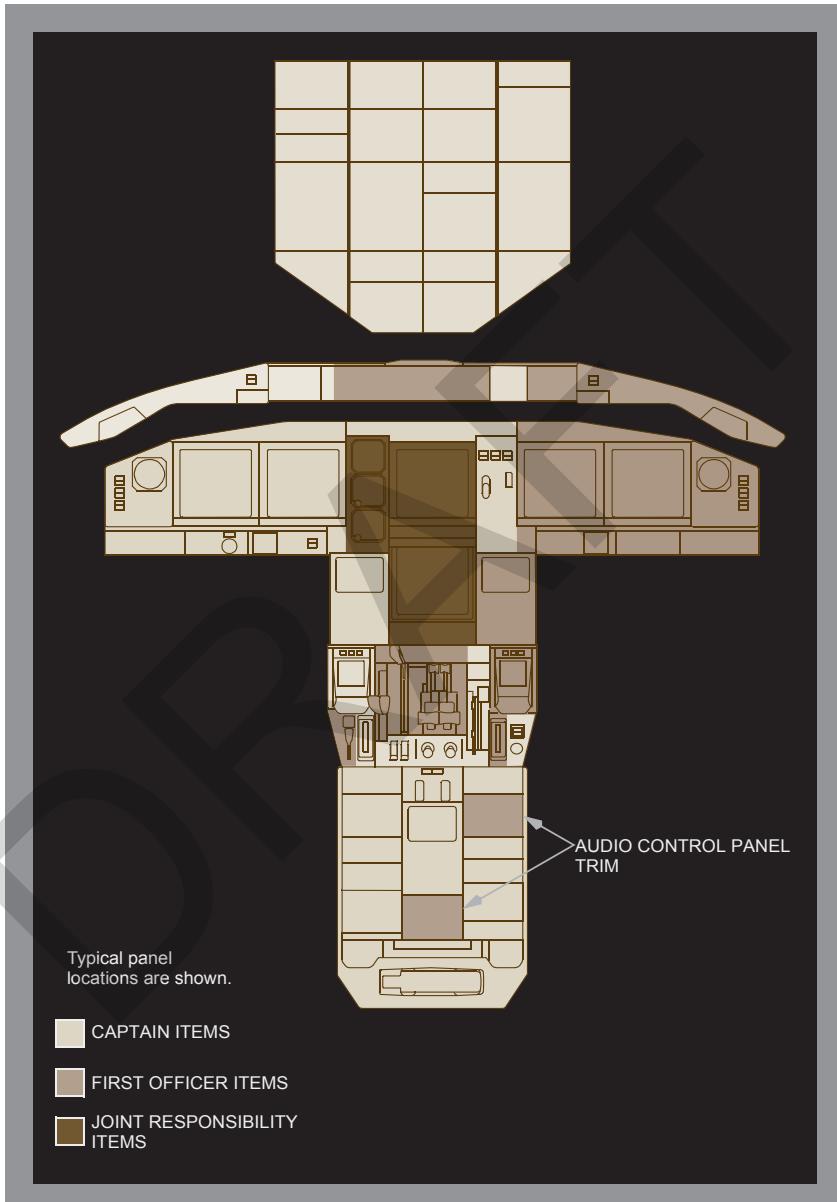


Areas of Responsibility - Captain as Pilot Flying or Taxiing





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.

ADIRU switch OFF 30 seconds, then ON

Verify that the ON BAT light is extinguished.

Verify that the OFF light is extinguished.

[Option]

VOICE RECORDER switch As needed

STATUS display Check

Verify that only expected messages are shown.

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

[Flight Deck Security Door]

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

Overhead maintenance panel Guards closed

Verify that all lights are extinguished.

[Medical Power Outlets]

MEDICAL OUTLETS POWER switches – As needed

CARGO TEMPERATURE selectors – As needed

Circuit breakers 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 INERTIAL POS line. Use the most accurate latitude and longitude.

Navigation Data Set

RTE page:

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.

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

Verify or enter the correct RNP for the departure.

NAV RADIO page:

Tune the navigation radios as needed.

Performance Data Set

PERF INIT page:

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

Enter the ZFW.

Verify that the FUEL on the CDU, the dispatch papers, and EICAS agree.

Verify that the fuel is sufficient for flight.

Verify that the GR WT on the CDU and the dispatch papers agree.

THRUST LIM page:

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

[777-200LR, 777-300ER, 777-200FRTR]

Select the APU to pack mode, if needed.

Select a full or a derated climb thrust as needed.

TAKOFF REF page:

[Datalink T/O Pages]

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

[Non-Datalink T/O Pages]

Select or enter the takeoff V speeds.

Exterior Inspection

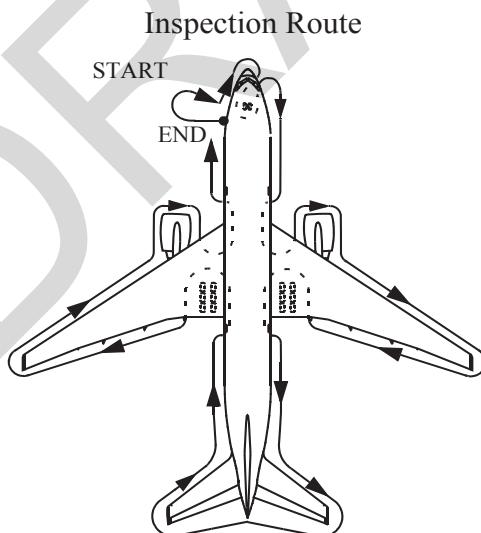
Before each flight the Captain, First Officer, or maintenance crew must verify that the airplane is satisfactory for flight.

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 antennae are not damaged
- the light lenses are clean and not damaged

For cold weather operations see the Supplementary Procedures.





Left Forward Fuselage

Probes, sensors, ports, vents, and drains (as applicable) Check
Doors and access panels (not in use) Latched
Oxygen pressure relief green disc In place
Forward outflow valve Check

Nose

Radome Check
Diverter strips - Secure
Forward access door Secure

Nose Wheel Well

Tires and wheels Check
Gear strut and doors Check
Nose wheel steering assembly Check
Gear pin As needed
Nose gear towing lever NORMAL
Nose gear towing lever pin Verify removed
Exterior lights Check
Wheel well light switches As needed
Forward E and E door Secure

Right Forward Fuselage

Probes, sensors, ports, vents, and drains (as applicable) Check
Doors and access panels (not in use) Latched
Negative pressure relief vents Closed

Right Wing Root, Pack, and Lower Fuselage

- | | |
|---|--------|
| Probes, sensors, ports, vents, and drains (as applicable) | Check |
| Exterior lights | Check |
| Pack inlet and pneumatic access doors | Secure |
| Leading edge flaps | Check |

Right 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 slats | Check |
| Fuel measuring sticks | Flush and secure |
| Wing Surfaces | Check |
| Fuel tank vent | Check |

Right Wing Tip and Trailing Edge

- | | |
|--|-------|
| Navigation and strobe lights | Check |
| Static discharge wicks | Check |
| Fuel jettison nozzle | Check |
| Aileron, flaperon, 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 pins As needed

Right Main Wheel Well

- Wheel well Check

Right Aft Fuselage

- Ram air turbine door Check
- Doors and access panels (not in use) Latched
- Probes, sensors, ports, vents, and drains (as applicable) Check
- [Gaseous Oxygen]
- Oxygen pressure relief green disc In place

Tail

- Vertical stabilizer and rudder Check
- [777-300, 777-300ER]
- Tail skid Check
Verify that the tail skid is not damaged.
- Horizontal stabilizer and elevator Check
- Static discharge wicks Check
- Strobe light Check
- APU exhaust outlet Check

Left Aft Fuselage

- Aft outflow valve Check
Doors and access panels (not in use) Latched
Probes, sensors, ports, vents, and drains (as applicable) Check

Left Main Wheel Well

- Wheel well 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 pins As needed

Left Wing Tip and Trailing Edge

- Navigation and strobe lights Check
Static discharge wicks Check
Aileron, flaperon, and trailing edge flaps Check
Fuel jettison nozzle Check
Fuel tank vent Check

Left Wing and Leading Edge

- Wing Surfaces Check
Fuel measuring sticks Flush and secure
Fuel tank vent Check
Leading edge slats Check
Access panels Latched



Left Engine

- | | |
|---|---------|
| Exhaust area and tailcone | Check |
| Thrust reverser | Stowed |
| Probes, sensors, ports, vents, and drains (as applicable) | Check |
| Access panels | Latched |
| Fan blades, probes, and spinner | Check |

Left Wing Root, Pack, and Lower Fuselage

- | | |
|---|--------|
| Probes, sensors, ports, vents, and drains (as applicable) | Check |
| Exterior lights | Check |
| Pack inlet and pneumatic access doors | Secure |
| Negative pressure relief vents | Closed |
| Positive pressure relief valves | Closed |
| Leading edge flaps | Check |

Preflight Procedure – First Officer

The First Officer normally does this procedure. The Captain may do this procedure as needed.

THRUST ASYMMETRY COMPENSATION
switch AUTO

Verify that the OFF light is extinguished.

PRIMARY FLIGHT COMPUTERS

DISCONNECT switch Guard closed

Verify that the DISC light is extinguished.

ELECTRICAL panel Set

BATTERY switch – ON

Verify that the OFF light is extinguished.

IFE/PASS SEATS power switch – ON

Verify that the OFF light is extinguished.

CABIN/UTILITY power switch – ON

Verify that the OFF light is extinguished.

APU GENERATOR switch – ON

Verify that the OFF light is extinguished.

BUS TIE switches – AUTO

Verify that the ISLN lights are extinguished.

GENERATOR CONTROL switches – ON

Verify that the OFF lights are illuminated.

Verify that the DRIVE lights are illuminated.

BACKUP GENERATOR switches – ON

The OFF lights stay illuminated until the respective engine is started.

APU selector (as needed) START, then ON

Do not allow the APU selector to spring back to the ON position.

Verify that the FAULT light is extinguished.

[777-300, 777-300ER]

CAMERA LIGHTS switch As needed

L WIPER selector OFF

[Option]

GROUND PROXIMITY RUNWAY OVERRIDE switch Off

[Option]

ELT switch Guard closed

EMERGENCY LIGHTS switch Guard closed

SERVICE INTERPHONE switch OFF

[Gaseous Passenger Oxygen]

Note: Do not set the PASSENGER OXYGEN switch to ON. The switch causes deployment of the passenger oxygen masks.

[Gaseous Passenger Oxygen]

PASSENGER OXYGEN SWITCH Guard closed

[Chemical Passenger Oxygen]

Note: Do not push the PASSENGER OXYGEN switch. The switch causes deployment of the passenger oxygen masks.

[Chemical Passenger Oxygen]

PASSENGER OXYGEN ON light Verify extinguished

[777 Freighter]

Note: Do not set the SUPRNMRY OXYGEN switch to ON. The switch causes deployment of the supernumerary oxygen masks.

[777 Freighter]

SUPRNMRY OXYGEN switch Guard closed

WINDOW HEAT switches ON

Verify that the INOP lights are extinguished.

WARNING: Do not push the RAM AIR TURBINE switch. The switch causes deployment of the ram air turbine.

RAM AIR TURBINE UNLOCKED light Verify extinguished

HYDRAULIC panel Set

LEFT and RIGHT ENGINE PRIMARY pump switches – ON

Verify that the FAULT lights are illuminated.

Center 1 and Center 2 ELECTRIC PRIMARY pump switches – OFF

Verify that the FAULT lights are illuminated.

DEMAND pump selectors – OFF

Verify that the FAULT lights are illuminated.

[Passenger]

PASSENGER SIGNS panel Set

[Option]

NO SMOKING selector – AUTO or ON

SEAT BELTS selector – AUTO or ON

[777 Freighter]

SUPRNMRY SIGNS panel Set

[Option]

NO SMOKING selector – AUTO or ON

SEAT BELTS selector – AUTO or ON

Lighting panel Set

OVERHEAD panel light control – Mid position

CIRCUIT BREAKER panel light control – Mid position

MASTER BRIGHTNESS switch – ON

MASTER BRIGHTNESS control – As needed

GLARESHIELD PANEL light control – Mid position

FLOOD light control – Mid position

LANDING light switches – OFF

APU fire panel Set

Verify that the APU BTL DISCH light is extinguished.

APU fire switch – In

Verify that the APU fire warning light is extinguished.

[777 Passenger]

CARGO FIRE panel Set

CARGO FIRE ARM switches – Off

Verify that the FWD and AFT fire warning lights are extinguished.

Verify that the cargo fire DISCH light is extinguished.

[777 Freighter]

CARGO FIRE panel Set

CARGO FIRE ARM switches – Off

Verify that the MAIN, FWD and AFT fire warning lights are extinguished.

Verify that the cargo fire DISCH and DEPR light is extinguished.

ENGINE panel Set

EEC MODE switches – NORM

[GE Engines with CON Position, PW Engines]

START/IGNITION selectors – NORM

[GE Engines without CON Position, RR Engines]

START selectors – NORM

AUTOSTART switch – ON

Verify that the OFF light is extinguished.

FUEL JETTISON panel Set

FUEL JETTISON NOZZLE switches – Off

Verify that the VALVE lights are extinguished.

FUEL TO REMAIN selector – IN

FUEL JETTISON ARM switch – Off

Verify that the FAULT light is extinguished.

FUEL panel Set

CROSSFEED switches – OFF

Verify that the VALVE lights are extinguished.

FUEL PUMP switches – OFF

Verify that the left forward pump PRESS light is extinguished if the APU is on or is illuminated if the APU is off.

Verify that the other left and right pump PRESS lights are illuminated.

Verify that the center pump PRESS lights are extinguished.

[Auxiliary Fuel Tank]

AUXILIARY FUEL switch - OFF

Verify the auxiliary fuel switch PRESS light is extinguished.

ANTI-ICE panel Set

WING anti-ice selector – AUTO

ENGINE anti-ice selectors – AUTO

Lighting panel Set

BEACON light switch – OFF

NAVIGATION light switch – As needed

LOGO light switch – As needed

WING light switch – As needed

INDICATOR LIGHTS switch – As needed

RUNWAY TURNOFF light switches – OFF

TAXI light switch – OFF

STROBE light switch – OFF

[Option]

FORWARD CARGO AIR CONDITIONING As needed

[777 Freighter]

LWR CARGO TEMP panel Set



FORWARD LOWER CARGO

AIR CONDITIONING control - As needed

AFT LOWER CARGO AIR CONDITIONING control - As needed

AIR CONDITIONING panel Set

[Flight Deck Humidification]

HUMIDIFICATION switch – ON

EQUIPMENT COOLING switch – AUTO

Verify that the OVRD light is extinguished.

[777 Freighter]

RECIRCULATION FANS switch – ON

[777 Freighter]

MAIN DECK FLOW control – NORMAL

[777 Freighter]

ALTERNATE VENTILATION switch – OFF

[Gasper Air]

GASPER switch – ON

[777 Passenger]

RECIRCULATION FANS switches – ON

FLIGHT DECK TEMPERATURE control – mid AUTO position

[777 Passenger]

CABIN TEMPERATURE control – Mid position

[777 Freighter]

FORWARD MAIN DECK CARGO

TEMPERATURE control – As needed

[777 Freighter]

AFT MAIN DECK CARGO

TEMPERATURE control – As needed

PACK switches – AUTO

Verify that the OFF lights are extinguished.

TRIM AIR switches – ON

Verify that the FAULT lights are extinguished.

BLEED AIR panel Set

LEFT, CENTER and RIGHT ISOLATION switches – AUTO

Verify that the CLOSED lights are extinguished.

ENGINE bleed switches – ON

The OFF lights stay illuminated until the respective engine is started.

APU bleed switch – AUTO

Verify that the OFF light is extinguished.

PRESSURIZATION panel Set

OUTFLOW VALVE switches – AUTO

Verify that the MAN lights are extinguished.

LANDING ALTITUDE selector – IN

R WIPER selector OFF

FLIGHT DIRECTOR switch ON

Display select panel Set

LOWER CENTER display switch – Push

EFIS control panel Set

MINIMUMS reference selector – RADIO or BARO

MINIMUMS selector – Set decision height or altitude reference

FLIGHT PATH VECTOR switch – As needed

METERS switch – As needed

BAROMETRIC reference selector – IN or HPA

BAROMETRIC selector – Set local altimeter setting

VOR/ADF switches – As needed

ND mode selector – MAP

ND CENTER switch – As needed

ND range selector – As needed



ND TRAFFIC switch – As needed

WEATHER RADAR – Off

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

Map switches – As needed

Oxygen Test and set

Oxygen mask – Stowed and doors closed

RESET/TEST switch – Push and hold

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

EMERGENCY/TEST selector – Push and hold

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

RESET/TEST switch and EMERGENCY/TEST selector – Release

Verify that the yellow cross does not show in the flow indicator.

Normal/100% selector – 100%

[Gaseous Passenger Oxygen]

Crew and passenger oxygen pressure – Check EICAS

Verify that the pressure is sufficient for dispatch.

[Chemical Passenger Oxygen]

Crew oxygen pressure – Check EICAS

Verify that the pressure is sufficient for dispatch.

[777 Freighter]

Crew and supernumerary oxygen pressure – Check EICAS

Verify that the pressure is sufficient for dispatch.

[Option]

ELECTRONIC FLIGHT BAG Set

[Option]

SIDE DISPLAY control As needed

FORWARD PANEL BRIGHTNESS controls Mid position

Instrument source select panel Set

NAVIGATION source switch – Off

DISPLAY CONTROL source switch – Off

AIR DATA/ATT source switch – Off

Clock Set

Time/date selector – UTC

INBOARD DISPLAY selector MFD

FMC Selector AUTO

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 takeoff V-speeds are selected

Verify that the flight mode annunciations are correct:

- autothrottle mode is blank
- roll mode is TO/GA
- pitch mode is TO/GA
- AFDS status is FLT DIR

Select the map mode.

Landing gear panel Set

Verify that the GND PROX light is extinguished.

FLAP OVERRIDE switch – Off

GEAR OVERRIDE switch – Off

TERRAIN OVERRIDE switch – Off

Landing gear lever – DN

ALTERNATE GEAR switch – Guard closed



AUTOBRAKE selector – RTO

EICAS display Check

Verify that the primary engine indications show existing conditions.

Verify that no exceedance is shown.

MFD Check

Secondary ENGINE indications – Check

Verify that the secondary engine indications show existing conditions.

Verify that no exceedance is shown.

STATUS display switch – Push.

Check status messages.

CHECKLIST display switch – Push

LOWER CENTER cursor location switch – Push

Verify that the lower center cursor location light is illuminated.

RESETS – Select

[Dual Database]

Verify the AIRLINE DATABASE is current.

RESET ALL – Select

[Datalink NOT Automatically Reset]

COMMUNICATION display switch – Push

MANAGER – Select

MASTER – Select

DATA LINK SYSTEM RESET – Select

CONFIRM RESET – Select

Center DISPLAY CONTROL source switch Off

CENTER PANEL BRIGHTNESS controls Mid position

Left radio tuning panel Set

Verify that the OFF light is extinguished.

WEATHER RADAR panel	Set
Center radio tuning panel	Set
Verify that the OFF light is extinguished.	
Observer's audio control panel	As needed
[777 Freighter - the step below is not applicable]	
Flight deck door panel	As needed
Engine fire panel	Set
Verify that the ENG BTL 1 DISCH and ENG BTL 2 DISCH lights are extinguished.	
Engine fire switches – In	
Verify that the LEFT and RIGHT fire warning lights are extinguished.	
Center CDU	Set
Flight deck printer	Set
Verify that the PAPER light is extinguished.	
Right radio tuning panel	Set
Verify that the OFF light is extinguished.	
First Officer audio control panel	As needed
Transponder panel	Set
[Option]	
Evacuation COMMAND switch	Guard closed
FLOOR LIGHTS switch	As needed
OBSERVER AUDIO selector	NORM
AISLE STAND PANEL light control	Mid position
AISLE STAND FLOOD light control	Mid position
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.	

Rudder pedals Adjust

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

Seat belt and shoulder harness Adjust

Do the PREFLIGHT checklist on the Captain's command.

DRAFT

Preflight Procedure – Captain

The Captain normally does this procedure. The First Officer may do this procedure if needed.

EFIS control panel Set

MINIMUMS reference selector – RADIO or BARO

MINIMUMS selector – Set decision height or altitude reference

FLIGHT PATH VECTOR switch – As needed

METERS switch – As needed

BAROMETRIC reference selector – IN or HPA

BAROMETRIC selector – Set local altimeter setting

VOR/ADF switches – As needed

ND mode selector – MAP

ND CENTER switch – As needed

ND range selector – As needed

ND TRAFFIC switch – As needed

WEATHER RADAR – Off

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

Map switches – As needed

Mode control panel Set

FLIGHT DIRECTOR switch – ON

AUTOTHROTTLE ARM switches – ARM

Autopilot DISENGAGE bar – UP

HEADING/TRACK reference switch – As needed

BANK LIMIT selector – AUTO

VERTICAL SPEED/FLIGHT PATH ANGLE reference switch – As needed



ALTITUDE increment selector – As needed

Oxygen Test and set

Oxygen mask – Stowed and doors closed

RESET/TEST switch – Push and hold

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

EMERGENCY/TEST selector – Push and hold

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

RESET/TEST switch and EMERGENCY/TEST selector – Release

Verify the yellow cross does not show in the flow indicator.

Normal/100% selector – 100%

[Gaseous Passenger Oxygen]

Crew and passenger oxygen pressure – Check EICAS

Verify that the pressure is sufficient for dispatch.

[Chemical Passenger Oxygen]

Crew oxygen pressure – Check EICAS

Verify that the pressure is sufficient for dispatch.

[777 Freighter]

Crew and supernumerary oxygen pressure – Check EICAS

Verify that the pressure is sufficient for dispatch.

[Option]

ELECTRONIC FLIGHT BAG Set

[Option]

SIDE DISPLAY control As needed

FORWARD PANEL BRIGHTNESS controls Mid position

Instrument source select panel Set

NAVIGATION source switch – Off

DISPLAY CONTROL source switch – Off

AIR DATA/ATTITUDE source switch – Off

Clock Set

Time/date selector – UTC

INBOARD DISPLAY selector MFD

HEADING REFERENCE switch NORM

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 takeoff V-speeds are selected

Verify that the flight mode annunciations are correct:

- autothrottle mode is blank
- roll mode is TO/GA
- pitch mode is TO/GA
- AFDS status is FLT DIR

Select the map mode.

[Standby Flight Instruments - non ISFD]

Standby instruments Check

Set local altimeter setting.

Verify that the flight instrument indications are correct.

Verify that no flags or messages are shown.

Verify not blank.

[Integrated Standby Flight Display - ISFD]

Integrated standby flight display Set

Verify that the approach mode display is blank.

Set local altimeter setting.

Verify that the flight instrument indications are correct.

Verify that no flags or messages are shown.

ALTERNATE PITCH TRIM levers Neutral

SPEEDBRAKE lever DOWN



Reverse thrust levers	Down
Forward thrust levers	Closed
Flap lever	Set
The flap position indicator does not show when the flaps are up.	
Set the flap lever to agree with the flap position.	
Parking brake	Set
Verify that the PARKING BRAKE SET message is shown.	
Note: Do not assume that the parking brake will prevent airplane movement. Accumulator pressure can be insufficient.	
STABILIZER cutout switches	Guards closed
FUEL CONTROL switches	CUTOFF
FUEL CONTROL switch fire warning lights	Verify extinguished
ALTERNATE FLAPS panel	Set
ALTERNATE FLAPS ARM switch – OFF	
ALTERNATE FLAPS selector – OFF	
Captain audio control panel	As needed
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.	
Rudder pedals	Adjust
Adjust the rudder pedals to allow full rudder pedal and brake pedal movement. Stow the rudder pedal adjust crank.	
Seat belt and shoulder harness	Adjust
Call “PREFLIGHT CHECKLIST.”	

Before Start Procedure

Start the Before Start Procedure after papers are on board.

[777 Freighter - the step below is not applicable]

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.

MCP Set C

IAS/MACH selector – Set V2

Arm LNAV as needed.

Arm VNAV.

Initial heading or track – 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.

Exterior doors Verify closed F/O

Flight deck windows Closed and locked C, F/O

Verify that the WINDOW NOT CLOSED decal does not show.

Verify that the orange indicator does not show.

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:

Nose gear steering Verify locked out C

HYDRAULIC panel Set F/O



WARNING: If the tow bar is connected, do not pressurize the hydraulic systems until the nose gear steering is locked out. Unwanted tow bar movement can occur.

Note: Pressurize the right system first to prevent fluid transfer between systems.

Right ELECTRIC DEMAND pump selector – AUTO

Verify that FAULT light is extinguished.

Center 1 and Center 2 ELECTRIC PRIMARY pump switches – ON

Verify that the Center 1 FAULT light is extinguished.

The Center 2 FAULT light may stay illuminated until after engine start because of load shedding.

Left ELECTRIC DEMAND pump selector – AUTO

Verify that the FAULT light is extinguished.

Center 1 and Center 2 AIR DEMAND pump selectors – AUTO

Verify that the FAULT lights are extinguished.

Fuel panel Set F/O

LEFT and RIGHT FUEL PUMP switches – ON

Verify that the PRESS lights are extinguished.

[After PRR 61998-2 - English Units -200]

If there is more than 7,500 pounds of fuel in the center tank:

CENTER FUEL PUMP switches – ON

One or both PRESS lights may stay illuminated until after the engine start because of load shedding.

[After PRR 61998-2 Metric Units -200]

If there is more than 3,400 kilograms of fuel in the center tank:

CENTER FUEL PUMP switches – ON

One or both PRESS lights may stay illuminated until after the engine start because of load shedding.

[After PRR 61998-2 - English Units not -200]

If there is more than 10,500 pounds of fuel in the center tank:

CENTER FUEL PUMP switches – ON

One or both PRESS lights may stay illuminated until after the engine start because of load shedding.

[After PRR 61998-2 - Metric Units not -200]

If there is more than 4,800 kilograms of fuel in the center tank:

CENTER FUEL PUMP switches – ON

One or both PRESS lights may stay illuminated until after the engine start because of load shedding.

[Auxiliary Fuel Tank]

If there is more than 100 kilograms of fuel in the auxiliary tank:

AUXILIARY FUEL switch – ON

Verify that the PRESS light is extinguished.

Note: Failure to push the auxiliary fuel switch ON may result in unusable fuel.

[Auxiliary Fuel Tank]

If there is more than 200 pounds of fuel in the auxiliary tank:

AUXILIARY FUEL switch – ON

Verify that the PRESS light is extinguished.

Note: Failure to push the auxiliary fuel switch ON may result in unusable fuel.

BEACON light switch ON F/O

CANCEL/RECALL switch Push F/O

Verify that only the expected alert messages are shown.

CANCEL/RECALL switch Push F/O

Verify that the messages cancel.

Trim Set C

Stabilizer trim – ____ UNITS

Set the trim for takeoff.

Verify that the trim is in the greenband.

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.

Ground handling personnel Establish communications C

CAUTION: Do not hold or turn the nose wheel tiller during pushback or towing. This can damage the nose gear or the tow bar.

CAUTION: Do not use airplane brakes to stop the airplane during pushback or towing. This can damage the nose gear or the tow bar.

Transponder As needed F/O

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

Parking brake Set or release C

Set or release as directed by ground handling personnel.

When pushback or towing is complete:

Tow bar Verify not connected C

Nose gear steering Verify not locked out C

Engine Start Procedure

Select the secondary engine display. F/O

Start sequence Announce C

[PW Engines, RR Engines]

The engines may be started at the same time.

Call “START ____ ENGINE” C

[GE Engines with CON Position, PW Engines]

Engine START/IGNITION selector START F/O

[GE Engines without CON Position, RR Engines]

Engine START selector START F/O

FUEL CONTROL switch RUN C

Verify that the oil pressure increases. C, F/O

[GE Engines]

After the engine is stable at idle, start the other engine.

[PW Engines, RR Engine]

If the engines were not started at the same time:

After the engine is stable at idle, start the other engine.

Autostart corrects for:

- no EGT rise
- a hot start
- a hung start
- no N1 rotation
- a compressor stall
- a starter shaft failure
- insufficient starter air pressure
- a start time that exceeds the maximum starter duty cycle time

Do the ABORTED ENGINE START checklist for the following abort start condition:

- there is no oil pressure indication after the EGT increases



Before Taxi Procedure

APU selector	OFF	F/O
ENGINE ANTI-ICE selectors	As needed	F/O
Verify that the ground equipment is clear.		C, F/O
Call "FLAPS__" as needed for takeoff.		C
Flap lever	Set takeoff flaps	F/O
Flight controls	Check Make slow and deliberate inputs, one direction at a time.	C
Note: To avoid nuisance FLIGHT CONTROLS faults, a complete cycle of the control wheel during the flight control check should be done slowly (more than approximately 6 seconds) and not combined with the check of the pitch controls.		
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 tiller 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		
Transponder	As needed	F/O
At airports where ground tracking is not available, select STANDBY. 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 only expected alert messages are shown.		

[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

DRAFT

Before Takeoff Procedure

[PW Engines]

Engine warm up requirements:

- engine oil temperature must be above the lower amber band before takeoff

Engine warm up recommendations (there is no need to delay the takeoff for these recommendations):

- when the engines have been shut down more than 2 hours:
 - run the engines for 5 minutes
 - when taxi time is expected to be less than 5 minutes, start the engines as early as feasible
 - use a thrust setting normally used for taxi operations

[GE Engines]

Engine warm up requirements:

- engine oil temperature must be above the bottom of the temperature scale

Engine warm up recommendations:

- run the engines for at least 3 minutes
- use a thrust setting normally used for taxi operations

[RR Engines]

Engine warm up requirements:

- when the engines have been shut down more than 1.5 hours:
 - run the engines for at least 5 minutes
- when the engines have been shut down less than 1.5 hours:
 - run the engines for at least 3 minutes
- use a thrust setting normally used for the taxi operations
- engine oil temperature must be above the lower amber band before takeoff

Pilot Flying	Pilot Monitoring
	<p>[777 Passenger] Notify the cabin crew to prepare for takeoff. Verify that the cabin is secure.</p> <p>[777 Freighter] Notify the supernumeraries to prepare for takeoff.</p>
The pilot who will do the takeoff updates changes to the takeoff briefing as needed.	
Set the weather radar display as needed. Set the terrain display as needed.	
Call "BEFORE TAKEOFF CHECKLIST."	Do the BEFORE TAKEOFF checklist.

DRAFT

Takeoff Procedure

Pilot Flying	Pilot Monitoring
Before entering the departure runway, verify that the runway and runway entry point are correct.	
	<p>When entering the departure runway, set the STROBE light switch to ON. Use other lights as needed.</p> <p>Set the transponder mode selector to TA/RA.</p>
Verify that the brakes are released. Align the airplane with the runway.	<p>When cleared for takeoff, set the LEFT and RIGHT LANDING light switches to ON.</p>
Verify that the airplane heading agrees with the assigned runway heading.	
<p>[GE Engines] Advance the thrust levers to approximately 55% N1.</p> <p>[PW Engines, RR Engines] Advance the thrust levers to approximately 1.05 EPR.</p> <p>Allow the engines to stabilize.</p>	
Push the TO/GA switch.	
Verify that the correct takeoff thrust is set.	
	<p>Monitor the engine instruments during the takeoff. Call out any abnormal indications.</p> <p>Adjust takeoff thrust before 80 knots as needed.</p> <p>During strong headwinds, if the thrust levers do not advance to the planned takeoff thrust, manually advance the thrust levers by 80 knots.</p>
After takeoff thrust is set, the Captain's hand must be on the thrust levers until V1.	
<p>Monitor airspeed.</p> <p>Maintain light forward pressure on the control column.</p>	<p>Monitor airspeed and call out any abnormal indications.</p>

Pilot Flying	Pilot Monitoring
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. Verify VNAV engaged.
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 the ENGINE ANTI-ICE selectors to AUTO.
Call "AFTER TAKEOFF CHECKLIST."	
	Do the AFTER TAKEOFF checklist.

Takeoff Flap Retraction Speed Schedule

Takeoff Flaps	At "Display"	Select Flaps
20 or 15	VREF 30 + 20	5
	"5"	1
	"1"	UP
5	VREF 30 + 40	1
	"1"	UP

DRAFT

Climb and Cruise Procedure

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

Note: Maintain at least 15 knots above minimum maneuver speed when climbing through FL200 to prevent the EICAS caution message, “AIRSPEED LOW” from occurring.

Note: Perform all step climbs using VNAV or maximum climb thrust.

Pilot Flying	Pilot Monitoring
	At or above 10,000 feet MSL, set the LANDING light switches to OFF.
	<p>[777 Passenger] Set the passenger signs as needed.</p> <p>[777 Freighter] Set the supernumerary signs as needed.</p>
At transition altitude, set and crosscheck the altimeters to standard.	
	<p>If the FUEL IN CENTER message shows, set both CENTER FUEL PUMP switches to ON.</p> <p>[Auxiliary Fuel Tank] When the FUEL LOW AUX message shows, set the AUXILIARY FUEL switch to OFF.</p> <p>When the FUEL LOW CENTER message shows, set both CENTER FUEL PUMP switches to OFF.</p>
	<p>Before the top of descent, modify the active route as needed for the arrival and approach.</p> <p>Verify or enter the correct RNP for the arrival.</p>



Descent Procedure

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

Complete the Descent Procedure by 10,000 feet MSL.

[RR Engines]

During initial descent, maintain idle thrust for a minimum of 30 seconds.

Pilot Flying	Pilot Monitoring
Review all alert messages. Review all operational notes.	Recall and review all alert messages. Recall and review all operational notes.
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 the NAV RADIO page for the approach.
	Set the AUTOBRAKE selector 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

Pilot Flying	Pilot Monitoring
	<p style="color: blue;">[777 Passenger] Set the passenger signs as needed.</p> <p style="color: blue;">[777 Freighter] Set the supernumerary signs as needed.</p>
	At or above 10,000 feet MSL, set the LEFT and RIGHT LANDING light switches to ON.
At transition level, set and crosscheck the altimeters.	
Update changes to the arrival and approach procedures as needed. Update changes to 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”	20	“20”
20	20	25 or 30	(VREF25 or VREF30) + wind additives



Landing Procedure - ILS

Pilot Flying	Pilot Monitoring
	<p>[777 Passenger] Notify the cabin crew to prepare for landing. Verify that the cabin is secure.</p> <p>[777 Freighter] Notify the supernumeraries to prepare for landing.</p>
Call “FLAPS ___” according to the flap extension schedule.	Set the flap lever as directed.
When on localizer intercept heading: <ul style="list-style-type: none">• verify that the ILS is tuned and identified• verify that the LOC and G/S pointers are shown	
Arm the APP mode.	

[GS Capture NOT Inhibited Before LOC Capture]

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 glideslope with the localizer not captured.

[GS Capture Inhibited Before LOC Capture]

<p>Note: When using LNAV to intercept the final approach course, LNAV might parallel the localizer without capturing it.</p>	
Use HDG SEL/TRK SEL or HDG HOLD /TRK HOLD to intercept the final approach course as needed.	
Verify that the localizer is captured.	
	Call “GLIDESLOPE ALIVE.”
At glideslope alive, call: <ul style="list-style-type: none">• “GEAR DOWN”• “FLAPS 20”	
	Set the landing gear lever to DN. Set the flap lever to 20.
Set the speedbrake lever to ARMED.	

Pilot Flying	Pilot Monitoring
At glideslope capture, call “FLAPS ___” as needed for landing.	Set the flap lever as directed.
Set the missed approach altitude on the MCP.	
Call “LANDING CHECKLIST.”	Do the LANDING checklist.
At the final approach fix or OM, verify the crossing altitude.	
Monitor the approach. Verify the autoland status at 500 feet radio altitude.	

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Landing Procedure - Instrument Approach Using VNAV

Use the autopilot during the approach to give:

- autopilot alerts and mode fail indications
- more accurate course and glidepath tracking
- lower RNP limits

This procedure is not authorized using QFE.

Pilot Flying	Pilot Monitoring
	<p>[777 Passenger] Notify the cabin crew to prepare for landing. Verify that the cabin is secure.</p> <p>[777 Freighter] Notify the supernumeraries to prepare for landing.</p>
Call "FLAPS __" according to the flap extension schedule.	Set the flap lever as directed.
The recommended roll modes for the final approach are:	
	<ul style="list-style-type: none">• for a 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 LOC
	Verify that the VNAV glidepath angle is shown on the final approach segment of the LEGS page.
When on the final approach course intercept heading for LOC, LOC-BC, SDF, or LDA approaches:	
	<ul style="list-style-type: none">• verify that the localizer is tuned and identified• verify that the LOC pointer is shown
<p>[Option - Enhanced RNP]</p> <ul style="list-style-type: none">• verify that the anticipation cue or LOC pointer is shown	
Arm the LNAV or LOC mode.	
<p>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.</p>	

Pilot Flying	Pilot Monitoring
Use LNAV, HDG SEL, TRK SEL, HDG HOLD, or TRK HOLD to intercept the final approach course as needed.	
Verify that LNAV is engaged or that the localizer is captured.	
Approximately 2 NM before the final approach fix and after ALT, VNAV PTH, or VNAV ALT is annunciated: <ul style="list-style-type: none">• verify that the autopilot is engaged• set DA(H) or MDA(H) on the MCP• select or verify VNAV• select or verify speed intervention	Call “APPROACHING GLIDEPATH.”
Approaching glidepath, call: “GEAR DOWN” “FLAPS 20”	Set the landing gear lever to DN. Set the flap lever to 20
Set the SPEEDBRAKE lever to ARMED.	
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 MDA(H), DA(H), or the missed approach point, disengage the autopilot.	
Maintain the glidepath to landing.	

Go-Around and Missed Approach Procedure

Pilot Flying	Pilot Monitoring
At the same time: <ul style="list-style-type: none"> • push the TO/GA switch • call “FLAPS 20” 	
	Position the flap lever to 20.
Verify: <ul style="list-style-type: none"> • 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 “POSITIVE RATE.”
Verify a positive rate of climb on the altimeter and call “GEAR UP.”	
	Set the landing gear lever to UP.
Limit bank angle to 15 degrees if airspeed is below minimum maneuver speed.	
Above 400 feet radio altitude, select or verify a roll mode.	Verify that the missed approach altitude is set.
Verify that the missed approach route is tracked.	
At acceleration height, set speed to the maneuver speed for the planned flap setting.	
Call “FLAPS ___” according to the flap retraction schedule.	Set the flap lever as directed.
After flap retraction to the planned flap setting, select FLCH or VNAV as needed.	
Verify that climb thrust is set.	
Verify that the missed approach altitude is captured.	

Pilot Flying	Pilot Monitoring
Call "AFTER TAKEOFF CHECKLIST."	Do the AFTER TAKEOFF checklist.

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Landing Roll Procedure

Pilot Flying	Pilot Monitoring
Verify that the thrust levers are closed. Verify that the SPEEDBRAKE lever is UP.	Verify that the SPEEDBRAKE lever is UP. Call "SPEEDBRAKES UP." If the SPEEDBRAKE lever is not UP, call "SPEEDBRAKES NOT UP."
Monitor the rollout progress.	
Verify correct autobrake operation.	
WARNING: After the reverse thrust levers are raised, a full stop landing must be made. If an engine remains in reverse, safe flight is not possible.	
Without delay, raise 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 reach the reverse idle detent before taxi speed.	Call "60 KNOTS."
After the engines are at reverse idle, move the reverse thrust levers to full down.	
Before taxi speed, disarm the autobrake. Use manual braking as needed.	
Before turning off the runway, disconnect the autopilot.	

[Electronic Flight Bag]

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

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

[PW Engines]

Engine cooldown requirement

- Run the engines for at least 90 seconds
- Use a thrust setting no higher than that normally used for all engine taxi operations

Engine cooldown recommendations:

- Run the engines for at least 5 minutes
- Use a thrust setting no higher than that normally used for all engine taxi operations

[RR Engines]

Engine cooldown recommendations:

- Run the engines for at least 1 minute
- Use a thrust setting no higher than that normally used for all engine taxi operations

[GE Engines]

Engine cooldown recommendations:

- Run the engines for at least 3 minutes
- Use a thrust setting normally used for taxi operations

Pilot Flying	Pilot Monitoring
The Captain positions or verifies that the SPEEDBRAKE lever is DOWN.	
	Set the APU selector to START, then ON, as needed.
	Set the ENGINE ANTI-ICE selectors to ON, if needed.
	Set the exterior lights as needed.
Set the weather radar to off.	
	Set the AUTOBRAKE selector OFF.
	Set the flap lever to UP.

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

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Shutdown Procedure

Start the Shutdown Procedure after taxi is complete.

Parking brake Set C or F/O

Verify that the PARKING BRAKE SET message is shown.

Electrical power Set F/O

If APU power is needed:

Check that the APU RUNNING message is shown.

If external power is needed:

Verify that the PRIMARY EXTERNAL POWER AVAIL light is illuminated.

PRIMARY EXTERNAL POWER switch – Push

Verify that the ON light is illuminated.

If the SECONDARY EXTERNAL POWER AVAIL light is illuminated:

SECONDARY EXTERNAL POWER switch – Push

Verify that the ON light is illuminated.

FUEL CONTROL switches CUTOFF C



If towing is needed:

Ground handling personnel Establish communications C

WARNING: If the nose gear steering is not locked out, any change to hydraulic power with the tow bar connected may cause unwanted tow bar movement.

Nose gear steering Verify locked out C

CAUTION: Do not hold or turn the nose wheel tiller 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.

Parking brake Set or release C or F/O

Set or release as directed by ground handling personnel.

SEAT BELTS selector OFF F/O

HYDRAULIC panel Set F/O

Note: Depressurize the right system last to prevent fluid transfer between systems.

Center 1, and Center 2 AIR DEMAND pump selectors – OFF

Left ELECTRIC DEMAND pump selector – OFF

Center 1 and Center 2 ELECTRIC PRIMARY pump switches – OFF

Right ELECTRIC DEMAND pump selector – OFF

FUEL PUMP switches OFF F/O

[Auxiliary Fuel Tank]

AUXILIARY FUEL switch OFF F/O

BEACON light switch OFF F/O

FLIGHT DIRECTOR switches OFF C, F/O

Transponder mode selector STBY F/O

[Electronic Flight Bag]

EFB CLOSE FLIGHT Select C, F/O

Status messages Check F/O

Note: Disregard EICAS alert and status messages displayed during the PFC self test after hydraulic shutdown. Wait approximately 3 minutes after HYD PRESS SYS L+C+R message is shown before recording status and alert messages in the maintenance log.

After wheel chocks are in place:

Parking brake Release C

APU selector As needed F/O

Call "SHUTDOWN CHECKLIST." C

Do the SHUTDOWN checklist. F/O

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Secure Procedure

ADIRU switch	OFF	F/O
EMERGENCY LIGHTS switch.....	OFF	F/O
PACK switches	OFF	F/O
[Electronic Flight Bag]		
EFB Display	Off	C, F/O
Call "SECURE CHECKLIST."		C
Do the SECURE checklist.		F/O

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Supplementary Procedures

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Supplementary Procedures

Introduction

Chapter SP

Section 05

General

This chapter contains procedures (adverse weather operation, engine crossbleed start, and so on) that are accomplished as required rather than routinely performed on each flight. Systems tests are described in the System Description chapter of the applicable system.

Note: System tests are not normally a flight crew action.

Procedures accomplished in flight, or those that are an alternate means of accomplishing normal procedures (such as manual engine start), are usually accomplished by memory. Infrequently used procedures, not normally accomplished (such as engine crossbleed start) are usually accomplished by reference.

Supplementary procedures are provided by section. Section titles correspond to the respective chapter title for the system being addressed except for the Adverse Weather section.

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**PMDG****DO NOT USE FOR FLIGHT**

777 Flight Crew Operations Manual

Supplementary Procedures

Chapter SP

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

Doors

Entry/Service Door Closing

Gust lock latch Release

Door Close

Manually position the door aft and inboard to cover the entry.

Door handle Rotate

Rotate forward 180° to the closed position. The door lowers into position, latches, and locks.

[Option – ARMED/DISARMED Shown, AUTOMATIC/MANUAL Optional]

Mode select lever ARMED

Observe yellow forward and aft girt bar flags are in view.

Entry/Service Door Opening

Mode select lever (interior only) DISARMED

Note: Escape slide/raft and powered door opening is disarmed automatically when the door is opened from outside.

Door handle Rotate

Rotate aft 180° to the open position. The door is lifted clear of the pressure stops.

Door Open

Manually position the door outboard and forward to open. The gust lock latch automatically engages and locks door in the open position.

Emergency Equipment

Emergency Oxygen Use

Emergency oxygen should be used when necessary to provide positive pressure in the masks and goggles to prevent or evacuate contaminants. When positive pressure is not required, but contamination of flight deck air exists, 100% oxygen must be used. If prolonged use is required and the situation permits, oxygen availability should be extended by selecting normal flow. When oxygen use is no longer required, close the left hand oxygen compartment door, then push the RESET/TEST switch to restore normal boom microphone operation.

Flight Deck Door Access System Test

[Passenger - Enhanced security door]

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.	

Air Conditioning Packs

Ground Conditioned Air Use

Before connecting ground conditioned air:

PACK switches (both) – OFF

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

RECIRCULATION FANS switches (both) – OFF

[Allows conditioned air unit to operate at maximum efficiency.]

RECIRCULATION FANS switch – OFF

[Allows conditioned air unit to operate at maximum efficiency.]

After disconnecting ground conditioned air:

PACK switches (both) – AUTO

RECIRCULATION FANS switches (both) – ON

RECIRCULATION FANS switch – ON

Packs Off Takeoff

Before takeoff:

PACK switches (both) – OFF

Wait 30 seconds before setting takeoff thrust.

[PW or RR Engines]

[Allows packs to shut down and EECs time to recompute maximum EPR line and reference/target EPR indications.]

[GE Engines]

[Allows packs to shut down and EECs time to recompute maximum N1 line and reference/target N1 indications.]

After takeoff:

PACK switches (both) – AUTO

After engine thrust is reduced from takeoff to climb and prior to reaching 3000 feet above field elevation, position both pack switches to AUTO.



APU to Pack Takeoff

[Standard on 300ER and 200LR; option on all others]

Before start:

PACK switches (both) – AUTO

On the THRUST LIMIT Page, select one of the following takeoff thrust ratings:

- full thrust
- percent derate

[Increased Takeoff Thrust Rating]

- takeoff bump

Enter “APU” into the scratchpad and line select to the “SEL-APU” field. “APU” appears in small font representing the armed mode.

After engine start:

Leave APU running to supply air to the left pack.

Approximately one minute after second engine start, “APU” displays in large font representing the active mode.

Confirm proper configuration by noting a green “A-TO, A-TO1, A-TO2, or A-TOB on EICAS.

Note: If cabin temperature becomes excessive during extended ground operation, establish dual pack operation by deleting the APU selection. To re-establish APU to Pack operation, enter “APU” into the scratchpad and line select to the “SEL-APU” field.

Note: If an engine is shutdown after selecting APU to Pack operation, the engine cannot be started until APU to Pack takeoff mode has been deleted. To re-establish APU to Pack operation after start, re-enter "APU" into the scratchpad and line select to the "SEL-APU" field.

After climb thrust reduction:

APU Selector - Off.

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Supplementary Procedures

Anti-Ice, Rain

Chapter SP

Section 3

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.

Windshield Wiper Use

CAUTION: Windshield scratching will occur if the windshield wipers are operated on a dry windshield.

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Supplementary Procedures
Automatic Flight

Chapter SP
Section 4

AFDS

AFDS Operation

FLIGHT DIRECTOR switches ON

Verify FLT DIR is displayed in the AFDS system status annunciator.

If the autopilot is desired:

AUTOPILOT engage switch Push

Verify A/P is displayed in the AFDS system status annunciator.

Heading Hold

If the airplane is operating in polar regions:

HEADING REFERENCE switch TRUE

HEADING/TRACK reference switch Push

Verify HDG is displayed in the HDG/TRK window.

Heading/track HOLD switch Push

Verify HDG HOLD is displayed in the roll mode annunciator.

Heading Select

Maintains the airplane heading the same as the selected heading.

If the airplane is operating in polar regions:

HEADING REFERENCE switch TRUE

HEADING/TRACK reference switch Push

Verify HDG is displayed in the HDG/TRK window.

Heading/track SELECT switch Push

Verify HDG SEL is displayed in the roll mode annunciator.

Heading/track selector Rotate

Set desired heading in the HDG/TRK window.

Track Hold

If the airplane is operating in polar regions:

- HEADING REFERENCE switch TRUE
HEADING/TRACK switch Push
Verify TRK is displayed in the HDG/TRK window.
Heading/track HOLD switch Push
Verify TRK HOLD is displayed in the roll mode annunciator.

Track Select

Maintains the airplane track the same as the selected track.

If the airplane is operating in polar regions:

- HEADING REFERENCE switch TRUE
HEADING/TRACK reference switch Push
Verify TRK is displayed in the HDG/TRK window.
Heading/track SELECT switch Push
Verify TRK SEL is displayed in the roll mode annunciator.
Heading/track selector Rotate
Set desired track in the HDG/TRK window.

Altitude Hold

- Altitude HOLD switch Push
Verify ALT is displayed in the pitch mode annunciator.

Flight Level Change, Climb or Descent

- ALTITUDE selector Rotate
Set the desired altitude in the MCP ALTITUDE window.
FLCH switch Push
Verify FLCH SPD is displayed in the pitch mode annunciator.
IAS/MACH selector Rotate
Set the desired speed in the IAS/MACH window.



Vertical Speed, Climb or Descent

ALITUDE selector Rotate
Set the desired altitude in the MCP ALTITUDE window.

VERTICAL SPEED/FLIGHT PATH ANGLE reference switch Push
Verify V/S is displayed in the vertical speed/flight path angle window.

VERTICAL SPEED/FLIGHT PATH ANGLE switch Push
Verify V/S is displayed in the pitch mode annunciator.

VERTICAL SPEED/FLIGHT PATH ANGLE selector Rotate
Set the desired vertical speed in the VERTICAL SPEED/FLIGHT PATH ANGLE window.

If a climb is desired:

Select climb thrust limit on the CDU THRUST LIM page.

Flight Path Angle, Climb or Descent

ALITUDE selector Rotate
Set the desired altitude in the MCP ALTITUDE window.

VERTICAL SPEED/FLIGHT PATH ANGLE Reference switch Push
Verify FPA is displayed in the vertical speed/flight path angle window.

VERTICAL SPEED/FLIGHT PATH ANGLE switch Push
Verify FPA is displayed in the pitch mode annunciator.

VERTICAL SPEED/FLIGHT PATH ANGLE selector Rotate
Set the desired flight path angle in the VERTICAL SPEED/FLIGHT PATH ANGLE window.

If a climb is desired:

Select climb thrust limit on the CDU THRUST LIM page.

Autothrottle Operation

AUTOTHROTTLE ARM switches ARM

If the pitch mode is TO/GA:

TO/GA switch Push

Verify that THR REF is displayed in the autothrottle mode annunciator. THR REF changes to HOLD at 80 knots.

If the pitch mode is ALT, V/S, FPA, G/S, or no pitch mode:

AUTOTHROTTLE switch Push

Verify that SPD is displayed in the autothrottle mode annunciator.

If a constant speed is desired:

IAS/MACH selector Rotate

Set the desired speed in the IAS/MACH window.

If climb or continuous thrust is desired:

CLB CON switch Push

Verify that THR REF is displayed in the autothrottle mode annunciator.

If FLCH or VNAV is desired:

FLCH or VNAV switch Push

Verify that THR REF, THR, SPD, IDLE, or HOLD as appropriate is displayed in the autothrottle mode annunciator.

If TO/GA is desired:

TO/GA switch Push

The pitch mode will change to TO/GA. Verify that THR or THR REF is displayed in the autothrottle mode annunciator.

If the pitch mode is VNAV PTH, VNAV ALT, VNAV SPD, or FLCH SPD:

AUTOTHROTTLE switch Push

Verify THR REF, THR, SPD, IDLE, or HOLD as appropriate is displayed in the autothrottle mode annunciator.



Instrument Approach - RNAV (RNP) AR

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

The RNAV (RNP) 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 (GND PROX SYS or TERR POS alert not shown)
- 2 FMCs, CDUs* (FMC L or FMC R alert not shown)
- 2 GPS Receivers
- Current Navigation Database
- 2 Radio Altimeters (SGL SOURCE RAD ALT alert not shown)
- NAV AIR DATA SYS or NAV ADIRU INERTIAL alert not shown
- 2 PFD/ND displays*
- F/D capable of LNAV and VNAV for RNP 0.14 or greater (SINGLE SOURCE F/D alert not shown)
- A/P capable of LNAV and VNAV for RNP less than 0.14 (SINGLE SOURCE F/D alert not shown)

Note: Go-around/missed approach is required if the NAV UNABLE RNP or VERIFY POSITION alert displays 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 the NAV UNABLE RNP alert is not displayed
- review RNP availability predictions
- verify the approach RNP is equal to or greater than:
 - 0.11 (A/P)
 - 0.14 (F/D)
- set current local altimeter (remote altimeter settings not allowed)

- verify wind is within limits published for the approach (if applicable)
- verify 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
	<p>When selecting the approach from the navigation database verify FMC LEGS page matches the charted approach.</p> <p>Verify GP within 0.01 of the charted GP.</p> <p>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 IAF.</p>

Descent Procedure

Pilot Flying	Pilot Monitoring
In the approach briefing include speed and altitude restrictions, missed approach, engine failure, and unable RNP procedures.	Select/verify RAD NAV INHIBIT - ON on the REF NAV DATA page.



Approach Procedure

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

Note: When receiving radar vectors from ATC, intercept course modifications may be used to join the LNAV path at any point on the initial, intermediate, or missed approach segments.

Note: Direct-To modifications are not permitted when:

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

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

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.

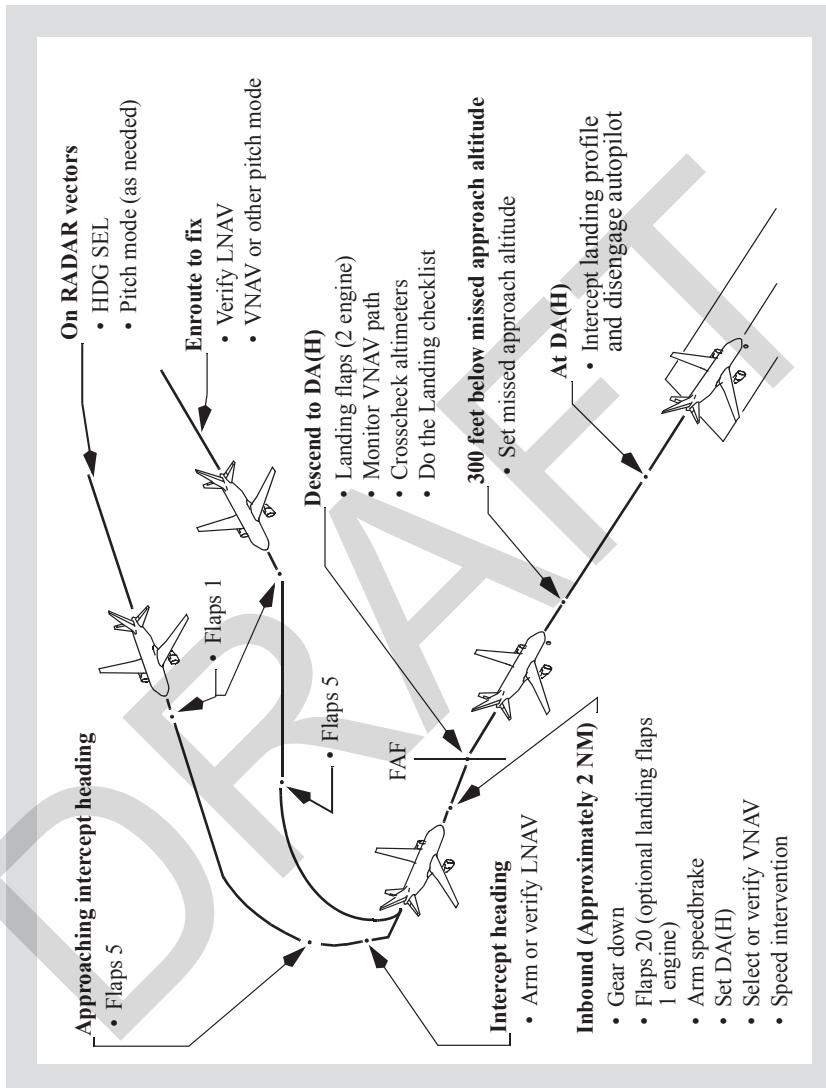
Landing Procedure

Pilot Flying	Pilot Monitoring
	Notify the cabin crew to prepare for landing. Verify the cabin is secure. Notify the supernumeraries to prepare for landing.
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.

Pilot Flying	Pilot Monitoring
<p>Approximately 2 NM before the final approach fix and after ALT or VNAV PTH or VNAV ALT is annunciated:</p> <ul style="list-style-type: none"> • Set DA(H) on the MCP • Select or verify VNAV • Select or verify speed intervention 	<p>Call “APPROACHING GLIDE PATH.”</p>
<p>Maximum Lateral Deviation (XTK ERROR): NPS amber indication or 1 x RNP.</p> <p>Maximum Vertical Deviation - FAF to DA: 75 feet.</p> <p>Monitor NPS.</p>	
<p>Approaching glidepath, call:</p> <ul style="list-style-type: none"> • “GEAR DOWN” • “FLAPS 20” 	<p>Set the landing gear lever to DN. Set the flap lever to 20.</p>
<p>Set the SPEEDBRAKE lever to ARM.</p>	
<p>Beginning the final approach descent, call “FLAPS ____” as needed for landing.</p>	<p>Set the flap lever as directed.</p>
<p>Call “LANDING CHECKLIST.”</p>	<p>Do the LANDING checklist.</p>
<p>When at least 300 feet below the missed approach altitude, set the missed approach altitude on the MCP.</p>	
<p>At the final approach fix, verify the crossing altitude and crosscheck the altimeters (maximum 100 feet difference between primary altimeters).</p>	
<p>Monitor the approach.</p>	
<p>If suitable visual reference is established at DA(H), disengage the autopilot.</p> <p>Maintain the glidepath to landing.</p>	



Instrument Approach Flight Pattern - RNAV (RNP) AR



Instrument Approach Using Vertical Speed (V/S) or Flight Path Angle (FPA)

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

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

Recommended roll modes:

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

Note: When using LNAV to intercept a localizer, LNAV might parallel the localizer without capturing it. Use HDG SEL/TRK or HDG HOLD/TRK HOLD to intercept the final approach course, if needed.

Ensure appropriate navaids (VOR, LOC, or NDB) are tuned and identified prior to commencing the 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 MDA(H). When the current constraint is assured, the next constraint may be set prior to ALT engaged to achieve continuous descent path.

If constraints or MDA(H) do not end in zero zero (00) (for example, 1820), set MCP ALTITUDE window to the closest 100 foot increment below the constraint or the closest 10 foot increment above the MDA(H).



At descent point:

V/S or FPA switch Push

Verify V/S or FPA mode annunciates.

Desired V/S or FPA Set

Set desired V/S or FPA to descend to MDA(H). Use a V/S or FPA that results in no level flight segment at MDA(H).

Approximately 300 feet above MDA(H):

MCP altitude Set Missed Approach Altitude

At MDA(H)/missed approach point:

If suitable visual reference is not established, execute missed approach.

After suitable visual reference is established:

A/P Disengage switch Push

Disengage autopilot before descending below MDA(H).

Circling Approach

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

MCP Altitude selector Set

Accomplish an instrument approach, establish suitable visual reference, and level off at MDA(H).

Verify ALT or VNAV ALT mode annunciates.

MCP Altitude selector Set Missed Approach Altitude

HDG SEL/TRK SEL switch Push

Verify HDG SEL or TRK SEL mode annunciates.

Intercepting the landing profile:

Autopilot disengage switch Push

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Flight Deck Communications System (Datalink)

The following procedures are one means which may be used to verify Pre-Departure Clearance, Digital-Automatic Terminal Information Service (D-ATIS), Oceanic Clearances, Weight and Balance and Takeoff Data messages transmitted via the COMPANY format.

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 Terminal 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 value are different, or the alpha value is not present, the flight crew must verify the altimeter setting by other means.

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 that the Weight and Balance numeric and alphabetic values are identical. If the Weight and Balance numeric and alphabetic values are different, the flight crew must not accept the Weight and Balance data.

Takeoff Data

The flight crew shall verify that 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.

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Supplementary Procedures
Electrical

Chapter SP
Section 6

Electrical Power Down

The following procedure is accomplished to remove all electrical power from the airplane.

Before accomplishing the following steps, verify ADIRU, EMER LIGHTS, and PACK switches are off and HYD PRESS SYS L+C+R message is displayed.

APU selector and/or EXTERNAL POWER switch(es) OFF
BATTERY switch OFF

Electrical Power Up

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

BATTERY switch	ON
C1 and C2 PRIMARY pump switches	OFF
DEMAND pump selectors	OFF
WIPER selectors	OFF
Landing gear lever.....	DN
ALTERNATE FLAPS selector.....	OFF
Electrical power	Establish

BUS TIE switches – AUTO

If external power is desired:

PRIMARY EXTERNAL POWER AVAIL light – Illuminated

PRIMARY EXTERNAL POWER switch – Push

If the SECONDARY EXTERNAL POWER AVAIL light is illuminated:

SECONDARY EXTERNAL POWER switch – Push

If APU power is desired:

APU GENERATOR switch – ON

APU selector – START, then ON

Supplementary Procedures
Engines, APU

Chapter SP
Section 7

APU Ground Pneumatic Start

- Duct pressure Observe
Observe duct pressure is a minimum of 15 PSI (less 1 PSI per 1000 feet of pressure altitude).
Accomplish normal APU start.

Engine Battery Start

Accomplish the normal Exterior Inspection and the normal Preliminary Preflight Procedure – Captain or First Officer through “Circuit breakers.....Check.”

- BATTERY switch ON
C1 and C2 PRIMARY pump switches OFF
DEMAND pump selectors OFF
WIPER selectors OFF
Landing gear lever DN
ALTERNATE FLAPS selector OFF
STANDBY POWER switch
(overhead maintenance panel) Push to BAT, release to AUTO
Center bleed ISOLATION switch OFF
Ground pneumatic source (if available) Connect

If the APU is required for pneumatic power:

- APU selector START, then ON
Speedbrake lever Down
Reverse thrust levers Down
Thrust levers Closed
Flap position indication and flap lever Agree

Parking brake Set

FUEL CONTROL switches CUTOFF

Captain's audio control panel Set

Start the left engine using the normal Engine Start procedure. Bleed air is available only to the left engine.

Limit start attempts to one autostart or two manual start attempts.

After left engine is started:

Ground pneumatic source (if used) Disconnect

Center bleed ISOLATION switch AUTO

Complete the normal Preflight, Before Start, and Engine Start procedures.

Engine Crossbleed Start

The APU must be shutdown or the APU Bleed switch must be turned off.

Verify the area behind the airplane is clear of equipment and personnel prior to increasing thrust on operating engine.

Thrust lever (operating engine) Advance

[GE, PW Engines]

Increase thrust until 5% N2 above idle (25 PSI minimum duct pressure).

[RR Engines]

Increase thrust until 5% N3 above idle (25 PSI minimum duct pressure).

Accomplish normal engine start.

Engine Ground Pneumatic Start

Duct pressure Observe

[Observe duct pressure is a minimum of 25 PSI (less 1 PSI per 1000 feet of pressure altitude)].

Accomplish normal engine start.



Manual Engine Start

[RR Engines]

Captain	First Officer
Announce start sequence.	Position AUTOSTART switch to OFF.
Call "START ____ ENGINE."	Position ____ START selector to START.
Observe oil pressure increase.	
Position ____ FUEL CONTROL switch to RUN when: <ul style="list-style-type: none">• EGT less than 100 degrees C, and• at maximum motoring, or N3 greater than 25%, whichever occurs first (maximum motoring occurs when N3 acceleration is less than 1% in approximately 5 seconds).	
Observe initial EGT rise and EGT within limits.	
	When engine is stabilized at idle, push AUTOSTART switch ON, if AUTOSTART is available. If more than one engine is to be started manually, AUTOSTART switch may remain OFF between manual starts.

[PW Engines]

Captain	First Officer
Announce start sequence.	Position AUTOSTART switch to OFF.
Call "START ____ ENGINE."	Position ____ START/IGNITION selector to START.
Observe oil pressure increase.	
Position ____ FUEL CONTROL switch to RUN at maximum motoring, 15% N2 minimum (maximum motoring occurs when N2 acceleration is less than 1% in approximately 5 seconds).	
Observe initial EGT rise and EGT within limits.	
	When engine is stabilized at idle, push AUTOSTART switch ON, if AUTOSTART is available. If more than one engine is to be started manually, AUTOSTART switch may remain OFF between manual starts.

[GE Engines with CON IGN]

Captain	First Officer
Announce start sequence.	Position AUTOSTART switch to OFF.
Call "START ____ ENGINE."	Position ____ START/IGNITION selector to START.
Observe oil pressure increase.	
Position ____ FUEL CONTROL switch to RUN at maximum motoring (maximum motoring occurs when N2 acceleration is less than 1% in approximately 5 seconds).	
Observe initial EGT rise and EGT within limits.	
	When engine is stabilized at idle, push AUTOSTART switch ON, if AUTOSTART is available. If more than one engine is to be started manually, AUTOSTART switch may remain OFF between manual starts.



Monitor engine displays for start parameters listed below until engine is stabilized at idle:

- Oil pressure should rise before selecting RUN.

[GE, PW Engines]

- EGT should rise within 20 seconds after selecting RUN.

[RR Engines]

- EGT should rise within 30 seconds after selecting RUN.

[GE Engines]

- N1 rotation must be indicated by 50% N2.

[PW Engines]

- N1 rotation must be indicated by 40% N2.

[RR Engines]

- N1 rotation must be indicated by 45% N3.

- EGT must stay within limits.

[GE, PW Engines]

- N2 should reach idle within two minutes after selecting RUN.

[RR Engines]

- N3 should reach idle within two minutes after selecting RUN.

If both engines are to be started manually, the AUTOSTART switch may remain OFF between manual starts.

Repeat procedure to start remaining engine.

Manual Override Engine Start

Start the engine using normal engine start procedure, except direct the ground crew to:

[GE with CON IGN, PW Engines]

- manually open the start valve after positioning START/IGNITION selector to START

[GE with no CON IGN, RR Engines]

- manually open the start valve after positioning START selector to START

[GE Engines]

- manually close the start valve at 62% N2.

[PW Engines]

- manually close the start valve at 42% N2.

[RR Engines]

- manually close the start valve at 50% N3.

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Supplementary Procedures
Flight Instruments, Displays

Chapter SP
Section 10

Heading Reference Switch Operation

Use TRUE when operating in regions where true referencing is required.
Use NORM in all other regions.

HDG REF switch NORM or TRUE

Note: If using HDG SEL or TRK SEL mode and the HDG REF switch position is changed, the AFDS roll mode changes to HDG HOLD or TRK HOLD, respectively; HDG SEL or TRK SEL may be reselected.

QFE Operation

Accomplish this procedure when ATC altitude assignments are referenced to QFE altimeter settings.

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

INIT REF key Push

<INDEX Select

<APPROACH Select

LANDING REF key Select

Verify QFE selected.

[This sets the landing altitude to zero.]

Altimeters Set

Set altimeters to QFE when below transition altitude/level.

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

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Supplementary Procedures
Flight Management, Navigation

Chapter SP
Section 11

Departure or Destination Airport Not in the FMC Navigation Database

When departing from or landing at an airport that is not in the FMC navigation database, the following items are affected:

- Cabin pressurization schedule
- Availability of departure, arrival, and approach procedures in the FMC
- Automatic tuning of VOR, DME, and ILS radios for departure, arrival, and approach procedures
- Format of altitudes and flight levels on the ND and CDU
- Barometric transition altitude alerts (amber display and box) on the PFD

[Option - Landing Altitude Reference Bar]

- Landing altitude reference bar (white/amber bar) on the PFD altitude tape
- Landing altitude indication (amber crosshatched area) on the PFD altitude tape

Use the following procedures when departing from or landing at an airport that is not in the FMC navigation database.

Departure Airport Not in the FMC Navigation Database

CDU Preflight Procedure - Captain and First Officer

RTE key Push

If ORIGIN contains an ICAO identifier:

The following steps clear the ORIGIN and erase the previous route.

- INIT REF key Push
<INDEX Select
<IDENT Select
Inactive date range Select
ACTIVE date range Select
Transfers the inactive navigation database to the ACTIVE line
and removes the previously entered route.

Clear the NAV DATA OUT OF DATE scratchpad message.

- Inactive date range Select
ACTIVE date range Select
Transfers the inactive navigation database to the ACTIVE line.

Verify the ACTIVE date range is current.

- RTE key Push

Leave ORIGIN blank.

- DEST Enter
Route Enter
LEGS key Push

Enter the latitude and longitude of the departure airport as the first
waypoint on the route.

ACTIVATE and execute the route.

- VNAV key Push
Displays the CLB page.

- TRANS ALT Enter
NAV RAD key Push
Departure navaid frequency and CRS (as needed) Enter



LDG ALT selector Pull

Rotate to set the departure airport altitude manually. This reduces crew workload in the event of a return to the departure airport.

Do not accomplish the following checklist:

LANDING ALTITUDE

After engine start, override the LANDING ALTITUDE checklist.

Note: The LDG ALT flag is shown on the PFD.

[Option - Landing Altitude Reference Bar]

Note: The landing altitude reference bar (white/amber bar) is not shown on the PFD altitude tape.

Note: The landing altitude indication (amber crosshatched area) is not shown on the PFD altitude tape.

When no longer needed, delete the departure navaid frequency and CRS.

Before Descent

LDG ALT selector Push

The FMC sets the destination altitude automatically.

VNAV key Push

NEXT PAGE key Push

FORECAST> Select

Displays the DESCENT FORECAST page.

TRANS LVL Enter

Overwrites the manually entered departure airport transition altitude.

Destination Airport Not in the FMC Navigation Database

CDU Preflight Procedure - Captain and First Officer

The following steps can also be done in flight.

LEGS key Push

Enter the latitude and longitude of the destination airport as the final waypoint on the route.

Enter a speed/altitude constraint for the final waypoint. The speed constraint should be the planned approach speed and the altitude constraint should be the destination airport elevation.

ACTIVATE (if needed) and execute the route.

Before Descent

VNAV key Push

NEXT PAGE key Push

FORECAST> Select

Displays the DESCENT FORECAST page.

TRANS LVL Enter

LDG ALT selector Pull

Rotate to set the destination airport altitude manually.

Do not accomplish the following checklist:

LANDING ALTITUDE

Override the LANDING ALTITUDE checklist.

Note: The LDG ALT flag displays on the PFD.

[Option - Landing Altitude Reference Bar]

Note: The landing altitude reference bar (white/amber bar) does not display on the PFD altitude tape during approach.

Note: The landing altitude indication (amber crosshatched area) does not display on the PFD latitude tape during landing.

Note: The ARRIVALS page is not available for the destination airport.

Before Approach

- NAV RAD key Push
- Destination navaid frequency and CRS (as needed) Enter
- ND mode selector As needed
- Select APP, VOR, or MAP based on the type of approach to be flown.

[Option - Enhanced FIX Pages]

Note: To create a reference on the ND map, on the FIX INFO page, enter the latitude and longitude of the runway threshold and enter the reciprocal of the final approach course as a bearing. This creates a dashed green line, aligned with the final approach course on the ND map.

ADIRU Alignment/Position Update

If an ADIRU position update is desired during an automatic realignment (on ground only):

CDU – SET

When dash prompts appear on the SET INERTIAL POS line of the POS INIT page, enter the most accurate position.

If a manual ADIRU alignment is desired (on ground only):

ADIRU switch – OFF 30 seconds, then ON

Wait an additional 30 seconds.

CDU – SET

Enter the most accurate position in the boxes on the SET INERTIAL POS line of the POS INIT page.

Alignment requires from six to fifteen minutes depending on latitude (six minutes at the equator, ten minutes average).

FMS Position Update

When the FMC message VERIFY POSITION is displayed, the FMC position may require updating.

POS REF page 2/3 Select

POS REF 2/3 is the second page of POS INIT 1/3.

Compare the FMS positions with the displayed GPS, RADIO, and INERTIAL positions.

Select the most appropriate source for FMC position updating.

UPDATE ARM> Select

The ARM prompt changes to ARMED and NOW prompts appear to the right of the remaining position sources.

Appropriate source UPDATE NOW> Select



Navaid Inhibit or Enable

Note: GPS position updates should be used during all approaches in which the FMC database and approach procedures are referenced to the WGS-84 reference datum. GPS updates should be inhibited for other approach operations not based on WGS-84 unless other appropriate procedures are used. GPS position updates should be used for all other operations unless a specific state requires the use of other update provisions within their airspace (eg, to accommodate a non-WGS reference datum or other reason).

To inhibit GPS:

- INIT REF key Push
<INDEX Select
<POS Select
Displays the POS INIT page 1/3.
- PREV PAGE key Push
Displays the POS REF page 3/3.
- GPS NAV Select
Verify OFF displays in large font.

Note: The FMC uses inertial inputs only.

To enable radio updating:

- INIT REF key Push
<INDEX Select
NAV DATA> Select

Note: The default state of RAD NAV INHIBIT is ON; all radio updating is inhibited. ON displays.

- RAD NAV INHIBIT Select
Selection enables all radio updating. Verify OFF displays.
Second selection inhibits VOR/DME updating. Verify VOR displays. DME/DME updating is operable.
Third selection inhibits all radio updating; ON displays.

To inhibit VORs, VOR/DMEs, VORTACs, or DMEs:

INIT REF key Push

<INDEX Select

NAV DATA> Select

To inhibit navaid data (up to two navaids):

Navaid identifier (NAVAID INHIBIT line) Enter

To inhibit VOR ONLY data (up to two VORs):

VOR identifier (VOR ONLY INHIBIT line) Enter

RNP Manual Entry

The FMC automatically supplies default RNP values based on phase of flight. When the airplane is on a procedure or airway that has an RNP requirement, and does not have an RNP value stored in the navigation database, a manual RNP entry may be made.

POS REF page 2/3 Select

POS REF 2/3 is the second page of POS INIT 1/3.

If the displayed RNP is different from the RNP for the current airway or procedure:

RNP Enter

When the manually entered RNP is no longer required:

POS REF page 2/3 Select

RNP Delete

Supplementary Procedures

Fuel

Chapter SP Section 12

Fuel Balancing

If fuel leak is suspected:

Accomplish the FUEL LEAK checklist.

If fuel balancing is desired prior to display of the FUEL IMBALANCE alert message, accomplish the FUEL IMBALANCE non-normal checklist.

Cold Fuel Operations

[RR Engines]

CAUTION: Do not do this procedure and balance fuel at the same time. Balance fuel before or after doing the procedure.

Within 2 hours of top of descent (TD), but not less than 15 minutes before top of descent (TD), check fuel temperature.

If fuel temperature is colder than -10 degrees C:

Do one of the following:

(1) Perform a step climb using maximum climb thrust (VNAV preferred), or

(2) Select or verify CLB thrust on the thrust limit page and verify cruise speed is set to 0.84 Mach or less. Then,

- manually advance thrust levers to maximum (autothrottles may be overridden). After reaching maximum climb thrust, hold for 10 seconds or until reaching 0.86 Mach, whichever occurs first,
- check engines have achieved maximum climb thrust and respond normally,
- retard thrust levers to cruise power and resume normal operations.

If fuel temperature is -10 degrees C or warmer, no crew action required.

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Supplementary Procedures
Warning Systems

Chapter SP
Section 15

Runway Awareness and Advisory System (RAAS) Override Operation

[Option - With Runway Awareness and Advisory System]

If one or more of the following exist:

- The airport is not in the GPWS database
- A NOTAM applies to the intended runway
- Airline policy prohibits the use of RAAS for an airport or runway.

GROUND PROXIMITY RUNWAY OVERRIDE switch OVRD

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Supplementary Procedures

Adverse Weather

Chapter SP

Section 16

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:

[Option - Airplanes with fixed derate option.]

- For wet runways, reduced thrust (fixed derate, assumed temperature method, or both) is allowed provided suitable takeoff performance accountability is made for the increased stopping distance on a wet surface
- For runways contaminated by slush, snow, standing water, or ice, reduced thrust (fixed derate) is allowed provided takeoff performance accounts for the runway surface condition. Reduced thrust using assumed temperature method, whether alone or in combination with a fixed derate, is not allowed
- V1 may be reduced to minimum V1 to provide increased stopping margin provided the field length required for a continued takeoff from the minimum V1 and obstacle clearance meet the regulatory requirements. The determination of such minimum V1 may require a real-time performance calculation tool or other performance information supplied by dispatch
- Takeoffs are not recommended when slush, wet snow, or standing water depth is more than 1/2 inch (13 mm) or dry snow depth is more than 4 inches (102 mm).

Cold Weather Operations

Considerations associated with cold weather operation are primarily concerned with low temperatures and with ice, snow, slush, and standing water on the airplane, ramps, taxiways, and runways.

Icing conditions exist when OAT (on the ground) or TAT (in-flight) is 10°C or below and any of the following exists:

- visible moisture (clouds, fog with visibility of one statute mile (1600 m) or less, rain, snow, sleet, ice crystals, and so on) is present, or
- ice, snow, slush, or standing water is present on the ramps, taxiways, or runways.

CAUTION: Do not use engine anti-ice when OAT (on the ground) is above 10°C. Do not use engine or wing anti-ice when TAT (in-flight) is above 10°C.

Exterior Inspection

Although removal of surface snow, ice and frost is normally a maintenance function, during preflight procedures, the captain or first officer should carefully inspect areas where surface snow, ice or frost could change or affect normal system operations.

Do the normal Exterior Inspection with the following additional steps:

Surfaces Check

Takeoff with light coatings of frost, up to 1/8 inch (3mm) in thickness, on lower wing surfaces due to cold fuel is allowable; however, all leading edge devices, all control surfaces, and upper wing surfaces must be free of snow, ice and frost.

Thin hoarfrost is acceptable on the upper surface of the fuselage provided all vents and ports are clear. Thin hoarfrost is a uniform white deposit of fine crystalline texture, which usually occurs on exposed surfaces on a cold and cloudless night, and which is thin enough to distinguish surface features underneath, such as paint lines, markings or lettering.

Pitot probes and static ports Check

Verify that all pitot probes and static ports are 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 valves, are free of snow and ice.
- Engine inlets Check
Verify that the inlet cowling is free of snow and ice.
- Fuel tank vents Check
Verify that 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 must be free of snow and ice before APU start.

Engine Start Procedure

Do the normal Engine Start Procedure with the following considerations:

- Oil pressure may be slow to rise
- Initial oil pressure rise may be higher than normal
- Additional warm-up time may be needed to allow oil temperature to reach the normal range.
- Displays may require additional warm-up time before displayed engine indications accurately show changing values. Displays 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, except when the temperature is below -40°C OAT.

WARNING: Do not rely on airframe visual icing cues before activating engine anti-ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.

CAUTION: Do not use engine anti-ice when OAT is above 10°C .

When engine anti-ice is needed:

ENGINE ANTI-ICE selectors ON F/O

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE selectors AUTO F/O

Before Taxi Procedure

Do the normal Before Taxi Procedure with the following modifications:

If taxi-in on the previous flight occurred in icing conditions and the temperature stayed below 3°C , taxi-in time from the previous flight in the airplane logbook must be included in the total taxi time. If the engine is considered free of ice before engine start, only the taxi-out time should be included in the total taxi time. The engine is considered free of ice before engine start if:

- the engine has been manually de-iced,
- the engine has been visually inspected per the AMM, or
- an engine run-up to shed ice was conducted within 5 minutes of engine shutdown after taxi-in.

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. Taxing 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 tiller 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.

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.

[PW Engines and GE Engines except 110B/115B]

Run-up to a minimum of 50% N1 for approximately 1 second duration at intervals no greater than 15 minutes.

[RR Engines and GE 110B/115B engines]

Run-up to a minimum of 50% N1 for approximately 1 second duration at intervals no greater than 60 minutes.

De-icing / Anti-icing

Testing of undiluted de-icing/anti-icing fluids has shown that some of the fluid remains on the wing during takeoff rotation and initial climb. The residual fluid causes a temporary decrease in lift and increase in drag, however, the effects are temporary. Use the normal takeoff rotation rate.

CAUTION: Operate the APU during de-icing only if necessary. If the APU is running, ingestion of de-icing fluid causes objectionable fumes and odors to enter the airplane. Ingestion of snow, slush, ice, or de-icing/anti-icing fluid can also cause damage to the APU.

If de-icing / anti-icing is needed:

APU As needed F/O

The APU should be shut down unless APU operation is necessary.

Call "FLAPS UP". C

Flaps UP F/O

Prevents ice and slush from accumulating in flap cavities during de-icing.

Thrust levers Idle C

Reduces the possibility of injury to personnel at inlet or exhaust areas.

PACK switches OFF

Wait approximately 10 seconds after pack switches are off before positioning bleed switches to off to reduce pack wear.

ENGINE bleed switches (engines running) OFF F/O

Reduces the possibility of fumes entering the air conditioning system.

APU bleed switch (APU running) 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 restore engine and APU bleed air and pack operation to ensure all de-icing fluid has been cleared from the engines:

PACK switches AUTO F/O

ENGINE bleed switches ON F/O

APU bleed switch AUTO F/O

Before Takeoff Procedure

Do the normal Before Takeoff Procedure with the following modification:

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, standing water, or icing conditions, or because exterior de-icing / anti-icing.

[PW, RR engines]

Engine oil temperature Minimum 50°C PF

[RR engines]

Oil temperature must be at least 50°C before takeoff.

[PW engines]

Oil temperature must be at least 50°C before takeoff. Any subsequent drop in oil temperature will not affect engine performance.

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:

[PW, RR engines]

Run-up to a minimum of 50% N1 and confirm stable engine operation before the start of the takeoff roll.

[GE engines]

Note: Operation in icing conditions may result in engine vibration indications above the normal operating range during ice shedding.

[GE engines]

Run-up to as high a thrust setting as practical, confirm stable engine operation, and if vibration indications are available, ensure engine vibration indications are below 4 units before the start of the takeoff roll.

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Engine Anti-ice Operation - In-flight

Engine anti-ice must be AUTO or ON during all flight operations when icing conditions exist or are anticipated, except when the temperature is below -40°C SAT.

CAUTION: Do not use engine anti-ice when TAT is above 10°C.

Manual Use of Engine Anti-ice

When using the engine anti-ice system manually in areas of possible icing, activate engine anti-ice before entering icing conditions.

WARNING: If using the engine anti-ice system manually, 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.

When manual use of engine anti-ice is needed:

ENGINE ANTI-ICE selectors ON PM

When manual use of engine anti-ice is no longer needed:

ENGINE ANTI-ICE selectors AUTO or OFF PM

Fan Ice Removal

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

If moderate to severe icing conditions are encountered:

[GE engines]

During flight in moderate to severe icing conditions for prolonged periods with N1 settings at or below 70%, or when fan icing is suspected due to high engine vibration, the fan blades must be cleared of any ice. Do the following procedure every 15 minutes on both engines, one engine at a time: reduce thrust toward idle then increase to a minimum of 70% N1 for 10 to 30 seconds.

[GE 110B, GE 115B engines]

Note: Operation in icing conditions may result in displayed vibration levels up to and exceeding the normal operating range. Extended operation at high vibration levels in icing conditions will not result in engine damage.

[PW engines]

During flight in moderate to severe icing conditions for prolonged periods with N1 settings at or below 70% and when fan icing is suspected due to high engine vibration, the fan blades must be cleared of any ice. Do the following procedure on both engines, one engine at a time: reduce thrust toward idle then increase to a minimum of 70% N1 for 15 seconds. Repeat this procedure as required to avoid high vibration.

[RR engines]

During flight in moderate to severe icing conditions for prolonged periods, if fan icing is suspected due to high engine vibration, the fan blades must be cleared of any ice. Do the following procedure on both engines, one engine at a time: quickly reduce thrust to idle for 5 seconds then restore the required thrust. If vibration persists, advance thrust lever to 90% N1 momentarily.

Wing Anti-ice Operation - In-flight

Ice accumulation on the flight deck window frames, windshield center post, or windshield wiper arm, or side windows 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 the automatic ice detection system which acts 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.

The secondary method is to select the WING ANTI-ICE selector ON when wing icing is possible and use the system as an anti-icer.

The airplane is capable of continued safe flight and landing in icing conditions in the event of an in-flight failure of the wing anti-ice system.

CAUTION: Do not use wing anti-ice when TAT is above 10°C.

Manual Use of Wing Anti-ice

When manual use of wing anti-ice is needed:

WING ANTI-ICE switch.....ON PM

When manual use of wing anti-ice is no longer needed:

WING ANTI-ICE switch.....AUTO or OFF PM

Cold Temperature Altitude Corrections

Extremely low temperatures create significant altimeter errors and greater potential for reduced terrain clearance. When the temperature is colder than ISA, true altitude will be lower than indicated altitude. Altimeter errors become significantly larger when the surface temperature approaches -30°C or colder, and also become larger with increasing height above the altimeter reference source.

Apply the altitude correction table when needed:

- 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 1. 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 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	90	120	150	180	210	240	270	300	450	600	900
	MTRS	MTRS	MTRS	MTRS	MTRS	MTRS	MTRS	MTRS	MTRS	MTRS	MTRS	MTRS
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

After Landing Procedure

CAUTION: Taxi at a reduced speed. Use smaller tiller 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.

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 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, except when the temperature is below -40°C OAT.

WARNING: Do not rely on airframe visual icing cues before activating engine anti-ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.

CAUTION: Do not use engine anti-ice when OAT is above 10°C.

When engine anti-ice is needed:

ENGINE ANTI-ICE selectors ON F/O

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE selectors AUTO 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.

[PW Engines and GE Engines except 110B/115B]

Run-up to a minimum of 50% N1 for approximately 1 second duration at intervals no greater than 15 minutes.

[RR Engines and GE 110B/115B engines]

Run-up to a minimum of 50% N1 for approximately 1 second duration at intervals no greater than 60 minutes.



Secure Procedure

Do the normal Secure Procedure with the following modifications:

If the airplane will be attended:

PACK switches AUTO 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:

OUTFLOW VALVE switches MAN F/O

OUTFLOW VALVE MANUAL switches CLOSE F/O

Position the outflow valves 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 found in the approved Aircraft Maintenance Manual.

Hot Weather Operation

During extended ground operations prior to flight deck preparation, consideration should be given to reducing the heat being generated on the flight deck. Window heat, radar, and other electronic components which contribute to a high temperature level on the flight deck may be turned off. All the flight deck air outlets should be open.

[777 Passenger]

Both packs should be used (when possible) for maximum cooling. Recirculation fans should be on for maximum cooling capacity. To maximize the cooling capacity of the air conditioning system, the flight deck side windows and all doors, including cargo doors, should be kept closed as much as possible. All gasper outlets should be open and window shades on the hot (sun-exposed) side of the passenger cabin should be closed. Flight deck cooling can be improved by closing the flight deck door and lowering the side trays adjacent to the pilot seats.

[777 Freighter]

Both packs should be used (when possible) for maximum cooling. Recirculation fans should be on for maximum cooling capacity. To maximize the cooling capacity of the air conditioning system, the flight deck side windows and all doors, including cargo doors, should be kept closed as much as possible. Flight deck cooling can be improved by lowering the side trays adjacent to the pilot seats.

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

Moderate to Heavy Rain, Hail or Sleet

Flight should be conducted to avoid thunderstorms, hail activity or visible moisture over storm cells. To the maximum extent possible, moderate to heavy rain, hail or sleet should be avoided.

Severe Turbulence

The turbulent air penetration speed provides ample protection from stall and high speed buffet, while also providing protection from exceeding the structural limit.

The recommended procedures for flight in severe turbulence are summarized below:

[777 Passenger]

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

[777 Freighter]

Supernumerary signs ON
Advise supernumeraries to fasten seatbelts prior to entering areas of reported or anticipated turbulence.

Structural Considerations

Flap extension in an area of known turbulence should be delayed as long as possible because the airplane can withstand higher gust loads in the clean configuration. Diversion to another airfield is recommended if severe turbulence persists in the area.

Climb, Cruise, and Descent Considerations

After takeoff, and when established in a clean climb configuration, use of the autoflight system is recommended for flight through turbulence.

During climb and descent, use of VNAV or flight level change may result in excessive pitch changes as the AFDS attempts to fly speed with the elevators. Therefore, vertical speed mode (speed on autothrottles) is recommended for climb and descent in severe turbulence.

During cruise, VNAV and altitude hold modes both fly speed on autothrottles and can be used in turbulence.

[PW or RR Engines]

In severe turbulence during cruise, it may be necessary to disconnect the autothrottles to prevent excessive thrust changes. Thrust setting guidance is available on EICAS when VNAV is engaged. Set EPR at or slightly above the magenta VNAV target EPR indication. Change thrust setting only if required to modify an unacceptable speed trend.

[GE Engines]

In severe turbulence during cruise, it may be necessary to disconnect the autothrottles to prevent excessive thrust changes. Thrust setting guidance is available on EICAS when VNAV is engaged. Set N1 at or slightly above the magenta VNAV target N1 indication. Change thrust setting only if required to modify an unacceptable speed trend.

Manual Flight in Severe Turbulence

If manual flight in severe turbulence becomes necessary, trim the airplane for the turbulent air penetration speed. Control the airplane pitch attitude with the elevators using the attitude indicator as the primary instrument. In extreme drafts, large altitude changes may occur. Do not make sudden large control inputs. Corrective actions to regain the desired attitude should be smooth and deliberate. Altitude variations are likely in severe turbulence and should be allowed to occur if terrain clearance is adequate. Control airplane attitude first, then make corrections for airspeed, altitude, and heading.

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 Non-Normal Maneuvers section 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 (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 alert to any of the danger signals and be prepared for the possibility of an inadvertent encounter. The following precautionary actions are recommended if windshear is suspected:

Takeoff

- Takeoff with less than full rated thrust is not recommended if windshear conditions exist or are suspected, unless the use of a fixed derate or ATM is required to meet a dispatch performance requirement.
- For optimum takeoff performance, use flaps 20 for takeoff unless limited by obstacle clearance and/or climb gradient. Flaps 15 may be used as a precautionary setting and will provide nearly equivalent performance to Flaps 20.
- Use the longest suitable runway provided it is clear of areas of known windshear.
- Use the flight director after takeoff.
- Consider increasing V_r speed to the performance limited gross weight rotation speed, not to exceed actual gross weight V_r+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 V_r, do not attempt to accelerate to the increased V_r, 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 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 either Flaps 25 or 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 the 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 glide slope displacement. The pilot monitoring should call out any deviations from normal. Use of 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.

Ice Crystal Icing

At temperatures below freezing near convective weather, the airplane can encounter visible moisture made up of high concentrations of small ice crystals. Ice crystals can accumulate aft of the engine fan, in the engine core. Ice shedding can cause engine vibration, engine power loss, and engine damage.

These weather conditions are difficult to detect because ice crystals do not cause significant weather radar returns. They are often found in high concentrations above and near regions of heavy precipitation. Ice crystals do not stick to cold aircraft surfaces.

Flight in clouds containing ice crystals has been associated with engine vibration, engine power loss, engine damage, and airplane Total Air Temperature (TAT) probe icing.

Recognize Ice Crystal Icing Weather

Ice crystals are most frequently found in areas of visible moisture and above altitudes normally associated with icing conditions. Their presence can be indicated by one or more of the following:

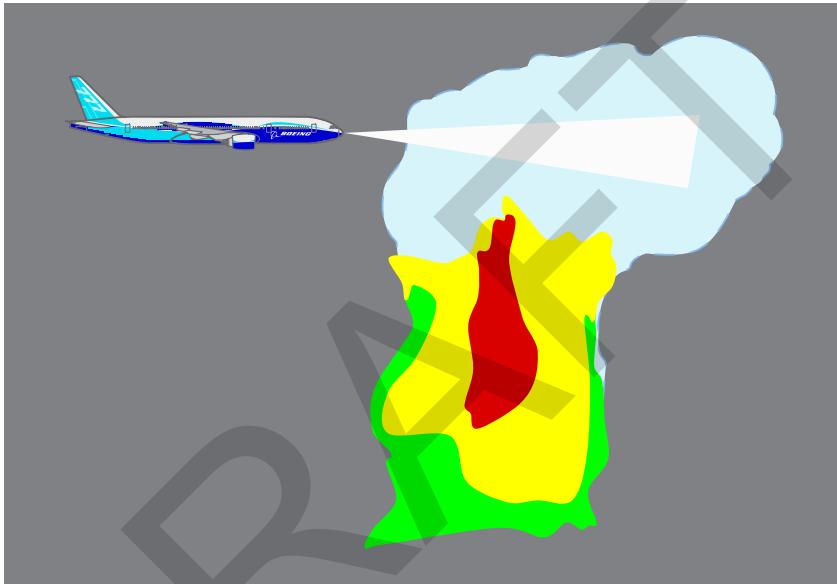
- Appearance of rain on the windshield at temperatures too cold for liquid water to exist. This is due to ice crystals melting on the heated windows (sounds different than rain)
- Airplane TAT indication remains near 0 degrees C due to TAT probe icing
- Areas of light to moderate turbulence
- In IMC with:
 - No significant radar returns at airplane altitude and
 - Heavy precipitation below the airplane, identified by amber and red radar returns on weather radar
- Cloud tops above typical cruise levels (above the tropopause)

Note: There is no significant airframe icing. The icing conditions detections system does not detect ice crystal icing. It is designed to detect supercooled water only.

Avoid Ice Crystal Icing Weather

During flight in IMC, avoid flying directly over significant amber or red radar returns, even if there are no returns at airplane altitude.

Use the weather radar controls to assess weather radar reflectivity below the airplane flight path. Refer to weather radar operating instructions for additional information.



Ice Crystal Icing Suspected

Exit the ice crystal icing conditions. Request a route change to minimize the time above red and amber radar returns.

Do the Ice Crystal Icing non-normal checklist.

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Performance Dispatch

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Performance Dispatch

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777-200 GE90-76B KG JAA

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Performance Dispatch

Takeoff

Chapter PD

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	1210	1210	1210	1200	1200	1180	1150	1130	1100
1400	1430	1430	1420	1410	1400	1380	1350	1330	1300
1600	1660	1640	1630	1610	1600	1570	1540	1510	1480
1800	1880	1860	1840	1820	1800	1760	1720	1670	1630
2000	2110	2080	2050	2030	2000	1950	1890	1840	1780
2200	2330	2300	2260	2230	2200	2130	2070	2000	1940
2400	2550	2510	2480	2440	2400	2320	2250	2170	2090
2600	2780	2730	2690	2640	2600	2510	2420	2330	2250
2800	3000	2950	2900	2850	2800	2700	2600	2500	2400
3000	3220	3170	3110	3060	3000	2880	2770	2650	2540
3200	3450	3390	3320	3260	3200	3070	2940	2810	2680
3400	3670	3600	3540	3470	3400	3250	3110	2960	2810
3600	3900	3820	3750	3670	3600	3440	3280	3110	2950
3800	4120	4040	3960	3880	3800	3620	3450	3270	3090
4000	4340	4260	4170	4090	4000	3810	3610	3420	3230

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH(M)					
	WIND COMPONENT (KTS)					
	-10	0	10	20	30	40
1200	970	1200	1280	1360	1450	1540
1400	1140	1400	1490	1580	1670	1760
1600	1320	1600	1690	1790	1890	1990
1800	1500	1800	1900	2000	2100	2210
2000	1680	2000	2100	2210	2320	2430
2200	1860	2200	2310	2420	2540	2660
2400	2040	2400	2520	2640	2760	2880
2600	2220	2600	2720	2850	2980	3110
2800	2400	2800	2930	3060	3200	3330
3000	2580	3000	3140	3270	3410	3560
3200	2760	3200	3340	3490	3630	3780
3400	2940	3400	3550	3700	3850	4000
3600	3110	3600	3750	3910	4070	4230
3800	3290	3800	3960	4120	4290	4450
4000	3470	4000	4170	4330	4510	4680

Takeoff Field & Climb Limit Weights - Dry Runway**Flaps 15****Sea Level Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	(OAT)											
	°C	-40	14	18	22	25	29	31	33	42	46	50
	°F	-40	57	64	72	77	84	88	91	108	115	122
1200	185.7	165.0	163.6	162.2	161.2	159.8	159.1	158.3	147.1	141.3	135.3	
1400	201.7	182.4	181.1	179.8	178.8	177.5	176.9	176.1	165.7	160.2	154.7	
1600	217.1	197.3	196.0	194.6	193.7	192.4	191.7	190.9	180.2	174.6	168.9	
1800	231.4	210.6	209.1	207.7	206.7	205.3	204.6	203.8	192.5	186.7	180.6	
2000	243.5	222.1	220.6	219.1	218.1	216.7	216.0	215.1	203.5	197.4	191.2	
2200	255.1	233.0	231.5	230.0	228.9	227.4	226.7	225.8	213.9	207.6	201.2	
2400	266.2	243.4	241.8	240.3	239.2	237.7	236.9	236.0	223.7	217.3	210.7	
2600	276.7	253.3	251.6	250.1	248.9	247.4	246.6	245.7	233.0	226.4	219.6	
2800	286.7	262.5	260.8	259.2	258.0	256.4	255.6	254.7	241.6	234.8	227.8	
3000	296.0	271.0	269.3	267.6	266.3	264.7	263.9	262.9	249.3	242.3	235.1	
3200	304.9	279.1	277.3	275.6	274.3	272.6	271.8	270.7	256.8	249.5	242.0	
3400	313.4	286.8	285.0	283.2	281.9	280.1	279.3	278.2	263.9	256.3	248.7	
3600	321.5	294.2	292.4	290.5	289.2	287.4	286.5	285.4	270.6	262.9	255.0	
3800	329.3	301.3	299.4	297.5	296.1	294.3	293.4	292.3	277.1	269.2	261.1	
4000	336.6	308.0	306.0	304.1	302.7	300.8	299.9	298.8	283.3	275.2	267.0	
CLIMB LIMIT WT (1000 KG)	262.0	250.7	250.4	250.1	250.0	249.8	249.7	249.5	226.5	215.5	204.5	

1000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	(OAT)											
	°C	-40	14	18	22	25	29	31	33	42	46	50
	°F	-40	57	64	72	77	84	88	91	108	115	122
1200	181.3	160.8	159.4	158.0	157.0	155.7	154.9	152.7	140.8	135.0	128.5	
1400	197.6	178.4	177.1	175.8	174.9	173.7	172.9	170.9	159.7	154.4	148.3	
1600	212.9	193.3	191.9	190.6	189.7	188.4	187.7	185.6	174.1	168.6	162.4	
1800	226.9	206.3	204.9	203.5	202.5	201.2	200.4	198.2	186.1	180.3	173.8	
2000	238.9	217.6	216.2	214.8	213.7	212.4	211.5	209.3	196.9	190.9	184.2	
2200	250.4	228.4	227.0	225.5	224.4	223.0	222.2	219.8	207.0	200.9	193.9	
2400	261.3	238.7	237.2	235.7	234.6	233.1	232.3	229.9	216.7	210.4	203.2	
2600	271.7	248.4	246.9	245.3	244.2	242.7	241.8	239.3	225.8	219.2	211.9	
2800	281.5	257.5	255.9	254.3	253.1	251.6	250.7	248.1	234.2	227.4	219.9	
3000	290.6	265.8	264.2	262.5	261.3	259.7	258.7	256.1	241.6	234.7	226.8	
3200	299.4	273.8	272.0	270.3	269.1	267.5	266.5	263.7	248.8	241.6	233.6	
3400	307.7	281.4	279.6	277.8	276.5	274.9	273.8	271.0	255.7	248.3	239.9	
3600	315.7	288.6	286.8	285.0	283.7	281.9	280.9	278.0	262.2	254.6	246.1	
3800	323.3	295.5	293.7	291.8	290.5	288.7	287.6	284.7	268.5	260.7	252.0	
4000	330.5	302.1	300.2	298.3	296.9	295.1	294.0	291.0	274.5	266.5	257.6	
CLIMB LIMIT WT (1000 KG)	249.7	248.4	248.2	247.8	247.3	246.9	246.7	241.2	218.8	208.0	196.0	

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1500 kg.

With engine and wing anti-ice on, decrease field limit weight by 600 kg and climb limit weight by 900 kg.

Takeoff Field & Climb Limit Weights - Dry Runway**Flaps 15****2000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	(OAT)										
	°C	-40	14	18	22	25	29	31	33	42	46
1200	176.6	156.5	155.2	153.9	152.9	151.4	149.2	146.9	134.4	128.7	121.9
1400	193.2	174.5	173.2	172.0	171.1	169.7	167.6	165.5	153.8	148.4	142.1
1600	208.4	189.2	187.9	186.7	185.7	184.3	182.2	180.0	168.1	162.6	156.1
1800	222.3	202.0	200.7	199.3	198.4	196.9	194.6	192.3	179.7	173.9	167.1
2000	234.1	213.3	211.9	210.5	209.5	208.0	205.6	203.3	190.3	184.3	177.2
2200	245.4	223.9	222.5	221.1	220.0	218.5	216.1	213.6	200.3	194.1	186.8
2400	256.2	234.1	232.6	231.1	230.1	228.5	226.0	223.5	209.7	203.4	195.9
2600	266.4	243.6	242.1	240.6	239.5	237.9	235.3	232.7	218.6	212.0	204.3
2800	276.1	252.6	251.0	249.5	248.3	246.6	244.0	241.4	226.8	220.0	212.1
3000	285.0	260.7	259.1	257.5	256.3	254.6	251.8	249.1	234.0	227.0	218.8
3200	293.6	268.5	266.8	265.2	264.0	262.1	259.3	256.5	240.9	233.7	225.2
3400	301.8	275.9	274.2	272.5	271.3	269.4	266.5	263.6	247.5	240.1	231.4
3600	309.6	283.0	281.3	279.5	278.2	276.3	273.3	270.4	253.9	246.2	237.3
3800	317.0	289.8	288.0	286.2	284.9	282.9	279.9	276.8	259.9	252.1	243.0
4000	324.1	296.3	294.4	292.6	291.2	289.2	286.1	283.0	265.7	257.7	248.4
CLIMB LIMIT WT (1000 KG)	246.8	245.0	244.5	244.0	243.7	243.1	238.2	234.5	210.8	200.2	188.0

3000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	(OAT)										
	°C	-40	14	18	22	25	29	31	33	42	46
1200	171.7	152.0	150.7	149.4	148.4	144.4	142.2	139.7	127.4	121.3	114.7
1400	188.6	170.3	169.0	167.8	166.9	163.2	161.1	158.7	147.3	141.6	135.5
1600	203.7	184.9	183.6	182.4	181.5	177.7	175.5	173.1	161.4	155.5	149.3
1800	217.3	197.5	196.1	194.8	193.9	189.8	187.6	185.1	172.7	166.5	159.9
2000	229.0	208.6	207.2	205.8	204.8	200.7	198.3	195.8	183.0	176.7	169.8
2200	240.1	219.1	217.7	216.3	215.3	211.0	208.6	205.9	192.8	186.2	179.2
2400	250.7	229.1	227.6	226.2	225.2	220.8	218.3	215.5	202.0	195.3	188.0
2600	260.8	238.5	237.0	235.6	234.5	229.9	227.4	224.6	210.7	203.7	196.3
2800	270.3	247.3	245.8	244.3	243.1	238.5	235.8	232.9	218.6	211.4	203.8
3000	279.0	255.3	253.7	252.1	250.9	246.1	243.4	240.4	225.5	218.1	210.2
3200	287.4	262.9	261.2	259.6	258.4	253.4	250.6	247.5	232.2	224.5	216.4
3400	295.4	270.1	268.4	266.8	265.5	260.4	257.5	254.3	238.6	230.7	222.2
3600	303.0	277.1	275.3	273.6	272.4	267.1	264.1	260.8	244.6	236.6	227.9
3800	310.3	283.7	281.9	280.2	278.9	273.5	270.4	267.1	250.5	242.2	233.3
4000	317.2	290.0	288.2	286.4	285.1	279.6	276.4	273.0	256.1	247.6	238.5
CLIMB LIMIT WT (1000 KG)	242.4	241.1	241.0	240.8	240.2	232.5	229.0	224.5	201.5	190.8	180.2

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1500 kg.

With engine and wing anti-ice on, decrease field limit weight by 600 kg and climb limit weight by 900 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	1210	1210	1210	1200	1200	1180	1150	1130	1100
1400	1430	1430	1420	1410	1400	1370	1340	1310	1280
1600	1660	1640	1630	1610	1600	1560	1530	1490	1450
1800	1880	1860	1840	1820	1800	1760	1710	1670	1630
2000	2110	2080	2050	2030	2000	1950	1900	1850	1800
2200	2330	2300	2260	2230	2200	2140	2090	2030	1980
2400	2550	2510	2480	2440	2400	2340	2280	2210	2150
2600	2780	2730	2690	2640	2600	2530	2460	2390	2330
2800	3000	2950	2900	2850	2800	2730	2650	2580	2500
3000	3220	3170	3110	3060	3000	2920	2840	2760	2680
3200	3450	3390	3320	3260	3200	3110	3030	2940	2850
3400	3670	3600	3540	3470	3400	3310	3210	3120	3030
3600	3900	3820	3750	3670	3600	3500	3400	3300	3200
3800	4120	4040	3960	3880	3800	3690	3590	3480	3380
4000	4340	4260	4170	4090	4000	3890	3780	3660	3550

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)					
	WIND COMPONENT (KTS)					
-10	0	10	20	30	40	
1200	930	1200	1290	1380	1480	1580
1400	1100	1400	1490	1590	1700	1810
1600	1280	1600	1700	1810	1920	2040
1800	1460	1800	1910	2030	2150	2270
2000	1640	2000	2120	2240	2370	2500
2200	1820	2200	2330	2460	2590	2730
2400	1990	2400	2530	2670	2820	2960
2600	2170	2600	2740	2890	3040	3200
2800	2350	2800	2950	3100	3260	3430
3000	2530	3000	3160	3320	3490	3660
3200	2710	3200	3360	3530	3710	3890
3400	2880	3400	3570	3750	3930	4120
3600	3060	3600	3780	3960	4160	4350
3800	3240	3800	3990	4180	4380	4580
4000	3420	4000	4190	4400	4600	4820

Takeoff Field & Climb Limit Weights - Wet Runway**Flaps 15****Sea Level Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	(OAT)											
	°C	-40	14	18	22	25	29	31	33	42	46	50
	°F	-40	57	64	72	77	84	88	91	108	115	122
1200	185.7	165.0	163.6	162.2	161.2	159.8	159.1	158.3	147.1	141.3	135.3	
1400	201.4	181.9	180.6	179.3	178.3	177.1	176.4	175.7	165.5	160.2	154.7	
1600	215.9	195.8	194.4	193.0	192.0	190.7	190.0	189.3	178.8	173.3	167.8	
1800	229.6	208.2	206.7	205.3	204.2	202.8	202.1	201.3	190.2	184.4	178.5	
2000	242.3	219.7	218.1	216.6	215.5	214.0	213.3	212.4	200.7	194.6	188.4	
2200	254.3	230.6	229.0	227.4	226.2	224.7	223.9	223.0	210.7	204.3	197.8	
2400	265.6	240.9	239.2	237.5	236.3	234.7	233.9	232.9	220.1	213.4	206.6	
2600	276.3	250.6	248.8	247.1	245.8	244.1	243.3	242.3	228.9	222.0	215.0	
2800	286.4	259.8	258.0	256.2	254.9	253.1	252.2	251.2	237.4	230.2	222.9	
3000	296.0	268.4	266.5	264.7	263.3	261.5	260.6	259.5	245.2	237.8	230.3	
3200	304.9	276.7	274.8	272.9	271.4	269.6	268.7	267.5	252.8	245.1	237.3	
3400	313.4	284.7	282.7	280.7	279.3	277.3	276.4	275.2	260.0	252.1	244.1	
3600	321.5	292.4	290.3	288.3	286.8	284.8	283.8	282.6	267.0	258.9	250.6	
3800	329.3	299.7	297.6	295.5	294.0	292.0	291.0	289.7	273.7	265.3	256.9	
4000	336.6	306.7	304.5	302.4	300.8	298.8	297.7	296.5	280.0	271.5	262.8	
CLIMB LIMIT WT (1000 KG)	252.0	250.7	250.4	250.1	250.0	249.8	249.7	249.5	226.5	215.5	204.5	

1000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	(OAT)											
	°C	-40	14	18	22	25	29	31	33	42	46	50
	°F	-40	57	64	72	77	84	88	91	108	115	122
1200	181.3	160.8	159.4	158.0	157.0	155.7	154.9	152.7	140.8	135.0	128.5	
1400	197.2	177.9	176.6	175.3	174.4	173.2	172.4	170.5	159.7	154.4	148.3	
1600	211.6	191.6	190.2	188.9	187.9	186.7	185.9	183.9	172.7	167.4	161.5	
1800	225.0	203.8	202.4	201.0	199.9	198.6	197.7	195.6	183.7	178.1	171.8	
2000	237.4	215.0	213.5	212.0	211.0	209.5	208.6	206.4	193.9	187.9	181.3	
2200	249.2	225.7	224.1	222.6	221.4	219.9	219.0	216.6	203.5	197.3	190.3	
2400	260.2	235.8	234.1	232.5	231.3	229.7	228.8	226.3	212.6	206.1	198.8	
2600	270.7	245.3	243.5	241.9	240.6	239.0	238.0	235.4	221.2	214.4	206.9	
2800	280.7	254.3	252.5	250.8	249.5	247.8	246.8	244.1	229.4	222.3	214.5	
3000	290.0	262.7	260.9	259.1	257.7	256.0	254.9	252.2	236.9	229.7	221.6	
3200	299.0	270.8	268.9	267.1	265.7	263.9	262.8	259.9	244.2	236.7	228.4	
3400	307.7	278.6	276.7	274.8	273.3	271.5	270.4	267.4	251.2	243.5	234.9	
3600	315.7	286.1	284.1	282.2	280.7	278.8	277.6	274.6	257.9	250.0	241.1	
3800	323.3	293.3	291.3	289.2	287.7	285.8	284.6	281.5	264.4	256.2	247.1	
4000	330.5	300.2	298.1	296.0	294.4	292.4	291.2	288.0	270.5	262.1	252.8	
CLIMB LIMIT WT (1000 KG)	249.7	248.4	248.2	247.8	247.3	246.9	246.7	241.2	218.8	208.0	196.0	

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1500 kg.

With engine and wing anti-ice on, decrease field limit weight by 600 kg and climb limit weight by 900 kg.

Takeoff Field & Climb Limit Weights - Wet Runway**Flaps 15****2000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	(OAT)											
	°C	-40	14	18	22	25	29	31	33	42	46	50
	°F	-40	57	64	72	77	84	88	91	108	115	122
1200	176.6	156.5	155.2	153.9	152.9	151.4	149.2	146.9	134.4	128.7	121.9	
1400	192.8	173.9	172.7	171.4	170.5	169.2	167.1	165.1	153.8	148.4	142.1	
1600	207.0	187.5	186.2	184.9	183.9	182.5	180.4	178.3	166.7	161.4	155.3	
1800	220.2	199.4	198.0	196.6	195.6	194.2	191.9	189.7	177.4	171.7	165.2	
2000	232.3	210.4	209.0	207.5	206.4	204.9	202.5	200.1	187.2	181.2	174.4	
2200	243.9	220.9	219.3	217.8	216.7	215.0	212.6	210.1	196.5	190.2	183.1	
2400	254.7	230.7	229.1	227.5	226.3	224.6	222.1	219.5	205.3	198.8	191.3	
2600	264.9	240.0	238.3	236.7	235.5	233.7	231.0	228.3	213.6	206.8	199.0	
2800	274.7	248.9	247.1	245.4	244.2	242.3	239.5	236.7	221.4	214.4	206.4	
3000	283.8	257.1	255.3	253.5	252.2	250.3	247.4	244.6	228.7	221.5	213.2	
3200	292.6	265.0	263.2	261.4	260.0	258.0	255.1	252.1	235.8	228.3	219.7	
3400	301.1	272.7	270.8	268.9	267.5	265.5	262.4	259.3	242.5	234.8	225.9	
3600	309.2	280.0	278.0	276.1	274.7	272.6	269.4	266.3	249.0	241.0	231.9	
3800	317.0	287.0	285.0	283.0	281.5	279.4	276.2	272.9	255.2	247.0	237.7	
4000	324.1	293.7	291.6	289.6	288.1	285.9	282.6	279.3	261.1	252.7	243.2	
CLIMB LIMIT WT (1000 KG)	246.8	245.0	244.5	244.0	243.7	243.1	238.2	234.5	210.8	200.2	188.0	

3000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	(OAT)											
	°C	-40	14	18	22	25	29	31	33	42	46	50
	°F	-40	57	64	72	77	84	88	91	108	115	122
1200	171.7	152.0	150.7	149.4	148.4	144.4	142.2	139.7	127.4	121.3	114.7	
1400	188.2	169.7	168.4	167.2	166.3	162.7	160.7	158.5	147.3	141.6	135.5	
1600	202.2	183.1	181.8	180.5	179.6	175.9	173.8	171.5	160.1	154.6	149.2	
1800	215.1	194.7	193.4	192.0	191.1	187.1	184.8	182.4	170.4	164.5	158.7	
2000	226.9	205.5	204.1	202.6	201.6	197.4	195.1	192.5	179.8	173.6	167.5	
2200	238.2	215.7	214.2	212.7	211.6	207.2	204.7	202.1	188.8	182.3	175.9	
2400	248.7	225.3	223.7	222.2	221.1	216.5	213.9	211.1	197.2	190.5	183.8	
2600	258.8	234.4	232.8	231.2	230.0	225.2	222.5	219.6	205.2	198.2	191.2	
2800	268.3	243.0	241.3	239.7	238.5	233.5	230.7	227.7	212.8	205.5	198.3	
3000	277.2	251.1	249.3	247.6	246.4	241.2	238.4	235.2	219.8	212.2	204.8	
3200	285.8	258.8	257.0	255.3	253.9	248.7	245.7	242.5	226.5	218.7	211.0	
3400	294.0	266.3	264.4	262.6	261.2	255.8	252.7	249.4	232.9	224.9	217.0	
3600	302.0	273.4	271.5	269.6	268.2	262.6	259.5	256.0	239.1	230.9	222.7	
3800	309.6	280.2	278.3	276.4	274.9	269.2	266.0	262.4	245.1	236.6	228.2	
4000	316.8	286.8	284.8	282.8	281.3	275.4	272.1	268.5	250.8	242.1	233.5	
CLIMB LIMIT WT (1000 KG)	242.4	241.1	241.0	240.8	240.2	232.5	229.0	224.5	201.5	190.8	180.2	

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1500 kg.

With engine and wing anti-ice on, decrease field limit weight by 600 kg and climb limit weight by 900 kg.

Takeoff Obstacle Limit Weight**Flaps 15****Sea Level, 33°C & Below, Zero Wind****Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off**

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	227.9	246.2	257.8								
20	208.0	224.1	236.9	247.1	254.8	259.7					
40	190.8	205.7	218.7	229.2	237.7	245.0	250.8	254.7	257.9	260.6	262.9
60	177.9	193.0	205.7	216.3	225.0	232.2	238.1	243.2	248.7	251.9	254.6
80	168.0	183.0	195.4	205.8	214.7	222.1	228.4	233.8	238.4	242.5	246.7
100	159.3	174.4	186.8	197.1	205.9	213.5	220.1	225.7	230.6	234.8	238.6
120	151.2	167.0	179.2	189.5	198.3	205.9	212.6	218.5	223.5	228.0	232.0
140		160.3	172.5	182.8	191.6	199.2	205.9	211.9	217.2	221.8	226.0
160		154.0	166.4	176.7	185.5	193.2	199.9	206.0	211.3	216.1	220.4
180		148.1	160.9	171.1	179.9	187.7	194.5	200.5	206.0	210.9	215.3
200			155.7	166.0	174.8	182.6	189.5	195.6	201.0	205.9	210.5
220			150.8	161.3	170.1	177.8	184.8	190.9	196.4	201.4	205.9
240			146.2	156.9	165.7	173.4	180.3	186.6	192.1	197.1	201.7
260				152.7	161.6	169.3	176.2	182.4	188.1	193.1	197.7

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

OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)							
	140	160	180	200	220	240	260	280
33 & BELOW	0	0	0	0	0	0	0	0
34	-1.2	-1.5	-1.7	-2.0	-2.3	-2.6	-2.9	-3.1
36	-3.1	-3.9	-4.6	-5.4	-6.1	-6.9	-7.6	-8.4
38	-5.1	-6.3	-7.5	-8.7	-10.0	-11.2	-12.4	-13.6
40	-7.1	-8.7	-10.4	-12.1	-13.8	-15.5	-17.1	-18.8
42	-9.4	-11.7	-13.9	-16.1	-18.4	-20.6	-22.8	-25.1
44	-11.8	-14.6	-17.4	-20.2	-23.0	-25.8	-28.6	-31.4
46	-14.1	-17.5	-20.8	-24.2	-27.5	-30.9	-34.3	-37.6
48	-16.4	-20.4	-24.3	-28.2	-32.1	-36.0	-40.0	-43.9
50	-18.8	-23.3	-27.7	-32.2	-36.7	-41.2	-45.7	-50.2

Pressure Altitude Adjustment

ALT (FT)	TEMP CORR'D OBSTACLE LIMIT WEIGHT (1000 KG)							
	140	160	180	200	220	240	260	280
S.L. & BELOW	0	0	0	0	0	0	0	0
1000	-3.3	-4.1	-4.8	-5.6	-6.3	-7.0	-7.8	-8.5
2000	-7.3	-8.6	-9.9	-11.2	-12.5	-13.8	-15.1	-16.4
3000	-12.0	-14.3	-16.7	-19.0	-21.3	-23.6	-25.9	-28.3

Wind Adjustment

WIND (KTS)	TEMP & ALT CORR'D OBSTACLE LIMIT WEIGHT (1000 KG)							
	140	160	180	200	220	240	260	280
0	0	0	0	0	0	0	0	0
10 HW	4.0	3.6	3.2	2.9	2.5	2.1	1.8	1.4
20 HW	8.0	7.2	6.5	5.7	5.0	4.3	3.5	2.8
30 HW	12.0	10.9	9.8	8.7	7.6	6.4	5.3	4.2
40 HW	16.1	14.6	13.1	11.6	10.1	8.6	7.1	5.6

Takeoff Speeds - Dry Runway**Flaps 15****V1, VR, V2 for Max Takeoff Thrust**

WEIGHT (1000 KG)	KIAS		
	V1	VR	V2
250	144	148	153
240	139	145	151
230	137	141	148
220	133	138	145
210	129	134	142
200	124	131	138
190	119	127	135
180	114	123	132
170	109	119	129
160	103	114	125
150	98	110	122
140	91	106	118

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	1	2	3	-2	0	1	2	3	-2	0	1	2	3
50	122	5	7	8	9	11	2	3	3	3	4	-1	-1	-2	-2	-2
40	104	1	2	4	5	6	0	1	1	2	2	0	-1	-1	-1	-1
30	86	0	0	0	1	2	0	0	0	0	1	0	0	0	0	0
20	68	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
-40	-40	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Slope and Wind V1 Adjustments*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)						
	-2	-1	0	1	2	-10	-5	0	10	20	30	40
280	-5	-2	0	2	4	-1	-1	0	0	1	1	1
260	-4	-2	0	2	3	-1	0	0	0	1	1	1
240	-4	-2	0	2	3	-1	0	0	0	1	1	1
220	-3	-1	0	2	3	-1	0	0	0	1	1	2
200	-3	-1	0	2	3	-1	0	0	0	1	1	2
180	-3	-1	0	2	3	-1	0	0	0	1	1	2
160	-3	-1	0	2	3	-1	0	0	0	1	1	2

*V1 not to exceed VR

V1(MCG)**Max Takeoff Thrust**

TEMP		PRESSURE ALTITUDE (FT)				
°C	°F	-2000	0	1000	2000	3000
50	122	110	107	105	103	102
40	104	115	113	112	110	108
30	86	117	117	117	116	113
20	68	117	117	117	116	116
-40	-40	118	118	118	117	116

Takeoff Speeds - Wet Runway**Flaps 15****V1, VR, V2 for Max Takeoff Thrust**

WEIGHT (1000 KG)	KIAS		
	V1	VR	V2
250	137	148	153
240	133	145	151
230	129	141	148
220	125	138	145
210	120	134	142
200	116	131	138
190	111	127	135
180	106	123	132
170	101	119	129
160	96	114	125
150	91	110	122
140	85	106	118

Check V1(MCG).

V1, VR, V2 Adjustment*

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

Slope and Wind V1 Adjustment*

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)						
	-2	-1	0	1	2	-10	-5	0	10	20	30	40
260	-5	-3	0	3	5	-2	-1	0	1	2	2	3
240	-5	-3	0	3	5	-3	-1	0	1	2	2	3
220	-5	-3	0	2	5	-3	-1	0	1	2	2	3
200	-5	-3	0	2	4	-3	-2	0	1	2	2	4
180	-5	-2	0	2	4	-3	-1	0	1	2	3	4
160	-4	-2	0	2	4	-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	1000	2000	3000
50 122		110	107	105	103	102
40 104		115	113	112	110	108
30 86		117	117	117	116	113
20 68		117	117	117	116	116
-40 -40		118	118	118	117	116

Max Takeoff Thrust

DRAFT

Intentionally
Blank

Performance Dispatch**Enroute****Chapter PD****Section 11****Long Range Cruise Maximum Operating Altitude****Max Climb Thrust****ISA + 10°C and Below**

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30500	-2	33000*	32600	31100
290	31200	-3	34100*	33300	31800
280	32000	-5	35100*	34000	32600
270	32800	-7	35900*	34800	33300
260	33600	-9	36500*	35600	34200
250	34400	-11	37300*	36400	35000
240	35300	-12	38200*	37300	35800
230	36200	-14	39000*	38100	36700
220	37100	-14	39900*	39100	37600
210	38100	-14	40800*	40000	38600
200	39100	-14	41800*	41100	39600
190	40100	-14	42800*	42100	40700
180	41300	-14	43000	43000	41800
170	42500	-14	43000	43000	43000
160	43000	-14	43000	43000	43000
150	43000	-14	43000	43000	43000
140	43000	-14	43000	43000	43000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30500	4	31400*	31400*	31100
290	31200	2	32700*	32700*	31800
280	32000	1	33900*	33900*	32600
270	32800	-1	35100*	34800	33300
260	33600	-3	35900*	35600	34200
250	34400	-5	36500*	36400	35000
240	35300	-7	37400*	37300	35800
230	36200	-9	38300*	38100	36700
220	37100	-9	39200*	39100	37600
210	38100	-9	40000*	40000	38600
200	39100	-9	40900*	40900*	39600
190	40100	-9	41900*	41900*	40700
180	41300	-9	42900*	42900*	41800
170	42500	-9	43000	43000	43000
160	43000	-9	43000	43000	43000
150	43000	-9	43000	43000	43000
140	43000	-9	43000	43000	43000

*Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.

Long Range Cruise Maximum Operating Altitude**Max Climb Thrust**

ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30500	10	26100*	26100*	26100*
290	31200	8	27600*	27600*	27600*
280	32000	6	31700*	31700*	31700*
270	32800	5	33400*	33400*	33300
260	33600	3	34900*	34900*	34200
250	34400	1	35800*	35800*	35000
240	35300	-1	36400*	36400*	35800
230	36200	-3	37300*	37300*	36700
220	37100	-3	38200*	38200*	37600
210	38100	-3	39200*	39200*	38600
200	39100	-3	40000*	40000*	39600
190	40100	-3	41000*	41000*	40700
180	41300	-3	42000*	42000*	41800
170	42500	-3	43000	43000	43000
160	43000	-3	43000	43000	43000
150	43000	-3	43000	43000	43000
140	43000	-3	43000	43000	43000

*Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.

Long Range Cruise Trip Fuel and Time**Ground to Air Miles Conversion**

AIR DISTANCE (NM)					GROUND DISTANCED (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20	20	20	40	60	80	100
531	499	469	444	421	400	382	366	351	337	325
1056	993	936	886	841	800	766	735	706	679	656
1578	1485	1401	1327	1261	1200	1150	1104	1061	1022	986
2097	1977	1866	1768	1681	1600	1535	1473	1417	1365	1317
2616	2467	2330	2209	2100	2000	1919	1843	1772	1708	1648
3133	2955	2793	2649	2519	2400	2303	2212	2128	2051	1980
3649	3443	3255	3088	2938	2800	2687	2582	2484	2394	2311
4163	3930	3717	3527	3357	3200	3071	2951	2840	2737	2643
4676	4415	4178	3966	3775	3600	3455	3320	3195	3080	2974
5187	4900	4638	4404	4194	4000	3840	3690	3551	3423	3305
5697	5384	5097	4842	4612	4400	4224	4059	3906	3765	3636
6205	5866	5556	5280	5030	4800	4608	4429	4262	4108	3967
6712	6348	6015	5717	5448	5200	4992	4798	4618	4451	4299
7218	6829	6472	6154	5865	5600	5376	5167	4973	4794	4630
7723	7309	6930	6590	6283	6000	5761	5537	5329	5137	4961
8226	7788	7386	7026	6700	6400	6145	5906	5685	5480	5292
8729	8266	7842	7462	7117	6800	6529	6276	6040	5823	5623
9231	8744	8298	7898	7535	7200	6913	6645	6396	6166	5954
9733	9222	8754	8333	7952	7600	7297	7014	6751	6508	6285
10235	9700	9209	8769	8369	8000	7681	7383	7106	6851	6616

Long Range Cruise Trip Fuel and Time**Reference Fuel and Time Required**

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	29		31		33		35		37 & ABOVE	
	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	6.7	1:04	6.5	1:04	3.5	0:36	3.4	0:35	3.4	0:34
800	12.1	2:01	11.6	1:59	10.4	1:48	10.3	1:45	10.2	1:43
1200	17.5	2:57	16.8	2:54	16.5	2:50	16.3	2:46	16.0	2:42
1600	23.0	3:53	22.1	3:48	21.7	3:42	21.3	3:37	21.0	3:33
2000	28.5	4:48	27.4	4:42	26.8	4:35	26.4	4:29	25.9	4:23
2400	34.2	5:42	33.0	5:34	32.2	5:26	31.6	5:19	31.1	5:13
2800	39.9	6:36	38.5	6:27	37.6	6:18	36.9	6:09	36.3	6:02
3200	45.7	7:30	44.1	7:19	43.2	7:09	42.3	6:59	41.6	6:52
3600	51.7	8:22	49.9	8:11	48.8	7:59	47.9	7:49	47.0	7:42
4000	57.6	9:15	55.7	9:02	54.5	8:49	53.4	8:39	52.5	8:32
4400	63.9	10:06	61.7	9:53	60.4	9:39	59.2	9:28	58.3	9:21
4800	70.1	10:58	67.8	10:43	66.3	10:28	65.0	10:18	64.1	10:11
5200	76.5	11:49	74.0	11:33	72.4	11:18	71.0	11:07	70.2	11:01
5600	83.0	12:39	80.3	12:22	78.6	12:07	77.2	11:57	76.6	11:51
6000	89.5	13:29	86.7	13:11	84.8	12:56	83.4	12:46	82.9	12:41
6400	96.3	14:18	93.4	14:00	91.4	13:45	90.0	13:36		
6800	103.2	15:08	100.0	14:49	98.0	14:34	96.7	14:26		
7200	110.2	15:57	106.9	15:38	104.7	15:23				
7600	117.3	16:46	113.9	16:27	111.8	16:13				
8000	124.5	17:34	120.9	17:15	118.8	17:02				

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	FUEL REQUIRED ADJUSTMENTS (1000 KG)				
	LANDING WEIGHT (1000 KG)				
	140	160	180	200	220
10	-1.3	-0.6	0.0	0.8	1.6
20	-2.4	-1.1	0.0	1.6	3.5
30	-3.5	-1.7	0.0	2.5	5.7
40	-4.7	-2.2	0.0	3.6	8.4
50	-5.8	-2.8	0.0	4.8	11.4
60	-7.0	-3.4	0.0	6.2	14.9
70	-8.3	-4.1	0.0	7.8	18.8
80	-9.6	-4.7	0.0	9.5	23.1
90	-10.9	-5.4	0.0	11.4	27.8
100	-12.2	-6.1	0.0	13.4	33.0
110	-13.6	-6.9	0.0	15.6	38.5
120	-15.0	-7.7	0.0	18.0	44.5
130	-16.5	-8.4	0.0	20.5	50.8

Based on 310/.84 climb, LRC cruise and .84/310/250 descent.

Long Range Cruise Step Climb 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	
1038	980	928	881	839	800	765	733	703	676	651
1543	1459	1385	1317	1256	1200	1149	1102	1059	1019	982
2047	1939	1841	1753	1673	1600	1533	1471	1415	1362	1313
2552	2418	2298	2189	2090	2000	1917	1841	1770	1705	1644
3056	2898	2755	2626	2508	2400	2301	2210	2126	2048	1976
3561	3377	3212	3062	2925	2800	2685	2580	2482	2391	2307
4065	3857	3668	3498	3342	3200	3069	2949	2838	2734	2638
4570	4336	4125	3934	3760	3600	3453	3318	3193	3078	2970
5074	4815	4582	4370	4177	4000	3838	3688	3549	3421	3301
5578	5295	5038	4806	4594	4400	4222	4057	3905	3764	3633
6082	5774	5495	5242	5011	4800	4606	4427	4261	4107	3964
6586	6253	5951	5678	5428	5200	4990	4796	4617	4451	4296
7090	6732	6408	6114	5846	5600	5374	5166	4973	4794	4628
7594	7211	6864	6550	6263	6000	5758	5535	5329	5138	4959
8097	7689	7321	6986	6680	6400	6143	5905	5685	5481	5291
8600	8168	7777	7421	7097	6800	6527	6275	6041	5825	5623
9104	8646	8233	7857	7514	7200	6911	6644	6397	6168	5955
9607	9125	8689	8293	7931	7600	7295	7014	6754	6512	6287
10110	9603	9145	8729	8348	8000	7680	7384	7110	6856	6619

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG)								TIME (HRS:MIN)
	LANDING WEIGHT (1000 KG)								
140	150	160	170	180	190	200	210		
800	9.3	9.8	10.1	10.6	11.2	11.5	12.0	12.6	1:50
1200	13.3	13.8	14.4	15.2	15.9	16.5	17.3	18.1	2:40
1600	17.3	17.9	18.8	19.9	20.8	21.6	22.7	23.7	3:30
2000	21.3	22.2	23.3	24.6	25.7	26.8	28.2	29.5	4:20
2400	25.4	26.5	27.9	29.4	30.8	32.2	33.8	35.3	5:09
2800	29.6	31.0	32.6	34.4	36.0	37.7	39.5	41.3	5:59
3200	33.8	35.5	37.4	39.4	41.4	43.3	45.4	47.5	6:49
3600	38.2	40.2	42.3	44.6	46.9	49.1	51.4	53.8	7:38
4000	42.7	45.0	47.3	49.9	52.5	54.9	57.5	60.3	8:28
4400	47.3	49.8	52.4	55.4	58.2	60.9	63.9	66.9	9:18
4800	52.0	54.7	57.7	60.9	64.0	67.0	70.4	73.7	10:07
5200	56.8	59.8	63.1	66.6	70.0	73.3	77.0	80.6	10:57
5600	61.7	64.9	68.6	72.4	76.1	79.8	83.8	87.7	11:46
6000	66.6	70.3	74.2	78.3	82.3	86.4	90.7	94.9	12:35
6400	71.7	75.7	80.0	84.4	88.8	93.2	97.8	102.3	13:25
6800	77.0	81.3	85.8	90.6	95.4	100.1	105.0	109.9	14:14
7200	82.3	87.0	91.9	97.0	102.2	107.2	112.5	117.7	15:03
7600	87.9	92.8	98.0	103.6	109.0	114.4	120.0	125.6	15:53
8000	93.5	98.8	104.3	110.3	116.1	121.9	127.8	133.7	16:42

Based on .310/.84 climb, LRC and .84/310/250 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	
91	78	69	61	55	50	46	42	39	37	34	
158	142	128	117	108	100	93	87	82	77	73	
224	204	187	173	161	150	141	132	125	119	113	
288	265	245	228	213	200	188	178	169	161	153	
351	325	302	282	265	250	236	224	213	203	194	
412	384	359	337	317	300	284	271	258	246	236	
474	443	415	391	369	350	333	317	303	289	277	
536	502	472	445	421	400	381	363	347	333	319	
598	561	528	499	473	450	429	409	392	376	361	
661	621	586	554	526	500	477	456	436	418	402	

Trip Fuel and Time

AIR DIST (NM)	LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
	140	160	180	200	220	
50	FUEL (1000 KG)	1.4	1.5	1.6	1.7	1.8
	ALT (FT)	8000	8000	9000	6000	6000
100	FUEL (1000 KG)	2.2	2.3	2.5	2.6	2.8
	ALT (FT)	14000	14000	14000	13000	12000
150	FUEL (1000 KG)	2.9	3.1	3.3	3.5	3.7
	ALT (FT)	22000	21000	20000	19000	18000
200	FUEL (1000 KG)	3.5	3.8	4.0	4.3	4.5
	ALT (FT)	27000	27000	26000	25000	24000
250	FUEL (1000 KG)	4.0	4.4	4.7	5.0	5.3
	ALT (FT)	33000	33000	32000	28000	28000
300	FUEL (1000 KG)	4.6	4.9	5.3	5.7	6.0
	ALT (FT)	35000	35000	33000	30000	30000
350	FUEL (1000 KG)	5.0	5.6	5.9	6.3	6.7
	ALT (FT)	40000	39000	37000	35000	31000
400	FUEL (1000 KG)	5.5	6.0	6.5	7.0	7.4
	ALT (FT)	41000	41000	39000	36000	34000
450	FUEL (1000 KG)	6.0	6.5	7.0	7.6	8.1
	ALT (FT)	41000	41000	39000	37000	36000
500	FUEL (1000 KG)	6.5	7.1	7.6	8.2	8.8
	ALT (FT)	41000	41000	40000	37000	36000

Holding Planning
Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)									
	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
260	7210	7170	6960	6840	7040	7240	7440	7880		
240	6680	6610	6430	6300	6370	6740	6720	7070		
220	6160	6060	5910	5760	5760	5980	6070	6310	7020	
200	5670	5550	5410	5250	5220	5290	5430	5610	6080	
180	5190	5060	4930	4760	4720	4700	4860	4930	5290	5610
160	4720	4590	4470	4290	4240	4180	4170	4410	4690	4900
140	4260	4130	4010	3840	3780	3680	3700	3730	4000	4180

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
260	7560	7530	7370	7260	7320
240	6970	6930	6800	6660	6690
220	6390	6320	6230	6090	6080
200	5830	5740	5670	5520	5490
180	5280	5180	5110	4970	4940
160	4740	4640	4560	4430	4400
140	4230	4130	4020	3920	3890

These tables include 5% additional fuel for holding in a racetrack pattern.

Crew Oxygen Requirements**Table 1**

NUMBER OF CREW	OXYGEN REQUIRED (LITERS)
2	660
3	990
4	1320

Table 2

NUMBER OF CREW	OXYGEN REQUIRED FOR LEVEL OFF AT 14000 FT (LITERS)				
	TOTAL POST DECOMPRESSION TIME (HR)				
	2	3	4	5	
2	660	960	1270	1570	
3	980	1440	1900	2360	
4	1310	1920	2530	3140	

Crew Oxygen Requirements**Table 3**

NUMBER OF CREW	ADDITIONAL LITERS REQUIRED FOR EACH MINUTE HELD AT INTERMEDIATE ALTITUDE OTHER THAN 14000 FT				
	INTERMEDIATE PRESSURE ALTITUDE (FT)				
	UP TO 13999	14000	14001 TO 17999	18000 TO 21999	22000 TO 25000
REGULATOR ON "NORMAL" OR (100%)					
2	0 (22)	0 (17)	1 (16)	3 (12)	6 (10)
3	0 (33)	0 (25)	2 (24)	5 (18)	8 (15)
4	0 (44)	0 (34)	2 (32)	6 (24)	11 (20)

For more extensive than normal crew usage, add 2.05 liters/person/minute for each crew member at 8000 ft cabin altitude when regulator setting is NORMAL; or 13 liters/person/minute when regulator setting is 100%.

Instructions:

1. Determine protective breathing requirements from Table 1.
2. Determine supplemental requirements for level off at 14000 ft from Table 2 and correct for level off altitudes other than 14000 ft using Table 3.
3. Flight crew system oxygen requirements are the larger of protective breathing (Table 1) or supplemental requirements (Table 2).

Table 4 - Cylinder Volume to Pressure Conversion

OXYGEN VOLUME (1000 LITERS)	CYLINDER PRESSURE AT 21°C (PSI)
.1	200
.3	300
.5	400
.7	500
.8	600
1.0	700
1.2	800
1.4	900
1.5	1000
1.7	1100
1.9	1200
2.1	1300
2.2	1400
2.4	1500
2.6	1600
2.7	1700
2.9	1800
3.1	1900
3.3	2000

Check maximum pressure in shaded area. Maximum cylinder pressure = 1850 PSI at 21°C. For maximum cylinder pressure at hotter or colder temperatures, add or subtract 32 PSI per 5°C, respectively.

Crew Oxygen Requirements

Table 5 - Temperature Corrections

CYLINDER PRESSURE AT 21°C (PSI)	PRESSURE CORRECTION FOR EACH 5°C ABOVE/BELOW 21°C (PSI)
400	+7/-7
600	+11/-11
800	+14/-14
1000	+17/-17
1200	+21/-21
1400	+24/-24
1600	+28/-28
1800	+31/-31
2000	+34/-34

DRAFT

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
28	153.7	152.7	149.7
26	167.6	165.9	161.1
24	182.2	179.2	173.4
22	197.2	192.5	185.8
20	212.9	207.0	199.3
18	227.6	219.8	210.5
16	241.7	231.8	220.6
14	253.9	243.4	231.8
12	268.6	255.2	242.7
10	281.1	267.2	254.5
8	285.8	272.6	259.9
6	285.8	284.5	271.0

Anti-Ice Adjustments

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)										
	PRESSURE ALTITUDE (1000 FT)										
8	10	12	14	16	18	20	22	24	26	28	
ENGINE ONLY	-0.5	-1.1	-1.1	-0.8	-0.6	-0.2	-0.4	-1.0	-0.9	-1.0	-1.1
ENGINE AND WING	-4.2	-4.8	-4.4	-3.5	-3.5	-3.1	-3.0	-4.2	-4.0	-3.8	-3.8

ALL ENGINES**Long Range Cruise Critical Fuel Reserves**
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	
286	263	244	227	213	200	189	179	170	161	154	
571	526	487	454	425	400	377	357	339	323	308	
856	789	731	681	638	600	566	536	509	484	462	
1141	1051	975	909	851	800	755	715	678	646	616	
1426	1314	1218	1136	1064	1000	944	893	848	807	770	
1711	1577	1462	1363	1276	1200	1132	1072	1018	969	924	
1996	1840	1706	1590	1489	1400	1321	1251	1187	1130	1078	
2282	2102	1949	1817	1702	1600	1510	1429	1357	1291	1232	
2567	2365	2193	2044	1914	1800	1699	1608	1526	1453	1386	

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)					
	160	180	200	220	240	260
200	4.7	5.0	5.2	5.4	5.6	5.9
300	6.5	6.8	7.1	7.4	7.8	8.1
400	8.3	8.7	9.1	9.5	9.9	10.3
500	10.0	10.6	11.0	11.5	12.0	12.5
600	11.8	12.5	13.0	13.5	14.1	14.6
700	13.6	14.3	14.9	15.5	16.2	16.8
800	15.3	16.1	16.9	17.5	18.2	18.9
900	17.0	18.0	18.8	19.4	20.3	21.1
1000	18.7	19.8	20.7	21.4	22.4	23.3
1100	20.4	21.6	22.6	23.4	24.4	25.4
1200	22.2	23.4	24.5	25.3	26.5	27.5
1300	23.8	25.2	26.4	27.3	28.5	29.6
1400	25.5	27.0	28.3	29.3	30.5	31.7
1500	27.2	28.7	30.2	31.2	32.5	33.8
1600	28.9	30.5	32.0	33.2	34.5	35.9
1700	30.5	32.3	33.9	35.1	36.5	38.0
1800	32.2	34.0	35.7	37.0	38.5	40.0

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft. 15 minute hold at 1500 ft. One missed approach; approach and land. Includes 5% allowance for wind errors.

Increase fuel required 0.8% for each 10°C above ISA.

If icing conditions exist, increase fuel required by 6% to account for engine and wing anti-ice on (3%) and ice accumulation on unheated surfaces (3%).

Allowance for performance deterioration not included.

Compare the fuel required for all engine and engine inoperative critical fuel reserves and use the higher of the two.

ENGINE INOP**Long Range Cruise Critical Fuel Reserves
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	
287	264	245	228	213	200	189	178	169	161	153	
577	530	490	456	426	400	377	356	338	321	306	
866	795	735	684	639	600	565	534	507	482	459	
1155	1061	981	912	852	800	754	712	675	642	612	
1444	1326	1226	1140	1066	1000	942	890	844	803	765	
1733	1592	1472	1368	1279	1200	1130	1069	1013	963	918	
2022	1857	1717	1596	1492	1400	1319	1247	1182	1123	1071	
2311	2123	1962	1825	1705	1600	1507	1425	1351	1284	1224	
2600	2388	2208	2053	1918	1800	1696	1603	1519	1444	1376	

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)					
	160	180	200	220	240	260
200	4.5	4.7	5.0	5.3	5.6	5.8
300	6.2	6.5	6.9	7.3	7.7	8.1
400	7.9	8.3	8.8	9.3	9.8	10.3
500	9.6	10.1	10.7	11.3	11.9	12.5
600	11.3	11.9	12.6	13.3	14.0	14.7
700	13.0	13.7	14.4	15.2	16.0	16.9
800	14.6	15.4	16.3	17.2	18.1	19.0
900	16.3	17.2	18.1	19.1	20.2	21.2
1000	17.9	18.9	20.0	21.1	22.2	23.3
1100	19.6	20.7	21.8	23.0	24.2	25.5
1200	21.2	22.4	23.6	24.9	26.2	27.6
1300	22.8	24.1	25.4	26.8	28.2	29.7
1400	24.5	25.8	27.2	28.7	30.2	31.8
1500	26.1	27.5	29.0	30.6	32.2	33.9
1600	27.7	29.2	30.8	32.5	34.2	35.9
1700	29.3	30.9	32.6	34.4	36.2	38.0
1800	30.9	32.6	34.3	36.2	38.1	40.1

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft. 15 minute hold at 1500 ft. One missed approach; approach and land. Includes APU fuel burn and 5% allowance for wind errors.

Increase fuel required 0.8% for each 10°C above ISA.

If icing conditions exist, increase fuel required by 7% to account for engine and wing anti-ice on (1%) and ice accumulation on unheated surfaces (6%).

Allowance for performance deterioration not included.

Compare the fuel required for all engine and engine inoperative critical fuel reserves and use the higher of the two.

DRAFT

Intentionally
Blank

Performance Dispatch

Landing

Chapter PD

Section 12

Landing Field Limit Weight

Flaps 30

Wind Corrected Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)				
	-10	0	10	20	30
1000	780	1000	1080	1150	1230
1100	880	1100	1180	1260	1340
1200	970	1200	1280	1360	1450
1300	1060	1300	1390	1470	1560
1400	1150	1400	1490	1580	1670
1500	1240	1500	1590	1680	1780
1600	1330	1600	1690	1790	1880
1700	1430	1700	1800	1890	1990
1800	1520	1800	1900	2000	2100
1900	1610	1900	2000	2100	2210
2000	1700	2000	2100	2210	2330
2100	1790	2100	2210	2320	2440
2200	1880	2200	2310	2430	2550
2300	1970	2300	2420	2530	2670
2400	2060	2400	2520	2640	2780
2500	2140	2500	2630	2750	2900
2600	2230	2600	2730	2860	3010
2700	2320	2700	2840	2970	3130
2800	2410	2800	2940	3080	3240
2900	2500	2900	3050	3190	3360

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)							
	0		1000		2000		3000	
	DRY	WET	DRY	WET	DRY	WET	DRY	WET
1100	125	102	122	99	118	96	114	93
1200	142	116	137	113	133	109	129	106
1300	158	130	153	126	149	122	144	119
1400	174	144	169	140	164	136	159	132
1500	191	159	186	154	180	149	175	145
1600	208	173	202	168	196	163	190	158
1700	223	187	218	182	212	177	206	171
1800	233	202	229	196	225	190	220	185
1900	243	217	238	211	234	204	230	198
2000	252	227	248	223	243	218	239	212
2100	261	236	257	232	252	228	248	223
2200	270	244	266	240	261	236	256	231
2300	279	252	275	248	270	243	265	239
2400	289	260	283	256	278	251	273	247
2500	298	268	292	263	287	259	282	254
2600	307	276	301	271	296	266	290	261
2700	316	284	310	279	304	274	298	269

Decrease field limit weight 10500 kg for each deactivated brake.

Decrease field limit weight 22000 kg when using manual speed brakes.

Landing Climb Limit Weight**Valid for approach with flaps 20 and landing with flaps 25 or 30**

AIRPORT OAT °C	AIRPORT OAT °F	LANDING CLIMB LIMIT WEIGHT (1000 LB)				
		AIRPORT PRESSURE ALTITUDE (FT)				
0	2000	4000	6000	8000		
54	129	525.5				
52	126	538.5				
50	122	551.8	511.2			
48	118	565.4	524.0			
46	115	578.9	536.8	496.9		
44	111	592.8	549.6	508.3		
42	108	608.9	562.8	520.5	481.7	
40	104	625.8	577.1	533.2	493.8	
38	100	641.3	591.9	546.0	505.9	462.5
36	97	656.3	607.1	559.0	515.4	470.9
34	93	668.4	619.0	569.4	524.9	479.5
32	90	678.5	628.7	578.4	534.6	487.0
30	86	689.1	638.6	587.9	543.8	494.0
28	82	689.3	648.3	597.4	551.8	501.3
26	79	689.8	657.8	605.8	560.8	509.4
24	75	690.2	658.0	613.7	570.3	517.6
22	72	690.7	658.3	620.8	576.9	526.6
20	68	691.1	658.7	621.2	582.0	535.0
18	64	691.5	658.9	621.4	586.6	541.0
16	61	691.8	659.4	621.4	586.8	544.9
14	57	692.2	659.6	621.7	587.0	548.5
12	54	692.6	659.8	621.9	587.0	548.5
10	50	693.1	660.0	622.1	587.3	548.7
-40	-40	694.8	661.8	623.0	587.5	548.5

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

With engine bleed for packs off, increase weight by 5400 lb.

With engine and wing anti-ice on, decrease weight by 4800 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature below 50°F, decrease weight by 44400 lb.



ENGINE INOP**Go-Around Climb Gradient****Flaps 20, Gear Up****Based on engine bleed for packs on and anti-ice off.**

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)					
	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
54	3.00					
50	3.91	2.64				
46	4.67	3.64	2.14			
42	5.38	4.38	3.12	1.67		
38	6.10	5.09	3.80	2.60	1.18	
34	6.61	5.81	4.46	3.23	2.09	0.94
39	6.78	6.35	5.11	3.83	2.67	1.59
26	6.80	6.52	5.65	4.44	3.21	2.09
22	6.82	6.54	6.17	4.96	3.77	2.54
18	6.84	6.56	6.19	5.47	4.24	2.98
14	6.87	6.58	6.20	5.48	4.69	3.40
10	6.89	6.60	6.22	5.50	4.70	3.81

Weight Adjustment

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)							
	1	2	3	4	5	6	7	8
220	-1.96	-2.15	-2.34	-2.54	-2.73	-2.92	-3.11	-3.31
200	-1.09	-1.20	-1.31	-1.42	-1.53	-1.64	-1.74	-1.84
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
160	1.40	1.54	1.68	1.81	1.95	2.09	2.23	2.37
140	3.22	3.54	3.87	4.19	4.52	4.85	5.18	5.51

Speed Adjustment

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)								
	0	1	2	3	4	5	6	7	8
VREF	-0.26	-0.27	-0.27	-0.28	-0.28	-0.28	-0.27	-0.27	-0.26
VREF+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF+10	0.16	0.16	0.16	0.16	0.15	0.14	0.14	0.14	0.14
VREF+20	0.31	0.30	0.29	0.28	0.24	0.21	0.18	0.18	0.19
VREF+30	0.30	0.25	0.21	0.17	0.09	0.02	-0.02	-0.03	-0.02

With engine bleed for packs off, increase gradient by 0.1%.

With engine anti-ice on, decrease gradient by 0.1%.

With engine and wing anti-ice on, decrease gradient by 0.2%.

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 30 Limit Weight (1000 KG)

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	233.4				
50	122	234.9	226.0			
45	113	236.9	228.0	219.2		
40	104	238.9	229.9	221.0	212.6	
35	95	241.0	231.9	222.9	214.4	206.0
30	86	243.1	233.9	224.9	216.2	207.8
25	77	245.4	236.0	227.0	218.0	209.6
20	68	247.6	238.2	229.0	219.9	211.4
15	59	250.0	240.4	231.1	221.9	213.3
10	50	252.4	242.7	233.3	224.1	215.2
5	41	254.9	245.1	235.6	226.2	217.2
0	32	257.4	247.5	237.9	228.5	219.2
-5	23	259.9	250.1	240.3	230.8	221.4
-10	14	262.6	252.7	242.7	233.1	223.6
-15	5	265.3	255.3	245.3	235.5	226.0
-20	-4	268.1	258.0	247.9	238.0	228.4
-30	-22	273.9	263.6	253.5	243.3	233.4
-40	-40	280.0	269.6	259.3	248.9	238.7
-50	-58	286.0	275.6	265.3	254.9	
-54	-65	288.4	278.0	267.6	257.3	

Increase weight 2500 kg per 1% uphill slope. Decrease weight 4100 kg per 1% downhill slope.

Increase weight 6500 kg per 10 kts Headwind. Decrease weight 29000 kg per 10 kts tailwind.

Decrease weight 11800 kg with one brake deactivated. Decrease weight 24200 kg with two brakes deactivated.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 65 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

As an alternate procedure, if the BRAKE TEMP advisory message on EICAS is not displayed 10 to 15 minutes after parking, then no waiting period is required.

D
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Performance Dispatch**Gear Down****Chapter PD****Section 13****GEAR DOWN****Takeoff/Landing Climb Limit Weight**

AIRPORT OAT		CLIMB LIMIT WEIGHT (1000 KG)			
		AIRPORT PRESSURE ALTITUDE (FT)			
°C	°F	0	1000	2000	3000
54	129	150.0	148.8	153.4	152.6
52	126	153.0	149.4	153.4	155.9
50	122	156.3	152.7	154.2	155.8
48	118	159.7	156.1	157.8	156.5
46	115	163.4	159.7	161.4	159.8
44	111	167.2	163.4	165.2	163.3
42	108	171.2	167.1	168.9	166.8
40	104	175.1	171.0	172.6	170.4
38	100	178.9	174.7	176.2	174.0
36	97	182.7	178.5	180.0	177.5
34	93	186.5	182.4	183.9	181.2
32	90	190.6	186.3	187.7	184.9
30	86	194.7	190.3	191.6	188.6
28	82	198.7	194.4	195.6	192.4
26	79	202.8	198.6	199.7	196.3
24	75	205.1	202.8	203.7	200.2
22	72	205.2	205.0	207.7	204.0
20	68	205.3	205.2	209.8	207.9
18	64	205.3	205.3	210.0	209.7
16	61	205.4	205.5	210.2	209.8
14	57	205.5	205.7	210.3	209.9
12	54	205.6	205.9	210.5	209.9
10 & BELOW	50 & BELOW	205.7	206.1	210.7	210.0

With engine bleed for packs off, increase weight by 700 kg.

With engine anti-ice on, decrease weight by 1650 kg.

With engine and wing anti-ice on, decrease weight by 4000 kg.

GEAR DOWN**Takeoff Obstacle Limit Weight****Flaps 15****Sea Level, 33°C & Below, Zero Wind**

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

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	227.9	246.2	257.8							
20	208.0	224.1	236.9	247.1	254.8	259.7				
40	190.8	205.7	218.7	229.2	237.7	245.0	250.8	254.7	257.9	260.6
60	177.9	193.0	205.7	216.3	225.0	232.2	238.1	243.2	248.7	251.9
80	168.0	183.0	195.4	205.8	214.7	222.1	228.4	233.8	238.4	242.5
100	159.3	174.4	186.8	197.1	205.9	213.5	220.1	225.7	230.6	234.8
120	151.2	167.0	179.2	189.5	198.3	205.9	212.6	218.5	223.5	228.0
140		160.3	172.5	182.8	191.6	199.2	205.9	211.9	217.2	221.8
160		154.0	166.4	176.7	185.5	193.2	199.9	206.0	211.3	216.1
180		148.1	160.9	171.1	179.9	187.7	194.5	200.5	206.0	210.9
200			155.7	166.0	174.8	182.6	189.5	195.6	201.0	205.9
220			150.8	161.3	170.1	177.8	184.8	190.9	196.4	201.4
240			146.2	156.9	165.7	173.4	180.3	186.6	192.1	197.1
260				152.7	161.6	169.3	176.2	182.4	188.1	193.1
280				148.7	157.8	165.4	172.3	178.6	184.2	189.4
300					154.1	161.7	168.6	174.9	180.6	185.7

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

OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)						
	140	160	180	200	220	240	260
33 & BELOW	0	0	0	0	0	0	0
34	-1.2	-1.5	-1.7	-2.0	-2.3	-2.6	-2.9
36	-3.1	-3.9	-4.6	-5.4	-6.1	-6.9	-7.6
38	-5.1	-6.3	-7.5	-8.7	-10.0	-11.2	-12.4
40	-7.1	-8.7	-10.4	-12.1	-13.8	-15.5	-17.1
42	-9.4	-11.7	-13.9	-16.1	-18.4	-20.6	-22.8
44	-11.8	-14.6	-17.4	-20.2	-23.0	-25.8	-28.6
46	-14.1	-17.5	-20.8	-24.2	-27.5	-30.9	-34.3
48	-16.4	-20.4	-24.3	-28.2	-32.1	-36.0	-40.0
50	-18.8	-23.3	-27.7	-32.2	-36.7	-41.2	-45.7

Pressure Altitude Adjustment

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	140	160	180	200	220	240	260
S.L. & BELOW	0	0	0	0	0	0	0
1000	-3.3	-4.1	-4.8	-5.6	-6.3	-7.0	-7.8
2000	-7.3	-8.6	-9.9	-11.2	-12.5	-13.8	-15.1
3000	-12.0	-14.3	-16.7	-19.0	-21.3	-23.6	-25.9

GEAR DOWN**Takeoff Obstacle Limit Weight****Flaps 15****Wind Adjustment**

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	140	160	180	200	220	240	260	280
15 TW	-18.6	-19.5	-20.3	-21.2	-22.0	-22.9	-23.8	-24.6
10 TW	-12.4	-13.0	-13.5	-14.1	-14.7	-15.3	-15.8	-16.4
5 TW	-6.2	-6.5	-6.8	-7.1	-7.3	-7.6	-7.9	-8.2
0	0	0	0	0	0	0	0	0
10 HW	4.0	3.6	3.2	2.9	2.5	2.1	1.8	1.4
20 HW	8.0	7.2	6.5	5.7	5.0	4.3	3.5	2.8
30 HW	12.0	10.9	9.8	8.7	7.6	6.4	5.3	4.2
40 HW	16.1	14.6	13.1	11.6	10.1	8.6	7.1	5.6

Long Range Cruise Altitude Capability**Max Climb Thrust, 300 ft/min residual rate of climb**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
250	19200	16600	13800
240	20900	18400	15600
230	22600	20200	17600
220	24500	22000	19600
210	26100	24300	21400
200	27800	26400	23800
190	29500	28500	26400
180	30900	30500	28900
170	32100	32000	31200
160	33400	33300	32900
150	34800	34700	34600
140	36100	36100	36100

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	
342	301	267	240	219	200	187	175	165	156	148	
515	454	401	361	328	300	280	263	247	233	221	
688	605	535	481	438	400	374	350	329	311	295	
859	756	669	601	547	500	467	438	411	388	368	
1029	906	802	721	656	600	561	525	494	466	442	
1198	1056	935	841	766	700	654	613	576	544	515	
1365	1204	1068	961	875	800	748	701	658	621	589	
1532	1353	1200	1080	984	900	841	788	741	699	663	
1698	1500	1331	1199	1093	1000	935	876	823	777	737	
1863	1647	1463	1318	1202	1100	1028	964	906	855	811	
2027	1794	1594	1437	1310	1200	1122	1052	989	934	886	
2190	1939	1725	1556	1419	1300	1216	1140	1072	1012	960	
2353	2085	1855	1674	1528	1400	1309	1228	1155	1090	1035	
2515	2229	1985	1793	1636	1500	1403	1316	1238	1169	1110	
2675	2373	2115	1911	1745	1600	1497	1404	1321	1247	1184	
2836	2517	2244	2029	1853	1700	1591	1492	1404	1326	1259	
2995	2660	2373	2146	1961	1800	1684	1580	1487	1405	1334	
3154	2803	2502	2264	2070	1900	1778	1668	1570	1484	1409	
3312	2946	2631	2382	2178	2000	1872	1756	1653	1563	1484	
3469	3087	2760	2499	2286	2100	1966	1845	1737	1642	1560	
3626	3229	2888	2616	2394	2200	2060	1933	1820	1721	1635	
3782	3370	3015	2733	2502	2300	2154	2022	1904	1800	1710	
3937	3510	3142	2850	2610	2400	2248	2111	1988	1880	1786	
4092	3650	3270	2966	2717	2500	2342	2199	2072	1959	1861	
4246	3789	3397	3083	2825	2600	2436	2288	2156	2039	1937	
4399	3929	3523	3199	2933	2700	2530	2377	2240	2118	2013	

GEAR DOWN**Long Range Cruise Trip Fuel and Time****Reference Fuel and Time Required**

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	10		14		18		22	
	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	6.6	0:54	6.4	0:51	6.0	0:49	5.8	0:47
300	9.8	1:19	9.3	1:15	8.7	1:10	8.3	1:07
400	13.1	1:44	12.3	1:39	11.4	1:32	10.8	1:28
500	16.3	2:09	15.3	2:02	14.2	1:53	13.4	1:48
600	19.5	2:34	18.3	2:26	16.9	2:15	15.9	2:08
700	22.8	2:58	21.4	2:49	19.7	2:36	18.5	2:28
800	26.2	3:22	24.5	3:12	22.4	2:57	21.1	2:48
900	29.5	3:47	27.6	3:35	25.2	3:19	23.7	3:08
1000	32.9	4:11	30.7	3:58	28.0	3:40	26.3	3:28
1100	36.3	4:34	33.9	4:20	30.9	4:01	29.0	3:48
1200	39.8	4:58	37.1	4:43	33.8	4:21	31.7	4:07
1300	43.3	5:21	40.3	5:05	36.6	4:42	34.4	4:27
1400	46.7	5:45	43.5	5:27	39.5	5:03	37.2	4:47
1500	50.3	6:07	46.9	5:49	42.5	5:23	40.0	5:06
1600	53.9	6:30	50.2	6:11	45.5	5:43	42.8	5:25
1700	57.5	6:53	53.5	6:32	48.5	6:03	45.6	5:45
1800	61.1	7:15	56.9	6:54	51.5	6:24	48.5	6:04
1900	64.8	7:37	60.3	7:15	54.6	6:43	51.4	6:23
2000	68.6	7:60	63.8	7:36	57.7	7:03	54.3	6:42

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	140	160	180	200	220
10	-0.6	0.0	0.6	1.3	2.1
15	-0.8	0.0	0.9	2.0	3.1
20	-1.1	0.0	1.2	2.7	4.2
25	-1.3	0.0	1.5	3.4	5.4
30	-1.6	0.0	1.9	4.1	6.6
35	-1.9	0.0	2.2	4.9	7.8
40	-2.2	0.0	2.6	5.7	9.1
45	-2.5	0.0	2.9	6.5	10.5
50	-2.8	0.0	3.3	7.3	11.9
55	-3.1	0.0	3.7	8.1	13.4
60	-3.5	0.0	4.2	9.0	14.9
65	-3.8	0.0	4.6	9.9	16.5
70	-4.1	0.0	5.0	10.9	18.2
75	-4.4	0.0	5.5	11.8	19.9
80	-4.7	0.0	5.9	12.8	21.6

Based on VREF+80 climb, Long Range Cruise and VREF+80 descent.

GEAR DOWN**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
101	84	72	63	56	50	45	42	38	36	33
173	151	134	120	109	100	92	86	80	75	70
247	218	196	178	163	150	139	130	121	114	108
319	285	258	235	216	200	186	174	163	154	146
391	351	319	292	269	250	233	218	206	194	184
462	417	380	349	323	300	280	263	248	234	222
534	483	441	406	376	350	327	308	290	274	260
606	549	502	463	429	400	375	352	332	315	299
678	615	564	520	482	450	422	397	374	355	337
751	682	625	577	536	500	469	441	417	395	375

Trip Fuel and Time

AIR DISTANCE (NM)	LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
	140	160	180	200	220	
50 FUEL (1000 KG)	1.8	1.9	2.1	2.2	2.4	0:15
ALT (FT) 12000	12000	12000	10000	10000	8000	
100 FUEL (1000 KG)	3.1	3.3	3.6	3.8	4.1	0:25
ALT (FT) 24000	24000	22000	18000	18000	16000	
150 FUEL (1000 KG)	4.2	4.6	4.9	5.3	5.7	0:35
ALT (FT) 30000	30000	26000	24000	22000	22000	
200 FUEL (1000 KG)	5.3	5.8	6.3	6.8	7.3	0:45
ALT (FT) 32000	32000	28000	26000	24000	22000	
250 FUEL (1000 KG)	6.3	6.9	7.6	8.2	8.8	0:54
ALT (FT) 32000	32000	30000	28000	26000	24000	
300 FUEL (1000 KG)	7.4	8.1	8.9	9.6	10.4	1:03
ALT (FT) 32000	32000	30000	28000	26000	24000	
350 FUEL (1000 KG)	8.4	9.3	10.2	11.0	12.0	1:12
ALT (FT) 32000	32000	30000	28000	26000	24000	
400 FUEL (1000 KG)	9.5	10.5	11.5	12.5	13.5	1:21
ALT (FT) 32000	32000	30000	28000	26000	24000	
450 FUEL (1000 KG)	10.6	11.7	12.8	13.9	15.1	1:31
ALT (FT) 32000	32000	30000	28000	26000	24000	
500 FUEL (1000 KG)	11.6	12.9	14.1	15.4	16.7	1:40
ALT (FT) 32000	32000	30000	28000	26000	24000	

Holding Planning
Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)							
	PRESSURE ALTITUDE (FT)							
	1500	5000	10000	15000	20000	25000	30000	35000
260	11680	11330	11320	11410				
240	10880	10590	10530	10560	10720			
220	10110	9900	9760	9760	9800	10180		
200	9360	9220	9020	8960	8930	9160		
180	8630	8530	8310	8190	8310	8260	8680	
160	8070	7980	7760	7590	7570	7380	7630	
140	7320	7250	7050	6860	6820	6730	6740	7130

GEAR DOWN

Holding Planning Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
1500	5000	10000	15000	20000	
260	11060	10760	10760	10870	11050
240	10250	10040	9970	10030	10110
220	9450	9340	9190	9190	9200
200	8670	8610	8430	8360	8340
180	8070	8030	7820	7720	7730
160	7300	7270	7070	6940	6950
140	6540	6510	6330	6200	6190

These tables include 5% additional fuel for holding in a racetrack pattern.

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Net Level Off Weight

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

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
18	150		
16	159	154	148
14	169	162	154
12	178	170	162
10	187	178	170
8	191	182	174
6	199	190	182
4	207	199	190

With engine anti-ice on, decrease level off weight by 1200 kg.

With engine and wing anti-ice on, decrease level off weight by 3600 kg.

DRAFT

Performance Dispatch**Text****Chapter PD****Section 14****Introduction**

This chapter contains self dispatch performance data intended primarily for use by flight crews in the event that information cannot be obtained from the airline dispatch office. The data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. To satisfy JAA requirements, data is provided when appropriate for wet runway operations. In the event of conflict between data presented in this chapter and that contained in the Approved 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 following tables. Tire and Brake Energy Limits are not shown as they are not limiting for the range of conditions shown in this chapter. When determining a maximum weight for a wet runway, the dry runway limit weight must also be checked and the lower of the two weights used.

Regulations require that the runway length be adjusted to account for alignment of the airplane prior to takeoff. The table below provides TORA, TODA and ASDA adjustments for both 90 degree taxiway entry and 180 degree turnaround. For the 180 degree turnaround case, adjustments are provided for a nominal 60 m runway pavement width. These values may be used when obtaining takeoff weights from the AFM or a takeoff analysis program. When using line-up allowances with the Field Length Limit chart, the field length available must be reduced by the ASDA adjustment.

	90 DEGREE TAXIWAY ENTRY	180 DEGREE TURNAROUND
	MINIMUM LINE-UP DISTANCE (M)	NOMINAL LINE-UP DISTANCE (M) (60.0 M RUNWAY)
TORA & TODA	23	51
ASDA	49	77

Field Limit Weight - Slope and Wind Corrections

These tables for wet and dry runways provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the Slope Correction table with the available field

length and runway slope to determine the slope corrected field length. Now enter the Wind Correction 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 condition 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

This table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the correction tables to correct 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.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy, or obstacle clearance with unbalanced V1. 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

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method as this will reduce the minimum control speeds. Note that the assumed temperature method may 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 wet or dry table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than the minimum V1 for control on the ground, V1(MCG). It is therefore necessary to compare the adjusted V1 to V1(MCG). To find V1(MCG), enter the V1(MCG) table with 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 weight adjustment is required provided that the field length available exceeds the minimum field length required shown in the Field and Climb Limit Weight table.

Brakes Deactivated

When operating with brakes deactivated, the field limit weight and the V1 must be reduced to allow for reduced braking capability. A simplified method which conservatively accounts for the reduced braking capability of one brake deactivated is to reduce the normal runway limited weight by 3100 kg for a dry runway or 2050 kg for a wet runway and the V1 associated with the reduced weight by one knot. With two brakes deactivated, reduce the normal runway limited weight by 6650 kg for a dry runway or 4200 kg for a wet runway and the V1 associated with the reduced weight by two knots. If the resulting V1 is less than minimum V1, takeoff is permitted with V1 set equal to V1(MCG) provided the dry accelerate stop distance corrected for wind and slope exceeds approximately 1740m for one brake deactivated or 1830 m for two brakes deactivated. For wet runways, the corrected accelerate stop distance should exceed approximately 2140m for one brake deactivated or 2230 m for two brakes deactivated.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

One Thrust Reverser Inoperative

Wet runway takeoff performance presented for all brakes operating is based on the use of one thrust reverser during deceleration. When operating with a thrust reverser inoperative, the runway/obstacle limited takeoff weight and V1 speed must be reduced to account for the reduced deceleration capability. A simplified method which conservatively accounts for this is to reduce the normal wet runway/obstacle limited weight by 5400 kg and the V1 associated with the reduced weight by the amount shown in the table below.

THRUST REVERSER INOPERATIVE V1 ADJUSTMENTS	
FIELD LENGTH (M)	V1 ADJUSTMENTS (KIAS)
2000	- 4
2500	- 4
3000	- 3
3500	- 3
4000	- 3
4500	- 3

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 corrected for wind and slope exceeds approximately 2200 m.

Enroute

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination. Data is based on economy climb and descent speeds, and Long Range Cruise with normal engine bleed for air conditioning. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table 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 fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance as discussed above. Then enter the Trip Fuel and Time required with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. The data considers the use of the FMC short trip optimum altitude. Obtain air distance from upper table using the ground distance and wind component to the alternate. Enter Trip Fuel and Time 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

These tables provide total fuel flow information necessary for planning Flaps Up and Flaps 1 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%.

Oxygen Requirements

Flight Crew System

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck.

Tables are provided to determine the flight crew oxygen dispatch requirements. Table 1 shows minimum oxygen quantity necessary to ensure that protective breathing requirements are satisfied. Table 2 shows the supplemental oxygen requirement for loss of pressurization, emergency descent and total post decompression flight time above 10000 ft. Table 3 gives adjustments that must be applied to Table 2 crew member supplemental requirements in situations where the enroute altitude after decompression will exceed 14000 ft. The increments shown in Table 3 reflect only the increase in oxygen flow rate associated with periods of post decompression flight at altitudes other than 14000 ft. Hence, this time must also be included in the Table 2 time value used.

Table 1, Table 2 and Table 3 values are based on "NORMAL" regulator settings. Table 3 also shows "100%" regulator setting adjustments that can be used if the operator chooses to schedule oxygen dispatch requirements based on pure oxygen availability.

Additional adjustments for more extensive than normal crew usage can be made by adding 2.05 liters/person/minute (1.2 psi/person/minute for the single cylinder system) or 13 liters/person/minute (8 psi/person/minute) if 100% oxygen is selected during normal usage.

After determining the total volume (liters) required for the flight crew by using the larger value from Table 1 or Table 2, obtain the dispatch pressure required from the Cylinder Volume to Pressure Conversion table (Table 4). Adjust this reading for cylinder temperature as required, using the adjustments given (Table 5).

Net Level Off Weight

The Net Level Off Weight table is provided to determine terrain clearance capability in straight and level flight following an engine failure. Regulations require terrain clearance planning based on net performance which is the gross (or actual) gradient performance degraded by 1.1%. In addition, the net level off pressure altitude must clear the terrain by 1000 ft.

To determine the maximum weight for terrain clearance, enter the table with required net level off pressure altitude and expected ISA deviation to obtain weight. Adjust weight for anti-ice operation as noted below the table.

Extended Range Operations

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 diversion airport comply with rules set up specifically for "Extended Range Operation with Two Engine airplanes". This section provides reserve fuel planning information for the "Critical Fuel Scenario" based on two engine operation at Long Range Cruise as well as single engine operation at Long Range Cruise.

Long Range Cruise Critical Fuel Reserves

Enter Ground to Air Mile Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter 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 in-service 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 Flaps 30.

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

Landing Field Limit Weight

Obtain wind corrected field length by entering upper table with field length available and wind component along the runway. Now enter table with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

Landing Climb Limit Weight

Enter 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 engine bleed corrections as noted. Note that data is for one engine inoperative.

Quick Turnaround Limit Weight

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

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, 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.

Takeoff/Landing Climb Limit Weight

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

The remaining gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

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DRAFT

Performance Dispatch

Takeoff

Chapter PD

Section 20

Takeoff Field Corrections

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	1220	1220	1210	1210	1200	1180	1150	1130	1100
1400	1450	1440	1420	1410	1400	1370	1330	1300	1270
1600	1670	1660	1640	1620	1600	1560	1520	1480	1430
1800	1900	1880	1850	1830	1800	1750	1700	1650	1600
2000	2120	2090	2060	2030	2000	1940	1880	1820	1760
2200	2340	2310	2270	2240	2200	2130	2060	2000	1930
2400	2560	2520	2480	2440	2400	2320	2250	2170	2090
2600	2780	2740	2690	2650	2600	2510	2430	2340	2260
2800	3000	2950	2900	2850	2800	2710	2610	2520	2420
3000	3220	3170	3110	3060	3000	2890	2790	2680	2580
3200	3440	3380	3320	3260	3200	3080	2970	2850	2730
3400	3660	3600	3530	3470	3400	3270	3140	3020	2890
3600	3880	3810	3740	3670	3600	3460	3320	3180	3040
3800	4100	4030	3950	3880	3800	3650	3500	3350	3200
4000	4320	4240	4160	4080	4000	3840	3680	3520	3360
4200	4540	4460	4370	4290	4200	4030	3860	3680	3510
4400	4760	4670	4580	4490	4400	4220	4030	3850	3670
4600	4980	4890	4790	4700	4600	4410	4210	4020	3820
4800	5200	5100	5000	4900	4800	4600	4390	4190	3980
5000	5420	5320	5210	5110	5000	4780	4570	4350	4140

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	840	960	1080	1200	1270	1350	1440	1530
1400	1000	1140	1270	1400	1480	1570	1660	1760
1600	1170	1310	1460	1600	1690	1780	1880	1980
1800	1340	1490	1650	1800	1900	2000	2100	2210
2000	1510	1670	1840	2000	2100	2210	2320	2440
2200	1680	1850	2030	2200	2310	2430	2540	2660
2400	1850	2030	2220	2400	2520	2640	2770	2890
2600	2010	2210	2400	2600	2730	2860	2990	3120
2800	2180	2390	2590	2800	2930	3070	3210	3350
3000	2350	2570	2780	3000	3140	3290	3430	3570
3200	2520	2750	2970	3200	3350	3500	3650	3800
3400	2690	2930	3160	3400	3560	3710	3870	4030
3600	2860	3100	3350	3600	3770	3930	4090	4250
3800	3030	3280	3540	3800	3970	4140	4310	4480
4000	3190	3460	3730	4000	4180	4360	4530	4710
4200	3360	3640	3920	4200	4390	4570	4750	4930
4400	3530	3820	4110	4400	4600	4790	4980	5160
4600	3700	4000	4300	4600	4800	5000	5200	5390
4800	3870	4180	4490	4800	5010	5220	5420	5610
5000	4040	4360	4680	5000	5220	5430	5640	5840

Takeoff Field & Climb Limit Weights**Flaps 15****Sea Level Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT										
	°C	-40	14	18	22	23	25	27	29	30	40
°F	-40	57	64	72	73	77	81	84	86	104	122
1470	224.7	204.2	202.9	201.6	201.3	200.6	200.0	199.4	198.7	189.0	175.5
1600	235.2	213.9	212.6	211.3	210.9	210.3	209.6	209.0	208.3	198.2	184.2
1800	249.8	227.5	226.1	224.7	224.3	223.7	223.0	222.3	221.6	211.0	196.4
2000	263.2	240.0	238.5	237.1	236.7	236.0	235.3	234.6	233.9	222.8	207.7
2200	275.7	251.7	250.2	248.7	248.3	247.6	246.9	246.2	245.3	233.9	218.2
2400	287.6	262.8	261.2	259.7	259.3	258.5	257.8	257.0	256.2	244.4	228.2
2600	298.9	273.4	271.7	270.1	269.7	268.9	268.2	267.4	266.5	254.4	237.6
2800	309.8	283.5	281.8	280.2	279.8	279.0	278.2	277.4	276.5	264.0	246.7
3000	317.5	292.6	290.9	289.2	288.8	287.9	287.1	286.3	285.4	272.5	254.7
3200	317.5	301.1	299.3	297.6	297.1	296.3	295.5	294.6	293.7	280.5	262.3
3400	317.5	309.2	307.3	305.6	305.1	304.3	303.4	302.6	301.6	288.1	269.5
3600	317.5	316.9	315.0	313.2	312.8	311.9	311.0	310.1	309.2	295.4	276.4
3800	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.3	316.3	302.3	283.0
4000	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	309.0	289.3
4200	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	315.3	295.3
4400	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	301.1
4600	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	306.6
4800	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	311.9
CLIMB LIMIT WT (1000 KG)	294.2	293.1	293.0	292.9	292.9	292.8	292.8	292.8	291.8	271.9	242.4

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT										
	°C	-40	14	18	22	23	25	27	29	30	40
°F	-40	57	64	72	73	77	81	84	86	104	122
1470	211.3	191.9	190.7	189.5	189.2	188.6	187.3	185.7	184.9	175.4	162.9
1600	221.4	201.2	199.9	198.7	198.4	197.7	196.4	194.8	193.9	184.1	171.1
1800	235.3	214.2	212.8	211.5	211.2	210.6	209.2	207.5	206.6	196.2	182.7
2000	248.1	226.2	224.8	223.4	223.1	222.4	221.0	219.2	218.3	207.5	193.4
2200	260.1	237.4	236.0	234.5	234.2	233.5	232.0	230.1	229.2	218.0	203.4
2400	271.5	248.0	246.5	245.0	244.7	243.9	242.4	240.5	239.5	228.0	212.9
2600	282.3	258.1	256.5	255.0	254.6	253.9	252.3	250.3	249.3	237.4	221.9
2800	292.7	267.8	266.2	264.6	264.2	263.5	261.8	259.8	258.7	246.5	230.5
3000	302.1	276.4	274.8	273.1	272.7	272.0	270.3	268.2	267.1	254.5	238.0
3200	310.8	284.5	282.8	281.2	280.8	279.9	278.2	276.1	275.0	262.1	245.2
3400	317.5	292.2	290.5	288.8	288.4	287.6	285.8	283.6	282.5	269.3	252.0
3600	317.5	299.6	297.8	296.1	295.7	294.9	293.1	290.8	289.7	276.2	258.6
3800	317.5	306.6	304.8	303.1	302.6	301.8	300.0	297.7	296.5	282.8	264.9
4000	317.5	313.3	311.5	309.7	309.2	308.4	306.5	304.2	303.0	289.1	270.8
4200	317.5	317.5	317.5	316.0	315.6	314.7	312.8	310.5	309.3	295.1	276.6
4400	317.5	317.5	317.5	317.5	317.5	317.5	317.5	316.5	315.3	300.9	282.1
4600	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	306.4	287.3
4800	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	317.5	311.7	292.3
CLIMB LIMIT WT (1000 KG)	278.2	277.1	277.1	277.0	277.0	276.9	274.8	271.7	270.1	250.9	224.7

With engine bleed for packs off, increase field limit weight by 280 kg and climb limit weight by 800 kg.

With engine anti-ice on, decrease field limit weight by 30 kg.

With engine and wing anti-ice on, decrease field limit weight by 750 kg and climb limit weight by 1250 kg.

Takeoff Field & Climb Limit Weights**Flaps 15****4000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	OAT											
	°C	-40	14	18	22	23	25	27	29	30	40	50
	°F	-40	57	64	72	73	77	81	84	86	104	122
1470	197.3	179.1	177.9	176.4	175.8	174.4	173.0	171.3	170.5	161.3	151.6	
1600	206.8	187.9	186.7	185.1	184.4	183.0	181.6	179.9	179.0	169.4	159.3	
1800	220.1	200.3	199.0	197.4	196.6	195.1	193.6	191.8	190.9	180.9	170.4	
2000	232.3	211.7	210.4	208.7	207.9	206.4	204.8	202.9	202.0	191.5	180.6	
2200	243.7	222.4	221.0	219.3	218.5	216.9	215.3	213.3	212.3	201.5	190.2	
2400	254.5	232.5	231.1	229.2	228.4	226.8	225.1	223.1	222.1	210.9	199.2	
2600	264.8	242.1	240.6	238.7	237.9	236.2	234.5	232.4	231.3	219.8	207.8	
2800	274.7	251.3	249.8	247.8	247.0	245.2	243.5	241.3	240.2	228.4	215.9	
3000	283.5	259.4	257.9	255.9	255.0	253.2	251.4	249.2	248.0	235.8	223.0	
3200	291.8	267.1	265.5	263.5	262.6	260.7	258.9	256.6	255.4	242.9	229.8	
3400	299.7	274.4	272.8	270.8	269.8	267.9	266.0	263.7	262.5	249.8	236.4	
3600	307.2	281.5	279.8	277.7	276.8	274.8	272.9	270.5	269.3	256.3	242.6	
3800	314.3	288.1	286.5	284.3	283.3	281.4	279.4	277.0	275.8	262.5	248.6	
4000	317.5	294.5	292.8	290.6	289.6	287.6	285.6	283.2	281.9	268.4	254.3	
4200	317.5	300.6	298.9	296.7	295.7	293.6	291.6	289.1	287.9	274.1	259.8	
4400	317.5	306.5	304.7	302.5	301.4	299.4	297.3	294.8	293.5	279.6	265.0	
4600	317.5	312.1	310.3	308.0	307.0	304.9	302.8	300.2	298.9	284.8	270.0	
4800	317.5	317.4	315.6	313.3	312.2	310.1	308.0	305.4	304.1	289.8	274.8	
CLIMB LIMIT WT (1000 KG)	259.6	258.6	258.6	257.6	256.5	254.1	251.5	248.3	246.7	228.8	209.8	

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	OAT											
	°C	-40	14	18	22	23	25	27	29	30	40	50
	°F	-40	57	64	72	73	77	81	84	86	104	122
1470	183.9	166.8	165.5	163.7	163.3	161.8	160.3	158.7	157.9	149.4	140.1	
1600	192.9	175.1	173.8	171.9	171.5	170.0	168.4	166.7	165.9	157.1	147.4	
1800	205.5	186.9	185.5	183.5	183.1	181.5	179.8	178.1	177.2	168.0	157.9	
2000	217.1	197.8	196.3	194.3	193.8	192.1	190.4	188.6	187.7	178.2	167.6	
2200	228.0	208.0	206.4	204.4	203.9	202.1	200.3	198.5	197.5	187.7	176.7	
2400	238.3	217.6	216.0	213.9	213.4	211.6	209.7	207.8	206.8	196.6	185.3	
2600	248.0	226.7	225.1	222.9	222.4	220.5	218.6	216.6	215.6	205.1	193.4	
2800	257.4	235.5	233.8	231.5	231.0	229.1	227.1	225.1	224.0	213.2	201.2	
3000	265.8	243.1	241.4	239.1	238.5	236.5	234.5	232.4	231.3	220.2	207.8	
3200	273.6	250.4	248.6	246.3	245.7	243.7	241.6	239.5	238.4	226.9	214.3	
3400	281.1	257.4	255.6	253.2	252.6	250.5	248.4	246.2	245.1	233.4	220.5	
3600	288.2	264.1	262.2	259.8	259.2	257.1	254.9	252.7	251.5	239.6	226.4	
3800	295.0	270.5	268.6	266.0	265.4	263.3	261.1	258.8	257.7	245.5	232.1	
4000	301.5	276.5	274.6	272.0	271.4	269.2	267.0	264.7	263.5	251.2	237.5	
4200	307.7	282.4	280.4	277.8	277.2	275.0	272.7	270.3	269.1	256.6	242.7	
4400	313.7	287.9	285.9	283.3	282.7	280.4	278.1	275.7	274.5	261.8	247.7	
4600	317.5	293.3	291.2	288.5	287.9	285.6	283.3	280.9	279.6	266.7	252.4	
4800	317.5	298.3	296.3	293.6	292.9	290.6	288.2	285.8	284.5	271.4	256.9	
CLIMB LIMIT WT (1000 KG)	242.2	241.4	240.8	238.8	238.3	235.6	232.7	229.7	228.2	212.1	195.7	

With engine bleed for packs off, increase field limit weight by 280 kg and climb limit weight by 800 kg.

With engine anti-ice on, decrease field limit weight by 30 kg.

With engine and wing anti-ice on, decrease field limit weight by 750 kg and climb limit weight by 1250 kg.

Takeoff Field & Climb Limit Weights**Flaps 15****8000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)											
	OAT											
	°C	-40	14	18	22	23	25	27	29	30	40	50
	°F	-40	57	64	72	73	77	81	84	86	104	122
1470	171.7	155.5	153.4	151.4	150.9	149.7	148.2	146.6	145.8	137.2	128.4	
1600	180.2	163.4	161.2	159.1	158.6	157.4	155.9	154.2	153.3	144.4	135.2	
1800	192.2	174.6	172.3	170.1	169.6	168.3	166.7	164.9	164.0	154.7	145.1	
2000	203.3	185.0	182.6	180.3	179.8	178.5	176.8	174.9	174.0	164.3	154.4	
2200	213.7	194.7	192.2	189.9	189.3	188.0	186.3	184.3	183.4	173.3	163.0	
2400	223.5	203.9	201.3	198.9	198.3	196.9	195.1	193.1	192.2	181.8	171.1	
2600	232.8	212.6	210.0	207.5	206.9	205.4	203.6	201.5	200.5	189.8	178.8	
2800	241.8	220.9	218.2	215.6	215.0	213.5	211.6	209.5	208.4	197.4	186.1	
3000	249.6	228.2	225.4	222.7	222.1	220.5	218.6	216.4	215.3	203.9	192.3	
3200	257.1	235.1	232.2	229.5	228.9	227.3	225.3	223.1	221.9	210.3	198.4	
3400	264.2	241.8	238.8	236.0	235.4	233.8	231.7	229.5	228.3	216.4	204.2	
3600	271.0	248.1	245.1	242.3	241.6	240.0	237.9	235.6	234.4	222.3	209.9	
3800	277.5	254.2	251.1	248.3	247.6	245.9	243.8	241.4	240.2	227.9	215.2	
4000	283.7	260.0	256.9	254.0	253.3	251.6	249.4	247.0	245.8	233.2	220.4	
4200	289.6	265.6	262.4	259.4	258.7	257.0	254.8	252.3	251.1	238.4	225.3	
4400	295.3	270.9	267.7	264.6	263.9	262.2	260.0	257.5	256.2	243.3	230.0	
4600	300.8	276.0	272.7	269.6	268.9	267.2	264.9	262.4	261.1	248.0	234.5	
4800	305.9	280.8	277.5	274.4	273.7	271.9	269.6	267.0	265.7	252.4	238.8	
CLIMB LIMIT WT (1000 KG)	227.3	226.1	223.2	220.5	219.8	217.8	215.0	212.2	210.8	196.0	180.9	

With engine bleed for packs off, increase field limit weight by 280 kg and climb limit weight by 800 kg.

With engine anti-ice on, decrease field limit weight by 30 kg.

With engine and wing anti-ice on, decrease field limit weight by 750 kg and climb limit weight by 1250 kg.

Takeoff Obstacle Limit Weight**Flaps 15****Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off****Sea Level, 29°C & Below, Zero Wind**

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	254.1	275.8	292.9	303.6	312.1						
20	235.0	254.0	269.9	283.1	293.5	300.5	306.0	310.5			
40	216.9	234.6	249.7	262.7	273.7	282.8	290.2	295.8	300.1	303.7	306.8
60	202.3	220.3	235.5	248.2	258.9	268.0	275.9	282.6	288.2	292.9	296.6
80	192.3	208.8	223.9	236.5	247.2	256.3	264.2	271.1	277.1	282.4	286.9
100	184.1	199.1	214.0	226.5	237.2	246.4	254.4	261.3	267.4	273.0	277.8
120	175.6	191.8	205.1	217.7	228.4	237.6	245.7	252.8	259.0	264.5	269.6
140	167.9	185.2	197.4	209.8	220.5	229.8	238.0	245.2	251.5	257.2	262.2
160	160.9	178.4	191.4	202.4	213.4	222.7	230.9	238.2	244.6	250.4	255.6
180	154.4	171.9	185.8	196.3	206.7	216.1	224.4	231.7	238.3	244.2	249.5
200		166.0	180.1	191.1	200.6	210.0	218.4	225.8	232.4	238.4	243.8
220		160.4	174.6	186.1	195.4	204.3	212.7	220.2	226.9	232.9	238.4
240		155.2	169.5	181.2	190.7	199.0	207.4	215.0	221.7	227.8	233.3
260			164.6	176.5	186.2	194.5	202.4	210.0	216.8	222.9	228.6
280			160.0	171.9	181.9	190.3	197.8	205.3	212.1	218.3	224.0
300			155.6	167.6	177.8	186.3	193.8	200.8	207.7	214.0	219.7

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

OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
29 & BELOW	0	0	0	0	0	0	0	0
30	-1.1	-1.2	-1.4	-1.5	-1.6	-1.7	-1.9	-2.0
32	-3.3	-3.7	-4.1	-4.4	-4.8	-5.2	-5.6	-6.0
34	-5.5	-6.1	-6.8	-7.4	-8.0	-8.7	-9.3	-9.9
36	-7.7	-8.6	-9.5	-10.4	-11.3	-12.1	-13.0	-13.9
38	-9.9	-11.1	-12.2	-13.3	-14.5	-15.6	-16.7	-17.9
40	-12.1	-13.5	-14.9	-16.3	-17.7	-19.1	-20.5	-21.8
42	-15.7	-17.5	-19.4	-21.2	-23.0	-24.9	-26.7	-28.5
44	-19.3	-21.5	-23.8	-26.1	-28.4	-30.6	-32.9	-35.2
46	-22.8	-25.6	-28.3	-31.0	-33.7	-36.4	-39.1	-41.9
48	-26.4	-29.6	-32.7	-35.9	-39.0	-42.2	-45.4	-48.5
50	-30.0	-33.6	-37.2	-40.8	-44.4	-48.0	-51.6	-55.2

Pressure Altitude Adjustment

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
S.L. & BELOW	0	0	0	0	0	0	0	0
1000	-6.7	-7.4	-8.1	-8.7	-9.4	-10.1	-10.8	-11.4
2000	-13.4	-14.8	-16.1	-17.5	-18.8	-20.2	-21.5	-22.9
3000	-20.6	-22.8	-25.0	-27.2	-29.4	-31.6	-33.8	-36.0
4000	-27.7	-30.8	-33.9	-36.9	-40.0	-43.0	-46.1	-49.2
5000	-33.8	-37.5	-41.3	-45.0	-48.7	-52.4	-56.1	-59.8
6000	-39.9	-44.3	-48.7	-53.0	-57.4	-61.8	-66.1	-70.5
7000	-45.4	-50.4	-55.4	-60.4	-65.4	-70.4	-75.4	-80.4
8000	-50.8	-56.5	-62.1	-67.8	-73.4	-79.1	-84.7	-90.4

Takeoff Obstacle Limit Weight**Flaps 15****Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off****Wind Adjustment**

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
15 TW	-28.4	-27.9	-27.5	-27.0	-26.5	-26.1	-25.6	-25.2
10 TW	-18.9	-18.6	-18.3	-18.0	-17.7	-17.4	-17.1	-16.8
5TW	-9.5	-9.3	-9.2	-9.0	-8.8	-8.7	-8.5	-8.4
0	0	0	0	0	0	0	0	0
10 HW	3.2	3.0	2.8	2.6	2.3	2.1	1.9	1.7
20 HW	6.4	5.9	5.5	5.1	4.7	4.3	3.9	3.4
30 HW	9.8	9.1	8.5	7.8	7.1	6.5	5.8	5.2
40 HW	13.2	12.3	11.4	10.5	9.6	8.7	7.8	6.9

With engine bleed for packs off, increase weight by 300 kg.

With engine and wing anti-ice on, decrease weight by 1400 kg.

Brake Energy Limits VMBE**Maximum Brake Energy Speed**

OAT (°C)	REFERENCE VMBE (KIAS)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
54	198	190				
50	198	191	184			
46	199	191	185	178		
42	200	192	185	179	172	
38	200	193	186	180	173	167
34	202	194	187	180	174	168
30	203	194	188	181	175	169
26	205	196	189	182	176	170
22	207	198	190	184	177	171
18	208	199	192	185	178	172
14	210	201	194	186	180	173
10	210	203	195	188	181	174
6	210	205	197	190	183	176
2	210	207	199	191	184	177
-2	210	209	201	193	186	179
-6	210	210	202	195	188	180
-10	210	210	204	197	189	182

Brake Energy Limits VMBE**Weight Adjusted VMBE**

WEIGHT (1000 KG)	REFERENCE VMBE (KIAS)										
	160	165	170	175	180	185	190	195	200	205	210
160	205	210	210	210	210	210	210	210	210	210	210
170	196	202	209	210	210	210	210	210	210	210	210
180	188	194	201	207	210	210	210	210	210	210	210
190	182	188	194	200	206	210	210	210	210	210	210
200	177	183	188	194	200	206	210	210	210	210	210
210	172	178	183	189	194	200	205	210	210	210	210
220	168	173	178	184	189	195	200	205	210	210	210
230	164	169	174	179	184	190	195	200	205	210	210
240	160	165	170	175	180	185	190	195	200	205	210
250	156	161	166	171	176	181	185	190	195	200	205
260	153	158	162	167	172	177	181	186	191	195	200
270	150	155	159	164	168	173	177	182	187	191	196
280	147	152	156	161	165	169	174	178	183	187	192
290	145	149	153	158	162	166	171	175	179	183	188
300	142	147	151	155	159	163	167	172	176	180	184
310	140	144	148	152	156	161	165	169	173	177	181

Increase VMBE by 3 knots per 1% uphill runway slope. Decrease VMBE by 5 knots per 1% downhill runway slope.

Increase VMBE by 5 knots per 10 knots headwind. Decrease VMBE by 21 knots per 10 knots tailwind.

Decrease VMBE by 10 knots for one brake deactivated and 20 knots for two brakes deactivated.

Decrease brake release weight by 1600 kg for each knot V1 exceeds VMBE.

Determine normal V1, VR, V2 speeds for lower brake release weight.

Takeoff Speeds**Flaps 15****V1, VR, V2 for Max Takeoff Thrust**

WEIGHT (1000 KG)	FLAPS 15		
	V1	VR	V2
300	157	162	168
290	153	159	165
280	150	156	163
270	147	153	160
260	144	150	157
250	140	146	154
240	137	143	152
230	133	139	149
220	129	136	146
210	126	132	143
200	121	129	140
190	117	125	136
180	112	121	133
170	107	117	130
160	103	113	126
150	98	108	123
140	93	104	119

Check V1(MCG), Minimum VR and Minimum V2.

Takeoff Speeds**Flaps 15****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	-2	0	2	4	6	8	-2	0	2	4	6	8
60	140	7	8	10	12	3	4	5	6	-2	-2	-3	-3						
50	122	4	5	7	9	11	13	2	2	3	4	5	6	-1	-1	-2	-2	-3	-3
40	104	1	2	4	7	8	10	1	1	2	3	4	5	0	-1	-1	-2	-2	-3
30	86	0	0	2	5	7	9	0	0	1	2	4	5	0	0	-1	-1	-2	-2
20	68	0	0	1	3	6	7	0	0	1	2	3	4	0	0	0	-1	-1	-2
-60	-76	0	0	1	3	5	7	0	0	1	2	3	4	0	0	0	-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
300	-5	-2	0	2	4	-2	-1	-1	0	0	1	1	2
280	-4	-2	0	2	4	-2	-1	0	0	0	1	1	2
260	-4	-2	0	2	3	-2	-1	0	0	0	1	1	2
240	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
220	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
200	-3	-1	0	2	3	-2	-1	0	0	0	1	1	2
180	-3	-1	0	2	3	-2	-1	0	0	1	1	2	2
160	-3	-1	0	2	3	-2	-1	0	0	1	1	2	2
140	-3	-1	0	2	3	-2	-1	0	0	1	1	2	2

*V1 not to exceed VR

V1(MCG), Minimum VR**Max Takeoff Thrust**

TEMP	PRESSURE ALTITUDE (FT)												
	-2000		0		2000		4000		6000		8000		
°C	°F	V1 (MCG)	Min VR										
60	140	113	114	109	111	108	109	106	108				
50	122	115	116	112	114	108	110	106	108	104	106	101	104
40	104	121	122	118	119	114	115	109	110	105	107	101	104
30	86	123	124	122	123	118	119	113	114	108	110	104	106
20	68	123	124	123	123	119	120	115	117	111	113	107	109
-60	-76	124	124	124	124	120	121	116	117	112	113	109	110

Minimum V2**Max Takeoff Thrust**

PRESSURE ALTITUDE (FT)	-2000	0	2000	4000	6000	8000
SPEED (KIAS)	119	118	116	115	113	111

Performance Dispatch**Enroute****Chapter PD****Section 21****Long Range Cruise Maximum Operating Altitude****Max Climb 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°)
300	30300	-1	33500*	33500*	33500*	33400	31900
290	31100	-3	34300*	34300*	34300*	34100	32700
280	31800	-5	35200*	35200*	35200*	34900	33400
270	32600	-7	36100*	36100*	36100*	35600	34200
260	33400	-8	36800*	36800*	36800*	36400	35000
250	34200	-10	37600*	37600*	37600*	37200	35800
240	35100	-12	38400*	38400*	38400*	38100	36600
230	36000	-14	39300*	39300*	39300*	39000	37500
220	36900	-14	40200*	40200*	40200*	39900	38500
210	37900	-14	41100*	41100*	41100*	40900	39400
200	38900	-14	42100*	42100*	42100*	41900	40400
190	40000	-14	43000	43000	43000	42900	41500
180	41100	-14	43000	43000	43000	43000	42600
170	42300	-14	43000	43000	43000	43000	43000
160	43000	-14	43000	43000	43000	43000	43000
150	43000	-14	43000	43000	43000	43000	43000
140	43000	-14	43000	43000	43000	43000	43000

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°)
300	30300	4	32500*	32500*	32500*	32500*	31900
290	31100	3	33400*	33400*	33400*	33400*	32700
280	31800	1	34300*	34300*	34300*	34300*	33400
270	32600	-1	35200*	35200*	35200*	35200*	34200
260	33400	-3	36100*	36100*	36100*	36100*	35000
250	34200	-5	36900*	36900*	36900*	36900*	35800
240	35100	-7	37700*	37700*	37700*	37700*	36600
230	36000	-9	38600*	38600*	38600*	38600*	37500
220	36900	-9	39500*	39500*	39500*	39500*	38500
210	37900	-9	40400*	40400*	40400*	40400*	39400
200	38900	-9	41400*	41400*	41400*	41400*	40400
190	40000	-9	42400*	42400*	42400*	42400*	41500
180	41100	-9	43000	43000	43000	43000	42600
170	42300	-9	43000	43000	43000	43000	43000
160	43000	-9	43000	43000	43000	43000	43000
150	43000	-9	43000	43000	43000	43000	43000
140	43000	-9	43000	43000	43000	43000	43000

*Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.

Long Range Cruise Maximum Operating Altitude**Max Climb Thrust**

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°)
300	30300	10	31100*	31100*	31100*	31100*	31100*
290	31100	8	32100*	32100*	32100*	32100*	32100*
280	31800	7	33100*	33100*	33100*	33100*	33100*
270	32600	5	34100*	34100*	34100*	34100*	34100*
260	33400	3	35100*	35100*	35100*	35100*	35000
250	34200	1	36100*	36100*	36100*	36100*	35800
240	35100	-1	36800*	36800*	36800*	36800*	36600
230	36000	-3	37700*	37700*	37700*	37700*	37500
220	36900	-3	38600*	38600*	38600*	38600*	38500
210	37900	-3	39500*	39500*	39500*	39500*	39400
200	38900	-3	40500*	40500*	40500*	40500*	40400
190	40000	-3	41500*	41500*	41500*	41500*	41500
180	41100	-3	42600*	42600*	42600*	42600*	42600
170	42300	-3	43000	43000	43000	43000	43000
160	43000	-3	43000	43000	43000	43000	43000
150	43000	-3	43000	43000	43000	43000	43000
140	43000	-3	43000	43000	43000	43000	43000

*Denotes altitude thrust limited in level flight, 300 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	
1051	990	934	885	840	800	767	736	707	680	656	
1571	1480	1398	1325	1260	1200	1151	1105	1062	1023	987	
2089	1971	1863	1766	1680	1600	1535	1474	1417	1366	1318	
2606	2459	2325	2206	2099	2000	1919	1843	1773	1708	1649	
3121	2946	2787	2645	2517	2400	2303	2213	2129	2051	1980	
3635	3433	3248	3084	2936	2800	2688	2583	2485	2394	2311	
4147	3918	3709	3523	3355	3200	3072	2952	2840	2737	2643	
4657	4402	4169	3961	3773	3600	3456	3321	3196	3080	2974	
5166	4885	4628	4398	4191	4000	3839	3690	3551	3423	3305	
5674	5367	5086	4836	4609	4400	4224	4059	3907	3766	3636	
6181	5849	5545	5273	5027	4800	4608	4429	4262	4108	3967	
6686	6329	6002	5709	5444	5200	4992	4798	4617	4451	4298	
7190	6809	6459	6146	5862	5600	5376	5167	4973	4794	4629	
7693	7288	6915	6582	6279	6000	5761	5537	5329	5137	4960	
8196	7766	7371	7017	6696	6400	6145	5906	5684	5479	5291	
8698	8244	7827	7453	7113	6800	6528	6275	6039	5822	5622	
9200	8721	8282	7888	7530	7200	6913	6644	6395	6164	5953	
9702	9199	8738	8323	7947	7600	7297	7014	6751	6508	6285	
10204	9677	9194	8759	8365	8000	7681	7383	7106	6850	6615	

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)
800	12.4	2:00	12.1	1:58	11.9	1:56	11.7	1:54	11.5	1:52
1200	17.9	2:56	17.4	2:52	17.1	2:49	16.8	2:45	16.5	2:42
1600	23.6	3:51	23.0	3:46	22.5	3:41	22.0	3:36	21.6	3:32
2000	29.4	4:45	28.6	4:39	27.9	4:32	27.3	4:27	26.8	4:22
2400	35.2	5:39	34.2	5:31	33.4	5:24	32.7	5:17	32.1	5:12
2800	41.3	6:32	40.1	6:23	39.1	6:14	38.2	6:07	37.5	6:02
3200	47.4	7:24	46.0	7:14	44.9	7:05	43.8	6:57	43.1	6:52
3600	53.5	8:17	52.0	8:05	50.7	7:55	49.5	7:47	48.7	7:42
4000	59.9	9:08	58.2	8:56	56.7	8:44	55.4	8:36	54.6	8:32
4400	66.3	9:59	64.4	9:46	62.8	9:34	61.4	9:26	60.6	9:22
4800	72.9	10:50	70.8	10:36	68.9	10:23	67.5	10:16	66.8	10:12
5200	79.6	11:40	77.3	11:25	75.3	11:13	73.8	11:05	73.3	11:02
5600	86.4	12:29	83.9	12:14	81.8	12:02	80.3	11:55		
6000	93.3	13:19	90.6	13:03	88.5	12:51	86.9	12:45		
6400	100.4	14:08	97.6	13:52	95.3	13:40	93.8	13:35		
6800	107.6	14:57	104.6	14:41	102.3	14:30	101.0	14:25		
7200	114.9	15:46	111.8	15:30	109.5	15:19	108.4	15:15		
7600	122.4	16:35	119.3	16:19	116.9	16:09				
8000	130.1	17:23	126.8	17:08	124.6	16:58				

Long Range Cruise Trip Fuel and Time**Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	140	160	180	200	220
10	-1.2	-0.6	0.0	0.8	1.6
20	-2.4	-1.1	0.0	1.7	3.6
30	-3.6	-1.8	0.0	2.7	6.0
40	-4.8	-2.4	0.0	3.8	8.7
50	-6.0	-3.0	0.0	5.0	11.7
60	-7.3	-3.7	0.0	6.4	15.0
70	-8.6	-4.3	0.0	7.9	18.7
80	-9.9	-5.0	0.0	9.6	22.8
90	-11.2	-5.7	0.0	11.3	27.1
100	-12.6	-6.4	0.0	13.2	31.9
110	-14.0	-7.1	0.0	15.2	36.9
120	-15.4	-7.8	0.0	17.4	42.3
130	-16.9	-8.6	0.0	19.7	48.0
140	-18.3	-9.3	0.0	22.1	54.1

Based on 310/.84 climb, Long Range Cruise .84/310/250 descent.

Long Range Cruise Step Climb 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	
1040	981	928	881	839	800	765	732	703	675	650	
1545	1461	1386	1318	1256	1200	1149	1102	1058	1018	981	
2050	1941	1843	1754	1673	1600	1533	1471	1414	1361	1312	
2555	2421	2300	2190	2091	2000	1917	1840	1769	1704	1643	
3060	2900	2757	2627	2508	2400	2301	2209	2125	2047	1974	
3564	3380	3214	3063	2925	2800	2685	2579	2481	2390	2306	
4069	3859	3670	3499	3343	3200	3069	2948	2837	2733	2637	
4573	4339	4127	3935	3760	3600	3453	3318	3192	3076	2968	
5078	4818	4584	4371	4177	4000	3837	3687	3548	3419	3300	
5582	5297	5040	4807	4595	4400	4221	4056	3904	3763	3631	
6086	5776	5497	5243	5012	4800	4605	4426	4260	4106	3963	
6590	6256	5953	5679	5429	5200	4990	4795	4616	4449	4294	
7094	6735	6410	6115	5846	5600	5374	5165	4972	4792	4626	
7598	7214	6867	6551	6264	6000	5758	5534	5328	5136	4957	
8103	7693	7323	6987	6681	6400	6142	5904	5683	5479	5289	
8607	8173	7780	7423	7098	6800	6526	6273	6039	5822	5620	
9111	8652	8237	7859	7515	7200	6910	6643	6395	6165	5952	
9616	9131	8693	8296	7933	7600	7294	7012	6751	6508	6283	
10121	9611	9150	8732	8350	8000	7678	7381	7107	6852	6614	

Long Range Cruise Step Climb Trip Fuel and Time

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG)										TIME (HRS:MIN)	
	LANDING WEIGHT (1000 KG)											
	140	150	160	170	180	190	200	210	220			
800	9.6	10.1	10.4	11.0	11.5	11.9	12.4	13.0	13.5		1:51	
1200	13.6	14.2	14.9	15.7	16.4	17.1	17.9	18.7	19.4		2:41	
1600	17.7	18.5	19.5	20.5	21.4	22.4	23.5	24.6	25.4		3:31	
2000	21.9	22.9	24.2	25.5	26.6	27.9	29.3	30.6	31.7		4:21	
2400	26.1	27.5	28.9	30.5	31.9	33.5	35.1	36.7	38.1		5:11	
2800	30.5	32.1	33.8	35.6	37.4	39.2	41.1	42.9	44.7		6:00	
3200	35.0	36.8	38.8	40.9	43.0	45.1	47.2	49.4	51.5		6:50	
3600	39.5	41.7	43.9	46.4	48.7	51.1	53.5	56.0	58.4		7:40	
4000	44.2	46.6	49.2	51.9	54.5	57.2	60.0	62.8	65.5		8:29	
4400	49.0	51.7	54.6	57.6	60.5	63.5	66.6	69.8	72.7		9:19	
4800	53.9	56.8	60.1	63.5	66.6	70.0	73.5	76.9	80.2		10:09	
5200	58.9	62.2	65.7	69.4	72.9	76.6	80.4	84.2	87.8		10:58	
5600	64.0	67.7	71.5	75.5	79.3	83.4	87.6	91.6	95.7		11:48	
6000	69.2	73.3	77.4	81.7	85.9	90.4	94.9	99.3	103.7		12:37	
6400	74.6	79.0	83.4	88.1	92.7	97.5	102.4	107.2			13:27	
6800	80.2	84.8	89.6	94.7	99.7	104.8	110.1	115.4			14:17	
7200	85.8	90.8	96.0	101.5	106.8	112.3					15:06	
7600	91.6	96.9	102.5	108.4	114.1	120.0					15:56	
8000	97.5	103.2	109.3	115.5	121.6	127.9					16:46	

Based on 310/.84 climb, LRC and .84/310/250 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	79	69	61	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	133	125	119	113
287	264	245	228	213	200	189	178	169	161	153
349	324	301	282	265	250	237	224	214	204	195
411	382	358	336	317	300	285	271	258	247	236
472	441	414	390	369	350	333	317	303	290	278
534	500	471	445	421	400	381	364	348	333	320
597	560	528	499	473	450	429	410	392	376	361
661	621	586	554	526	500	477	456	436	418	402

Trip Fuel and Time Required

AIR DISTANCE (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		140	160	180	200	220	
50	FUEL (1000 KG)	1.5	1.6	1.7	1.8	1.9	0:14
	ALT (FT)	10000	10000	9000	8000	8000	
100	FUEL (1000 KG)	2.3	2.4	2.6	2.7	2.9	0:22
	ALT (FT)	19000	18000	17000	16000	15000	
150	FUEL (1000 KG)	3.0	3.2	3.4	3.6	3.8	0:30
	ALT (FT)	27000	25000	24000	22000	21000	
200	FUEL (1000 KG)	3.6	3.9	4.1	4.4	4.6	0:36
	ALT (FT)	34000	31000	29000	28000	26000	
250	FUEL (1000 KG)	4.2	4.5	4.8	5.1	5.4	0:43
	ALT (FT)	39000	36000	34000	32000	30000	
300	FUEL (1000 KG)	4.7	5.0	5.4	5.8	6.2	0:48
	ALT (FT)	43000	40000	37000	35000	33000	
350	FUEL (1000 KG)	5.1	5.6	6.0	6.5	6.9	0:54
	ALT (FT)	43000	42000	39000	36000	34000	
400	FUEL (1000 KG)	5.6	6.1	6.6	7.1	7.6	1:00
	ALT (FT)	43000	42000	39000	36000	34000	
450	FUEL (1000 KG)	6.1	6.6	7.2	7.8	8.3	1:06
	ALT (FT)	43000	42000	39000	36000	34000	
500	FUEL (1000 KG)	6.6	7.2	7.8	8.4	9.1	1:13
	ALT (FT)	43000	42000	39000	36000	34000	

Holding Planning
Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)									
	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
300	8700	8640	8370	8470	8880	9070	9420			
280	8110	8030	7780	7780	8110	8350	8600	9090		
260	7540	7450	7370	7150	7470	7650	7850	8110		
240	7120	7020	6920	6700	6750	6970	7120	7410		
220	6560	6460	6340	6280	6100	6330	6430	6620	7170	
200	6020	5920	5780	5700	5520	5600	5750	5900	6260	
180	5640	5390	5260	5160	5100	4940	5150	5210	5530	5750
160	5130	5020	4760	4650	4580	4520	4430	4640	4880	5110
140	4660	4530	4390	4160	4070	4010	3880	3950	4190	4340

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
300	9360	9070	9040	9070	9130
280	8700	8630	8370	8390	8430
260	8070	7980	7710	7710	7870
240	7440	7350	7260	7180	7190
220	6970	6880	6760	6540	6540
200	6360	6270	6160	6070	5900
180	5910	5680	5570	5470	5290
160	5340	5230	5000	4900	4820
140	4800	4670	4550	4340	4250

These tables include 5% additional fuel for holding in a racetrack pattern.

Crew Oxygen Requirements**Required Pressure (PSI) for One 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

For more extensive than normal crew usage, add 1.2 psi/person/minute.

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
29	151.8		
28	159.5	151.6	
27	167.5	159.5	151.3
26	175.8	167.6	159.2
25	184.4	176.1	167.4
24	192.4	183.7	174.7
23	200.6	191.7	182.1
22	209.1	199.9	189.8
21	218.0	208.4	197.8
20	227.1	217.2	206.1
19	236.0	225.9	214.5
18	245.2	234.8	223.2
17	254.6	244.0	232.1
16	264.3	253.5	241.4
15	272.4	261.5	248.8
14	280.8	269.5	256.4
13	289.2	277.7	264.2
12	297.8	285.8	272.1
11	305.6	292.9	278.6
10	313.5	300.0	284.7
9		306.8	290.2
8		313.4	295.8
7			301.3
6			306.6
5			311.8
4			316.2

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)								
	PRESSURE ALTITUDE (1000 FT)								
10	12	14	16	18	20	22	24	26	
ENGINE ONLY	-4.3	-3.8	-3.3	-2.7	-1.9	-1.1	-1.4	-1.2	-0.9
ENGINE AND WING	-5.7	-5.2	-4.7	-4.2	-3.4	-2.6	-3.2	-3.0	-2.8

ALL ENGINES**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	
282	260	242	226	212	200	189	179	170	162	155	
566	523	485	453	425	400	378	358	340	324	309	
850	785	729	680	638	600	567	537	510	486	464	
1134	1047	972	907	850	800	755	716	680	647	618	
1418	1309	1215	1134	1063	1000	944	894	850	809	772	
1703	1571	1458	1361	1275	1200	1133	1073	1019	971	927	
1987	1833	1702	1588	1488	1400	1322	1252	1189	1132	1081	
2271	2095	1945	1814	1700	1600	1511	1431	1359	1294	1235	
2555	2357	2188	2041	1913	1800	1700	1610	1529	1456	1389	
2839	2619	2431	2268	2126	2000	1888	1789	1699	1617	1544	
3124	2882	2674	2495	2338	2200	2077	1967	1869	1779	1698	
3408	3144	2918	2722	2551	2400	2266	2146	2038	1941	1852	
3692	3406	3161	2949	2763	2600	2455	2325	2208	2103	2007	
3976	3668	3404	3176	2976	2800	2644	2504	2378	2264	2161	
4260	3930	3647	3403	3189	3000	2832	2683	2548	2426	2315	

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.4	4.6	4.8	5.1	5.3	5.4	5.6	5.9
400	8.1	8.5	8.8	9.2	9.5	9.8	10.1	10.5
600	11.7	12.3	12.8	13.4	13.8	14.1	14.6	15.2
800	15.2	16.0	16.6	17.4	18.0	18.5	19.1	19.8
1000	18.8	19.7	20.5	21.4	22.2	22.8	23.5	24.4
1200	22.4	23.4	24.3	25.4	26.3	27.0	27.8	28.8
1400	25.9	27.1	28.2	29.4	30.5	31.3	32.2	33.3
1600	29.5	30.7	32.0	33.3	34.6	35.6	36.6	37.8
1800	33.0	34.3	35.7	37.2	38.6	39.7	40.8	42.2
2000	36.6	37.8	39.4	41.0	42.6	43.9	45.1	46.6
2200	40.1	41.4	43.1	44.9	46.6	48.0	49.4	51.0
2400	43.7	44.9	46.9	48.7	50.6	52.2	53.7	55.3
2600	47.2	48.5	50.5	52.5	54.5	56.2	57.9	59.6
2800	50.8	52.1	54.0	56.2	58.3	60.2	62.0	63.9
3000	54.3	55.6	57.6	59.9	62.2	64.2	66.2	68.2

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 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (4%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

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

ENGINE INOP**Decompression Critical Fuel Reserves - LRC Cruise
Ground to Air Miles Conversion**

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)				20		TAIL WIND COMPONENT (KTS)				100
100	80	60	40	20	200	189	179	170	162	155
283	262	243	227	212	400	377	357	339	322	307
572	527	488	455	426	600	566	535	508	483	460
861	792	734	683	639						
1150	1058	979	911	852	800	754	713	676	643	613
1439	1323	1224	1139	1065	1000	942	891	845	804	766
1729	1589	1470	1367	1278	1200	1131	1069	1014	964	919
2018	1854	1715	1595	1491	1400	1319	1247	1183	1125	1072
2307	2119	1960	1823	1704	1600	1508	1425	1352	1285	1225
2596	2385	2206	2052	1918	1800	1696	1603	1520	1446	1378
2885	2650	2451	2280	2131	2000	1884	1781	1689	1606	1531
3174	2916	2696	2508	2344	2200	2073	1960	1858	1766	1683
3463	3181	2942	2736	2557	2400	2261	2138	2027	1927	1836
3752	3447	3187	2964	2770	2600	2450	2316	2196	2087	1989
4041	3712	3432	3192	2983	2800	2638	2494	2364	2248	2142
4330	3977	3678	3420	3196	3000	2826	2672	2533	2408	2295

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.0	4.3	4.5	4.8	5.0	5.3	5.6	5.8
400	7.4	7.9	8.3	8.7	9.2	9.6	10.1	10.5
600	10.6	11.3	12.0	12.7	13.3	14.0	14.6	15.3
800	13.8	14.7	15.6	16.5	17.4	18.3	19.2	20.0
1000	16.9	18.1	19.2	20.3	21.4	22.5	23.5	24.6
1200	20.1	21.5	22.8	24.1	25.3	26.6	27.9	29.1
1400	23.3	24.8	26.4	27.8	29.3	30.8	32.3	33.7
1600	26.5	28.2	29.9	31.6	33.3	35.0	36.6	38.2
1800	29.6	31.3	33.3	35.2	37.1	39.0	40.8	42.6
2000	32.8	34.5	36.7	38.8	40.8	42.9	45.0	47.0
2200	36.0	37.7	40.1	42.4	44.6	46.9	49.1	51.3
2400	39.2	40.9	43.4	45.9	48.4	50.9	53.3	55.7
2600	42.3	44.0	46.8	49.5	52.1	54.8	57.4	59.9
2800	45.5	47.2	50.0	52.9	55.7	58.5	61.3	64.1
3000	48.7	50.4	53.2	56.3	59.3	62.3	65.3	68.2

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 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) 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**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	
264	248	234	221	210	200	190	182	174	167	160	
530	498	469	443	420	400	381	364	348	334	320	
799	749	705	666	631	600	571	545	521	500	480	
1069	1002	942	889	842	800	761	726	694	665	638	
1342	1256	1180	1113	1053	1000	951	907	867	830	796	
1615	1511	1419	1337	1265	1200	1141	1087	1039	995	954	
1890	1767	1658	1562	1476	1400	1330	1268	1211	1159	1111	
2167	2023	1898	1787	1688	1600	1520	1448	1382	1323	1268	
2444	2280	2138	2012	1900	1800	1709	1628	1554	1486	1424	
2721	2538	2378	2237	2112	2000	1899	1808	1725	1649	1580	
2999	2796	2618	2462	2323	2200	2088	1988	1896	1813	1736	
3277	3054	2859	2687	2535	2400	2277	2167	2067	1976	1893	
3555	3312	3099	2913	2747	2600	2467	2347	2238	2139	2049	
3833	3569	3340	3138	2959	2800	2656	2527	2410	2303	2205	
4110	3827	3580	3363	3171	3000	2846	2707	2581	2466	2361	

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)							
	160	180	200	220	240	260	280	300
200	4.2	4.4	4.6	4.9	5.1	5.3	5.6	5.7
400	6.8	7.3	7.8	8.3	8.8	9.4	9.9	10.3
600	9.2	10.0	10.8	11.6	12.4	13.3	14.1	14.8
800	11.6	12.7	13.8	14.9	16.0	17.1	18.3	19.2
1000	14.0	15.3	16.7	18.1	19.5	20.9	22.4	23.6
1200	16.3	18.0	19.6	21.3	23.0	24.7	26.4	28.0
1400	18.6	20.5	22.5	24.4	26.4	28.4	30.5	32.2
1600	20.9	23.1	25.3	27.6	29.8	32.1	34.4	36.5
1800	23.2	25.6	28.1	30.7	33.2	35.7	38.4	40.7
2000	25.4	28.2	30.9	33.7	36.5	39.3	42.2	44.8
2200	27.6	30.6	33.7	36.7	39.8	42.9	46.1	48.9
2400	29.8	33.1	36.4	39.7	43.0	46.4	49.9	52.9
2600	32.0	35.5	39.1	42.7	46.3	49.9	53.6	57.0
2800	34.1	37.9	41.7	45.6	49.4	53.3	57.3	60.9
3000	36.2	40.3	44.4	48.5	52.6	56.7	61.0	64.8

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 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (10%) 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.

DRAFT

Intentionally
Blank

Performance Dispatch

Landing

Chapter PD

Section 22

Landing Field Limit Weight - Dry Runway

Flaps 30

Wind Adjusted Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200		1030	1120	1200	1280	1350	1430	1500
1400	1090	1190	1300	1400	1480	1570	1650	1730
1600	1240	1360	1480	1600	1690	1780	1880	1970
1800	1380	1520	1660	1800	1900	2000	2100	2200
2000	1530	1680	1840	2000	2110	2220	2330	2430
2200	1670	1850	2020	2200	2320	2430	2550	2670
2400	1820	2010	2210	2400	2530	2650	2780	2900
2600	1960	2170	2390	2600	2730	2870	3000	3130
2800	2110	2340	2570	2800	2940	3080	3230	3370
3000	2250	2500	2750	3000	3150	3300	3450	3600
3200	2400	2660	2930	3200	3360	3520	3680	3830
3400	2540	2830	3110	3400	3570	3730	3900	4070
3600	2690	2990	3300	3600	3780	3950	4130	4300
3800	2830	3150	3480	3800	3980	4170	4350	4530
4000	2980	3320	3660	4000	4190	4380	4580	4770
4200	3120	3480	3840	4200	4400	4600	4800	
4400	3270	3640	4020	4400	4610			
4600	3410	3810	4200	4600				
4800	3560	3970	4390	4800				
5000	3700	4130	4570					

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1400	177.2	166.9	156.9	144.9	138.2
1600	210.9	198.6	186.7	175.4	164.8
1800	234.8	226.6	217.2	204.1	191.8
2000	253.9	245.1	236.4	227.9	219.2
2200	273.6	262.8	253.5	244.5	235.7
2400	292.2	281.6	271.2	260.4	251.0
2600	309.6	299.0	287.9	276.9	266.6
2800	326.5	314.9	303.7	292.2	281.1
3000			315.8	304.2	293.0
3200			327.0	314.3	302.9
3400				324.3	312.0
3600					320.7

With 1 brake deactivated, decrease weight by 16200 kg.

With 2 brakes deactivated, decrease weight by 34700 kg.

With manual speedbrakes, decrease weight by 18050 kg.

Landing Field Limit Weight - Wet Runway**Flaps 30****Wind Adjusted Field Length (M)**

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1200				1200	1280	1360	1440	1520
1400		1200	1300	1400	1490	1570	1660	1750
1600	1250	1360	1480	1600	1700	1790	1890	1980
1800	1390	1530	1660	1800	1900	2010	2110	2220
2000	1540	1690	1850	2000	2110	2220	2340	2450
2200	1680	1850	2030	2200	2320	2440	2560	2680
2400	1830	2020	2210	2400	2530	2660	2790	2910
2600	1970	2180	2390	2600	2740	2870	3010	3150
2800	2120	2340	2570	2800	2950	3090	3240	3380
3000	2260	2510	2750	3000	3150	3310	3460	3610
3200	2410	2670	2940	3200	3360	3520	3690	3850
3400	2550	2830	3120	3400	3570	3740	3910	4080
3600	2700	3000	3300	3600	3780	3960	4140	4310
3800	2840	3160	3480	3800	3990	4170	4360	4550
4000	2990	3320	3660	4000	4200	4390	4590	4780
4200	3130	3490	3840	4200	4400	4610	4810	5010
4400	3280	3650	4030	4400	4610	4820	5040	5250
4600	3420	3810	4210	4600	4820	5040	5260	5480
4800	3570	3980	4390	4800	5030	5260	5490	
5000	3710	4140	4570	5000	5240	5470		

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1600	175.8	165.5	155.6	139.4	137.0
1800	205.0	193.0	181.5	170.5	160.1
2000	228.7	219.3	207.9	195.4	183.5
2200	245.7	237.2	228.7	219.9	207.2
2400	262.7	252.9	244.0	235.2	226.7
2600	279.3	268.8	258.6	249.4	240.4
2800	295.3	284.7	274.1	263.4	253.6
3000	310.3	299.7	288.6	277.6	267.3
3200	325.0	313.5	302.4	290.9	279.9
3400		327.2	313.4	301.8	290.6
3600			323.1	310.9	299.5
3800				319.6	307.7
4000					315.4
4200					323.0

With 1 brake deactivated, decrease weight by 16200 kg.

With 2 brakes deactivated, decrease weight by 34700 kg.

With manual speedbrakes, decrease weight by 18050 kg.

Landing Climb Limit Weight**Valid for approach with flaps 20 and landing with flaps 25 or 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)						
		AIRPORT PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	
54	129	258.6	243.7					
52	126	264.6	249.6					
50	122	270.9	255.3	236.3				
48	118	277.2	261.0	242.0				
46	115	283.6	266.6	247.5	227.9			
44	111	289.9	272.9	253.0	232.3			
42	108	294.5	279.4	258.3	236.5	219.7		
40	104	298.9	285.7	263.4	240.9	223.4		
38	100	303.1	290.9	268.8	244.9	226.8	209.6	
36	97	307.2	296.1	273.9	249.0	230.3	212.9	
34	93	311.2	300.9	278.2	253.1	233.7	216.1	
32	90	311.3	305.3	282.4	256.9	237.2	219.3	
30	86	311.3	309.7	286.6	260.6	240.8	222.4	
28	82	311.4	309.7	290.4	264.4	244.5	225.8	
26	79	311.4	309.7	294.1	267.9	248.0	229.2	
24	75	311.5	309.8	294.9	271.1	251.4	232.5	
22	72	311.6	309.8	294.9	274.2	253.5	234.1	
20	68	311.6	309.9	294.9	274.8	254.5	235.5	
18	64	311.6	309.9	295.0	274.9	255.6	237.2	
16	61	311.6	310.0	295.1	274.9	256.1	239.0	
14	57	311.7	310.0	295.1	275.0	256.1	240.5	
12	54	311.7	310.1	295.2	275.0	256.2	240.6	
10	50	311.8	310.2	295.2	275.1	256.2	240.7	
-40	-40	312.9	311.5	296.6	276.3	257.3	241.7	

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

With engine bleed for packs off, increase weight by 900 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 is below 10°C, decrease weight by 20800 kg.

ENGINE INOP

ADVISORY INFORMATION

Go-Around Climb Gradient**Flaps 20, Gear Up****Based on engine bleed for packs on or off, engine anti-ice on or off and wing anti-ice off.**

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)						
	PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
54	6.55	5.65					
50	7.31	6.40	5.22				
46	8.10	7.13	5.96	4.72			
42	8.73	7.92	6.64	5.24	4.18		
38	9.28	8.57	7.23	5.73	4.61	3.55	
34	9.78	9.11	7.74	6.22	5.03	3.95	
30	9.79	9.64	8.20	6.67	5.46	4.32	3.27
26	9.80	9.66	8.58	7.06	5.83	4.69	3.60
22	9.81	9.67	8.62	7.38	6.14	4.95	3.87
18	9.81	9.68	8.63	7.44	6.27	5.13	3.99
14	9.82	9.68	8.64	7.45	6.32	5.35	4.15
10	9.83	9.69	8.64	7.45	6.32	5.36	4.38

Weight Adjustment

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)									
	0	1	2	3	4	5	6	7	8	9
280	-2.98	-3.42	-3.87	-4.31	-4.75	-5.13	-5.50	-5.88	-6.27	-6.65
260	-3.06	-3.33	-3.61	-3.88	-4.15	-4.46	-4.79	-5.12	-5.46	-5.80
240	-2.50	-2.72	-2.94	-3.16	-3.38	-3.65	-3.92	-4.19	-4.46	-4.74
220	-1.88	-2.03	-2.18	-2.33	-2.48	-2.67	-2.88	-3.07	-3.28	-3.48
200	-1.13	-1.19	-1.25	-1.31	-1.37	-1.49	-1.61	-1.72	-1.83	-1.94
180	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
160	1.16	1.30	1.44	1.57	1.71	1.85	1.99	2.13	2.29	2.45
140	2.57	2.92	3.26	3.60	3.95	4.27	4.59	4.94	5.31	5.70

Speed Adjustment

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)									
	0	1	2	3	4	5	6	7	8	9
VREF	-0.27	-0.28	-0.29	-0.30	-0.31	-0.32	-0.32	-0.33	-0.33	-0.32
VREF+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF+10	0.16	0.16	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.15
VREF+15	0.27	0.26	0.26	0.26	0.27	0.28	0.28	0.26	0.24	0.22
VREF+20	0.33	0.32	0.32	0.33	0.34	0.35	0.34	0.32	0.28	0.23
VREF+25	0.35	0.34	0.33	0.34	0.35	0.36	0.35	0.31	0.26	0.20
VREF+30	0.32	0.30	0.29	0.28	0.29	0.28	0.26	0.22	0.17	0.11

With engine and wing anti-ice on, decrease gradient by 0.1%.

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 30 Limit Weight (1000 KG)

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	235.4	226.3			
50	122	237.0	227.9	219.0	210.8	
45	113	238.9	229.8	220.9	212.5	204.5
40	104	241.0	231.8	222.7	214.3	206.3
35	95	243.1	233.8	224.7	216.0	208.0
30	86	245.2	235.9	226.6	217.9	209.7
25	77	247.4	238.0	228.7	219.7	211.4
20	68	249.7	240.1	230.8	221.7	213.3
15	59	252.0	242.4	232.9	223.7	215.1
10	50	254.5	244.6	235.1	225.8	217.1
5	41	257.0	247.0	237.4	228.0	219.0
0	32	259.5	249.4	239.7	230.2	221.1
-5	23	262.1	252.0	242.1	232.5	223.3
-10	14	265.6	254.6	244.5	234.9	225.5
-15	5	268.5	257.3	247.1	237.3	227.8
-20	-4	271.4	260.0	249.7	239.8	230.3
-30	-22	277.6	266.5	255.2	245.0	235.3
-40	-40	284.2	272.7	261.1	250.6	240.6
-50	-58	291.0	279.3	268.0	256.6	246.2
-54	-65	293.9	282.1	270.6	259.1	248.4

Increase weight by 2100 kg per 1% uphill slope. Decrease weight by 5100 kg per 1% downhill slope.

Increase weight by 5800 kg per 10 knots headwind. Decrease weight by 35200 kg per 10 knots tailwind.

Decrease weight by 13200 kg when one brake is deactivated. Decrease weight by 27300 kg when two brakes are deactivated.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 65 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

As an alternate procedure, no waiting period is required if the BRAKE TEMP advisory message on EICAS is not displayed 10 to 15 minutes after parking.

DRAFT

Intentionally
Blank

Performance Dispatch
Gear DownChapter PD
Section 23**GEAR DOWN****Takeoff Climb Limit Weight
Flaps 15**

AIRPORT OAT		TAKEOFF CLIMB WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	178.8	171.4	164.4	155.0	145.9
52	126	183.8	171.4	164.3	154.9	145.9
50	122	188.6	172.3	164.3	154.9	145.8
48	118	193.3	176.8	164.2	154.8	145.8
46	115	198.1	181.1	165.1	154.8	145.7
44	111	202.7	185.5	169.3	154.7	145.7
42	108	207.3	189.7	173.2	155.6	145.7
40	104	211.9	194.0	177.1	159.5	145.6
38	100	216.8	198.1	181.0	163.3	146.5
36	97	221.7	202.3	184.9	167.1	150.1
34	93	226.5	207.4	188.8	170.8	153.7
32	90	231.3	212.5	192.7	174.5	157.3
30	86	236.1	217.4	197.8	178.2	160.9
28	82	240.7	222.2	202.8	182.0	164.5
26	79	245.3	226.9	207.7	186.9	168.1
24	75	247.6	231.4	212.5	191.7	171.7
22	72	247.6	235.9	217.0	196.4	176.4
20	68	247.6	238.1	221.5	200.9	181.0
18	64	247.6	238.1	225.8	205.3	185.4
16	61	247.6	238.1	227.8	209.6	189.7
14	57	247.6	238.0	227.7	212.9	193.9
12	54	247.6	238.0	227.7	212.9	198.0
10	50	247.6	238.0	227.7	212.9	199.9
-40	-40	246.8	237.3	226.5	213.7	200.6

With engine bleeds for packs off, increase weight by 100 kg.

With engine anti-ice on, decrease weight by 4000 kg.

With engine and wing anti-ice on, decrease weight by 4900 kg.

GEAR DOWN**Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 25 or 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	211.0				
52	126	216.1				
50	122	221.2	205.2			
48	118	226.2	210.1			
46	115	231.0	214.9	198.0		
44	111	236.1	219.5	201.6		
42	108	241.3	224.0	205.1	190.5	
40	104	246.6	228.2	208.5	193.5	
38	100	250.4	232.3	211.9	196.4	181.6
36	97	254.2	236.0	215.3	199.3	184.4
34	93	258.0	239.4	218.6	202.1	187.1
32	90	261.7	242.7	221.8	204.9	189.7
30	86	265.4	245.9	224.8	207.8	192.3
28	82	265.3	248.7	227.8	210.6	194.9
26	79	265.4	251.6	230.4	213.5	197.6
24	75	265.4	252.2	232.9	216.3	200.2
22	72	265.5	252.2	235.3	218.0	201.4
20	68	265.5	252.2	235.8	218.8	202.5
18	64	265.5	252.3	235.9	219.7	204.0
16	61	265.6	252.3	235.9	220.1	205.7
14	57	265.6	252.4	235.9	220.1	207.2
12	54	265.7	252.4	236.0	220.2	207.2
10	50	265.8	252.4	236.0	220.2	207.2
-40	-40	266.9	253.5	237.0	221.1	208.0

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

With engine bleed for packs off, increase weight by 700 kg.

With engine and wing anti-ice on, decrease weight by 1150 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 26300 kg.



GEAR DOWN**Takeoff Obstacle Limit Weight**

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

Flaps 15**Sea Level, 29°C & Below, Zero Wind**

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	240.0										
20	228.8	240.0	240.0								
40	211.3	225.9	237.1	240.0							
60	197.8	212.7	224.2	233.3	240.0	240.0					
80	186.9	201.7	213.5	223.0	230.7	237.1	240.0	240.0			
100	177.7	192.3	204.3	214.1	222.1	228.8	234.5	239.1	240.0		
120	169.7	184.2	196.1	206.1	214.4	221.3	227.3	232.4	236.8	240.0	
140	162.7	177.0	188.9	198.9	207.4	214.6	220.7	226.1	230.7	234.8	
160	156.4	170.5	182.3	192.4	200.9	208.3	214.7	220.2	225.0	229.3	
180	150.7	164.6	176.3	186.4	195.1	202.5	209.0	214.8	219.7	224.2	
200		159.2	170.9	180.9	189.6	197.2	203.8	209.6	214.8	219.3	
220		154.2	165.8	175.8	184.5	192.2	198.9	204.8	210.0	214.7	
240		149.6	161.2	171.1	179.8	187.5	194.2	200.2	205.6	210.4	
260			156.8	166.7	175.4	183.0	189.9	195.9	201.3	206.2	
280			152.7	162.5	171.2	178.9	185.7	191.8	197.3	202.3	
300			148.8	158.6	167.3	174.9	181.8	188.0	193.5	198.5	
										203.0	

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

OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)						
	140	160	180	200	220	240	260
29 & BELOW	0	0	0	0	0	0	0
30	-1.1	-1.3	-1.6	-1.8	-2.1	-2.3	-2.6
32	-2.7	-3.6	-4.5	-5.3	-6.2	-7.1	-8.0
34	-4.3	-5.8	-7.3	-8.8	-10.3	-11.9	-13.4
36	-5.9	-8.1	-10.2	-12.3	-14.5	-16.6	-18.8
38	-7.5	-10.3	-13.1	-15.8	-18.6	-21.4	-24.1
40	-9.2	-12.5	-15.9	-19.3	-22.7	-26.1	-29.5
42	-10.5	-14.5	-18.6	-22.7	-26.8	-30.9	-35.0
44	-11.8	-16.5	-21.3	-26.1	-30.9	-35.7	-40.5
46	-13.1	-18.5	-24.0	-29.5	-35.0	-40.5	-46.0
48	-14.4	-20.5	-26.7	-32.9	-39.1	-45.3	-51.4
50	-15.7	-22.5	-29.4	-36.3	-43.2	-50.0	-56.9

GEAR DOWN**Takeoff Obstacle Limit Weight**

Based on engine bleed for packs on, engine anti-ice off and wing anti-ice off
Pressure Altitude Adjustment

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	140	160	180	200	220	240	260
S.L. & BELOW	0	0	0	0	0	0	0
1000	-5.4	-6.1	-6.9	-7.7	-8.4	-9.2	-10.0
2000	-10.8	-12.3	-13.8	-15.3	-16.9	-18.4	-19.9
3000	-15.7	-18.2	-20.6	-23.0	-25.4	-27.8	-30.3
4000	-20.7	-24.0	-27.3	-30.6	-34.0	-37.3	-40.6
5000	-24.8	-29.3	-33.7	-38.1	-42.5	-46.9	-51.3
6000	-29.0	-34.5	-40.0	-45.5	-51.0	-56.5	-62.0
7000	-32.5	-39.3	-46.0	-52.8	-59.5	-66.2	-73.0
8000	-36.0	-44.0	-52.0	-60.0	-68.0	-76.0	-84.0

Wind Adjustment

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	140	160	180	200	220	240	260
15 TW	-20.8	-20.6	-20.5	-20.4	-20.2	-20.1	-20.0
10 TW	-13.8	-13.8	-13.7	-13.6	-13.5	-13.4	-13.3
5 TW	-6.9	-6.9	-6.8	-6.8	-6.8	-6.7	-6.7
0	0	0	0	0	0	0	0
10 HW	3.5	3.0	2.5	2.0	1.5	1.0	0.5
20 HW	7.0	6.0	5.0	4.0	3.0	2.0	1.0
30 HW	10.5	9.0	7.5	6.0	4.5	3.0	1.5
40 HW	14.0	12.0	10.0	8.0	6.0	4.0	2.0

With engine bleed for packs off, increase weight by 300 kg.

With engine anti-ice on, decrease weight by 1000 kg.

With engine and wing anti-ice on, decrease weight by 1700 kg.

Long Range Cruise Altitude Capability

Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	13000	10400	7300
290	14600	12000	9100
280	16200	13700	11000
270	17800	15500	12800
260	19500	17200	14600
250	21100	18900	16400
240	22500	20500	18200
230	24000	22000	20100
220	25300	23600	21700
210	26300	25100	23300
200	27300	26100	25000
190	28300	27100	26000
180	29400	28200	27100
170	30600	29300	28200
160	32100	30500	29300
150	33800	32100	30600
140	35700	34000	32300

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	
329	292	261	236	216	200	187	175	165	156	148	
497	441	393	356	326	300	281	263	247	234	222	
663	589	526	476	435	400	374	351	330	312	296	
828	736	657	595	544	500	468	438	412	389	370	
992	882	788	714	653	600	561	526	495	468	444	
1155	1028	918	832	762	700	655	614	578	546	519	
1317	1172	1048	950	870	800	748	702	661	625	593	
1478	1317	1178	1068	978	899	841	790	743	702	667	
1638	1461	1308	1186	1086	999	935	877	826	781	742	
1797	1603	1437	1304	1194	1100	1029	966	910	860	818	
1955	1746	1565	1421	1303	1200	1124	1055	993	939	893	
2112	1887	1693	1538	1410	1300	1218	1143	1077	1018	968	
2269	2028	1821	1655	1519	1400	1312	1232	1160	1097	1043	
2426	2170	1950	1773	1627	1500	1406	1320	1244	1177	1119	
2582	2311	2078	1890	1736	1600	1500	1409	1328	1256	1194	
2736	2451	2205	2007	1843	1700	1594	1497	1411	1335	1269	
2890	2591	2332	2124	1951	1800	1688	1586	1495	1415	1345	
3043	2730	2459	2240	2059	1900	1782	1675	1579	1494	1421	
3196	2868	2585	2356	2166	2000	1876	1764	1663	1574	1497	
3348	3007	2711	2472	2274	2100	1970	1853	1747	1654	1573	
3499	3144	2837	2588	2382	2200	2065	1942	1831	1734	1649	
3650	3281	2962	2704	2489	2300	2159	2031	1916	1814	1725	
3800	3418	3087	2819	2596	2400	2253	2120	2000	1894	1801	
3949	3555	3213	2935	2704	2500	2347	2208	2083	1973	1877	
4098	3691	3338	3050	2811	2600	2440	2296	2167	2053	1953	
4247	3827	3462	3166	2918	2700	2534	2385	2251	2133	2029	

GEAR DOWN**Long Range Cruise Trip Fuel and Time****Reference Fuel and Time Required**

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	7.5	0:52	7.2	0:50	6.9	0:48	6.7	0:47	6.6	0:46
300	11.1	1:16	10.6	1:13	10.1	1:10	9.7	1:07	9.5	1:05
400	14.8	1:40	14.0	1:35	13.3	1:31	12.7	1:27	12.3	1:24
500	18.5	2:03	17.5	1:58	16.6	1:52	15.8	1:47	15.2	1:43
600	22.2	2:27	20.9	2:20	19.8	2:13	18.8	2:07	18.1	2:02
700	26.0	2:50	24.5	2:42	23.1	2:33	22.0	2:26	21.1	2:20
800	29.8	3:13	28.0	3:03	26.4	2:54	25.1	2:46	24.0	2:38
900	33.7	3:36	31.7	3:25	29.8	3:14	28.2	3:05		
1000	37.5	3:59	35.3	3:46	33.2	3:34	31.4	3:24		
1100	41.5	4:21	39.0	4:07	36.7	3:55	34.7	3:44		
1200	45.4	4:43	42.7	4:28	40.2	4:15	38.0	4:03		
1300	49.5	5:05	46.5	4:49	43.7	4:35	41.3	4:22		
1400	53.5	5:27	50.3	5:10	47.2	4:54	44.6	4:40		
1500	57.7	5:49	54.1	5:31	50.8	5:14	48.0	4:59		
1600	61.8	6:10	58.0	5:51	54.5	5:33	51.4	5:18		
1700	66.1	6:31	61.9	6:11	58.1	5:53				
1800	70.3	6:53	65.9	6:31	61.8	6:12				
1900	74.6	7:13	69.9	6:51	65.6	6:31				
2000	78.9	7:34	73.9	7:11	69.3	6:50				

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	140	160	180	200	220
10	-1.2	-0.6	0.0	0.7	1.4
15	-1.8	-0.9	0.0	1.0	2.1
20	-2.4	-1.2	0.0	1.4	2.8
25	-3.0	-1.5	0.0	1.7	3.4
30	-3.6	-1.8	0.0	2.0	4.1
35	-4.2	-2.1	0.0	2.4	4.9
40	-4.8	-2.4	0.0	2.7	5.6
45	-5.4	-2.7	0.0	3.0	6.3
50	-6.0	-3.0	0.0	3.4	7.1
55	-6.6	-3.3	0.0	3.7	7.9
60	-7.2	-3.6	0.0	4.1	8.6
65	-7.8	-3.9	0.0	4.4	9.4
70	-8.4	-4.2	0.0	4.8	10.3
75	-9.1	-4.6	0.0	5.2	11.1

Based on VREF30+80 climb, LRC, and VREF30+80 descent.

GEAR DOWN**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	
103	85	72	63	56	50	45	41	38	35	33	
176	152	135	121	109	100	92	85	79	74	70	
249	220	197	178	163	150	139	129	121	114	107	
321	286	258	235	216	200	186	174	163	154	145	
392	352	320	292	270	250	233	218	205	194	183	
463	418	380	349	323	300	280	263	248	234	222	
534	483	441	406	376	350	327	308	290	274	260	
606	549	502	463	429	400	375	352	332	315	299	
678	615	564	520	482	450	422	397	375	355	337	
751	682	625	577	536	500	469	441	417	395	375	

Trip Fuel and Time

AIR DIST (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		140	160	180	200	220	
50	FUEL (1000 KG)	1.8	2.0	2.2	2.3	2.5	0:15
	ALT (FT)	14000	12000	10000	10000	8000	
100	FUEL (1000 KG)	3.2	3.5	3.8	4.1	4.4	0:26
	ALT (FT)	24000	22000	20000	18000	16000	
150	FUEL (1000 KG)	4.4	4.8	5.2	5.7	6.2	0:36
	ALT (FT)	30000	26000	24000	22000	20000	
200	FUEL (1000 KG)	5.5	6.1	6.6	7.3	7.9	0:46
	ALT (FT)	30000	28000	26000	24000	20000	
250	FUEL (1000 KG)	6.6	7.3	8.1	8.8	9.6	0:56
	ALT (FT)	30000	28000	26000	24000	20000	
300	FUEL (1000 KG)	7.8	8.6	9.5	10.4	11.4	1:05
	ALT (FT)	30000	28000	26000	24000	20000	
350	FUEL (1000 KG)	8.9	9.9	10.9	12.1	13.2	1:15
	ALT (FT)	30000	28000	26000	22000	20000	
400	FUEL (1000 KG)	10.1	11.2	12.3	13.7	14.9	1:24
	ALT (FT)	30000	28000	26000	22000	20000	
450	FUEL (1000 KG)	11.3	12.5	13.8	15.3	16.7	1:34
	ALT (FT)	30000	28000	26000	22000	20000	
500	FUEL (1000 KG)	12.4	13.8	15.2	17.0	18.9	1:44
	ALT (FT)	30000	28000	26000	22000	18000	

GEAR DOWN**Holding Planning****Flaps Up**

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)						
	PRESSURE ALTITUDE (FT)						
	1500	5000	10000	15000	20000	25000	30000
300	14180	14180	14220	14420			
280	13230	13230	13240	13350			
260	12320	12300	12290	12350	12610		
240	11430	11390	11370	11370	11500		
220	10580	10510	10480	10460	10510	10790	
200	10010	9680	9620	9590	9590	9730	
180	9200	8880	8790	8760	8730	8770	9030
160	8540	8440	8130	8090	8050	8050	8190
140	8230	8120	7800	7740	7820	7660	7750

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
300	13520	13510	13520	13640	
280	12630	12620	12600	12660	12940
260	11770	11740	11720	11750	11920
240	10910	10850	10830	10820	10910
220	10060	9990	9940	9920	9960
200	9460	9140	9070	9050	9050
180	8630	8530	8230	8200	8180
160	7920	7840	7530	7610	7580
140	7530	7450	7280	7190	7170

These tables include 5% additional fuel for holding in a racetrack pattern.

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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
18	150.6		
17	156.6	149.1	
16	162.8	155.1	146.7
15	168.4	160.5	151.9
14	174.1	166.1	157.3
13	179.9	171.8	162.9
12	185.9	177.6	168.6
11	191.7	183.1	173.8
10	197.6	188.7	179.1
9	203.0	193.7	183.9
8	208.3	198.9	188.8
7	213.7	204.1	193.7
6	219.1	209.3	198.7
5	224.6	214.5	203.8
4	229.1	218.8	207.9
3	233.4	222.9	212.0
2	237.5	227.1	216.1

Anti-ice Adjustments

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)					
	PRESSURE ALTITUDE (1000 FT)					
	8	10	12	14	16	18
ENGINE ONLY	-3.3	-3.4	-3.4	-3.2	-2.4	-1.4
ENGINE AND WING	-4.1	-4.3	-4.4	-4.4	-3.6	-2.4

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Performance Dispatch**Text****Chapter PD****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 data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

Takeoff

The maximum allowable takeoff weight will be the least of the Field, Climb, Brake Energy, and Obstacle Limit Weights as determined from the following tables. Tire Limit is not shown as it is not limiting for the range of conditions shown in this chapter.

Field Limit Weight - Slope and Wind Corrections

These tables provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the Slope Correction table with the available field length and runway slope to determine the slope corrected field length. Now enter the Wind Correction 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 show both Field and Climb Limit Weights. Enter the appropriate table for pressure altitude 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.

Obstacle Limit Weight

This table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the correction tables to correct 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.

Brake Energy Limits VMBE

Tables are presented to determine the Maximum Brake Energy Speed VMBE. Compliance with this limitation is required to ensure that the brakes have enough capacity to execute a maximum effort stop from V1 without the use of thrust reversers. Enter the upper table with pressure altitude and OAT to determine the reference VMBE. Then enter the lower table with the reference VMBE and brake release weight to determine VMBE for a specific takeoff. Adjust for slope, wind and deactivated brakes as described below the table. The resulting VMBE must be greater than or equal to V1. If VMBE is less than V1, brake release weight must be decreased by the amount shown below the table.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy, or obstacle clearance with unbalanced V1. 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 may 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 the table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR 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 Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Brakes Deactivated

When operating with brakes deactivated, the field and brake energy limit weights and the V1 and VMBE must be reduced to allow for reduced braking capability. A simplified method which conservatively accounts for the reduced braking capability of one brake deactivated is to reduce the normal runway limited weight by 3500 kg and the V1 associated with the reduced weight by one knot. With two brakes deactivated, reduce the normal runway limited weight by 7300 kg and the V1 associated with the reduced weight by three knots. If the resulting V1 is less than V1(MCG), takeoff is permitted with V1 set equal to V1(MCG) provided the accelerate stop distance corrected for wind and slope exceeds approximately 1540m for one brake deactivated or 1610 m for two brakes deactivated.

For brake(s) deactivated, reduce VMBE by the amount shown on the Brake Energy Limit VMBE Chart. If the resulting VMBE is less than V1, the brake release weight must be reduced according to the instructions on the brake energy limit chart. The resulting V1 must not be less than V1(MCG). Determine VR and V2 for the actual weight.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

Enroute

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust

limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination. Data is based on economy climb and descent speeds, and Long Range Cruise with normal engine bleed for air conditioning. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table 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 fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance as discussed above. Then enter the Trip Fuel and Time required with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. The data considers the use of the FMC short trip optimum altitude. Obtain air distance from upper table using the ground distance and wind component to the alternate. Enter Trip Fuel and Time 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

These tables provide total fuel flow information necessary for planning Flaps Up and Flaps 1 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%.

Oxygen Requirements

Flight Crew System

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck. The oxygen quantity associated with these requirements is achieved with the minimum dispatch oxygen cylinder pressure. Enter the Crew Oxygen Requirements table with the number of crew plus observers using oxygen and read the minimum cylinder pressure required for the appropriate bottle temperature.

An additional quantity of oxygen is required when flight altitudes above 41000 ft are planned. Regulations require that one active duty pilot must don the oxygen mask and breathe diluted oxygen for the duration of the flight above 41000 ft. The additional quantity of oxygen required is 2.05 liters/person/minute (1.2 psi/person/minute for the single cylinder system), or 13 liters/person/minute (8 psi/person/minute) if 100% oxygen is selected during normal usage.

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 Range Operations

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 diversion airport comply with rules set up specifically for "Extended Range Operation with Two Engine airplanes". This section provides reserve fuel planning information for the "Critical Fuel Scenario" based on two engine operation at Long Range Cruise as well as single engine operation at Long Range Cruise.

Critical Fuel Reserves

Enter Ground to Air Mile Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter 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 in-service 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 Flaps 30.

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

Landing Field Limit Weight

Obtain wind corrected field length by entering upper table with field length available and wind component along the runway. Now enter table with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

Landing Climb Limit Weight

Enter 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 engine bleed corrections as noted. Note that data is for one engine inoperative.

Quick Turnaround Limit Weight

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

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, 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.

Takeoff/Landing Climb Limit Weight

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

The remaining gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

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777 Flight Crew Operations Manual

Performance Dispatch

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Performance Dispatch

Takeoff

Chapter PD

Section 30

Minimum Takeoff Weight

Weight Limit (1000 KG)

Flaps 15

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

OAT (°C)	AIRPORT PRESSURE ALTITUDE (FT)								
	S.L. & BELOW	1000	2000	3000	4000	5000	6000	7000	8000 & ABOVE
50	159.8								
45	169.6	162.9	155.7						
40	179.0	172.0	164.8	158.3					
35	187.6	180.4	172.9	166.2	159.6				
30	190.0	186.2	179.6	172.7	166.0	159.7			
25	190.2	186.4	182.0	177.3	171.4	165.7	158.3		
20	190.5	186.6	182.1	177.4	172.8	168.1	161.8	154.4	
15	190.7	186.7	182.3	177.6	172.9	168.3	162.8	156.3	
10	190.9	186.9	182.4	177.7	173.0	168.4	162.9	156.4	
0 & BELOW	191.2	187.2	182.7	178.0	173.3	168.6	163.1	156.5	

Light weight takeoffs at the GE90-110B1L thrust rating may be limited by minimum takeoff weight in order to maintain airplane controllability during takeoff. For takeoff at weights below the minimum takeoff weight, use of a lower thrust rating and/or the assumed temperature method of thrust reduction is required.

Takeoff Field Corrections - Dry Runway**Slope Corrections**

FIELD LENGTH AVAILABLE (M)	SLOPE CORRECTED FIELD LENGTH (M)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
1200	1250	1240	1220	1210	1200	1190	1180	1160	1150
1400	1470	1450	1430	1420	1400	1380	1350	1330	1310
1600	1690	1670	1640	1620	1600	1570	1530	1500	1470
1800	1910	1880	1850	1830	1800	1760	1710	1670	1620
2000	2120	2090	2060	2030	2000	1950	1890	1840	1780
2200	2340	2310	2270	2240	2200	2130	2070	2000	1940
2400	2560	2520	2480	2440	2400	2320	2250	2170	2100
2600	2780	2730	2690	2640	2600	2510	2430	2340	2250
2800	3000	2950	2900	2850	2800	2700	2610	2510	2410
3000	3220	3160	3110	3050	3000	2890	2780	2680	2570
3200	3440	3380	3320	3260	3200	3080	2960	2850	2730
3400	3650	3590	3530	3460	3400	3270	3140	3010	2890
3600	3870	3800	3740	3670	3600	3460	3320	3180	3040
3800	4090	4020	3950	3870	3800	3650	3500	3350	3200
4000	4310	4230	4160	4080	4000	3840	3680	3520	3360
4200	4530	4450	4360	4280	4200	4030	3860	3690	3520
4400	4750	4660	4570	4490	4400	4220	4040	3860	3670
4600	4970	4870	4780	4690	4600	4410	4220	4020	3830
4800	5180	5090	4990	4900	4800	4600	4390	4190	3990
5000	5400	5300	5200	5100	5000	4790	4570	4360	4150

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
-15	-10	-5	0	10	20	30	40	
1200	890	990	1100	1200	1270	1350	1430	1510
1400	1060	1170	1290	1400	1480	1560	1650	1740
1600	1220	1350	1470	1600	1690	1770	1870	1960
1800	1390	1530	1660	1800	1890	1990	2080	2180
2000	1550	1700	1850	2000	2100	2200	2300	2400
2200	1720	1880	2040	2200	2300	2410	2520	2630
2400	1890	2060	2230	2400	2510	2620	2730	2850
2600	2050	2230	2420	2600	2710	2830	2950	3070
2800	2220	2410	2610	2800	2920	3040	3170	3300
3000	2380	2590	2790	3000	3130	3250	3380	3520
3200	2550	2770	2980	3200	3330	3460	3600	3740
3400	2710	2940	3170	3400	3540	3680	3820	3970
3600	2880	3120	3360	3600	3740	3890	4040	4190
3800	3050	3300	3550	3800	3950	4100	4250	4410
4000	3210	3470	3740	4000	4150	4310	4470	4630
4200	3380	3650	3930	4200	4360	4520	4690	4860
4400	3540	3830	4110	4400	4560	4730	4900	5080
4600	3710	4010	4300	4600	4770	4940	5120	5300
4800	3880	4180	4490	4800	4980	5150	5340	5530
5000	4040	4360	4680	5000	5180	5370	5560	5750

Takeoff Field & Climb Limit Weights - Dry Runway**Flaps 15****Sea Level Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
1690	279.8	252.1	250.5	248.5	247.3	246.5	244.6	239.4	231.6	225.0	218.2
1800	289.9	261.2	259.5	257.5	256.3	255.5	253.5	248.1	240.0	233.2	226.2
2000	306.0	275.8	274.0	271.8	270.6	269.7	267.7	261.9	253.5	246.3	238.9
2200	321.8	290.2	288.3	286.1	284.8	283.9	281.7	275.7	266.9	259.4	251.6
2400	337.2	304.4	302.5	300.2	298.8	297.9	295.6	289.4	280.2	272.4	264.4
2600	351.3	317.4	315.3	312.9	311.5	310.6	308.3	301.8	292.3	284.2	275.9
2800	364.0	329.0	326.9	324.4	322.9	322.0	319.6	312.9	303.1	294.8	286.2
3000	375.3	339.2	337.0	334.5	333.0	332.0	329.5	322.6	312.5	303.9	295.1
3200	378.7	348.9	346.7	344.0	342.5	341.5	338.9	331.9	321.4	312.6	303.5
3400	378.7	358.2	355.9	353.2	351.6	350.6	348.0	340.7	330.0	320.9	311.6
3600	378.7	367.1	364.8	362.0	360.4	359.3	356.6	349.2	338.2	328.9	319.3
3800	378.7	375.4	373.0	370.2	368.5	367.4	364.7	357.1	345.9	336.4	326.7
4000	378.7	378.7	378.7	378.1	376.4	375.3	372.5	364.8	353.4	343.7	333.8
4200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	372.3	360.7	350.9	340.8
4400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	367.9	357.9	347.6
4600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	374.9	364.8	354.3
4800	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	371.5	360.9
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.1	367.4
CLIMB LIMIT WT (1000 KG)	351.5	350.9	350.7	350.4	350.2	350.1	349.7	336.8	319.5	305.3	290.6

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
1690	263.3	238.9	237.4	235.5	234.4	233.7	227.8	222.3	214.7	208.1	201.0
1800	272.8	247.5	246.0	244.1	243.0	242.2	236.1	230.4	222.6	215.7	208.4
2000	287.9	261.4	259.7	257.7	256.6	255.7	249.4	243.4	235.1	227.9	220.1
2200	302.9	275.2	273.4	271.3	270.1	269.3	262.6	256.3	247.7	240.1	232.1
2400	317.6	288.8	287.0	284.9	283.6	282.7	275.8	269.3	260.3	252.5	244.1
2600	331.0	301.2	299.4	297.1	295.8	294.9	287.7	281.0	271.7	263.6	254.9
2800	343.1	312.3	310.4	308.1	306.7	305.8	298.4	291.4	281.8	273.4	264.5
3000	353.7	322.0	320.0	317.6	316.2	315.3	307.7	300.5	290.6	282.0	272.7
3200	363.8	331.2	329.2	326.7	325.3	324.3	316.4	309.0	298.9	290.0	280.5
3400	373.5	340.0	337.9	335.4	333.9	332.9	324.9	317.2	306.8	297.7	287.9
3600	378.7	348.5	346.3	343.7	342.2	341.2	332.9	325.1	314.4	305.1	295.1
3800	378.7	356.4	354.2	351.6	350.0	348.9	340.5	332.6	321.7	312.1	301.9
4000	378.7	364.1	361.9	359.2	357.6	356.5	347.9	339.8	328.7	319.0	308.6
4200	378.7	371.6	369.3	366.6	365.0	363.9	355.2	346.9	335.6	325.7	315.1
4400	378.7	378.7	376.7	373.9	372.2	371.1	362.2	353.9	342.3	332.3	321.5
4600	378.7	378.7	378.7	378.7	378.7	378.7	369.2	360.7	349.0	338.8	327.8
4800	378.7	378.7	378.7	378.7	378.7	378.7	376.0	367.3	355.5	345.1	334.0
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	373.9	361.9	351.4	340.1
CLIMB LIMIT WT (1000 KG)	335.7	335.5	335.4	335.2	335.1	334.9	322.6	310.6	294.2	280.3	266.6

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1700 kg.

With engine and wing anti-ice on, decrease field limit weight by 2050 kg and climb limit weight by 2100 kg.

Takeoff Field & Climb Limit Weights - Dry Runway**Flaps 15****4000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
1690	246.9	225.1	223.7	221.9	219.6	217.6	211.6	206.3	198.5	192.1	186.3
1800	255.8	233.3	231.8	230.0	227.6	225.5	219.3	213.8	205.8	199.2	193.2
2000	270.1	246.4	244.8	242.9	240.4	238.2	231.7	225.9	217.4	210.5	204.2
2200	284.3	259.5	257.9	255.9	253.2	250.9	244.1	238.1	229.2	222.0	215.4
2400	298.3	272.6	270.9	268.8	266.0	263.7	256.6	250.4	241.1	233.7	226.8
2600	311.0	284.4	282.6	280.5	277.6	275.2	267.9	261.4	251.8	244.1	237.0
2800	322.4	294.9	293.1	290.9	287.9	285.4	277.9	271.2	261.3	253.3	246.0
3000	332.4	304.1	302.2	300.0	296.9	294.3	286.5	279.6	269.4	261.2	253.6
3200	341.9	312.7	310.8	308.5	305.3	302.7	294.7	287.6	277.1	268.6	260.8
3400	351.1	321.0	319.1	316.7	313.5	310.7	302.5	295.2	284.4	275.8	267.7
3600	359.8	329.0	327.1	324.6	321.3	318.5	310.0	302.6	291.5	282.6	274.4
3800	367.9	336.6	334.5	332.0	328.6	325.8	317.2	309.6	298.3	289.2	280.8
4000	375.8	343.9	341.8	339.3	335.8	332.9	324.1	316.3	304.9	295.6	287.1
4200	378.7	351.0	348.9	346.3	342.8	339.8	330.9	323.0	311.3	301.9	293.2
4400	378.7	358.1	355.9	353.3	349.7	346.7	337.6	329.6	317.7	308.1	299.3
4600	378.7	364.9	362.8	360.1	356.4	353.4	344.1	336.0	323.9	314.2	305.2
4800	378.7	371.7	369.5	366.7	363.0	359.9	350.6	342.3	330.1	320.2	311.1
5000	378.7	378.3	376.0	373.3	369.5	366.4	356.9	348.5	336.1	326.1	316.9
CLIMB LIMIT WT (1000 KG)	317.5	317.3	317.2	317.1	313.2	309.7	297.2	286.7	271.5	259.0	248.1

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
1690	231.6	211.1	209.8	206.5	203.2	200.6	194.9	190.0	183.2	177.6	172.2
1800	240.0	218.9	217.5	214.1	210.6	208.0	202.0	197.0	189.9	184.2	178.6
2000	253.5	231.2	229.7	226.2	222.5	219.8	213.5	208.2	200.7	194.7	188.8
2200	266.9	243.6	242.1	238.4	234.6	231.7	225.1	219.6	211.8	205.5	199.4
2400	280.2	256.1	254.5	250.7	246.7	243.7	236.9	231.1	223.1	216.5	210.2
2600	292.3	267.3	265.7	261.7	257.6	254.5	247.4	241.5	233.1	226.3	219.8
2800	303.1	277.3	275.6	271.5	267.3	264.0	256.8	250.6	242.0	235.0	228.2
3000	312.5	285.9	284.2	280.0	275.6	272.3	264.8	258.4	249.5	242.3	235.3
3200	321.4	294.1	292.3	287.9	283.4	280.0	272.3	265.7	256.6	249.2	242.0
3400	330.0	301.9	300.0	295.6	290.9	287.4	279.5	272.8	263.4	255.7	248.4
3600	338.2	309.4	307.5	302.9	298.2	294.6	286.5	279.6	270.0	262.2	254.6
3800	345.9	316.5	314.6	309.9	305.1	301.4	293.1	286.1	276.3	268.3	260.6
4000	353.4	323.4	321.5	316.7	311.8	308.1	299.6	292.5	282.5	274.3	266.4
4200	360.7	330.2	328.3	323.4	318.4	314.6	306.0	298.7	288.5	280.2	272.2
4400	367.9	336.9	334.9	330.0	324.9	321.0	312.2	304.8	294.5	286.1	277.9
4600	374.9	343.5	341.4	336.4	331.2	327.3	318.4	310.9	300.4	291.8	283.6
4800	378.7	349.9	347.8	342.7	337.5	333.5	324.5	316.8	306.2	297.5	289.1
5000	378.7	356.2	354.1	348.9	343.6	339.6	330.4	322.7	311.9	303.1	294.6
CLIMB LIMIT WT (1000 KG)	297.9	297.9	297.8	293.5	287.5	282.8	272.4	263.5	250.7	240.1	230.1

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1700 kg.

With engine and wing anti-ice on, decrease field limit weight by 2050 kg and climb limit weight by 2100 kg.

Takeoff Field & Climb Limit Weights - Dry Runway**Flaps 15****8000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
1690	214.4	194.4	191.9	187.2	183.8	181.7	176.4	171.6	165.2	160.2	155.2
1800	222.3	201.5	199.0	194.1	190.6	188.4	183.0	178.0	171.3	166.1	161.0
2000	234.8	212.9	210.2	205.1	201.5	199.2	193.4	188.1	181.2	175.7	170.3
2200	247.4	224.5	221.7	216.4	212.6	210.2	204.2	198.6	191.4	185.6	180.0
2400	260.0	236.3	233.4	227.8	223.9	221.4	215.1	209.4	201.9	195.9	190.1
2600	271.3	246.8	243.8	238.1	234.0	231.4	224.9	219.0	211.2	205.0	199.0
2800	281.4	256.1	253.0	247.1	242.9	240.2	233.5	227.4	219.3	213.0	206.7
3000	290.2	264.1	260.9	254.8	250.4	247.7	240.8	234.5	226.2	219.6	213.2
3200	298.5	271.6	268.3	262.0	257.5	254.7	247.6	241.1	232.5	225.8	219.2
3400	306.4	278.8	275.4	268.9	264.3	261.4	254.2	247.5	238.7	231.8	224.9
3600	314.0	285.8	282.3	275.7	271.0	268.0	260.5	253.7	244.7	237.6	230.6
3800	321.3	292.4	288.9	282.1	277.3	274.2	266.6	259.7	250.5	243.2	236.1
4000	328.3	298.9	295.3	288.4	283.5	280.4	272.6	265.5	256.1	248.8	241.5
4200	335.2	305.2	301.6	294.5	289.6	286.4	278.5	271.3	261.7	254.3	246.9
4400	341.9	311.5	307.7	300.6	295.6	292.3	284.3	277.0	267.3	259.7	252.1
4600	348.5	317.7	313.8	306.6	301.5	298.2	290.1	282.6	272.7	265.0	257.3
4800	355.0	323.7	319.8	312.5	307.3	303.9	295.7	288.1	278.1	270.3	262.5
5000	361.4	329.6	325.7	318.2	313.0	309.6	301.2	293.6	283.4	275.5	267.6
CLIMB LIMIT WT (1000 KG)	273.7	273.7	270.5	262.7	256.7	253.2	243.8	234.7	222.5	213.2	204.0

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1700 kg.

With engine and wing anti-ice on, decrease field limit weight by 2050 kg and climb limit weight by 2100 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	1230	1220	1210	1200	1190	1170	1160	1150
1400	1470	1450	1430	1420	1400	1380	1360	1340	1320
1600	1690	1670	1640	1620	1600	1570	1550	1520	1490
1800	1910	1880	1850	1830	1800	1770	1730	1700	1660
2000	2130	2100	2060	2030	2000	1960	1920	1880	1840
2200	2350	2310	2270	2240	2200	2150	2100	2060	2010
2400	2570	2530	2480	2440	2400	2350	2290	2240	2180
2600	2790	2740	2690	2650	2600	2540	2480	2420	2350
2800	3010	2960	2900	2850	2800	2730	2660	2600	2530
3000	3230	3170	3120	3060	3000	2930	2850	2780	2700
3200	3450	3390	3330	3260	3200	3120	3040	2950	2870
3400	3670	3600	3540	3470	3400	3310	3220	3130	3050
3600	3890	3820	3750	3670	3600	3500	3410	3310	3220
3800	4110	4030	3960	3880	3800	3700	3600	3490	3390
4000	4330	4250	4170	4080	4000	3890	3780	3670	3560
4200	4550	4460	4380	4290	4200	4080	3970	3850	3740
4400	4770	4680	4590	4490	4400	4280	4150	4030	3910
4600	4990	4900	4800	4700	4600	4470	4340	4210	4080
4800	5120	5110	5010	4900	4800	4660	4530	4390	4250
5000	5430	5330	5220	5110	5000	4860	4710	4570	4430

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	1450	1540
1400	1020	1150	1270	1400	1480	1570	1670	1770
1600	1190	1330	1460	1600	1690	1790	1890	2000
1800	1360	1510	1650	1800	1890	2000	2110	2220
2000	1530	1680	1840	2000	2100	2210	2320	2450
2200	1690	1860	2030	2200	2300	2420	2540	2680
2400	1860	2040	2220	2400	2510	2630	2760	2910
2600	2030	2220	2410	2600	2710	2840	2980	3140
2800	2190	2400	2600	2800	2920	3050	3200	3360
3000	2360	2570	2790	3000	3120	3260	3420	3590
3200	2530	2750	2980	3200	3320	3470	3630	3820
3400	2690	2930	3160	3400	3530	3680	3850	4050
3600	2860	3110	3350	3600	3730	3890	4070	4280
3800	3030	3290	3540	3800	3940	4100	4290	4500
4000	3200	3460	3730	4000	4140	4310	4510	4730
4200	3360	3640	3920	4200	4350	4520	4730	4960
4400	3530	3820	4110	4400	4550	4730	4940	5190
4600	3700	4000	4300	4600	4750	4940	5160	5420
4800	3860	4180	4490	4800	4960	5150	5380	5640
5000	4030	4350	4680	5000	5160	5360	5600	5870

Takeoff Field & Climb Limit Weights - Wet Runway**Flaps 15****Sea Level Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
2240	320.5	286.5	284.5	282.1	280.7	279.8	277.5	271.1	261.7	253.9	245.8
2400	331.8	296.6	294.5	292.1	290.6	289.6	287.2	280.6	270.9	262.8	254.4
2600	348.4	311.6	309.4	306.9	305.3	304.3	301.8	294.9	284.8	276.3	267.6
2800	362.9	324.5	322.3	319.6	318.0	316.9	314.3	307.1	296.6	287.7	278.6
3000	375.1	335.1	332.8	330.0	328.3	327.2	324.5	317.0	306.0	296.8	287.3
3200	378.7	345.7	343.3	340.4	338.6	337.5	334.7	326.9	315.4	305.8	296.0
3400	378.7	356.0	353.5	350.5	348.7	347.5	344.6	336.5	324.6	314.7	304.5
3600	378.7	366.0	363.4	360.3	358.4	357.2	354.2	345.8	333.6	323.3	312.7
3800	378.7	375.5	372.8	369.6	367.7	366.5	363.4	354.7	342.2	331.6	320.7
4000	378.7	378.7	378.7	378.7	376.7	375.4	372.3	363.4	350.5	339.6	328.5
4200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	371.9	358.6	347.5	336.1
4400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	366.6	355.2	343.6
4600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	374.3	362.7	350.8
4800	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	370.0	357.8	
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	377.0	364.7	
5200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	371.3
5400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	377.8
5600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7
CLIMB LIMIT WT (1000 KG)	351.5	350.9	350.7	350.4	350.2	350.1	349.7	336.8	319.5	305.3	290.6

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
2240	299.0	270.3	268.5	266.3	265.0	264.1	257.1	250.5	241.5	234.0	226.5
2400	309.6	279.9	278.0	275.7	274.3	273.4	266.1	259.2	250.0	242.2	234.4
2600	325.1	294.1	292.2	289.7	288.3	287.4	279.7	272.6	262.9	254.7	246.6
2800	338.6	306.3	304.2	301.7	300.3	299.2	291.3	283.8	273.7	265.2	256.8
3000	349.8	316.2	314.0	311.4	309.9	308.8	300.5	292.8	282.3	273.4	264.6
3200	361.1	326.0	323.8	321.0	319.4	318.3	309.7	301.6	290.7	281.5	272.3
3400	371.9	335.6	333.3	330.5	328.8	327.7	318.7	310.3	299.0	289.4	279.9
3600	378.7	344.9	342.5	339.6	337.9	336.7	327.4	318.8	307.1	297.2	287.4
3800	378.7	353.8	351.3	348.3	346.6	345.4	335.9	327.0	314.9	304.8	294.7
4000	378.7	362.4	359.9	356.8	355.0	353.8	344.0	334.9	322.6	312.2	301.8
4200	378.7	370.8	368.3	365.1	363.3	362.0	352.0	342.7	330.1	319.4	308.8
4400	378.7	378.7	376.4	373.2	371.3	370.0	359.8	350.3	337.3	326.4	315.6
4600	378.7	378.7	378.7	378.7	378.7	377.8	367.4	357.6	344.4	333.3	322.2
4800	378.7	378.7	378.7	378.7	378.7	378.7	374.8	364.8	351.3	340.0	328.7
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	371.8	358.1	346.5	334.9
5200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.6	364.6	352.8	341.0
5400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	358.9	347.0	
5600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	377.1	364.9	352.8	
CLIMB LIMIT WT (1000 KG)	335.7	335.5	335.4	335.2	335.1	334.9	322.6	310.6	294.2	280.3	266.6

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1700 kg.

With engine and wing anti-ice on, decrease field limit weight by 2200 kg and climb limit weight by 2100 kg.

Takeoff Field & Climb Limit Weights - Wet Runway**Flaps 15****4000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
2240	280.1	253.7	252.0	249.9	247.1	244.7	237.6	231.7	223.4	216.7	210.6
2400	290.0	262.6	260.8	258.6	255.7	253.2	245.9	239.7	231.2	224.2	217.8
2600	304.7	276.0	274.2	272.0	268.9	266.3	258.6	252.2	243.3	236.0	229.3
2800	317.3	287.4	285.5	283.2	280.0	277.3	269.3	262.6	253.3	245.7	238.7
3000	327.6	296.5	294.5	292.1	288.8	286.0	277.6	270.6	260.9	253.1	245.8
3200	337.9	305.6	303.5	300.9	297.5	294.6	285.9	278.6	268.5	260.4	252.8
3400	347.9	314.4	312.3	309.6	306.0	303.0	294.0	286.5	276.0	267.5	259.7
3600	357.6	323.0	320.8	318.0	314.3	311.2	301.9	294.1	283.3	274.6	266.4
3800	366.9	331.3	329.0	326.2	322.4	319.2	309.6	301.6	290.5	281.5	273.2
4000	375.9	339.3	337.0	334.1	330.2	326.9	317.1	308.9	297.5	288.3	279.8
4200	378.7	347.2	344.8	341.9	337.9	334.5	324.5	316.1	304.4	294.9	286.2
4400	378.7	354.9	352.4	349.4	345.3	341.9	331.6	323.0	311.1	301.4	292.5
4600	378.7	362.4	359.9	356.8	352.6	349.1	338.6	329.8	317.6	307.7	298.6
4800	378.7	369.6	367.1	363.9	359.7	356.1	345.4	336.4	324.0	313.9	304.6
5000	378.7	376.7	374.1	370.9	366.6	362.9	352.0	342.9	330.2	319.9	310.4
5200	378.7	378.7	378.7	377.7	373.3	369.5	358.4	349.1	336.2	325.7	316.0
5400	378.7	378.7	378.7	378.7	378.7	376.0	364.6	355.2	342.1	331.4	321.6
5600	378.7	378.7	378.7	378.7	378.7	378.7	370.7	361.1	347.7	336.9	326.9
CLIMB LIMIT WT (1000 KG)	317.5	317.3	317.2	317.1	313.2	309.7	297.2	286.7	271.5	259.0	248.1

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
2240	261.6	237.0	235.4	231.6	228.1	225.4	219.2	214.1	206.9	201.0	195.3
2400	270.8	245.3	243.6	239.7	236.0	233.2	226.8	221.5	214.0	207.9	202.0
2600	284.7	258.0	256.3	252.2	248.3	245.4	238.7	233.1	225.3	219.0	212.8
2800	296.4	268.6	266.8	262.6	258.5	255.5	248.5	242.7	234.6	227.9	221.5
3000	305.9	276.9	275.0	270.6	266.4	263.2	256.0	249.9	241.5	234.5	227.8
3200	315.3	285.1	283.2	278.6	274.2	270.9	263.4	257.1	248.3	241.0	234.1
3400	324.5	293.2	291.2	286.4	281.9	278.5	270.6	264.1	255.0	247.5	240.3
3600	333.4	301.1	299.0	294.1	289.4	285.9	277.8	271.0	261.6	253.9	246.4
3800	342.0	308.8	306.7	301.6	296.8	293.1	284.8	277.9	268.2	260.2	252.6
4000	350.4	316.3	314.1	308.9	304.0	300.2	291.7	284.6	274.6	266.5	258.6
4200	358.5	323.6	321.4	316.0	311.0	307.1	298.4	291.1	281.0	272.6	264.5
4400	366.4	330.7	328.4	323.0	317.8	313.9	305.0	297.5	287.1	278.6	270.3
4600	374.1	337.7	335.3	329.8	324.5	320.5	311.4	303.8	293.1	284.4	276.0
4800	378.7	344.5	342.1	336.4	331.0	326.9	317.6	309.8	299.0	290.1	281.5
5000	378.7	351.0	348.6	342.8	337.3	333.1	323.7	315.8	304.7	295.6	286.9
5200	378.7	357.4	355.0	349.1	343.5	339.2	329.6	321.5	310.3	301.0	292.1
5400	378.7	363.7	361.1	355.2	349.5	345.1	335.3	327.1	315.7	306.3	297.2
5600	378.7	369.7	367.1	361.1	355.3	350.9	340.9	332.6	320.9	311.4	302.1
CLIMB LIMIT WT (1000 KG)	297.9	297.9	297.8	293.5	287.5	282.8	272.4	263.5	250.7	240.1	230.1

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1700 kg.

With engine and wing anti-ice on, decrease field limit weight by 2200 kg and climb limit weight by 2100 kg.

Takeoff Field & Climb Limit Weights - Wet Runway**Flaps 15****8000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
2240	241.3	218.5	215.8	210.8	207.3	205.0	199.5	194.3	187.5	182.2	177.0
2400	249.7	226.1	223.3	218.1	214.4	212.1	206.3	201.0	194.0	188.5	183.1
2600	262.7	238.0	235.1	229.6	225.8	223.3	217.3	211.7	204.4	198.7	193.0
2800	273.5	247.7	244.7	239.0	235.0	232.5	226.2	220.4	212.7	206.7	200.9
3000	282.0	255.2	252.0	246.1	241.9	239.3	232.7	226.7	218.7	212.5	206.4
3200	290.4	262.5	259.2	253.1	248.8	246.0	239.2	232.9	224.6	218.1	211.7
3400	298.7	269.8	266.4	260.0	255.5	252.6	245.6	239.0	230.4	223.7	217.1
3600	306.8	276.9	273.4	266.8	262.1	259.2	251.9	245.1	236.2	229.3	222.5
3800	314.6	283.9	280.3	273.5	268.7	265.7	258.2	251.3	242.1	235.0	228.0
4000	322.3	290.8	287.1	280.1	275.2	272.1	264.4	257.3	247.9	240.6	233.4
4200	329.7	297.5	293.7	286.5	281.5	278.4	270.5	263.2	253.6	246.1	238.7
4400	337.0	304.0	300.1	292.8	287.7	284.5	276.4	269.0	259.1	251.4	243.9
4600	344.1	310.4	306.4	299.0	293.7	290.4	282.2	274.6	264.5	256.7	249.0
4800	351.0	316.6	312.5	304.9	299.6	296.2	287.8	280.1	269.8	261.8	254.0
5000	357.7	322.6	318.5	310.8	305.3	301.9	293.3	285.4	275.0	266.8	258.8
5200	364.2	328.5	324.3	316.4	310.9	307.4	298.6	290.6	280.0	271.7	263.5
5400	370.6	334.2	330.0	322.0	316.3	312.7	303.9	295.7	284.9	276.4	268.1
5600	376.7	339.8	335.5	327.3	321.6	317.9	308.9	300.6	289.6	281.0	272.6
CLIMB LIMIT WT (1000 KG)	273.7	273.7	270.5	262.7	256.7	253.2	243.8	234.7	222.5	213.2	204.0

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1700 kg.

With engine and wing anti-ice on, decrease field limit weight by 2200 kg and climb limit weight by 2100 kg.

Takeoff Obstacle Limit Weight**Flaps 15****Sea Level, 33°C & Below, Zero Wind****Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or Auto**

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	294.9	319.3	342.2	358.7							
20	274.3	297.3	315.6	330.9	344.4	355.8	362.6				
40	253.2	275.8	293.8	309.0	321.8	332.6	342.4	350.6	356.2	360.7	364.6
60	238.8	258.5	277.5	293.1	305.8	316.6	325.7	333.7	340.6	347.7	352.5
80	227.0	245.4	263.8	279.7	292.7	303.6	312.9	320.9	328.0	334.2	339.8
100	214.9	235.9	252.1	267.8	281.2	292.3	301.8	310.1	317.3	323.7	329.3
120	204.5	227.2	242.6	257.4	270.8	282.3	292.0	300.5	307.9	314.5	320.3
140	195.3	218.0	234.8	248.2	261.4	273.0	283.1	291.7	299.3	306.1	312.1
160		209.5	227.3	240.6	253.0	264.6	274.7	283.7	291.5	298.4	304.6
180		201.8	219.8	233.9	245.3	256.8	267.0	276.1	284.1	291.2	297.5
200		194.6	212.7	227.5	239.0	249.6	259.9	269.0	277.2	284.5	291.0
220			206.1	221.0	233.1	243.3	253.2	262.4	270.6	278.1	284.7
240			199.9	215.0	227.4	237.7	247.0	256.2	264.5	272.0	278.8
260			194.1	209.2	221.8	232.4	241.6	250.3	258.7	266.2	273.1
280				203.7	216.5	227.3	236.6	244.9	253.2	260.8	267.7
300					198.5	211.4	222.4	231.8	240.1	248.0	255.6

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

OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)						
	160	200	240	280	320	360	400
33 & BELOW	0	0	0	0	0	0	0
34	-1.0	-1.3	-1.6	-1.8	-2.1	-2.4	-2.7
36	-3.9	-5.0	-6.0	-7.1	-8.2	-9.2	-10.3
38	-6.8	-8.7	-10.5	-12.4	-14.2	-16.1	-18.0
40	-9.7	-12.4	-15.0	-17.6	-20.3	-22.9	-25.6
42	-13.0	-16.4	-19.9	-23.4	-26.8	-30.3	-33.8
44	-16.2	-20.5	-24.8	-29.1	-33.3	-37.6	-41.9
46	-19.4	-24.5	-29.6	-34.8	-39.9	-45.0	-50.1
48	-22.7	-28.6	-34.5	-40.5	-46.4	-52.3	-58.2
50	-25.9	-32.7	-39.4	-46.2	-52.9	-59.7	-66.4

Pressure Altitude Adjustment

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	160	200	240	280	320	360	400
S.L. & BELOW	0	0	0	0	0	0	0
1000	-6.8	-8.3	-9.8	-11.3	-12.9	-14.4	-15.9
2000	-13.5	-16.6	-19.6	-22.7	-25.7	-28.8	-31.8
3000	-19.3	-23.8	-28.3	-32.7	-37.2	-41.6	-46.1
4000	-25.2	-31.0	-36.9	-42.8	-48.6	-54.5	-60.4
5000	-31.2	-38.4	-45.6	-52.8	-60.0	-67.2	-74.5
6000	-37.2	-45.8	-54.3	-62.9	-71.4	-80.0	-88.6
7000	-43.6	-53.8	-64.1	-74.3	-84.5	-94.8	-105.0
8000	-50.0	-61.9	-73.8	-85.7	-97.6	-109.5	-121.4

Takeoff Obstacle Limit Weight**Flaps 15****Wind Adjustment**

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	160	200	240	280	320	360	400
15 TW	-34.2	-34.0	-33.7	-33.5	-33.2	-33.0	-32.7
10 TW	-22.8	-22.7	-22.5	-22.3	-22.2	-22.0	-21.8
5 TW	-11.4	-11.3	-11.2	-11.2	-11.1	-11.0	-10.9
0	0	0	0	0	0	0	0
10 HW	3.9	3.6	3.3	2.9	2.6	2.3	2.0
20 HW	7.9	7.2	6.5	5.9	5.2	4.6	3.9
30 HW	12.2	11.1	10.1	9.0	7.9	6.9	5.8
40 HW	16.5	15.0	13.6	12.1	10.6	9.2	7.7

With engine bleed for packs off, increase weight by 900 kg.

With engine and wing anti-ice on, decrease weight by 2500 kg.

Tire Speed Limit**Flaps 15**

AIRPORT OAT	TIRE SPEED LIMIT WEIGHT (1000 KG)					AIRPORT PRESSURE ALTITUDE (FT)
°C	°F	0	2000	4000	6000	8000
54	129	378.7	365.2	330.4	305.8	283.4
52	126	378.7	367.2	332.4	307.6	285.0
50	122	378.7	369.2	334.5	309.3	286.6
48	118	378.7	371.3	336.6	311.1	288.3
46	115	378.7	373.3	338.7	312.9	290.0
44	111	378.7	375.2	340.9	314.7	291.6
42	108	378.7	377.5	350.8	316.5	293.4
40	104	378.7	378.7	352.8	318.3	295.1
38	100	378.7	378.7	354.8	320.2	296.8
36	97	378.7	378.7	356.9	322.2	298.6
34	93	378.7	378.7	358.9	324.1	300.4
32	90	378.7	378.7	360.8	325.9	302.1
30	86	378.7	378.7	362.7	327.7	303.7
28	82	378.7	378.7	364.6	329.6	305.4
26	79	378.7	378.7	366.7	331.6	307.1
24	75	378.7	378.7	368.7	333.6	308.8
22	72	378.7	378.7	370.9	335.8	310.5
20	68	378.7	378.7	373.2	338.0	312.3
18	64	378.7	378.7	375.4	340.6	314.1
16	61	378.7	378.7	377.7	350.3	316.0
14	57	378.7	378.7	378.7	352.5	317.9
12	54	378.7	378.7	378.7	354.7	320.0
10	50	378.7	378.7	378.7	356.9	322.0
-40	-40	378.7	378.7	378.7	378.7	378.7

Increase tire speed limit weight by 2450 kg per knot headwind.

Decrease tire speed limit weight by 5600 kg per knot tailwind.

Takeoff Speeds - Dry Runway**Flaps 15****V1, VR, V2 for Max Takeoff Thrust**

WEIGHT (1000 KG)	KIAS		
	V1	VR	V2
360	167	174	178
340	164	170	176
320	158	165	171
300	152	158	166
280	146	152	161
260	138	145	156
240	130	138	151
220	122	131	145
200	113	123	139
180	103	114	132
160	93	105	125
140	82	96	118

Check V1(MCG), Minimum V2, and Minimum Takeoff Weight.

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	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	12	15					6	7					-2	-3				
60	140	8	10	13	15			4	5	7	8			-2	-2	-2	-3		
50	122	4	6	8	11	14	17	2	3	5	6	7	9	-1	-1	-2	-2	-2	-3
40	104	1	2	5	7	10	14	1	1	3	4	6	8	0	-1	-1	-1	-2	-2
30	86	0	0	2	4	7	11	0	0	1	3	4	6	0	0	0	-1	-1	-2
20	68	0	0	1	3	5	9	0	0	1	2	3	5	0	0	0	-1	-1	-2
-60	-76	0	0	1	3	5	8	0	0	1	2	3	4	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		
360	-4	-2	0	3	6	-3	-2	0	0	1	2	3	4		
340	-4	-1	0	3	5	-3	-2	0	0	1	2	3	3		
320	-3	-1	0	3	5	-2	-1	0	0	1	2	3	3		
300	-3	-1	0	3	4	-2	-1	0	0	1	2	3	3		
280	-3	-1	0	3	4	-2	-1	0	0	1	2	2	3		
260	-2	-1	0	2	4	-2	-1	0	0	1	2	2	3		
240	-2	0	0	2	4	-1	-1	0	0	1	2	3	3		
220	-2	0	0	2	4	-1	0	0	0	1	2	3	3		
200	-2	0	0	3	4	-1	0	0	0	1	2	3	3		
180	-1	0	0	3	4	-1	0	1	0	1	3	3	4		
160	-1	0	0	3	4	-1	0	1	0	1	3	3	4		
140	-1	0	0	3	4	-1	0	1	0	1	3	4	4		

*V1 not to exceed VR

Takeoff Speeds - Dry Runway**Flaps 15****V1(MCG)****Max Takeoff Thrust**

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	125	121	119	117		
50	122	128	125	119	117	115	110
40	104	136	133	127	122	116	110
30	86	138	137	133	127	122	115
20	68	138	138	134	130	126	119
-60	-76	140	139	135	131	127	121

Minimum V2**Max Takeoff Thrust**

PRESSURE ALTITUDE (FT)	-2000	0	2000	4000	6000	8000
SPEED (KIAS)	135	133	131	128	126	123

Takeoff Speeds - Wet Runway**Flaps 15****V1, VR, V2 for Max Takeoff Thrust**

WEIGHT (1000 KG)	KIAS					
	V1		VR		V2	
360	159		174		178	
340	155		170		176	
320	148		165		171	
300	141		158		166	
280	134		152		161	
260	126		145		156	
240	118		138		151	
220	110		131		145	
200	100		123		139	
180	92		114		132	
160	81		105		125	
140	71		96		118	

Check V1(MCG), Minimum V2, and Minimum Takeoff Weight.

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	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	14	17					6	7					-2	-3				
60	140	9	11	14	16			4	5	7	8			-2	-2	-2	-3		
50	122	5	7	9	12	14	18	2	3	5	6	7	9	-1	-1	-2	-2	-2	-3
40	104	1	2	5	8	11	15	1	1	3	4	6	8	0	-1	-1	-1	-2	-2
30	86	0	0	2	5	8	12	0	0	1	3	4	6	0	0	0	-1	-1	-2
20	68	0	0	1	3	6	9	0	0	1	2	3	5	0	0	0	-1	-1	-2
-60	-76	0	0	1	3	5	8	0	0	1	2	3	4	0	0	0	-1	-1	-1

Takeoff Speeds - Wet Runway**Flaps 15****Slope and Wind V1 Adjustment***

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
360	-6	-3	0	3	6	-4	-3	-1	0	1	2	3	4
340	-6	-3	0	3	6	-4	-3	-1	0	1	2	3	4
320	-6	-3	0	3	6	-5	-3	-1	0	1	2	3	4
300	-5	-3	0	3	5	-5	-3	-1	0	1	2	3	4
280	-5	-2	0	3	5	-5	-3	-1	0	1	2	3	4
260	-4	-2	0	3	5	-5	-3	-1	0	1	3	4	5
240	-4	-2	0	3	5	-5	-3	-1	0	1	3	4	5
220	-3	-1	0	3	5	-4	-2	-1	0	2	3	4	5
200	-3	-1	0	3	5	-4	-2	0	0	2	4	5	6
180	-2	0	0	4	6	-3	-1	0	0	2	4	5	6
160	-1	1	0	4	6	-2	-1	1	0	2	5	6	7
140	0	2	0	5	6	-2	0	2	0	3	5	6	7

*V1 not to exceed VR

V1(MCG)**Max Takeoff Thrust**

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	125	121	119	117		
50	122	128	125	119	117	115	110
40	104	136	133	127	122	116	110
30	86	138	137	133	127	122	115
20	68	138	138	134	130	126	119
-60	-76	140	139	135	131	127	121

Minimum V2**Max Takeoff Thrust**

PRESSURE ALTITUDE (FT)	-2000	0	2000	4000	6000	8000
SPEED (KIAS)	135	133	131	128	126	123

Performance Dispatch**Enroute****Chapter PD****Section 31****Long Range Cruise Maximum Operating Altitude****Max Climb Thrust****ISA + 10°C and Below**

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	5	30400	28800	27200
350	27900	4	31000	29400	27800
340	28500	3	31700	30000	28500
330	29200	1	32200	30500	29000
320	29900	0	32700	31000	29500
310	30600	-2	33200	31600	30000
300	31300	-4	33700	32100	30600
290	32000	-5	34300	32700	31200
280	32800	-7	34900	33300	31800
270	33600	-9	35500	33900	32400
260	34400	-11	36100	34500	31100
250	35200	-12	36800	35200	33800
240	36000	-14	37500	35900	34500
230	36900	-15	38200	36600	35200
220	37800	-15	39000	37400	36000
210	38800	-15	39800	38200	36800
200	39800	-15	40600	39000	37700
190	40900	-15	41500	39900	38600
180	42000	-15	42500	40900	39600
170	43100	-15	43100	42100	40800
160	43100	-15	43100	43100	42000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	11	30400	28800	27200
350	27900	10	31000	29400	27800
340	28500	8	31700	30000	28500
330	29200	7	32200	30500	29000
320	29900	5	32700	31000	29500
310	30600	4	33200	31600	30000
300	31300	2	33700	32100	30600
290	32000	0	34300	32700	31200
280	32800	-1	34900	33300	31800
270	33600	-3	35500	33900	32400
260	34400	-5	36100	34500	33100
250	35200	-7	36800	35200	33800
240	36000	-9	37500	35900	34500
230	36900	-9	38200	36600	35200
220	37800	-9	39000	37400	36000
210	38800	-9	39800	38200	36800
200	39800	-9	40600	39000	37700
190	40900	-9	41500	39900	38600
180	42000	-9	42500	40900	39600
170	43100	-9	43100	42100	40800
160	43100	-9	43100	43100	42000

Long Range Cruise Maximum Operating Altitude**Max Climb Thrust**

ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	17	30400	28800	27200
350	27900	15	31000	29400	27800
340	28500	14	31700	30000	28500
330	29200	12	32200	30500	29000
320	29900	11	32700	31000	29500
310	30600	9	33200	31600	30000
300	31300	8	33700	32100	30600
290	32000	6	34300	32700	31200
280	32800	4	34900	33300	31800
270	33600	3	35500	33900	32400
260	34400	1	36100	34500	33100
250	35200	-1	36800	35200	33800
240	36000	-3	37500	35900	34500
230	36900	-3	38200	36600	35200
220	37800	-3	39000	37400	36000
210	38800	-3	39800	38200	36800
200	39800	-3	40600	39000	37700
190	40900	-3	41500	39900	38600
180	42000	-3	42500	40900	39600
170	43100	-3	43100	42100	40800
160	43100	-3	43100	43100	42000

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	
665	625	588	556	526	500	479	458	440	423	407
1320	1242	1171	1108	1052	1000	958	919	883	850	820
1973	1857	1752	1660	1576	1500	1438	1381	1327	1278	1233
2623	2471	2333	2211	2101	2000	1918	1842	1771	1706	1647
3271	3083	2913	2761	2625	2500	2398	2304	2216	2135	2061
3915	3693	3491	3311	3149	3000	2879	2766	2661	2564	2475
4556	4301	4068	3860	3672	3500	3359	3228	3106	2993	2890
5195	4906	4643	4407	4195	4000	3840	3690	3551	3422	3304
5831	5510	5216	4954	4717	4500	4320	4152	3995	3851	3719
6465	6112	5788	5500	5240	5000	4800	4613	4440	4280	4133
7096	6712	6360	6046	5762	5500	5280	5075	4885	4709	4547
7726	7311	6931	6591	6283	6000	5761	5537	5329	5137	4961
8354	7909	7501	7136	6805	6500	6240	5998	5773	5565	5375
8981	8506	8070	7680	7326	7000	6720	6460	6217	5993	5788
9607	9102	8639	8224	7847	7500	7201	6921	6661	6421	6201
10233	9698	9208	8768	8368	8000	7681	7382	7105	6849	6614
10858	10294	9777	9312	8890	8500	8161	7844	7549	7277	7028
11483	10890	10345	9856	9411	9000	8641	8305	7993	7705	7441
12108	11486	10914	10399	9932	9500	9121	8766	8437	8133	7854
12732	12081	11482	10943	10453	10000	9601	9228	8881	8561	8267

Long Range Cruise Trip Fuel and Time**Reference Fuel and Time Required**

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	27		29		31		33	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
500	8.6	1:19	8.4	1:18	8.4	1:17	8.3	1:15
1000	15.8	2:30	15.5	2:28	15.2	2:24	14.9	2:20
1500	23.2	3:40	22.7	3:36	22.2	3:29	21.8	3:23
2000	30.7	4:50	29.9	4:43	29.3	4:34	28.6	4:27
2500	38.4	5:58	37.4	5:49	36.6	5:38	35.7	5:29
3000	46.1	7:06	45.0	6:55	43.9	6:42	42.8	6:32
3500	54.2	8:11	52.8	7:58	51.5	7:44	50.2	7:34
4000	62.3	9:17	60.6	9:02	59.1	8:47	57.6	8:36
4500	70.7	10:21	68.8	10:04	67.0	9:48	65.3	9:38
5000	79.1	11:25	76.9	11:07	74.9	10:50	73.1	10:39
5500	87.8	12:27	85.4	12:08	83.1	11:51	81.2	11:41
6000	96.6	13:29	93.8	13:10	91.3	12:53	89.3	12:42
6500	105.7	14:30	102.7	14:11	100.0	13:54	97.9	13:44
7000	114.8	15:32	111.5	15:11	108.6	14:55	106.5	14:46
7500	124.3	16:32	120.7	16:12	117.8	15:56	115.8	15:48
8000	133.8	17:33	130.0	17:13	126.9	16:57	125.1	16:50
8500	143.9	18:33	139.8	18:13	136.7	17:58	135.3	17:52
9000	153.9	19:33	149.7	19:14	146.5	19:00	145.5	18:54
9500	164.4	20:33	160.1	20:15	157.2	20:01	156.8	19:57
10000	175.0	21:33	170.5	21:15	167.9	21:03	168.0	21:00

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	160	180	200	220	240
20	-2.1	-1.1	0.0	1.2	2.7
30	-3.1	-1.6	0.0	1.9	4.3
40	-4.2	-2.1	0.0	2.7	6.2
50	-5.3	-2.7	0.0	3.6	8.3
60	-6.4	-3.2	0.0	4.7	10.7
70	-7.5	-3.8	0.0	5.9	13.4
80	-8.7	-4.4	0.0	7.2	16.3
90	-9.8	-5.0	0.0	8.6	19.5
100	-11.0	-5.6	0.0	10.2	23.0
110	-12.2	-6.2	0.0	11.9	26.7
120	-13.4	-6.8	0.0	13.7	30.7
130	-14.6	-7.5	0.0	15.7	35.0
140	-15.9	-8.1	0.0	17.8	39.5
150	-17.1	-8.8	0.0	20.0	44.3
160	-18.4	-9.5	0.0	22.3	49.4
170	-19.7	-10.2	0.0	24.8	54.7
180	-21.0	-10.9	0.0	27.3	60.3

Based on 310/.84 climb, Long Range Cruise and .84/310/250 descent.

Long Range Cruise Step Climb 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	
1292	1221	1157	1099	1047	1000	957	917	881	847	816	
1923	1820	1728	1645	1569	1500	1437	1379	1325	1276	1229	
2554	2420	2299	2190	2091	2000	1917	1840	1770	1704	1643	
3185	3020	2871	2735	2612	2500	2397	2302	2214	2133	2057	
3816	3619	3442	3281	3134	3000	2877	2764	2659	2562	2472	
4446	4218	4012	3826	3656	3500	3357	3225	3104	2991	2886	
5077	4817	4583	4371	4177	4000	3837	3687	3548	3420	3300	
5707	5416	5154	4916	4699	4500	4317	4149	3993	3849	3715	
6336	6015	5724	5461	5220	5000	4798	4611	4438	4278	4129	
6966	6613	6295	6006	5742	5500	5278	5073	4883	4707	4544	
7595	7212	6865	6550	6263	6000	5758	5535	5329	5137	4959	
8224	7810	7435	7095	6784	6500	6238	5997	5774	5566	5373	
8853	8408	8005	7640	7306	7000	6719	6459	6219	5996	5788	
9481	9006	8575	8184	7827	7500	7199	6921	6664	6426	6204	
10110	9603	9145	8729	8348	8000	7679	7384	7110	6855	6619	
10738	10201	9715	9273	8870	8500	8160	7846	7555	7285	7034	
11366	10798	10284	9817	9391	9000	8640	8308	8001	7715	7449	
11993	11395	10854	10362	9912	9500	9121	8771	8446	8145	7865	
12621	11992	11423	10906	10433	10000	9601	9233	8892	8575	8280	

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG)								TIME (HRS:MIN)
	LANDING WEIGHT (1000 KG)								
150	160	170	180	190	200	210	220	230	
1000	11.8	12.2	12.7	13.3	13.8	14.5	14.9	15.5	16.0
1500	16.9	17.6	18.3	19.1	20.0	20.9	21.6	22.4	23.3
2000	22.1	23.0	24.1	25.2	26.4	27.5	28.5	29.6	30.9
2500	27.4	28.6	29.9	31.4	32.9	34.3	35.6	37.1	38.6
3000	32.9	34.4	36.0	37.8	39.5	41.3	42.9	44.7	46.5
3500	38.5	40.3	42.3	44.3	46.4	48.4	50.4	52.5	54.6
4000	44.2	46.3	48.7	51.0	53.4	55.8	58.1	60.5	63.0
4500	50.1	52.6	55.2	57.9	60.6	63.4	66.0	68.8	71.5
5000	56.2	59.0	61.9	64.9	68.1	71.2	74.1	77.2	80.3
5500	62.5	65.6	68.8	72.2	75.7	79.2	82.5	85.9	89.4
6000	68.9	72.3	75.9	79.7	83.6	87.4	91.0	94.8	98.8
6500	75.4	79.2	83.2	87.4	91.6	95.8	99.8	104.1	108.5
7000	82.1	86.3	90.8	95.3	99.9	104.4	108.9	113.6	118.4
7500	89.0	93.6	98.5	103.4	108.3	113.3	118.2	123.4	128.6
8000	96.1	101.2	106.4	111.7	117.0	122.5	127.9	133.4	139.0
8500	103.4	108.9	114.5	120.2	126.1	132.0	137.8	143.8	149.8
9000	111.0	116.8	122.8	129.0	135.3	141.7	148.0	154.4	160.9
9500	118.7	124.9	131.4	138.0	144.9	151.7	158.4	165.3	172.2
10000	126.6	133.3	140.2	147.4	154.7	162.0	169.2	176.5	183.9

Based on 310/.84 climb, Long Range Cruise and .84/310/250 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	143	129	118	108	100	93	87	82	77	73	
225	205	187	173	161	150	141	132	125	118	113	
288	264	245	228	213	200	189	178	169	161	153	
349	323	301	282	265	250	237	225	214	204	195	
410	382	357	336	317	300	285	271	258	247	237	
471	440	414	390	369	350	333	317	303	290	279	
532	499	470	444	421	400	381	364	348	334	320	
595	559	527	499	473	450	429	410	393	376	362	
660	621	585	554	526	500	477	456	436	419	402	

Trip Fuel and Time

AIR DIST (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		160	180	200	220	240	
50	FUEL (1000 KG)	1.6	1.8	1.9	2.0	2.1	0:14
	ALT (FT)	11000	9000	9000	7000	5000	
100	FUEL (1000 KG)	2.4	2.6	2.7	2.8	3.0	0:23
	ALT (FT)	15000	13000	13000	13000	13000	
150	FUEL (1000 KG)	3.2	3.4	3.5	3.7	3.9	0:30
	ALT (FT)	21000	21000	21000	21000	21000	
200	FUEL (1000 KG)	3.8	4.1	4.3	4.5	4.8	0:37
	ALT (FT)	27000	27000	27000	25000	25000	
250	FUEL (1000 KG)	4.4	4.7	5.0	5.3	5.6	0:43
	ALT (FT)	37000	31000	29000	29000	29000	
300	FUEL (1000 KG)	5.0	5.3	5.6	6.0	6.3	0:48
	ALT (FT)	41000	39000	37000	35000	33000	
350	FUEL (1000 KG)	5.5	5.9	6.2	6.6	7.0	0:54
	ALT (FT)	43000	39000	37000	35000	35000	
400	FUEL (1000 KG)	6.0	6.4	6.9	7.3	7.8	1:00
	ALT (FT)	43000	39000	37000	37000	35000	
450	FUEL (1000 KG)	6.5	7.0	7.5	8.0	8.5	1:06
	ALT (FT)	43000	41000	39000	37000	35000	
500	FUEL (1000 KG)	7.0	7.6	8.1	8.7	9.2	1:13
	ALT (FT)	43000	41000	39000	37000	35000	

Holding Planning

Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)									
	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
360	9310	9240	9140	9180	9690	10040	10600			
340	8810	8730	8620	8620	9080	9360	9780			
320	8250	8160	8050	8030	8430	8630	8950	9950		
300	7720	7630	7510	7480	7600	7980	8260	8850		
280	7250	7150	7030	6970	7000	7380	7620	8060		
260	6790	6670	6530	6470	6470	6800	6990	7250	8510	
240	6350	6220	6060	5980	5970	6030	6380	6590	7270	
220	5940	5790	5610	5530	5490	5490	5770	5960	6450	7070
200	5590	5430	5230	5140	5070	5040	5150	5350	5660	6020
180	5270	5100	4900	4800	4710	4760	4650	4750	5000	5210
160	5120	4940	4750	4610	4500	4440	4330	4310	4460	4560

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
360	10290	10260	10210	10300	10530
340	9680	9630	9570	9620	9830
320	9080	9030	8960	8980	9160
300	8510	8450	8370	8380	8520
280	7940	7870	7770	7770	7860
260	7390	7300	7190	7190	7240
240	6860	6740	6630	6600	6620
220	6340	6200	6070	6010	6020
200	5880	5720	5550	5470	5430
180	5480	5300	5110	5020	4960
160	5260	5080	4860	4760	4660

These tables include 5% additional fuel for holding in a racetrack pattern.

Crew Oxygen Requirements

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

BOTTLE TEMPERATURE		NUMBER OF CREW USING OXYGEN		
°C	°F	2	3	4
50	122	325	435	545
45	113	320	430	540
40	104	315	420	530
35	95	310	415	520
30	86	305	410	510
25	77	300	400	505
20	68	295	395	495
15	59	290	390	485
10	50	285	380	480
5	41	280	375	470
0	32	275	370	460
-5	23	270	360	455
-10	14	265	355	445

For more extensive than normal crew usage, add 0.6 psi/person/minute.

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
32	166.0	164.5	161.0
30	183.7	181.5	175.5
28	197.9	193.2	185.8
26	213.1	207.2	199.2
24	229.4	222.1	213.9
22	246.8	238.7	230.1
20	271.4	264.3	254.0
18	293.8	284.5	273.3
16	318.2	306.9	294.9
14	339.7	326.4	313.5
12	361.3	347.4	334.2

Anti-Ice Adjustments

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)								
	PRESSURE ALTITUDE (1000 FT)								
	14	16	18	20	22	24	26	28	30
ENGINE ONLY	-0.7	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ENGINE AND WING	-2.7	-2.0	-1.6	-1.2	-1.3	-1.4	-1.5	-1.5	-1.5

ALL ENGINES**Decompression Critical Fuel Reserves - LRC Cruise****Ground to Air Miles Conversion**

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEAD WIND COMPONENT (KTS)				20	20	TAIL WIND COMPONENT (KTS)				100
100	80	60	40	20		20	40	60	80	
283	261	243	227	212	200	189	179	170	162	155
567	523	486	453	425	400	378	358	340	324	309
851	785	729	680	638	600	567	537	510	486	463
1134	1047	972	907	850	800	755	716	680	647	618
1418	1309	1215	1134	1063	1000	944	895	850	809	772
1702	1570	1458	1360	1275	1200	1133	1073	1020	971	927
1985	1832	1701	1587	1488	1400	1322	1252	1190	1133	1081
2269	2094	1944	1814	1700	1600	1511	1431	1360	1295	1236
2553	2356	2187	2041	1913	1800	1700	1610	1529	1456	1390
2836	2617	2430	2267	2125	2000	1889	1789	1699	1618	1545
3120	2879	2673	2494	2338	2200	2077	1968	1869	1780	1699
3404	3141	2916	2721	2550	2400	2266	2147	2039	1942	1853
3687	3403	3159	2948	2763	2600	2455	2326	2209	2104	2008
3971	3665	3402	3174	2976	2800	2644	2505	2379	2266	2162
4255	3926	3645	3401	3188	3000	2833	2683	2549	2427	2317

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)										
	160	180	200	220	240	260	280	300	320	340	360
200	4.2	4.3	4.5	4.7	4.9	5.1	5.3	5.5	5.7	6.0	6.2
400	7.6	7.9	8.1	8.5	8.9	9.3	9.6	9.9	10.3	10.7	11.1
600	11.0	11.4	11.8	12.3	12.8	13.3	13.8	14.3	14.8	15.4	16.0
800	14.4	14.9	15.4	16.1	16.7	17.4	18.0	18.6	19.3	20.0	20.8
1000	17.8	18.4	19.1	19.8	20.6	21.4	22.2	22.9	23.7	24.6	25.6
1200	21.1	21.9	22.7	23.6	24.5	25.4	26.4	27.2	28.1	29.2	30.3
1400	24.5	25.3	26.2	27.2	28.3	29.4	30.5	31.5	32.6	33.8	35.1
1600	27.8	28.7	29.7	30.9	32.1	33.3	34.5	35.7	36.9	38.2	39.7
1800	31.1	32.1	33.2	34.5	35.9	37.2	38.5	39.9	41.2	42.6	44.3
2000	34.5	35.5	36.8	38.2	39.6	41.1	42.6	44.0	45.5	47.1	48.8
2200	37.8	38.8	40.2	41.8	43.4	45.0	46.6	48.2	49.8	51.5	53.4
2400	41.1	42.2	43.6	45.3	47.0	48.8	50.5	52.3	54.0	55.8	57.9
2600	44.5	45.5	47.0	48.8	50.7	52.6	54.4	56.3	58.2	60.1	62.3
2800	47.8	48.8	50.4	52.3	54.3	56.3	58.4	60.3	62.3	64.5	66.7
3000	51.1	52.1	53.8	55.9	58.0	60.1	62.3	64.4	66.5	68.8	71.2

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 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (3%) for the total forecast time or engine and wing anti-ice on and ice drag (7%) for 10% of the forecast time.

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

ENGINE INOP**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	
286	263	244	227	213	200	189	179	169	161	154	
572	527	488	455	426	400	377	357	339	322	308	
858	790	732	682	638	600	566	536	508	484	461	
1145	1054	976	910	851	800	755	714	678	645	615	
1431	1317	1221	1137	1064	1000	943	892	847	806	769	
1717	1581	1465	1364	1277	1200	1132	1071	1016	967	922	
2003	1844	1709	1592	1490	1400	1320	1249	1186	1128	1076	
2290	2108	1953	1819	1703	1600	1509	1428	1355	1289	1230	
2576	2372	2197	2047	1915	1800	1698	1606	1524	1450	1383	
2862	2635	2441	2274	2128	2000	1886	1785	1694	1612	1537	
3149	2899	2685	2501	2341	2200	2075	1963	1863	1773	1691	
3435	3162	2930	2729	2554	2400	2264	2142	2033	1934	1844	
3721	3426	3174	2956	2767	2600	2452	2320	2202	2095	1998	
4007	3689	3418	3184	2980	2800	2641	2499	2371	2256	2152	
4294	3953	3662	3411	3192	3000	2829	2677	2541	2417	2305	

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)										
	160	180	200	220	240	260	280	300	320	340	360
200	4.0	4.1	4.4	4.7	4.9	5.1	5.4	5.6	5.8	6.1	6.4
400	7.2	7.6	8.0	8.4	8.9	9.4	9.8	10.2	10.7	11.1	11.6
600	10.5	11.0	11.6	12.2	12.9	13.5	14.1	14.8	15.4	16.2	16.8
800	13.8	14.5	15.2	16.0	16.8	17.6	18.4	19.3	20.1	21.0	21.9
1000	17.0	17.9	18.8	19.8	20.8	21.8	22.7	23.7	24.7	25.8	26.9
1200	20.1	21.2	22.3	23.5	24.7	25.9	27.0	28.2	29.4	30.6	31.9
1400	23.2	24.5	25.7	27.1	28.5	29.9	31.2	32.6	33.9	35.4	36.9
1600	26.3	27.7	29.2	30.7	32.3	33.8	35.3	36.9	38.4	40.1	41.8
1800	29.4	31.0	32.6	34.3	36.0	37.8	39.5	41.2	42.9	44.7	46.6
2000	32.5	34.3	36.1	37.9	39.8	41.7	43.6	45.5	47.4	49.3	51.4
2200	35.6	37.5	39.4	41.5	43.5	45.6	47.7	49.7	51.8	53.9	56.2
2400	38.7	40.6	42.7	44.9	47.2	49.4	51.6	53.8	56.1	58.4	60.8
2600	41.8	43.7	46.0	48.4	50.8	53.2	55.6	57.9	60.4	62.9	65.4
2800	44.9	46.8	49.2	51.8	54.4	57.0	59.5	62.1	64.7	67.3	70.1
3000	48.0	49.9	52.5	55.2	58.0	60.7	63.5	66.2	68.9	71.7	74.6

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. 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 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (9%) 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**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	
264	248	234	221	210	200	190	182	174	167	160	
531	498	469	444	420	400	381	363	348	333	320	
800	750	706	666	631	600	571	545	521	499	479	
1072	1003	943	890	842	800	761	726	694	665	638	
1344	1257	1181	1114	1054	1000	951	906	866	829	795	
1618	1513	1420	1338	1265	1200	1140	1087	1038	994	953	
1894	1769	1659	1563	1477	1400	1330	1267	1210	1158	1110	
2170	2026	1899	1788	1688	1600	1520	1447	1382	1321	1266	
2447	2283	2139	2013	1900	1800	1709	1627	1553	1485	1423	
2725	2541	2380	2238	2112	2000	1898	1807	1724	1648	1579	
3003	2799	2620	2463	2324	2200	2088	1987	1895	1812	1735	
3281	3056	2861	2688	2536	2400	2277	2167	2066	1975	1891	
3559	3314	3101	2914	2748	2600	2467	2346	2238	2138	2047	
3836	3572	3341	3139	2959	2800	2656	2526	2409	2302	2204	
4113	3829	3581	3364	3171	3000	2845	2706	2580	2465	2360	

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)										
	160	180	200	220	240	260	280	300	320	340	360
200	4.6	4.8	5.1	5.3	5.5	5.6	5.8	6.1	6.3	6.5	6.8
400	7.1	7.6	8.1	8.6	9.1	9.5	10.0	10.4	11.0	11.5	12.2
600	9.5	10.2	11.1	11.8	12.5	13.2	13.9	14.6	15.4	16.3	17.3
800	11.9	12.9	13.9	15.0	15.9	16.8	17.8	18.7	19.8	21.1	22.3
1000	14.2	15.4	16.8	18.1	19.2	20.4	21.6	22.8	24.2	25.7	27.3
1200	16.5	18.0	19.6	21.1	22.5	24.0	25.4	26.9	28.5	30.3	32.2
1400	18.7	20.5	22.3	24.1	25.8	27.5	29.2	30.9	32.7	34.8	37.1
1600	21.0	23.0	25.0	27.1	29.0	31.0	32.9	34.8	36.9	39.3	41.8
1800	23.1	25.4	27.7	30.0	32.1	34.4	36.6	38.7	41.0	43.7	46.5
2000	25.3	27.8	30.4	32.9	35.3	37.8	40.2	42.6	45.1	48.0	51.1
2200	27.5	30.2	33.0	35.7	38.4	41.1	43.8	46.4	49.2	52.3	55.7
2400	29.6	32.6	35.6	38.5	41.5	44.4	47.3	50.2	53.2	56.6	60.2
2600	31.7	34.9	38.1	41.3	44.5	47.7	50.8	53.9	57.1	60.8	64.6
2800	33.8	37.2	40.7	44.1	47.5	51.0	54.3	57.6	61.1	65.0	69.0
3000	35.8	39.5	43.2	46.8	50.4	54.2	57.7	61.3	64.9	69.1	73.4

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 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (12%) 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

Landing

Chapter PD

Section 32

Landing Field Limit Weight - Dry Runway

Flaps 30

Wind Corrected Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1400	1160	1210	1320	1400	1450	1530	1600	1690
1600	1300	1380	1500	1600	1660	1760	1850	1960
1800	1440	1540	1670	1800	1880	1990	2090	2220
2000	1590	1700	1850	2000	2090	2220	2340	2480
2200	1730	1860	2030	2200	2310	2450	2590	2740
2400	1880	2020	2200	2400	2520	2670	2830	3000
2600	2020	2190	2380	2600	2740	2900	3080	3260
2800	2170	2350	2560	2800	2960	3130	3330	3530
3000	2310	2510	2730	3000	3170	3360	3570	3790
3200	2450	2670	2910	3200	3390	3590	3820	4050
3400	2600	2830	3080	3400	3600	3820	4060	4310
3600	2740	3000	3260	3600	3820	4050	4310	4570
3800	2890	3160	3440	3800	4030	4280	4560	4830
4000	3030	3320	3610	4000	4250	4510	4800	5100
4200	3180	3480	3790	4200	4460	4740	5050	5360
4400	3320	3640	3960	4400	4680	4960	5290	5620

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1400	188.7	176.8	166.1	155.9	
1600	227.3	213.3	200.0	187.5	175.6
1800	263.8	249.9	234.4	219.5	205.4
2000	293.0	277.5	265.6	252.5	236.4
2200	309.3	301.2	292.7	276.4	264.6
2400	322.0	313.1	305.0	296.9	287.0
2600	334.7	324.6	315.2	307.0	298.7
2800	347.9	336.1	325.8	316.1	307.8
3000	360.6	348.5	336.3	325.9	316.1
3200	372.1	359.6	347.0	335.3	324.9
3400	383.1	369.9	357.6	344.9	333.5
3600		379.7	366.7	354.7	341.7
3800			375.4	362.8	351.2
4000			384.0	370.5	358.4
4200				377.8	365.3
4400				385.0	371.8

With manual speedbrakes, decrease weight by 21450 kg.

With 1 brake deactivated, decrease weight by 20600 kg.

With 2 brakes deactivated, decrease weight by 41900 kg.

Landing Field Limit Weight - Wet Runway**Flaps 30****Wind Corrected Field Length (M)**

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1400	1180	1230	1340	1400	1440	1520	1580	1670
1600	1320	1390	1510	1600	1650	1750	1830	1930
1800	1470	1550	1690	1800	1870	1980	2080	2200
2000	1610	1710	1860	2000	2080	2200	2320	2460
2200	1750	1870	2040	2200	2300	2430	2570	2720
2400	1900	2040	2220	2400	2510	2660	2820	2980
2600	2040	2200	2390	2600	2730	2890	3060	3240
2800	2190	2360	2570	2800	2950	3120	3310	3500
3000	2330	2520	2740	3000	3160	3350	3550	3770
3200	2480	2680	2920	3200	3380	3580	3800	4030
3400	2620	2850	3100	3400	3590	3810	4050	4290
3600	2760	3010	3270	3600	3810	4040	4290	4550
3800	2910	3170	3450	3800	4020	4270	4540	4810
4000	3050	3330	3630	4000	4240	4500	4780	5070
4200	3200	3490	3800	4200	4450	4720	5030	5340
4400	3340	3660	3980	4400	4670	4950	5280	5600

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1400	153.4				
1600	187.0	175.2	164.6	154.6	
1800	220.6	206.9	194.1	182.0	170.4
2000	253.4	238.7	223.8	209.7	196.3
2200	278.4	266.6	253.6	238.1	222.9
2400	300.4	291.1	275.9	263.7	250.0
2600	313.2	305.1	296.8	285.0	270.5
2800	324.2	315.0	306.8	298.7	289.3
3000	335.2	325.1	315.7	307.4	299.1
3200	346.6	335.1	324.9	315.4	307.0
3400	357.9	345.5	334.0	323.8	314.3
3600	368.1	355.8	343.0	332.1	321.8
3800	377.9	365.0	353.0	340.1	329.4
4000	387.4	373.7	361.2	349.2	336.7
4200		382.3	369.0	356.8	344.1
4400			376.5	363.8	352.1

With manual speedbrakes, decrease weight by 21450 kg.

With 1 brake deactivated, decrease weight by 20600 kg.

With 2 brakes deactivated, decrease weight by 41900 kg.

Landing Climb Limit Weight**Valid for approach with flaps 20 and landing with flaps 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)						
		AIRPORT PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	
54	129	297.3	279.1					
52	126	306.3	287.0					
50	122	315.2	294.5	269.7				
48	118	323.5	303.4	276.9				
46	115	331.8	312.4	284.1	259.6			
44	111	340.4	321.1	291.5	267.7			
42	108	352.1	329.0	299.1	275.0	251.6		
40	104	359.1	337.3	307.2	281.4	257.0		
38	100	366.2	349.6	316.0	287.8	262.8	233.8	
36	97	369.0	356.4	323.2	293.4	269.2	238.4	
34	93	369.3	363.2	330.4	299.7	274.4	243.0	
32	90	369.5	365.7	338.2	306.4	278.7	247.1	
30	86	369.8	365.9	346.1	312.9	282.9	250.9	
28	82	370.1	366.0	352.5	318.7	287.3	254.6	
26	79	370.3	366.1	352.7	322.6	292.2	258.2	
24	75	370.6	366.3	352.8	326.0	297.0	263.1	
22	72	370.8	366.4	352.9	327.4	300.3	268.1	
20	68	371.1	366.5	352.9	327.5	302.5	272.4	
18	64	371.3	366.7	353.0	327.6	304.7	275.2	
16	61	371.6	366.8	353.1	327.6	304.7	276.9	
14	57	371.8	366.9	353.2	327.7	304.8	278.5	
12	54	372.0	367.0	353.3	327.8	304.9	278.6	
10	50	372.2	367.2	353.3	327.9	304.9	278.7	
8	46	372.3	367.3	353.4	327.9	304.9	278.7	
6	43	372.5	367.4	350.4	328.0	304.9	272.8	
4	40	372.6	367.4	341.5	313.7	286.7	254.9	
2	36	372.7	367.5	341.6	313.8	286.8	254.9	
0	32	372.8	367.5	341.6	313.8	286.8	255.0	
-40	-40	373.4	367.8	341.6	313.8	286.8	255.0	

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

With engine bleed for packs off, increase weight by 1250 kg.

With engine and wing anti-ice on, decrease weight by 2350 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 26950 kg.

ENGINE INOP

ADVISORY INFORMATION

Go-Around Climb Gradient**Flaps 20, Gear Up****Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off.**

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
54	9.16	7.98	6.54	5.32	4.09	2.49
50	10.10	8.98	7.32	5.99	4.73	3.07
46	11.06	9.95	8.21	6.69	5.39	3.66
42	11.98	10.90	9.09	7.48	6.08	4.27
38	12.83	11.81	9.96	8.25	6.75	4.90
34	13.01	12.64	10.76	8.97	7.32	5.49
30	13.03	12.79	11.43	9.64	7.87	5.98
26	13.06	12.80	11.74	10.19	8.48	6.46
22	13.08	12.81	11.75	10.46	8.89	6.98
18	13.10	12.83	11.75	10.47	9.15	7.33
14	13.13	12.84	11.76	10.47	9.15	7.55
10	13.15	12.85	11.77	10.48	9.16	7.55

Weight Adjustment

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)											
	2	3	4	5	6	7	8	9	10	11	12	13
320	-4.29	-4.77	-5.26	-5.74	-6.13	-6.59	-7.04	-7.50	-7.95	-8.45	-8.92	-9.39
300	-4.02	-4.44	-4.89	-5.32	-5.66	-6.08	-6.49	-6.90	-7.32	-7.77	-8.21	-8.64
280	-3.56	-3.94	-4.33	-4.72	-5.01	-5.38	-5.74	-6.10	-6.47	-6.89	-7.28	-7.67
260	-3.12	-3.43	-3.77	-4.11	-4.34	-4.66	-4.96	-5.26	-5.58	-5.95	-6.29	-6.63
240	-2.44	-2.67	-2.95	-3.23	-3.39	-3.64	-3.88	-4.11	-4.37	-4.68	-4.96	-5.23
220	-1.61	-1.76	-1.97	-2.17	-2.26	-2.43	-2.58	-2.74	-2.93	-3.15	-3.36	-3.52
200	-0.61	-0.66	-0.76	-0.81	-0.85	-0.91	-0.97	-1.03	-1.12	-1.20	-1.25	-1.28
190	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180	0.66	0.75	0.85	0.88	0.94	1.00	1.07	1.17	1.26	1.30	1.33	1.36
160	2.37	2.67	2.86	3.00	3.20	3.44	3.71	3.95	4.13	4.22	4.33	4.44

Speed Adjustment

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)											
	-2	0	2	4	6	8	10	12	14	16	18	
VREF	-0.23	-0.24	-0.25	-0.27	-0.28	-0.27	-0.23	-0.16	-0.07	0.03	0.10	
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	0.17	0.18	0.19	0.20	0.21	0.19	0.15	0.07	-0.03	-0.11	-0.14	
VREF+20	0.38	0.40	0.42	0.43	0.44	0.37	0.23	-0.01	-0.24	-0.42	-0.56	
VREF+30	0.43	0.44	0.44	0.43	0.40	0.28	0.05	-0.28	-0.61	-0.90	-1.12	

With engine bleed for packs off, increase gradient by 0.1%.

With engine and wing anti-ice on, decrease gradient by 0.1%.

When operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C, decrease gradient by 1.2%.

Quick Turnaround Limit Weight**Flaps 30 Limit Weight (1000 KG)**

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	235.5				
50	122	237.0	228.2			
45	113	239.0	230.0	221.4		
40	104	240.9	231.9	223.2	214.8	
35	95	242.9	233.9	225.1	216.6	208.1
30	86	245.0	235.9	227.0	218.4	209.9
25	77	247.1	237.9	228.9	220.3	211.7
20	68	249.2	240.0	231.0	222.2	213.6
15	59	251.5	242.2	233.0	224.1	215.6
10	50	253.8	244.4	235.2	226.2	217.5
5	41	256.2	246.6	237.4	228.3	219.5
0	32	258.6	248.9	239.6	230.4	221.5
-5	23	261.0	251.3	241.9	232.6	223.6
-10	14	262.9	253.8	244.2	234.9	225.8
-15	5	264.8	256.4	246.7	237.3	228.1
-20	-4	266.8	259.0	249.2	239.7	230.4
-30	-22	270.8	263.5	254.4	244.7	235.3
-40	-40	276.0	267.7	260.0	250.1	240.4
-50	-58	282.2	272.0	264.6	255.7	245.8
-54	-65	284.7	274.4	266.4	258.1	248.0

Increase weight by 2100 kg per 1% uphill slope. Decrease weight by 3450 kg per 1% downhill slope.

Increase weight by 6100 kg per 10 knots headwind. Decrease weight by 29450 kg per 10 knots tailwind.

Decrease weight by 12600 kg when one brake is deactivated. Decrease weight by 24950 kg when two brakes are deactivated.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 65 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

Alternate procedure:

No sooner than 10 and no later than 15 minutes after parking, check for the BRAKE TEMP advisory message on EICAS. If the message is not displayed, no waiting period is required. If it is displayed, do not dispatch until at least 65 minutes after landing or until the Brake Temperature Monitoring System (BTMS) readings on the Landing Gear Synoptic Display are all 3.0 or lower. Check that wheel thermal plugs have not melted before making a subsequent takeoff.

Note: If any brake temperature display digit is blank or the BRAKE TEMP SYS status message is displayed, then this alternate procedure cannot be used.

DRAFT

Intentionally
Blank

Performance Dispatch**Gear Down****Chapter PD****Section 33****GEAR DOWN****Takeoff Climb Limit Weight****Flaps 15****Based on engine bleed for packs on, engine anti-ice off, and wing anti-ice off**

AIRPORT OAT		TAKEOFF CLIMB WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	236.9	225.2	209.9	189.5	159.7
52	126	242.3	226.1	214.7	195.1	166.9
50	122	248.1	227.3	217.1	200.5	173.2
48	118	254.1	232.9	217.0	205.8	178.4
46	115	259.9	238.4	218.2	206.1	183.5
44	111	264.7	243.7	223.0	206.0	188.5
42	108	269.1	249.0	227.9	207.1	191.2
40	104	273.8	254.4	233.0	211.6	191.1
38	100	280.0	260.2	238.4	216.4	192.3
36	97	286.2	264.9	243.9	221.5	196.7
34	93	292.5	269.6	249.6	226.7	201.3
32	90	298.3	274.8	255.0	231.8	206.2
30	86	303.7	280.9	260.5	237.2	211.1
28	82	308.6	286.8	265.2	242.4	215.9
26	79	308.7	292.3	269.3	247.6	221.0
24	75	308.8	296.1	273.6	252.7	225.9
22	72	308.9	296.2	278.0	256.7	231.0
20	68	309.0	296.2	280.6	260.0	235.5
18	64	309.1	296.3	280.7	262.7	239.0
16	61	309.2	296.3	280.7	263.7	240.7
14	57	309.3	296.4	280.7	263.7	242.0
12	54	309.4	296.4	280.7	263.7	242.1
10	50	309.5	296.5	280.7	263.7	242.1
-40	-40	309.8	296.5	280.9	263.7	242.0

With engine bleed for packs off, increase weight by 800 kg.

With engine anti-ice on, decrease weight by 900 kg.

With engine and wing anti-ice on, decrease weight by 2250 kg.

GEAR DOWN**Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 30****Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	249.4				
52	126	256.6				
50	122	264.0	241.5			
48	118	272.0	247.4			
46	115	278.7	254.0	234.8		
44	111	285.5	260.6	240.6		
42	108	291.8	268.0	246.3	227.7	
40	104	298.7	274.5	252.1	232.7	
38	100	305.4	280.9	257.9	237.6	211.3
36	97	312.2	286.5	263.0	241.7	215.6
34	93	318.6	292.0	268.8	245.7	219.8
32	90	320.7	297.6	273.8	249.3	223.5
30	86	320.8	302.8	278.7	253.2	226.8
28	82	320.9	307.5	283.1	257.2	230.1
26	79	321.1	307.6	286.4	261.7	233.4
24	75	321.2	307.7	288.9	266.2	237.0
22	72	321.3	307.7	289.9	269.2	240.7
20	68	321.4	307.8	290.0	271.0	243.8
18	64	321.5	307.9	290.0	272.8	246.0
16	61	321.6	308.0	290.1	272.8	247.5
14	57	321.8	308.0	290.1	272.9	248.9
12	54	321.9	308.1	290.1	272.9	249.0
10	50	322.0	308.2	290.2	272.9	249.0
-40	-40	322.5	308.5	290.5	273.1	249.2

With engine bleed for packs off, increase weight 1600 kg.

With engine and wing anti-ice on, decrease weight by 2150 kg.

When operating in icing conditions during any part of the flight when forecast landing temperature is below 10°C, decrease weight by 29150 kg.



GEAR DOWN**Takeoff Obstacle Limit Weight****Flaps 15****Sea Level, 33°C & Below, Zero Wind****Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or Auto**

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	291.3										
20	268.3	287.6									
40	248.0	266.7	281.2	292.1							
60	235.1	251.1	265.7	277.4	286.6	294.1					
80	223.5	239.5	253.0	265.0	274.8	282.9	289.5	295.0			
100	212.0	230.2	242.8	254.4	264.5	272.9	280.1	286.1	291.2	295.6	298.2
120	201.9	220.7	234.4	245.1	255.3	264.0	271.5	277.9	283.4	288.1	292.3
140		211.8	226.7	237.7	247.1	256.0	263.6	270.3	276.1	281.2	285.6
160		203.7	218.9	230.8	240.1	248.5	256.4	263.3	269.3	274.6	279.3
180		196.2	211.6	224.0	233.9	242.1	249.8	256.8	263.0	268.5	273.3
200			204.8	217.5	227.9	236.4	243.7	250.7	257.0	262.7	267.7
220			198.4	211.3	222.1	230.9	238.4	245.1	251.4	257.2	262.4
240				192.4	205.5	216.4	225.6	233.3	240.0	246.1	252.0
260					199.9	211.1	220.5	228.4	235.3	241.4	247.1
280					194.7	205.9	215.5	223.7	230.8	237.0	242.6
300						201.0	210.8	219.2	226.4	232.7	238.4

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

OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
33 & BELOW	0	0	0	0	0	0	0	0
34	-1.2	-1.4	-1.5	-1.7	-1.8	-2.0	-2.1	-2.3
36	-4.7	-5.3	-5.9	-6.5	-7.1	-7.7	-8.2	-8.8
38	-8.3	-9.3	-10.3	-11.3	-12.3	-13.3	-14.3	-15.4
40	-11.8	-13.2	-14.7	-16.1	-17.6	-19.0	-20.4	-21.9
42	-15.0	-16.8	-18.7	-20.5	-22.4	-24.2	-26.0	-27.9
44	-18.2	-20.5	-22.7	-24.9	-27.2	-29.4	-31.6	-33.8
46	-21.5	-24.1	-26.7	-29.3	-32.0	-34.6	-37.2	-39.8
48	-24.7	-27.7	-30.7	-33.7	-36.8	-39.8	-42.8	-45.8
50	-27.9	-31.3	-34.7	-38.1	-41.6	-45.0	-48.4	-51.8

GEAR DOWN**Takeoff Obstacle Limit Weight****Flaps 15****Pressure Altitude Adjustment**

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
S.L. & BELOW	0	0	0	0	0	0	0	0
1000	-7.1	-7.9	-8.6	-9.4	-10.2	-10.9	-11.7	-12.4
2000	-14.3	-15.8	-17.3	-18.8	-20.3	-21.8	-23.3	-24.9
3000	-20.8	-23.0	-25.2	-27.4	-29.6	-31.8	-34.0	-36.2
4000	-27.3	-30.2	-33.1	-36.0	-38.9	-41.8	-44.7	-47.6
5000	-33.9	-37.5	-41.2	-44.8	-48.5	-52.1	-55.8	-59.4
6000	-40.5	-44.9	-49.3	-53.7	-58.0	-62.4	-66.8	-71.2
7000	-47.6	-52.8	-58.1	-63.3	-68.5	-73.7	-78.9	-84.1
8000	-54.8	-60.8	-66.8	-72.9	-78.9	-85.0	-91.0	-97.0

Wind Adjustment

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)							
	180	200	220	240	260	280	300	320
15 TW	-34.2	-33.2	-32.1	-31.1	-30.1	-29.1	-28.0	-27.0
10 TW	-22.8	-22.1	-21.4	-20.7	-20.1	-19.4	-18.7	-18.0
5 TW	-11.4	-11.1	-10.7	-10.4	-10.0	-9.7	-9.3	-9.0
0	0	0	0	0	0	0	0	0
10 HW	4.2	3.6	3.0	2.4	1.8	1.1	0.5	0.0
20 HW	8.5	7.2	6.0	4.8	3.5	2.2	1.0	0.0
30 HW	12.8	10.9	9.0	7.1	5.2	3.4	1.5	0.0
40 HW	17.0	14.5	12.0	9.5	7.0	4.5	2.0	0.0

With engine bleed for packs off, increase weight by 500 kg.

With engine and wing anti-ice on, decrease weight by 3000 kg.

GEAR DOWN**Long Range Cruise Altitude Capability****Max Climb Thrust, 300 ft/min residual rate of climb**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18500	16600	14200
350	19200	17300	14800
340	19700	18000	15500
330	20600	18900	16300
320	21700	20100	17600
310	22800	21300	19000
300	23900	22400	20300
290	25000	23500	21800
280	26000	24600	23000
270	27100	25900	24300
260	28200	27200	25700
250	29400	28600	27100
240	30400	30000	28500
230	31200	30800	29900
220	32000	31700	31000
210	32800	32600	32000
200	33500	33200	32700
190	34000	33900	33400
180	34600	34500	34100
170	35200	35100	34700
160	35800	35700	35300

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	
326	291	261	237	217	200	188	177	167	158	150
488	436	391	355	326	300	282	266	251	238	227
649	580	521	473	434	400	376	354	335	318	303
809	724	650	591	543	500	470	443	419	398	380
968	867	779	709	651	600	565	533	504	479	456
1127	1009	908	826	759	700	659	622	589	559	533
1285	1152	1036	944	867	800	754	712	673	639	609
1442	1293	1165	1061	975	900	848	801	758	720	686
1599	1435	1293	1178	1083	1000	943	890	843	800	763
1755	1576	1421	1295	1191	1100	1037	980	928	881	840
1910	1716	1548	1412	1299	1200	1131	1069	1012	962	917
2065	1856	1675	1529	1407	1300	1226	1158	1097	1042	994
2219	1996	1802	1646	1515	1400	1320	1248	1182	1123	1072
2373	2135	1929	1762	1623	1500	1415	1337	1267	1204	1149
2526	2274	2056	1878	1730	1600	1509	1427	1352	1285	1226
2679	2413	2182	1994	1838	1700	1604	1516	1437	1366	1304
2831	2551	2308	2110	1945	1800	1699	1606	1522	1447	1382
2982	2689	2434	2226	2053	1900	1793	1696	1608	1529	1459
3133	2826	2559	2342	2160	2000	1888	1786	1693	1610	1537

GEAR DOWN**Long Range Cruise Trip Fuel and Time****Reference Fuel and Time Required**

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	7.8	0:51	7.4	0:49	7.2	0:47	7.0	0:46	6.9	0:44
300	11.4	1:13	10.8	1:10	10.4	1:07	10.0	1:05	9.7	1:03
400	15.0	1:36	14.2	1:32	13.6	1:28	13.0	1:25	12.6	1:22
500	18.6	1:59	17.6	1:53	16.7	1:48	16.0	1:44	15.4	1:40
600	22.3	2:21	21.1	2:14	20.0	2:08	19.1	2:03	18.4	1:58
700	26.1	2:43	24.6	2:35	23.3	2:28	22.2	2:22	21.3	2:17
800	29.8	3:05	28.1	2:56	26.6	2:48	25.3	2:41	24.2	2:35
900	33.6	3:27	31.6	3:17	29.9	3:08	28.4	3:00	27.2	2:53
1000	37.3	3:49	35.1	3:38	33.2	3:28	31.5	3:20	30.1	3:11
1100	41.3	4:10	38.8	3:59	36.7	3:48	34.7	3:38	33.2	3:29
1200	45.2	4:32	42.4	4:19	40.1	4:07	37.9	3:57	36.2	3:47
1300	49.1	4:53	46.1	4:39	43.5	4:27	41.2	4:15	39.3	4:04
1400	53.0	5:14	49.8	5:00	47.0	4:46	44.4	4:34	42.4	4:22
1500	57.0	5:36	53.4	5:20	50.4	5:05	47.6	4:52	45.5	4:40
1600	61.1	5:56	57.3	5:40	54.0	5:24	51.0	5:11	48.7	4:57
1700	65.2	6:17	61.1	5:59	57.6	5:43	54.4	5:29	51.9	5:15
1800	69.3	6:37	64.9	6:19	61.1	6:02	57.8	5:47	55.2	5:32
1900	73.4	6:58	68.7	6:39	64.7	6:21	61.2	6:05	58.4	5:49
2000	77.5	7:19	72.6	6:58	68.3	6:40	64.6	6:23	61.6	6:07

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	160	180	200	220	240
5	-0.4	-0.2	0.0	0.3	0.7
10	-0.9	-0.5	0.0	0.6	1.3
15	-1.3	-0.7	0.0	0.9	2.0
20	-1.8	-1.0	0.0	1.3	2.7
25	-2.3	-1.3	0.0	1.6	3.5
30	-2.8	-1.6	0.0	2.0	4.2
35	-3.3	-1.9	0.0	2.3	5.0
40	-3.9	-2.1	0.0	2.7	5.9
45	-4.4	-2.4	0.0	3.1	6.7
50	-4.9	-2.7	0.0	3.5	7.6
55	-5.4	-2.9	0.0	3.9	8.5
60	-6.0	-3.2	0.0	4.4	9.4
65	-6.5	-3.5	0.0	4.8	10.4
70	-7.0	-3.7	0.0	5.2	11.3
75	-7.6	-4.0	0.0	5.7	12.3
80	-8.1	-4.2	0.0	6.2	13.4

Based on VREF+80 climb, Long Range Cruise and VREF+80 descent.

GEAR DOWN**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	
101	84	72	63	56	50	45	42	38	36	33	
171	150	133	120	109	100	92	86	80	75	71	
242	215	194	177	162	150	139	130	122	115	109	
311	280	255	233	215	200	187	175	165	156	147	
380	344	315	290	268	250	234	220	207	196	186	
448	408	374	346	321	300	281	265	250	237	225	
517	472	434	402	374	350	329	310	293	278	265	
586	536	494	458	427	400	376	355	336	319	304	
655	600	554	514	480	450	423	400	379	360	343	
726	666	615	571	533	500	471	445	421	400	381	

Trip Fuel and Time

AIR DISTANCE (NM)	LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)	
	160	180	200	220	240		
50	FUEL (1000 KG)	2.2	2.3	2.5	2.6	2.7	0:15
	ALT (FT)	13000	11000	11000	11000	11000	
100	FUEL (1000 KG)	3.7	3.9	4.1	4.3	4.5	0:25
	ALT (FT)	23000	21000	21000	19000	19000	
150	FUEL (1000 KG)	5.0	5.2	5.5	5.8	6.2	0:34
	ALT (FT)	29000	27000	25000	25000	23000	
200	FUEL (1000 KG)	6.2	6.5	6.9	7.3	7.8	0:43
	ALT (FT)	31000	29000	29000	27000	25000	
250	FUEL (1000 KG)	7.4	7.8	8.3	8.8	9.4	0:51
	ALT (FT)	33000	31000	29000	27000	25000	
300	FUEL (1000 KG)	8.6	9.1	9.6	10.3	11.0	1:00
	ALT (FT)	33000	31000	31000	29000	27000	
350	FUEL (1000 KG)	9.8	10.3	11.0	11.7	12.6	1:08
	ALT (FT)	33000	33000	31000	29000	27000	
400	FUEL (1000 KG)	11.0	11.6	12.3	13.2	14.2	1:16
	ALT (FT)	33000	33000	31000	29000	27000	
450	FUEL (1000 KG)	12.2	12.9	13.7	14.7	15.8	1:25
	ALT (FT)	33000	33000	31000	29000	27000	
500	FUEL (1000 KG)	13.4	14.2	15.1	16.2	17.5	1:33
	ALT (FT)	33000	33000	31000	29000	27000	

GEAR DOWN**Holding Planning****Flaps Up**

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)						
	PRESSURE ALTITUDE (FT)						
1500	5000	10000	15000	20000	25000	30000	
360	15490						
340	14720	14710					
320	13780	13740					
300	12760	12730	12670				
280	11940	11920	11840				
260	11030	11010	10930	10980			
240	10300	10270	10190	10210			
220	9600	9550	9460	9460	9550		
200	9210	9140	9050	9030	9100	9210	
180	8900	8820	8720	8690	8750	8840	9040
160	8630	8540	8430	8390	8430	8510	8690

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
1500	5000	10000	15000	20000	
360	15330	15400	15380	15620	16410
340	14470	14510	14490	14690	15250
320	13540	13550	13540	13670	14090
300	12540	12540	12530	12650	12900
280	11680	11670	11630	11750	11960
260	10760	10730	10680	10790	10930
240	9970	9920	9860	9940	10050
220	9210	9140	9070	9110	9210
200	8700	8610	8520	8540	8620
180	8290	8190	8090	8090	8140
160	7950	7850	7720	7710	7730

These tables include 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	171.5	171.5	166.7
18	182.0	180.0	175.8
16	194.2	192.5	188.4
14	207.3	206.6	201.2
12	223.4	221.2	214.5
10	239.5	236.8	229.8
8	256.5	252.7	246.2
6	275.8	268.7	258.8
4	292.6	281.7	268.8
2	306.2	293.1	279.3
0	318.4	303.7	288.9

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	20	
ENGINE ONLY	0.0	-0.7	-1.2	-1.2	-1.1	-0.9	-0.7	-0.2	0.0	0.0	0.0
ENGINE AND WING	-2.3	-3.0	-3.0	-3.2	-2.7	-2.4	-1.9	-1.6	-1.3	-1.0	-0.7

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Intentionally
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Performance Dispatch**Text****Chapter PD****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 data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

Takeoff

The maximum allowable takeoff weight will be the least of the Field, Climb, Tire Speed, and Obstacle Limit Weights as determined from the following tables. Brake Energy Limit is not shown as it is not limiting for the range of conditions shown in this chapter. When determining a maximum weight for a wet runway, the dry runway limit weight must also be checked and the lower of the two weights used.

Minimum Takeoff Weight

Light weight takeoffs at the GE90-110B1L thrust rating may be limited by minimum takeoff weight in order to maintain airplane controllability during takeoff. For takeoff at weights below the minimum takeoff weight, use of a lower thrust rating and/or the assumed temperature method of thrust reduction is required.

Field Limit Weight - Slope and Wind Corrections

These tables for wet and dry runways provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the Slope Correction table with the available field length and runway slope to determine the slope corrected field length. Now enter the Wind Correction 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 condition 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

This table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the correction tables to correct 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 235 MPH tires. To determine the tire speed limit weight, enter the table with OAT, move to airport pressure altitude and read the tire speed limit weight. Adjust the tire speed limit weight according to the notes below the table to account for wind.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy, or obstacle clearance with unbalanced V1. 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. 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. This typically occurs at full rated thrust and light weights and is shown in the Minimum Takeoff Weight tables provided. The options are to select a smaller flaps setting, use reduced takeoff thrust and/or add weight (fuel). Selecting derate thrust is the preferred method of reduced takeoff thrust as this will reduce the minimum control speeds.

Normal takeoff speeds, V1, VR, and V2 are read from either the wet or dry table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than the minimum V1 for control on the ground, V1(MCG). It is therefore necessary to compare the adjusted V1 to V1(MCG). To find V1(MCG), enter the V1(MCG) table with 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 weight adjustment is required provided that the field length available exceeds the minimum field length required shown in the Field and Climb Limit Weight table.

Minimum V2

Minimum takeoff safety speeds (V2) are provided to ensure an adequate margin between the normal operating speed and the in-air minimum control speed is maintained for directional control with high thrust asymmetry during a light weight takeoff.

Data are presented as a function of airport pressure altitude and are valid for all temperatures. To obtain the proper V2 speed for takeoff, first determine the normal takeoff V2 using the takeoff speeds tables provided, adjusted for pressure altitude, temperature, and VR correction (if applicable). Compare this V2 with the minimum V2. If the calculated V2 is less than the minimum V2, set V2 equal to minimum V2 and determine a new VR by adding the difference between calculated V2 and minimum V2 to the original VR obtained from the V1, VR, V2 Adjustments table or Minimum VR table (if applicable).

Brakes Deactivated

When operating with brakes deactivated, the field limit weight and the V1 must be reduced to allow for reduced braking capability. A simplified method which conservatively accounts for the reduced braking capability of one brake deactivated is to reduce the normal runway limited weight by 3700 kg for a dry runway or 2200 kg for a wet runway and the V1 associated with the reduced weight by 2 knots. With two brakes deactivated, reduce the normal runway limited weight by 7250 kg for a dry runway or 4550 kg for a wet runway and the V1 associated with the

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reduced weight by 5 knots for a dry runway or 3 knots for a wet runway. If the resulting V1 is less than minimum V1, takeoff is permitted with V1 set equal to V1(MCG) provided the dry accelerate stop distance corrected for wind and slope exceeds approximately 1800 m for one brake deactivated or 1900 m for two brakes deactivated. For wet runways, the corrected accelerate stop distance should exceed approximately 2350 m for one brake deactivated or 2450 m for two brakes deactivated.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

One Thrust Reverser Inoperative

Wet runway takeoff performance presented for all brakes operating is based on the use of one thrust reverser during deceleration. When operating with a thrust reverser inoperative, the runway/obstacle limited takeoff weight and V1 speed must be reduced to account for the reduced deceleration capability. A simplified method which conservatively accounts for this is to reduce the normal wet runway/obstacle limited weight by 6900 kg and the V1 associated with the reduced weight by 3 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 corrected for wind and slope exceeds approximately 2400 m.

Enroute

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of approximately 1.3g (39° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination. Data is based on economy climb and descent speeds, and Long Range Cruise with normal engine bleed for air conditioning. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table 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 fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance as discussed above. Then enter the Trip Fuel and Time required with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. The data considers the use of the FMC short trip optimum altitude. Obtain air distance from upper table using the ground distance and wind component to the alternate. Enter Trip Fuel and Time 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

These tables provide total fuel flow information necessary for planning Flaps Up and Flaps 1 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%.

Oxygen Requirements

Flight Crew System

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck. The oxygen quantity associated with these requirements is achieved with the minimum dispatch oxygen cylinder pressure. Enter the Crew Oxygen Requirements table with the number of crew plus observers using oxygen and read the minimum cylinder pressure required for the appropriate bottle temperature.

An additional quantity of oxygen is required when flight altitudes above 41000 ft are planned. Regulations require that one active duty pilot must don the oxygen mask and breathe diluted oxygen for the duration of the flight above 41000 ft. The additional quantity of oxygen required is 2.05 liters/person/minute (0.6 psi/person/minute for the dual cylinder system), or 13 liters/person/minute (4 psi/person/minute) if 100% oxygen is selected during normal usage.

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 Range Operations

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 diversion airport comply with rules set up specifically for "Extended Range Operation with Two Engine airplanes". This section provides reserve fuel planning information for the "Critical Fuel Scenario" based on two engine operation at Long Range Cruise as well as single engine operation at Long Range Cruise.

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Critical Fuel Reserves

Enter Ground to Air Mile Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter 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 in-service 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 Flaps 30.

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

Landing Field Limit Weight

Obtain wind corrected field length by entering upper table with field length available and wind component along the runway. Now enter table with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

Landing Climb Limit Weight

Enter 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 engine bleed corrections as noted. Note that data is for one engine inoperative.

Quick Turnaround Limit Weight

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

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, 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.

Takeoff/Landing Climb Limit Weight

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

The remaining gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

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777 Flight Crew Operations Manual

Performance Dispatch

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Performance Dispatch

Takeoff

Chapter PD

Section 40

Minimum Takeoff Weight

Weight Limit (1000 KG)

Flaps 15

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

OAT (°C)	S.L. & BELOW	AIRPORT PRESSURE ALTITUDE (FT)						
		1000	2000	3000	4000	5000	6000	7000
50	165.5	158.6						
45	175.9	169.0	161.5	155.1				
40	186.0	178.7	171.2	164.4	158.0			
35	195.0	187.6	179.8	172.8	166.0	159.6		
30	197.6	193.8	186.9	179.7	172.7	166.1	158.8	
25	197.7	193.8	189.3	184.6	178.4	172.6	164.7	156.1
20	197.8	193.9	189.4	184.6	179.8	175.1	168.4	160.7
15	198.0	194.0	189.4	184.6	179.8	175.1	169.4	162.6
10	198.1	194.0	189.5	184.7	179.8	175.1	169.4	162.6
0 & BELOW	198.2	194.2	189.6	184.7	179.9	175.1	169.4	162.6
								155.8

Light weight takeoffs at the GE90-110B1L thrust rating may be limited by minimum takeoff weight in order to maintain airplane controllability during takeoff. For takeoff at weights below the minimum takeoff weight, use of a lower thrust rating and/or the assumed temperature method of thrust reduction is required.

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	1220	1220	1210	1200	1190	1180	1160	1150	
1400	1460	1440	1430	1410	1400	1380	1350	1330	1310	
1600	1680	1660	1640	1620	1600	1570	1530	1500	1470	
1800	1900	1870	1850	1820	1800	1760	1710	1670	1620	
2000	2120	2090	2060	2030	2000	1950	1890	1840	1780	
2200	2340	2310	2270	2240	2200	2130	2070	2000	1940	
2400	2570	2520	2480	2440	2400	2320	2250	2170	2100	
2600	2790	2740	2690	2650	2600	2510	2430	2340	2250	
2800	3010	2960	2910	2850	2800	2700	2610	2510	2410	
3000	3230	3170	3120	3060	3000	2890	2780	2680	2570	
3200	3460	3390	3330	3260	3200	3080	2960	2840	2730	
3400	3680	3610	3540	3470	3400	3270	3140	3010	2880	
3600	3900	3820	3750	3670	3600	3460	3320	3180	3040	
3800	4120	4040	3960	3880	3800	3650	3500	3350	3200	
4000	4340	4260	4170	4090	4000	3840	3680	3520	3350	
4200	4570	4470	4380	4290	4200	4030	3860	3680	3510	
4400	4790	4690	4590	4500	4400	4220	4030	3850	3670	
4600	5010	4910	4810	4700	4600	4410	4210	4020	3830	
4800	5230	5120	5020	4910	4800	4600	4390	4190	3980	
5000	5450	5340	5230	5110	5000	4790	4570	4360	4140	

Wind Corrections

SLOPE CORR'D FIELD LENGTH (M)	SLOPE & WIND CORRECTED FIELD LENGTH (M)							
	WIND COMPONENT (KTS)							
-15	-10	-5	0	10	20	30	40	
1200	890	990	1100	1200	1280	1350	1430	1520
1400	1060	1170	1290	1400	1480	1560	1650	1740
1600	1220	1350	1470	1600	1690	1780	1870	1960
1800	1390	1530	1660	1800	1890	1990	2080	2180
2000	1560	1710	1850	2000	2100	2200	2300	2410
2200	1720	1880	2040	2200	2300	2410	2520	2630
2400	1890	2060	2230	2400	2510	2620	2740	2850
2600	2060	2240	2420	2600	2710	2830	2950	3080
2800	2230	2420	2610	2800	2920	3040	3170	3300
3000	2390	2600	2800	3000	3130	3250	3390	3520
3200	2560	2770	2990	3200	3330	3470	3600	3740
3400	2730	2950	3180	3400	3540	3680	3820	3970
3600	2890	3130	3360	3600	3740	3890	4040	4190
3800	3060	3310	3550	3800	3950	4100	4250	4410
4000	3230	3490	3740	4000	4150	4310	4470	4640
4200	3400	3660	3930	4200	4360	4520	4690	4860
4400	3560	3840	4120	4400	4560	4730	4910	5080
4600	3730	4020	4310	4600	4770	4940	5120	5310
4800	3900	4200	4500	4800	4980	5160	5340	5530
5000	4060	4380	4690	5000	5180	5370	5560	5750

Takeoff Field & Climb Limit Weights - Dry Runway**Flaps 15****Sea Level Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
1700	278.9	253.1	251.5	249.5	248.3	247.5	245.6	240.3	232.4	225.8	218.9
1800	287.9	261.4	259.6	257.6	256.4	255.6	253.6	248.1	240.0	233.2	226.1
2000	304.4	276.6	274.8	272.6	271.3	270.5	268.4	262.7	254.2	247.0	239.5
2200	320.1	290.9	289.0	286.8	285.4	284.6	282.4	276.4	267.5	259.9	252.2
2400	334.7	304.4	302.4	300.1	298.7	297.8	295.5	289.3	280.0	272.2	264.1
2600	347.9	316.7	314.6	312.2	310.8	309.8	307.5	301.0	291.5	283.4	275.1
2800	361.1	329.0	326.9	324.4	322.9	321.9	319.5	312.9	303.1	294.7	286.2
3000	372.0	339.0	336.9	334.3	332.8	331.8	329.3	322.5	312.4	303.9	295.1
3200	378.7	348.5	346.3	343.7	342.2	341.1	338.6	331.6	321.3	312.5	303.5
3400	378.7	357.6	355.4	352.7	351.1	350.1	347.5	340.3	329.8	320.8	311.6
3600	378.7	366.3	364.1	361.3	359.7	358.6	356.0	348.7	337.9	328.7	319.3
3800	378.7	374.6	372.3	369.5	367.8	366.7	364.1	356.6	345.6	336.3	326.6
4000	378.7	378.7	378.7	377.3	375.6	374.5	371.8	364.2	353.0	343.5	333.7
4200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	371.5	360.1	350.4	340.5
4400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.5	367.0	357.1	347.0
4600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	373.6	363.6	353.3
4800	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	369.8	359.4	
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	375.7	365.2
CLIMB LIMIT WT (1000 KG)	350.8	350.2	350.0	349.7	349.6	349.4	349.1	336.7	319.5	305.3	290.6

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
1700	263.7	239.8	238.3	236.4	235.3	234.6	228.7	223.1	215.4	208.7	201.6
1800	272.3	247.6	246.1	244.1	243.0	242.2	236.2	230.4	222.5	215.6	208.3
2000	288.1	262.1	260.5	258.5	257.3	256.5	250.1	244.0	235.7	228.5	220.7
2200	302.9	275.8	274.1	272.0	270.7	269.9	263.2	256.9	248.2	240.6	232.5
2400	316.9	288.7	286.9	284.7	283.4	282.5	275.6	269.0	260.0	252.1	243.7
2600	329.5	300.4	298.6	296.3	295.0	294.1	286.9	280.1	270.8	262.7	254.0
2800	342.2	312.3	310.4	308.0	306.7	305.7	298.4	291.4	281.8	273.4	264.5
3000	352.6	321.9	319.9	317.5	316.1	315.2	307.6	300.4	290.6	282.0	272.8
3200	362.5	331.0	329.0	326.5	325.1	324.1	316.3	309.0	298.9	290.1	280.7
3400	371.9	339.7	337.6	335.1	333.6	332.6	324.7	317.2	306.9	297.9	288.2
3600	378.7	348.0	345.9	343.4	341.8	340.8	332.7	325.0	314.5	305.3	295.5
3800	378.7	355.9	353.8	351.2	349.6	348.6	340.3	332.5	321.7	312.3	302.3
4000	378.7	363.5	361.3	358.6	357.1	356.0	347.6	339.6	328.7	319.1	308.9
4200	378.7	370.8	368.6	365.9	364.3	363.2	354.6	346.5	335.4	325.7	315.3
4400	378.7	377.8	375.6	372.8	371.2	370.1	361.4	353.2	341.8	332.0	321.4
4600	378.7	378.7	378.7	378.7	377.9	376.7	367.9	359.6	348.1	338.1	327.3
4800	378.7	378.7	378.7	378.7	378.7	378.7	374.2	365.7	354.1	343.9	333.1
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	371.6	359.8	349.5	338.5
CLIMB LIMIT WT (1000 KG)	335.7	335.5	335.4	335.2	335.1	334.9	322.6	310.6	294.2	280.3	266.6

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1700 kg.

With engine and wing anti-ice on, decrease field limit weight by 1200 kg and climb limit weight by 2100 kg.

Takeoff Field & Climb Limit Weights - Dry Runway**Flaps 15****4000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
1700	247.9	225.9	224.5	222.7	220.3	218.3	212.3	206.9	199.0	192.7	186.8
1800	256.0	233.3	231.8	230.0	227.6	225.5	219.3	213.8	205.6	199.1	193.0
2000	270.9	247.1	245.5	243.6	241.0	238.8	232.3	226.5	218.0	211.1	204.7
2200	285.0	260.1	258.4	256.5	253.7	251.5	244.6	238.6	229.6	222.4	215.8
2400	298.2	272.3	270.6	268.6	265.7	263.4	256.3	250.0	240.7	233.2	226.3
2600	310.3	283.5	281.8	279.7	276.7	274.3	267.0	260.5	250.9	243.1	236.0
2800	322.4	294.9	293.1	290.9	287.9	285.4	277.8	271.2	261.3	253.3	245.9
3000	332.3	304.0	302.2	299.9	296.9	294.3	286.5	279.7	269.5	261.4	253.8
3200	341.6	312.7	310.8	308.5	305.3	302.7	294.8	287.7	277.3	269.0	261.2
3400	350.6	320.9	319.0	316.7	313.4	310.7	302.6	295.4	284.8	276.2	268.3
3600	359.1	328.9	326.9	324.5	321.2	318.4	310.2	302.8	291.9	283.2	275.1
3800	367.3	336.4	334.4	331.9	328.6	325.8	317.3	309.8	298.7	289.8	281.5
4000	375.0	343.6	341.6	339.1	335.6	332.8	324.2	316.5	305.2	296.2	287.7
4200	378.7	350.6	348.5	345.9	342.5	339.6	330.8	323.0	311.6	302.3	293.8
4400	378.7	357.3	355.2	352.6	349.1	346.1	337.2	329.3	317.6	308.2	299.6
4600	378.7	363.7	361.6	359.0	355.4	352.4	343.3	335.3	323.5	314.0	305.2
4800	378.7	369.9	367.8	365.1	361.5	358.4	349.3	341.2	329.2	319.5	310.6
5000	378.7	375.9	373.7	371.0	367.3	364.2	355.0	346.8	334.6	324.8	315.8
CLIMB LIMIT WT (1000 KG)	317.5	317.3	317.2	317.1	313.2	309.7	297.2	286.7	271.5	259.0	248.1

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
1700	232.4	211.8	210.5	207.2	203.8	201.2	195.4	190.5	183.6	178.0	172.6
1800	240.0	218.8	217.4	214.0	210.5	207.9	201.9	196.8	189.7	184.0	178.4
2000	254.2	231.8	230.4	226.8	223.1	220.4	214.0	208.7	201.3	195.2	189.3
2200	267.5	244.1	242.6	238.9	235.0	232.1	225.5	219.9	212.2	205.8	199.7
2400	280.0	255.7	254.2	250.3	246.3	243.3	236.4	230.6	222.5	215.9	209.5
2600	291.5	266.4	264.8	260.8	256.7	253.5	246.5	240.5	232.1	225.3	218.7
2800	303.1	277.3	275.6	271.5	267.2	264.0	256.7	250.6	242.0	235.0	228.2
3000	312.4	286.0	284.2	280.0	275.7	272.4	264.9	258.6	249.7	242.5	235.6
3200	321.3	294.2	292.4	288.1	283.6	280.2	272.6	266.1	257.0	249.7	242.5
3400	329.8	302.0	300.2	295.8	291.2	287.7	279.9	273.3	264.0	256.5	249.2
3600	337.9	309.5	307.7	303.2	298.5	295.0	287.0	280.2	270.7	263.0	255.6
3800	345.6	316.7	314.8	310.2	305.4	301.8	293.6	286.7	277.1	269.2	261.6
4000	353.0	323.5	321.6	316.9	312.1	308.4	300.1	293.0	283.2	275.2	267.5
4200	360.1	330.1	328.2	323.4	318.5	314.7	306.3	299.1	289.1	281.0	273.1
4400	367.0	336.5	334.5	329.7	324.7	320.9	312.3	305.0	294.9	286.6	278.6
4600	373.6	342.7	340.7	335.7	330.7	326.8	318.1	310.7	300.4	292.0	283.9
4800	378.7	348.6	346.6	341.6	336.4	332.5	323.7	316.2	305.8	297.2	289.0
5000	378.7	354.3	352.2	347.2	342.0	338.0	329.0	321.5	310.9	302.3	294.0
CLIMB LIMIT WT (1000 KG)	297.9	297.9	297.8	293.5	287.5	282.8	272.4	263.5	250.7	240.1	230.1

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1700 kg.

With engine and wing anti-ice on, decrease field limit weight by 1200 kg and climb limit weight by 2100 kg.

Takeoff Field & Climb Limit Weights - Dry Runway**Flaps 15****8000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
1700	215.1	194.9	192.4	187.7	184.3	182.2	176.8	171.9	165.5	160.4	155.4
1800	222.2	201.4	198.8	193.9	190.4	188.2	182.8	177.7	171.1	165.8	160.7
2000	235.4	213.5	210.8	205.7	202.0	199.7	193.9	188.6	181.6	176.1	170.7
2200	247.9	225.0	222.1	216.8	212.9	210.5	204.5	198.9	191.6	185.9	180.2
2400	259.7	235.8	232.9	227.3	223.3	220.8	214.5	208.8	201.2	195.2	189.3
2600	270.5	245.9	242.8	237.0	232.9	230.3	223.9	217.9	210.1	203.9	197.8
2800	281.4	256.1	253.0	247.0	242.8	240.2	233.5	227.4	219.3	213.0	206.7
3000	290.2	264.2	261.0	254.9	250.6	247.9	241.0	234.8	226.5	220.0	213.5
3200	298.5	271.9	268.6	262.4	257.9	255.1	248.1	241.7	233.2	226.5	219.9
3400	306.5	279.2	275.9	269.5	265.0	262.1	254.9	248.3	239.6	232.8	226.1
3600	314.1	286.3	282.8	276.3	271.7	268.7	261.4	254.7	245.8	238.8	231.9
3800	321.3	292.9	289.4	282.8	278.1	275.1	267.6	260.7	251.7	244.6	237.5
4000	328.3	299.4	295.8	289.0	284.2	281.1	273.5	266.5	257.3	250.1	242.9
4200	335.0	305.6	301.9	295.0	290.1	287.0	279.3	272.2	262.8	255.4	248.2
4400	341.4	311.6	307.9	300.9	295.9	292.7	284.9	277.7	268.1	260.6	253.3
4600	347.6	317.3	313.6	306.5	301.4	298.2	290.3	282.9	273.3	265.7	258.2
4800	353.6	322.9	319.1	311.9	306.8	303.6	295.5	288.1	278.2	270.6	263.0
5000	359.4	328.3	324.4	317.1	312.0	308.7	300.5	293.0	283.0	275.3	267.6
CLIMB LIMIT WT (1000 KG)	273.7	273.7	270.6	262.7	256.7	253.2	243.8	234.7	222.5	213.2	204.0

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1700 kg.

With engine and wing anti-ice on, decrease field limit weight by 1200 kg and climb limit weight by 2100 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	1170	1160	1150	
1400	1450	1440	1430	1410	1400	1380	1360	1340	1320	
1600	1670	1660	1640	1620	1600	1570	1550	1520	1490	
1800	1900	1870	1850	1820	1800	1770	1730	1700	1660	
2000	2120	2090	2060	2030	2000	1960	1920	1880	1840	
2200	2350	2310	2270	2240	2200	2150	2100	2060	2010	
2400	2570	2530	2490	2440	2400	2350	2290	2240	2180	
2600	2800	2750	2700	2650	2600	2540	2480	2420	2360	
2800	3020	2960	2910	2850	2800	2730	2660	2600	2530	
3000	3240	3180	3120	3060	3000	2930	2850	2780	2700	
3200	3470	3400	3330	3270	3200	3120	3040	2950	2870	
3400	3690	3620	3550	3470	3400	3310	3220	3130	3050	
3600	3920	3840	3760	3680	3600	3500	3410	3310	3220	
3800	4140	4060	3970	3890	3800	3700	3600	3490	3390	
4000	4360	4270	4180	4090	4000	3890	3780	3670	3560	
4200	4590	4490	4390	4300	4200	4080	3970	3850	3740	
4400	4810	4710	4610	4500	4400	4280	4150	4030	3910	
4600	5040	4930	4820	4710	4600	4470	4340	4210	4080	
4800	5260	5150	5030	4920	4800	4660	4530	4390	4250	
5000	5490	5360	5240	5120	5000	4860	4710	4570	4430	

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	1280	1370	1450	1550
1400	1020	1150	1270	1400	1490	1580	1670	1770
1600	1190	1330	1460	1600	1690	1790	1890	2000
1800	1360	1500	1650	1800	1900	2010	2110	2230
2000	1520	1680	1840	2000	2110	2220	2330	2460
2200	1690	1860	2030	2200	2310	2430	2560	2680
2400	1860	2040	2220	2400	2520	2640	2780	2910
2600	2030	2220	2410	2600	2730	2860	3000	3140
2800	2190	2400	2600	2800	2930	3070	3220	3370
3000	2360	2570	2790	3000	3140	3280	3440	3590
3200	2530	2750	2980	3200	3340	3500	3660	3820
3400	2700	2930	3170	3400	3550	3710	3880	4050
3600	2860	3110	3350	3600	3760	3920	4100	4280
3800	3030	3290	3540	3800	3960	4140	4320	4510
4000	3200	3470	3730	4000	4170	4350	4540	4730
4200	3370	3640	3920	4200	4380	4560	4760	4960
4400	3530	3820	4110	4400	4580	4780	4980	5190
4600	3700	4000	4300	4600	4790	4990	5200	5420
4800	3870	4180	4490	4800	5000	5200	5420	5640
5000	4040	4360	4680	5000	5200	5410	5640	5870

Takeoff Field & Climb Limit Weights - Wet Runway**Flaps 15****Sea Level Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
2240	320.5	289.1	287.1	284.7	283.3	282.3	280.0	273.6	264.2	256.3	248.2
2400	331.9	299.3	297.2	294.7	293.2	292.3	289.9	283.2	273.5	265.3	256.9
2600	345.5	311.5	309.4	306.8	305.3	304.2	301.8	294.8	284.6	276.1	267.4
2800	359.8	324.5	322.3	319.5	317.9	316.9	314.3	307.1	296.5	287.7	278.6
3000	371.9	335.3	333.0	330.2	328.5	327.4	324.7	317.3	306.3	297.1	287.7
3200	378.7	345.7	343.3	340.4	338.7	337.6	334.8	327.0	315.7	306.2	296.5
3400	378.7	355.7	353.2	350.2	348.5	347.3	344.4	336.4	324.8	314.9	304.9
3600	378.7	365.3	362.8	359.7	357.9	356.7	353.7	345.5	333.5	323.4	313.0
3800	378.7	374.5	371.9	368.7	366.9	365.6	362.6	354.1	341.8	331.4	320.8
4000	378.7	378.7	378.7	377.4	375.5	374.2	371.1	362.5	349.8	339.2	328.3
4200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	370.5	357.6	346.7	335.6
4400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.4	365.1	354.0	342.6
4600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	372.4	361.1	349.5
4800	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	367.9	356.1
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	374.5	362.5
5200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	368.7
5400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	374.6
5600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7
CLIMB LIMIT WT (1000 KG)	350.8	350.2	350.0	349.7	349.6	349.4	349.1	336.7	319.5	305.3	290.6

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
2240	301.7	272.9	271.0	268.8	267.5	266.6	259.5	252.9	243.9	236.3	228.8
2400	312.3	282.5	280.6	278.2	276.9	275.9	268.6	261.7	252.4	244.5	236.7
2600	325.2	294.0	292.0	289.6	288.2	287.2	279.6	272.4	262.7	254.5	246.4
2800	338.6	306.3	304.2	301.7	300.2	299.2	291.3	283.8	273.7	265.2	256.7
3000	349.9	316.4	314.3	311.7	310.1	309.1	300.9	293.1	282.7	273.8	265.1
3200	360.9	326.2	324.0	321.3	319.7	318.6	310.1	302.1	291.2	282.1	273.0
3400	371.4	335.5	333.3	330.5	328.9	327.7	318.9	310.7	299.5	290.1	280.7
3600	378.7	344.6	342.2	339.4	337.7	336.5	327.5	319.0	307.5	297.8	288.1
3800	378.7	353.2	350.8	347.8	346.1	344.9	335.6	326.9	315.1	305.1	295.2
4000	378.7	361.5	359.0	356.0	354.3	353.0	343.5	334.6	322.5	312.3	302.1
4200	378.7	369.5	367.0	364.0	362.1	360.9	351.1	342.0	329.6	319.2	308.8
4400	378.7	377.3	374.8	371.6	369.8	368.5	358.5	349.2	336.6	325.9	315.3
4600	378.7	378.7	378.7	378.7	377.1	375.8	365.7	356.2	343.3	332.4	321.6
4800	378.7	378.7	378.7	378.7	378.7	378.7	378.7	372.6	362.9	349.8	338.7
5000	378.7	378.7	378.7	378.7	378.7	378.7	378.7	378.7	369.4	356.1	344.8
5200	378.7	378.7	378.7	378.7	378.7	378.7	378.7	372.1	362.1	350.7	339.3
5400	378.7	378.7	378.7	378.7	378.7	378.7	378.7	372.6	360.0	356.4	344.9
5600	378.7	378.7	378.7	378.7	378.7	378.7	378.7	372.6	363.6	361.9	350.2
CLIMB LIMIT WT (1000 KG)	335.7	335.5	335.4	335.2	335.1	334.9	322.6	310.6	294.2	280.3	266.6

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1700 kg.

With engine and wing anti-ice on, decrease field limit weight by 1350 kg and climb limit weight by 2100 kg.

Takeoff Field & Climb Limit Weights - Wet Runway**Flaps 15****4000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
2240	282.7	256.1	254.4	252.3	249.4	247.0	239.9	233.9	225.6	218.9	212.7
2400	292.6	265.0	263.3	261.1	258.2	255.7	248.3	242.1	233.5	226.5	220.1
2600	304.6	275.9	274.0	271.8	268.7	266.1	258.4	252.0	243.0	235.7	229.0
2800	317.3	287.4	285.5	283.2	280.0	277.3	269.3	262.6	253.3	245.7	238.7
3000	327.8	296.9	294.9	292.4	289.1	286.4	278.0	271.1	261.4	253.6	246.4
3200	338.0	305.9	303.9	301.4	297.9	295.1	286.5	279.3	269.3	261.2	253.7
3400	347.7	314.7	312.6	310.0	306.4	303.4	294.6	287.2	276.8	268.5	260.8
3600	357.1	323.1	320.9	318.2	314.6	311.5	302.4	294.8	284.2	275.6	267.6
3800	366.1	331.1	328.9	326.1	322.4	319.3	309.9	302.1	291.1	282.3	274.1
4000	374.7	338.9	336.6	333.8	330.0	326.7	317.1	309.1	297.9	288.9	280.5
4200	378.7	346.4	344.1	341.2	337.3	334.0	324.2	315.9	304.5	295.2	286.7
4400	378.7	353.7	351.3	348.4	344.4	341.0	331.0	322.6	310.9	301.5	292.7
4600	378.7	360.8	358.3	355.3	351.3	347.8	337.6	329.0	317.1	307.5	298.6
4800	378.7	367.6	365.1	362.1	357.9	354.4	344.0	335.3	323.1	313.3	304.2
5000	378.7	374.2	371.7	368.5	364.3	360.8	350.2	341.3	329.0	319.0	309.8
5200	378.7	378.7	378.0	374.8	370.5	366.9	356.2	347.2	334.6	324.5	315.1
5400	378.7	378.7	378.7	376.5	372.8	361.9	352.8	340.1	329.8	320.3	
5600	378.7	378.7	378.7	378.7	378.5	378.5	367.5	358.2	345.4	334.9	325.3
CLIMB LIMIT WT (1000 KG)	317.5	317.3	317.2	317.1	313.2	309.7	297.2	286.7	271.5	259.0	248.1

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
2240	264.1	239.3	237.7	233.9	230.3	227.6	221.4	216.2	209.0	203.1	197.3
2400	273.4	247.7	246.0	242.1	238.4	235.5	229.1	223.7	216.2	210.1	204.1
2600	284.5	257.7	256.0	251.9	248.0	245.1	238.4	232.8	225.0	218.6	212.4
2800	296.4	268.6	266.8	262.5	258.5	255.4	248.5	242.7	234.5	227.9	221.5
3000	306.2	277.3	275.5	271.1	266.9	263.7	256.5	250.5	242.0	235.1	228.5
3200	315.6	285.7	283.8	279.2	274.9	271.6	264.2	257.9	249.2	242.1	235.2
3400	324.6	293.8	291.8	287.1	282.7	279.3	271.6	265.1	256.1	248.8	241.6
3600	333.3	301.6	299.6	294.7	290.1	286.6	278.7	272.1	262.8	255.2	247.9
3800	341.7	309.1	307.0	302.0	297.3	293.7	285.6	278.8	269.3	261.5	253.9
4000	349.7	316.3	314.1	309.1	304.2	300.5	292.2	285.2	275.5	267.5	259.8
4200	357.5	323.3	321.1	315.9	310.9	307.2	298.7	291.5	281.6	273.4	265.5
4400	365.0	330.1	327.9	322.5	317.5	313.6	304.9	297.7	287.5	279.1	271.1
4600	372.3	336.7	334.4	329.0	323.8	319.9	311.0	303.6	293.2	284.7	276.5
4800	378.7	343.1	340.8	335.2	330.0	326.0	317.0	309.4	298.8	290.1	281.8
5000	378.7	349.3	346.9	341.3	335.9	331.9	322.7	315.0	304.2	295.4	286.9
5200	378.7	355.2	352.8	347.1	341.7	337.6	328.2	320.4	309.5	300.6	291.9
5400	378.7	361.0	358.5	352.8	347.2	343.1	333.6	325.7	314.6	305.5	296.7
5600	378.7	366.5	364.1	358.2	352.6	348.4	338.8	330.8	319.5	310.3	301.5
CLIMB LIMT WT (1000 KG)	297.9	297.9	297.8	293.5	287.5	282.8	272.4	263.5	250.7	240.1	230.1

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1700 kg.

With engine and wing anti-ice on, decrease field limit weight by 1350 kg and climb limit weight by 2100 kg.

Takeoff Field & Climb Limit Weights - Wet Runway**Flaps 15****8000 FT Pressure Altitude**

CORR'D FIELD LENGTH (M)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	14	18	23	26	28	33	37	42	46	50
2240	243.6	220.7	218.0	213.0	209.4	207.1	201.5	196.4	189.5	184.2	179.0
2400	252.2	228.4	225.6	220.4	216.7	214.3	208.5	203.1	196.1	190.5	185.1
2600	262.4	237.7	234.8	229.3	225.4	223.0	216.9	211.4	204.0	198.2	192.6
2800	273.5	247.7	244.7	239.0	235.0	232.5	226.2	220.4	212.7	206.7	200.8
3000	282.4	255.7	252.6	246.7	242.5	239.9	233.4	227.4	219.4	213.2	207.1
3200	291.0	263.3	260.1	254.0	249.7	247.0	240.2	234.0	225.8	219.4	213.1
3400	299.2	270.7	267.4	261.1	256.7	253.8	246.9	240.5	232.0	225.3	218.8
3600	307.2	277.8	274.4	267.9	263.4	260.5	253.3	246.7	237.9	231.1	224.4
3800	314.8	284.7	281.1	274.5	269.8	266.8	259.5	252.7	243.7	236.7	229.8
4000	322.2	291.3	287.7	280.8	276.1	273.0	265.5	258.5	249.3	242.1	235.1
4200	329.3	297.7	294.0	287.0	282.1	279.0	271.3	264.2	254.8	247.4	240.2
4400	336.2	304.0	300.2	293.1	288.1	284.9	277.0	269.7	260.1	252.6	245.2
4600	342.9	310.0	306.2	298.9	293.8	290.6	282.5	275.1	265.3	257.7	250.2
4800	349.4	315.9	312.0	304.6	299.4	296.1	287.9	280.4	270.4	262.6	255.0
5000	355.7	321.7	317.6	310.1	304.9	301.5	293.2	285.5	275.3	267.4	259.6
5200	361.8	327.2	323.1	315.5	310.1	306.7	298.2	290.5	280.2	272.1	264.2
5400	367.6	332.5	328.4	320.7	315.2	311.8	303.2	295.3	284.8	276.7	268.7
5600	373.3	337.7	333.5	325.7	320.2	316.7	308.0	300.0	289.4	281.1	273.0
CLIMB LIMIT WT (1000 KG)	273.7	273.7	270.6	262.7	256.7	253.2	243.8	234.7	222.5	213.2	204.0

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

With engine bleed for packs off, increase field limit weight by 500 kg and climb limit weight by 1700 kg.

With engine and wing anti-ice on, decrease field limit weight by 1350 kg and climb limit weight by 2100 kg.

Takeoff Obstacle Limit Weight**Flaps 15****Sea Level, 33°C & Below, Zero Wind****Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or Auto**

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	294.9	319.3	340.7	356.6	367.3					
20	274.3	297.3	315.6	330.9	344.0	354.2	361.2			
40	253.3	275.8	293.8	308.9	321.8	332.6	341.8	349.3	355.0	363.5
60	237.0	258.5	277.5	293.0	305.8	316.6	325.7	333.6	340.5	346.5
80		245.1	263.8	279.6	292.7	303.5	312.9	320.9	328.0	334.2
100		233.8	252.2	267.8	281.2	292.3	301.8	310.1	317.3	323.7
120		224.0	242.0	257.4	270.8	282.3	292.0	300.5	307.9	314.5
140		215.2	232.9	248.2	261.4	273.0	283.1	291.7	299.3	306.1
160			224.7	239.8	253.0	264.6	274.7	283.7	291.5	298.4
180				217.2	232.2	245.3	256.8	267.0	276.1	284.1
200				210.4	225.1	238.1	249.6	259.9	269.0	277.2
220				204.0	218.6	231.5	243.0	253.2	262.4	270.6
240					198.2	212.6	225.4	236.8	247.0	256.2
260						206.9	219.6	231.0	241.1	250.3
280						201.6	214.2	225.5	235.6	244.8
300						196.7	209.1	220.3	230.4	239.6

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

OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)						
	160	200	240	280	320	360	400
33 & BELOW	0	0	0	0	0	0	0
34	-1.1	-1.3	-1.6	-1.8	-2.1	-2.4	-2.6
36	-4.1	-5.1	-6.1	-7.1	-8.1	-9.2	-10.2
38	-7.1	-8.8	-10.6	-12.4	-14.2	-15.9	-17.7
40	-10.1	-12.6	-15.1	-17.7	-20.2	-22.7	-25.3
42	-13.4	-16.7	-20.1	-23.4	-26.7	-30.0	-33.3
44	-16.8	-20.9	-25.0	-29.1	-33.2	-37.3	-41.4
46	-20.1	-25.0	-29.9	-34.8	-39.6	-44.5	-49.4
48	-23.4	-29.1	-34.8	-40.4	-46.1	-51.8	-57.5
50	-26.8	-33.2	-39.7	-46.1	-52.6	-59.1	-65.5

Pressure Altitude Adjustment

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	160	200	240	280	320	360	400
S.L. & BELOW	0	0	0	0	0	0	0
1000	-6.9	-8.3	-9.7	-11.1	-12.5	-13.9	-15.3
2000	-13.9	-16.7	-19.4	-22.2	-25.0	-27.8	-30.5
3000	-19.9	-24.1	-28.3	-32.5	-36.6	-40.8	-45.0
4000	-26.0	-31.6	-37.1	-42.7	-48.3	-53.9	-59.5
5000	-31.9	-38.8	-45.8	-52.7	-59.7	-66.7	-73.6
6000	-37.8	-46.1	-54.4	-62.8	-71.1	-79.4	-87.8
7000	-44.1	-54.1	-64.1	-74.2	-84.2	-94.2	-104.3
8000	-50.4	-62.1	-73.9	-85.6	-97.3	-109.0	-120.8

Takeoff Obstacle Limit Weight**Flaps 15****Wind Adjustment**

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	160	200	240	280	320	360	400
15 TW	-12.0	-18.7	-25.3	-32.0	-31.2	-30.4	-29.6
10 TW	-8.0	-12.4	-16.9	-21.3	-20.8	-20.3	-19.7
5 TW	-4.0	-6.2	-8.4	-10.7	-10.4	-10.1	-9.9
0	0	0	0	0	0	0	0
10 HW	4.5	4.0	3.6	3.2	2.7	2.3	1.8
20 HW	8.9	8.1	7.2	6.3	5.4	4.6	3.7
30 HW	13.7	12.4	11.0	9.6	8.2	6.8	5.5
40 HW	18.5	16.7	14.8	12.9	11.0	9.1	7.2

With engine bleed for packs off, increase weight by 900 kg.

With engine and wing anti-ice on, decrease weight by 2250 kg.

Tire Speed Limit**Flaps 15**

AIRPORT OAT	TIRE SPEED LIMIT WEIGHT (1000 KG)					AIRPORT PRESSURE ALTITUDE (FT)
°C	°F	0	2000	4000	6000	8000
54	129	378.7	359.0	330.4	305.8	283.4
52	126	378.7	361.0	332.4	307.5	285.0
50	122	378.7	363.0	334.5	309.3	286.6
48	118	378.7	365.0	336.6	311.1	288.3
46	115	378.7	367.0	338.7	312.9	289.9
44	111	378.7	369.0	340.9	314.7	291.6
42	108	378.7	371.1	343.4	316.5	293.3
40	104	378.7	373.2	346.1	318.3	295.1
38	100	378.7	375.3	348.8	320.2	296.8
36	97	378.7	377.5	350.8	322.1	298.6
34	93	378.7	378.7	352.9	324.1	300.4
32	90	378.7	378.7	354.7	325.9	302.1
30	86	378.7	378.7	356.6	327.7	303.7
28	82	378.7	378.7	358.5	329.6	305.4
26	79	378.7	378.7	360.5	331.6	307.1
24	75	378.7	378.7	362.5	333.6	308.8
22	72	378.7	378.7	364.7	335.8	310.5
20	68	378.7	378.7	366.9	338.0	312.3
18	64	378.7	378.7	369.1	340.2	314.1
16	61	378.7	378.7	371.4	342.9	316.0
14	57	378.7	378.7	373.7	345.8	317.9
12	54	378.7	378.7	376.0	348.7	319.9
10	50	378.7	378.7	378.3	350.9	322.0
-40	-40	378.7	378.7	378.7	378.7	378.7

Increase tire speed limit weight by 2300 kg per knot headwind.

Decrease tire speed limit weight by 5300 kg per knot tailwind.

Takeoff Speeds - Dry Runway**Flaps 15****V1, VR, V2 for Max Takeoff Thrust**

WEIGHT (1000 KG)	KIAS							
	V1				VR			
					V2			
360		169			176			180
340		164			170			176
320		158			165			171
300		152			158			166
280		146			152			161
260		139			145			156
240		131			138			151
220		122			131			145
200		113			123			139
180		102			115			133
160		91			106			126
140		83			97			119

Check V1(MCG), Minimum VR, Minimum V2, and Minimum Takeoff Weight.

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	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	12	14					6	7					-3	-3				
60	140	8	10	12	15			4	5	6	7			-2	-2	-3	-3		
50	122	4	5	8	10	13	17	2	3	4	6	7	8	-1	-1	-2	-2	-3	-4
40	104	1	2	4	7	10	14	0	1	3	4	5	7	0	-1	-1	-2	-2	-3
30	86	0	0	1	4	7	11	0	0	1	3	4	6	0	0	0	-1	-1	-2
20	68	0	0	1	3	5	9	0	0	1	2	3	5	0	0	0	-1	-1	-2
-60	-76	0	0	1	3	5	7	0	0	1	2	3	4	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		
360	-4	-2	0	3	5	-3	-2	-1	0	1	2	3	3		
340	-4	-2	0	3	5	-3	-2	-1	0	1	2	3	3		
320	-3	-1	0	3	5	-3	-1	0	0	1	2	2	3		
300	-3	-1	0	3	4	-2	-1	0	0	1	2	2	3		
280	-3	-1	0	2	4	-2	-1	0	0	1	2	2	3		
260	-2	-1	0	2	4	-2	-1	0	0	1	2	2	3		
240	-2	-1	0	2	4	-1	-1	0	0	1	2	2	3		
220	-2	0	0	2	4	-1	0	0	0	1	2	2	3		
200	-2	0	0	2	4	-1	0	0	0	1	2	2	3		
180	-1	0	0	3	4	-1	0	1	0	1	2	3	3		
160	-1	0	0	3	4	-1	0	1	0	1	2	3	3		
140	-1	0	0	3	4	-1	0	1	0	1	2	3	4		

*V1 not to exceed VR

Takeoff Speeds - Dry Runway**Flaps 15****V1(MCG), Minimum VR****Max Takeoff Thrust**

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	125	127	121	124	119	122	117	120	115	118	111	114
50	122	129	131	125	128	119	122	117	120	117	120	111	114
40	104	136	138	133	135	127	130	122	125	125	127	115	118
30	86	138	140	138	140	133	136	128	130	122	125	119	123
20	68	139	140	138	140	134	137	131	133	126	129	119	123
-60	-76	140	140	139	140	136	137	132	133	127	129	121	124

Minimum V2**Max Takeoff Thrust**

PRESSURE ALTITUDE (FT)	-2000	0	2000	4000	6000	8000
SPEED (KIAS)	135	133	131	128	126	123

Takeoff Speeds - Wet Runway**Flaps 15****V1, VR, V2 for Max Takeoff Thrust**

WEIGHT (1000 KG)	KIAS		
	V1	VR	V2
360	161	176	180
340	155	170	176
320	148	165	171
300	141	158	166
280	134	152	161
260	126	145	156
240	119	138	151
220	110	131	145
200	101	123	139
180	91	115	133
160	81	106	126
140	71	97	119

Check V1(MCG), Minimum VR, Minimum V2, and Minimum Takeoff Weight.

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	-2	0	2	4	6	8
70	158	14	16			6	7			-3	-3		
60	140	9	11	14	16	4	5	6	7	-2	-2	-3	-3
50	122	5	6	9	11	14	17	2	3	4	6	7	8
40	104	1	2	5	8	10	14	0	1	3	4	5	7
30	86	0	0	2	5	7	11	0	0	1	3	4	6
20	68	0	0	1	3	5	9	0	0	1	2	3	5
-60	-76	0	0	1	3	5	8	0	0	1	2	3	4

Takeoff Speeds - Wet Runway**Flaps 15****Slope and Wind V1 Adjustment***

WEIGHT (1000 KG)	SLOPE (%)					WIND (KTS)							
	-2	-1	0	1	2	-15	-10	-5	0	10	20	30	40
360	-6	-3	0	3	6	-4	-3	-1	0	1	2	3	4
340	-6	-3	0	3	6	-4	-3	-1	0	1	2	3	4
320	-6	-3	0	3	5	-5	-3	-2	0	1	2	3	4
300	-5	-3	0	3	5	-5	-3	-2	0	1	2	3	4
280	-5	-2	0	3	5	-5	-3	-2	0	1	2	3	4
260	-5	-2	0	3	5	-5	-3	-1	0	1	2	3	4
240	-4	-2	0	3	5	-5	-3	-1	0	1	3	4	5
220	-4	-1	0	3	5	-4	-3	-1	0	1	3	4	5
200	-3	-1	0	3	5	-4	-2	-1	0	1	3	4	5
180	-2	0	0	3	5	-3	-2	0	0	2	3	4	5
160	-2	0	0	4	5	-3	-1	0	0	2	4	5	6
140	-1	0	0	4	6	-2	0	0	0	2	4	5	6

*V1 not to exceed VR

V1(MCG), Minimum VR**Max Takeoff Thrust**

TEMP	PRESSURE ALTITUDE (FT)												
	-2000		0		2000		4000		6000		8000		
°C	°F	V1 (MCG)	Min VR										
60	140	125	127	121	124	119	122	117	120	115	118	111	114
50	122	129	131	125	128	119	122	117	120	117	120	111	114
40	104	136	138	133	135	127	130	122	125	122	125	111	114
30	86	138	140	138	140	133	136	128	130	122	125	115	118
20	68	139	140	138	140	134	137	131	133	126	129	119	123
-60	-76	140	140	139	140	136	137	132	133	127	129	121	124

Minimum V2**Max Takeoff Thrust**

PRESSURE ALTITUDE (FT)	-2000	0	2000	4000	6000	8000
SPEED (KIAS)	135	133	131	128	126	123

Performance Dispatch**Enroute****Chapter PD****Section 41****Long Range Cruise Maximum Operating Altitude****Max Climb Thrust****ISA + 10°C and Below**

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	5	30400	28800	27200
350	27900	4	31000	29400	27800
340	28500	3	31700	30000	28500
330	29200	1	32200	30500	29000
320	29900	0	32700	31000	29500
310	30600	-2	33200	31600	30000
300	31300	-4	33700	32100	30600
290	32000	-5	34300	32700	31200
280	32800	-7	34900	33300	31800
270	33600	-9	35500	33900	32400
260	34400	-11	36100	34500	31100
250	35200	-12	36800	35200	33800
240	36000	-14	37500	35900	34500
230	36900	-15	38200	36600	35200
220	37800	-15	39000	37400	36000
210	38800	-15	39800	38200	36800
200	39800	-15	40600	39000	37700
190	40900	-15	41500	39900	38600
180	42000	-15	42500	40900	39600
170	43100	-15	43100	42100	40800
160	43100	-15	43100	43100	42000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	11	30400	28800	27200
350	27900	10	31000	29400	27800
340	28500	8	31700	30000	28500
330	29200	7	32200	30500	29000
320	29900	5	32700	31000	29500
310	30600	4	33200	31600	30000
300	31300	2	33700	32100	30600
290	32000	0	34300	32700	31200
280	32800	-1	34900	33300	31800
270	33600	-3	35500	33900	32400
260	34400	-5	36100	34500	33100
250	35200	-7	36800	35200	33800
240	36000	-9	37500	35900	34500
230	36900	-9	38200	36600	35200
220	37800	-9	39000	37400	36000
210	38800	-9	39800	38200	36800
200	39800	-9	40600	39000	37700
190	40900	-9	41500	39900	38600
180	42000	-9	42500	40900	39600
170	43100	-9	43100	42100	40800
160	43100	-9	43100	43100	42000

Long Range Cruise Maximum Operating Altitude**Max Climb Thrust**

ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	17	30400	28800	27200
350	27900	15	31000	29400	27800
340	28500	14	31700	30000	28500
330	29200	12	32200	30500	29000
320	29900	11	32700	31000	29500
310	30600	9	33200	31600	30000
300	31300	8	33700	32100	30600
290	32000	6	34300	32700	31200
280	32800	4	34900	33300	31800
270	33600	3	35500	33900	32400
260	34400	1	36100	34500	33100
250	35200	-1	36800	35200	33800
240	36000	-3	37500	35900	34500
230	36900	-3	38200	36600	35200
220	37800	-3	39000	37400	36000
210	38800	-3	39800	38200	36800
200	39800	-3	40600	39000	37700
190	40900	-3	41500	39900	38600
180	42000	-3	42500	40900	39600
170	43100	-3	43100	42100	40800
160	43100	-3	43100	43100	42000

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	
665	625	588	556	526	500	479	458	440	423	407	
1320	1242	1171	1108	1052	1000	958	919	883	850	820	
1973	1857	1752	1660	1576	1500	1438	1381	1327	1278	1233	
2623	2471	2333	2211	2101	2000	1918	1842	1771	1706	1647	
3271	3083	2913	2761	2625	2500	2398	2304	2216	2135	2061	
3915	3693	3491	3311	3149	3000	2879	2766	2661	2564	2475	
4556	4301	4068	3860	3672	3500	3359	3228	3106	2993	2890	
5195	4906	4643	4407	4195	4000	3840	3690	3551	3422	3304	
5831	5510	5216	4954	4717	4500	4320	4152	3995	3851	3719	
6465	6112	5788	5500	5240	5000	4800	4613	4440	4280	4133	
7096	6712	6360	6046	5762	5500	5280	5075	4885	4709	4547	
7726	7311	6931	6591	6283	6000	5761	5537	5329	5137	4961	
8354	7909	7501	7136	6805	6500	6240	5998	5773	5565	5375	
8981	8506	8070	7680	7326	7000	6720	6460	6217	5993	5788	
9607	9102	8639	8224	7847	7500	7201	6921	6661	6421	6201	
10233	9698	9208	8768	8368	8000	7681	7382	7105	6849	6614	
10858	10294	9777	9312	8890	8500	8161	7844	7549	7277	7028	
11483	10890	10345	9856	9411	9000	8641	8305	7993	7705	7441	
12108	11486	10914	10399	9932	9500	9121	8766	8437	8133	7854	
12732	12081	11482	10943	10453	10000	9601	9228	8881	8561	8267	

Long Range Cruise Trip Fuel and Time

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	27		29		31		33	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
500	8.6	1:19	8.4	1:18	8.4	1:17	8.3	1:15
1000	15.8	2:30	15.5	2:28	15.2	2:24	14.9	2:20
1500	23.2	3:40	22.7	3:36	22.2	3:29	21.8	3:23
2000	30.7	4:50	29.9	4:43	29.3	4:34	28.6	4:27
2500	38.4	5:58	37.4	5:49	36.6	5:38	35.7	5:29
3000	46.1	7:06	45.0	6:55	43.9	6:42	42.8	6:32
3500	54.2	8:11	52.8	7:58	51.5	7:44	50.2	7:34
4000	62.3	9:17	60.6	9:02	59.1	8:47	57.6	8:36
4500	70.7	10:21	68.8	10:04	67.0	9:48	65.3	9:38
5000	79.1	11:25	76.9	11:07	74.9	10:50	73.1	10:39
5500	87.8	12:27	85.4	12:08	83.1	11:51	81.2	11:41
6000	96.6	13:29	93.8	13:10	91.3	12:53	89.3	12:42
6500	105.7	14:30	102.7	14:11	100.0	13:54	97.9	13:44
7000	114.8	15:32	111.5	15:11	108.6	14:55	106.5	14:46
7500	124.3	16:32	120.7	16:12	117.8	15:56	115.8	15:48
8000	133.8	17:33	130.0	17:13	126.9	16:57	125.1	16:50
8500	143.9	18:33	139.8	18:13	136.7	17:58	135.3	17:52
9000	153.9	19:33	149.7	19:14	146.5	19:00	145.5	18:54
9500	164.4	20:33	160.1	20:15	157.2	20:01	156.8	19:57
10000	175.0	21:33	170.5	21:15	167.9	21:03	168.0	21:00

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	160	180	200	220	240
20	-2.1	-1.1	0.0	1.2	2.7
30	-3.1	-1.6	0.0	1.9	4.3
40	-4.2	-2.1	0.0	2.7	6.2
50	-5.3	-2.7	0.0	3.6	8.3
60	-6.4	-3.2	0.0	4.7	10.7
70	-7.5	-3.8	0.0	5.9	13.4
80	-8.7	-4.4	0.0	7.2	16.3
90	-9.8	-5.0	0.0	8.6	19.5
100	-11.0	-5.6	0.0	10.2	23.0
110	-12.2	-6.2	0.0	11.9	26.7
120	-13.4	-6.8	0.0	13.7	30.7
130	-14.6	-7.5	0.0	15.7	35.0
140	-15.9	-8.1	0.0	17.8	39.5
150	-17.1	-8.8	0.0	20.0	44.3
160	-18.4	-9.5	0.0	22.3	49.4
170	-19.7	-10.2	0.0	24.8	54.7
180	-21.0	-10.9	0.0	27.3	60.3

Based on 310/.84 climb, Long Range Cruise and .84/310/250 descent.

Long Range Cruise Step Climb 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
1292	1221	1157	1099	1047	1000	957	917	881	847	816
1923	1820	1728	1645	1569	1500	1437	1379	1325	1276	1229
2554	2420	2299	2190	2091	2000	1917	1840	1770	1704	1643
3185	3020	2871	2735	2612	2500	2397	2302	2214	2133	2057
3816	3619	3442	3281	3134	3000	2877	2764	2659	2562	2472
4446	4218	4012	3826	3656	3500	3357	3225	3104	2991	2886
5077	4817	4583	4371	4177	4000	3837	3687	3548	3420	3300
5707	5416	5154	4916	4699	4500	4317	4149	3993	3849	3715
6336	6015	5724	5461	5220	5000	4798	4611	4438	4278	4129
6966	6613	6295	6006	5742	5500	5278	5073	4883	4707	4544
7595	7212	6865	6550	6263	6000	5758	5535	5329	5137	4959
8224	7810	7435	7095	6784	6500	6238	5997	5774	5566	5373
8853	8408	8005	7640	7306	7000	6719	6459	6219	5996	5788
9481	9006	8575	8184	7827	7500	7199	6921	6664	6426	6204
10110	9603	9145	8729	8348	8000	7679	7384	7110	6855	6619
10738	10201	9715	9273	8870	8500	8160	7846	7555	7285	7034
11366	10798	10284	9817	9391	9000	8640	8308	8001	7715	7449
11993	11395	10854	10362	9912	9500	9121	8771	8446	8145	7865
12621	11992	11423	10906	10433	10000	9601	9233	8892	8575	8280

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG)								TIME (HRS:MIN)	
	LANDING WEIGHT (1000 KG)									
150	160	170	180	190	200	210	220	230		
1000	11.8	12.2	12.7	13.3	13.8	14.5	14.9	15.5	16.0	2:16
1500	16.9	17.6	18.3	19.1	20.0	20.9	21.6	22.4	23.3	3:18
2000	22.1	23.0	24.1	25.2	26.4	27.5	28.5	29.6	30.9	4:20
2500	27.4	28.6	29.9	31.4	32.9	34.3	35.6	37.1	38.6	5:23
3000	32.9	34.4	36.0	37.8	39.5	41.3	42.9	44.7	46.5	6:25
3500	38.5	40.3	42.3	44.3	46.4	48.4	50.4	52.5	54.6	7:27
4000	44.2	46.3	48.7	51.0	53.4	55.8	58.1	60.5	63.0	8:29
4500	50.1	52.6	55.2	57.9	60.6	63.4	66.0	68.8	71.5	9:31
5000	56.2	59.0	61.9	64.9	68.1	71.2	74.1	77.2	80.3	10:33
5500	62.5	65.6	68.8	72.2	75.7	79.2	82.5	85.9	89.4	11:34
6000	68.9	72.3	75.9	79.7	83.6	87.4	91.0	94.8	98.8	12:36
6500	75.4	79.2	83.2	87.4	91.6	95.8	99.8	104.1	108.5	13:38
7000	82.1	86.3	90.8	95.3	99.9	104.4	108.9	113.6	118.4	14:39
7500	89.0	93.6	98.5	103.4	108.3	113.3	118.2	123.4	128.6	15:40
8000	96.1	101.2	106.4	111.7	117.0	122.5	127.9	133.4	139.0	16:42
8500	103.4	108.9	114.5	120.2	126.1	132.0	137.8	143.8	149.8	17:43
9000	111.0	116.8	122.8	129.0	135.3	141.7	148.0	154.4	160.9	18:44
9500	118.7	124.9	131.4	138.0	144.9	151.7	158.4	165.3	172.2	19:45
10000	126.6	133.3	140.2	147.4	154.7	162.0	169.2	176.5	183.9	20:46

Based on 310/.84 climb, Long Range Cruise and .84/310/250 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	143	129	118	108	100	93	87	82	77	73	
225	205	187	173	161	150	141	132	125	118	113	
288	264	245	228	213	200	189	178	169	161	153	
349	323	301	282	265	250	237	225	214	204	195	
410	382	357	336	317	300	285	271	258	247	237	
471	440	414	390	369	350	333	317	303	290	279	
532	499	470	444	421	400	381	364	348	334	320	
595	559	527	499	473	450	429	410	393	376	362	
660	621	585	554	526	500	477	456	436	419	402	

Trip Fuel and Time

AIR DIST (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		160	180	200	220	240	
50	FUEL (1000 KG)	1.6	1.8	1.9	2.0	2.1	0:14
	ALT (FT)	11000	9000	9000	7000	5000	
100	FUEL (1000 KG)	2.4	2.6	2.7	2.8	3.0	0:23
	ALT (FT)	15000	13000	13000	13000	13000	
150	FUEL (1000 KG)	3.2	3.4	3.5	3.7	3.9	0:30
	ALT (FT)	21000	21000	21000	21000	21000	
200	FUEL (1000 KG)	3.8	4.1	4.3	4.5	4.8	0:37
	ALT (FT)	27000	27000	27000	25000	25000	
250	FUEL (1000 KG)	4.4	4.7	5.0	5.3	5.6	0:43
	ALT (FT)	37000	31000	29000	29000	29000	
300	FUEL (1000 KG)	5.0	5.3	5.6	6.0	6.3	0:48
	ALT (FT)	41000	39000	37000	35000	33000	
350	FUEL (1000 KG)	5.5	5.9	6.2	6.6	7.0	0:54
	ALT (FT)	43000	39000	37000	35000	35000	
400	FUEL (1000 KG)	6.0	6.4	6.9	7.3	7.8	1:00
	ALT (FT)	43000	39000	37000	37000	35000	
450	FUEL (1000 KG)	6.5	7.0	7.5	8.0	8.5	1:06
	ALT (FT)	43000	41000	39000	37000	35000	
500	FUEL (1000 KG)	7.0	7.6	8.1	8.7	9.2	1:13
	ALT (FT)	43000	41000	39000	37000	35000	

Holding Planning
Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)									
	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
360	9310	9240	9140	9180	9690	10040	10600			
340	8810	8730	8620	8620	9080	9360	9780			
320	8250	8160	8050	8030	8430	8630	8950	9950		
300	7720	7630	7510	7480	7600	7980	8260	8850		
280	7250	7150	7030	6970	7000	7380	7620	8060		
260	6790	6670	6530	6470	6470	6800	6990	7250	8510	
240	6350	6220	6060	5980	5970	6030	6380	6590	7270	
220	5940	5790	5610	5530	5490	5490	5770	5960	6450	7070
200	5590	5430	5230	5140	5070	5040	5150	5350	5660	6020
180	5270	5100	4900	4800	4710	4760	4650	4750	5000	5210
160	5120	4940	4750	4610	4500	4440	4330	4310	4460	4560

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
360	10290	10260	10210	10300	10530
340	9680	9630	9570	9620	9830
320	9080	9030	8960	8980	9160
300	8510	8450	8370	8380	8520
280	7940	7870	7770	7770	7860
260	7390	7300	7190	7190	7240
240	6860	6740	6630	6600	6620
220	6340	6200	6070	6010	6020
200	5880	5720	5550	5470	5430
180	5480	5300	5110	5020	4960
160	5260	5080	4860	4760	4660

These tables include 5% additional fuel for holding in a racetrack pattern.

Crew Oxygen Requirements**Required Pressure (PSI) for Three 115 Cubic Ft. Cylinders****Table 1 - Minimum Dispatch Pressure Using Normal Oxygen Flow**

NUMBER OF CREW USING OXYGEN	TOTAL TIME ON DILUTED OXYGEN (MINUTES)				
	120	180	207	240	300
2	390	520	570	650	770
3	530	720	810	920	1110
4	680	930	1050	1190	1440

For more extensive than normal crew usage, add 0.5 psi/person/minute.

Table 2 - Minimum Dispatch Pressure Using 100% Oxygen Flow

NUMBER OF CREW USING OXYGEN	TOTAL TIME ON 100% OXYGEN (MINUTES)				
	120	180	207	240	300
2	440	590	650	740	880
3	610	830	930	1050	1280
4	770	1070	1210	1370	1670

For more extensive than normal crew usage, add 2.7 psi/person/minute.

Table 3 - Temperature Corrections

CYLINDER PRESSURE AT 21°C (PSI)	PRESSURE CORRECTION FOR EACH 5°C ABOVE/Below 21°C (PSI)
400	+7/-7
600	+11/-11
800	+14/-14
1000	+17/-17
1200	+21/-21
1400	+24/-24
1600	+28/-28
1800	+31/-31
2000	+34/-34

Maximum cylinder pressure = 1850 PSI at 21°C. For maximum cylinder pressure at hotter or colder temperatures, add or subtract 32 PSI per 5°C, respectively.

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
32	166.0	164.5	161.0
30	183.7	181.5	175.5
28	197.9	193.2	185.8
26	213.1	207.2	199.2
24	229.4	222.1	213.9
22	246.8	238.7	230.1
20	271.4	264.3	254.0
18	293.8	284.5	273.3
16	318.2	306.9	294.9
14	339.7	326.4	313.5
12	361.3	347.4	334.2

Anti-Ice Adjustments

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 KG)									
	PRESSURE ALTITUDE (1000 FT)									
14	16	18	20	22	24	26	28	30		
ENGINE ONLY	-0.7	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ENGINE AND WING	-2.7	-2.0	-1.6	-1.2	-1.3	-1.4	-1.5	-1.5	-1.5	-1.5

ALL ENGINES**Long Range Cruise Critical Fuel Reserves
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	
286	263	244	227	213	200	189	179	170	161	154	
571	526	487	454	425	400	377	357	339	323	308	
856	789	731	681	638	600	566	536	509	484	462	
1141	1051	975	909	851	800	755	715	678	646	616	
1426	1314	1218	1136	1064	1000	944	893	848	807	770	
1711	1577	1462	1363	1276	1200	1132	1072	1018	969	924	
1996	1840	1706	1590	1489	1400	1321	1251	1187	1130	1078	
2282	2102	1949	1817	1702	1600	1510	1429	1357	1291	1232	
2567	2365	2193	2044	1914	1800	1699	1608	1526	1453	1386	

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)										
	160	180	200	220	240	260	280	300	320	340	360
200	4.8	4.9	5.0	5.2	5.4	5.6	5.8	6.0	6.2	6.5	6.7
300	6.7	6.7	6.9	7.2	7.5	7.7	8.0	8.3	8.6	8.9	9.3
400	8.5	8.6	8.8	9.2	9.5	9.9	10.2	10.6	11.0	11.4	11.8
500	10.4	10.4	10.8	11.2	11.6	12.0	12.5	12.9	13.3	13.9	14.4
600	12.2	12.2	12.7	13.2	13.7	14.2	14.7	15.2	15.7	16.3	16.9
700	14.0	14.1	14.6	15.1	15.7	16.3	16.9	17.5	18.1	18.8	19.5
800	15.9	15.9	16.5	17.1	17.8	18.5	19.1	19.8	20.4	21.2	22.0
900	17.7	17.8	18.4	19.1	19.9	20.6	21.4	22.1	22.8	23.7	24.5
1000	19.6	19.6	20.3	21.1	21.9	22.8	23.6	24.3	25.1	26.0	27.0
1100	21.4	21.5	22.2	23.1	23.9	24.8	25.7	26.5	27.4	28.4	29.5
1200	23.3	23.3	24.1	25.0	25.9	26.9	27.8	28.8	29.7	30.8	31.9
1300	25.1	25.2	26.0	26.9	27.9	29.0	30.0	31.0	32.0	33.2	34.4
1400	27.0	27.0	27.8	28.8	29.9	31.0	32.1	33.2	34.3	35.5	36.8
1500	28.8	28.8	29.6	30.7	31.9	33.1	34.3	35.4	36.6	37.9	39.3
1600	30.7	30.7	31.5	32.7	33.9	35.2	36.4	37.7	38.9	40.3	41.8
1700	32.5	32.5	33.3	34.6	35.9	37.2	38.6	39.9	41.2	42.6	44.2
1800	34.3	34.4	35.2	36.5	37.9	39.3	40.7	42.1	43.5	44.9	46.5

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minute hold at 1500 ft, one missed approach, approach and land. Includes 5% allowance for wind errors.

Increase fuel required 0.8% for each 10°C above ISA.

If icing conditions exist, increase fuel required by 7% to account for engine and wing anti-ice on (3%) and ice accumulation on unheated surfaces (4%).

Allowance for performance deterioration not included.

Compare the fuel required for all engine and engine inoperative critical fuel reserves, and use the higher of the two.

ENGINE INOP**Long Range Cruise Critical Fuel Reserves**
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	
287	264	245	228	213	200	189	178	169	161	153	
577	530	490	456	426	400	377	356	338	321	306	
866	795	735	684	639	600	565	534	507	482	459	
1155	1061	981	912	852	800	754	712	675	642	612	
1444	1326	1226	1140	1066	1000	942	890	844	803	765	
1733	1592	1472	1368	1279	1200	1130	1069	1013	963	918	
2022	1857	1717	1596	1492	1400	1319	1247	1182	1123	1071	
2311	2123	1962	1825	1705	1600	1507	1425	1351	1284	1224	
2600	2388	2208	2053	1918	1800	1696	1603	1519	1444	1376	

Critical Fuel (1000 KG)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 KG)										
	160	180	200	220	240	260	280	300	320	340	360
200	4.6	4.7	4.9	5.2	5.4	5.7	5.9	6.2	6.5	6.8	7.1
300	6.4	6.5	6.8	7.2	7.5	7.9	8.2	8.6	9.0	9.4	9.8
400	8.2	8.3	8.7	9.2	9.6	10.1	10.5	11.0	11.5	12.0	12.5
500	10.0	10.1	10.6	11.2	11.7	12.3	12.8	13.4	14.0	14.6	15.2
600	11.8	11.9	12.5	13.2	13.8	14.4	15.1	15.7	16.5	17.2	17.9
700	13.6	13.7	14.4	15.1	15.9	16.6	17.4	18.1	19.0	19.8	20.7
800	15.4	15.5	16.3	17.1	18.0	18.8	19.6	20.5	21.4	22.4	23.4
900	17.2	17.3	18.2	19.1	20.1	21.0	21.9	22.9	23.9	25.0	26.0
1000	19.0	19.1	20.1	21.1	22.2	23.2	24.2	25.2	26.3	27.5	28.6
1100	20.8	20.9	22.0	23.1	24.2	25.3	26.3	27.5	28.7	30.0	31.2
1200	22.6	22.7	23.8	25.0	26.2	27.4	28.5	29.8	31.1	32.5	33.8
1300	24.4	24.4	25.6	26.9	28.2	29.5	30.7	32.0	33.5	35.0	36.4
1400	26.2	26.2	27.4	28.8	30.2	31.6	32.9	34.3	35.8	37.5	39.1
1500	27.9	28.0	29.2	30.6	32.2	33.6	35.1	36.6	38.2	39.9	41.7
1600	29.7	29.8	31.0	32.5	34.2	35.7	37.3	38.9	40.6	42.4	44.2
1700	31.5	31.6	32.7	34.4	36.1	37.8	39.5	41.2	43.0	44.9	46.7
1800	33.3	33.4	34.5	36.3	38.1	39.9	41.7	43.4	45.3	47.2	49.2

Based on: Emergency descent to 10000 ft, level cruise at 10000 ft, 250 KIAS descent to 1500 ft, 15 minute hold at 1500 ft, one missed approach, approach and land. Includes APU fuel burn and 5% allowance for wind errors.

Increase fuel required 0.8% for each 10°C above ISA.

If icing conditions exist, increase fuel required by 9% to account for engine and wing anti-icing on (1%) and ice accumulation on unheated surfaces (8%).

Allowance for performance deterioration not included.

Compare the fuel required for all engine and engine inoperative critical fuel reserves, and use the higher of the two.

Performance Dispatch

Landing

Chapter PD

Section 42

Landing Field Limit Weight - Dry Runway

Flaps 30

Wind Corrected Field Length (M)

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1400			1280	1400	1450	1520	1580	1640
1600	1300	1360	1460	1600	1670	1750	1820	1900
1800	1440	1520	1640	1800	1880	1980	2070	2170
2000	1580	1680	1820	2000	2090	2210	2310	2430
2200	1720	1840	2000	2200	2310	2430	2550	2690
2400	1860	2010	2180	2400	2520	2660	2800	2950
2600	2010	2170	2360	2600	2730	2890	3040	3210
2800	2150	2330	2540	2800	2940	3120	3290	3470
3000	2290	2490	2720	3000	3160	3350	3530	3740
3200	2430	2650	2900	3200	3370	3580	3770	4000
3400	2570	2810	3080	3400	3580	3800	4020	4260
3600	2710	2980	3260	3600	3790	4030	4260	4520
3800	2860	3140	3440	3800	4010	4260	4500	4780
4000	3000	3300	3620	4000	4220	4490	4750	5050
4200	3140	3460	3800	4200	4430	4720	4990	5310
4400	3280	3620	3980	4400	4650	4950	5230	5570

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1400	188.7	176.8	166.1	155.9	
1600	227.3	213.3	200.0	187.5	175.6
1800	263.8	249.9	234.4	219.5	205.4
2000	293.0	277.5	265.6	252.5	236.4
2200	309.3	301.2	292.7	276.4	264.6
2400	322.0	313.1	305.0	296.9	287.0
2600	334.7	324.6	315.2	307.0	298.7
2800	345.8	336.1	325.8	316.1	307.8
3000	357.7	346.0	336.3	325.9	316.1
3200	369.1	356.7	345.3	335.3	324.9
3400	380.0	366.9	354.8	343.8	333.5
3600		376.4	363.8	352.1	341.5
3800		385.9	372.3	360.1	348.4
4000			380.5	367.6	355.9
4200			388.7	374.8	362.6
4400				381.7	369.0

With manual speedbrakes, decrease weight by 21450 kg.

With 1 brake deactivated, decrease weight by 20600 kg.

With 2 brakes deactivated, decrease weight by 41900 kg.

Landing Field Limit Weight - Wet Runway**Flaps 30****Wind Corrected Field Length (M)**

FIELD LENGTH AVAILABLE (M)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
1400				1400	1450	1510	1560	1610
1600			1460	1600	1660	1740	1800	1870
1800	1460	1530	1640	1800	1870	1960	2050	2140
2000	1600	1690	1820	2000	2090	2190	2290	2400
2200	1750	1850	2000	2200	2300	2420	2540	2660
2400	1890	2010	2180	2400	2510	2650	2780	2920
2600	2030	2180	2360	2600	2730	2880	3020	3180
2800	2170	2340	2540	2800	2940	3110	3270	3450
3000	2310	2500	2720	3000	3150	3330	3510	3710
3200	2460	2660	2900	3200	3360	3560	3750	3970
3400	2600	2820	3080	3400	3580	3790	4000	4230
3600	2740	2980	3260	3600	3790	4020	4240	4490
3800	2880	3150	3440	3800	4000	4250	4480	4760
4000	3020	3310	3620	4000	4210	4480	4730	5020
4200	3160	3470	3800	4200	4430	4700	4970	5280
4400	3310	3630	3980	4400	4640	4930	5220	5540

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (M)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
1400	153.4				
1600	187.0	175.2	164.6	154.6	
1800	220.6	206.9	194.1	182.0	170.4
2000	253.4	238.7	223.8	209.7	196.3
2200	278.4	266.6	253.6	238.1	222.9
2400	300.4	291.1	275.9	263.7	250.0
2600	313.2	305.1	296.8	285.0	269.5
2800	324.2	315.0	306.8	298.7	289.3
3000	335.2	325.1	315.7	307.4	299.1
3200	344.9	335.1	324.9	315.4	307.0
3400	355.0	344.1	334.0	323.8	314.3
3600	365.2	353.0	342.5	332.1	321.8
3800	374.8	362.1	350.2	340.0	329.4
4000	384.2	370.6	358.4	346.6	336.7
4200		378.9	366.0	354.2	343.2
4400		387.1	373.4	361.1	349.4

With manual speedbrakes, decrease weight by 21450 kg.

With 1 brake deactivated, decrease weight by 20600 kg.

With 2 brakes deactivated, decrease weight by 41900 kg.

Landing Climb Limit Weight**Valid for approach with flaps 20 and landing with flaps 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)						
		AIRPORT PRESSURE ALTITUDE (FT)						
°C	°F	-2000	0	2000	4000	6000	8000	
54	129	297.3	279.1					
52	126	306.3	287.0					
50	122	315.2	294.5	269.7				
48	118	323.5	303.4	276.9				
46	115	331.8	312.4	284.1	259.6			
44	111	340.4	321.1	291.5	267.7			
42	108	349.8	329.0	299.1	275.0	251.6		
40	104	356.7	337.3	307.2	281.4	257.0		
38	100	363.8	347.0	316.0	287.8	262.8	233.8	
36	97	366.6	354.0	323.2	293.4	269.2	238.4	
34	93	366.8	360.8	330.4	299.7	274.4	243.0	
32	90	367.1	363.3	337.6	306.4	278.7	247.1	
30	86	367.3	363.4	344.5	312.9	282.9	250.9	
28	82	367.6	363.6	350.2	318.7	287.3	254.6	
26	79	367.9	363.7	350.4	322.6	292.2	258.2	
24	75	368.1	363.9	350.5	326.0	297.0	263.1	
22	72	368.4	364.0	350.5	327.4	300.3	268.1	
20	68	368.6	364.1	350.6	327.5	302.5	272.4	
18	64	368.9	364.3	350.7	327.6	304.7	275.2	
16	61	369.2	364.4	350.8	327.6	304.7	276.9	
14	57	369.4	364.5	350.8	327.7	304.8	278.5	
12	54	369.6	364.6	350.9	327.8	304.9	278.6	
10	50	369.8	364.7	351.0	327.9	304.9	278.7	
8	46	369.9	364.8	351.1	327.9	304.9	278.7	
6	43	370.0	364.9	349.7	328.0	304.9	272.8	
4	40	370.1	365.0	341.5	313.7	286.7	254.9	
2	36	370.2	365.1	341.5	313.8	286.8	254.9	
0	32	370.3	365.1	341.5	313.8	286.8	255.0	
-40	-40	371.0	365.4	341.6	313.8	286.8	255.0	

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

With engine bleed for packs off, increase weight by 1250 kg.

With engine anti-ice on, decrease weight by 150 kg.

With engine and wing anti-ice on, decrease weight by 2350 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 24600 kg.

ENGINE INOP**Go-Around Climb Gradient****Flaps 20, Gear Up****Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off.**

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
54	9.16	7.98	6.54	5.32	4.09	2.49
50	10.10	8.98	7.32	5.99	4.73	3.07
46	11.06	9.95	8.21	6.69	5.39	3.66
42	11.98	10.90	9.09	7.48	6.08	4.27
38	12.83	11.81	9.96	8.25	6.75	4.90
34	13.01	12.64	10.76	8.97	7.32	5.49
30	13.03	12.79	11.43	9.64	7.87	5.98
26	13.06	12.80	11.74	10.19	8.48	6.46
22	13.08	12.81	11.75	10.46	8.89	6.98
18	13.10	12.83	11.75	10.47	9.15	7.33
14	13.13	12.84	11.76	10.47	9.15	7.55
10	13.15	12.85	11.77	10.48	9.16	7.55

Weight Adjustment

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)											
	2	3	4	5	6	7	8	9	10	11	12	13
320	-4.29	-4.77	-5.26	-5.74	-6.13	-6.59	-7.04	-7.50	-7.95	-8.45	-8.92	-9.39
300	-4.02	-4.44	-4.89	-5.32	-5.66	-6.08	-6.49	-6.90	-7.32	-7.77	-8.21	-8.64
280	-3.56	-3.94	-4.33	-4.72	-5.01	-5.38	-5.74	-6.10	-6.47	-6.89	-7.28	-7.67
260	-3.12	-3.43	-3.77	-4.11	-4.34	-4.66	-4.96	-5.26	-5.58	-5.95	-6.29	-6.63
240	-2.44	-2.67	-2.95	-3.23	-3.39	-3.64	-3.88	-4.11	-4.37	-4.68	-4.96	-5.23
220	-1.61	-1.76	-1.97	-2.17	-2.26	-2.43	-2.58	-2.74	-2.93	-3.15	-3.36	-3.52
200	-0.61	-0.66	-0.76	-0.81	-0.85	-0.91	-0.97	-1.03	-1.12	-1.20	-1.25	-1.28
190	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
180	0.66	0.75	0.85	0.88	0.94	1.00	1.07	1.17	1.26	1.30	1.33	1.36
160	2.37	2.67	2.86	3.00	3.20	3.44	3.71	3.95	4.13	4.22	4.33	4.44

Speed Adjustment

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)											
	-2	0	2	4	6	8	10	12	14	16	18	
VREF	-0.23	-0.24	-0.25	-0.27	-0.28	-0.27	-0.23	-0.16	-0.07	0.03	0.10	
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	0.17	0.18	0.19	0.20	0.21	0.19	0.15	0.07	-0.03	-0.11	-0.14	
VREF+20	0.38	0.40	0.42	0.43	0.44	0.37	0.23	-0.01	-0.24	-0.42	-0.56	
VREF+30	0.43	0.44	0.44	0.43	0.40	0.28	0.05	-0.28	-0.61	-0.90	-1.12	

With engine bleed for packs off, increase gradient by 0.1%.

With engine and wing anti-ice on, decrease gradient by 0.1%.

When operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C, decrease gradient by 1.2%.

Quick Turnaround Limit Weight

Flaps 30 Limit Weight (1000 KG)

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	235.5				
50	122	237.0	228.2			
45	113	239.0	230.0	221.4		
40	104	240.9	231.9	223.2	214.8	
35	95	242.9	233.9	225.1	216.6	208.1
30	86	245.0	235.9	227.0	218.4	209.9
25	77	247.1	237.9	228.9	220.3	211.7
20	68	249.2	240.0	231.0	222.2	213.6
15	59	251.5	242.2	233.0	224.1	215.6
10	50	253.8	244.4	235.2	226.2	217.5
5	41	256.2	246.6	237.4	228.3	219.5
0	32	258.6	248.9	239.6	230.4	221.5
-5	23	261.0	251.3	241.9	232.6	223.6
-10	14	262.9	253.8	244.2	234.9	225.8
-15	5	264.8	256.4	246.7	237.3	228.1
-20	-4	266.8	259.0	249.2	239.7	230.4
-30	-22	270.8	263.5	254.4	244.7	235.3
-40	-40	276.0	267.7	260.0	250.1	240.4
-50	-58	282.2	272.0	264.6	255.7	245.8
-54	-65	284.7	274.4	266.4	258.1	248.0

Increase weight by 2100 kg per 1% uphill slope. Decrease weight by 3450 kg per 1% downhill slope.

Increase weight by 6100 kg per 10 knots headwind. Decrease weight by 29450 kg per 10 knots tailwind.

Decrease weight by 12600 kg when one brake is deactivated. Decrease weight by 24950 kg when two brakes are deactivated.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 65 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

Alternate procedure:

No sooner than 10 and no later than 15 minutes after parking, check for the BRAKE TEMP advisory message on EICAS. If the message is not displayed, no waiting period is required. If it is displayed, do not dispatch until at least 65 minutes after landing or until the Brake Temperature Monitoring System (BTMS) readings on the Landing Gear Synoptic Display are all 3.0 or lower. Check that wheel thermal plugs have not melted before making a subsequent takeoff.

Note: If any brake temperature display digit is blank or the BRAKE TEMP SYS status message is displayed, then this alternate procedure cannot be used.

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Performance Dispatch
Gear Down

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GEAR DOWN

Takeoff Climb Limit Weight

Flaps 15

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

AIRPORT OAT		TAKEOFF CLIMB WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	236.9	225.2	209.9	189.5	159.7
52	126	242.3	226.1	214.7	195.1	166.9
50	122	248.1	227.3	217.1	200.5	173.2
48	118	254.1	232.9	217.0	205.8	178.4
46	115	259.9	238.4	218.2	206.1	183.5
44	111	264.7	243.7	223.0	206.0	188.5
42	108	269.1	249.0	227.9	207.1	191.2
40	104	273.8	254.4	233.0	211.6	191.1
38	100	280.0	260.2	238.4	216.4	192.3
36	97	286.2	264.9	243.9	221.5	196.7
34	93	292.5	269.6	249.6	226.7	201.3
32	90	298.3	274.8	255.0	231.8	206.2
30	86	303.7	280.9	260.5	237.2	211.1
28	82	308.6	286.8	265.2	242.4	215.9
26	79	308.7	292.3	269.3	247.6	221.0
24	75	308.8	296.1	273.6	252.7	225.9
22	72	308.9	296.2	278.0	256.7	231.0
20	68	309.0	296.2	280.6	260.0	235.5
18	64	309.1	296.3	280.7	262.7	239.0
16	61	309.2	296.3	280.7	263.7	240.7
14	57	309.3	296.4	280.7	263.7	242.0
12	54	309.4	296.4	280.7	263.7	242.1
10	50	309.5	296.5	280.7	263.7	242.1
-40	-40	309.8	296.5	280.9	263.7	242.0

With engine bleed for packs off, increase weight by 800 kg.

With engine anti-ice on, decrease weight by 900 kg.

With engine and wing anti-ice on, decrease weight by 2250 kg.

GEAR DOWN**Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 30****Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	249.4				
52	126	256.6				
50	122	264.0	241.5			
48	118	272.0	247.4			
46	115	278.7	254.0	234.8		
44	111	285.5	260.6	240.6		
42	108	291.8	268.0	246.3	227.7	
40	104	298.7	274.5	252.1	232.7	
38	100	305.4	280.9	257.9	237.6	211.3
36	97	312.2	286.5	263.0	241.7	215.6
34	93	318.6	292.0	268.8	245.7	219.8
32	90	320.7	297.6	273.8	249.3	223.5
30	86	320.8	302.8	278.7	253.2	226.8
28	82	320.9	307.5	283.1	257.2	230.1
26	79	321.1	307.6	286.4	261.7	233.4
24	75	321.2	307.7	288.9	266.2	237.0
22	72	321.3	307.7	289.9	269.2	240.7
20	68	321.4	307.8	290.0	271.0	243.8
18	64	321.5	307.9	290.0	272.8	246.0
16	61	321.6	308.0	290.1	272.8	247.5
14	57	321.8	308.0	290.1	272.9	248.9
12	54	321.9	308.1	290.1	272.9	249.0
10	50	322.0	308.2	290.2	272.9	249.0
-40	-40	322.5	308.5	290.5	273.1	249.2

With engine bleed for packs off, increase weight 1600 kg.

With engine and wing anti-ice on, decrease weight by 2150 kg.

When operating in icing conditions during any part of the flight when forecast landing temperature is below 10°C, decrease weight by 29150 kg.

GEAR DOWN**Takeoff Obstacle Limit Weight****Flaps 15****Sea Level, 33°C & Below, Zero Wind****Based on engine bleed for packs on, engine anti-ice on or off, and wing anti-ice off or Auto**

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	291.3										
20	268.2	287.5									
40	247.9	266.7	281.2	292.1							
60	232.8	251.1	265.7	277.4	286.6	294.1					
80		239.0	253.1	265.0	274.8	282.9	289.5	295.0			
100			227.4	242.3	254.4	264.5	272.9	280.1	286.1	291.2	295.6
120				232.9	245.0	255.3	264.0	271.5	277.9	283.4	288.1
140					224.5	236.7	247.0	256.0	263.6	270.3	276.1
160						216.9	229.1	239.5	248.6	256.4	263.3
180						222.1	232.6	241.8	249.8	256.8	263.0
200							215.7	226.3	235.5	243.6	250.7
220								220.3	229.6	237.8	245.0
240								204.2	214.8	224.1	232.3
260									199.1	209.6	218.9
280										204.7	214.0
300											200.1
											209.3
											217.7
											225.1
											231.9
											238.0
											243.5

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

OAT Adjustment

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)						
	180	200	220	240	260	280	300
33 & BELOW	0	0	0	0	0	0	0
34	-1.1	-1.2	-1.4	-1.5	-1.7	-1.8	-2.0
36	-4.1	-4.7	-5.2	-5.8	-6.4	-7.0	-7.5
38	-7.1	-8.1	-9.1	-10.1	-11.1	-12.1	-13.1
40	-10.1	-11.6	-13.0	-14.4	-15.9	-17.3	-18.7
42	-13.7	-15.5	-17.4	-19.2	-21.0	-22.8	-24.6
44	-17.3	-19.5	-21.7	-23.9	-26.2	-28.4	-30.6
46	-20.9	-23.5	-26.1	-28.7	-31.3	-33.9	-36.5
48	-24.5	-27.5	-30.5	-33.5	-36.4	-39.4	-42.4
50	-28.1	-31.4	-34.8	-38.2	-41.6	-45.0	-48.4

GEAR DOWN**Takeoff Obstacle Limit Weight****Flaps 15****Pressure Altitude Adjustment**

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	180	200	220	240	260	280	300
S.L. & BELOW	0	0	0	0	0	0	0
1000	-7.3	-8.0	-8.7	-9.5	-10.2	-10.9	-11.6
2000	-14.6	-16.0	-17.5	-18.9	-20.4	-21.8	-23.3
3000	-21.0	-23.2	-25.3	-27.5	-29.6	-31.8	-34.0
4000	-27.4	-30.3	-33.2	-36.1	-38.9	-41.8	-44.7
5000	-34.1	-37.7	-41.3	-44.9	-48.5	-52.1	-55.7
6000	-40.7	-45.0	-49.4	-53.7	-58.0	-62.4	-66.7
7000	-47.7	-52.9	-58.1	-63.3	-68.5	-73.7	-78.8
8000	-54.8	-60.8	-66.8	-72.9	-78.9	-85.0	-91.0

Wind Adjustment

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	180	200	220	240	260	280	300
15 TW	-12.7	-15.3	-18.0	-20.7	-23.3	-26.0	-28.7
10 TW	-8.4	-10.2	-12.0	-13.8	-15.6	-17.3	-19.1
5 TW	-4.2	-5.1	-6.0	-6.9	-7.8	-8.7	-9.6
0	0	0	0	0	0	0	0
10 HW	3.9	3.5	3.1	2.6	2.2	1.7	1.3
20 HW	7.9	7.0	6.1	5.2	4.3	3.4	2.6
30 HW	12.1	11.0	9.9	8.7	7.6	6.5	5.4
40 HW	16.4	15.0	13.6	12.3	10.9	9.5	8.2

With engine bleed for packs off, increase weight by 950 kg.

With engine and wing anti-ice on, decrease weight by 3000 kg.



GEAR DOWN**Long Range Cruise Altitude Capability**
Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18500	16600	14200
350	19200	17300	14800
340	19700	18000	15500
330	20600	18900	16300
320	21700	20100	17600
310	22800	21300	19000
300	23900	22400	20300
290	25000	23500	21800
280	26000	24600	23000
270	27100	25900	24300
260	28200	27200	25700
250	29400	28600	27100
240	30400	30000	28500
230	31200	30800	29900
220	32000	31700	31000
210	32800	32600	32000
200	33500	33200	32700
190	34000	33900	33400
180	34600	34500	34100
170	35200	35100	34700
160	35800	35700	35300

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	
326	291	261	237	217	200	188	177	167	158	150
488	436	391	355	326	300	282	266	251	238	227
649	580	521	473	434	400	376	354	335	318	303
809	724	650	591	543	500	470	443	419	398	380
968	867	779	709	651	600	565	533	504	479	456
1127	1009	908	826	759	700	659	622	589	559	533
1285	1152	1036	944	867	800	754	712	673	639	609
1442	1293	1165	1061	975	900	848	801	758	720	686
1599	1435	1293	1178	1083	1000	943	890	843	800	763
1755	1576	1421	1295	1191	1100	1037	980	928	881	840
1910	1716	1548	1412	1299	1200	1131	1069	1012	962	917
2065	1856	1675	1529	1407	1300	1226	1158	1097	1042	994
2219	1996	1802	1646	1515	1400	1320	1248	1182	1123	1072
2373	2135	1929	1762	1623	1500	1415	1337	1267	1204	1149
2526	2274	2056	1878	1730	1600	1509	1427	1352	1285	1226
2679	2413	2182	1994	1838	1700	1604	1516	1437	1366	1304
2831	2551	2308	2110	1945	1800	1699	1606	1522	1447	1382
2982	2689	2434	2226	2053	1900	1793	1696	1608	1529	1459
3133	2826	2559	2342	2160	2000	1888	1786	1693	1610	1537

GEAR DOWN**Long Range Cruise Trip Fuel and Time****Reference Fuel and Time Required**

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	7.8	0:51	7.4	0:49	7.2	0:47	7.0	0:46	6.9	0:44
300	11.4	1:13	10.8	1:10	10.4	1:07	10.0	1:05	9.7	1:03
400	15.0	1:36	14.2	1:32	13.6	1:28	13.0	1:25	12.6	1:22
500	18.6	1:59	17.6	1:53	16.7	1:48	16.0	1:44	15.4	1:40
600	22.3	2:21	21.1	2:14	20.0	2:08	19.1	2:03	18.4	1:58
700	26.1	2:43	24.6	2:35	23.3	2:28	22.2	2:22	21.3	2:17
800	29.8	3:05	28.1	2:56	26.6	2:48	25.3	2:41	24.2	2:35
900	33.6	3:27	31.6	3:17	29.9	3:08	28.4	3:00	27.2	2:53
1000	37.3	3:49	35.1	3:38	33.2	3:28	31.5	3:20	30.1	3:11
1100	41.3	4:10	38.8	3:59	36.7	3:48	34.7	3:38	33.2	3:29
1200	45.2	4:32	42.4	4:19	40.1	4:07	37.9	3:57	36.2	3:47
1300	49.1	4:53	46.1	4:39	43.5	4:27	41.2	4:15	39.3	4:04
1400	53.0	5:14	49.8	5:00	47.0	4:46	44.4	4:34	42.4	4:22
1500	57.0	5:36	53.4	5:20	50.4	5:05	47.6	4:52	45.5	4:40
1600	61.1	5:56	57.3	5:40	54.0	5:24	51.0	5:11	48.7	4:57
1700	65.2	6:17	61.1	5:59	57.6	5:43	54.4	5:29	51.9	5:15
1800	69.3	6:37	64.9	6:19	61.1	6:02	57.8	5:47	55.2	5:32
1900	73.4	6:58	68.7	6:39	64.7	6:21	61.2	6:05	58.4	5:49
2000	77.5	7:19	72.6	6:58	68.3	6:40	64.6	6:23	61.6	6:07

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)				
	160	180	200	220	240
5	-0.4	-0.2	0.0	0.3	0.7
10	-0.9	-0.5	0.0	0.6	1.3
15	-1.3	-0.7	0.0	0.9	2.0
20	-1.8	-1.0	0.0	1.3	2.7
25	-2.3	-1.3	0.0	1.6	3.5
30	-2.8	-1.6	0.0	2.0	4.2
35	-3.3	-1.9	0.0	2.3	5.0
40	-3.9	-2.1	0.0	2.7	5.9
45	-4.4	-2.4	0.0	3.1	6.7
50	-4.9	-2.7	0.0	3.5	7.6
55	-5.4	-2.9	0.0	3.9	8.5
60	-6.0	-3.2	0.0	4.4	9.4
65	-6.5	-3.5	0.0	4.8	10.4
70	-7.0	-3.7	0.0	5.2	11.3
75	-7.6	-4.0	0.0	5.7	12.3
80	-8.1	-4.2	0.0	6.2	13.4

Based on VREF+80 climb, Long Range Cruise and VREF+80 descent.

GEAR DOWN

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	
101	84	72	63	56	50	45	42	38	36	33	
171	150	133	120	109	100	92	86	80	75	71	
242	215	194	177	162	150	139	130	122	115	109	
311	280	255	233	215	200	187	175	165	156	147	
380	344	315	290	268	250	234	220	207	196	186	
448	408	374	346	321	300	281	265	250	237	225	
517	472	434	402	374	350	329	310	293	278	265	
586	536	494	458	427	400	376	355	336	319	304	
655	600	554	514	480	450	423	400	379	360	343	
726	666	615	571	533	500	471	445	421	400	381	

Trip Fuel and Time

AIR DISTANCE (NM)		LANDING WEIGHT (1000 KG)					TIME (HRS:MIN)
		160	180	200	220	240	
50	FUEL (1000 KG)	2.2	2.3	2.5	2.6	2.7	0:15
	ALT (FT)	13000	11000	11000	11000	11000	
100	FUEL (1000 KG)	3.7	3.9	4.1	4.3	4.5	0:25
	ALT (FT)	23000	21000	21000	19000	19000	
150	FUEL (1000 KG)	5.0	5.2	5.5	5.8	6.2	0:34
	ALT (FT)	29000	27000	25000	25000	23000	
200	FUEL (1000 KG)	6.2	6.5	6.9	7.3	7.8	0:43
	ALT (FT)	31000	29000	29000	27000	25000	
250	FUEL (1000 KG)	7.4	7.8	8.3	8.8	9.4	0:51
	ALT (FT)	33000	31000	29000	27000	25000	
300	FUEL (1000 KG)	8.6	9.1	9.6	10.3	11.0	1:00
	ALT (FT)	33000	31000	31000	29000	27000	
350	FUEL (1000 KG)	9.8	10.3	11.0	11.7	12.6	1:08
	ALT (FT)	33000	33000	31000	29000	27000	
400	FUEL (1000 KG)	11.0	11.6	12.3	13.2	14.2	1:16
	ALT (FT)	33000	33000	31000	29000	27000	
450	FUEL (1000 KG)	12.2	12.9	13.7	14.7	15.8	1:25
	ALT (FT)	33000	33000	31000	29000	27000	
500	FUEL (1000 KG)	13.4	14.2	15.1	16.2	17.5	1:33
	ALT (FT)	33000	33000	31000	29000	27000	

GEAR DOWN**Holding Planning**
Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)						
	PRESSURE ALTITUDE (FT)						
1500	5000	10000	15000	20000	25000	30000	
360	15490						
340	14720	14710					
320	13780	13740					
300	12760	12730	12670				
280	11940	11920	11840				
260	11030	11010	10930	10980			
240	10300	10270	10190	10210			
220	9600	9550	9460	9460	9550		
200	9210	9140	9050	9030	9100	9210	
180	8900	8820	8720	8690	8750	8840	9040
160	8630	8540	8430	8390	8430	8510	8690

Flaps 1

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)				
	PRESSURE ALTITUDE (FT)				
1500	5000	10000	15000	20000	
360	15330	15400	15380	15620	16410
340	14470	14510	14490	14690	15250
320	13540	13550	13540	13670	14090
300	12540	12540	12530	12650	12900
280	11680	11670	11630	11750	11960
260	10760	10730	10680	10790	10930
240	9970	9920	9860	9940	10050
220	9210	9140	9070	9110	9210
200	8700	8610	8520	8540	8620
180	8290	8190	8090	8090	8140
160	7950	7850	7720	7710	7730

These tables include 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	171.5	171.5	166.7
18	182.0	180.0	175.8
16	194.2	192.5	188.4
14	207.3	206.6	201.2
12	223.4	221.2	214.5
10	239.5	236.8	229.8
8	256.5	252.7	246.2
6	275.8	268.7	258.8
4	292.6	281.7	268.8
2	306.2	293.1	279.3
0	318.4	303.7	288.9

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	20	
ENGINE ONLY	0.0	-0.7	-1.2	-1.2	-1.1	-0.9	-0.7	-0.2	0.0	0.0	0.0
ENGINE AND WING	-2.3	-3.0	-3.0	-3.2	-2.7	-2.4	-1.9	-1.6	-1.3	-1.0	-0.7

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Performance Dispatch
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Chapter PD
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 data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

Takeoff

The maximum allowable takeoff weight will be the least of the Field, Climb, Tire Speed, and Obstacle Limit Weights as determined from the following tables. Brake Energy Limit is not shown as it is not limiting for the range of conditions shown in this chapter. When determining a maximum weight for a wet runway, the dry runway limit weight must also be checked and the lower of the two weights used.

Regulations require that the runway length be adjusted to account for alignment of the airplane prior to takeoff. The table below provides TORA, TODA and ASDA adjustments for both 90 degree taxiway entry and 180 degree turnaround. For the 180 degree turnaround case, adjustments are provided for a nominal 60 m runway pavement width. These values may be used when obtaining takeoff weights from the AFM or a takeoff analysis program. When using line-up allowances with the Field Length Limit chart, the field length available must be reduced by the ASDA adjustment.

	90 DEGREE TAXIWAY ENTRY	180 DEGREE TURNAROUND
	MINIMUM LINE-UP DISTANCE (M)	NOMINAL LINE-UP DISTANCE (M) (60.0 M RUNWAY)
TORA & TODA	23	51
ASDA	49	77

Minimum Takeoff Weight

Light weight takeoffs at the GE90-110B1L thrust rating may be limited by minimum takeoff weight in order to maintain airplane controllability during takeoff. For takeoff at weights below the minimum takeoff weight, use of a lower thrust rating and/or the assumed temperature method of thrust reduction is required.

Field Limit Weight - Slope and Wind Corrections

These tables for wet and dry runways provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the Slope Correction table with the available field length and runway slope to determine the slope corrected field length. Now enter the Wind Correction 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 condition 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

This table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the correction tables to correct 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.

Tire Speed Limit

Maximum tire speed limited weights are presented for 235 MPH tires. To determine the tire speed limit weight, enter the table with OAT, move to airport pressure altitude and read the tire speed limit weight. Adjust the tire speed limit weight according to the notes below the table to account for wind.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations,

unbalanced for brake energy, or obstacle clearance with unbalanced V1. 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. 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. This typically occurs at full rated thrust and light weights and is shown in the Minimum Takeoff Weight tables provided. The options are to select a smaller flaps setting, use reduced takeoff thrust and/or add weight (fuel). Selecting derate thrust is the preferred method of reduced takeoff thrust as this will reduce the minimum control speeds.

Normal takeoff speeds, V1, VR, and V2 are read from either the wet or dry table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR 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 Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Minimum V2

Minimum takeoff safety speeds (V2) are provided to ensure an adequate margin between the normal operating speed and the in-air minimum control speed is maintained for directional control with high thrust asymmetry during a light weight takeoff.

Data are presented as a function of airport pressure altitude and are valid for all temperatures. To obtain the proper V2 speed for takeoff, first determine the normal takeoff V2 using the takeoff speeds tables provided, adjusted for pressure altitude, temperature, and VR correction (if applicable). Compare this V2 with the minimum V2. If the calculated V2 is less than the minimum V2, set V2 equal to minimum V2 and determine a new VR by adding the difference between calculated V2 and minimum V2 to the original VR obtained from the V1, VR, V2 Adjustments table or Minimum VR table (if applicable).

Brakes Deactivated

When operating with brakes deactivated, the field limit weight and the V1 must be reduced to allow for reduced braking capability. A simplified method which conservatively accounts for the reduced braking capability of one brake deactivated is to reduce the normal runway limited weight by 4050 kg for a dry runway or 2550 kg for a wet runway and the V1 associated with the reduced weight by 2 knots. With two brakes deactivated, reduce the normal runway limited weight by 8300 kg for a dry runway or 5300 kg for a wet runway and the V1 associated with the reduced weight by 5 knots for a dry runway or 3 knots for a wet runway. If the resulting V1 is less than minimum V1, takeoff is permitted with V1 set equal to V1(MCG) provided the dry accelerate stop distance corrected for wind and slope exceeds approximately 1800 m for one brake deactivated or 1900 m for two brakes deactivated. For wet runways, the corrected accelerate stop distance should exceed approximately 2350 m for one brake deactivated or 2450 m for two brakes deactivated.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

One Thrust Reverser Inoperative

Wet runway takeoff performance presented for all brakes operating is based on the use of one thrust reverser during deceleration. When operating with a thrust reverser inoperative, the runway/obstacle limited takeoff weight and V1 speed must be reduced to account for the reduced deceleration capability. A simplified method which conservatively accounts for this is to reduce the normal wet runway/obstacle limited weight by 5050 kg and the V1 associated with the reduced weight by 3 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 corrected for wind and slope exceeds approximately 2400 m.

Enroute

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of approximately 1.3g (39° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination. Data is based on economy climb and descent speeds, and Long Range Cruise with normal engine bleed for air conditioning. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table 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 fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance as discussed above. Then enter the Trip Fuel and Time required with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. The data considers the use of the FMC short trip optimum altitude. Obtain air distance from upper table using the ground distance and wind component to the alternate. Enter Trip Fuel and Time 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

These tables provide total fuel flow information necessary for planning Flaps Up and Flaps 1 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%.

Oxygen Requirements

Flight Crew System

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck.

For freighter airplanes, regulations also require that sufficient oxygen be provided to the flight crew in case of a main deck cargo fire, which requires cabin depressurization, intermediate level off at 25000 ft altitude, and landing at the nearest suitable airport.

Data are provided to determine the flight crew oxygen dispatch requirements. Table 1 shows the dispatch pressure required for NORMAL regulator setting. Table 2, which can be used if oxygen dispatch requirements are scheduled based on pure oxygen availability, shows the dispatch pressure required for 100% regulator setting.

To determine the flight crew oxygen dispatch requirements, enter the appropriate table with number of crew plus observers using oxygen and total time, which should include maximum diversion time from the intended route to the nearest suitable airport, and read the minimum oxygen system dispatch pressure.

Additional adjustments for more extensive than normal crew usage can be made by adding 0.5 psi/person/minute for NORMAL regulator setting or 2.7 psi/person/minute for 100% regulator setting.

For ambient temperatures above or below 21°C, adjust the required dispatch pressure by the appropriate correction from Table 3.

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 Range Operations

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 diversion airport comply with rules set up specifically for "Extended Range Operation with Two Engine airplanes". This section provides reserve fuel planning information for the "Critical Fuel Scenario" based on two engine operation at Long Range Cruise as well as single engine operation at Long Range Cruise.

Long Range Cruise Critical Fuel Reserves

Enter Ground to Air Mile Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter 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 in-service 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 Flaps 30.

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

Landing Field Limit Weight

Obtain wind corrected field length by entering upper table with field length available and wind component along the runway. Now enter table with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

Landing Climb Limit Weight

Enter 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 engine bleed corrections as noted. Note that data is for one engine inoperative.

Quick Turnaround Limit Weight

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

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, 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.

Takeoff/Landing Climb Limit Weight

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

The remaining gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

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DO NOT USE FOR FLIGHT

777 Flight Crew Operations Manual

Performance Dispatch

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777-300 PW4090 LB FAA

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Performance Dispatch

Takeoff

Chapter PD

Section 50

Takeoff Field Corrections

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	4310	4280	4260	4230	4200	4110	4020	3930	3840	
4600	4730	4700	4670	4630	4600	4510	4410	4320	4220	
5000	5150	5110	5080	5040	5000	4900	4800	4700	4600	
5400	5570	5530	5490	5440	5400	5300	5190	5090	4980	
5800	5990	5940	5900	5850	5800	5690	5580	5470	5360	
6200	6430	6370	6320	6260	6200	6080	5970	5850	5740	
6600	6890	6820	6750	6670	6600	6480	6350	6230	6110	
7000	7350	7260	7180	7090	7000	6870	6740	6610	6480	
7400	7810	7710	7610	7500	7400	7260	7120	6980	6850	
7800	8270	8150	8040	7920	7800	7650	7510	7360	7220	
8200	8720	8590	8460	8330	8200	8040	7880	7720	7560	
8600	9150	9010	8870	8740	8600	8420	8240	8060	7880	
9000	9580	9430	9290	9140	9000	8800	8600	8400	8200	
9400	10010	9850	9700	9550	9400	9180	8960	8740	8520	
9800	10440	10280	10120	9960	9800	9560	9320	9080	8840	
10200	10880	10710	10540	10370	10200	9940	9680	9420	9160	
10600	11330	11140	10960	10780	10600	10320	10040	9760	9480	
11000	11780	11580	11390	11190	11000	10700	10400	10100	9800	
11400	12230	12020	11810	11610	11400	11080	10760	10440	10120	
11800	12680	12460	12240	12020	11800	11460	11120	10780	10440	

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	2930	3350	3780	4200	4390	4620	4860	5140	
4600	3290	3730	4160	4600	4810	5050	5310	5610	
5000	3650	4100	4550	5000	5220	5480	5760	6080	
5400	4010	4470	4940	5400	5640	5910	6210	6550	
5800	4370	4850	5320	5800	6050	6340	6660	7020	
6200	4720	5210	5710	6200	6460	6770	7110	7490	
6600	5050	5560	6080	6600	6880	7200	7550	7960	
7000	5380	5920	6460	7000	7290	7630	8000	8430	
7400	5710	6270	6840	7400	7700	8060	8450	8900	
7800	6040	6620	7210	7800	8120	8490	8900	9370	
8200	6370	6980	7590	8200	8540	8920	9350	9830	
8600	6700	7330	7970	8600	8960	9360	9800	10280	
9000	7030	7680	8340	9000	9380	9800	10250	10730	
9400	7360	8040	8720	9400	9810	10240	10700	11180	
9800	7690	8390	9100	9800	10230	10680	11140	11630	
10200	8020	8740	9470	10200	10650	11120	11590	12090	
10600	8350	9100	9850	10600	11060	11550	12040	12560	
11000	8680	9450	10230	11000	11480	11980	12490	13030	
11400	9010	9800	10600	11400	11890	12410	12940	13500	
11800	9340	10160	10980	11800	12310	12840	13390	13970	

Takeoff Field & Climb Limit Weights**Flaps 15****Sea Level Pressure Altitude**

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)											
	OAT											
	°C	-40	15	20	22	24	28	30	32	36	44	50
	°F	-40	59	68	72	75	82	86	90	97	111	122
4000	413.1	373.1	370.0	368.8	367.6	365.6	364.0	360.5	352.5	331.7	314.4	
4200	425.0	384.0	380.8	379.5	378.3	375.8	374.6	371.0	362.8	341.6	323.9	
4600	447.6	404.8	401.5	400.2	398.9	396.4	395.1	391.3	382.8	360.6	342.2	
5000	468.8	424.4	421.0	419.6	418.3	415.6	414.3	410.4	401.5	378.5	359.4	
5400	488.1	442.3	438.7	437.3	436.0	433.2	431.9	427.8	418.7	395.0	375.2	
5800	506.5	459.4	455.8	454.3	452.9	450.1	448.7	444.6	435.1	410.8	390.5	
6200	523.9	475.7	471.9	470.5	469.0	466.1	464.7	460.4	450.8	425.8	405.0	
6600	540.6	491.2	487.4	485.9	484.4	481.4	480.0	475.7	465.8	440.2	418.9	
7000	556.8	506.3	502.4	500.9	499.3	496.3	494.8	490.4	480.3	454.2	432.4	
7400	572.4	520.8	516.8	515.3	513.7	510.6	509.1	504.6	494.3	467.6	445.3	
7800	587.6	535.0	530.9	529.3	527.7	524.5	523.0	518.3	507.8	480.6	457.9	
8200	602.7	549.0	544.8	543.2	541.6	538.4	536.8	532.1	521.3	493.5	470.3	
8600	617.2	562.5	558.2	556.6	554.9	551.6	550.0	545.2	534.2	505.9	482.3	
9000	630.6	574.8	570.5	568.8	567.1	563.8	562.1	557.2	546.1	517.2	493.1	
9400	643.0	586.3	581.8	580.1	578.4	575.0	573.3	568.3	557.0	527.6	503.1	
9800	655.1	597.4	592.9	591.1	589.4	585.9	584.2	579.2	567.6	537.7	512.8	
10200	666.7	608.1	603.6	601.8	600.0	596.5	594.8	589.6	577.9	547.5	522.3	
10600	677.9	618.5	613.9	612.1	610.3	606.8	605.0	599.8	587.9	557.1	531.5	
CLIMB LIMIT WT (1000 LB)	660.6	658.8	658.6	658.5	658.4	658.2	658.1	649.8	630.7	578.2	532.5	

1000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)											
	OAT											
	°C	-40	15	20	22	24	28	30	32	36	44	50
	°F	-40	59	68	72	75	82	86	90	97	111	122
4000	400.0	361.1	358.1	356.9	355.8	353.4	350.3	347.0	339.0	319.3	302.6	
4200	411.5	371.7	368.6	367.4	366.2	363.8	360.6	357.2	349.0	328.9	311.8	
4600	433.6	392.1	388.8	387.6	386.3	383.8	380.5	376.9	368.4	347.4	329.5	
5000	454.3	411.2	407.8	406.5	405.2	402.6	399.1	395.5	386.6	364.8	346.3	
5400	473.1	428.6	425.2	423.8	422.5	419.8	416.2	412.4	403.3	380.8	361.7	
5800	491.0	445.4	441.8	440.4	439.0	436.3	432.6	428.7	419.3	396.2	376.6	
6200	508.1	461.3	457.6	456.2	454.8	452.0	448.2	444.2	434.5	410.8	390.7	
6600	524.4	476.5	472.8	471.3	469.8	467.0	463.1	459.0	449.1	424.9	404.4	
7000	540.2	491.2	487.4	485.9	484.4	481.5	477.6	473.4	463.3	438.5	417.5	
7400	555.5	505.4	501.5	500.0	498.5	495.5	491.5	487.2	476.9	451.6	430.1	
7800	570.3	519.2	515.3	513.7	512.1	509.1	505.0	500.6	490.1	464.2	442.3	
8200	585.1	533.0	528.9	527.3	525.7	522.6	518.4	514.0	503.2	476.9	454.5	
8600	599.3	546.1	542.0	540.4	538.7	535.6	531.3	526.8	515.8	488.9	466.1	
9000	612.3	558.2	553.9	552.3	550.6	547.4	543.1	538.5	527.3	499.9	476.7	
9400	624.4	569.3	565.0	563.3	561.6	558.3	553.9	549.2	537.8	510.0	486.3	
9800	636.2	580.1	575.8	574.1	572.3	569.0	564.5	559.7	548.1	519.8	495.7	
10200	647.5	590.6	586.2	584.5	582.7	579.3	574.8	569.9	558.1	529.4	504.9	
10600	658.5	600.8	596.3	594.5	592.8	589.3	584.7	579.8	567.9	538.7	514.0	
CLIMB LIMIT WT (1000 LB)	643.3	641.6	641.4	641.3	641.2	640.7	633.8	626.2	607.0	557.1	512.9	

With engine bleed for packs off, increase field limit weight by 1400 lb and climb limit weight by 4400 lb.

With engine anti-ice on, decrease field limit weight by 200 lb and climb limit weight by 1100 lb.

With engine and wing anti-ice on, decrease field limit weight by 2300 lb and climb limit weight by 4600 lb.

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Takeoff Field & Climb Limit Weights**Flaps 15****2000 FT Pressure Altitude**

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)											
	OAT											
	°C	-40	15	20	22	24	28	30	32	36	44	50
	°F	-40	59	68	72	75	82	86	90	97	111	122
4000	386.9	349.2	346.2	345.1	343.9	339.6	337.0	333.9	326.2	307.1	290.2	
4200	398.1	359.5	356.5	355.3	354.1	349.7	347.0	343.8	336.0	316.4	299.1	
4600	419.6	379.3	376.1	374.9	373.7	369.0	366.3	363.0	354.8	334.3	316.3	
5000	439.7	397.9	394.6	393.4	392.1	387.3	384.4	381.0	372.4	351.2	332.5	
5400	458.0	414.9	411.6	410.3	409.0	404.0	401.0	397.5	388.7	366.8	347.6	
5800	475.6	431.3	427.8	426.5	425.1	420.0	417.0	413.3	404.3	381.8	362.0	
6200	492.3	446.8	443.3	441.9	440.5	435.3	432.2	428.4	419.2	396.1	375.8	
6600	508.2	461.7	458.1	456.7	455.3	449.9	446.7	442.9	433.4	409.9	389.1	
7000	523.7	476.2	472.5	471.0	469.6	464.1	460.8	456.9	447.2	423.1	401.9	
7400	538.6	490.0	486.3	484.8	483.3	477.7	474.4	470.4	460.5	435.8	414.1	
7800	553.1	503.5	499.6	498.1	496.6	490.9	487.5	483.4	473.3	448.2	426.0	
8200	567.5	516.9	513.0	511.4	509.9	504.1	500.6	496.4	486.1	460.5	437.9	
8600	581.3	529.8	525.7	524.2	522.6	516.6	513.1	508.9	498.4	472.2	449.2	
9000	594.0	541.5	537.4	535.8	534.2	528.1	524.5	520.2	509.5	482.9	459.4	
9400	605.8	552.3	548.2	546.5	544.9	538.7	535.1	530.7	519.8	492.6	468.7	
9800	617.2	562.9	558.6	557.0	555.3	549.0	545.3	540.8	529.8	502.2	477.8	
10200	628.3	573.1	568.8	567.1	565.4	559.0	555.3	550.7	539.5	511.5	486.8	
10600	639.0	583.0	578.7	577.0	575.3	568.8	565.0	560.4	549.0	520.6	495.6	
CLIMB LIMIT WT (1000 LB)	624.8	623.2	623.0	622.8	622.6	615.2	610.0	603.1	584.3	535.2	491.8	

3000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)											
	OAT											
	°C	-40	15	20	22	24	28	30	32	36	44	50
	°F	-40	59	68	72	75	82	86	90	97	111	122
4000	373.8	337.2	334.3	332.6	330.7	326.4	323.8	320.8	313.7	295.2	278.4	
4200	384.6	347.2	344.3	342.5	340.5	336.1	333.5	330.4	323.1	304.2	287.1	
4600	405.5	366.5	363.4	361.6	359.5	354.9	352.2	349.0	341.3	321.6	303.7	
5000	425.1	384.6	381.4	379.5	377.4	372.6	369.8	366.4	358.5	338.0	319.5	
5400	443.0	401.2	398.0	396.0	393.8	388.9	386.0	382.5	374.4	353.2	334.1	
5800	460.2	417.2	413.9	411.8	409.6	404.5	401.5	398.0	389.6	367.8	348.1	
6200	476.4	432.4	429.0	426.9	424.6	419.4	416.3	412.7	404.1	381.8	361.6	
6600	492.0	447.0	443.5	441.3	438.9	433.6	430.5	426.8	418.0	395.2	374.5	
7000	507.1	461.0	457.5	455.3	452.9	447.4	444.2	440.4	431.4	408.1	387.0	
7400	521.7	474.6	470.9	468.7	466.2	460.7	457.4	453.5	444.3	420.5	399.0	
7800	535.8	487.7	484.0	481.7	479.2	473.5	470.2	466.2	456.8	432.5	410.5	
8200	549.9	500.8	497.0	494.7	492.1	486.4	483.0	478.9	469.3	444.5	422.1	
8600	563.4	513.4	509.5	507.1	504.5	498.6	495.1	491.0	481.2	455.9	433.0	
9000	575.7	524.8	520.8	518.4	515.7	509.7	506.2	502.0	492.0	466.3	443.0	
9400	587.2	535.3	531.3	528.8	526.1	520.0	516.4	512.1	502.0	475.7	452.0	
9800	598.3	545.6	541.5	538.9	536.2	530.0	526.3	522.0	511.7	485.0	460.8	
10200	609.1	555.5	551.4	548.8	546.0	539.7	536.0	531.6	521.1	494.0	469.5	
10600	619.5	565.3	561.0	558.4	555.6	549.2	545.5	541.0	530.4	502.9	478.1	
CLIMB LIMIT WT (1000 LB)	606.5	605.0	604.5	602.2	599.5	592.3	586.9	579.8	562.5	514.5	474.8	

With engine bleed for packs off, increase field limit weight by 1400 lb and climb limit weight by 4400 lb.

With engine anti-ice on, decrease field limit weight by 200 lb and climb limit weight by 1100 lb.

With engine and wing anti-ice on, decrease field limit weight by 2300 lb and climb limit weight by 4600 lb.

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Takeoff Obstacle Limit Weight**Flaps 15**

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

Sea Level, 30°C & Below, Zero Wind

OBSTACLE HEIGHT (FT)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 LB)								
	DISTANCE FROM BRAKE RELEASE (1000 FT)								
8	10	12	14	16	18	20	22	24	
10	522.3	580.8	628.0	664.2	685.1	703.4			
50	493.7	547.0	590.7	625.5	653.7	671.4	685.7	698.3	708.8
100	465.5	515.2	556.5	590.3	618.3	642.2	660.8	673.2	683.8
150	440.7	489.7	529.4	563.8	592.9	616.6	636.2	652.5	664.6
200	419.6	468.4	507.8	542.5	571.4	595.4	615.2	632.0	646.2
250	401.2	448.9	489.9	523.9	552.6	576.8	597.0	614.1	628.8
300	384.8	433.0	474.1	507.3	535.8	560.0	580.7	598.1	613.1
350	370.0	418.7	459.4	492.4	520.6	544.9	565.7	583.6	598.9
400	357.5	405.6	445.7	478.9	506.8	531.0	551.9	570.0	585.8
450	346.2	393.5	433.0	466.4	494.0	518.1	539.1	557.4	573.5
500		382.3	421.3	454.4	482.3	506.2	527.2	545.7	561.9
550		371.9	410.4	443.2	471.3	495.0	516.0	534.6	551.0
600		362.2	400.2	432.7	460.7	484.6	505.5	524.1	540.6
650		353.0	390.6	422.8	450.7	474.8	495.6	514.3	530.9
700		344.4	381.5	413.5	441.2	465.5	486.3	504.9	521.5
750		346.6	373.0	404.6	432.2	456.4	477.4	495.9	512.7
800			364.8	396.2	423.6	447.7	469.0	487.5	504.2
850			357.1	388.2	415.5	439.5	460.7	479.4	496.1
900			349.7	380.6	407.7	431.6	452.8	471.7	488.3
950			342.7	373.4	400.3	424.0	445.2	464.2	480.9
1000				366.4	393.1	416.8	437.9	456.9	473.8

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)						
	400	450	500	550	600	650	700
30 & Below	0	0	0	0	0	0	0
32	-6.0	-6.8	-7.5	-8.3	-9.1	-9.9	-10.6
34	-12.0	-13.5	-15.1	-16.6	-18.2	-19.7	-21.3
36	-18.0	-20.3	-22.6	-25.0	-27.3	-29.6	-31.9
38	-24.0	-27.1	-30.2	-33.3	-36.4	-39.5	-42.6
40	-30.0	-33.9	-37.7	-41.6	-45.5	-49.3	-53.2
42	-37.4	-42.5	-47.7	-52.8	-57.9	-63.0	-68.2
44	-44.8	-51.2	-57.6	-64.0	-70.3	-76.7	-83.1
46	-52.2	-59.8	-67.5	-75.1	-82.8	-90.4	-98.1
48	-59.6	-68.5	-77.4	-86.3	-95.2	-104.1	-113.0
50	-67.0	-77.2	-87.3	-97.5	-107.7	-117.8	-128.0

Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 LB)						
	400	450	500	550	600	650	700
S.L. & Below	0	0	0	0	0	0	0
1000	-14.9	-16.7	-18.5	-20.2	-22.0	-23.8	-25.6
2000	-29.7	-33.1	-36.5	-39.9	-43.3	-46.7	-50.1
3000	-43.6	-48.8	-54.0	-59.1	-64.3	-69.5	-74.6

Takeoff Obstacle Limit Weight**Flaps 15**

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

Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 LB)						
	400	450	500	550	600	650	700
15 TW	-57.6	-57.6	-57.6	-57.6	-57.6	-57.6	-57.5
10 TW	-38.4	-38.4	-38.4	-38.4	-38.4	-38.4	-38.4
5 TW	-19.2	-19.2	-19.2	-19.2	-19.2	-19.2	-19.2
0	0	0	0	0	0	0	0
10 HW	8.2	7.7	7.1	6.5	6.0	5.4	4.8
20 HW	16.5	15.3	14.2	13.1	11.9	10.8	9.6
30 HW	25.8	23.8	21.9	20.0	18.1	16.1	14.2
40 HW	35.1	32.4	29.6	26.9	24.2	21.5	18.7

With engine bleed for packs off, increase weight by 1700 lb.

With engine anti-ice on, decrease weight by 1000 lb.

With engine and wing anti-ice on, decrease weight by 3200 lb.

Tire Speed Limit**Flaps 15**

AIRPORT		TIRE SPEED LIMIT WEIGHT (1000 LB)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	715.0	701.8	651.8	602.8	556.8	514.0
52	126	715.0	705.6	655.7	606.3	560.1	517.0
50	122	715.0	709.4	659.5	609.8	563.3	519.9
48	118	715.0	711.6	663.2	613.5	566.7	523.0
46	115	715.0	713.8	666.9	617.1	570.1	526.1
44	111	715.0	715.0	670.7	620.8	573.6	529.3
42	108	715.0	715.0	674.5	624.5	577.0	532.6
40	104	715.0	715.0	678.2	628.2	580.5	535.9
38	100	715.0	715.0	682.3	632.1	584.1	539.2
36	97	715.0	715.0	686.3	636.0	587.7	542.5
34	93	715.0	715.0	690.4	640.0	591.3	545.9
32	90	715.0	715.0	694.7	644.2	595.2	549.6
30	86	715.0	715.0	699.1	648.6	599.3	553.4
28	82	715.0	715.0	703.7	653.1	603.4	557.3
26	79	715.0	715.0	708.4	657.7	607.7	561.2
24	75	715.0	715.0	713.1	662.5	612.1	565.1
22	72	715.0	715.0	715.0	667.0	616.5	569.2
20	68	715.0	715.0	715.0	671.6	621.0	573.4
18	64	715.0	715.0	715.0	676.3	625.6	577.6
16	61	715.0	715.0	715.0	681.1	630.2	581.8
14	57	715.0	715.0	715.0	686.0	634.9	586.2
12	54	715.0	715.0	715.0	691.0	639.7	590.6
10	50	715.0	715.0	715.0	696.0	644.7	595.0
-40	-40	715.0	715.0	715.0	715.0	715.0	715.0

Increase tire speed limit weight by 5200 lb per knot headwind.

Decrease tire speed limit weight by 6600 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
54	195	188				
50	196	189	182			
46	196	189	182	176		
42	196	189	183	176	170	
38	197	190	183	176	170	164
34	199	190	184	177	171	165
30	200	191	184	178	172	165
26	202	193	185	179	173	167
22	204	194	187	180	174	168
18	206	196	189	182	175	169
14	208	198	190	183	176	170
10	210	200	192	185	178	171
6	210	202	194	186	179	173
2	210	204	196	188	181	174
-2	210	206	198	190	183	176
-6	210	208	200	192	185	178
-10	210	210	202	194	186	179

Weight Adjusted VMBE

WEIGHT (1000 LB)	REFERENCE VMBE (KIAS)										
	160	165	170	175	180	185	190	195	200	205	210
420	185	191	197	204	210	210	210	210	210	210	210
440	180	186	192	198	204	210	210	210	210	210	210
460	175	181	187	192	198	204	210	210	210	210	210
480	171	176	182	187	193	199	204	210	210	210	210
500	167	172	178	183	188	194	199	204	210	210	210
520	163	168	174	179	184	189	194	200	205	210	210
540	160	165	170	175	180	185	190	195	200	205	210
560	157	162	167	171	176	181	186	191	196	200	205
580	154	159	163	168	173	177	182	187	191	196	201
600	151	156	160	165	169	174	178	183	187	192	197
620	149	153	157	162	166	171	175	179	184	188	193
640	146	151	155	159	164	168	172	176	181	185	189
660	144	148	153	157	161	165	169	173	177	182	186

Increase VMBE by 3 knots per 1% uphill runway slope. Decrease VMBE by 6 knots per 1% downhill runway slope.

Increase VMBE by 5 knot per 10 knots headwind. Decrease VMBE by 23 knots per 10 knots tailwind.

Decrease VMBE by 11 knots for one brake deactivated and 22 knots for two brakes deactivated.

Decrease brake release weight by 5200 lb for each knot V1 exceeds VMBE.

Determine normal V1, VR, V2 speeds for lower brake release weight.

Takeoff Speeds**Flaps 15****V1, VR, V2 for Max Takeoff Thrust**

WEIGHT (1000 LB)	KIAS		
	V1	VR	V2
680	170	179	184
660	167	176	181
640	164	173	179
620	161	170	176
600	158	167	174
580	154	164	171
560	151	161	169
540	147	157	166
520	144	154	163
500	140	151	160
480	136	147	158
460	132	143	155
440	127	140	151
420	122	136	148
400	117	132	145
380	113	128	142
360	108	124	138
340	102	119	134

Check V1(MCG) and minimum VR.

V1, VR, V2 Adjustments*

TEMP	V1					VR					V2					
	PRESS ALT (FT)					PRESS ALT (FT)					PRESS ALT (FT)					
°C	°F	-2000	0	1000	2000	3000	-2000	0	1000	2000	3000	-2000	0	1000	2000	3000
50	122	5	8	9	11	12	2	3	4	4	5	-1	-2	-2	-2	-2
40	104	0	4	5	6	8	0	2	2	3	3	0	-1	-1	-1	-1
30	86	0	0	2	3	5	0	0	1	2	2	0	0	0	-1	-1
20	68	0	0	1	2	3	0	0	1	1	1	0	0	0	0	-1
-40	-40	0	0	1	2	3	0	0	1	1	1	0	0	0	0	-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
680	-5	-2	0	3	5	-3	-1	-1	0	0	1	1	2
660	-5	-2	0	3	5	-3	-1	-1	0	0	1	1	2
620	-4	-2	0	3	5	-2	-1	0	0	1	2	2	2
580	-3	-1	0	3	5	-1	0	0	0	1	2	2	2
540	-3	-1	0	3	4	-1	0	0	0	1	2	2	3
500	-2	0	0	3	4	-1	0	0	0	1	2	2	3
460	-2	0	0	3	4	-1	0	0	0	1	2	2	3
420	-2	0	0	3	4	-1	0	0	0	1	2	2	3
380	-2	0	0	3	4	-1	0	0	0	1	2	2	3
340	-2	0	0	3	4	-1	0	0	0	1	2	2	3

*V1 not to exceed VR

Takeoff Speeds**Flaps 15****V1(MCG), Minimum VR****Max Takeoff Thrust**

TEMP		PRESSURE ALTITUDE (FT)									
		-2000		0		1000		2000		3000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
50	122	104	109	100	105	98	104	96	102	95	101
40	104	110	114	106	111	104	109	102	107	100	105
30	86	110	115	110	115	108	113	106	111	103	109
20	68	110	115	110	115	108	113	107	112	105	110
-40	-40	111	115	111	115	109	113	107	112	106	110

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Performance Dispatch**Enroute****Chapter PD****Section 51****Long Range Cruise Maximum Operating Altitude****Max Climb 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°)
660	29500	0	32800*	32800*	32800*	32800*	32200
640	30100	-1	33600*	33600*	33600*	33600*	32900
620	30800	-3	34300*	34300*	34300*	34300*	33500
600	31500	-4	35100*	35100*	35100*	35100*	34200
580	32300	-6	35800*	35800*	35800*	35800*	35000
560	33000	-8	36300*	36300*	36300*	36300*	35700
540	33800	-9	37000*	37000*	37000*	37000*	36400
520	34600	-11	37800*	37800*	37800*	37800*	37200
500	35400	-13	38600*	38600*	38600*	38600*	38000
480	36300	-14	39400*	39400*	39400*	39400*	38900
460	37200	-14	40200*	40200*	40200*	40200*	39800
440	38100	-14	41100*	41100*	41100*	41100*	40700
420	39100	-14	42000*	42000*	42000*	42000*	41700
400	40100	-14	43000*	43000*	43000*	43000*	42700
380	41100	-14	43100	43100	43100	43100	43100
360	42300	-14	43100	43100	43100	43100	43100
340	43100	-14	43100	43100	43100	43100	43100

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°)
660	29500	6	31800*	31800*	31800*	31800*	31800*
640	30100	5	32600*	32600*	32600*	32600*	32600*
620	30800	3	33400*	33400*	33400*	33400*	33400*
600	31500	1	34300*	34300*	34300*	34300*	34200
580	32300	0	35100*	35100*	35100*	35100*	35000
560	33000	-2	35800*	35800*	35800*	35800*	35700
540	33800	-4	36400*	36400*	36400*	36400*	36400
520	34600	-5	37200*	37200*	37200*	37200*	37200
500	35400	-7	38000*	38000*	38000*	38000*	38000
480	36300	-9	38800*	38800*	38800*	38800*	38800*
460	37200	-9	39600*	39600*	39600*	39600*	39600*
440	38100	-9	40500*	40500*	40500*	40500*	40500*
420	39100	-9	41400*	41400*	41400*	41400*	41400*
400	40100	-9	42300*	42300*	42300*	42300*	42300*
380	41100	-9	43100	43100	43100	43100	43100
360	42300	-9	43100	43100	43100	43100	43100
340	43100	-9	43100	43100	43100	43100	43100

*Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.

Long Range Cruise Maximum Operating Altitude**Max Climb Thrust****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°)
660	29500	12	30300*	30300*	30300*	30300*	30300*
640	30100	10	31200*	31200*	31200*	31200*	31200*
620	30800	9	32100*	32100*	32100*	32100*	32100*
600	31500	7	33000*	33000*	33000*	33000*	33000*
580	32300	6	34000*	34000*	34000*	34000*	34000*
560	33000	4	34900*	34900*	34900*	34900*	34900*
540	33800	2	35600*	35600*	35600*	35600*	35600*
520	34600	0	36200*	36200*	36200*	36200*	36200*
500	35400	-2	37000*	37000*	37000*	37000*	37000*
480	36300	-3	37800*	37800*	37800*	37800*	37800*
460	37200	-3	38700*	38700*	38700*	38700*	38700*
440	38100	-3	39500*	39500*	39500*	39500*	39500*
420	39100	-3	40400*	40400*	40400*	40400*	40400*
400	40100	-3	41300*	41300*	41300*	41300*	41300*
380	41100	-3	42300*	42300*	42300*	42300*	42300*
360	42300	-3	43100	43100	43100	43100	43100
340	43100	-3	43100	43100	43100	43100	43100

*Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.

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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	
527	496	468	443	420	400	382	366	351	337	324	
1041	982	929	882	839	800	766	735	706	679	655	
1553	1468	1390	1320	1258	1200	1150	1104	1061	1022	987	
2063	1952	1850	1758	1676	1600	1534	1473	1417	1365	1318	
2572	2435	2309	2196	2094	2000	1919	1843	1773	1708	1649	
3079	2916	2767	2633	2512	2400	2303	2213	2129	2051	1980	
3584	3397	3224	3070	2929	2800	2687	2582	2485	2395	2312	
4089	3877	3681	3506	3347	3200	3072	2952	2841	2738	2644	
4594	4356	4138	3942	3764	3600	3456	3322	3197	3082	2976	
5097	4835	4594	4378	4182	4000	3840	3692	3553	3425	3308	
5599	5313	5050	4814	4599	4400	4225	4061	3909	3769	3640	
6101	5791	5506	5249	5016	4800	4609	4431	4265	4112	3972	
6603	6269	5961	5685	5433	5200	4994	4801	4622	4456	4304	
7105	6746	6417	6120	5850	5600	5378	5170	4978	4800	4636	
7607	7224	6873	6556	6267	6000	5762	5540	5334	5143	4968	
8109	7703	7329	6991	6684	6400	6147	5910	5690	5486	5299	
8612	8181	7785	7427	7101	6800	6531	6280	6046	5830	5631	
9114	8659	8241	7863	7519	7200	6915	6649	6402	6173	5963	
9617	9138	8696	8298	7936	7600	7300	7019	6758	6517	6295	
10119	9616	9152	8734	8353	8000	7684	7389	7114	6860	6627	

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	29		31		33		35 & 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)
400	16.1	1:02	16.1	1:02	15.9	1:02	15.9	1:02
800	29.3	1:56	28.8	1:56	28.4	1:56	28.1	1:56
1200	42.6	2:48	41.8	2:48	41.0	2:48	40.5	2:48
1600	56.2	3:40	55.0	3:40	53.9	3:40	53.2	3:40
2000	69.8	4:31	68.2	4:31	66.8	4:31	65.9	4:31
2400	83.9	5:22	81.9	5:22	80.3	5:22	79.4	5:22
2800	98.1	6:12	95.7	6:12	93.8	6:12	92.8	6:12
3200	112.5	7:02	109.8	7:02	107.7	7:02	106.8	7:02
3600	127.3	7:52	124.3	7:52	122.0	7:52	121.2	7:52
4000	142.0	8:41	138.7	8:41	136.3	8:41	135.7	8:41
4400	157.5	9:30	153.9	9:30	151.5	9:30	151.6	9:30
4800	172.9	10:19	169.1	10:19	166.7	10:19	167.5	10:19
5200	188.7	11:08	184.8	11:08	182.6	11:08		
5600	204.9	11:57	200.9	11:57	199.1	11:57		
6000	221.1	12:45	217.0	12:45	215.6	12:45		
6400	238.1	13:34	234.2	13:34				
6800	255.0	14:23	251.4	14:23				
7200	272.6	15:11						
7600	290.9	16:00						
8000	309.1	16:49						

Long Range Cruise Trip Fuel and Time**Fuel Required Adjustment (1000 LB)**

REFERENCE FUEL REQUIRED (1000 LB)	LANDING WEIGHT (1000 LB)				
	350	400	450	500	550
20	-2.5	-1.3	0.0	1.5	3.1
40	-4.9	-2.5	0.0	3.0	6.5
60	-7.3	-3.6	0.0	4.7	10.3
80	-9.8	-4.9	0.0	6.5	14.7
100	-12.3	-6.1	0.0	8.6	19.4
120	-14.9	-7.5	0.0	10.8	24.7
140	-17.5	-8.8	0.0	13.2	30.4
160	-20.2	-10.2	0.0	15.7	36.5
180	-23.0	-11.7	0.0	18.4	43.1
200	-25.8	-13.2	0.0	21.3	50.2
220	-28.6	-14.7	0.0	24.4	57.7
240	-31.6	-16.3	0.0	27.6	65.7
260	-34.5	-17.9	0.0	31.0	74.2
280	-37.5	-19.6	0.0	34.5	83.1
300	-40.6	-21.4	0.0	38.3	92.5
320	-43.8	-23.1	0.0	42.2	102.3
340	-46.9	-25.0	0.0	46.3	112.6

Based on 310/.84 climb, Long Range Cruise and .84/310/250 descent.

DRAFT

Long Range Cruise Step Climb**Ground to Air Miles Conversion**

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	
1293	1221	1157	1100	1047	1000	957	917	880	847	815	
1923	1820	1728	1645	1569	1500	1437	1379	1325	1276	1230	
2553	2419	2299	2190	2091	2000	1917	1841	1770	1705	1644	
3183	3018	2869	2735	2612	2500	2397	2302	2215	2134	2058	
3812	3617	3440	3280	3134	3000	2877	2764	2660	2563	2473	
4442	4215	4010	3824	3655	3500	3358	3226	3105	2992	2888	
5072	4814	4581	4369	4177	4000	3838	3688	3550	3422	3302	
5701	5412	5151	4914	4698	4500	4318	4150	3995	3851	3717	
6331	6011	5722	5459	5219	5000	4798	4612	4440	4280	4131	
6961	6610	6292	6004	5741	5500	5278	5074	4885	4709	4546	
7591	7208	6863	6549	6262	6000	5759	5536	5330	5139	4961	
8221	7807	7433	7094	6784	6500	6239	5998	5775	5568	5375	
8851	8406	8004	7639	7306	7000	6719	6460	6220	5997	5789	
9481	9005	8575	8184	7827	7500	7199	6921	6664	6426	6204	
10112	9605	9146	8729	8349	8000	7679	7383	7109	6855	6618	

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 LB)					TIME (HRS:MIN)
	LANDING WEIGHT (1000 LB)					
	350	400	450	500	550	
1000	28.6	31.9	34.6	37.7	40.8	2:16
1500	41.2	46.0	50.4	55.0	59.6	3:18
2000	54.2	60.6	66.6	72.7	79.0	4:20
2500	67.6	75.5	83.3	91.0	98.9	5:22
3000	81.4	90.9	100.4	109.8	119.4	6:24
3500	95.5	106.9	118.0	129.2	140.4	7:25
4000	110.1	123.3	136.1	149.2	162.0	8:27
4500	125.0	140.1	154.8	169.6	184.3	9:29
5000	140.4	157.5	174.0	190.6	207.4	10:31
5500	156.3	175.3	193.8	212.2	231.2	11:32
6000	172.7	193.6	214.2	234.6	256.0	12:34
6500	189.6	212.5	235.0	257.6	282.3	13:36
7000	206.9	232.0	256.5	281.5	308.5	14:38
7500	224.7	252.0	278.7	306.2	337.5	15:40
8000	243.0	272.6	301.5	331.9	366.4	16:43

Based on 310/.84 climb, LRC and .84/310/250 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	69	61	55	50	46	42	39	36	34
159	142	129	118	108	100	93	87	82	77	73
224	204	187	173	161	150	141	132	125	119	113
287	264	245	228	213	200	189	178	169	161	153
349	324	301	282	265	250	237	224	214	204	195
411	382	358	336	317	300	285	271	258	247	236
472	441	414	390	369	350	333	317	303	290	278
534	500	471	445	421	400	381	364	348	333	320
597	560	528	499	473	450	429	410	392	376	361
661	621	586	554	526	500	477	456	436	418	402

Trip Fuel and Time Required

AIR DIST (NM)		LANDING WEIGHT (1000 LB)					TIME (HRS:MIN)
		350	400	450	500	550	
50	FUEL (1000 LB)	3.5	3.8	4.0	4.3	4.6	0:14
	ALT (FT)	11000	9000	9000	9000	9000	
100	FUEL (1000 LB)	5.4	5.7	6.0	6.4	6.8	0:22
	ALT (FT)	17000	17000	17000	15000	15000	
150	FUEL (1000 LB)	7.1	7.5	8.0	8.5	9.0	0:30
	ALT (FT)	21000	21000	21000	21000	19000	
200	FUEL (1000 LB)	8.6	9.1	9.7	10.4	11.0	0:36
	ALT (FT)	29000	25000	25000	23000	23000	
250	FUEL (1000 LB)	10.0	10.7	11.4	12.2	13.0	0:43
	ALT (FT)	31000	29000	27000	27000	25000	
300	FUEL (1000 LB)	11.3	12.2	13.1	13.9	14.9	0:48
	ALT (FT)	37000	35000	31000	29000	27000	
350	FUEL (1000 LB)	12.5	13.5	14.6	15.6	16.7	0:54
	ALT (FT)	39000	37000	35000	31000	29000	
400	FUEL (1000 LB)	13.7	14.9	16.1	17.3	18.5	1:00
	ALT (FT)	39000	37000	35000	33000	31000	
450	FUEL (1000 LB)	15.0	16.3	17.6	18.9	20.3	1:06
	ALT (FT)	39000	37000	35000	33000	31000	
500	FUEL (1000 LB)	16.2	17.6	19.1	20.6	22.1	1:13
	ALT (FT)	41000	37000	35000	33000	31000	

Holding Planning

Flaps Up

WEIGHT (1000 LB)	TOTAL FUEL FLOW (LB/HR)									
	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
660	19330	19010	18750	18570	19100	19500	20510			
620	18120	17920	17630	17320	17650	18150	18860			
580	17220	17070	16770	16380	16200	16850	17340	18550		
540	16100	15890	15690	15270	15110	15570	15920	16790		
500	15010	14740	14610	14190	13860	14190	14590	15210		
460	13930	13670	13490	13130	12760	12800	13330	13690	15160	
420	12860	12620	12370	12090	11790	11770	12050	12300	13340	
380	11810	11580	11320	11060	10850	10610	10850	11020	11700	12440
340	10800	10550	10320	10050	9910	9610	9540	9850	10220	10760

Flaps 1

WEIGHT (1000 LB)	TOTAL FUEL FLOW (LB/HR)				
	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
660	20100	19880	19700	19200	19370
620	18840	18630	18490	17990	17990
580	17910	17670	17470	17040	16580
540	16710	16460	16270	15860	15590
500	15510	15260	15070	14720	14440
460	14320	14090	13880	13580	13320
420	13140	12930	12720	12460	12240
380	11970	11770	11590	11350	11190
340	10850	10640	10470	10270	10160

These tables include 5% additional fuel for holding in a racetrack pattern.

Crew Oxygen Requirements

Required Pressure (PSI) for One 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

For more extensive than normal crew usage, add 1.2 psi/person/minute.

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
27	351.2	347.7	
26	365.9	363.7	350.5
25	380.6	380.3	365.9
24	395.8	393.6	378.6
23	411.3	407.3	391.9
22	427.4	421.2	405.6
21	444.0	435.3	419.4
20	460.9	449.9	433.4
19	486.0	468.2	447.7
18	512.1	487.1	461.8
17	532.5	506.1	478.7
16	553.5	525.6	495.9
15	575.1	545.8	513.5
14	597.4	566.5	531.4
13	621.6	589.5	554.4
12	646.5	613.4	578.3
11	654.0	620.6	585.8
10	661.1	623.5	590.8
9	675.1	637.0	603.6
8	686.8	649.8	616.1
7	697.7	661.9	628.7
6	709.0	673.1	641.3
5	715.0	683.9	653.5
4	715.0	693.8	663.6

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 LB)											
	PRESSURE ALTITUDE (1000 FT)											
	6	8	10	12	14	16	18	20	22	24	26	
ENGINE ONLY	-12.6	-9.2	-7.6	-5.7	-4.4	-5.1	-6.2	-7.4	-7.2	-7.1	-6.7	
ENGINE AND WING	-19.6	-15.8	-13.0	-10.2	-8.6	-9.2	-10.3	-11.9	-11.6	-11.2	-10.3	

ALL ENGINES**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	
278	258	241	225	212	200	189	180	171	163	156	
569	525	487	454	425	400	378	358	340	323	308	
860	791	733	682	639	600	566	535	508	483	461	
1151	1058	979	911	852	800	754	713	676	643	613	
1442	1325	1225	1140	1065	1000	942	891	845	803	765	
1733	1591	1471	1368	1279	1200	1130	1069	1013	963	918	
2024	1858	1718	1597	1492	1400	1319	1246	1182	1123	1070	
2315	2125	1964	1825	1705	1600	1507	1424	1350	1283	1223	
2606	2392	2210	2054	1919	1800	1695	1602	1518	1443	1375	
2897	2658	2456	2283	2132	2000	1883	1780	1687	1603	1527	
3188	2925	2702	2511	2345	2200	2072	1957	1855	1763	1680	
3479	3192	2949	2740	2559	2400	2260	2135	2024	1923	1832	
3770	3459	3195	2968	2772	2600	2448	2313	2192	2083	1984	
4061	3725	3441	3197	2985	2800	2636	2491	2360	2243	2137	
4352	3992	3687	3426	3199	3000	2825	2668	2529	2403	2289	

Critical Fuel (1000 LB)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 LB)								
	340	380	420	460	500	540	580	620	660
200	9.6	10.1	10.6	11.1	11.5	12.0	12.4	12.9	13.3
400	17.8	18.7	19.6	20.3	21.0	21.9	22.7	23.4	24.1
600	25.9	27.1	28.4	29.4	30.4	31.5	32.6	33.6	34.6
800	33.6	35.3	37.0	38.4	39.7	41.1	42.5	43.8	45.1
1000	41.3	43.5	45.5	47.4	48.9	50.6	52.4	54.1	55.6
1200	49.0	51.6	54.1	56.3	58.2	60.1	62.3	64.3	66.1
1400	56.8	59.8	62.7	65.3	67.3	69.5	72.0	74.2	76.3
1600	64.5	67.8	70.9	73.8	76.3	78.8	81.5	84.1	86.5
1800	72.2	75.5	79.1	82.4	85.3	88.0	91.0	94.0	96.7
2000	80.0	83.2	87.3	91.0	94.2	97.3	100.6	103.9	106.9
2200	87.7	91.0	95.4	99.6	103.2	106.5	109.9	113.5	116.8
2400	95.4	98.7	103.6	108.0	111.8	115.5	119.2	123.0	126.7
2600	103.1	106.4	111.4	116.1	120.4	124.4	128.5	132.5	136.6
2800	110.9	114.1	119.1	124.3	129.0	133.4	137.7	142.1	146.4
3000	118.6	121.9	126.8	132.5	137.6	142.4	146.9	151.4	155.9

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 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (2%) for the total forecast time or engine and wing anti-ice on and ice drag (6%) for 10% of the forecast time.

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

ENGINE INOP**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)		20	40	60	80	100
100	80	60	40	20						
284	262	243	227	213	200	189	179	170	162	154
577	530	490	456	426	400	377	356	338	321	306
871	799	738	685	640	600	565	534	506	481	458
1164	1067	985	914	853	800	753	711	674	640	609
1457	1335	1232	1143	1067	1000	941	889	842	799	761
1750	1603	1479	1373	1281	1200	1129	1066	1010	959	913
2043	1871	1726	1602	1494	1400	1317	1243	1178	1118	1065
2337	2140	1973	1831	1708	1600	1505	1421	1346	1278	1217
2630	2408	2220	2060	1921	1800	1693	1598	1513	1437	1368
2923	2676	2467	2289	2135	2000	1881	1776	1681	1597	1520
3216	2944	2715	2518	2348	2200	2069	1953	1849	1756	1672
3509	3212	2962	2747	2562	2400	2257	2131	2017	1916	1824
3803	3481	3209	2977	2776	2600	2445	2308	2185	2075	1975
4096	3749	3456	3206	2989	2800	2633	2485	2353	2234	2127
4389	4017	3703	3435	3203	3000	2821	2663	2521	2394	2279

Critical Fuel (1000 LB)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 LB)								
	340	380	420	460	500	540	580	620	660
200	9.1	9.5	10.0	10.5	11.0	11.6	12.1	12.7	13.3
400	16.8	17.6	18.4	19.3	20.3	21.3	22.3	23.3	24.4
600	24.5	25.5	26.7	28.0	29.3	30.7	32.1	33.5	35.0
800	31.8	33.3	34.7	36.4	38.1	39.9	41.7	43.7	45.6
1000	39.1	41.0	42.8	44.8	46.9	49.2	51.4	53.8	56.3
1200	46.4	48.7	50.8	53.2	55.8	58.4	61.1	63.9	66.8
1400	53.8	56.4	58.8	61.6	64.6	67.5	70.5	73.6	76.9
1600	61.1	64.1	66.7	69.7	73.0	76.3	79.8	83.3	87.1
1800	68.4	71.4	74.5	77.7	81.4	85.2	89.0	93.0	97.2
2000	75.7	78.7	82.2	85.8	89.8	94.0	98.3	102.7	107.2
2200	83.1	86.0	89.9	93.8	98.1	102.8	107.4	112.0	116.9
2400	90.4	93.4	97.6	101.8	106.4	111.3	116.2	121.3	126.6
2600	97.7	100.7	105.2	109.6	114.5	119.7	125.0	130.5	136.3
2800	105.0	108.0	112.5	117.4	122.5	128.0	133.8	139.8	145.9
3000	112.4	115.3	119.9	125.1	130.5	136.4	142.6	148.8	155.1

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 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (2%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) 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**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	
265	249	234	221	210	200	190	182	174	167	160	
533	499	470	444	421	400	380	363	347	333	320	
803	752	707	667	632	600	571	544	520	498	478	
1075	1006	945	891	843	800	760	725	693	663	636	
1350	1261	1184	1115	1054	1000	950	906	865	828	794	
1626	1518	1423	1340	1266	1200	1140	1086	1036	992	950	
1903	1775	1664	1565	1478	1400	1329	1266	1208	1155	1107	
2181	2033	1904	1791	1690	1600	1518	1445	1379	1318	1263	
2461	2292	2145	2016	1902	1800	1708	1625	1550	1481	1418	
2741	2552	2387	2242	2114	2000	1897	1804	1720	1644	1574	
3021	2811	2628	2468	2326	2200	2086	1984	1891	1806	1729	
3301	3071	2870	2694	2538	2400	2275	2163	2062	1969	1885	
3582	3330	3111	2920	2750	2600	2464	2343	2232	2132	2040	
3861	3589	3353	3145	2962	2800	2654	2522	2403	2295	2196	
4140	3848	3594	3371	3174	3000	2843	2702	2574	2458	2352	

Critical Fuel (1000 LB)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 LB)								
	340	380	420	460	500	540	580	620	660
200	9.9	10.3	10.7	11.2	11.7	12.2	12.5	13.0	13.5
400	16.1	17.1	18.1	19.2	20.3	21.4	22.4	23.6	24.6
600	21.9	23.5	25.1	26.9	28.6	30.3	31.9	33.6	35.3
800	27.6	29.8	32.0	34.3	36.7	39.0	41.3	43.5	45.8
1000	33.2	36.0	38.8	41.7	44.6	47.6	50.4	53.3	56.1
1200	38.7	42.0	45.4	48.9	52.4	56.0	59.4	62.8	66.2
1400	44.0	48.0	51.9	56.0	60.1	64.2	68.2	72.2	76.2
1600	49.3	53.8	58.3	63.0	67.7	72.4	77.0	81.5	86.1
1800	54.5	59.5	64.6	69.9	75.2	80.4	85.6	90.7	95.8
2000	59.6	65.2	70.9	76.7	82.5	88.4	94.0	99.7	105.4
2200	64.6	70.7	77.0	83.4	89.8	96.2	102.4	108.6	114.8
2400	69.5	76.2	83.0	90.0	97.0	103.9	110.7	117.4	124.2
2600	74.4	81.6	89.0	96.6	104.1	111.6	118.9	126.2	133.4
2800	79.3	87.0	94.9	103.0	111.1	119.1	126.9	134.8	142.6
3000	84.0	92.2	100.7	109.4	118.0	126.6	134.9	143.3	151.6

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 0.8% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (2%) for the total forecast time or engine and wing anti-ice on and ice drag (10%) 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.

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Performance Dispatch

Landing

Chapter PD

Section 52

Landing Field Limit Weight

Flaps 30

Wind Adjusted Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
3000			2650	3000	3210	3430	3640	3850
3400		2690	3010	3400	3610	3840	4070	4310
3800	2740	3030	3370	3800	4010	4250	4500	4770
4200	3070	3380	3740	4200	4420	4670	4930	5230
4600	3400	3730	4110	4600	4840	5100	5380	5680
5000	3730	4080	4480	5000	5250	5530	5820	6140
5400	4060	4430	4850	5400	5670	5960	6270	6600
5800	4390	4790	5220	5800	6090	6390	6710	7050
6200	4720	5140	5590	6200	6500	6820	7160	7510
6600	5050	5490	5960	6600	6920	7250	7610	7980
7000	5380	5850	6330	7000	7330	7680	8050	8440
7400	5710	6200	6700	7400	7740	8110	8520	8960
7800	6040	6550	7070	7800	8150	8550	8990	9470
8200	6370	6900	7440	8200	8560	8980	9450	9990
8600	6710	7260	7820	8600	8970	9410	9920	10500
9000	7040	7610	8190	9000	9390	9860	10400	11020
9400	7370	7960	8560	9400	9820	10310	10880	11510
9800	7660	8280	8920	9800	10250	10760	11350	12010
10200	7930	8590	9280	10200	10670	11210	11820	12500
10600	8200	8900	9640	10600	11100	11660	12290	12990

Landing Field Limit Weight**Flaps 30****Field Limit Weight (1000 LB)**

WIND CORRECTED FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)							
	0		1000		2000		3000	
	DRY	WET	DRY	WET	DRY	WET	DRY	WET
4200	346.2		335.8		325.4			
4600	390.2	324.3	378.6		367.1		356.0	
5000	434.8	362.4	422.0	351.6	409.2	340.8	396.9	330.4
5400	480.1	400.8	465.9	389.0	451.8	377.1	438.3	365.7
5800	509.6	439.7	500.5	426.8	491.3	413.8	478.4	401.4
6200	536.0	479.1	526.4	465.0	516.8	450.9	507.4	437.4
6600	561.8	505.4	551.8	495.6	541.7	485.9	531.9	472.5
7000	587.0	528.6	576.5	519.1	566.0	509.6	555.7	500.4
7400	611.5	551.3	600.6	541.4	589.7	531.5	579.0	521.8
7800	635.6	573.4	624.2	563.1	612.9	552.9	601.8	542.8
8200	658.7	595.0	647.1	584.4	635.5	573.8	624.1	563.4
8600	678.0	616.3	667.7	605.3	657.4	594.3	645.7	583.5
9000	696.3	637.1	686.1	625.7	675.9	614.4	665.2	603.2
9400	711.2	657.2	701.3	645.6	691.4	634.1	681.0	622.6
9800	724.1	674.3	714.1	663.8	704.2	653.2	693.7	641.5
10200		690.4	726.5	680.3	716.1	670.2	705.7	659.0
10600			705.3	695.3	727.9	685.3	717.2	674.9
11000			716.5	706.7		696.9	728.5	686.4
11400			727.7		717.6		707.5	697.1
11800					728.4		717.9	707.5
12200							728.2	717.5
12600								727.3

With manual speedbrakes, decrease weight by 36800 lb.

With 1 brake deactivated, decrease weight by 36200 lb.

With 2 brakes deactivated, decrease weight by 73800 lb.

Landing Climb Limit Weight**Valid for approach with flaps 20 and landing with flaps 25 or 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 LB)			
		AIRPORT PRESSURE ALTITUDE (FT)			
°C	°F	0	1000	2000	3000
54	129	509.5			
52	126	524.1	504.0		
50	122	539.1	519.0	497.5	
48	118	555.3	533.9	512.5	493.3
46	115	571.0	549.5	526.9	506.8
44	111	586.0	564.3	541.8	520.4
42	108	600.7	578.4	555.9	533.9
40	104	614.6	591.8	569.1	546.8
38	100	628.0	604.4	581.5	559.3
36	97	640.3	616.1	592.9	570.6
34	93	651.1	627.0	603.2	581.0
32	90	660.2	636.1	612.5	588.7
30	86	668.7	644.0	619.6	596.1
28	82	668.8	651.9	625.1	601.9
26	79	668.9	652.0	630.4	606.1
24	75	669.0	652.2	633.1	610.0
22	72	669.2	652.3	633.3	612.9
20	68	669.3	652.4	633.4	615.3
18	64	669.4	652.5	633.5	615.4
16	61	669.5	652.6	633.6	615.5
14	57	669.6	652.8	633.7	615.6
12	54	669.8	652.9	633.8	615.7
10 & BELOW	50 & BELOW	669.9	653.0	634.0	615.9

Based on engine bleed for 2 packs on and engine anti-ice on or off and wing anti-ice off.

With engine bleed for packs off, increase weight by 4800 lb.

With engine anti-ice on, decrease weight by 1100 lb.

With engine and wing anti-ice on, decrease weight by 4800 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 43300 lb.

ENGINE INOP

ADVISORY INFORMATION

Go-Around Climb Gradient**Flaps 20, Gear Up****Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off.**

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)					
	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
54	2.93					
50	3.70	2.65				
46	4.45	3.41	2.39			
42	5.18	4.08	3.02	2.05		
38	5.86	4.72	3.59	2.63	1.69	
34	6.46	5.24	4.12	3.08	2.12	1.21
39	6.87	5.62	4.48	3.42	2.36	1.36
26	6.88	5.89	4.70	3.60	2.53	1.49
22	6.88	5.95	4.83	3.73	2.66	1.62
18	6.89	5.96	4.97	3.85	2.77	1.74
14	6.89	5.97	5.01	3.98	2.89	1.84
10	6.90	5.97	5.02	4.05	3.01	1.94

Weight Adjustment

WEIGHT (1000 LB)	REFERENCE GO-AROUND GRADIENT (%)						
	1	2	3	4	5	6	7
650	-3.13	-3.53	-3.89	-4.23	-4.57	-4.90	-5.21
600	-2.58	-2.89	-3.19	-3.46	-3.74	-4.00	-4.26
550	-1.91	-2.12	-2.34	-2.53	-2.73	-2.93	-3.12
500	-1.06	-1.19	-1.30	-1.41	-1.52	-1.63	-1.74
450	0.00	0.00	0.00	0.00	0.00	0.00	0.00
400	1.35	1.49	1.62	1.76	1.90	2.06	2.21
350	3.10	3.40	3.71	4.03	4.36	4.72	5.10

Speed Adjustment

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)							
	1	2	3	4	5	6	7	8
VREF	-0.30	-0.31	-0.32	-0.33	-0.34	-0.34	-0.34	-0.34
VREF+5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VREF+10	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24
VREF+20	0.55	0.54	0.53	0.52	0.50	0.49	0.47	0.45
VREF+30	0.63	0.60	0.55	0.49	0.44	0.39	0.35	0.32

With engine bleed for packs off, increase gradient by 0.1%.

With engine and wing anti-ice on, decrease gradient by 0.1%.

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 30 Limit Weight (1000 LB)**

AIRPORT OAT		PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	512				
50	122	516	496			
45	113	520	500	481		
40	104	525	504	484	466	
35	95	530	509	489	470	452
30	86	534	513	493	474	456
25	77	539	518	497	478	460
20	68	544	523	502	482	464
15	59	550	528	507	486	468
10	50	555	533	512	491	472
5	41	560	538	517	496	476
0	32	566	544	522	501	480
-5	23	572	549	527	506	485
-10	14	578	555	533	511	490
-15	5	584	561	538	516	495
-20	-4	591	567	544	522	500
-30	-22	604	580	556	534	511
-40	-40	618	594	570	546	523
-50	-58	633	608	584	560	536
-54	-65	640	614	589	565	541

Increase weight by 4800 lb per 1% uphill slope. Decrease weight by 10700 lb per 1% downhill slope.

Increase weight by 13000 lb per 10 knots headwind. Decrease weight by 74000 lb per 10 knots tailwind.

Decrease weight by 28000 lb when one brake is deactivated. Decrease weight by 57300 lb when two brakes are deactivated.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 65 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

As an alternate procedure, no waiting period is required if the BRAKE TEMP advisory message on EICAS is not displayed 10 to 15 minutes after parking.

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Performance Dispatch**Gear Down****Chapter PD****Section 53****GEAR DOWN****Takeoff Climb Limit Weight**

AIRPORT OAT		TAKEOFF CLIMB WEIGHT (1000 LB)			
		AIRPORT PRESSURE ALTITUDE (FT)			
°C	°F	0	1000	2000	3000
54	129	369.1	361.1	358.5	355.6
52	126	378.8	363.3	358.5	355.4
50	122	388.5	374.1	360.7	355.4
48	118	398.2	384.9	371.0	357.6
46	115	408.3	395.5	381.6	367.5
44	111	418.0	406.3	391.5	377.0
42	108	427.0	416.2	401.2	386.5
40	104	435.8	425.5	410.9	395.9
38	100	444.7	434.7	420.0	405.0
36	97	453.5	443.6	428.8	413.8
34	93	462.5	451.9	436.7	422.4
32	90	471.6	459.9	444.4	429.9
30	86	480.4	467.2	451.7	437.2
28	82	489.6	474.0	457.9	443.3
26	79	498.2	481.7	464.1	448.9
24	75	502.6	489.0	470.7	454.1
22	72	502.6	492.3	477.1	459.9
20	68	502.6	492.3	480.2	465.6
18	64	502.6	492.3	480.2	468.0
16	61	502.6	492.3	480.2	468.0
14	57	502.6	492.3	479.9	468.0
12	54	502.9	492.3	479.9	468.0
10	50	502.9	492.3	479.9	468.0

With engine anti-ice on, decrease weight by 17000 lb.

With engine and wing anti-ice on, decrease weight by 23100 lb.

GEAR DOWN**Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 25 or 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 LB)			
		AIRPORT PRESSURE ALTITUDE (FT)			
°C	°F	0	1000	2000	3000
54	129	439.8			
52	126	452.1	435.0		
50	122	464.7	447.8	429.5	
48	118	478.5	460.6	442.5	426.2
46	115	491.7	473.6	454.8	437.8
44	111	504.3	485.9	467.1	449.3
42	108	516.7	497.6	478.7	460.3
40	104	528.6	509.1	489.7	470.9
38	100	540.4	520.0	500.4	481.3
36	97	551.1	530.0	510.1	490.9
34	93	560.0	539.0	518.4	499.5
32	90	567.8	546.8	526.3	506.0
30	86	575.2	553.7	532.6	512.3
28	82	575.3	560.2	537.3	517.0
26	79	575.4	560.3	541.7	520.4
24	75	575.6	560.4	544.0	523.6
22	72	575.7	560.5	544.1	526.0
20	68	575.7	560.6	544.2	528.0
18	64	575.8	560.7	544.3	528.1
16	61	575.9	560.8	544.3	528.1
14	57	576.0	560.9	544.4	528.2
12	54	576.2	561.0	544.5	528.3
10	50	576.3	561.1	544.6	528.4
-40	-40	578.0	562.8	546.3	530.0

Based on engine bleed for 2 packs on, APU on or off, engine anti-ice off and wing anti-ice off.

With engine bleed for packs off, increase weight by 4000 lb.

With engine anti-ice on, decrease weight by 1000 lb.

With engine and wing anti-ice on, decrease weight by 4200 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 57600 lb.

GEAR DOWN**Takeoff Obstacle Limit Weight****Flaps 15****Sea Level, 30°C & Below, Zero Wind**

OBSTACLE HEIGHT (FT)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 LB)								
	DISTANCE FROM BRAKE RELEASE (1000 FT)								
8	10	12	14	16	18	20	22	24	
10	506.0	542.7	573.4	598.1					
50	484.0	517.4	544.5	566.1	582.9	595.6			
100	455.7	494.1	520.0	540.9	557.8	571.3	582.0	590.6	597.5
150	431.8	474.1	500.6	521.5	538.5	552.5	564.0	573.5	581.3
200	412.1	453.8	484.4	505.1	522.3	536.8	548.8	558.8	567.3
250	395.1	436.0	468.0	490.8	508.2	522.9	535.3	545.9	554.9
300	380.0	420.4	452.4	477.6	495.4	510.4	523.2	534.1	543.6
350	366.5	406.5	438.3	464.0	484.0	499.0	512.0	523.3	533.1
400	354.3	393.8	425.5	451.3	472.3	488.5	501.7	513.3	523.3
450	343.1	382.2	413.7	439.6	461.0	478.6	492.1	503.9	514.2
500	343.9	371.4	402.9	428.7	450.3	468.4	483.2	495.0	505.6
550		361.4	392.7	418.6	440.3	458.6	474.1	486.8	497.4
600		352.1	383.2	409.1	430.9	449.4	465.2	478.7	489.7
650		343.4	374.3	400.2	422.0	440.7	456.7	470.5	482.3
700			365.9	391.7	413.6	432.4	448.6	462.6	474.8
750				357.9	383.7	405.6	424.5	440.8	455.0
800				350.3	376.0	398.0	416.9	433.4	447.8
850				343.2	368.8	390.7	409.7	426.2	440.8
900					361.8	383.8	402.8	419.4	434.0
950					355.2	377.1	396.2	412.9	427.6
1000					348.8	370.7	389.8	406.5	421.3

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)							
	340	380	420	460	500	540	580	620
30 & Below	0	0	0	0	0	0	0	0
32	-4.9	-5.6	-6.4	-7.2	-7.9	-8.7	-9.4	-10.2
34	-9.8	-11.3	-12.8	-14.3	-15.8	-17.3	-18.8	-20.3
36	-14.7	-16.9	-19.2	-21.5	-23.7	-26.0	-28.2	-30.5
38	-19.6	-22.6	-25.6	-28.6	-31.6	-34.6	-37.6	-40.6
40	-24.5	-28.2	-32.0	-35.8	-39.5	-43.3	-47.0	-50.8
42	-31.6	-36.4	-41.2	-45.9	-50.7	-55.5	-60.2	-65.0
44	-38.7	-44.5	-50.3	-56.1	-61.9	-67.7	-73.5	-79.2
46	-45.9	-52.7	-59.5	-66.3	-73.1	-79.9	-86.7	-93.5
48	-53.0	-60.8	-68.6	-76.4	-84.2	-92.1	-99.9	-107.7
50	-60.1	-68.9	-77.8	-86.6	-95.4	-104.3	-113.1	-121.9

Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 LB)							
	340	380	420	460	500	540	580	620
S.L. & Below	0	0	0	0	0	0	0	0
1000	-12.7	-14.2	-15.6	-17.1	-18.6	-20.0	-21.5	-23.0
2000	-26.6	-29.5	-32.3	-35.2	-38.0	-40.9	-43.7	-46.5
3000	-39.8	-44.1	-48.3	-52.6	-56.8	-61.1	-65.3	-69.6

GEAR DOWN**Takeoff Obstacle Limit Weight****Flaps 15****Wind Adjustments**

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 LB)							
	340	380	420	460	500	540	580	620
15 TW	-54.4	-51.7	-49.0	-46.4	-43.7	-41.0	-38.4	-35.7
10 TW	-36.3	-34.5	-32.7	-30.9	-29.1	-27.4	-25.6	-23.8
5 TW	-18.1	-17.2	-16.3	-15.5	-14.6	-13.7	-12.8	-11.9
0	0	0	0	0	0	0	0	0
10 HW	8.0	7.2	6.3	5.5	4.7	3.8	3.0	2.2
20 HW	16.0	14.3	12.7	11.0	9.3	7.7	6.0	4.3
30 HW	24.0	21.7	19.3	17.0	14.7	12.3	10.0	7.7
40 HW	32.0	29.0	26.0	23.0	20.0	17.0	14.0	11.0

With engine bleed for packs off, increase weight by 300 lb.

With engine anti-ice on, decrease weight by 2400 lb.

With engine and wing anti-ice on, decrease weight by 3500 lb.

Long Range Cruise Altitude Capability**Max Climb Thrust, 300 ft/min residual rate of climb**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
660	14400	14300	12000
640	15800	15700	13600
620	17100	17000	15100
600	18400	18300	16500
580	19700	19600	17900
560	20800	20700	19300
540	21900	21800	20500
520	23000	22900	21700
500	24200	24100	22800
480	25300	25200	24000
460	26300	26100	25100
440	27300	27100	26200
420	28300	28000	27200
400	29400	29100	28300
380	30600	30100	29400
360	31500	31200	30600
340	32200	31900	31500

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	289	260	236	217	200	187	175	165	156	148	
483	433	389	354	325	300	281	263	248	234	222	
642	576	518	472	434	400	375	352	331	313	297	
800	718	647	590	542	500	468	440	414	391	372	
958	860	775	707	650	600	562	528	497	470	447	
1115	1002	904	824	758	700	656	616	581	549	522	
1272	1143	1031	941	866	800	750	705	664	628	597	
1428	1284	1159	1058	974	900	844	793	747	707	672	
1583	1424	1286	1174	1082	1000	938	881	830	786	747	
1737	1564	1413	1291	1189	1100	1032	970	914	865	823	
1891	1703	1540	1408	1297	1200	1126	1058	998	944	898	
2045	1842	1667	1524	1405	1300	1219	1146	1081	1023	973	
2198	1981	1793	1640	1513	1400	1313	1235	1165	1103	1049	
2350	2120	1920	1757	1620	1500	1408	1324	1249	1183	1125	
2502	2258	2046	1873	1728	1600	1502	1413	1333	1263	1201	
2653	2396	2171	1988	1835	1700	1596	1501	1417	1342	1276	
2804	2533	2297	2104	1943	1800	1690	1590	1500	1421	1352	
2955	2671	2423	2220	2050	1900	1784	1679	1585	1501	1429	
3105	2808	2548	2336	2157	2000	1878	1768	1669	1581	1505	
3254	2944	2673	2451	2265	2100	1973	1857	1753	1661	1581	
3403	3080	2797	2566	2372	2200	2067	1946	1837	1741	1657	

Reference Fuel and Time Required

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	18.2	0:50	17.3	0:49	16.8	0:47	16.7	0:46	17.1	0:46
300	26.6	1:13	25.2	1:10	24.1	1:08	23.7	1:06	24.1	1:06
400	35.0	1:35	33.0	1:31	31.5	1:28	30.8	1:25	31.2	1:25
500	43.5	1:57	41.0	1:52	38.9	1:48	38.0	1:45		
600	52.1	2:19	48.9	2:13	46.4	2:09	45.2	2:04		
700	60.8	2:41	57.1	2:34	54.1	2:29	52.6	2:23		
800	69.5	3:03	65.2	2:55	61.7	2:49	60.0	2:43		
900	78.3	3:24	73.5	3:16	69.5	3:08	67.6	3:02		
1000	87.2	3:46	81.8	3:36	77.4	3:28	75.3	3:21		
1100	96.3	4:07	90.3	3:57	85.4	3:48	83.1	3:39		
1200	105.3	4:28	98.8	4:17	93.4	4:07	90.9	3:58		
1300	114.6	4:49	107.4	4:37	101.5	4:27	99.0	4:17		
1400	123.8	5:10	116.0	4:57	109.7	4:46	107.1	4:36		
1500	133.2	5:30	124.9	5:17	118.1	5:06				
1600	142.7	5:51	133.7	5:37	126.5	5:25				
1700	152.3	6:12	142.7	5:57	135.1	5:44				
1800	161.9	6:32	151.7	6:16	143.7	6:03				
1900	171.7	6:52	160.8	6:36	152.6	6:22				
2000	181.5	7:12	170.0	6:55	161.4	6:41				
2100	191.5	7:32	179.4	7:15	170.5	7:00				
2200	201.5	7:52	188.8	7:34	179.5	7:19				

GEAR DOWN**Long Range Cruise Trip Fuel and Time****Fuel Required Adjustment (1000 LB)**

REFERENCE FUEL REQUIRED (1000 LB)	LANDING WEIGHT (1000 LB)				
	350	400	450	500	550
20	-2.4	-1.2	0.0	1.6	3.3
40	-4.6	-2.3	0.0	3.2	6.6
60	-6.7	-3.4	0.0	4.8	10.1
80	-8.9	-4.5	0.0	6.5	13.7
100	-11.2	-5.6	0.0	8.2	17.4
120	-13.5	-6.8	0.0	10.1	21.3
140	-15.8	-8.0	0.0	12.0	25.4
160	-18.1	-9.2	0.0	14.0	29.7
180	-20.5	-10.4	0.0	16.0	34.0
200	-22.9	-11.7	0.0	18.2	38.6
220	-25.4	-12.9	0.0	20.4	43.3
240	-27.9	-14.2	0.0	22.6	48.2
260	-30.4	-15.5	0.0	24.9	53.2

Based on VREF+80 climb, Long Range Cruise and VREF+80 descent.

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	
99	83	71	62	55	50	46	42	39	36	33	
174	152	134	121	109	100	92	85	80	75	70	
249	220	197	178	163	150	139	129	121	114	107	
323	287	259	236	216	200	186	174	163	153	145	
396	354	321	293	270	250	233	218	205	193	183	
468	421	382	350	323	300	280	262	247	233	221	
541	488	444	407	377	350	327	307	289	273	259	
614	554	506	465	430	400	374	351	331	313	297	
687	622	568	522	483	450	421	395	373	353	335	
762	690	630	580	537	500	468	440	414	392	372	

GEAR DOWN**Short Trip Fuel and Time****Trip Fuel and Time**

AIR DISTANCE (NM)	FUEL (1000 LB) ALT (FT)	LANDING WEIGHT (1000 LB)					TIME (HRS:MIN)
		300	350	400	450	500	
50	FUEL (1000 LB) ALT (FT)	4.2 14000	4.6 12000	4.9 10000	5.3 10000	5.7 8000	0:15
100	FUEL (1000 LB) ALT (FT)	7.2 22000	7.8 18000	8.5 18000	9.2 16000	9.9 16000	0:26
150	FUEL (1000 LB) ALT (FT)	9.8 26000	10.8 22000	11.8 20000	12.8 20000	13.9 18000	0:36
200	FUEL (1000 LB) ALT (FT)	12.3 28000	13.7 26000	15.0 24000	16.4 22000	17.8 20000	0:46
250	FUEL (1000 LB) ALT (FT)	14.8 30000	16.5 28000	18.1 24000	19.8 22000	21.6 20000	0:55
300	FUEL (1000 LB) ALT (FT)	17.3 30000	19.3 28000	21.3 24000	23.3 22000	25.5 20000	1:05
350	FUEL (1000 LB) ALT (FT)	19.8 30000	22.1 28000	24.5 26000	26.9 22000	29.4 20000	1:14
400	FUEL (1000 LB) ALT (FT)	22.3 30000	24.9 28000	27.7 26000	30.4 22000	33.3 20000	1:24
450	FUEL (1000 LB) ALT (FT)	24.8 30000	27.8 28000	30.9 26000	34.0 22000	37.2 20000	1:33
500	FUEL (1000 LB) ALT (FT)	27.3 30000	30.6 28000	34.1 26000	37.6 22000	41.2 20000	1:43

GEAR DOWN**Holding Planning**
Flaps Up

WEIGHT (1000 LB)	TOTAL FUEL FLOW (LB/HR)						
	PRESSURE ALTITUDE (FT)						
1500	5000	10000	15000	20000	25000	30000	
660	30550	30000	30290	31040			
620	28790	28170	28320	28710			
580	27230	26590	26570	26740	28330		
540	25720	25160	24930	24950	25940		
500	24120	23720	23360	23190	23690		
460	22510	22210	21830	21490	21710	23080	
420	20910	20590	20290	19770	19850	20560	
380	19320	18980	18770	18150	18100	18490	20080
340	18050	17720	17440	16880	16410	16660	17400

Flaps 1

WEIGHT (1000 LB)	TOTAL FUEL FLOW (LB/HR)				
	PRESSURE ALTITUDE (FT)				
1500	5000	10000	15000	20000	
660	29330	28790	29140	29660	
620	27540	26970	27120	27400	
580	25860	25370	25270	25430	26620
540	24250	23930	23630	23640	24270
500	22600	22330	22030	21840	22100
460	20980	20680	20460	20040	20160
420	19350	19040	18880	18300	18350
380	18020	17740	17510	16990	16620
340	16410	16160	15900	15460	15220

These tables include 5% additional fuel for holding in a racetrack pattern.

Do not hold at Flaps 1 in icing conditions.

GEAR DOWN
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
14	350.1	342.7	
12	377.2	372.0	366.0
10	395.9	389.9	383.5
8	419.6	412.0	404.3
6	443.6	433.7	424.0
4	466.7	453.2	440.3
2	487.9	470.6	453.6
0	503.1	475.5	

Anti-Ice Adjustments

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 LB)						
	PRESSURE ALTITUDE (1000 FT)						
	2	4	6	8	10	12	14
ENGINE ONLY	-14.3	-12.2	-10.4	-8.4	-7.1	-5.2	-4.0
ENGINE AND WING	-21.0	-18.1	-15.7	-13.1	-10.9	-8.6	-6.8

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Performance Dispatch**Text****Chapter PD****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 data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

Takeoff

The maximum allowable takeoff weight will be the least of the Field, Climb, Tire, Brake Energy and Obstacle Limit Weights as determined from the following tables.

Field Limit Weight - Slope and Wind Corrections

These tables provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the Slope Correction table with the available field length and runway slope to determine the slope corrected field length. Now enter the Wind Correction 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 show both Field and Climb Limit Weights. Enter the appropriate table for pressure altitude 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.

Obstacle Limit Weight

This table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the correction tables to correct 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 235 MPH tires. To determine the tire speed limit weight, enter the table with OAT, move to airport pressure altitude and read the tire speed limit weight. Adjust the tire speed limit weight according to the notes below the table to account for wind.

Brake Energy Limits VMBE

Tables are presented to determine the Maximum Brake Energy Speed VMBE. Compliance with this limitation is required to ensure that the brakes have enough capacity to execute a maximum effort stop from V1 without the use of thrust reversers. Enter the upper table with pressure altitude and OAT to determine the reference VMBE. Then enter the lower table with the reference VMBE and brake release weight to determine VMBE for a specific takeoff. Adjust for slope, wind and deactivated brakes as described below the table. The resulting VMBE must be greater than or equal to V1. If VMBE is less than V1, brake release weight must be decreased by the amount shown below the table.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy, or obstacle clearance with unbalanced V1. 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 may 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 the table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR 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 Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Brakes Deactivated

When operating with brakes deactivated, the field and brake energy limit weights and the V1 and VMBE must be reduced to allow for reduced braking capability. A simplified method which conservatively accounts for the reduced braking capability of one brake deactivated is to reduce the normal runway limited weight by 8100 lb and the V1 associated with the reduced weight by one knot. With two brakes deactivated, reduce the normal runway limited weight by 17000 lb and the V1 associated with the reduced weight by three 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 corrected for wind and slope exceeds approximately 4200 ft for one brake deactivated or 4400 ft for two brakes deactivated.

For brake(s) deactivated, reduce VMBE by the amount shown on the Brake Energy Limit VMBE Chart. If the resulting VMBE is less than V1, the brake release weight must be reduced according to the instructions on the brake energy limit chart. The resulting V1 must not be less than V1(MCG). Determine VR and V2 for the actual weight.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

Enroute

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination. Data is based on economy climb and descent speeds, and Long Range Cruise with normal engine bleed for air conditioning. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table 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 fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance as discussed above. Then enter the Trip Fuel and Time required with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. The data considers the use of the FMC short trip optimum altitude. Obtain air distance from upper table using the ground distance and wind component to the alternate. Enter Trip Fuel and Time 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

These tables provide total fuel flow information necessary for planning Flaps Up and Flaps 1 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%.

Oxygen Requirements

Flight Crew System

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck. The oxygen quantity associated with these requirements is achieved with the minimum dispatch oxygen cylinder pressure. Enter the Crew Oxygen Requirements table with the number of crew plus observers using oxygen and read the minimum cylinder pressure required for the appropriate bottle temperature.

An additional quantity of oxygen is required when flight altitudes above 41000 ft are planned. Regulations require that one active duty pilot must don the oxygen mask and breathe diluted oxygen for the duration of the flight above 41000 ft. The additional quantity of oxygen required is 2.05 liters/person/minute (1.2 psi/person/minute for the single cylinder system), or 13 liters/person/minute (8 psi/person/minute) if 100% oxygen is selected during normal usage.

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 Range Operations

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 diversion airport comply with rules set up specifically for "Extended Range Operation with Two Engine airplanes". This section provides reserve fuel planning information for the "Critical Fuel Scenario" based on two engine operation at Long Range Cruise as well as single engine operation at Long Range Cruise.

Critical Fuel Reserves

Enter Ground to Air Mile Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter 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 in-service 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 Flaps 30.

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

Landing Field Limit Weight

Obtain wind corrected field length by entering upper table with field length available and wind component along the runway. Now enter table with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

Landing Climb Limit Weight

Enter 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 engine bleed corrections as noted. Note that data is for one engine inoperative.

Quick Turnaround Limit Weight

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

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, 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.

Takeoff/Landing Climb Limit Weight

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

The remaining gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

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777 Flight Crew Operations Manual

Performance Dispatch

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Performance Dispatch

Takeoff

Chapter PD

Section 60

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	4310	4280	4260	4230	4200	4150	4110	4060	4020
4600	4750	4710	4680	4640	4600	4540	4480	4420	4360
5000	5190	5140	5090	5050	5000	4930	4860	4780	4710
5400	5630	5570	5510	5460	5400	5310	5230	5140	5060
5800	6070	6000	5930	5870	5800	5700	5600	5500	5400
6200	6510	6430	6350	6280	6200	6090	5970	5860	5750
6600	6950	6860	6770	6690	6600	6470	6350	6220	6090
7000	7380	7290	7190	7100	7000	6860	6720	6580	6440
7400	7820	7720	7610	7510	7400	7250	7090	6940	6780
7800	8260	8150	8030	7920	7800	7630	7460	7300	7130
8200	8700	8580	8450	8330	8200	8020	7840	7660	7480
8600	9140	9010	8870	8740	8600	8410	8210	8020	7820
9000	9580	9440	9290	9150	9000	8790	8580	8370	8170
9400	10020	9860	9710	9550	9400	9180	8960	8730	8510
9800	10460	10290	10130	9960	9800	9560	9330	9090	8860
10200	10900	10720	10550	10370	10200	9950	9700	9450	9200
10600	11340	11150	10970	10780	10600	10340	10070	9810	9550
11000	11780	11580	11390	11190	11000	10720	10450	10170	9890
11400	12210	12010	11810	11600	11400	11110	10820	10530	10240
11800	12650	12440	12230	12010	11800	11500	11190	10890	10590

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	4450	4700	4970	5250
4600	3500	3870	4230	4600	4860	5130	5410	5700
5000	3840	4220	4610	5000	5270	5550	5850	6150
5400	4170	4580	4990	5400	5680	5980	6280	6600
5800	4500	4940	5370	5800	6100	6400	6720	7050
6200	4840	5290	5750	6200	6510	6830	7160	7490
6600	5170	5650	6120	6600	6920	7250	7590	7940
7000	5500	6000	6500	7000	7330	7680	8030	8390
7400	5840	6360	6880	7400	7750	8100	8470	8840
7800	6170	6710	7260	7800	8160	8530	8900	9290
8200	6500	7070	7630	8200	8570	8950	9340	9740
8600	6840	7420	8010	8600	8980	9370	9780	10190
9000	7170	7780	8390	9000	9390	9800	10210	10640
9400	7500	8140	8770	9400	9810	10220	10650	11090
9800	7840	8490	9150	9800	10220	10650	11090	11540
10200	8170	8850	9520	10200	10630	11070	11520	11990
10600	8500	9200	9900	10600	11040	11500	11960	12430
11000	8840	9560	10280	11000	11460	11920	12400	12880
11400	9170	9910	10660	11400	11870	12350	12840	13330
11800	9500	10270	11030	11800	12280	12770	13270	13780

777 Flight Crew Operations Manual

Takeoff Field & Climb Limit Weights - Dry Runway**Flaps 15****Sea Level Pressure Altitude**

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
4600	549.2	495.8	492.5	489.3	486.1	483.0	473.2	461.4	448.3	434.8	421.2
5000	575.4	519.8	516.3	513.0	509.7	506.4	496.3	483.9	470.3	456.2	442.0
5400	600.5	542.7	539.2	535.7	532.3	528.9	518.3	505.5	491.3	476.7	462.0
5800	624.7	564.9	561.2	557.6	554.0	550.5	539.6	526.3	511.7	496.5	481.3
6200	647.9	586.2	582.4	578.6	575.0	571.4	560.1	546.3	531.2	515.6	499.9
6600	670.2	606.6	602.7	598.9	595.1	591.4	579.8	565.6	550.1	534.0	517.8
7000	691.6	626.3	622.3	618.3	614.5	610.7	598.7	584.2	568.2	551.7	535.1
7400	711.9	645.1	640.9	636.9	632.9	629.0	616.8	602.0	585.6	568.7	551.7
7800	731.5	663.2	659.0	654.9	650.8	646.9	634.4	619.2	602.5	585.2	567.8
8200	751.3	681.6	677.3	673.1	668.9	664.9	652.1	636.7	619.6	601.9	584.2
8600	770.2	699.1	694.7	690.4	686.2	682.1	669.1	653.3	635.9	617.9	599.8
9000	787.1	714.7	710.2	705.8	701.5	697.3	684.1	668.0	650.3	631.9	613.5
9400	802.6	728.8	724.3	719.8	715.4	711.2	697.7	681.3	663.2	644.5	625.8
9800	817.8	742.7	738.1	733.6	729.1	724.7	711.0	694.3	676.0	656.9	637.8
10200	832.6	756.3	751.6	747.0	742.4	738.0	724.0	707.1	688.4	669.0	649.6
10600	834.9	769.5	764.7	760.0	755.4	750.9	736.7	719.5	700.5	680.8	661.1
11000	834.9	782.4	777.5	772.8	768.1	763.5	749.1	731.6	712.3	692.3	672.2
CLIMB LIMIT WT (1000 LB)	823.3	823.2	822.9	822.6	822.3	821.9	794.3	763.1	728.8	695.6	662.7

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
4600	513.5	465.3	462.2	459.2	456.3	447.9	438.5	427.2	414.9	400.0	386.1
5000	538.2	488.0	484.8	481.7	478.6	469.9	460.1	448.3	435.5	420.0	405.5
5400	561.9	509.8	506.4	503.1	500.0	490.9	480.8	468.5	455.2	439.1	424.0
5800	584.7	530.7	527.3	523.9	520.6	511.2	500.7	488.0	474.2	457.5	442.0
6200	606.6	550.9	547.3	543.8	540.4	530.7	519.9	506.8	492.5	475.3	459.3
6600	627.7	570.4	566.7	563.1	559.6	549.6	538.4	524.9	510.3	492.5	476.0
7000	647.9	589.1	585.3	581.6	578.0	567.7	556.3	542.4	527.4	509.2	492.2
7400	667.2	606.9	603.1	599.3	595.6	585.1	573.4	559.2	543.8	525.2	507.8
7800	685.8	624.3	620.3	616.4	612.7	601.9	590.0	575.4	559.7	540.7	522.9
8200	704.7	641.8	637.8	633.8	630.0	619.0	606.8	592.0	575.9	556.5	538.4
8600	722.6	658.6	654.4	650.4	646.5	635.3	622.9	607.7	591.4	571.6	553.1
9000	738.7	673.4	669.2	665.1	661.1	649.7	637.0	621.6	604.9	584.7	565.9
9400	753.2	686.7	682.5	678.3	674.2	662.6	649.7	634.0	617.0	596.5	577.3
9800	767.6	699.9	695.6	691.3	687.2	675.4	662.2	646.2	629.0	608.0	588.5
10200	781.6	712.7	708.3	704.0	699.8	687.8	674.4	658.1	640.6	619.3	599.4
10600	795.2	725.2	720.7	716.3	712.1	699.9	686.2	669.7	651.9	630.2	610.1
11000	808.5	737.4	732.9	728.4	724.0	711.7	697.8	681.1	662.9	641.0	620.4
CLIMB LIMIT WT (1000 LB)	779.2	778.9	778.6	778.4	778.1	756.9	733.8	704.6	673.5	640.1	610.2

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

With engine bleed for packs off, increase field limit weight by 1100 lb and climb limit weight by 4200 lb.

With engine and wing anti-ice on, decrease field limit weight by 2100 lb and climb limit weight by 3900 lb.

Takeoff Field & Climb Limit Weights - Dry Runway**Flaps 15****4000 FT Pressure Altitude**

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
4600	479.2	434.6	431.7	428.8	422.4	414.1	403.9	393.0	380.3	367.0	355.3
5000	502.5	456.0	453.0	450.0	443.3	434.7	424.0	412.7	399.4	385.6	373.4
5400	524.8	476.4	473.3	470.2	463.3	454.4	443.2	431.5	417.7	403.3	390.7
5800	546.3	496.2	493.0	489.8	482.7	473.4	461.8	449.7	435.4	420.5	407.4
6200	567.0	515.3	512.0	508.7	501.3	491.7	479.8	467.3	452.5	437.2	423.6
6600	586.9	533.7	530.3	526.8	519.3	509.4	497.1	484.2	469.1	453.2	439.3
7000	606.1	551.4	547.9	544.4	536.6	526.5	513.9	500.6	485.1	468.8	454.5
7400	624.3	568.4	564.8	561.2	553.2	542.9	530.0	516.4	500.5	483.9	469.2
7800	642.1	584.9	581.2	577.5	569.4	558.8	545.6	531.8	515.5	498.5	483.5
8200	660.0	601.6	597.9	594.1	585.8	575.0	561.5	547.4	530.8	513.4	498.1
8600	677.1	617.6	613.7	609.9	601.4	590.4	576.7	562.3	545.3	527.6	512.1
9000	692.2	631.6	627.7	623.8	615.2	603.9	590.0	575.3	558.0	540.0	524.1
9400	706.0	644.2	640.2	636.3	627.5	616.0	601.8	586.9	569.3	550.9	534.8
9800	719.5	656.6	652.6	648.5	639.6	627.9	613.5	598.2	580.3	561.6	545.2
10200	732.6	668.7	664.6	660.5	651.4	639.5	624.8	609.3	591.1	572.1	555.3
10600	745.4	680.5	676.3	672.1	662.8	650.8	635.8	620.1	601.6	582.3	565.2
11000	758.0	692.0	687.7	683.5	674.1	661.8	646.6	630.6	611.8	592.2	574.9
CLIMB LIMIT WT (1000 LB)	726.9	726.6	726.4	726.1	714.1	696.2	673.1	648.6	619.1	589.4	564.4

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
4600	445.9	403.3	400.3	394.9	386.8	377.0	368.3	358.8	347.6	336.6	326.0
5000	467.8	423.3	420.3	414.6	406.2	396.0	386.9	377.1	365.3	353.9	342.8
5400	488.7	442.6	439.4	433.5	424.8	414.2	404.7	394.5	382.3	370.4	358.9
5800	509.0	461.2	457.9	451.8	442.8	431.8	422.0	411.4	398.8	386.5	374.6
6200	528.4	479.1	475.7	469.4	460.1	448.8	438.6	427.7	414.7	402.0	389.7
6600	547.2	496.4	492.9	486.4	476.9	465.2	454.8	443.5	430.1	417.0	404.4
7000	565.3	513.1	509.6	502.9	493.1	481.1	470.4	458.8	445.0	431.6	418.7
7400	582.6	529.2	525.6	518.7	508.7	496.4	485.5	473.7	459.5	445.8	432.5
7800	599.4	544.8	541.1	534.1	523.8	511.3	500.1	488.0	473.6	459.6	446.0
8200	616.4	560.7	556.9	549.8	539.3	526.5	515.1	502.8	488.0	473.7	459.9
8600	632.7	575.9	572.0	564.7	554.0	541.0	529.3	516.8	501.8	487.2	473.0
9000	647.0	589.1	585.2	577.8	566.9	553.6	541.7	528.9	513.6	498.7	484.3
9400	659.9	601.0	597.0	589.4	578.3	564.8	552.7	539.6	524.1	508.9	494.3
9800	672.6	612.6	608.5	600.8	589.5	575.7	563.4	550.2	534.3	518.9	504.0
10200	684.9	623.9	619.8	611.9	600.4	586.4	573.9	560.4	544.3	528.6	513.4
10600	697.0	635.0	630.7	622.8	611.1	596.8	584.1	570.4	554.0	538.1	522.6
11000	708.7	645.7	641.4	633.3	621.5	607.0	594.1	580.2	563.5	547.3	531.6
CLIMB LIMIT WT (1000 LB)	674.9	674.9	674.6	667.1	651.5	631.2	612.9	592.5	567.3	543.2	520.7

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

With engine bleed for packs off, increase field limit weight by 1100 lb and climb limit weight by 4200 lb.

With engine and wing anti-ice on, decrease field limit weight by 2100 lb and climb limit weight by 3900 lb.

Takeoff Field & Climb Limit Weights - Dry Runway**Flaps 15****8000 FT Pressure Altitude**

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
4600	409.4	369.4	364.4	357.3	348.5	340.4	331.8	322.0	311.9	302.0	292.0
5000	429.8	388.0	382.9	375.5	366.3	357.8	348.9	338.7	328.1	317.8	307.4
5400	449.2	405.9	400.5	392.8	383.3	374.5	365.2	354.7	343.7	333.0	322.2
5800	468.1	423.2	417.6	409.7	399.8	390.7	381.1	370.1	358.8	347.7	336.5
6200	486.2	439.9	434.2	425.9	415.8	406.3	396.4	385.1	373.4	361.9	350.4
6600	503.7	456.0	450.2	441.7	431.2	421.5	411.3	399.7	387.6	375.8	363.9
7000	520.7	471.7	465.6	456.9	446.2	436.2	425.8	413.8	401.4	389.3	377.1
7400	536.9	486.8	480.6	471.7	460.7	450.5	439.8	427.6	414.9	402.5	390.0
7800	552.7	501.5	495.2	486.1	474.8	464.4	453.4	440.9	427.9	415.3	402.5
8200	568.8	516.5	510.0	500.7	489.3	478.6	467.5	454.7	441.4	428.5	415.5
8600	584.1	530.8	524.2	514.7	503.0	492.2	480.8	467.8	454.2	441.1	427.8
9000	597.5	543.2	536.5	526.8	514.9	503.8	492.2	479.0	465.2	451.8	438.3
9400	609.5	554.2	547.3	537.5	525.4	514.1	502.3	488.8	474.8	461.1	447.3
9800	621.3	564.9	558.0	548.0	535.6	524.2	512.2	498.4	484.1	470.2	456.2
10200	632.7	575.4	568.4	558.2	545.6	534.0	521.7	507.8	493.2	479.1	464.8
10600	643.9	585.7	578.5	568.1	555.3	543.5	531.1	516.9	502.1	487.7	473.2
11000	654.8	595.7	588.4	577.9	564.9	552.9	540.2	525.8	510.8	496.2	481.5
CLIMB LIMIT WT (1000 LB)	620.6	620.5	613.3	599.8	581.8	565.4	547.3	526.4	504.0	482.8	461.8

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

With engine bleed for packs off, increase field limit weight by 1100 lb and climb limit weight by 4200 lb.

With engine and wing anti-ice on, decrease field limit weight by 2100 lb and climb limit weight by 3900 lb.

Takeoff Field Corrections - Wet Runway

Slope Corrections

FIELD LENGTH AVAILABLE (FT)	SLOPE CORRECTED FIELD LENGTH (FT)								
	RUNWAY SLOPE (%)								2.0
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	
4200	4240	4230	4220	4210	4200	4150	4110	4060	4020
4600	4690	4670	4650	4620	4600	4540	4480	4420	4360
5000	5140	5100	5070	5030	5000	4930	4850	4780	4710
5400	5590	5540	5490	5450	5400	5310	5230	5140	5060
5800	6040	5980	5920	5860	5800	5700	5600	5500	5400
6200	6480	6410	6340	6270	6200	6090	5980	5860	5750
6600	6930	6850	6770	6680	6600	6470	6350	6220	6100
7000	7380	7290	7190	7100	7000	6860	6720	6580	6450
7400	7830	7720	7610	7510	7400	7250	7100	6940	6790
7800	8280	8160	8040	7920	7800	7640	7470	7310	7140
8200	8730	8600	8460	8330	8200	8020	7840	7670	7490
8600	9180	9030	8890	8740	8600	8410	8220	8030	7830
9000	9620	9470	9310	9160	9000	8800	8590	8390	8180
9400	10070	9900	9740	9570	9400	9180	8960	8750	8530
9800	10520	10340	10160	9980	9800	9570	9340	9110	8880
10200	10970	10780	10580	10390	10200	9960	9710	9470	9220
10600	11420	11210	11010	10800	10600	10340	10090	9830	9570
11000	11870	11650	11430	11220	11000	10730	10460	10190	9920
11400	12310	12090	11860	11630	11400	11120	10830	10550	10270
11800	12760	12520	12280	12040	11800	11500	11210	10910	10610

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	4470	4740	5040	5340
4600	3380	3790	4190	4600	4880	5170	5480	5800
5000	3720	4150	4570	5000	5290	5600	5920	6260
5400	4050	4500	4950	5400	5700	6020	6360	6720
5800	4390	4860	5330	5800	6110	6450	6800	7180
6200	4720	5220	5710	6200	6520	6870	7250	7640
6600	5060	5570	6090	6600	6940	7300	7690	8100
7000	5400	5930	6470	7000	7350	7730	8130	8560
7400	5730	6290	6840	7400	7760	8150	8570	9020
7800	6070	6640	7220	7800	8170	8580	9010	9480
8200	6400	7000	7600	8200	8580	9000	9450	9940
8600	6740	7360	7980	8600	9000	9430	9900	10400
9000	7070	7710	8360	9000	9410	9850	10340	10860
9400	7410	8070	8740	9400	9820	10280	10780	11320
9800	7740	8430	9110	9800	10230	10710	11220	11780
10200	8080	8790	9490	10200	10640	11130	11660	12240
10600	8410	9140	9870	10600	11060	11560	12110	12700
11000	8750	9500	10250	11000	11470	11980	12550	13160
11400	9080	9860	10630	11400	11880	12410	12990	13620
11800	9420	10210	11010	11800	12290	12830	13430	14080

Takeoff Field & Climb Limit Weights - Wet Runway**Flaps 15****Sea Level Pressure Altitude**

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
5900	626.2	563.5	559.7	555.9	552.2	548.6	537.1	523.2	507.8	492.1	476.6
6200	643.2	578.7	574.8	570.9	567.1	563.4	551.6	537.2	521.5	505.3	489.4
6600	664.8	598.0	593.9	589.9	586.0	582.2	569.9	555.1	538.8	522.1	505.6
7000	685.6	616.7	612.5	608.4	604.3	600.3	587.7	572.4	555.5	538.3	521.2
7400	705.5	634.5	630.1	625.9	621.7	617.6	604.6	588.8	571.5	553.7	536.1
7800	725.1	652.1	647.6	643.2	638.9	634.7	621.4	605.1	587.3	569.0	550.9
8200	745.6	670.6	666.0	661.5	657.1	652.8	639.0	622.4	604.0	585.3	566.7
8600	765.6	688.7	684.0	679.4	674.8	670.4	656.3	639.2	620.4	601.2	582.2
9000	783.6	704.8	700.0	695.3	690.7	686.1	671.7	654.2	634.9	615.2	595.7
9400	800.0	719.4	714.4	709.6	704.9	700.2	685.4	667.5	647.8	627.6	607.7
9800	816.2	733.8	728.7	723.8	718.9	714.1	699.1	680.7	660.6	639.9	619.5
10200	832.7	748.5	743.3	738.2	733.3	728.4	713.0	694.2	673.6	652.5	631.7
10600	834.9	763.2	757.9	752.8	747.7	742.7	727.0	707.8	686.8	665.3	644.0
11000	834.9	777.7	772.3	767.0	761.8	756.8	740.7	721.2	699.7	677.7	656.0
11400	834.9	791.7	786.2	780.9	775.6	770.4	754.1	734.2	712.3	689.9	667.7
11800	834.9	805.5	799.9	794.4	789.1	783.8	767.1	746.9	724.6	701.8	679.2
12200	834.9	818.8	813.1	807.5	802.1	796.7	779.7	759.1	736.5	713.3	690.3
12600	834.9	831.7	825.9	820.2	814.7	809.3	792.0	771.1	748.0	724.5	701.2
CLIMB LIMIT WT (1000 LB)	823.3	823.2	822.9	822.6	822.3	821.9	794.3	763.1	728.8	695.6	662.7

2000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
5900	583.5	527.5	524.0	520.4	517.0	507.2	496.3	483.2	469.1	453.9	439.7
6200	599.3	541.7	538.0	534.4	530.9	520.8	509.6	496.1	481.7	466.0	451.4
6600	619.4	559.8	555.9	552.2	548.5	538.1	526.5	512.5	497.6	481.3	466.3
7000	638.7	577.2	573.2	569.4	565.6	554.8	542.8	528.4	513.0	496.2	480.6
7400	657.2	593.8	589.7	585.7	581.9	570.7	558.4	543.6	527.6	510.4	494.3
7800	675.4	610.2	606.0	601.9	597.9	586.5	573.8	558.6	542.2	524.4	508.0
8200	694.5	627.6	623.3	619.1	615.0	603.3	590.2	574.5	557.7	539.5	522.6
8600	713.3	644.6	640.2	635.9	631.7	619.6	606.3	590.2	573.0	554.3	536.9
9000	730.0	659.7	655.2	650.7	646.4	634.1	620.4	603.9	586.3	567.1	549.3
9400	745.1	673.1	668.5	664.0	659.6	647.0	633.0	616.1	598.0	578.4	560.2
9800	760.1	686.5	681.7	677.1	672.6	659.7	645.4	628.1	609.7	589.6	571.0
10200	775.4	700.1	695.3	690.6	686.0	672.8	658.1	640.5	621.6	601.1	582.1
10600	790.7	713.9	708.9	704.1	699.4	685.9	671.0	653.0	633.7	612.8	593.3
11000	805.7	727.3	722.3	717.3	712.5	698.8	683.5	665.2	645.5	624.1	604.3
11400	820.3	740.4	735.3	730.3	725.4	711.4	695.8	677.1	657.0	635.3	615.1
11800	834.6	753.2	748.0	742.9	737.9	723.6	707.8	688.7	668.3	646.2	625.6
12200	834.9	765.6	760.3	755.1	750.0	735.5	719.4	700.0	679.3	656.7	635.8
12600	834.9	777.6	772.2	767.0	761.8	747.1	730.7	711.0	689.9	667.0	645.7
CLIMB LIMIT WT (1000 LB)	779.2	778.9	778.6	778.4	778.1	756.9	733.8	704.6	673.5	640.1	610.2

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

With engine bleed for packs off, increase field limit weight by 1100 lb and climb limit weight by 4200 lb.

With engine and wing anti-ice on, decrease field limit weight by 2400 lb and climb limit weight by 3900 lb.

Takeoff Field & Climb Limit Weights - Wet Runway**Flaps 15****4000 FT Pressure Altitude**

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
5900	543.5	491.5	488.2	484.9	477.5	468.0	457.2	446.1	433.0	419.3	407.4
6200	558.1	504.7	501.3	497.9	490.3	480.5	469.4	457.9	444.5	430.5	418.2
6600	576.7	521.4	517.9	514.3	506.5	496.4	484.9	473.0	459.1	444.6	431.9
7000	594.7	537.6	533.9	530.3	522.2	511.7	499.9	487.6	473.3	458.3	445.1
7400	611.8	553.0	549.2	545.5	537.2	526.4	514.1	501.5	486.7	471.3	457.8
7800	628.8	568.2	564.4	560.5	552.0	540.9	528.3	515.4	500.1	484.2	470.3
8200	646.7	584.5	580.5	576.6	567.8	556.4	543.5	530.2	514.5	498.2	483.9
8600	664.1	600.4	596.3	592.3	583.3	571.6	558.3	544.7	528.7	511.9	497.3
9000	679.7	614.4	610.2	606.1	596.8	584.9	571.3	557.3	540.9	523.8	508.7
9400	693.6	626.8	622.5	618.3	608.9	596.6	582.7	568.4	551.6	534.1	518.7
9800	707.4	639.1	634.7	630.4	620.7	608.2	594.0	579.3	562.2	544.2	528.5
10200	721.5	651.7	647.2	642.8	632.9	620.1	605.6	590.6	573.1	554.7	538.7
10600	735.7	664.4	659.8	655.3	645.2	632.1	617.3	602.0	584.1	565.4	549.0
11000	749.6	676.8	672.2	667.5	657.3	643.9	628.8	613.2	594.9	575.8	559.1
11400	763.2	689.0	684.2	679.5	669.0	655.4	640.0	624.1	605.5	586.0	568.9
11800	776.4	700.8	696.0	691.2	680.5	666.7	651.0	634.8	615.8	596.0	578.6
12200	789.2	712.3	707.4	702.5	691.7	677.6	661.6	645.2	625.9	605.7	588.0
12600	801.6	723.5	718.5	713.6	702.5	688.2	672.0	655.3	635.6	615.1	597.2
CLIMB LIMIT WT (1000 LB)	726.9	726.6	726.4	726.1	714.1	696.2	673.1	648.6	619.1	589.4	564.4

6000 FT Pressure Altitude

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
5900	504.6	456.3	453.2	447.5	439.2	429.1	420.1	410.4	398.8	387.5	376.6
6200	518.2	468.5	465.3	459.4	450.9	440.5	431.2	421.3	409.3	397.7	386.6
6600	535.4	484.0	480.7	474.6	465.7	455.0	445.4	435.1	422.7	410.7	399.2
7000	552.0	498.9	495.5	489.2	480.1	469.0	459.1	448.4	435.7	423.3	411.4
7400	567.9	513.2	509.7	503.2	493.8	482.4	472.1	461.2	448.0	435.3	423.0
7800	583.6	527.3	523.7	517.0	507.4	495.6	485.1	473.8	460.3	447.2	434.6
8200	600.2	542.4	538.7	531.9	522.0	509.9	499.1	487.5	473.7	460.2	447.2
8600	616.5	557.3	553.5	546.4	536.3	523.9	512.8	500.9	486.7	472.9	459.6
9000	630.9	570.2	566.3	559.1	548.7	536.0	524.7	512.5	497.9	483.8	470.1
9400	643.7	581.6	577.6	570.3	559.6	546.6	535.0	522.5	507.6	493.1	479.2
9800	656.4	592.8	588.8	581.2	570.4	557.1	545.2	532.4	517.2	502.4	488.1
10200	669.3	604.4	600.3	592.6	581.4	567.9	555.7	542.7	527.1	511.9	497.4
10600	682.4	616.1	611.9	604.0	592.6	578.8	566.4	553.1	537.2	521.7	506.8
11000	695.2	627.6	623.2	615.2	603.6	589.5	576.8	563.2	547.0	531.2	516.0
11400	707.7	638.8	634.4	626.2	614.4	600.0	587.0	573.2	556.7	540.6	525.1
11800	719.9	649.7	645.2	636.9	624.9	610.2	597.0	583.0	566.1	549.7	533.9
12200	731.8	660.3	655.8	647.3	635.1	620.1	606.8	592.4	575.3	558.6	542.6
12600	743.2	670.7	666.0	657.4	645.0	629.8	616.2	601.7	584.3	567.3	551.0
CLIMB LIMIT WT (1000 LB)	674.9	674.9	674.6	667.1	651.5	631.2	612.9	592.5	567.3	543.2	520.7

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

With engine bleed for packs off, increase field limit weight by 1100 lb and climb limit weight by 4200 lb.

With engine and wing anti-ice on, decrease field limit weight by 2400 lb and climb limit weight by 3900 lb.

Takeoff Field & Climb Limit Weights - Wet Runway**Flaps 15****8000 FT Pressure Altitude**

CORR'D FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 LB)										
	OAT (°C)										
	-40	14	18	22	26	30	34	38	42	46	50
5900	465.5	420.9	415.7	408.4	399.3	390.9	382.1	372.0	361.6	351.7	341.9
6200	477.9	432.1	426.8	419.2	409.9	401.2	392.2	381.8	371.1	360.9	350.8
6600	493.7	446.2	440.7	432.9	423.3	414.3	404.9	394.2	383.2	372.6	362.1
7000	509.0	460.0	454.3	446.2	436.3	427.0	417.3	406.3	394.9	384.0	373.1
7400	523.5	473.0	467.2	458.9	448.6	439.1	429.1	417.7	406.0	394.8	383.6
7800	537.9	486.0	480.0	471.5	460.9	451.1	440.9	429.2	417.1	405.5	394.1
8200	553.4	500.1	493.9	485.1	474.3	464.2	453.7	441.7	429.3	417.4	405.6
8600	568.5	513.8	507.5	498.5	487.4	477.0	466.2	453.9	441.2	429.0	416.9
9000	581.7	525.7	519.2	510.0	498.6	488.0	477.0	464.3	451.3	438.8	426.5
9400	593.3	536.0	529.4	520.0	508.3	497.5	486.2	473.2	459.9	447.2	434.5
9800	604.9	546.2	539.5	529.8	517.9	506.8	495.2	482.0	468.4	455.3	442.4
10200	616.7	556.8	549.9	540.0	527.8	516.5	504.7	491.1	477.2	463.9	450.6
10600	628.7	567.5	560.4	550.3	537.9	526.3	514.2	500.4	486.2	472.6	459.0
11000	640.4	578.0	570.7	560.4	547.7	535.9	523.6	509.5	495.0	481.1	467.3
11400	651.8	588.2	580.8	570.3	557.4	545.4	532.8	518.5	503.7	489.5	475.4
11800	663.0	598.2	590.7	580.0	566.9	554.6	541.8	527.2	512.1	497.7	483.4
12200	673.8	608.0	600.3	589.5	576.1	563.6	550.6	535.7	520.4	505.8	491.2
12600	684.4	617.5	609.7	598.7	585.1	572.4	559.2	544.1	528.5	513.6	498.8
CLIMB LIMIT WT (1000 LB)	620.6	620.5	613.3	599.8	581.8	565.4	547.3	526.4	504.0	482.8	461.8

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

With engine bleed for packs off, increase field limit weight by 1100 lb and climb limit weight by 4200 lb.

With engine and wing anti-ice on, decrease field limit weight by 2400 lb and climb limit weight by 3900 lb.

Takeoff Obstacle Limit Weight**Flaps 15****Sea Level, 30°C & Below, Zero Wind****Based on engine bleed for packs on, engine anti-ice on or off and wing anti-ice off**

OBSTACLE HEIGHT (FT)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 LB)								
	DISTANCE FROM BRAKE RELEASE (1000 FT)								
	8	10	12	14	16	18	20	22	24
10	651.6	721.7	784.7	831.0					
50	621.4	687.0	741.4	787.8	822.7				
100	588.2	653.4	703.9	746.2	782.2	809.6	830.3		
150	560.4	625.1	674.3	714.9	749.2	778.7	801.4	820.0	834.1
200	536.5	599.6	649.3	689.2	722.7	751.2	776.1	795.5	811.8
250	515.5	576.9	627.2	666.9	700.1	728.3	752.5	773.9	791.0
300	496.6	556.6	606.7	647.0	680.0	708.1	732.4	753.4	772.0
350	479.5	538.5	587.9	628.7	661.8	690.0	714.2	735.4	753.9
400	463.8	522.0	570.6	611.5	645.1	673.3	697.7	718.9	737.7
450	449.3	506.7	554.7	595.4	629.5	657.9	682.4	703.8	722.6
500	436.3	492.6	540.0	580.3	614.7	643.5	668.1	689.7	708.7
550	424.2	479.4	526.3	566.3	600.6	629.9	654.7	676.4	695.6
600	412.6	467.1	513.5	553.1	587.3	616.9	642.0	663.9	683.3
650	401.9	455.5	501.4	540.7	574.8	604.4	629.9	652.0	671.5
700	391.7	444.6	489.9	529.0	562.9	592.5	618.4	640.7	660.3
750	381.9	434.5	479.1	517.9	551.6	581.2	607.1	629.8	649.7
800	372.6	424.9	468.9	507.4	540.9	570.4	596.4	619.3	639.4
850		415.6	459.1	497.3	530.6	560.0	586.1	609.2	629.5
900		406.8	449.9	487.7	520.9	550.2	576.2	599.3	620.0
950		398.4	441.1	478.5	511.6	540.7	566.7	589.9	610.7
1000		390.3	432.8	469.8	502.6	531.7	557.6	580.8	601.6

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)						
	360	440	520	600	680	760	840
30 & Below	0	0	0	0	0	0	0
32	-6.2	-7.6	-9.0	-10.4	-11.7	-13.1	-14.5
34	-12.4	-15.1	-17.9	-20.7	-23.5	-26.3	-29.0
36	-18.6	-22.7	-26.9	-31.1	-35.2	-39.4	-43.6
38	-24.7	-30.3	-35.9	-41.4	-47.0	-52.5	-58.1
40	-30.9	-37.9	-44.8	-51.8	-58.7	-65.6	-72.6
42	-38.6	-46.9	-55.3	-63.7	-72.1	-80.5	-88.9
44	-46.2	-56.0	-65.8	-75.7	-85.5	-95.3	-105.2
46	-53.8	-65.1	-76.4	-87.6	-98.9	-110.2	-121.5
48	-61.4	-74.2	-86.9	-99.6	-112.3	-125.0	-137.8
50	-69.1	-83.2	-97.4	-111.6	-125.7	-139.9	-154.0

Takeoff Obstacle Limit Weight**Flaps 15****Pressure Altitude Adjustments**

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 LB)						
	360	440	520	600	680	760	840
S.L. & Below	0	0	0	0	0	0	0
1000	-15.5	-18.4	-21.3	-24.1	-27.0	-29.9	-32.7
2000	-31.1	-36.8	-42.5	-48.3	-54.0	-59.7	-65.4
3000	-45.4	-53.8	-62.2	-70.5	-78.9	-87.3	-95.7
4000	-59.7	-70.7	-81.8	-92.8	-103.8	-114.9	-125.9
5000	-75.1	-89.0	-102.9	-116.8	-130.7	-144.6	-158.5
6000	-90.6	-107.3	-124.1	-140.8	-157.5	-174.3	-191.0
7000	-105.3	-125.1	-144.8	-164.6	-184.4	-204.1	-223.9
8000	-120.0	-142.8	-165.6	-188.4	-211.2	-234.0	-256.8

Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 LB)						
	360	440	520	600	680	760	840
15 TW	-79.5	-80.5	-81.6	-82.6	-83.7	-84.7	-85.7
10 TW	-53.0	-53.7	-54.4	-55.1	-55.8	-56.5	-57.2
5 TW	-26.5	-26.8	-27.2	-27.5	-27.9	-28.2	-28.6
0	0	0	0	0	0	0	0
10 HW	8.8	8.4	8.0	7.6	7.2	6.7	6.3
20 HW	17.7	16.8	16.0	15.1	14.3	13.5	12.6
30 HW	27.8	26.4	25.0	23.5	22.1	20.7	19.3
40 HW	37.9	35.9	33.9	31.9	29.9	27.9	25.9

With engine bleed for packs off, increase weight by 1900 lb.

With engine and wing anti-ice on, decrease weight by 4400 lb.

**Tire Speed Limit
Flaps 15**

AIRPORT OAT (°C)	AIRPORT OAT (°F)	TIRE SPEED LIMIT WEIGHT (1000 LB)				
		AIRPORT PRESSURE ALTITUDE (FT)				
0	2000	4000	6000	8000		
54	129	810.2	746.0	689.8	638.7	591.1
52	126	814.6	750.5	693.7	642.4	594.5
50	122	818.9	754.9	697.6	646.0	597.9
48	118	823.5	761.0	701.7	649.8	601.4
46	115	828.0	767.0	705.7	653.6	604.9
44	111	831.2	772.7	709.8	657.3	608.4
42	108	833.1	777.8	713.9	661.2	612.1
40	104	834.9	783.0	718.0	665.0	615.7
38	100	835.0	787.5	722.6	669.0	619.4
36	97	835.0	792.1	727.2	673.0	623.2
34	93	835.0	796.7	731.8	677.2	627.1
32	90	835.0	801.5	736.8	681.4	631.0
30	86	835.0	806.5	741.6	685.8	635.1
28	82	835.0	811.6	746.7	690.2	639.2
26	79	835.0	816.7	752.0	694.7	643.5
24	75	835.0	822.5	757.5	699.2	647.8
22	72	835.0	828.3	764.0	704.1	652.0
20	68	835.0	834.0	774.2	709.1	656.4
18	64	835.0	835.0	780.2	714.2	661.0
16	61	835.0	835.0	785.9	719.6	665.7
14	57	835.0	835.0	791.6	725.4	670.5
12	54	835.0	835.0	797.4	731.2	675.6
10	50	835.0	835.0	803.2	737.1	680.7
-40	-40	835.0	835.0	835.0	835.0	835.0

Increase tire speed limit weight by 5600 lb per knot headwind.

Decrease tire speed limit weight by 11900 lb per knot tailwind.

Takeoff Speeds - Dry Runway**Flaps 15****V1, VR, V2 for Max Takeoff Thrust**

WEIGHT (1000 LB)	V1	VR	V2
840	175	185	190
800	171	179	186
760	166	175	182
720	162	170	178
680	157	164	174
640	152	159	169
600	146	153	165
560	140	146	160
520	133	140	155
480	125	133	150
440	117	126	145
400	108	119	139
360	98	111	132

Check V1(MCG), Minimum VR.

Takeoff Speeds - Dry Runway**Flaps 15****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	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	12	14					7	8					-4	-4				
60	140	8	10	12	14			4	6	7	8			-3	-3	-4	-4		
50	122	5	6	8	10	13	16	3	4	5	6	8	9	-2	-2	-3	-3	-4	-5
40	104	1	3	5	7	10	13	1	2	3	5	6	8	-1	-1	-2	-2	-3	-4
30	86	0	0	2	5	8	11	0	0	2	3	5	7	0	0	-1	-2	-2	-3
20	68	0	0	2	4	6	9	0	0	1	2	4	6	0	0	-1	-1	-2	-3
-60	-76	0	0	2	4	6	8	0	0	1	2	4	5	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		
840	-4	-1	0	3	6	-3	-1	0	0	1	3	4	5		
800	-4	-1	0	3	5	-2	-1	0	0	1	3	3	4		
760	-3	-1	0	3	4	-2	-1	0	0	1	2	3	4		
720	-3	-1	0	2	4	-2	-1	0	0	1	2	3	3		
680	-3	-1	0	2	4	-2	-1	0	0	1	2	2	3		
640	-2	-1	0	2	4	-2	-1	0	0	1	2	2	3		
600	-2	-1	0	2	3	-2	-1	0	0	1	2	2	3		
560	-2	0	0	2	3	-2	-1	0	0	1	2	2	3		
520	-2	0	0	2	3	-1	-1	0	0	1	2	3	3		
480	-1	0	0	2	3	-1	-1	0	0	1	2	3	3		
440	-1	0	0	3	4	-1	0	0	0	1	2	3	4		
400	-1	0	0	3	4	-1	0	0	1	0	1	3	3	4	
360	-1	0	0	3	4	-1	0	1	0	2	3	4	5		

*V1 not to exceed VR

V1(MCG), Minimum VR**Max Takeoff Thrust**

TEMP	PRESSURE ALTITUDE (FT)											
	-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR									
60	140	116	118	113	115	111	113	109	111			
50	122	119	121	116	118	111	113	109	111	106	109	
40	104	126	127	123	124	118	120	113	115	108	111	
30	86	128	130	128	130	123	125	118	120	112	115	
20	68	129	130	129	130	125	126	120	122	116	118	
-60	-76	130	130	130	130	126	126	121	122	117	118	
										112	114	

Takeoff Speeds - Wet Runway**Flaps 15****V1, VR, V2 for Max Takeoff Thrust**

WEIGHT (1000 LB)	KIAS											
	V1				VR				V2			
840		169			185				190			
800		164			179				186			
760		158			175				182			
720		153			170				178			
680		147			164				174			
640		141			159				169			
600		134			153				165			
560		128			146				160			
520		121			140				155			
480		113			133				150			
440		105			126				145			
400		97			119				139			
360		89			111				132			

Check V1(MCG), Minimum VR.

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	-2	0	2	4	6	8	-2	0	2	4	6	8	-2	0	2	4	6	8
70	158	14	16					7	8					-4	-4										
60	140	10	11	14	16			4	6	7	8			-3	-3	-4	-4								
50	122	5	7	9	12	14	17	3	4	5	6	8	9	-2	-2	-3	-3	-3	-4	-5					
40	104	2	3	6	8	11	14	1	2	3	5	6	8	-1	-1	-2	-2	-3	-4						
30	86	0	0	3	5	8	12	0	0	2	3	5	7	0	0	-1	-2	-2	-3						
20	68	0	0	2	4	7	10	0	0	1	2	4	6	0	0	-1	-1	-2	-3						
-60	-76	0	0	2	4	6	9	0	0	1	2	4	5	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		
840	-6	-3	0	3	6	-3	-2	-1	0	1	2	3	4		
800	-6	-3	0	3	6	-4	-3	-1	0	1	2	3	4		
760	-6	-3	0	3	5	-4	-3	-1	0	1	2	3	4		
720	-5	-3	0	3	5	-4	-3	-2	0	1	2	3	4		
680	-5	-3	0	2	5	-5	-3	-2	0	1	2	3	4		
640	-5	-2	0	2	5	-5	-3	-2	0	1	2	3	4		
600	-5	-2	0	2	5	-5	-3	-1	0	1	2	3	4		
560	-4	-2	0	2	4	-5	-3	-1	0	1	2	3	4		
520	-4	-2	0	3	4	-5	-3	-1	0	1	3	4	5		
480	-3	-1	0	3	4	-5	-3	-1	0	1	3	4	5		
440	-2	-1	0	3	5	-4	-2	-1	0	2	3	4	5		
400	-2	0	0	3	5	-4	-2	0	0	2	4	5	6		
360	-1	1	0	4	5	-4	-2	0	0	2	4	5	7		

*V1 not to exceed VR

Takeoff Speeds - Wet Runway**Flaps 15****V1(MCG), Minimum VR****Max Takeoff Thrust**

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	116	118	113	115	111	113	109	111	112	115	106	109
50	122	119	121	116	118	111	113	109	111	106	109	103	106
40	104	126	127	123	124	118	120	113	115	108	111	103	106
30	86	128	130	128	130	123	125	118	120	112	115	106	109
20	68	129	130	129	130	125	126	120	122	116	118	110	113
-60	-76	130	130	130	130	126	126	121	122	117	118	112	114

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Performance Dispatch**Enroute****Chapter PD****Section 61****Long Range Cruise Maximum Operating Altitude****Max Climb Thrust****ISA + 10°C and Below**

WEIGHT (1000 LB)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
780	28300	3	30800	29100	27600
760	28800	2	31300	29700	28200
740	29400	0	31800	30200	28700
720	30000	-1	32300	30700	29100
700	30700	-2	32800	31100	29600
680	31300	-4	33200	31600	30100
660	31900	-5	33700	32100	30600
640	32600	-7	34300	32700	31200
620	33300	-8	34800	33200	31700
600	34000	-10	35300	33800	32300
580	34700	-11	35900	34300	32900
560	35400	-13	36500	34900	33500
540	36200	-15	37100	35600	34100
520	37000	-15	37800	36200	34800
500	37800	-15	38400	36900	35500
480	38600	-15	39100	37600	36200
460	39500	-15	39900	38300	37000
440	40400	-15	40600	39100	37700
420	41400	-15	41400	39900	38600
400	42400	-15	42300	40800	39500
380	43100	-15	43100	41800	40500

ISA + 15°C

WEIGHT (1000 LB)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
780	28300	9	30800	29100	27600
760	28800	8	31300	29700	28200
740	29400	6	31800	30200	28700
720	30000	5	32300	30700	29100
700	30700	3	32800	31100	29600
680	31300	2	33200	31600	30100
660	31900	1	33700	32100	30600
640	32600	-1	34300	32700	31200
620	33300	-2	34800	33200	31700
600	34000	-4	35300	33800	32300
580	34700	-6	35900	34300	32900
560	35400	-7	36500	34900	33500
540	36200	-9	37100	35600	34100
520	37000	-9	37800	36200	34800
500	37800	-9	38400	36900	35500
480	38600	-9	39100	37600	36200
460	39500	-9	39900	38300	37000
440	40400	-9	40600	39100	37700
420	41400	-9	41400	39900	38600
400	42400	-9	42300	40800	39500
380	43100	-9	43100	41800	40500

Long Range Cruise Maximum Operating Altitude**Max Climb Thrust****ISA + 20°C**

WEIGHT (1000 LB)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
780	28300	15	30800	29100	27600
760	28800	13	31300	29700	28200
740	29400	12	31800	30200	28700
720	30000	11	32300	30700	29100
700	30700	9	32800	31100	29600
680	31300	8	33200	31600	30100
660	31900	6	33700	32100	30600
640	32600	5	34300	32700	31200
620	33300	3	34800	33200	31700
600	34000	2	35300	33800	32300
580	34700	0	35900	34300	32900
560	35400	-2	36500	34900	33500
540	36200	-3	37100	35600	34100
520	37000	-3	37800	36200	34800
500	37800	-3	38400	36900	35500
480	38600	-3	39100	37600	36200
460	39500	-3	39900	38300	37000
440	40400	-3	40600	39100	37700
420	41400	-3	41400	39900	38600
400	42400	-3	42300	40800	39500
380	43100	-3	43100	41800	40500

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	
1058	994	937	886	841	800	766	735	706	679	655	
1580	1487	1403	1328	1261	1200	1150	1104	1061	1021	985	
2101	1979	1868	1769	1681	1600	1534	1473	1416	1364	1316	
2620	2469	2332	2210	2100	2000	1918	1842	1771	1706	1647	
3138	2959	2795	2650	2520	2400	2302	2211	2127	2049	1978	
3654	3447	3258	3090	2939	2800	2687	2581	2483	2392	2309	
4168	3933	3719	3529	3358	3200	3071	2950	2838	2735	2641	
4679	4418	4180	3968	3776	3600	3455	3320	3194	3078	2972	
5190	4903	4640	4406	4194	4000	3839	3689	3550	3421	3303	
5699	5386	5099	4844	4612	4400	4224	4059	3906	3764	3635	
6207	5868	5558	5281	5030	4800	4608	4429	4262	4108	3966	
6713	6348	6015	5717	5448	5200	4992	4798	4618	4451	4298	
7217	6828	6472	6153	5865	5600	5376	5168	4973	4794	4629	
7721	7307	6928	6590	6283	6000	5761	5537	5329	5137	4960	
8224	7786	7385	7026	6700	6400	6145	5906	5685	5480	5292	
8726	8264	7841	7461	7117	6800	6529	6276	6040	5823	5623	
9228	8742	8296	7897	7534	7200	6913	6645	6396	6166	5955	
9728	9219	8751	8332	7951	7600	7297	7015	6752	6509	6286	
10228	9695	9206	8767	8368	8000	7681	7384	7107	6852	6617	

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	27		29		31		33		35	
	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)
800	29.5	2:01	29.0	1:59	28.6	1:56	28.2	1:53	27.7	1:52
1200	43.1	2:57	42.1	2:53	41.4	2:49	40.7	2:45	39.9	2:42
1600	56.8	3:52	55.5	3:47	54.4	3:41	53.3	3:35	52.2	3:32
2000	70.5	4:47	68.8	4:41	67.4	4:33	66.0	4:26	64.5	4:22
2400	84.8	5:41	82.8	5:33	80.9	5:23	79.2	5:16	77.3	5:12
2800	99.1	6:34	96.7	6:25	94.5	6:14	92.3	6:06	90.1	6:02
3200	113.7	7:27	110.9	7:16	108.3	7:04	105.8	6:56	103.2	6:51
3600	128.6	8:19	125.5	8:07	122.4	7:54	119.5	7:45	116.5	7:41
4000	143.6	9:11	140.0	8:58	136.6	8:44	133.2	8:35	129.9	8:31
4400	159.2	10:02	155.1	9:47	151.2	9:33	147.4	9:24	144.0	9:20
4800	174.8	10:53	170.3	10:37	165.9	10:23	161.7	10:13	158.2	10:10
5200	190.8	11:43	185.7	11:26	180.9	11:12	176.3	11:02	172.8	11:00
5600	207.1	12:33	201.5	12:15	196.1	12:01	191.3	11:52	188.1	11:50
6000	223.4	13:22	217.2	13:04	211.4	12:49	206.2	12:41	203.3	12:39
6400	240.3	14:11	233.6	13:53	227.3	13:38	222.2	13:30	220.0	13:29
6800	257.3	15:00	250.0	14:42	243.2	14:27	238.2	14:20	236.6	14:19
7200	274.6	15:48	266.7	15:30	259.6	15:16	254.8	15:09	254.3	15:09
7600	292.3	16:37	283.8	16:19	276.5	16:05	272.1	15:58	273.0	15:59
8000	309.9	17:25	300.9	17:07	293.3	16:54	289.5	16:48	291.8	16:49

Long Range Cruise Trip Fuel and Time**Fuel Required Adjustment (1000 LB)**

REFERENCE FUEL REQUIRED (1000 LB)	LANDING WEIGHT (1000 LB)					
	350	400	450	500	550	600
20	-2.2	-1.1	0.0	1.5	2.8	4.6
40	-4.6	-2.3	0.0	2.6	5.6	10.0
60	-7.1	-3.6	0.0	3.9	9.0	16.5
80	-9.5	-4.9	0.0	5.4	13.1	24.0
100	-12.0	-6.2	0.0	7.4	17.8	32.7
120	-14.5	-7.5	0.0	9.6	23.1	42.4
140	-17.0	-8.8	0.0	12.2	29.2	53.2
160	-19.6	-10.1	0.0	15.1	35.8	65.1
180	-22.2	-11.4	0.0	18.3	43.2	78.1
200	-24.8	-12.7	0.0	21.8	51.1	92.2
220	-27.4	-14.0	0.0	25.7	59.8	107.3
240	-30.0	-15.3	0.0	29.8	69.0	123.6
260	-32.7	-16.6	0.0	34.3	79.0	140.9
280	-35.3	-17.9	0.0	39.1	89.6	159.3
300	-38.0	-19.3	0.0	44.2	100.8	178.8
320	-40.7	-20.6	0.0	49.7	112.7	199.3
340	-43.5	-21.9	0.0	55.4	125.2	221.0
360	-46.2	-23.2	0.0	61.4	138.4	243.7

Based on 310/.84 climb, Long Range Cruise and .84/310/250 descent.

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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	
1040	981	928	881	839	800	765	732	703	675	650	
1545	1461	1386	1318	1256	1200	1149	1102	1058	1018	981	
2050	1941	1843	1754	1673	1600	1533	1471	1414	1361	1312	
2555	2421	2300	2190	2091	2000	1917	1840	1769	1704	1643	
3060	2900	2757	2626	2508	2400	2301	2209	2125	2047	1974	
3564	3380	3213	3063	2925	2800	2685	2579	2481	2390	2306	
4068	3859	3670	3499	3343	3200	3069	2948	2837	2733	2637	
4572	4338	4127	3935	3760	3600	3453	3318	3193	3077	2969	
5076	4817	4583	4371	4177	4000	3837	3687	3549	3420	3300	
5580	5296	5039	4807	4594	4400	4221	4057	3905	3763	3632	
6083	5775	5496	5242	5011	4800	4606	4426	4261	4107	3964	
6587	6253	5952	5678	5429	5200	4990	4796	4617	4450	4296	
7090	6732	6408	6114	5846	5600	5374	5166	4973	4794	4628	
7593	7210	6864	6550	6263	6000	5758	5536	5329	5138	4960	
8095	7688	7320	6985	6680	6400	6143	5905	5686	5482	5292	
8598	8166	7776	7421	7097	6800	6527	6275	6042	5826	5624	
9100	8644	8231	7856	7514	7200	6911	6645	6398	6169	5956	
9602	9122	8687	8292	7931	7600	7296	7015	6755	6513	6289	
10104	9599	9142	8727	8348	8000	7680	7385	7111	6858	6621	

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 LB)										TIME (HRS:MIN)
	LANDING WEIGHT (1000 LB)										
	360	380	400	420	440	460	480	500	520	540	560
800	23.3	24.0	24.9	25.7	26.8	27.7	28.5	29.3	30.2	31.4	32.3
1200	33.0	34.1	35.3	36.7	38.4	39.6	40.7	42.0	43.6	45.3	46.5
1600	42.9	44.4	46.0	48.0	50.1	51.7	53.3	55.1	57.3	59.4	61.0
2000	53.0	54.9	57.0	59.6	62.1	64.1	66.1	68.6	71.3	73.8	75.8
2400	63.3	65.6	68.3	71.4	74.3	76.7	79.3	82.4	85.5	88.4	90.8
2800	73.7	76.6	79.9	83.4	86.7	89.6	92.9	96.5	100.0	103.3	106.3
3200	84.4	87.9	91.7	95.6	99.3	102.9	106.8	110.8	114.7	118.6	122.1
3600	95.3	99.5	103.7	108.0	112.4	116.6	121.0	125.3	129.8	134.3	138.4
4000	106.6	111.2	115.9	120.7	125.7	130.6	135.4	140.2	145.2	150.4	155.1
4400	118.2	123.2	128.4	133.7	139.5	144.8	150.0	155.4	161.1	166.8	172.1
4800	129.9	135.4	141.1	147.2	153.5	159.3	165.0	171.0	177.3	183.6	189.3
5200	141.9	147.9	154.1	161.0	167.8	174.0	180.3	187.0	193.9	200.7	206.9
5600	154.1	160.6	167.6	175.0	182.3	189.0	196.0	203.4	210.9	218.2	224.9
6000	166.5	173.6	181.4	189.3	197.1	204.4	212.1	220.1	228.1	236.0	243.4
6400	179.1	187.0	195.4	203.9	212.2	220.3	228.6	237.2	245.7	254.1	262.3
6800	192.1	200.8	209.7	218.7	227.7	236.5	245.5	254.5	263.6	272.9	281.6
7200	205.5	214.9	224.3	233.8	243.6	253.1	262.6	272.3	282.1	291.9	301.3
7600	219.3	229.2	239.1	249.4	259.9	270.1	280.1	290.4	300.9	311.4	321.4
8000	233.3	243.7	254.3	265.4	276.6	287.3	298.0	308.9	320.1	331.4	342.0

Based on 310/.84 climb, LRC and .84/310/250 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
96	81	70	62	55	50	46	42	39	36	34
160	143	129	118	108	100	93	87	82	77	73
224	204	187	173	161	150	141	133	125	119	113
287	264	244	227	213	200	189	178	169	161	154
348	323	301	282	265	250	237	225	214	204	195
410	382	357	336	317	300	285	271	259	247	237
471	440	414	390	369	350	333	317	303	290	279
533	499	470	444	421	400	381	364	348	334	320
595	559	527	499	473	450	429	410	393	376	362
660	620	585	554	525	500	477	456	437	419	403

Trip Fuel and Time Required

AIR DISTANCE (NM)	LANDING WEIGHT (1000 LB)						TIME (HRS:MIN)	
	360	400	440	480	520	560		
50	FUEL (1000 LB)	3.7	3.9	4.2	4.4	4.6	4.8	0:14
	ALT (FT)	11000	11000	9000	7000	7000	5000	
100	FUEL (1000 LB)	5.5	5.8	6.1	6.4	6.7	7.0	0:22
	ALT (FT)	15000	15000	13000	13000	13000	13000	
150	FUEL (1000 LB)	7.2	7.6	8.0	8.4	8.7	9.2	0:30
	ALT (FT)	23000	23000	23000	21000	21000	21000	
200	FUEL (1000 LB)	8.7	9.2	9.6	10.1	10.6	11.1	0:36
	ALT (FT)	29000	27000	27000	27000	25000	25000	
250	FUEL (1000 LB)	10.1	10.7	11.2	11.8	12.4	13.0	0:42
	ALT (FT)	37000	31000	29000	29000	27000	29000	
300	FUEL (1000 LB)	11.3	12.0	12.7	13.4	14.1	14.8	0:48
	ALT (FT)	43000	39000	37000	37000	35000	33000	
350	FUEL (1000 LB)	12.4	13.3	14.1	14.9	15.7	16.5	0:54
	ALT (FT)	43000	41000	39000	37000	35000	35000	
400	FUEL (1000 LB)	13.6	14.5	15.5	16.4	17.3	18.2	0:59
	ALT (FT)	43000	41000	39000	37000	35000	35000	
450	FUEL (1000 LB)	14.8	15.8	16.8	17.9	18.9	19.9	1:06
	ALT (FT)	43000	41000	39000	37000	37000	35000	
500	FUEL (1000 LB)	15.9	17.1	18.2	19.4	20.5	21.6	1:13
	ALT (FT)	43000	41000	39000	37000	37000	35000	

Holding Planning
Flaps Up

WEIGHT (1000 LB)	TOTAL FUEL FLOW (LB/HR)									
	PRESSURE ALTITUDE (FT)									
1500	5000	10000	15000	20000	25000	30000	35000	40000	43000	
800	21080	20850	20650	21390	22070	22890	24000			
760	20030	19830	19600	19980	20850	21520	22350			
720	18980	18810	18560	18680	19660	20140	20800			
680	17950	17770	17530	17480	18410	18820	19430			
640	16940	16740	16500	16420	16950	17570	18140			
600	15950	15730	15480	15370	15600	16380	16850	17580		
560	15000	14750	14460	14330	14360	15200	15560	16040		
520	14110	13820	13480	13320	13300	13760	14300	14730		
480	13280	12940	12550	12370	12310	12420	13070	13450		
440	12470	12110	11680	11500	11370	11330	11850	12180	12870	
400	11690	11320	10870	10680	10490	10400	10460	10970	11530	
360	11180	10800	10350	10110	9880	9730	9680	9810	10230	10550

Flaps 1

WEIGHT (1000 LB)	TOTAL FUEL FLOW (LB/HR)				
	PRESSURE ALTITUDE (FT)				
1500	5000	10000	15000	20000	
800	23060	23000	22910	23120	23640
760	21780	21670	21550	21670	22160
720	20580	20460	20320	20370	20800
680	19410	19270	19110	19130	19490
640	18250	18110	17920	17930	18180
600	17120	16950	16730	16710	16860
560	16020	15810	15570	15530	15610
520	14970	14700	14440	14360	14400
480	13970	13660	13340	13220	13210
440	13010	12650	12290	12110	12060
400	12100	11710	11300	11080	10970
360	11450	11070	10600	10350	10210

These tables include 5% additional fuel for holding in a racetrack pattern.

Crew Oxygen Requirements**Required Pressure (PSI) for One 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

For more extensive than normal crew usage, add 1.2 psi/person/minute.

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	399.4	395.0	382.9
28	430.8	421.2	405.7
26	464.5	451.9	435.2
24	500.6	484.9	467.6
22	538.7	521.7	503.0
20	592.3	577.6	555.9
18	641.7	622.3	598.3
16	695.5	671.7	645.7
14	743.0	715.0	686.1
12	790.9	760.6	730.9
10	833.2	801.9	768.0

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 LB)								
	PRESSURE ALTITUDE (1000 FT)								
	14	16	18	20	22	24	26	28	30
ENGINE ONLY	-1.4	-0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ENGINE AND WING	-5.6	-3.9	-3.2	-2.2	-2.5	-2.6	-2.6	-2.7	-2.6

ALL ENGINES**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	
282	261	242	226	212	200	189	179	170	162	155	
565	522	485	453	425	400	378	358	340	324	310	
847	783	727	679	637	600	567	537	511	486	464	
1130	1044	970	906	850	800	756	716	681	649	619	
1412	1304	1212	1132	1062	1000	945	895	851	811	774	
1694	1565	1455	1359	1274	1200	1134	1075	1021	973	929	
1977	1826	1697	1585	1487	1400	1323	1254	1191	1135	1084	
2259	2087	1939	1811	1699	1600	1512	1433	1362	1297	1239	
2541	2348	2182	2038	1912	1800	1701	1612	1532	1459	1393	
2824	2609	2424	2264	2124	2000	1890	1791	1702	1622	1548	
3106	2870	2667	2491	2336	2200	2079	1970	1872	1784	1703	
3389	3131	2909	2717	2549	2400	2268	2149	2042	1946	1858	
3671	3392	3152	2943	2761	2600	2457	2328	2213	2108	2013	
3953	3652	3394	3170	2973	2800	2646	2507	2383	2270	2168	
4236	3913	3637	3396	3186	3000	2835	2687	2553	2432	2322	

Critical Fuel (1000 LB)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 LB)										
	380	420	460	500	540	580	620	660	700	740	780
200	9.7	10.1	10.4	10.8	11.2	11.6	12.1	12.5	12.9	13.3	13.8
400	17.8	18.4	19.1	19.8	20.5	21.2	21.9	22.6	23.3	24.0	24.8
600	25.8	26.7	27.6	28.6	29.6	30.6	31.6	32.5	33.5	34.5	35.6
800	33.5	34.7	36.0	37.3	38.6	39.9	41.2	42.4	43.6	45.0	46.3
1000	41.3	42.8	44.3	45.9	47.5	49.1	50.8	52.3	53.8	55.4	57.1
1200	49.1	50.9	52.7	54.6	56.5	58.4	60.3	62.2	63.9	65.8	67.8
1400	56.8	58.9	61.0	63.2	65.4	67.6	69.8	71.8	73.8	75.9	78.2
1600	64.6	66.9	69.2	71.6	74.1	76.6	79.0	81.4	83.7	86.1	88.6
1800	72.0	74.6	77.3	80.0	82.7	85.5	88.3	91.0	93.6	96.2	99.0
2000	79.5	82.4	85.3	88.3	91.4	94.5	97.6	100.6	103.4	106.3	109.3
2200	87.0	90.2	93.4	96.7	100.0	103.4	106.8	110.0	113.1	116.2	119.5
2400	94.5	97.9	101.5	105.0	108.5	112.1	115.7	119.3	122.7	126.1	129.6
2600	102.0	105.6	109.3	113.1	116.9	120.8	124.7	128.5	132.2	135.9	139.8
2800	109.4	113.1	117.1	121.1	125.2	129.4	133.7	137.8	141.8	145.8	149.8
3000	116.9	120.6	124.8	129.2	133.6	138.1	142.6	147.0	151.2	155.4	159.7

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.

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 (3%) for the total forecast time or engine and wing anti-ice on and ice drag (8%) for 10% of the forecast time.

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

ENGINE INOP**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)		20	40	60	80	100
100	80	60	40	20						
283	262	243	227	213	200	189	179	170	162	155
570	526	487	454	425	400	377	357	339	323	308
857	790	732	682	638	600	566	536	508	484	462
1144	1053	976	909	851	800	755	714	678	645	615
1431	1317	1221	1137	1064	1000	943	892	847	806	769
1718	1581	1465	1365	1277	1200	1132	1071	1016	967	922
2005	1845	1709	1592	1490	1400	1320	1249	1185	1128	1075
2292	2109	1954	1820	1703	1600	1509	1428	1355	1289	1229
2579	2373	2198	2047	1916	1800	1697	1606	1524	1450	1382
2866	2637	2443	2275	2129	2000	1886	1784	1693	1611	1536
3153	2901	2687	2502	2342	2200	2075	1963	1862	1772	1689
3440	3165	2932	2730	2554	2400	2263	2141	2032	1933	1843
3727	3429	3176	2958	2767	2600	2452	2320	2201	2094	1996
4014	3693	3421	3185	2980	2800	2640	2498	2370	2255	2150
4300	3957	3665	3413	3193	3000	2829	2676	2539	2416	2303

Critical Fuel (1000 LB)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 LB)										
	380	420	460	500	540	580	620	660	700	740	780
200	9.3	9.8	10.3	10.8	11.2	11.7	12.2	12.8	13.3	13.8	14.3
400	17.1	18.1	19.0	19.9	20.8	21.6	22.5	23.4	24.3	25.2	26.1
600	24.9	26.2	27.5	28.8	30.0	31.3	32.5	33.8	35.1	36.3	37.5
800	32.3	34.1	35.8	37.5	39.2	40.8	42.4	44.1	45.8	47.4	49.0
1000	39.8	42.0	44.1	46.2	48.3	50.3	52.3	54.4	56.4	58.4	60.4
1200	47.2	49.8	52.4	55.0	57.4	59.8	62.2	64.6	67.1	69.4	71.7
1400	54.6	57.7	60.7	63.7	66.4	69.1	71.8	74.6	77.3	80.1	82.7
1600	62.1	65.5	68.8	72.0	75.2	78.3	81.3	84.4	87.6	90.7	93.8
1800	69.2	72.9	76.6	80.3	83.9	87.4	90.8	94.3	97.9	101.4	104.9
2000	76.2	80.3	84.5	88.6	92.6	96.5	100.4	104.2	108.1	111.9	115.6
2200	83.2	87.8	92.4	96.9	101.3	105.6	109.7	113.8	118.0	122.1	126.3
2400	90.2	95.2	100.2	105.2	109.8	114.3	118.8	123.3	127.9	132.4	136.9
2600	97.2	102.6	107.9	113.0	118.1	123.0	127.9	132.8	137.7	142.7	147.5
2800	104.3	109.7	115.3	120.9	126.4	131.7	137.0	142.3	147.5	152.7	157.8
3000	111.3	116.7	122.7	128.7	134.7	140.5	146.1	151.5	157.0	162.6	168.1

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 0.7% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (10%) 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**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	
261	246	232	220	209	200	191	182	175	168	162	
523	492	465	441	419	400	381	365	350	336	323	
786	740	699	662	629	600	572	547	525	504	484	
1050	988	933	884	840	800	763	730	699	671	645	
1316	1237	1168	1106	1050	1000	954	912	874	838	806	
1582	1487	1403	1328	1260	1200	1144	1094	1048	1005	966	
1848	1737	1638	1550	1471	1400	1335	1276	1222	1172	1126	
2116	1987	1874	1772	1682	1600	1525	1457	1395	1338	1286	
2383	2238	2110	1995	1892	1800	1715	1639	1569	1505	1445	
2651	2489	2346	2218	2103	2000	1906	1820	1742	1671	1605	
2920	2740	2582	2440	2314	2200	2096	2002	1916	1837	1764	
3188	2992	2818	2663	2524	2400	2286	2183	2089	2003	1924	
3457	3243	3054	2886	2735	2600	2477	2365	2263	2169	2083	
3726	3494	3290	3109	2946	2800	2667	2546	2436	2335	2242	
3994	3746	3526	3331	3157	3000	2857	2728	2610	2501	2401	

Critical Fuel (1000 LB)

AIR DISTANCE (NM)	WEIGHT AT CRITICAL POINT (1000 LB)										
	380	420	460	500	540	580	620	660	700	740	780
200	10.7	11.2	11.8	12.3	12.5	12.9	13.3	13.8	14.2	14.7	15.0
400	16.9	18.0	19.1	20.2	21.0	21.9	22.8	23.8	24.8	26.0	26.9
600	22.8	24.5	26.1	27.7	29.0	30.5	31.9	33.5	35.0	36.8	38.3
800	28.6	30.8	33.0	35.1	36.9	38.9	40.9	43.0	45.1	47.5	49.6
1000	34.4	37.1	39.8	42.4	44.8	47.3	49.8	52.4	55.0	58.0	60.6
1200	40.0	43.2	46.5	49.6	52.5	55.5	58.6	61.7	64.8	68.3	71.6
1400	45.5	49.3	53.0	56.7	60.1	63.7	67.2	70.8	74.5	78.6	82.4
1600	51.0	55.2	59.5	63.7	67.7	71.8	75.8	79.9	84.0	88.7	93.0
1800	56.4	61.1	65.9	70.6	75.1	79.7	84.2	88.8	93.5	98.7	103.6
2000	61.7	67.0	72.2	77.4	82.5	87.6	92.6	97.7	102.8	108.5	114.0
2200	67.0	72.7	78.4	84.2	89.7	95.4	100.9	106.4	112.1	118.3	124.3
2400	72.2	78.4	84.6	90.8	96.9	103.1	109.1	115.0	121.2	127.9	134.4
2600	77.3	84.0	90.7	97.4	104.0	110.7	117.2	123.6	130.2	137.5	144.5
2800	82.4	89.6	96.7	103.9	111.1	118.2	125.2	132.1	139.2	146.9	154.4
3000	87.4	95.0	102.6	110.4	118.0	125.6	133.1	140.4	148.0	156.3	164.3

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 0.7% per 10°C above ISA.
- When icing conditions are forecast, use the greater of engine and wing anti-ice on (1%) for the total forecast time or engine and wing anti-ice on and ice drag (12%) 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.

DRAFT

Intentionally
Blank

Performance Dispatch

Landing

Chapter PD

Section 62

Landing Field Limit Weight - Dry Runway

Flaps 30

Wind Adjusted Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
3000			2750	3000	3070	3080	3140	3200
3400	2700	2870	3110	3400	3500	3540	3640	3730
3800	2990	3200	3470	3800	3930	4000	4130	4260
4200	3280	3530	3830	4200	4360	4460	4630	4790
4600	3570	3850	4190	4600	4790	4920	5120	5320
5000	3860	4180	4550	5000	5220	5380	5620	5860
5400	4150	4510	4910	5400	5650	5840	6120	6390
5800	4450	4840	5270	5800	6080	6300	6610	6920
6200	4740	5160	5630	6200	6500	6760	7110	7450
6600	5030	5490	5990	6600	6930	7210	7600	7980
7000	5320	5820	6350	7000	7360	7670	8100	8520
7400	5610	6150	6710	7400	7790	8130	8600	9050
7800	5900	6470	7070	7800	8220	8590	9090	9580
8200	6190	6800	7430	8200	8650	9050	9590	10110
8600	6480	7130	7790	8600	9080	9510	10080	10650
9000	6770	7450	8150	9000	9510	9970	10580	11180
9400	7060	7780	8510	9400	9940	10430	11080	11710
9800	7350	8110	8870	9800	10370	10890	11570	12240
10200	7650	8440	9230	10200	10800	11350	12070	12770
10600	7940	8760	9590	10600	11230	11800	12560	13310

Landing Field Limit Weight - Dry Runway**Flaps 30****Field Limit Weight (1000 LB)**

WIND CORRECTED FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
4600	403.3				
5000	451.4	423.9	397.7		
5400	502.1	470.6	440.9	413.4	387.0
5800	553.3	518.9	486.1	454.7	425.8
6200	605.0	567.7	532.0	498.0	465.5
6600	649.4	616.8	578.4	541.7	506.6
7000	670.9	653.4	625.1	585.6	548.0
7400	690.1	672.5	655.1	629.9	589.7
7800	706.4	687.6	669.9	652.2	629.6
8200	723.8	702.2	683.9	666.1	647.6
8600	740.7	718.2	697.1	679.0	661.0
9000	756.7	733.8	711.5	691.4	673.2
9400	779.5	748.8	725.9	703.6	684.6
9800	796.2	764.7	739.8	716.9	695.6
10200	812.3	784.9	753.2	729.9	707.1
10600	827.8	799.9	770.6	742.3	718.9
11000	843.1	814.3	786.5	754.3	730.6
11400		828.3	800.0	770.2	741.8
11800		842.1	813.1	784.9	752.6
12200			825.7	797.1	764.5
12600			838.0	808.9	780.5
13000			850.3	820.3	791.6
13400				831.5	802.2
13800				842.6	812.6
14200				853.7	822.8
14600					832.9

With manual speedbrakes, decrease weight by 47800 lb.

With 1 brake deactivated, decrease weight by 50200 lb.

With 2 brakes deactivated, decrease weight by 102100 lb.

Landing Field Limit Weight - Wet Runway**Flaps 30****Wind Adjusted Field Length (FT)**

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
3000			3120	3000	3050	3030	3050	3080
3400		3210	3480	3400	3480	3490	3550	3610
3800	3020		3480	3800	3910	3950	4050	4140
4200	3320	3540	3840	4200	4340	4410	4540	4670
4600	3610	3870	4200	4600	4770	4870	5040	5200
5000	3900	4200	4560	5000	5190	5320	5530	5740
5400	4190	4520	4920	5400	5620	5780	6030	6270
5800	4480	4850	5280	5800	6050	6240	6520	6800
6200	4770	5180	5640	6200	6480	6700	7020	7330
6600	5060	5500	6000	6600	6910	7160	7520	7870
7000	5350	5830	6360	7000	7340	7620	8010	8400
7400	5640	6160	6720	7400	7770	8080	8510	8930
7800	5930	6490	7080	7800	8200	8540	9010	9460
8200	6220	6810	7440	8200	8630	9000	9500	9990
8600	6520	7140	7800	8600	9060	9460	10000	10530
9000	6810	7470	8160	9000	9490	9910	10490	11060
9400	7100	7800	8520	9400	9920	10370	10990	11590
9800	7390	8120	8880	9800	10340	10830	11480	12120
10200	7680	8450	9240	10200	10770	11290	11980	12660
10600	7970	8780	9600	10600	11200	11750	12480	13190

Field Limit Weight (1000 LB)

WIND CORRECTED FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
5400	414.8	389.4			
5800	456.9	428.9	402.4		
6200	501.0	469.6	440.0	412.5	386.2
6600	545.5	511.6	479.1	448.4	419.9
7000	590.3	553.9	519.0	485.7	454.1
7400	634.1	596.5	559.2	523.6	489.6
7800	659.4	638.5	599.7	561.7	525.4
8200	677.6	660.0	637.8	600.1	561.6
8600	693.1	675.5	658.0	635.2	597.9
9000	707.6	688.6	670.8	653.1	630.8
9400	722.7	701.2	683.0	665.2	646.4
9800	737.4	715.1	694.6	676.5	658.5
10200	751.5	728.8	706.7	687.4	669.2
10600	768.6	742.0	719.3	697.9	679.5
11000	786.5	754.8	731.7	709.2	689.2
11400	800.8	771.7	743.6	720.6	698.7
11800	814.7	787.2	755.1	731.8	708.9
12200	828.1	800.2	771.0	742.6	719.2
12600	841.5	812.8	785.0	753.0	729.4
13000	854.8	825.0	796.8	765.4	739.2
13400		837.0	808.3	780.3	748.7
13800		849.1	819.5	791.1	757.9
14200			830.2	801.5	772.2
14600			840.9	811.7	783.2

With manual speedbrakes, decrease weight by 47800 lb.

With 1 brake deactivated, decrease weight by 50200 lb.

With 2 brakes deactivated, decrease weight by 102100 lb.

Landing Climb Limit Weight**Valid for approach with flaps 20 and landing with flaps 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 LB)					
		AIRPORT PRESSURE ALTITUDE (FT)					
(°C)	(°F)	-2000	0	2000	4000	6000	8000
54	129	672.3	628.0				
52	126	690.0	643.1				
50	122	707.8	659.3	605.6			
48	118	725.5	677.8	619.9			
46	115	743.7	696.5	635.4	585.0		
44	111	761.0	714.1	652.5	600.2		
42	108	777.3	732.3	671.6	614.6	563.6	
40	104	793.0	750.7	689.9	629.6	576.5	
38	100	809.0	769.5	707.1	644.2	589.2	523.7
36	97	823.4	785.6	722.9	658.1	600.0	534.2
34	93	834.9	801.0	739.6	671.9	609.6	544.6
32	90	835.0	816.7	753.4	684.7	618.5	554.2
30	86	835.0	830.3	765.2	699.0	627.8	562.5
28	82	835.0	830.6	775.5	709.9	638.0	570.7
26	79	835.0	830.8	787.4	718.4	648.3	578.8
24	75	835.0	831.0	787.5	725.5	659.0	587.6
22	72	835.0	831.2	787.7	732.4	666.4	596.9
20	68	835.0	831.5	787.8	732.6	671.0	604.8
18	64	835.0	831.6	788.0	732.8	675.5	610.3
16	61	835.0	831.8	788.2	732.9	675.6	614.2
14	57	835.0	831.9	788.4	733.1	675.8	617.6
12	54	835.0	832.1	788.5	733.3	675.9	617.8
10	50	835.0	832.1	788.7	733.4	675.9	617.9
8	46	835.0	832.2	788.9	733.6	676.0	617.9
6	43	835.0	832.3	788.9	733.7	676.0	617.8
4	40	835.0	832.4	781.7	706.6	645.9	570.9
2	36	835.0	832.4	781.9	706.7	646.0	570.9
0	32	835.0	832.5	781.9	706.8	646.1	571.0
-40	-40	835.0	832.7	781.9	706.8	646.1	571.1

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

With engine bleed for packs off, increase weight by 2900 lb.

With engine and wing anti-ice on, decrease weight by 4800 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 48400 lb.

ENGINE INOP**ADVISORY INFORMATION****Go-Around Climb Gradient****Flaps 20, Gear Up**

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

OAT (°C)	REFERENCE GO-AROUND GRADIENT (%)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
54	6.10	5.13	3.96			
50	6.87	5.86	4.59	3.52	2.51	1.16
46	7.69	6.66	5.32	4.11	3.04	1.64
42	8.44	7.49	6.11	4.83	3.61	2.13
38	9.17	8.30	6.86	5.49	4.19	2.65
34	9.62	9.05	7.54	6.08	4.67	3.14
30	9.64	9.64	8.07	6.61	5.10	3.54
26	9.66	9.65	8.51	7.03	5.59	3.93
22	9.67	9.66	8.52	7.34	5.93	4.36
18	9.69	9.66	8.52	7.34	6.15	4.65
14	9.71	9.67	8.53	7.35	6.15	4.84
10	9.72	9.68	8.54	7.35	6.15	4.84

Weight Adjustment

WEIGHT (1000 LB)	REFERENCE GO-AROUND GRADIENT (%)										
	0	1	2	3	4	5	6	7	8	9	10
800	-3.08	-3.51	-3.94	-4.37	-4.80	-5.22	-5.64	-6.05	-6.46	-6.86	-7.26
750	-2.74	-3.13	-3.52	-3.90	-4.28	-4.65	-5.03	-5.40	-5.76	-6.12	-6.47
700	-2.41	-2.74	-3.07	-3.40	-3.72	-4.04	-4.36	-4.68	-4.99	-5.30	-5.60
650	-2.08	-2.35	-2.61	-2.87	-3.12	-3.38	-3.63	-3.88	-4.13	-4.39	-4.64
600	-1.51	-1.70	-1.89	-2.08	-2.26	-2.45	-2.63	-2.81	-2.99	-3.18	-3.37
550	-0.83	-0.93	-1.04	-1.14	-1.24	-1.34	-1.44	-1.54	-1.64	-1.74	-1.85
500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
450	1.03	1.16	1.28	1.40	1.53	1.65	1.77	1.90	2.03	2.16	2.29
400	2.38	2.66	2.93	3.21	3.49	3.77	4.06	4.35	4.64	4.95	5.26

Speed Adjustment

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)										
	0	1	2	3	4	5	6	7	8	9	10
VREF	-0.22	-0.23	-0.23	-0.23	-0.23	-0.22	-0.22	-0.22	-0.21	-0.21	-0.21
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	0.08	0.07	0.07	0.07	0.09	0.11	0.12	0.11	0.12	0.10	0.10
VREF+20	0.17	0.14	0.12	0.13	0.16	0.19	0.19	0.17	0.17	0.14	0.13
VREF+30	0.14	0.10	0.08	0.08	0.10	0.05	0.03	0.01	-0.01	-0.07	-0.04

With engine bleed for packs off, increase gradient by 0.1%.

With engine and wing anti-ice on, decrease gradient by 0.1%.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease gradient by 0.7%.

Quick Turnaround Limit Weight

Flaps 30 Limit Weight (1000 LB)

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	510.4				
50	122	513.7	494.5			
45	113	517.9	498.5	479.9		
40	104	522.2	502.6	483.7	465.1	
35	95	526.6	506.8	487.7	469.0	450.5
30	86	531.1	511.2	491.8	473.1	454.4
25	77	535.6	515.6	496.1	477.3	458.4
20	68	540.3	520.2	500.4	481.5	462.5
15	59	545.2	524.9	504.9	485.7	466.8
10	50	550.2	529.7	509.6	490.1	471.1
5	41	555.3	534.6	514.3	494.6	475.5
0	32	560.6	539.6	519.2	499.3	480.1
-5	23	566.1	544.8	524.3	504.1	484.6
-10	14	571.7	550.2	529.5	509.1	489.3
-15	5	577.5	555.7	534.7	514.2	494.2
-20	-4	583.4	561.5	540.1	519.5	499.2
-30	-22	595.8	573.4	551.6	530.5	509.8
-40	-40	608.4	586.1	563.8	542.1	521.1
-50	-58	622.0	599.4	576.8	554.5	532.9
-54	-65	627.7	604.9	582.2	559.8	537.7

Increase weight by 4800 lb per 1% uphill slope. Decrease weight by 7600 lb per 1% downhill slope.

Increase weight by 13200 lb per 10 knots headwind. Decrease weight by 69500 lb per 10 knots tailwind.

Decrease weight by 27600 lb when one brake is deactivated. Decrease weight by 56100 lb when two brakes are deactivated.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 65 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

Alternate procedure:

No sooner than 10 and no later than 15 minutes after parking, check for the BRAKE TEMP advisory message on EICAS. If the message is not displayed, no waiting period is required. If it is displayed, do not dispatch until at least 65 minutes after landing or until the Brake Temperature Monitoring System (BTMS) readings on the Landing Gear Synoptic Display are all 3.0 or lower. Check that wheel thermal plugs have not melted before making a subsequent takeoff.

Note: If any brake temperature display digit is blank or the BRAKE TEMP SYS status message is displayed, then this alternate procedure cannot be used.

Performance Dispatch**Gear Down****Chapter PD****Section 63****GEAR DOWN****Takeoff Climb Limit Weight****Flaps 15**

AIRPORT OAT		TAKEOFF CLIMB WEIGHT (1000 LB)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	517.8	494.0	458.7	412.7	
52	126	529.7	493.8	471.7	424.7	
50	122	542.4	496.4	473.5	436.5	377.2
48	118	555.5	508.7	473.4	447.8	388.6
46	115	568.6	520.8	475.9	448.8	399.8
44	111	581.5	532.6	486.8	448.6	410.6
42	108	593.6	544.2	497.7	451.1	416.5
40	104	605.9	556.3	508.9	461.3	416.3
38	100	619.5	569.1	520.9	471.9	418.8
36	97	633.2	581.8	532.9	483.2	428.4
34	93	647.1	594.8	545.3	494.8	438.3
32	90	659.4	607.7	557.5	506.1	448.8
30	86	671.1	621.1	569.7	517.9	459.9
28	82	683.0	634.3	582.3	529.5	470.5
26	79	693.7	646.4	593.8	540.9	481.9
24	75	699.0	657.0	604.2	551.5	492.3
22	72	699.2	666.6	614.1	560.7	503.6
20	68	699.4	671.1	622.4	568.3	513.5
18	65	699.6	671.2	630.2	575.3	521.5
16	61	699.7	671.2	634.0	580.4	528.3
14	58	699.8	671.2	633.9	584.6	534.3
10	50	700.0	671.3	633.6	586.4	540.4
-40	-40	696.2	666.9	627.1	579.2	535.1

With engine bleed for packs off, increase weight by 1800 lb.

With engine anti-ice on, decrease weight by 4000 lb.

With engine and wing anti-ice on, decrease weight by 9200 lb.

GEAR DOWN**Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 LB)				
		AIRPORT PRESSURE ALTITUDE (FT)				
°C	°F	0	2000	4000	6000	8000
54	129	565.0				
52	126	578.9				
50	122	592.7	544.9			
48	118	607.7	558.2			
46	115	623.2	572.8	527.0		
44	111	638.1	588.5	541.2		
42	108	653.6	603.6	554.3	507.6	
40	104	669.5	618.4	567.9	519.1	
38	100	684.8	631.1	580.5	530.6	470.4
36	97	699.4	643.8	591.9	539.9	480.0
34	93	714.0	657.3	601.9	548.5	489.6
32	90	727.3	668.9	612.0	556.3	497.9
30	86	740.1	679.4	622.6	564.9	505.5
28	82	740.3	688.5	632.0	574.0	512.8
26	79	740.5	698.7	639.1	583.5	520.2
24	75	740.7	698.8	644.5	591.9	528.4
22	72	740.9	698.9	650.1	597.5	536.7
20	68	741.1	699.1	650.3	601.0	543.9
18	64	741.3	699.3	650.4	604.6	548.8
16	61	741.5	699.4	650.5	604.7	552.2
14	57	741.6	699.6	650.6	604.8	555.4
12	54	741.7	699.8	650.6	604.8	555.5
10	50	741.8	699.9	650.7	604.8	555.6
-40	-40	742.3	700.4	651.4	605.4	556.0

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

With engine bleed for packs off, increase weight by 3900 lb.

With engine and wing anti-ice on, decrease weight by 3800 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 67500 lb.



GEAR DOWN**Takeoff Obstacle Limit Weight****Flaps 15****Sea Level, 30°C & Below, Zero Wind****Based on engine bleed for packs on, engine and wing anti-ice off**

OBSTACLE HEIGHT (FT)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 LB)								
	DISTANCE FROM BRAKE RELEASE (1000 FT)								
	8	10	12	14	16	18	20	22	24
10	647.4								
50	607.6	666.0							
100	570.3	627.7	668.4						
150	541.1	597.0	638.7	669.6					
200	516.9	571.3	613.6	645.4	670.1				
250	496.0	549.2	591.3	624.2	649.8	670.3			
300	477.4	529.7	571.5	605.0	631.6	652.9	670.4	681.7	681.7
350	460.9	512.3	553.8	587.4	614.8	636.8	655.0	670.2	681.0
400	445.9	496.5	537.7	571.4	599.1	622.0	640.7	656.5	670.0
450	432.4	482.0	522.9	556.6	584.6	607.9	627.4	643.7	657.7
500	419.8	468.6	509.2	542.8	571.0	594.7	614.7	631.6	646.0
550	408.1	456.2	496.5	530.0	558.3	582.3	602.7	620.1	634.9
600	397.2	444.7	484.5	518.1	546.4	570.5	591.3	609.0	624.3
650	387.0	434.0	473.3	506.8	535.1	559.4	580.4	598.4	614.1
700	377.4	423.9	462.8	496.1	524.5	548.9	570.0	588.4	604.3
750		414.4	452.8	486.0	514.4	538.8	560.1	578.7	594.9
800		405.3	443.5	476.3	504.7	529.2	550.6	569.4	585.9
850		396.7	434.6	467.2	495.5	520.1	541.6	560.4	577.1
900		388.5	426.2	458.5	486.7	511.3	532.9	551.9	568.7
950		380.7	418.2	450.1	478.3	502.9	524.5	543.6	560.6
1000		373.3	410.4	442.3	470.2	494.8	516.5	535.7	552.7

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 LB)								
	360	400	440	480	520	560	600	640	680
30 & BELOW	0	0	0	0	0	0	0	0	0
32	-6.3	-7.1	-7.9	-8.8	-9.6	-10.4	-11.3	-12.1	-12.9
34	-12.5	-14.2	-15.9	-17.5	-19.2	-20.9	-22.5	-24.2	-25.8
36	-18.8	-21.3	-23.8	-26.3	-28.8	-31.3	-33.8	-36.3	-38.8
38	-25.1	-28.4	-31.7	-35.1	-38.4	-41.7	-45.0	-48.4	-51.7
40	-31.4	-35.5	-39.7	-43.8	-48.0	-52.1	-56.3	-60.5	-64.6
42	-37.5	-42.5	-47.5	-52.5	-57.6	-62.6	-67.6	-72.7	-77.7
44	-43.5	-49.5	-55.4	-61.3	-67.2	-73.1	-79.0	-84.9	-90.8
46	-49.6	-56.4	-63.2	-70.0	-76.8	-83.6	-90.3	-97.1	-103.9
48	-55.7	-63.4	-71.0	-78.7	-86.4	-94.0	-101.7	-109.3	-117.0
50	-61.8	-70.4	-78.9	-87.4	-96.0	-104.5	-113.0	-121.6	-130.1

GEAR DOWN**Takeoff Obstacle Limit Weight****Flaps 15****Pressure Altitude Adjustments**

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 LB)								
	360	400	440	480	520	560	600	640	680
S.L. & BELOW	0	0	0	0	0	0	0	0	0
1000	-15.3	-16.7	-18.1	-19.5	-20.9	-22.3	-23.7	-25.1	-26.5
2000	-30.7	-33.5	-36.3	-39.1	-41.9	-44.7	-47.5	-50.3	-53.1
3000	-43.7	-48.0	-52.4	-56.7	-61.0	-65.3	-69.6	-73.9	-78.2
4000	-56.8	-62.6	-68.5	-74.3	-80.1	-85.9	-91.7	-97.5	-103.4
5000	-72.4	-79.7	-87.0	-94.3	-101.6	-108.9	-116.3	-123.6	-130.9
6000	-87.9	-96.7	-105.5	-114.3	-123.2	-132.0	-140.8	-149.6	-158.4
7000	-102.1	-112.5	-122.9	-133.3	-143.7	-154.1	-164.5	-174.9	-185.4
8000	-116.3	-128.3	-140.3	-152.3	-164.3	-176.3	-188.3	-200.3	-212.3

Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 LB)								
	360	400	440	480	520	560	600	640	680
15 TW	-38.3	-42.0	-45.7	-49.3	-53.0	-56.7	-60.3	-64.0	-67.7
10 TW	-25.6	-28.0	-30.4	-32.9	-35.3	-37.8	-40.2	-42.7	-45.1
5 TW	-12.8	-14.0	-15.2	-16.4	-17.7	-18.9	-20.1	-21.3	-22.6
0	0	0	0	0	0	0	0	0	0
10 HW	8.0	7.6	7.1	6.7	6.3	5.9	5.4	5.0	4.6
20 HW	16.0	15.1	14.3	13.4	12.6	11.7	10.9	10.0	9.1
30 HW	26.0	24.6	23.1	21.7	20.3	18.9	17.4	16.0	14.6
40 HW	36.0	34.0	32.0	30.0	28.0	26.0	24.0	22.0	20.0

With engine bleed for packs off, increase weight by 2100 lb.

With engine anti-ice on, decrease weight by 3600 lb.

With engine and wing anti-ice on, decrease weight by 8700 lb.

GEAR DOWN

Long Range Cruise Altitude Capability Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
780	18600	16600	14200
760	19100	17200	14800
740	19700	17900	15500
720	20200	18500	16100
700	21000	19400	17100
680	21900	20400	18200
660	22900	21500	19400
640	23900	22500	20600
620	25000	23500	21900
600	25900	24600	23000
580	27000	25700	24200
560	28000	27000	25400
540	29100	28200	26700
520	30100	29500	28000
500	30900	30500	29300
480	31600	31300	30500
460	32400	32200	31500
440	33300	33100	32600
420	34100	33900	33600
400	34900	34800	34600
380	35800	35700	35600
360	36700	36600	36400

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	
334	296	264	239	218	200	187	175	165	156	149	
500	444	396	358	327	300	281	264	249	235	224	
666	591	527	477	436	400	375	352	332	314	299	
830	738	659	596	545	500	469	441	416	393	374	
993	883	789	714	653	600	563	530	500	473	450	
1156	1029	920	833	762	700	657	618	583	552	525	
1318	1173	1050	951	870	800	751	707	667	632	601	
1479	1318	1179	1069	979	900	845	796	751	712	677	
1639	1462	1309	1187	1087	1000	939	884	835	791	753	
1799	1605	1438	1305	1196	1100	1033	973	919	871	829	
1958	1748	1567	1423	1304	1200	1128	1062	1003	951	905	
2116	1890	1696	1540	1412	1300	1222	1151	1087	1030	981	
2273	2032	1824	1658	1520	1400	1316	1240	1171	1110	1058	
2430	2174	1952	1775	1628	1500	1410	1329	1255	1191	1134	
2586	2315	2080	1892	1736	1600	1504	1418	1340	1271	1211	
2741	2455	2208	2009	1844	1700	1599	1507	1425	1351	1287	
2896	2595	2335	2125	1952	1800	1693	1596	1509	1432	1364	
3050	2734	2461	2242	2060	1900	1788	1686	1594	1512	1441	
3203	2873	2588	2358	2167	2000	1882	1776	1679	1593	1518	

Reference Fuel and Time Required

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	17.3	0:52	16.6	0:50	16.1	0:48	15.8	0:46	15.6	0:45
300	25.3	1:15	24.2	1:12	23.3	1:09	22.5	1:06	22.1	1:03
400	33.4	1:39	31.7	1:34	30.4	1:30	29.2	1:25	28.5	1:21
500	41.4	2:02	39.2	1:56	37.5	1:50	36.0	1:45	35.0	1:40
600	49.7	2:25	47.1	2:18	44.9	2:11	43.0	2:04	41.7	1:58
700	58.1	2:48	54.9	2:39	52.3	2:31	50.0	2:23	48.4	2:16
800	66.4	3:11	62.7	3:01	59.7	2:51	57.0	2:42	55.1	2:34
900	74.8	3:33	70.5	3:22	67.1	3:12	64.0	3:02	61.8	2:52
1000	83.1	3:56	78.4	3:44	74.5	3:32	71.0	3:21	68.5	3:10
1100	91.8	4:18	86.6	4:05	82.2	3:52	78.4	3:39	75.6	3:27
1200	100.6	4:40	94.8	4:25	90.0	4:11	85.7	3:58	82.7	3:45
1300	109.3	5:02	103.0	4:46	97.7	4:31	93.1	4:16	89.7	4:02
1400	118.1	5:24	111.2	5:07	105.4	4:51	100.4	4:35	96.8	4:19
1500	126.8	5:46	119.4	5:28	113.2	5:10	107.8	4:53	103.9	4:37
1600	136.0	6:07	128.0	5:48	121.2	5:29	115.5	5:11	111.4	4:54
1700	145.2	6:28	136.5	6:08	129.3	5:48	123.2	5:29	118.8	5:11
1800	154.3	6:49	145.1	6:28	137.4	6:07	130.9	5:47	126.3	5:28
1900	163.5	7:10	153.7	6:48	145.5	6:26	138.6	6:05	133.8	5:45
2000	172.6	7:32	162.3	7:08	153.6	6:45	146.3	6:23	141.3	6:02

GEAR DOWN**Long Range Cruise Trip Fuel and Time
Fuel Required Adjustment (1000 LB)**

REFERENCE FUEL REQUIRED (1000 LB)	LANDING WEIGHT (1000 LB)					
	350	400	450	500	550	600
20	-2.4	-1.2	0.0	1.5	3.0	4.6
40	-4.7	-2.4	0.0	2.9	5.9	9.2
60	-7.1	-3.6	0.0	4.4	8.9	13.9
80	-9.5	-4.9	0.0	5.9	12.0	18.8
100	-11.9	-6.1	0.0	7.4	15.2	23.7
120	-14.3	-7.3	0.0	9.0	18.4	28.9
140	-16.7	-8.5	0.0	10.6	21.8	34.1
160	-19.1	-9.7	0.0	12.2	25.1	39.4
180	-21.6	-10.9	0.0	13.8	28.6	44.9

Based on VREF+80 climb, Long Range Cruise and VREF+80 descent.

**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)		20	40	60	80	100
100	80	60	40	20	50	45	41	38	35	33
105	86	73	63	56	100	92	85	80	75	70
174	152	134	120	109	150	139	130	122	115	108
245	217	195	177	163	200	186	175	164	155	147
314	282	256	234	216	250	234	219	207	196	185
384	347	316	290	269	300	281	264	250	236	224
452	411	376	347	322	350	328	309	292	277	264
521	474	436	403	375	400	376	354	335	318	303
590	539	496	459	428	450	423	399	378	359	342
659	603	556	515	480	500	470	444	421	399	380
730	668	616	572	534						

Trip Fuel and Time

AIR DISTANCE (NM)	LANDING WEIGHT (1000 LB)						TIME (HRS:MIN)	
	360	400	440	480	520	560		
50	FUEL (1000 LB)	4.9	5.1	5.4	5.7	6.0	6.4	0:16
	ALT (FT)	11000	11000	11000	11000	11000	9000	
100	FUEL (1000 LB)	8.0	8.5	9.0	9.5	10.0	10.6	0:26
	ALT (FT)	21000	21000	19000	19000	19000	17000	
150	FUEL (1000 LB)	10.8	11.5	12.2	13.0	13.7	14.5	0:35
	ALT (FT)	27000	25000	25000	23000	23000	21000	
200	FUEL (1000 LB)	13.5	14.4	15.3	16.3	17.3	18.3	0:44
	ALT (FT)	33000	29000	27000	27000	25000	23000	
250	FUEL (1000 LB)	16.0	17.2	18.4	19.6	20.9	22.2	0:52
	ALT (FT)	33000	31000	29000	27000	25000	23000	
300	FUEL (1000 LB)	18.6	20.0	21.5	23.0	24.5	26.0	1:01
	ALT (FT)	33000	33000	29000	29000	27000	25000	
350	FUEL (1000 LB)	21.2	22.8	24.5	26.3	28.0	29.8	1:09
	ALT (FT)	33000	33000	31000	29000	27000	25000	
400	FUEL (1000 LB)	23.8	25.7	27.6	29.6	31.6	33.7	1:17
	ALT (FT)	33000	33000	31000	29000	27000	25000	
450	FUEL (1000 LB)	26.5	28.5	30.7	33.0	35.3	37.6	1:26
	ALT (FT)	33000	33000	31000	29000	27000	25000	
500	FUEL (1000 LB)	29.1	31.4	33.8	36.3	38.9	41.5	1:34
	ALT (FT)	33000	33000	31000	29000	27000	25000	

GEAR DOWN**Holding Planning****Flaps Up**

WEIGHT (1000 LB)	TOTAL FUEL FLOW (LB/HR)						
	PRESSURE ALTITUDE (FT)						
1500	5000	10000	15000	20000	25000	30000	
800	34550						
760	33390	33420					
720	31570	31530					
680	29640	29580	29490				
640	27710	27670	27560				
600	26100	26080	25930				
560	24550	24520	24350	24470			
520	23040	22970	22800	22860	23100		
480	21610	21500	21320	21320	21540		
440	20150	20000	19800	19790	19950	20220	
400	18760	18580	18340	18340	18430	18570	19050
360	17350	17150	16890	16860	16880	17000	17360

Flaps 1

WEIGHT (1000 LB)	TOTAL FUEL FLOW (LB/HR)				
	PRESSURE ALTITUDE (FT)				
1500	5000	10000	15000	20000	
800	33920	34110	34060	34600	36410
760	32630	32740	32680	33150	34530
720	30740	30780	30750	31090	32130
680	28770	28780	28750	28990	29710
640	26830	26830	26770	27030	27540
600	25180	25160	25060	25310	25710
560	23580	23520	23400	23620	23890
520	22000	21900	21750	21910	22150
480	20490	20340	20180	20260	20480
440	18960	18770	18570	18610	18790
400	17490	17280	17030	17010	17140
360	16020	15800	15520	15420	15520

These tables include 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 LB)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
20	374.5	374.5	
18	397.5	393.1	384.4
16	424.4	420.7	412.2
14	453.3	451.7	440.3
12	488.9	484.2	469.7
10	524.5	518.7	503.5
8	562.0	553.8	539.5
6	604.3	588.9	567.4
4	641.4	617.7	589.7
2	671.4	642.9	613.1
0	698.4	666.6	634.4

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	LEVEL OFF WEIGHT ADJUSTMENT (1000 LB)									
	PRESSURE ALTITUDE (1000 FT)									
ENGINE ONLY	0.0	-1.3	-2.2	-2.4	-2.1	-1.7	-1.4	-0.2	0.0	0.0
ENGINE AND WING	-4.7	-6.2	-6.3	-6.6	-5.7	-4.9	-4.0	-3.3	-2.6	-2.0

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Performance Dispatch**Text****Chapter PD****Section 64****Introduction**

This chapter contains self dispatch performance data intended primarily for use by flight crews in the event that information cannot be obtained from the airline dispatch office. The data provided is for a single takeoff flap at max takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between data presented in this chapter and that contained in the Approved Flight Manual, the Flight Manual shall always take precedence.

Takeoff

The maximum allowable takeoff weight will be the least of the Field, Climb, Tire Speed, and Obstacle Limit Weights as determined from the following tables. Brake Energy Limit is not shown as it is not limiting for the range of conditions shown in this chapter. When determining a maximum weight for a wet runway, the dry runway limit weight must also be checked and the lower of the two weights used.

Field Limit Weight - Slope and Wind Corrections

These tables for wet and dry runways provide corrections to the field length available for the effects of runway slope and wind component along the runway. Enter the Slope Correction table with the available field length and runway slope to determine the slope corrected field length. Now enter the Wind Correction 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 condition 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

This table provides obstacle limit weights for reference airport conditions based on obstacle height above the runway surface and distance from brake release. Enter the correction tables to correct 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 235 MPH tires. To determine the tire speed limit weight, enter the table with OAT, move to airport pressure altitude and read the tire speed limit weight. Adjust the tire speed limit weight according to the notes below the table to account for wind.

Takeoff Speeds

The speeds presented in the Takeoff Speeds table as well as FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy, or obstacle clearance with unbalanced V1. 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 may 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 wet or dry table by entering with takeoff flap setting and brake release weight. Use the tables provided to correct takeoff speeds for altitude and actual temperature or assumed temperature for reduced thrust takeoffs. Slope and wind corrections to V1 are obtained by entering the Slope and Wind V1 Adjustment Table.

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Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR 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 Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Brakes Deactivated

When operating with brakes deactivated, the field limit weight and the V1 must be reduced to allow for reduced braking capability. A simplified method which conservatively accounts for the reduced braking capability of one brake deactivated is to reduce the normal runway limited weight by 8400 lb for a dry runway or 5000 lb for a wet runway and the V1 associated with the reduced weight by 2 knots. With two brakes deactivated, reduce the normal runway limited weight by 17000 lb for a dry runway or 10400 lb for a wet runway and the V1 associated with the reduced weight by 5 knots for a dry runway or 3 knots for a wet runway. If the resulting V1 is less than minimum V1, takeoff is permitted with V1 set equal to V1(MCG) provided the dry accelerate stop distance corrected for wind and slope exceeds approximately 4900 ft for one brake deactivated or 5100 ft for two brakes deactivated. For wet runways, the corrected accelerate stop distance should exceed approximately 6200 ft for one brake deactivated or 6400 ft for two brakes deactivated.

Detailed analysis for the specific case from the Airplane Flight Manual may yield a less restrictive penalty.

One Thrust Reverser Inoperative

Wet runway takeoff performance presented for all brakes operating is based on the use of one thrust reverser during deceleration. When operating with a thrust reverser inoperative, the runway/obstacle limited takeoff weight and V1 speed must be reduced to account for the reduced deceleration capability. A simplified method which conservatively accounts for this is to reduce the normal wet runway/obstacle limited weight by 11800 lb and the V1 associated with the reduced weight by 3 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 corrected for wind and slope exceeds approximately 6300 ft.

Enroute

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of approximately 1.3g (39° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination. Data is based on economy climb and descent speeds, and Long Range Cruise with normal engine bleed for air conditioning. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine trip fuel and time for a constant altitude cruise, first enter the Ground to Air Miles Conversion table 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 fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

These tables are provided to determine trip fuel and time required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance

as discussed above. Then enter the Trip Fuel and Time required with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. The data considers the use of the FMC short trip optimum altitude. Obtain air distance from upper table using the ground distance and wind component to the alternate. Enter Trip Fuel and Time 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

These tables provide total fuel flow information necessary for planning Flaps Up and Flaps 1 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%.

Oxygen Requirements

Flight Crew System

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck. The oxygen quantity associated with these requirements is achieved with the minimum dispatch oxygen cylinder pressure. Enter the Crew Oxygen Requirements table with the number of crew plus observers using oxygen and read the minimum cylinder pressure required for the appropriate bottle temperature.

An additional quantity of oxygen is required when flight altitudes above 41000 ft are planned. Regulations require that one active duty pilot must don the oxygen mask and breathe diluted oxygen for the duration of the flight above 41000 ft. The additional quantity of oxygen required is 2.05 liters/person/minute (1.2 psi/person/minute for the single cylinder system), or 13 liters/person/minute (8 psi/person/minute) if 100% oxygen is selected during normal usage.

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 Range Operations

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 diversion airport comply with rules set up specifically for "Extended Range Operation with Two Engine airplanes". This section provides reserve fuel planning information for the "Critical Fuel Scenario" based on two engine operation at Long Range Cruise as well as single engine operation at Long Range Cruise.

Critical Fuel Reserves

Enter Ground to Air Mile Conversion table with forecast wind and ground distance to diversion airport from critical point to obtain air distance. Now enter 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 in-service 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 Flaps 30.

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

Landing Field Limit Weight

Obtain wind corrected field length by entering upper table with field length available and wind component along the runway. Now enter table with wind corrected field length and pressure altitude to read field limit weight for the expected runway condition.

Landing Climb Limit Weight

Enter 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 engine bleed corrections as noted. Note that data is for one engine inoperative.

Quick Turnaround Limit Weight

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

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff, 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.

Takeoff/Landing Climb Limit Weight

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

The remaining gear down tables in this section are identical in format and usage to the corresponding gear up tables previously described.

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DRAFT

Intentionally
Blank

Performance Inflight

General

Chapter PI

Section 10

Maximum Allowable Clearway

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	170
2000	220
2500	260
3000	320
3500	360
4000	410
4500	460

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
300	-3	-3	-3	-3	-2	-2	-2	-2
200	-3	-3	-3	-3	-2	-2	-2	-2
100	-2	-2	-2	-2	-2	-2	-2	-2
0	0	0	0	0	0	0	0	0
-100	3	3	2	2	2	2	2	2
-200	5	4	3	3	4	3	3	3
-300	7	6	5	5	6	5	5	5

VREF

WEIGHT (1000 KG)	FLAPS		
	30	25	20
250	151	159	164
240	148	156	161
230	145	152	158
220	142	149	154
210	139	145	150
200	135	142	147
190	132	138	143
180	128	134	139
170	124	131	135
160	121	127	131
150	117	123	127
140	113	118	123

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Flap Maneuver Speed

FLAP POSITION	MANEUVER SPEED
FLAPS 0	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

DRAFT

ADVISORY INFORMATION**Slush/Standing Water Takeoff****Maximum Reverse Thrust****Weight Adjustment (1000 KG)**

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH							
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)	
	PRESS ALT (FT)		PRESS ALT (FT)			PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-40.2	-44.2	-48.2	-46.7	-50.7	-54.7	-60.5	-64.5
300	-36.8	-40.7	-44.7	-42.6	-46.6	-50.5	-54.8	-58.7
280	-33.3	-37.3	-41.3	-38.4	-42.4	-46.4	-49.0	-53.0
260	-29.8	-33.8	-37.8	-34.2	-38.2	-42.2	-43.3	-47.3
240	-26.4	-30.4	-34.4	-30.0	-34.0	-38.0	-37.5	-41.5
220	-22.9	-26.9	-30.9	-25.9	-29.8	-33.8	-31.8	-35.8
200	-19.5	-23.5	-27.5	-21.7	-25.7	-29.7	-26.1	-30.0
180	-16.0	-20.0	-24.0	-17.5	-21.5	-25.5	-20.3	-24.3

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
2200						162		
2400	159			175		201		
2600	200			217		241	159	
2800	242	156		258	172	281	199	
3000	283	197		299	214		238	156
3200		239	153		255	169	278	196
3400		280	194		296	211		235
3600			236			252		275
3800			277			293		

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
260	-20	-20	-20	-14	-14	-14	-2	-2
240	-22	-22	-22	-17	-17	-17	-6	-6
220	-24	-24	-24	-20	-20	-20	-10	-10
200	-26	-26	-26	-22	-22	-22	-14	-14
180	-27	-27	-27	-24	-24	-24	-18	-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**Slush/Standing Water Takeoff****No Reverse Thrust****Weight Adjustment (1000 KG)**

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)		PRESS ALT (FT)		PRESS ALT (FT)				
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
320	-53.7	-57.9	-62.1	-61.4	-65.6	-69.8	-80.6	-84.7	-88.9
300	-49.4	-53.5	-57.7	-56.0	-60.2	-64.3	-71.7	-75.8	-80.0
280	-45.0	-49.2	-53.4	-50.6	-54.8	-59.0	-63.0	-67.2	-71.3
260	-40.8	-44.9	-49.1	-45.3	-49.5	-53.7	-55.0	-59.1	-63.3
240	-36.6	-40.8	-44.9	-40.2	-44.4	-48.5	-47.6	-51.7	-55.9
220	-32.5	-36.7	-40.9	-35.2	-39.3	-43.5	-40.8	-45.0	-49.1
200	-28.6	-32.7	-36.9	-30.2	-34.4	-38.6	-34.7	-38.8	-43.0
180	-24.7	-28.8	-33.0	-25.5	-29.6	-33.8	-29.1	-33.3	-37.5

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
3000							147.9	
3200							198.4	
3400							252.7	
3600	145.7			217.1			312.0	163.7
3800	210.4			285.5				215.2
4000	281.9			345.2	161.9			270.9
4200		166.5			240.2		332.0	179.7
4400		231.8			305.0			232.4
4600		308.5				188.8		289.7
4800			186.9			261.9		
5000			254.2			323.8		
5200			338.5					352.0

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 $-75 \text{ m} / +70 \text{ m}$ 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
260	-34	-32	-30	-26	-24	-22	-6	-4	-2
240	-37	-35	-33	-30	-28	-26	-13	-11	-9
220	-40	-38	-36	-35	-33	-31	-20	-18	-16
200	-44	-42	-40	-39	-37	-35	-28	-26	-24
180	-47	-45	-43	-44	-42	-40	-35	-33	-31

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 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
320	0.0	-0.7	-2.0	-13.9	-15.1	-16.4	-33.0	-34.2	-35.5
300	0.0	-1.2	-2.4	-15.4	-16.7	-18.0	-32.6	-33.9	-35.1
280	-0.3	-1.6	-2.9	-17.0	-18.2	-19.5	-32.2	-33.5	-34.7
260	-1.6	-2.9	-4.2	-17.9	-19.2	-20.5	-31.3	-32.6	-33.9
240	-3.1	-4.4	-5.6	-18.1	-19.3	-20.6	-29.8	-31.1	-32.3
220	-3.8	-5.0	-6.3	-17.3	-18.6	-19.9	-27.6	-28.8	-30.1
200	-3.7	-5.0	-6.2	-15.7	-17.0	-18.3	-24.6	-25.9	-27.2
180	-2.9	-4.1	-5.4	-13.3	-14.6	-15.8	-21.1	-22.3	-23.6

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1600	158							
1800	233	156						
2000	307	230	153					
2200		305	228	170				
2400			302	228				
2600				285	201			
2800					258	175		
3000					316	232	181	
3200						289	221	
3400							260	176
3600							300	216
3800								255
4000								171
4200								
4400								

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 -25 m/+20 m for every 5°C above/below 4°C.
Adjust "Medium" field length available by -40 m/+35 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**
Maximum Reverse Thrust
V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)		PRESS ALT (FT)		PRESS ALT (FT)		PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
260	-6	-4	-2	-17	-15	-13	-30	-28	-26
240	-8	-6	-4	-19	-17	-15	-34	-32	-30
220	-9	-7	-5	-22	-20	-18	-38	-36	-34
200	-10	-8	-6	-24	-22	-20	-42	-40	-38
180	-11	-9	-7	-26	-24	-22	-45	-43	-41

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.

No 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)		PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
320	0.0	0.0	-0.7	-25.6	-26.4	-27.1	-48.8	-49.5	-50.2
300	-3.2	-3.9	-4.7	-27.5	-28.2	-28.9	-47.8	-48.5	-49.2
280	-6.3	-7.1	-7.8	-28.5	-29.3	-30.0	-46.0	-46.8	-47.5
260	-8.7	-9.4	-10.1	-28.8	-29.5	-30.2	-43.6	-44.3	-45.1
240	-10.2	-10.9	-11.6	-28.2	-28.9	-29.7	-40.5	-41.2	-41.9
220	-10.8	-11.6	-12.3	-26.9	-27.6	-28.3	-36.6	-37.4	-38.1
200	-10.7	-11.4	-12.2	-24.7	-25.4	-26.1	-32.1	-32.8	-33.5
180	-9.8	-10.5	-11.2	-21.7	-22.5	-23.2	-26.8	-27.5	-28.3
160	-8.0	-8.7	-9.4	-18.0	-18.7	-19.4	-20.8	-21.5	-22.3

ADVISORY INFORMATION**Slippery Runway Takeoff****No Reverse Thrust****V1(MCG) Limit Weight (1000 KG)**

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)		S.L.	PRESS ALT (FT)		S.L.	PRESS ALT (FT)		
S.L.	4000	8000		S.L.	4000	8000	S.L.	4000	8000
2000	238.5								
2200	333.2	241.5							
2400		335.1	244.5						
2600			337.1						
3000				243.8					
3200				351.8					
3400					295.1				
3600						216.5			
3800						335.8			
4800							285.5		
5400								304.1	
6000									319.9

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/+30 m for every 5°C above/below 4°C.
Adjust "Medium" field length available by -45 m/+40 m for every 5°C above/below 4°C.
Adjust "Poor" field length available by -80 m/+75 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.

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)		S.L.	PRESS ALT (FT)		S.L.	PRESS ALT (FT)		
S.L.	4000	8000		S.L.	4000	8000	S.L.	4000	8000
260	-10	-8	-6	-26	-24	-22	-51	-49	-47
240	-12	-10	-8	-30	-28	-26	-58	-56	-54
220	-15	-13	-11	-34	-32	-30	-65	-63	-61
200	-17	-15	-13	-39	-37	-35	-74	-72	-70
180	-20	-18	-16	-45	-43	-41	-84	-82	-80
160	-22	-20	-18	-50	-48	-46	-95	-93	-91

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.

Minimum Control Speeds**V1(MCG)****Max Takeoff Thrust**

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	107	103	102	100		
50	122	110	107	103	100	99	97
40	104	115	113	110	105	101	97
30	86	117	117	116	111	107	103
20	68	117	117	116	115	112	107
-60	-76	118	118	117	116	113	110

Go-around %N1

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

REPORTED OAT		TAT	AIRPORT PRESSURE ALTITUDE (FT)											
°F	°C	°C	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
133	56	60	91.5	91.4	91.6	91.8	91.6	91.4	91.1	90.9	90.8	90.5	90.2	90.0
124	51	55	93.2	93.7	93.5	93.4	93.37	93.1	92.7	92.6	92.4	92.1	91.9	91.6
115	46	50	94.3	95.4	95.5	95.6	95.2	94.8	94.3	94.2	94.1	93.8	93.5	93.3
106	41	45	95.4	97.0	97.1	97.2	96.9	96.7	96.3	95.9	95.6	95.3	95.1	94.8
97	36	40	96.0	98.2	98.6	98.7	98.3	98.1	97.8	97.7	97.6	97.1	96.7	96.4
88	31	35	95.2	98.3	99.2	99.7	99.6	99.5	99.2	99.0	98.9	98.6	98.4	98.4
79	26	30	94.4	97.5	98.6	99.6	100.4	100.4	100.4	100.3	100.1	99.9	99.6	99.6
70	21	25	93.6	96.7	97.7	98.8	99.8	100.9	101.2	101.2	101.1	101.0	100.7	100.4
61	16	20	92.8	95.9	96.9	98.0	98.9	100.0	100.7	101.4	101.9	101.8	101.5	101.3
52	11	15	92.0	95.0	96.0	97.1	98.1	99.2	99.9	100.5	101.1	101.7	102.1	102.1
45	7	10	91.2	94.2	95.2	96.3	97.2	98.3	99.0	99.6	100.2	100.9	101.3	101.7
36	2	5	90.4	93.4	94.4	95.4	96.4	97.4	98.1	98.7	99.3	100.0	100.4	100.8
27	-3	0	89.6	92.5	93.5	94.6	95.5	96.5	97.2	97.8	98.5	99.1	99.5	99.9
9	-13	-10	88.0	90.8	91.8	92.8	93.7	94.8	95.4	96.0	96.6	97.2	97.6	98.0
-9	-23	-20	86.3	89.1	90.1	91.0	91.9	92.9	93.6	94.2	94.8	95.4	95.7	96.1
-27	-33	-30	84.6	87.3	88.3	89.2	90.1	91.1	91.7	92.3	92.9	93.5	93.8	94.2
-45	-43	-40	82.8	85.5	86.4	87.4	88.2	89.2	89.8	90.4	91.0	91.5	91.9	92.3
-63	-53	-50	81.0	83.6	84.6	85.5	86.3	87.3	87.9	88.4	89.0	89.5	89.9	90.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)											
	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
PACKS OFF	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
1 PACK ON	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.4	-0.4
WING ANTI-ICE ON	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2

Max Climb %N1**Based on engine bleed for packs on or off and anti-ice off**

TAT		PRESSURE ALTITUDE (FT) / SPEED (IAS/MACH)									
		0	5000	10000	15000	20000	25000	30000	35000	40000	43000
°C	°F	310(0.47)	310(0.51)	310(0.56)	310(0.61)	310(0.67)	310(0.74)	310(0.81)	(0.84)	(0.84)	
60	140	86.5	87.9	89.4	91.3	93.9	96.3	99.7	103.2	103.1	102.5
50	122	88.7	88.8	89.2	89.9	92.5	94.8	98.2	101.6	101.5	100.9
40	104	90.0	90.5	90.7	90.8	91.3	93.3	96.7	100.1	99.9	99.3
30	86	89.1	93.2	92.9	92.8	93.1	93.6	95.2	98.4	98.3	97.7
20	68	87.6	91.6	93.9	94.6	94.8	95.2	96.5	97.2	96.7	96.1
15	59	86.9	90.8	93.1	95.3	95.5	95.9	97.0	97.8	97.0	96.4
10	50	86.1	90.0	92.3	94.5	96.2	96.5	97.6	98.4	97.6	97.1
5	41	85.4	89.2	91.5	93.7	95.8	97.2	98.2	99.0	98.2	97.7
0	32	84.6	88.4	90.7	92.8	94.9	97.0	98.9	99.6	98.9	98.4
-5	23	83.8	87.6	89.8	92.0	94.1	96.1	98.9	100.4	99.6	99.0
-10	14	83.0	86.8	89.0	91.1	93.2	95.2	98.0	101.6	100.5	99.9
-15	5	82.2	86.0	88.1	90.2	92.3	94.3	97.1	101.5	101.4	100.8
-20	-4	81.4	85.1	87.3	89.4	91.4	93.3	96.1	100.5	100.4	99.9
-25	-13	80.6	84.3	86.4	88.5	90.5	92.4	95.2	99.5	99.4	98.9
-30	-22	79.8	83.4	85.5	87.6	89.6	91.5	94.2	98.5	98.4	97.9
-35	-31	79.0	82.6	84.6	86.7	88.6	90.5	93.2	97.5	97.4	96.9
-40	-40	78.2	81.7	83.8	85.8	87.7	89.6	92.3	96.5	96.4	95.8

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)					
	0	10	20	30	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.5	-0.6	-0.8	-0.8	-1.2	-1.4
1 PACK ON - 1 BLEED SOURCE	-0.5	-0.6	-0.8	-0.8	-1.2	-1.4
1 PACK ON - 2 BLEED SOURCES	-0.5	-0.6	-0.8	-0.8	-1.2	-1.4
ENGINE ANTI-ICE ON	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE AND WING ANTI-ICE ON*	-0.5	-0.5	-0.5	-0.9	-1.1	-1.4
ENGINE AND WING ANTI-ICE ON**	-0.6	-0.7	-0.7	-1.4	-1.9	-2.3

*Wing anti-ice on, packs on, or packs off with 2 bleed sources.

**Wing anti-ice on, packs off, 1 bleed source.

Flight With Unreliable Airspeed / Turbulent Air Penetration**Altitude and/or vertical speed indications may also be unreliable.****Climb****Flaps Up, Set Max Climb Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)			
		160	200	240	280
40000 (.82M)	PITCH ATT V/S (FT/MIN)	3.5 1300	3.5 600		
30000 (280 KIAS)	PITCH ATT V/S (FT/MIN)	4.5 2100	4.0 1500	4.0 1000	4.0 600
20000 (270 KIAS)	PITCH ATT V/S (FT/MIN)	6.5 3100	6.0 2300	6.0 1700	6.0 1200
10000 (270 KIAS)	PITCH ATT V/S (FT/MIN)	9.5 4200	8.5 3200	8.0 2500	7.5 2000
SEA LEVEL (270 KIAS)	PITCH ATT V/S (FT/MIN)	11.5 4700	10.0 3700	9.0 2900	9.0 2300

Cruise**Flaps Up, %N1 for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)			
		160	200	240	280
40000 (.82M)	PITCH ATT %N1	1.7 87.5	2.3 91.4		
35000 (280 KIAS)	PITCH ATT %N1	1.4 84.1	1.9 86.7	2.4 89.8	
30000 (280 KIAS)	PITCH ATT %N1	1.5 79.4	2.1 82.2	2.7 85.5	3.4 89.4
25000 (280 KIAS)	PITCH ATT %N1	1.6 75.3	2.2 77.8	2.9 80.7	3.5 84.4
20000 (270 KIAS)	PITCH ATT %N1	1.8 70.2	2.5 72.9	3.2 75.9	4.0 79.3
15000 (270 KIAS)	PITCH ATT %N1	1.7 65.9	2.5 68.4	3.2 71.3	4.0 74.6

Descent**Flaps Up, Set Idle Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)			
		160	200	240	280
40000 (.82M)	PITCH ATT V/S (FT/MIN)	-1.7 -2900	-0.9 -2700		
30000 (280 KIAS)	PITCH ATT V/S (FT/MIN)	-1.3 -2200	-0.4 -2000	0.4 -1900	1.0 -1900
20000 (270 KIAS)	PITCH ATT V/S (FT/MIN)	-1.1 -1800	-0.1 -1600	0.8 -1600	1.6 -1600
10000 (270 KIAS)	PITCH ATT V/S (FT/MIN)	-1.4 -1700	-0.3 -1500	0.7 -1400	1.5 -1400
SEA LEVEL (270 KIAS)	PITCH ATT V/S (FT/MIN)	-1.4 -1400	-0.3 -1200	0.7 -1200	1.5 -1200

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

Holding**Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)			
		160	200	240	280
10000	PITCH ATT	4.0	4.5	5.0	5.0
	%N1	55.1	60.4	65.1	69.6
	KIAS	202	216	230	247
5000	PITCH ATT	4.0	4.5	5.0	5.0
	%N1	52.0	57.0	61.5	65.8
	KIAS	202	216	230	246

Terminal Area (5000 FT)**%N1 for Level Flight**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		160	200	240	280
FLAPS UP GEAR UP (VREF 30 + 80)	PITCH ATT	4.5	5.0	5.5	5.5
	%N1	52.7	58.3	63.1	67.5
	KIAS	201	216	229	241
FLAPS 1 GEAR UP (VREF 30 + 60)	PITCH ATT	6.0	6.5	7.0	7.5
	%N1	53.1	58.7	64.1	68.6
	KIAS	181	196	209	221
FLAPS 5 GEAR UP (VREF 30 + 40)	PITCH ATT	5.0	5.5	5.5	6.0
	%N1	54.3	60.2	65.4	70.0
	KIAS	161	176	189	201
FLAPS 15 GEAR UP (VREF 30 + 20)	PITCH ATT	6.0	6.0	6.5	6.5
	%N1	55.1	61.6	67.1	72.0
	KIAS	141	156	169	181
FLAPS 20 GEAR DOWN (VREF 30 + 20)	PITCH ATT	4.0	4.5	5.0	5.0
	%N1	61.6	68.3	73.9	78.9
	KIAS	141	156	169	181

Final Approach (1500 FT)**Gear Down, %N1 for 3° Glideslope**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		160	200	240	280
FLAPS 20 (VREF 20 + 10)	PITCH ATT	1.0	1.5	1.5	1.5
	%N1	41.0	45.8	49.8	53.4
	KIAS	142	157	172	185
FLAPS 25 (VREF 25 + 10)	PITCH ATT	0.0	0.5	0.5	0.5
	%N1	49.9	55.0	59.6	63.9
	KIAS	138	153	166	179
FLAPS 30 (VREF 30 + 10)	PITCH ATT	-0.5	0.0	0.0	0.0
	%N1	55.1	60.7	65.8	70.3
	KIAS	131	146	159	171

DRAFT

Intentionally
Blank

Performance Inflight

All Engine

Chapter PI

Section 11

Long Range Cruise Maximum Operating Altitude

Max Climb Thrust

ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30500	-2	33000*	32600	31100
290	31200	-3	34100*	33300	31800
280	32000	-5	35100*	34000	32600
270	32800	-7	35900*	34800	33300
260	33600	-9	36500*	35600	34200
250	34400	-11	37300*	36400	35000
240	35300	-12	38200*	37300	35800
230	36200	-14	39000*	38100	36700
220	37100	-14	39900*	39100	37600
210	38100	-14	40800*	40000	38600
200	39100	-14	41800*	41100	39600
190	40100	-14	42800*	42100	40700
180	41300	-14	43000	43000	41800
170	42500	-14	43000	43000	43000
160	43000	-14	43000	43000	43000
150	43000	-14	43000	43000	43000
140	43000	-14	43000	43000	43000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30500	4	31400*	31400*	31100
290	31200	2	32700*	32700*	31800
280	32000	1	33900*	33900*	32600
270	32800	-1	35100*	34800	33300
260	33600	-3	35900*	35600	34200
250	34400	-5	36500*	36400	35000
240	35300	-7	37400*	37300	35800
230	36200	-9	38300*	38100	36700
220	37100	-9	39200*	39100	37600
210	38100	-9	40000*	40000	38600
200	39100	-9	40900*	40900*	39600
190	40100	-9	41900*	41900*	40700
180	41300	-9	42900*	42900*	41800
170	42500	-9	43000	43000	43000
160	43000	-9	43000	43000	43000
150	43000	-9	43000	43000	43000
140	43000	-9	43000	43000	43000

*Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.

Long Range Cruise Maximum Operating Altitude**Max Climb Thrust**

ISA + 20°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
300	30500	10	26100*	26100*	26100*
290	31200	8	27600*	27600*	27600*
280	32000	6	31700*	31700*	31700*
270	32800	5	33400*	33400*	33300
260	33600	3	34900*	34900*	34200
250	34400	1	35800*	35800*	35000
240	35300	-1	36400*	36400*	35800
230	36200	-3	37300*	37300*	36700
220	37100	-3	38200*	38200*	37600
210	38100	-3	39200*	39200*	38600
200	39100	-3	40000*	40000*	39600
190	40100	-3	41000*	41000*	40700
180	41300	-3	42000*	42000*	41800
170	42500	-3	43000	43000	43000
160	43000	-3	43000	43000	43000
150	43000	-3	43000	43000	43000
140	43000	-3	43000	43000	43000

*Denotes altitude thrust limited in level flight, 300 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	43
260	%N1	84.9	86.6	88.2	89.5	90.7	92.4			
	MACH	.760	.787	.814	.837	.844	.842			
	KIAS	319	318	316	313	302	288			
	FF/ENG	3910	3893	3902	3902	3847	3842			
240	%N1	82.8	84.5	86.2	87.8	89.1	90.3	92.5		
	MACH	.737	.763	.790	.817	.839	.844	.841		
	KIAS	309	307	306	304	300	288	275		
	FF/ENG	3598	3573	3565	3582	3582	3525	3547		
220	%N1	80.6	82.3	84.0	85.7	87.3	88.6	90.2	92.9	
	MACH	.711	.737	.763	.791	.819	.840	.843	.841	
	KIAS	297	296	295	294	292	287	276	262	
	FF/ENG	3287	3336	3249	3251	3273	3264	3223	3283	
200	%N1	78.1	79.9	81.6	83.3	85.0	86.6	88.3	90.4	93.1
	MACH	.680	.708	.735	.762	.791	.818	.840	.843	.841
	KIAS	284	284	283	282	281	279	274	263	250
	FF/ENG	3035	3030	2949	2939	2950	2965	2964	2952	3013
180	%N1	75.6	77.2	79.0	80.7	82.4	84.1	86.1	88.3	90.3
	MACH	.650	.675	.703	.731	.758	.787	.816	.839	.844
	KIAS	270	270	270	270	268	267	265	261	251
	FF/ENG	2732	2714	2709	2641	2632	2645	2671	2699	2683
160	%N1	72.9	74.4	76.0	77.8	79.6	81.3	83.3	85.9	88.0
	MACH	.620	.643	.666	.695	.724	.751	.780	.810	.835
	KIAS	257	256	255	255	255	254	253	251	248
	FF/ENG	2447	2422	2397	2341	2335	2328	2358	2406	2429

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitude

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	
282	262	243	227	213	200	191	182	174	167	161	
564	522	485	453	425	400	382	366	351	337	324	
846	783	727	679	638	600	574	549	527	506	487	
1130	1045	970	906	850	800	765	733	703	675	650	
1414	1308	1214	1133	1063	1000	957	916	879	844	813	
1699	1572	1458	1361	1276	1200	1148	1099	1054	1013	976	
1986	1836	1703	1589	1489	1400	1339	1282	1230	1182	1138	
2273	2101	1947	1816	1702	1600	1530	1465	1405	1350	1300	
2561	2366	2192	2044	1916	1800	1721	1648	1580	1518	1462	
2850	2632	2438	2273	2129	2000	1912	1830	1755	1686	1624	

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	3.7	0:37	3.3	0:36	2.7	0:35	2.5	0:34	2.1	0:33
400	7.5	1:13	6.9	1:10	6.0	1:06	5.6	1:03	5.0	1:00
600	11.3	1:48	10.5	1:43	9.3	1:36	8.7	1:32	7.8	1:28
800	15.1	2:24	14.1	2:17	12.6	2:07	11.8	2:01	10.7	1:55
1000	18.9	2:59	17.7	2:50	15.9	2:38	14.9	2:30	13.5	2:23
1200	22.6	3:35	21.3	3:25	19.1	3:09	17.9	2:60	16.3	2:50
1400	26.4	4:11	24.8	3:59	22.3	3:41	20.9	3:29	19.1	3:18
1600	30.1	4:47	28.3	4:33	25.5	4:12	23.9	3:59	21.9	3:46
1800	33.8	5:24	31.8	5:08	28.7	4:44	26.9	4:29	24.6	4:14
2000	37.5	6:01	35.2	5:43	31.8	5:16	29.9	4:60	27.4	4:42

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)						
	140	160	180	200	220	240	260
5	-0.8	-0.5	-0.3	-0.3	0.0	0.2	0.4
10	-1.6	-1.1	-0.7	-0.4	0.0	0.5	1.0
15	-2.5	-1.8	-1.0	-0.5	0.0	0.8	1.6
20	-3.3	-2.4	-1.4	-0.7	0.0	1.1	2.2
25	-4.2	-3.1	-1.8	-0.8	0.0	1.3	2.7
30	-5.1	-3.7	-2.3	-1.0	0.0	1.6	3.2
35	-6.0	-4.4	-2.7	-1.2	0.0	1.8	3.7
40	-6.9	-5.1	-3.2	-1.4	0.0	1.9	4.2
45	-7.9	-5.8	-3.7	-1.7	0.0	2.1	4.6
50	-8.8	-6.6	-4.2	-1.9	0.0	2.2	5.0
55	-9.8	-7.3	-4.7	-2.2	0.0	2.3	5.4
60	-10.8	-8.1	-5.3	-2.5	0.0	2.4	5.7

Long Range Cruise Enroute Fuel and Time - High Altitude

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
526	494	465	441	420	400	383	367	353	340	328
1040	981	928	881	839	800	767	737	709	683	659
1556	1470	1391	1321	1258	1200	1152	1107	1065	1026	991
2075	1960	1855	1762	1677	1600	1536	1476	1420	1369	1322
2595	2451	2320	2203	2097	2000	1920	1845	1776	1712	1653
3117	2944	2785	2644	2517	2400	2304	2215	2131	2055	1984
3641	3437	3251	3086	2937	2800	2688	2584	2487	2397	2315
4167	3933	3719	3528	3357	3200	3072	2952	2841	2739	2645
4695	4430	4187	3972	3778	3600	3455	3321	3196	3080	2975
5226	4928	4657	4416	4199	4000	3839	3689	3550	3421	3304
5759	5429	5128	4861	4620	4400	4223	4058	3904	3762	3632
6294	5931	5600	5306	5042	4800	4606	4425	4258	4103	3960
6832	6435	6073	5752	5464	5200	4989	4793	4610	4442	4288
7373	6940	6547	6199	5886	5600	5372	5159	4962	4780	4614
7915	7447	7022	6646	6309	6000	5755	5526	5314	5119	4940
8459	7956	7498	7094	6731	6400	6138	5893	5666	5457	5265
9006	8466	7975	7542	7155	6800	6520	6259	6017	5794	5590
9556	8979	8454	7992	7578	7200	6903	6625	6368	6131	5914
10109	9493	8934	8442	8002	7600	7285	6991	6718	6467	6237
10665	10010	9416	8893	8426	8000	7667	7356	7068	6803	6560

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	5.1	0:58	4.9	0:57	4.8	0:57	4.7	0:56	4.6	0:57
800	10.6	1:53	10.2	1:51	10.0	1:49	9.8	1:47	9.6	1:47
1200	16.0	2:48	15.5	2:44	15.2	2:41	14.8	2:38	14.6	2:37
1600	21.5	3:44	20.8	3:38	20.4	3:33	19.9	3:28	19.6	3:26
2000	26.9	4:39	26.1	4:31	25.5	4:25	25.0	4:19	24.5	4:16
2400	32.2	5:35	31.3	5:26	30.5	5:18	29.9	5:11	29.3	5:06
2800	37.6	6:32	36.4	6:21	35.4	6:11	34.7	6:03	34.1	5:57
3200	42.8	7:29	41.5	7:17	40.3	7:05	39.5	6:55	38.7	6:48
3600	47.9	8:28	46.5	8:13	45.0	8:00	44.1	7:48	43.3	7:39
4000	53.0	9:26	51.4	9:10	49.7	8:55	48.7	8:41	47.8	8:30
4400	57.9	10:27	56.2	10:08	54.3	9:51	53.1	9:36	52.2	9:23
4800	62.8	11:28	61.0	11:07	58.8	10:47	57.6	10:30	56.5	10:16
5200	67.6	12:29	65.6	12:06	63.2	11:44	61.9	11:26	60.8	11:09
5600	72.3	13:32	70.2	13:06	67.6	12:42	66.2	12:22	65.0	12:03
6000	77.0	14:34	74.8	14:07	72.0	13:40	70.4	13:18	69.1	12:57
6400	81.5	15:39	79.1	15:09	76.1	14:40	74.5	14:15	73.2	13:52
6800	86.0	16:43	83.5	16:11	80.3	15:40	78.5	15:13	77.2	14:48
7200	90.4	17:49	87.8	17:15	84.5	16:41	82.6	16:11	81.2	15:44
7600	94.7	18:56	92.0	18:19	88.5	17:43	86.5	17:11	85.1	16:41
8000	99.0	20:03	96.2	19:23	92.6	18:44	90.5	18:10	89.0	17:38

Long Range Cruise Enroute Fuel and Time - High Altitude

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)						
	140	160	180	200	220	240	260
5	-0.6	-0.4	-0.2	-0.1	0.0	0.4	1.3
10	-1.7	-1.2	-0.7	-0.3	0.0	0.8	2.2
15	-2.9	-2.0	-1.2	-0.6	0.0	1.2	3.0
20	-4.0	-2.9	-1.8	-0.8	0.0	1.6	3.8
25	-5.1	-3.7	-2.3	-1.1	0.0	2.0	4.6
30	-6.2	-4.6	-2.9	-1.3	0.0	2.4	5.4
35	-7.4	-5.4	-3.4	-1.6	0.0	2.7	6.1
40	-8.5	-6.2	-4.0	-1.9	0.0	3.1	6.9
45	-9.7	-7.1	-4.5	-2.1	0.0	3.4	7.6
50	-10.8	-8.0	-5.1	-2.4	0.0	3.7	8.2
55	-12.0	-8.8	-5.7	-2.7	0.0	4.0	8.9
60	-13.2	-9.7	-6.3	-3.0	0.0	4.3	9.5
65	-14.3	-10.6	-6.8	-3.3	0.0	4.6	10.1
70	-15.5	-11.5	-7.4	-3.6	0.0	4.9	10.7
75	-16.7	-12.4	-8.0	-3.9	0.0	5.2	11.3
80	-17.9	-13.3	-8.6	-4.2	0.0	5.5	11.8
85	-19.1	-14.2	-9.2	-4.5	0.0	5.7	12.4
90	-20.3	-15.1	-9.8	-4.8	0.0	6.0	12.9
95	-21.5	-16.0	-10.5	-5.1	0.0	6.2	13.3
100	-22.8	-16.9	-11.1	-5.4	0.0	6.4	13.8

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)						
	260	240	220	200	180	160	140
43				37	8	-1	8
41			37	10	0	4	20
39		33	9	0	2	15	35
37	27	8	0	2	12	29	51
35	6	0	2	11	26	45	68
33	-1	2	11	24	41	61	83
31	3	11	23	39	57	77	98
29	13	24	38	54	72	91	111
27	25	38	53	69	87	105	123
25	40	53	68	84	100	117	133

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. Read wind factors for present and new altitudes from table.
2. Determine difference (new altitude wind factor minus present altitude wind factor);
This difference may be negative or positive.
3. Break-even wind at new altitude is present altitude wind plus difference from step 2.

Descent at .84M/310/250

PRESSURE ALTITUDE (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	99	106	112	119	125	130	133	141	147	152
TIME (MINUTES)	20	21	22	22	23	24	24	25	26	27

**Holding
Flaps Up**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
260	%N1	61.0	63.8	67.4	72.2	77.2	82.5	87.4	92.0	
	KIAS	236	237	238	240	262	280	284	283	
	FF/ENG	3600	3590	3480	3420	3520	3620	3720	3940	
240	%N1	58.9	61.5	65.1	70.0	74.5	80.1	85.2	89.8	
	KIAS	229	229	229	229	242	269	272	276	
	FF/ENG	3340	3300	3220	3150	3180	3370	3360	3540	
220	%N1	56.8	59.3	62.9	67.6	71.9	77.3	82.7	87.5	94.7
	KIAS	223	223	223	223	224	247	260	263	252
	FF/ENG	3080	3030	2960	2880	2880	2990	3030	3160	3510
200	%N1	54.6	57.0	60.4	65.1	69.1	74.2	79.9	85.0	91.2
	KIAS	216	216	216	216	216	225	247	250	252
	FF/ENG	2840	2770	2710	2630	2610	2640	2720	2800	3040
180	%N1	52.4	54.6	57.8	62.5	66.3	71.1	76.7	82.0	88.4
	KIAS	209	209	209	209	209	209	227	236	240
	FF/ENG	2600	2530	2470	2380	2360	2350	2430	2470	2640
160	%N1	49.9	52.0	55.1	59.8	63.4	68.0	72.8	78.7	85.4
	KIAS	202	202	202	202	202	202	202	221	225
	FF/ENG	2360	2290	2230	2150	2120	2090	2090	2200	2340
140	%N1	47.2	49.3	52.2	56.8	60.3	64.7	69.4	74.6	81.7
	KIAS	194	194	194	194	194	194	194	199	209
	FF/ENG	2130	2070	2010	1920	1890	1840	1850	1860	2000
										2090

Flaps 1

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	1500	5000	10000	15000	20000	
260	%N1	62.3	65.1	69.0	74.2	78.7
	KIAS	216	216	216	216	216
	FF/ENG	3780	3760	3680	3630	3660
240	%N1	60.1	62.8	66.6	71.8	76.2
	KIAS	209	209	209	209	209
	FF/ENG	3480	3460	3400	3330	3340
220	%N1	57.7	60.4	64.2	69.2	73.6
	KIAS	203	203	203	203	203
	FF/ENG	3190	3160	3120	3040	3040
200	%N1	55.3	57.8	61.6	66.5	70.7
	KIAS	196	196	196	196	196
	FF/ENG	2910	2870	2830	2760	2750
180	%N1	52.7	55.1	58.7	63.6	67.7
	KIAS	189	189	189	189	189
	FF/ENG	2640	2590	2550	2490	2470
160	%N1	50.1	52.2	55.7	60.5	64.5
	KIAS	182	182	182	182	182
	FF/ENG	2370	2320	2280	2220	2200
140	%N1	47.0	49.2	52.4	57.2	61.1
	KIAS	174	174	174	174	174
	FF/ENG	2110	2070	2010	1960	1940

These tables include 5% additional fuel for holding in a racetrack pattern.

Performance Inflight Advisory Information

Chapter PI Section 12

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

	REF DIST	LANDING DISTANCE AND ADJUSTMENT (M)						
		WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE/BELOW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF30	ONE REV NO REV

Dry Runway

MAX MANUAL	880	+25/-5	20	-35/+125	+10/-10	+20/-20	35	15	40
AUTOBRAKE MAX	1180	+20/-5	25	-50/+175	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1455	+25/-10	40	-70/+245	0/-5	+40/-40	80	0	0
AUTOBRAKE 3	1740	+30/-10	45	-90/+305	+10/-10	+50/-50	95	0	0
AUTOBRAKE 2	1935	+40/-20	55	-100/+350	+20/-35	+55/-55	85	20	20
AUTOBRAKE 1	2060	+45/-25	65	-115/+395	+45/-50	+60/-60	90	120	120

Good Reported Braking Action

MAX MANUAL	1390	+25/-10	35	-70/+245	+35/-30	+35/-35	60	80	195
AUTOBRAKE MAX	1485	+30/-10	40	-70/+255	+30/-25	+35/-35	70	85	200
AUTOBRAKE 4	1680	+30/-5	45	-80/+290	+5/-5	+45/-45	90	10	50
AUTOBRAKE 3	2000	+35/-10	50	-105/+350	+10/-10	+60/-60	110	0	0
AUTOBRAKE 2	2225	+45/-25	65	-115/+400	+25/-40	+65/-65	100	25	25
AUTOBRAKE 1	2370	+50/-30	75	-130/+455	+50/-60	+70/-70	105	140	140

Medium Reported Braking Action

MAX MANUAL	1865	+40/-25	60	-110/+395	+80/-70	+45/-45	70	235	610
AUTOBRAKE MAX	1880	+40/-15	60	-110/+400	+80/-65	+45/-50	80	230	605
AUTOBRAKE 4	1910	+40/-15	60	-110/+400	+80/-60	+50/-50	85	235	620
AUTOBRAKE 3	2100	+40/-15	60	-115/+430	+60/-40	+60/-60	110	125	465
AUTOBRAKE 2	2275	+45/-25	65	-125/+455	+60/-60	+65/-65	100	100	345
AUTOBRAKE 1	2400	+50/-30	75	-130/+485	+75/-70	+70/-70	105	185	345

Poor Reported Braking Action

MAX MANUAL	2380	+50/-35	80	-155/+615	+190/-125	+65/-65	80	530	1620
AUTOBRAKE MAX	2385	+60/-35	80	-155/+620	+195/-130	+65/-65	80	535	1625
AUTOBRAKE 4	2405	+60/-35	80	-160/+620	+190/-130	+65/-70	80	535	1640
AUTOBRAKE 3	2440	+50/-30	80	-160/+625	+185/-110	+65/-70	105	510	1620
AUTOBRAKE 2	2535	+60/-35	80	-165/+640	+175/-120	+70/-70	100	430	1520
AUTOBRAKE 1	2600	+60/-35	85	-165/+650	+180/-120	+70/-75	100	465	1455

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 70 m.

For autobrake and manual speedbrakes, increase reference landing distance by 60 m.

Distances for GOOD, MEDIUM, AND POOR are increased by 15%.

Includes distance from 50 ft above threshold (305 meters of unfactored air distance).

ADVISORY INFORMATION**Normal Configuration Landing Distance****Flaps 25**

LANDING DISTANCE AND ADJUSTMENT (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 5 KTS ABOVE VREF25	TEMP ADJ PER 10°C	APP SPD ADJ ONE REV	REVERSE THRUST ADJ NO REV
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE/BELOW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF25	ONE REV NO REV

Dry Runway

MAX MANUAL	925	+25/-10	20	-35/+130	+10/-10	+20/-20	35	20	45
AUTOBRAKE MAX	1260	+20/-15	30	-55/+180	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1570	+30/-20	40	-75/+255	0/-5	+40/-40	85	0	0
AUTOBRAKE 3	1880	+35/-25	50	-95/+320	+10/-15	+55/-55	95	0	0
AUTOBRAKE 2	2070	+45/-35	60	-105/+365	+30/-45	+60/-60	85	50	50
AUTOBRAKE 1	2190	+50/-40	70	-115/+405	+50/-55	+60/-60	90	170	180

Good Reported Braking Action

MAX MANUAL	1465	+30/-15	40	-70/+255	+35/-30	+35/-35	60	90	225
AUTOBRAKE MAX	1565	+30/-15	40	-75/+260	+30/-25	+35/-40	70	100	235
AUTOBRAKE 4	1805	+35/-25	45	-85/+300	+5/-5	+45/-45	100	10	50
AUTOBRAKE 3	2160	+40/-30	60	-110/+370	+10/-15	+65/-65	110	0	0
AUTOBRAKE 2	2380	+50/-40	70	-120/+420	+35/-50	+70/-70	100	60	60
AUTOBRAKE 1	2520	+60/-45	80	-130/+465	+60/-65	+70/-70	105	195	205

Medium Reported Braking Action

MAX MANUAL	1960	+40/-35	60	-110/+410	+85/-70	+50/-50	70	265	695
AUTOBRAKE MAX	1980	+40/-30	60	-110/+410	+85/-65	+50/-50	80	260	685
AUTOBRAKE 4	2025	+40/-30	60	-115/+415	+75/-50	+50/-60	90	245	690
AUTOBRAKE 3	2260	+45/-35	65	-120/+445	+50/-45	+65/-65	110	125	495
AUTOBRAKE 2	2430	+50/-40	75	-130/+470	+65/-70	+70/-70	100	130	395
AUTOBRAKE 1	2545	+60/-45	80	-140/+495	+85/-80	+70/-75	105	240	425

Poor Reported Braking Action

MAX MANUAL	2495	+60/-45	85	-160/+625	+190/-130	+65/-70	80	585	1835
AUTOBRAKE MAX	2505	+60/-45	85	-160/+625	+195/-130	+65/-70	85	585	1840
AUTOBRAKE 4	2525	+60/-45	85	-160/+635	+190/-130	+65/-70	80	590	1850
AUTOBRAKE 3	2595	+60/-45	85	-165/+640	+180/-115	+70/-75	105	535	1800
AUTOBRAKE 2	2685	+65/-45	85	-165/+650	+180/-125	+70/-75	90	475	1700
AUTOBRAKE 1	2750	+65/-50	90	-175/+660	+185/-125	+75/-80	100	535	1645

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 70 m.

For autobrake and manual speedbrakes, increase reference landing distance by 65 m.

Distances for GOOD, MEDIUM, and POOR are increased by 15%.

Includes distance from 50 ft above threshold (305 meters of unfactored air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 20

	REF DIST	LANDING DISTANCE AND ADJUSTMENT (M)							
		WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE/BELOW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF20	ONE REV	NO REV

Dry Runway

MAX MANUAL	960	+30/-15	20	-40/+130	+10/-10	+20/-20	35	25	50
AUTOBRAKE MAX	1320	+20/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1655	+30/-30	45	-75/+260	0/0	+45/-45	90	0	0
AUTOBRAKE 3	2000	+40/-35	55	-95/+330	+5/-15	+55/-55	100	0	0
AUTOBRAKE 2	2200	+45/-45	65	-110/+380	+25/-45	+60/-60	95	50	50
AUTOBRAKE 1	2335	+55/-50	75	-120/+420	+50/-60	+65/-65	95	180	180

Good Reported Braking Action

MAX MANUAL	1540	+30/-25	40	-75/+260	+40/-35	+35/-40	60	110	255
AUTOBRAKE MAX	1635	+30/-30	45	-75/+265	+35/-25	+40/-40	75	110	265
AUTOBRAKE 4	1905	+35/-35	50	-90/+305	+5/-5	+50/-50	105	10	60
AUTOBRAKE 3	2300	+45/-40	65	-110/+380	+5/-15	+65/-65	115	0	0
AUTOBRAKE 2	2530	+50/-50	75	-125/+435	+30/-50	+70/-70	110	60	60
AUTOBRAKE 1	2685	+65/-60	85	-140/+485	+60/-70	+75/-75	110	205	205

Medium Reported Braking Action

MAX MANUAL	2075	+45/-40	65	-115/+420	+90/-75	+50/-60	75	300	805
AUTOBRAKE MAX	2085	+45/-40	65	-115/+420	+90/-70	+50/-60	80	295	795
AUTOBRAKE 4	2135	+45/-40	65	-115/+425	+80/-50	+60/-60	100	280	800
AUTOBRAKE 3	2390	+45/-45	70	-125/+455	+50/-45	+65/-70	115	145	585
AUTOBRAKE 2	2590	+50/-50	80	-140/+490	+65/-70	+75/-75	110	130	455
AUTOBRAKE 1	2710	+65/-60	85	-145/+510	+85/-80	+75/-80	110	255	460

Poor Reported Braking Action

MAX MANUAL	2650	+65/-60	90	-165/+645	+205/-140	+70/-75	85	665	2140
AUTOBRAKE MAX	2655	+65/-60	90	-165/+645	+205/-145	+70/-75	85	665	2145
AUTOBRAKE 4	2675	+65/-60	90	-165/+650	+200/-140	+70/-75	90	675	2150
AUTOBRAKE 3	2750	+65/-60	90	-175/+655	+185/-120	+75/-80	110	615	2110
AUTOBRAKE 2	2860	+65/-60	90	-175/+665	+185/-130	+75/-80	105	530	1990
AUTOBRAKE 1	2920	+70/-65	100	-180/+685	+195/-130	+80/-80	105	580	1910

Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 75 m.

For autobrake and manual speedbrakes, increase reference landing distance by 65 m.

Distances for GOOD, MEDIUM, AND POOR are increased by 15%.

Includes distance from 50 ft above threshold (305 meters of unfactored air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ANTISKID - Flaps 25****VREF25**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10° C	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1705	+40/-30	50	-95/+355	+75/-60	+45/-45	60	230	605
AUTOBRAKE MAX									Autobrake inoperative
AUTOBRAKE 2									Autobrake inoperative

Good Reported Braking Action

MAX MANUAL	1705	+40/-30	50	-95/+355	+75/-60	+45/-45	60	230	605
AUTOBRAKE MAX									Autobrake inoperative
AUTOBRAKE 2									Autobrake inoperative

Medium Reported Braking Action

MAX MANUAL	2170	+55/-45	75	-140/+545	+165/-115	+55/-60	70	510	1595
AUTOBRAKE MAX									Autobrake inoperative
AUTOBRAKE 3									Autobrake inoperative

Poor Reported Braking Action

MAX MANUAL	2930	+85/-70	110	-235/+1045	+1350/-260	+75/-85	80	1790	5000
AUTOBRAKE MAX									Autobrake inoperative
AUTOBRAKE 3									Autobrake inoperative

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ANTISKID - Flaps 30****VREF30**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1620	+35/-20	50	-95/+345	+70/-60	+40/-40	60	205	530
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Good Reported Braking Action

MAX MANUAL	1620	+35/-20	50	-95/+345	+70/-60	+40/-40	60	205	530
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Medium Reported Braking Action

MAX MANUAL	2070	+50/-30	70	-135/+535	+165/-110	+55/-55	70	460	1410
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Poor Reported Braking Action

MAX MANUAL	2805	+80/-55	100	-230/+1035	+1310/-255	+70/-85	80	1675	5000
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ENG SHUTDOWN L, R - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 5 KTS	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	970	+35/-15	20	-40/+135	+15/-10	+20/-20	35	0	25
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2240	+50/-45	65	-110/+385	+10/-10	+65/-65	125	0	0

Good Reported Braking Action

MAX MANUAL	1400	+30/-25	35	-65/+235	+40/-35	+35/-35	55	0	120
AUTOBRAKE MAX	1490	+30/-30	40	-70/+245	+35/-30	+35/-40	65	0	125
AUTOBRAKE 2	2240	+50/-45	65	-110/+385	+10/-10	+65/-65	125	0	0

Medium Reported Braking Action

MAX MANUAL	1980	+45/-40	60	-110/+400	+105/-80	+55/-55	75	0	385
AUTOBRAKE MAX	1985	+45/-45	60	-110/+400	+105/-75	+55/-55	85	0	380
AUTOBRAKE 3	2135	+50/-45	65	-115/+415	+80/-50	+60/-60	105	0	310

Poor Reported Braking Action

MAX MANUAL	2665	+70/-65	90	-170/+645	+265/-170	+75/-75	90	0	990
AUTOBRAKE MAX	2675	+70/-65	90	-170/+645	+270/-175	+75/-80	90	0	995
AUTOBRAKE 3	2705	+70/-65	90	-170/+645	+270/-170	+75/-80	95	0	1005

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ENG SHUTDOWN L, R - Flaps 30****VREF30**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	890	+25/-5	20	-35/+125	+10/-10	+20/-20	35	0	20
AUTOBRAKE MAX	1180	+20/-5	25	-50/+175	0/0	+30/-30	65	0	0
AUTOBRAKE 2	1945	+40/-15	55	-105/+355	+10/-10	+55/-55	115	0	0

Good Reported Braking Action

MAX MANUAL	1250	+25/-10	30	-65/+220	+35/-30	+30/-30	55	0	85
AUTOBRAKE MAX	1340	+25/-10	35	-65/+230	+30/-25	+35/-35	65	0	90
AUTOBRAKE 2	1945	+40/-15	55	-105/+355	+10/-10	+55/-55	115	0	0

Medium Reported Braking Action

MAX MANUAL	1750	+40/-20	50	-100/+375	+95/-70	+45/-45	70	0	280
AUTOBRAKE MAX	1755	+40/-20	50	-105/+375	+90/-65	+50/-50	80	0	280
AUTOBRAKE 3	1875	+40/-15	55	-105/+390	+75/-45	+50/-50	95	0	235

Poor Reported Braking Action

MAX MANUAL	2335	+60/-35	75	-160/+605	+235/-150	+65/-65	85	0	725
AUTOBRAKE MAX	2340	+60/-35	75	-160/+605	+235/-150	+65/-70	85	0	725
AUTOBRAKE 3	2370	+60/-35	75	-160/+610	+240/-150	+65/-70	85	0	735

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAP / SLAT CONTROL - Flaps 20****VREF20**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10°C	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	955	+30/-15	20	-40/+130	+10/-10	+20/-20	35	20	50
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2180	+50/-50	65	-110/+375	+30/-45	+60/-60	90	60	60

Good Reported Braking Action

MAX MANUAL	1325	+25/-25	35	-65/+220	+30/-30	+30/-30	50	90	215
AUTOBRAKE MAX	1415	+30/-25	35	-65/+230	+25/-20	+35/-35	65	95	220
AUTOBRAKE 2	2180	+50/-50	65	-110/+375	+30/-45	+60/-60	90	60	60

Medium Reported Braking Action

MAX MANUAL	1780	+40/-40	55	-100/+360	+75/-60	+45/-45	65	250	670
AUTOBRAKE MAX	1795	+40/-40	55	-100/+360	+75/-55	+45/-50	70	245	660
AUTOBRAKE 3	2070	+45/-40	60	-110/+395	+45/-40	+55/-60	95	115	470

Poor Reported Braking Action

MAX MANUAL	2270	+60/-55	75	-145/+555	+175/-115	+60/-65	75	555	1765
AUTOBRAKE MAX	2275	+60/-55	80	-145/+555	+175/-120	+60/-65	75	555	1770
AUTOBRAKE 3	2365	+60/-55	75	-145/+565	+155/-105	+65/-65	95	500	1725

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS DRIVE - (Flaps ≤ 5)****VREF30+40**

LANDING DISTANCES AND ADJUSTMENTS (M)									
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1170	+45/-15	30	-45/+150	+15/-15	+25/-25	40	40	95
AUTOBRAKE MAX	1710	+30/-5	45	-65/+215	0/0	+45/-45	75	0	0
AUTOBRAKE 2	2845	+65/-45	95	-130/+430	+50/-70	+85/-85	95	220	220

Good Reported Braking Action

MAX MANUAL	1585	+30/-15	45	-70/+240	+35/-30	+40/-40	50	135	325
AUTOBRAKE MAX	1780	+30/-10	50	-75/+260	+15/-10	+45/-45	75	85	285
AUTOBRAKE 2	2845	+65/-45	95	-130/+430	+50/-70	+85/-85	95	220	220

Medium Reported Braking Action

MAX MANUAL	2170	+50/-30	70	-110/+390	+85/-70	+60/-60	65	375	1055
AUTOBRAKE MAX	2200	+50/-25	70	-110/+390	+80/-65	+60/-60	75	370	1040
AUTOBRAKE 3	2725	+55/-35	85	-130/+450	+50/-60	+75/-80	105	175	675

Poor Reported Braking Action

MAX MANUAL	2785	+70/-45	100	-155/+600	+195/-135	+75/-80	80	815	2845
AUTOBRAKE MAX	2795	+70/-45	100	-160/+600	+195/-135	+75/-80	80	815	2855
AUTOBRAKE 3	3005	+70/-45	105	-165/+620	+170/-120	+85/-85	100	665	2720

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS DRIVE - (5 < Flaps < 20)****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1020	+35/-5	25	-40/+135	+15/-10	+20/-20	35	25	60
AUTOBRAKE MAX	1430	+25/-5	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2425	+55/-30	75	-115/+400	+25/-50	+70/-70	100	60	60

Good Reported Braking Action

MAX MANUAL	1430	+30/-15	40	-65/+230	+35/-30	+35/-35	55	110	260
AUTOBRAKE MAX	1525	+30/-10	40	-70/+240	+30/-20	+40/-40	65	110	270
AUTOBRAKE 2	2425	+55/-30	75	-115/+400	+25/-50	+70/-70	100	60	60

Medium Reported Braking Action

MAX MANUAL	1945	+45/-25	60	-105/+375	+85/-70	+50/-50	70	305	840
AUTOBRAKE MAX	1965	+45/-25	60	-105/+380	+85/-65	+50/-55	70	300	835
AUTOBRAKE 3	2280	+45/-20	65	-115/+415	+40/-40	+65/-65	105	135	610

Poor Reported Braking Action

MAX MANUAL	2495	+65/-40	90	-150/+580	+190/-130	+65/-70	80	675	2250
AUTOBRAKE MAX	2515	+65/-40	90	-150/+585	+195/-135	+65/-70	80	680	2265
AUTOBRAKE 3	2610	+65/-35	90	-155/+590	+170/-110	+70/-75	100	625	2220

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS DRIVE - (Flaps \geq 20)****VREF20**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	960	+30/-15	20	-40/+130	+10/-10	+20/-20	35	25	50
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2200	+50/-50	65	-110/+380	+25/-45	+60/-60	95	50	50

Good Reported Braking Action

MAX MANUAL	1340	+25/-25	35	-65/+225	+35/-30	+30/-35	50	95	220
AUTOBRAKE MAX	1420	+30/-25	40	-65/+230	+30/-20	+35/-35	65	95	230
AUTOBRAKE 2	2200	+50/-50	65	-110/+380	+25/-45	+60/-60	95	50	50

Medium Reported Braking Action

MAX MANUAL	1805	+40/-40	55	-100/+365	+80/-65	+45/-50	65	260	700
AUTOBRAKE MAX	1815	+45/-40	55	-100/+365	+80/-60	+45/-50	70	255	690
AUTOBRAKE 3	2080	+45/-40	60	-110/+395	+45/-40	+55/-60	100	125	510

Poor Reported Braking Action

MAX MANUAL	2305	+60/-55	80	-145/+560	+180/-120	+60/-65	75	580	1860
AUTOBRAKE MAX	2310	+60/-55	80	-145/+560	+180/-125	+60/-65	75	580	1865
AUTOBRAKE 3	2390	+60/-55	80	-150/+570	+160/-105	+65/-70	95	535	1835

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS PRIMARY FAIL - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1080	+30/-15	25	-40/+145	+15/-15	+25/-25	45	30	60
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2245	+50/-50	65	-110/+385	+5/-25	+65/-65	115	10	10

Good Reported Braking Action

MAX MANUAL	1475	+30/-25	40	-70/+240	+35/-35	+35/-35	60	110	265
AUTOBRAKE MAX	1485	+30/-30	40	-70/+240	+35/-30	+35/-35	70	110	265
AUTOBRAKE 2	2245	+50/-50	65	-110/+385	+5/-25	+65/-65	115	10	10

Medium Reported Braking Action

MAX MANUAL	1965	+45/-40	60	-105/+385	+90/-70	+50/-50	75	305	835
AUTOBRAKE MAX	1955	+45/-40	60	-105/+380	+95/-75	+50/-50	80	305	830
AUTOBRAKE 3	2120	+45/-40	60	-110/+405	+55/-35	+60/-60	110	175	710

Poor Reported Braking Action

MAX MANUAL	2480	+65/-60	85	-155/+585	+195/-130	+65/-70	85	660	2200
AUTOBRAKE MAX	2490	+65/-60	85	-155/+585	+200/-140	+65/-70	85	660	2205
AUTOBRAKE 3	2515	+65/-55	85	-155/+590	+190/-120	+65/-70	100	645	2195

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLIGHT CONTROL MODE - Flaps 20****VREF20**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1105	+30/-15	25	-45/+145	+15/-15	+25/-25	50	30	70
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2260	+50/-50	65	-115/+385	0/-15	+65/-65	125	0	0

Good Reported Braking Action

MAX MANUAL	1520	+30/-30	40	-70/+245	+40/-35	+35/-35	65	125	300
AUTOBRAKE MAX	1510	+30/-30	40	-70/+245	+35/-30	+40/-40	70	120	290
AUTOBRAKE 2	2260	+50/-50	65	-115/+385	0/-15	+65/-65	125	0	0

Medium Reported Braking Action

MAX MANUAL	2030	+50/-45	65	-110/+390	+95/-75	+50/-55	80	340	945
AUTOBRAKE MAX	2020	+50/-45	65	-110/+390	+100/-80	+55/-55	85	335	940
AUTOBRAKE 3	2140	+50/-40	65	-115/+405	+70/-35	+60/-60	110	245	855

Poor Reported Braking Action

MAX MANUAL	2570	+70/-60	90	-155/+600	+210/-140	+65/-70	95	725	2515
AUTOBRAKE MAX	2580	+70/-60	90	-155/+600	+215/-145	+70/-70	95	730	2525
AUTOBRAKE 3	2585	+70/-60	90	-160/+600	+215/-130	+70/-75	105	725	2520

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS C - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1080	+30/-15	25	-40/+145	+15/-15	+25/-25	45	30	60
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2245	+50/-50	65	-110/+385	+5/-25	+65/-65	115	10	10

Good Reported Braking Action

MAX MANUAL	1475	+30/-25	40	-70/+240	+35/-35	+35/-35	60	110	265
AUTOBRAKE MAX	1485	+30/-30	40	-70/+240	+35/-30	+35/-35	70	110	265
AUTOBRAKE 2	2245	+50/-50	65	-110/+385	+5/-25	+65/-65	115	10	10

Medium Reported Braking Action

MAX MANUAL	1965	+45/-40	60	-105/+385	+90/-70	+50/-50	75	305	835
AUTOBRAKE MAX	1955	+45/-40	60	-105/+380	+95/-75	+50/-50	80	305	830
AUTOBRAKE 3	2120	+45/-40	60	-110/+405	+55/-35	+60/-60	110	175	710

Poor Reported Braking Action

MAX MANUAL	2480	+65/-60	85	-155/+585	+195/-130	+65/-70	85	660	2200
AUTOBRAKE MAX	2490	+65/-60	85	-155/+585	+200/-140	+65/-70	85	660	2205
AUTOBRAKE 3	2515	+65/-55	85	-155/+590	+190/-120	+65/-70	100	645	2195

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS L - Flaps 25****VREF25**

LANDING DISTANCES AND ADJUSTMENTS (M)									
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	990	+30/-10	20	-40/+140	+15/-15	+20/-20	40	0	30
AUTOBRAKE MAX	1260	+25/-15	30	-55/+180	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2135	+45/-30	60	-110/+375	0/-10	+60/-60	125	0	0

Good Reported Braking Action

MAX MANUAL	1435	+30/-20	40	-70/+250	+45/-40	+35/-35	65	0	135
AUTOBRAKE MAX	1495	+30/-20	40	-75/+255	+40/-30	+40/-40	70	0	135
AUTOBRAKE 2	2135	+45/-30	60	-110/+375	0/-10	+60/-60	125	0	0

Medium Reported Braking Action

MAX MANUAL	2065	+45/-35	65	-120/+435	+125/-95	+55/-60	85	0	455
AUTOBRAKE MAX	2070	+45/-35	65	-120/+435	+130/-100	+55/-60	85	0	455
AUTOBRAKE 3	2145	+45/-35	65	-120/+445	+115/-75	+60/-60	105	0	455

Poor Reported Braking Action

MAX MANUAL	2875	+70/-55	100	-195/+765	+380/-215	+80/-85	100	0	1310
AUTOBRAKE MAX	2885	+70/-55	100	-195/+765	+385/-220	+80/-85	100	0	1315
AUTOBRAKE 3	2910	+70/-55	100	-195/+765	+375/-220	+85/-85	100	0	1325

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS L - Flaps 30****VREF30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	945	+25/-5	20	-40/+135	+15/-15	+20/-20	40	0	25
AUTOBRAKE MAX	1180	+20/-5	25	-50/+175	0/0	+30/-30	65	0	0
AUTOBRAKE 2	1970	+40/-10	55	-105/+355	0/-5	+55/-55	120	0	0

Good Reported Braking Action

MAX MANUAL	1365	+25/-10	35	-70/+245	+45/-35	+35/-35	65	0	120
AUTOBRAKE MAX	1410	+25/-10	35	-70/+250	+35/-30	+35/-35	70	0	115
AUTOBRAKE 2	1970	+40/-10	55	-105/+355	0/-5	+55/-55	120	0	0

Medium Reported Braking Action

MAX MANUAL	1965	+45/-20	60	-115/+430	+125/-95	+55/-55	85	0	400
AUTOBRAKE MAX	1965	+45/-20	60	-115/+430	+130/-95	+55/-55	85	0	405
AUTOBRAKE 3	2020	+45/-20	60	-120/+435	+120/-75	+55/-55	95	0	415

Poor Reported Braking Action

MAX MANUAL	2745	+65/-35	95	-190/+750	+375/-210	+75/-80	100	0	1180
AUTOBRAKE MAX	2755	+65/-35	95	-190/+750	+380/-215	+80/-80	100	0	1185
AUTOBRAKE 3	2775	+65/-35	95	-195/+755	+370/-210	+80/-80	105	0	1190

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS L+C - Flaps 20****VREF30+20**

LANDING DISTANCES AND ADJUSTMENTS (M)									
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1245	+30/-5	30	-50/+165	+20/-20	+30/-30	55	0	50
AUTOBRAKE MAX	1430	+25/-5	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2485	+50/-10	70	-120/+405	0/0	+75/-75	140	0	0

Good Reported Braking Action

MAX MANUAL	1810	+35/-10	50	-85/+285	+60/-50	+45/-50	80	0	215
AUTOBRAKE MAX	1790	+35/-10	50	-85/+285	+60/-45	+50/-50	90	0	205
AUTOBRAKE 2	2485	+50/-10	70	-120/+405	0/0	+75/-75	140	0	0

Medium Reported Braking Action

MAX MANUAL	2595	+55/-25	85	-140/+495	+170/-125	+75/-75	105	0	710
AUTOBRAKE MAX	2585	+55/-25	85	-140/+495	+175/-135	+75/-75	110	0	705
AUTOBRAKE 3	2610	+55/-25	85	-140/+495	+170/-115	+75/-75	115	0	715

Poor Reported Braking Action

MAX MANUAL	3580	+85/-50	130	-225/+845	+480/-275	+105/-105	125	0	2015
AUTOBRAKE MAX	3590	+85/-50	135	-225/+850	+490/-285	+105/-110	125	0	2020
AUTOBRAKE 3	3595	+85/-50	135	-225/+850	+490/-275	+105/-110	130	0	2020

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS L+R - Flaps 20****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 5 KTS	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1360	+25/-5	35	-60/+195	+35/-30	+35/-35	65	0	0
AUTOBRAKE MAX Autobrake inoperative									
AUTOBRAKE 2 Autobrake inoperative									

Good Reported Braking Action

MAX MANUAL	2180	+40/-10	65	-110/+375	+120/-95	+65/-65	100	0	0
AUTOBRAKE MAX Autobrake inoperative									
AUTOBRAKE 2 Autobrake inoperative									

Medium Reported Braking Action

MAX MANUAL	3580	+65/-20	115	-210/+750	+450/-280	+110/-115	145	0	0
AUTOBRAKE MAX Autobrake inoperative									
AUTOBRAKE 3 Autobrake inoperative									

Poor Reported Braking Action

MAX MANUAL	6125	+85/15	215	-445/+1775	+3390/-875	+200/-205	180	0	0
AUTOBRAKE MAX Autobrake inoperative									
AUTOBRAKE 3 Autobrake inoperative									

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS R - Flaps 25****VREF25**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1090	+20/-15	25	-45/+165	+20/-20	+25/-25	50	0	45
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Good Reported Braking Action

MAX MANUAL	1580	+30/-25	45	-80/+290	+60/-50	+40/-40	70	0	190
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Medium Reported Braking Action

MAX MANUAL	2240	+50/-40	70	-135/+500	+165/-115	+60/-65	85	0	590
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Poor Reported Braking Action

MAX MANUAL	3070	+70/-55	110	-220/+880	+535/-255	+85/-90	100	0	1675
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS R - Flaps 30****VREF30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1035	+20/-5	25	-45/+160	+20/-15	+25/-25	45	0	40
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Good Reported Braking Action

MAX MANUAL	1480	+30/-10	40	-80/+280	+55/-45	+40/-40	65	0	160
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Medium Reported Braking Action

MAX MANUAL	2090	+45/-25	65	-130/+485	+155/-110	+60/-60	85	0	495
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Poor Reported Braking Action

MAX MANUAL	2860	+65/-40	100	-210/+855	+505/-240	+80/-85	95	0	1415
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS R+C - Flaps 20****VREF30+20**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1550	+25/-5	40	-65/+225	+40/-35	+40/-40	75	0	120
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Good Reported Braking Action

MAX MANUAL	2240	+45/-20	70	-110/+385	+110/-90	+60/-60	100	0	440
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Medium Reported Braking Action

MAX MANUAL	3130	+70/-35	110	-180/+655	+290/-195	+90/-90	120	0	1290
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Poor Reported Braking Action

MAX MANUAL	4220	+100/-60	165	-290/+1150	+1095/-405	+120/-130	135	0	3680
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****PITCH UP AUTHORITY - (Flaps ≤ 15)****VREF30+40**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1150	+40/-10	25	-45/+150	+15/-15	+25/-25	40	35	75
AUTOBRAKE MAX	1710	+30/-5	45	-65/+215	0/0	+45/-45	75	0	0
AUTOBRAKE 2	2750	+60/-40	90	-125/+420	+60/-65	+80/-80	90	245	265

Good Reported Braking Action

MAX MANUAL	1575	+30/-15	45	-70/+240	+35/-30	+40/-40	50	120	285
AUTOBRAKE MAX	1795	+30/-10	50	-75/+260	+20/-15	+45/-50	75	80	245
AUTOBRAKE 2	2750	+60/-40	90	-125/+420	+60/-65	+80/-80	90	245	265

Medium Reported Braking Action

MAX MANUAL	2135	+45/-30	70	-105/+390	+85/-70	+55/-60	60	325	865
AUTOBRAKE MAX	2210	+50/-30	70	-110/+395	+80/-65	+60/-60	75	325	870
AUTOBRAKE 3	2655	+55/-35	85	-125/+445	+70/-65	+75/-75	85	190	565

Poor Reported Braking Action

MAX MANUAL	2720	+65/-45	95	-155/+595	+190/-130	+75/-75	75	690	2225
AUTOBRAKE MAX	2750	+65/-45	100	-155/+595	+190/-130	+75/-80	80	685	2225
AUTOBRAKE 3	2940	+70/-50	100	-165/+615	+180/-130	+80/-85	85	585	2090

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****PITCH UP AUTHORITY - (Flaps ≥ 20)**

VREF30+20

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	990	+35/-5	20	-40/+130	+10/-10	+20/-20	35	25	50
AUTOBRAKE MAX	1430	+25/-5	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2320	+55/-35	75	-115/+385	+45/-50	+65/-65	85	130	130

Good Reported Braking Action

MAX MANUAL	1380	+25/-15	35	-65/+225	+30/-30	+35/-35	45	95	220
AUTOBRAKE MAX	1520	+30/-10	40	-70/+240	+20/-15	+40/-40	70	80	215
AUTOBRAKE 2	2320	+55/-35	75	-115/+385	+45/-50	+65/-65	85	130	130

Medium Reported Braking Action

MAX MANUAL	1855	+40/-25	55	-100/+365	+75/-60	+50/-50	60	260	680
AUTOBRAKE MAX	1895	+45/-20	60	-100/+370	+70/-55	+50/-50	70	255	670
AUTOBRAKE 3	2225	+45/-25	65	-115/+410	+55/-50	+60/-65	90	125	440

Poor Reported Braking Action

MAX MANUAL	2365	+60/-40	80	-145/+560	+175/-120	+65/-65	70	565	1775
AUTOBRAKE MAX	2375	+60/-40	80	-145/+565	+175/-120	+65/-65	75	565	1775
AUTOBRAKE 3	2505	+60/-40	85	-150/+575	+160/-110	+70/-70	85	470	1690

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****PRIMARY FLIGHT COMPUTERS - Flaps 20**

VREF20

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1105	+30/-15	25	-45/+145	+15/-15	+25/-25	50	30	70
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2260	+50/-50	65	-115/+385	0/-15	+65/-65	125	0	0

Good Reported Braking Action

MAX MANUAL	1520	+30/-30	40	-70/+245	+40/-35	+35/-35	65	125	300
AUTOBRAKE MAX	1510	+30/-30	40	-70/+245	+35/-30	+40/-40	70	120	290
AUTOBRAKE 2	2260	+50/-50	65	-115/+385	0/-15	+65/-65	125	0	0

Medium Reported Braking Action

MAX MANUAL	2030	+50/-45	65	-110/+390	+95/-75	+50/-55	80	340	945
AUTOBRAKE MAX	2020	+50/-45	65	-110/+390	+100/-80	+55/-55	85	335	940
AUTOBRAKE 3	2140	+50/-40	65	-115/+405	+70/-35	+60/-60	110	245	855

Poor Reported Braking Action

MAX MANUAL	2570	+70/-60	90	-155/+600	+210/-140	+65/-70	95	725	2515
AUTOBRAKE MAX	2580	+70/-60	90	-155/+600	+215/-145	+70/-70	95	730	2525
AUTOBRAKE 3	2585	+70/-60	90	-160/+600	+215/-130	+70/-75	105	725	2520

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****SLATS DRIVE - Flaps 20****VREF30+30**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1110	+35/-5	25	-40/+145	+15/-15	+25/-25	40	30	70
AUTOBRAKE MAX	1565	+25/-5	40	-60/+205	+5/0	+40/-40	75	0	0
AUTOBRAKE 2	2550	+55/-35	80	-120/+405	+55/-60	+75/-75	90	170	175

Good Reported Braking Action

MAX MANUAL	1545	+30/-15	45	-70/+240	+40/-35	+40/-40	55	120	285
AUTOBRAKE MAX	1670	+30/-10	45	-75/+250	+25/-20	+45/-45	75	115	290
AUTOBRAKE 2	2550	+55/-35	80	-120/+405	+55/-60	+75/-75	90	170	175

Medium Reported Braking Action

MAX MANUAL	2065	+45/-30	65	-105/+385	+90/-70	+55/-55	65	315	840
AUTOBRAKE MAX	2100	+45/-25	65	-105/+390	+80/-65	+55/-60	75	310	825
AUTOBRAKE 3	2455	+50/-30	75	-120/+430	+65/-60	+70/-70	90	160	565

Poor Reported Braking Action

MAX MANUAL	2605	+65/-45	90	-155/+585	+190/-130	+70/-75	75	655	2095
AUTOBRAKE MAX	2615	+65/-45	90	-155/+590	+190/-130	+70/-75	80	655	2095
AUTOBRAKE 3	2755	+65/-45	95	-160/+600	+175/-125	+75/-80	90	555	2000

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****STABILIZER - Flaps 20****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 5 KTS	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1030	+30/-5	25	-40/+135	+15/-10	+25/-25	35	25	60
AUTOBRAKE MAX	1430	+25/-5	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2360	+55/-35	75	-115/+390	+40/-50	+65/-65	90	100	100

Good Reported Braking Action

MAX MANUAL	1435	+30/-15	40	-65/+230	+35/-30	+35/-35	50	105	255
AUTOBRAKE MAX	1535	+30/-10	40	-70/+240	+30/-20	+40/-40	70	110	260
AUTOBRAKE 2	2360	+55/-35	75	-115/+390	+40/-50	+65/-65	90	100	100

Medium Reported Braking Action

MAX MANUAL	1925	+45/-25	60	-105/+375	+85/-65	+50/-50	65	285	770
AUTOBRAKE MAX	1945	+45/-25	60	-105/+375	+80/-60	+50/-55	75	280	755
AUTOBRAKE 3	2250	+45/-25	65	-115/+410	+55/-45	+65/-65	95	135	535

Poor Reported Braking Action

MAX MANUAL	2440	+60/-40	85	-150/+575	+185/-125	+65/-70	75	615	1965
AUTOBRAKE MAX	2450	+65/-40	85	-150/+575	+185/-125	+65/-70	75	615	1970
AUTOBRAKE 3	2555	+60/-35	85	-155/+585	+165/-110	+70/-75	95	540	1905

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 25 or 30

AIRPORT OAT		CLIMB LIMIT WEIGHT (1000 KG)			
		AIRPORT PRESSURE ALTITUDE (FT)			
°C	°F	0	1000	2000	3000
54	130	199			
50	122	214	205	196	
45	113	229	220	212	202
40	104	245	235	226	216
35	95	258	252	242	230
30	86	263	260	255	243
25	77	263	261	258	255
20	68	264	261	258	255
15	59	264	261	259	256
10 & BELOW	50 & BELOW	264	262	259	256

Based on engine bleed for 2 packs on and engine anti-ice on or off and wing anti-ice off.

With packs off, increase allowable weight by 2100 kg.

With engine and wing anti-ice on, decrease allowable weight by 900 kg.

Decrease allowable weight by 18000 kg for ice accumulation when operating in icing conditions during any part of the flight with forecast landing temperatures below 10°C.

777 Flight Crew Operations Manual

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Reference Brake Energy (Millions of Foot Pounds)**

WEIGHT (1000 KG)	OAT (°C)	BRAKES ON SPEED (KIAS)											
		PRESSURE ALTITUDE (1000 FT)											
		80		100		120		140		160		180	
0	0	0	2	4	0	2	4	0	2	4	0	2	4
300	0	18.3	19.2	20.2	27.3	28.8	30.5	37.8	40.0	42.4	49.5	52.5	55.8
	10	18.8	19.7	20.7	28.2	29.7	31.4	39.0	41.3	43.8	51.1	54.2	57.6
	15	19.2	20.1	21.1	28.7	30.3	32.0	39.7	42.1	44.6	52.0	55.2	58.6
	20	19.5	20.4	21.5	29.2	30.8	32.5	40.4	42.8	45.3	52.9	56.1	59.6
	30	19.9	20.9	22.0	29.9	31.6	33.3	41.5	43.9	46.6	54.4	57.7	61.3
	40	20.1	21.1	22.2	30.3	32.0	33.8	42.2	44.7	47.4	55.4	58.9	62.5
280	0	17.3	18.2	19.1	25.8	27.2	28.8	35.7	37.7	40.0	46.7	49.5	52.5
	10	17.8	18.7	19.6	26.6	28.1	29.6	36.8	38.9	41.2	48.2	51.1	54.2
	15	18.1	19.0	20.0	27.1	28.6	30.2	37.5	39.6	42.0	49.1	52.0	55.2
	20	18.4	19.3	20.3	27.6	29.1	30.7	38.1	40.3	42.7	49.9	52.9	56.1
	30	18.9	19.8	20.8	28.3	29.8	31.5	39.1	41.4	43.9	51.3	54.4	57.7
	40	19.0	20.0	21.0	28.6	30.2	31.9	39.8	42.1	44.6	52.2	55.4	58.9
260	0	16.4	17.2	18.0	24.4	25.7	27.1	33.5	35.5	37.5	43.8	46.4	49.3
	10	16.8	17.6	18.5	25.1	26.4	27.9	34.6	36.6	38.7	45.2	47.9	50.8
	15	17.1	18.0	18.9	25.6	26.9	28.4	35.2	37.3	39.4	46.0	48.8	51.7
	20	17.4	18.3	19.2	26.0	27.4	28.9	35.8	37.9	40.1	46.8	49.6	52.6
	30	17.8	18.7	19.6	26.6	28.0	29.6	36.8	38.9	41.2	48.1	51.0	54.1
	40	18.0	18.8	19.8	26.9	28.4	30.0	37.3	39.5	41.9	49.0	51.9	55.2
240	0	15.5	16.2	17.0	22.9	24.1	25.4	31.4	33.2	35.1	40.9	43.5	45.9
	10	15.9	16.6	17.4	23.5	24.8	26.1	32.4	34.2	36.2	42.2	44.7	47.4
	15	16.2	16.9	17.7	24.0	25.3	26.6	33.0	34.8	36.9	43.0	45.5	48.3
	20	16.4	17.2	18.0	24.4	25.7	27.0	33.5	35.4	37.5	43.7	46.3	49.1
	30	16.8	17.6	18.4	25.0	26.3	27.7	34.4	36.3	38.5	44.9	47.5	50.4
	40	16.9	17.7	18.6	25.3	26.6	28.1	34.9	36.9	39.1	45.7	48.4	51.4
220	0	14.5	15.2	15.9	21.4	22.5	23.7	29.2	30.9	32.6	37.9	40.2	42.6
	10	14.9	15.6	16.4	22.0	23.2	24.4	30.1	31.8	33.6	39.1	41.4	43.9
	15	15.2	15.9	16.7	22.4	23.6	24.8	30.7	32.4	34.2	39.8	42.2	44.7
	20	15.5	16.2	16.9	22.8	24.0	25.2	31.2	32.9	34.8	40.5	42.9	45.5
	30	15.8	16.5	17.3	23.3	24.6	25.9	32.0	33.8	35.7	41.6	44.1	46.7
	40	15.9	16.6	17.4	23.6	24.8	26.2	32.5	34.3	36.3	42.3	44.8	47.6
200	0	13.6	14.3	14.9	19.9	20.9	22.0	27.1	28.5	30.1	35.0	37.0	39.2
	10	14.0	14.6	15.3	20.5	21.5	22.6	27.9	29.4	31.1	36.0	38.1	40.4
	15	14.3	14.9	15.6	20.9	21.9	23.0	28.4	29.9	31.7	36.7	38.8	41.1
	20	14.5	15.1	15.8	21.2	22.3	23.4	28.9	30.4	32.2	37.3	39.5	41.8
	30	14.8	15.5	16.2	21.7	22.8	24.0	29.6	31.2	33.0	38.3	40.6	43.0
	40	14.9	15.6	16.3	21.9	23.1	24.3	30.0	31.7	33.5	38.9	41.2	43.7
180	0	12.8	13.3	13.9	18.4	19.4	20.3	24.9	26.2	27.6	31.9	33.8	35.7
	10	13.1	13.7	14.3	19.0	19.9	20.9	25.6	27.0	28.5	32.9	34.8	36.8
	15	13.3	13.9	14.6	19.3	20.3	21.3	26.1	27.5	29.0	33.5	35.4	37.5
	20	13.5	14.1	14.8	19.6	20.6	21.7	26.5	27.9	29.5	34.1	36.0	38.1
	30	13.8	14.4	15.1	20.1	21.1	22.2	27.2	28.6	30.2	35.0	37.0	39.2
	40	13.9	14.5	15.2	20.3	21.3	22.4	27.5	29.0	30.7	35.5	37.6	39.8

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.

If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Event Adjusted Brake Energy (Millions of Foot Pounds)****No Reverse Thrust**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)									
EVENT		10	20	30	40	50	60	70	80	90	100
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100
	MAX MAN	5.5	14.9	24.1	33.2	42.3	51.4	60.6	69.9	79.3	88.9
	MAX AUTO	5.5	14.0	22.4	31.0	39.6	48.5	57.6	67.0	76.7	86.9
	AUTOBRAKE 4	5.5	13.5	21.4	29.3	37.3	45.5	54.1	63.1	72.6	82.8
	AUTOBRAKE 3	5.5	12.9	20.3	27.6	35.0	42.5	50.5	58.8	67.8	77.4
	AUTOBRAKE 2	5.4	12.4	19.2	25.9	32.7	39.7	46.9	54.6	62.8	71.7
	AUTOBRAKE 1	5.4	11.9	18.2	24.4	30.6	37.0	43.7	50.8	58.5	66.8

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)									
EVENT		10	20	30	40	50	60	70	80	90	100
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100
	MAX MAN	4.8	13.6	22.1	30.5	38.8	47.0	55.2	63.4	71.7	80.0
	MAX AUTO	3.0	10.1	17.3	24.5	31.9	39.6	47.5	55.9	64.7	74.0
	AUTOBRAKE 4	2.5	7.9	13.5	19.4	25.6	32.1	39.1	46.6	54.7	63.4
	AUTOBRAKE 3	1.6	5.5	9.7	14.2	19.1	24.5	30.3	36.6	43.4	50.7
	AUTOBRAKE 2	0.9	3.6	6.6	10.0	13.7	17.8	22.4	27.4	32.8	38.7
	AUTOBRAKE 1	0.6	2.7	5.0	7.5	10.3	13.4	16.8	20.7	25.1	30.1

Cooling Time (Minutes)

		EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
16 & BELOW		17	18	20	24	28	32	35	36 TO 44	45 & ABOVE	
INFLIGHT GEAR DOWN	NO SPECIAL PROCEDURE	1	1	2	4	5	6	7	CAUTION	FUSE PLUG MELT ZONE	
GROUND REQUIRED		10	13	23	40	53	66	73			
BTMS	UP TO 2.4	2.4	2.5	2.9	3.4	4.0	4.4	4.9	5.0 TO 6.3	6.3 & ABOVE	

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

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 8 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 EICAS may be used 12 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule.

(Inflight gear extended, the BTMS indications may vary between individual brakes, due to airstream effects, gear tilt, and position of the gear temperature probes.)

DRAFT

Intentionally
Blank

Performance Inflight

Engine Inoperative

Chapter PI

Section 13

ENGINE INOP

Initial Max Continuous %N1

Based on .84M, engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	98.7	98.2	97.7	97.3	97.2	96.8	96.9	96.5	96.1
15	99.3	98.8	98.3	97.8	97.8	97.1	97.2	96.8	96.4
10	99.9	99.4	98.9	98.4	98.4	97.7	97.8	97.4	97.1
5	100.3	100.1	99.5	99.1	99.0	98.3	98.4	98.1	97.7
0	99.4	100.3	100.2	99.7	99.6	99.0	99.1	98.7	98.4
-5	98.5	99.4	100.4	100.6	100.4	99.6	99.8	99.4	99.0
-10	97.6	98.5	99.5	100.7	101.6	100.6	100.7	100.3	99.9
-15	96.6	97.6	98.5	99.7	101.5	101.5	101.6	101.2	100.8
-20	95.7	96.6	97.6	98.7	100.5	100.6	100.6	100.2	99.9
-25	94.8	95.6	96.6	97.7	99.5	99.6	99.6	99.3	98.9
-30	93.8	94.7	95.6	96.8	98.5	98.6	98.6	98.2	97.9
-35	92.8	93.7	94.6	95.8	97.5	97.5	97.6	97.2	96.9
-40	91.8	92.7	93.6	94.7	96.5	96.5	96.5	96.2	95.8

ENGINE INOP**Max Continuous %N1**

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

37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT			TAT (°C)										
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.63	95.1	96.1	97.2	98.2	99.2	100.2	100.8	100.4	99.6	98.9	98.2	98.0
240	0.74	95.1	96.1	97.2	98.2	99.3	100.3	101.0	100.9	100.2	99.3	98.6	98.0
280	0.86	94.0	95.1	96.1	97.1	98.2	99.2	100.2	101.1	100.7	99.7	99.0	98.4
35000 FT PRESS ALT			TAT (°C)										
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.60	94.8	95.9	96.9	98.0	99.0	100.0	101.0	101.2	100.4	99.6	98.8	98.5
240	0.71	94.9	95.9	97.0	98.0	99.0	100.0	101.0	101.6	100.9	99.9	99.2	98.7
280	0.82	94.7	95.8	96.8	97.9	98.9	99.9	100.9	101.9	101.3	100.3	99.6	98.9
33000 FT PRESS ALT			TAT (°C)										
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.58	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.3	100.6	99.7	98.9	98.1
240	0.68	94.7	95.7	96.8	97.8	98.8	99.8	100.8	101.2	100.8	100.0	99.3	98.6
280	0.79	93.8	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.3	100.4	99.6	98.9
320	0.89	91.4	92.5	93.5	94.5	95.5	96.4	97.4	98.4	99.3	100.2	99.9	99.2
31000 FT PRESS ALT			TAT (°C)										
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
200	0.55	95.8	96.8	97.8	98.9	99.9	100.8	101.4	101.1	100.2	99.3	98.5	97.8
240	0.66	95.5	96.5	97.6	98.6	99.6	100.6	101.4	101.2	100.4	99.6	99.0	98.3
280	0.76	94.4	95.4	96.4	97.4	98.4	99.4	100.4	101.3	100.8	99.9	99.3	98.6
320	0.85	92.3	93.3	94.3	95.2	96.2	97.2	98.1	99.1	100.0	100.3	99.5	98.9
29000 FT PRESS ALT			TAT (°C)										
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	0.53	96.7	97.7	98.7	99.7	100.7	101.5	101.6	100.8	99.8	98.9	98.0	98.1
240	0.63	96.2	97.2	98.2	99.2	100.2	101.2	101.5	101.0	100.1	99.4	98.7	98.0
280	0.73	95.1	96.2	97.2	98.2	99.1	100.1	101.1	101.3	100.4	99.7	99.1	98.5
320	0.82	93.1	94.1	95.1	96.1	97.0	98.0	98.9	99.9	100.8	100.0	99.4	98.7
360	0.91	91.0	92.0	93.0	93.9	94.9	95.8	96.7	97.6	98.5	99.4	99.7	99.1
27000 FT PRESS ALT			TAT (°C)										
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	0.51	96.5	97.5	98.6	99.6	100.6	101.5	101.9	101.4	100.4	99.4	98.5	97.5
240	0.60	95.9	96.9	97.9	98.9	99.9	100.9	101.7	101.5	100.7	99.9	99.2	98.4
280	0.70	94.8	95.8	96.8	97.8	98.7	99.7	100.7	101.6	101.0	100.2	99.5	98.9
320	0.79	92.9	93.9	94.9	95.9	96.8	97.8	98.7	99.7	100.6	100.5	99.8	99.2
360	0.88	90.9	91.9	92.9	93.8	94.8	95.7	96.6	97.5	98.4	99.3	100.0	99.4

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION			PRESS ALT (1000 FT)					
			37	35	33	31	29	27
ENGINE ANTI-ICE ON			-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON (packs on)			-1.0	-1.0	-0.9	-0.9	-0.8	-0.8
ENGINE & WING ANTI-ICE ON (packs off)			-1.7	-1.6	-1.5	-1.4	-1.3	-1.2

ENGINE INOP**Max Continuous %N1**

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

25000 FT to 18000 FT Pressure Altitudes

25000 FT PRESS ALT			TAT (°C)										
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.49	97.5	98.5	99.5	100.5	101.5	102.2	101.9	100.9	99.9	98.9	97.9	97.7
240	0.58	96.7	97.7	98.7	99.7	100.6	101.6	101.8	101.1	100.3	99.6	98.8	98.0
280	0.67	95.3	96.3	97.2	98.2	99.2	100.1	101.1	101.3	100.6	100.0	99.3	98.7
320	0.76	93.6	94.6	95.5	96.5	97.4	98.4	99.3	100.2	100.9	100.2	99.6	99.0
360	0.85	91.8	92.7	93.7	94.6	95.5	96.5	97.4	98.3	99.2	100.1	99.8	99.2
24000 FT PRESS ALT			TAT (°C)										
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
200	0.48	97.4	98.4	99.4	100.4	101.4	102.2	102.2	101.2	100.2	99.2	98.2	97.4
240	0.57	96.4	97.4	98.4	99.4	100.4	101.4	102.0	101.5	100.6	99.9	99.1	98.2
280	0.66	95.1	96.1	97.1	98.0	99.0	100.0	100.9	101.6	100.9	100.2	99.6	98.9
320	0.75	93.5	94.4	95.4	96.4	97.3	98.3	99.2	100.1	101.0	100.5	99.8	99.3
360	0.83	91.7	92.7	93.6	94.6	95.5	96.4	97.3	98.2	99.1	100.0	100.1	99.4
22000 FT PRESS ALT			TAT (°C)										
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
200	0.46	98.1	99.1	100.1	101.0	102.0	102.4	101.7	100.7	99.7	98.7	97.8	97.7
240	0.55	97.0	98.0	99.0	100.0	101.0	101.9	101.9	101.2	100.4	99.6	98.8	98.0
280	0.63	95.8	96.8	97.7	98.7	99.6	100.6	101.5	101.4	100.7	100.1	99.4	98.7
320	0.72	94.2	95.1	96.1	97.0	98.0	98.9	99.8	100.7	100.9	100.3	99.7	99.1
360	0.80	92.5	93.5	94.4	95.3	96.3	97.2	98.1	99.0	99.9	100.5	99.9	99.3
20000 FT PRESS ALT			TAT (°C)										
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
200	0.44	97.7	98.7	99.7	100.7	101.7	102.6	102.3	101.3	100.3	99.3	98.4	97.7
240	0.53	96.7	97.7	98.7	99.7	100.6	101.6	102.4	101.8	101.0	100.2	99.3	98.6
280	0.61	95.5	96.5	97.5	98.4	99.4	100.3	101.3	102.0	101.3	100.6	99.9	99.2
320	0.69	93.9	94.8	95.8	96.7	97.7	98.6	99.5	100.4	101.3	100.8	100.0	99.2
360	0.77	92.4	93.4	94.3	95.2	96.1	97.0	98.0	98.8	99.7	100.6	100.3	99.6
18000 FT PRESS ALT			TAT (°C)										
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.42	98.3	99.2	100.2	101.2	102.1	102.6	101.6	100.5	99.5	98.6	97.8	97.4
240	0.51	97.2	98.1	99.1	100.0	101.0	101.9	102.0	101.1	100.2	99.4	98.7	98.0
280	0.59	95.6	96.5	97.5	98.4	99.3	100.3	101.2	101.2	100.4	99.8	99.2	98.6
320	0.67	94.1	95.0	95.9	96.9	97.8	98.7	99.6	100.5	100.7	100.1	99.5	98.9
360	0.75	92.7	93.6	94.5	95.4	96.3	97.2	98.1	99.0	99.9	100.3	99.8	99.2

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESS ALT (1000 FT)				
	25	24	22	20	18
ENGINE ANTI-ICE ON	-0.4	-0.4	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON (packs on)	-0.8	-0.7	-0.7	-0.5	-0.5
ENGINE & WING ANTI-ICE ON (packs off)	-1.1	-1.1	-1.0	-0.7	-0.7

ENGINE INOP**Max Continuous %N1**

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

16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT			TAT (°C)										
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.41	97.1	98.1	99.0	100.0	100.9	101.9	101.7	100.6	99.6	98.7	97.9	97.1
240	0.49	96.2	97.1	98.1	99.0	100.0	100.9	101.8	101.2	100.2	99.4	98.6	97.9
280	0.57	94.7	95.7	96.6	97.6	98.5	99.4	100.3	101.2	100.5	99.8	99.1	98.3
320	0.64	93.4	94.3	95.2	96.1	97.0	97.9	98.8	99.7	100.6	100.0	99.5	98.8
360	0.72	92.1	93.0	93.9	94.8	95.7	96.6	97.5	98.3	99.2	100.1	99.8	99.2
14000 FT PRESS ALT			TAT (°C)										
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
200	0.39	96.7	97.7	98.6	99.6	100.5	101.4	100.5	99.5	98.6	97.8	97.1	96.3
240	0.47	95.9	96.8	97.8	98.7	99.6	100.5	101.1	100.2	99.4	98.5	97.8	97.0
280	0.54	94.9	95.8	96.7	97.6	98.5	99.4	100.3	100.7	100.0	99.2	98.3	97.5
320	0.62	93.8	94.7	95.6	96.5	97.4	98.3	99.2	100.1	100.4	99.7	99.0	98.1
360	0.69	92.5	93.4	94.3	95.2	96.1	96.9	97.8	98.7	99.5	99.9	99.3	98.6
12000 FT PRESS ALT			TAT (°C)										
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
200	0.38	96.4	97.4	98.3	99.2	100.1	100.6	99.7	98.7	97.9	97.1	96.3	95.5
240	0.45	95.8	96.7	97.7	98.6	99.5	100.4	100.3	99.4	98.6	97.7	96.8	96.0
280	0.52	95.0	96.0	96.9	97.8	98.7	99.5	100.4	100.0	99.2	98.5	97.5	96.7
320	0.60	93.9	94.8	95.7	96.6	97.5	98.4	99.2	100.1	99.7	99.0	98.2	97.3
360	0.67	92.7	93.6	94.5	95.4	96.3	97.1	98.0	98.8	99.7	99.3	98.6	97.8
10000 FT PRESS ALT			TAT (°C)										
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
200	0.36	95.4	96.3	97.2	98.1	99.0	99.9	99.8	98.9	98.1	97.3	96.5	95.7
240	0.43	94.8	95.7	96.6	97.5	98.4	99.3	100.1	99.5	98.7	97.9	96.9	96.1
280	0.51	94.1	95.0	95.9	96.8	97.7	98.6	99.4	100.1	99.3	98.5	97.7	96.8
320	0.58	93.1	94.0	94.9	95.8	96.7	97.5	98.4	99.3	99.7	99.0	98.2	97.4
360	0.65	92.0	92.9	93.8	94.6	95.5	96.3	97.2	98.0	98.9	99.2	98.6	97.8
5000 FT PRESS ALT			TAT (°C)										
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
200	0.33	92.4	93.3	94.1	95.0	95.8	96.7	97.5	97.3	96.6	95.8	94.9	94.1
240	0.40	92.0	92.9	93.7	94.6	95.4	96.3	97.1	97.7	97.0	96.2	95.3	94.5
280	0.46	91.6	92.4	93.3	94.2	95.0	95.8	96.7	97.5	97.5	96.7	95.9	95.0
320	0.53	91.0	91.8	92.7	93.5	94.4	95.2	96.0	96.8	97.6	97.2	96.4	95.6
360	0.59	90.2	91.0	91.9	92.7	93.5	94.4	95.2	96.0	96.8	97.6	96.9	96.1

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESS ALT (1000 FT)				
	16	14	12	10	5
ENGINE ANTI-ICE ON	-0.4	-0.4	-0.4	-0.4	-0.3
ENGINE & WING ANTI-ICE ON (packs on)	-0.5	-0.5	-0.5	-0.5	-0.5
ENGINE & WING ANTI-ICE ON (packs off)	-0.7	-0.7	-0.7	-0.7	-0.7

ENGINE INOP**MAX CONTINUOUS THRUST****Driftdown Speed/Level Off Altitude****100 ft/min residual rate of climb****Includes APU fuel burn**

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
260	252	263	19700	18400	16600
240	232	253	22000	21000	19700
220	213	243	24200	23500	22300
200	194	232	26600	26000	25000
180	174	220	29000	28700	27900
160	155	208	31600	31500	31000

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	
134	125	118	111	105	100	95	91	87	83	80	
273	255	238	224	211	200	190	181	172	165	158	
412	383	358	337	317	300	285	271	258	246	236	
550	511	478	449	423	400	379	361	344	329	314	
686	639	597	561	529	500	474	451	430	411	393	
822	765	716	673	634	600	569	541	516	493	472	
958	892	835	784	740	700	664	632	603	576	552	
1093	1018	953	896	845	800	759	723	689	659	631	
1227	1144	1071	1007	951	900	854	813	776	742	711	
1362	1270	1190	1119	1056	1000	950	904	863	825	790	
1496	1395	1308	1230	1161	1100	1045	995	949	908	870	
1630	1521	1426	1342	1267	1200	1140	1085	1036	991	949	
1765	1647	1544	1453	1372	1300	1235	1176	1123	1074	1029	
1900	1773	1662	1565	1478	1400	1330	1267	1209	1157	1108	
2035	1900	1781	1676	1583	1500	1425	1357	1296	1239	1188	
2171	2027	1900	1788	1689	1600	1520	1448	1382	1322	1267	
2308	2154	2019	1900	1795	1700	1615	1538	1468	1404	1346	
2445	2282	2139	2012	1900	1800	1710	1628	1554	1486	1424	

ENGINE INOP**MAX CONTINUOUS THRUST****Driftdown/LRC Cruise Range Capability****Driftdown/Cruise Fuel and Time**

AIR DIST (NM)	FUEL REQUIRED (1000 KG)						TIME (HR:MIN)	
	WEIGHT AT START OF DRIFTDOWN (1000 KG)							
	160	180	200	220	240	260		
100	0.9	1.0	1.0	1.1	1.2	1.3	0:15	
200	2.1	2.3	2.5	2.7	2.9	3.1	0:32	
300	3.4	3.7	4.1	4.4	4.8	5.2	0:49	
400	4.7	5.2	5.7	6.2	6.7	7.2	1:05	
500	6.0	6.6	7.3	8.0	8.6	9.3	1:21	
600	7.2	8.0	8.8	9.6	10.4	11.2	1:37	
700	8.4	9.3	10.3	11.3	12.2	13.1	1:53	
800	9.6	10.7	11.8	12.9	13.9	15.0	2:09	
900	10.8	12.0	13.3	14.5	15.7	16.9	2:24	
1000	12.0	13.3	14.7	16.1	17.5	18.8	2:39	
1100	13.2	14.7	16.2	17.7	19.2	20.7	2:55	
1200	14.4	16.0	17.6	19.3	20.9	22.5	3:10	
1300	15.5	17.3	19.1	20.9	22.6	24.4	3:25	
1400	16.7	18.6	20.5	22.4	24.3	26.2	3:41	
1500	17.8	19.8	21.9	24.0	26.0	28.0	3:57	
1600	18.9	21.1	23.3	25.5	27.6	29.8	4:13	
1700	20.0	22.3	24.7	27.0	29.3	31.6	4:29	
1800	21.1	23.6	26.1	28.5	30.9	33.4	4:45	

APU fuel included.

Driftdown at optimum speed and cruise at LRC speed.

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
260	15400	13400	10700
240	18500	16300	14400
220	21300	20100	18000
200	23900	22900	21500
180	26600	25800	24600
160	29500	28900	27900
140	32400	32200	31400

With engine anti-ice on, decrease altitude capability by 700 ft.

With engine and wing anti-ice on, decrease altitude capability by 1100 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
260	%N1	91.5	95.9	97.6					
	MACH	.557	.602	.624					
	KIAS	309	305	304					
	FF/ENG	7544	7611	7718					
240	%N1	89.2	93.5	95.2	97.1				
	MACH	.541	.582	.602	.625				
	KIAS	300	294	293	293				
	FF/ENG	6945	6927	6973	7082				
220	%N1	86.6	90.9	92.6	94.4	96.3			
	MACH	.523	.563	.581	.601	.624			
	KIAS	290	285	283	281	281			
	FF/ENG	6360	6291	6302	6339	6448			
200	%N1	83.9	88.3	89.9	91.7	93.5	95.3	98.2	
	MACH	.504	.544	.561	.578	.598	.621	.653	
	KIAS	279	275	272	270	269	268	272	
	FF/ENG	5797	5700	5677	5683	5711	5811	6096	
180	%N1	81.3	85.3	87.0	88.7	90.4	92.2	94.0	96.6
	MACH	.486	.523	.539	.556	.574	.593	.615	.646
	KIAS	269	263	262	259	257	256	255	257
	FF/ENG	5264	5145	5101	5071	5067	5086	5163	5384
160	%N1	78.6	82.1	83.8	85.5	87.2	88.9	90.6	92.4
	MACH	.468	.499	.515	.532	.549	.566	.585	.607
	KIAS	259	251	250	248	246	244	242	241
	FF/ENG	4777	4580	4553	4511	4470	4457	4468	4522
140	%N1	75.8	79.0	80.4	81.9	83.6	85.4	87.0	88.7
	MACH	.449	.477	.490	.505	.522	.539	.557	.575
	KIAS	248	240	237	235	233	232	230	228
	FF/ENG	4333	4071	4015	3973	3925	3879	3863	3881

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	
289	266	245	228	213	200	191	182	174	167	160	
581	534	492	457	427	400	381	364	348	333	320	
873	802	739	686	641	600	572	545	521	500	480	
1166	1071	987	916	855	800	762	726	694	665	639	
1460	1340	1235	1145	1069	1000	952	908	867	831	798	
1755	1611	1483	1375	1283	1200	1142	1089	1040	996	956	
2051	1881	1732	1605	1497	1400	1333	1270	1213	1161	1114	
2348	2153	1980	1836	1711	1600	1523	1451	1386	1326	1272	
2645	2424	2230	2066	1925	1800	1713	1632	1558	1491	1430	
2943	2697	2479	2297	2140	2000	1902	1812	1730	1655	1588	

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	3.3	0:40	2.9	0:39	2.6	0:38	2.4	0:36	2.2	0:34
400	7.0	1:18	6.4	1:15	5.9	1:12	5.5	1:09	5.3	1:05
600	10.6	1:56	9.8	1:51	9.1	1:46	8.6	1:42	8.4	1:35
800	14.1	2:34	13.1	2:27	12.3	2:21	11.6	2:15	11.4	2:06
1000	17.7	3:12	16.5	3:04	15.4	2:56	14.7	2:48	14.4	2:37
1200	21.2	3:51	19.8	3:41	18.5	3:31	17.6	3:21	17.3	3:08
1400	24.7	4:30	23.0	4:18	21.6	4:06	20.6	3:55	20.2	3:40
1600	28.1	5:09	26.3	4:56	24.7	4:42	23.5	4:29	23.0	4:12

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)						
	140	160	180	200	220	240	260
5	-0.7	-0.5	-0.2	0.0	0.5	1.0	1.5
10	-1.4	-1.0	-0.5	0.0	1.1	2.2	3.4
15	-2.2	-1.5	-0.8	0.0	1.7	3.4	5.2
20	-2.9	-2.0	-1.0	0.0	2.2	4.5	7.0
25	-3.6	-2.5	-1.3	0.0	2.7	5.6	8.8
30	-4.3	-3.0	-1.6	0.0	3.2	6.7	10.5

ENGINE INOP**MAX CONTINUOUS THRUST****Holding
Flaps Up**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
260	%N1	79.8	82.7	87.5	92.4	
	KIAS	236	237	238	240	
	FF/ENG	6860	6650	6630	6770	
240	%N1	77.5	80.3	84.8	89.8	94.9
	KIAS	229	229	229	229	242
	FF/ENG	6320	6110	6090	6160	6380
220	%N1	75.0	77.8	82.0	87.0	92.0
	KIAS	223	223	223	223	224
	FF/ENG	5800	5600	5560	5570	5660
200	%N1	72.4	75.1	79.2	84.0	88.9
	KIAS	216	216	216	216	225
	FF/ENG	5260	5120	5060	5040	5050
180	%N1	69.5	72.2	76.2	80.9	85.7
	KIAS	209	209	209	209	209
	FF/ENG	4730	4670	4580	4520	4480

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

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available

Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	240	140				
50	280	200	60			
48	320	240	110			
46	360	290	170			
44	400	330	210	50		
42	440	380	260	100	-60	
40	470	430	300	150	-10	
38	510	470	350	190	40	
36	530	510	400	230	80	-80
34	530	540	450	280	120	-30
32	530	560	480	320	160	0
30	540	560	520	370	200	40
20	550	580	560	520	400	240
10	570	600	570	530	450	340
0	590	610	590	550	460	350
-20	610	640	610	570	480	370
-40	640	670	640	590	500	380

Rate of climb capability shown is valid for 180000 kg, gear down at VREF20 + 5.

Decrease rate of climb 45 ft/min per 5000 kg greater than 180000 kg.

Increase rate of climb 55 ft/min per 5000 kg less than 180000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-210	-320				
50	-180	-270	-400			
48	-150	-230	-360			
46	-110	-190	-310	-470		
44	-70	-150	-270	-430		
42	-40	-110	-230	-380	-540	
40	-10	-60	-180	-340	-500	
38	20	-20	-140	-300	-450	-620
36	40	10	-100	-260	-420	-570
34	40	40	-60	-220	-380	-530
32	40	50	-30	-180	-340	-500
30	40	60	10	-140	-310	-460
20	50	60	30	-10	-130	-290
10	60	70	40	-10	-100	-210
0	70	80	40	0	-100	-210
-20	70	80	50	0	-100	-210
-40	70	90	50	0	-100	-220

Rate of climb capability shown is valid for 180000 kg, gear down at VREF30 + 5.

Decrease rate of climb 50 ft/min per 5000 kg greater than 180000 kg.

Increase rate of climb 60 ft/min per 5000 kg less than 180000 kg.

Performance Inflight

Gear Down

Chapter PI

Section 14

GEAR DOWN

Long Range Cruise Altitude Capability

Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
260	17400	15300	12200
240	20900	18400	15600
220	24500	22000	19600
200	27800	26400	23800
180	30900	30500	28900
160	33400	33300	32900
140	36100	36100	36100

Long Range Cruise Control

WEIGHT (1000 KG)	PRESSURE ALTITUDE (1000 FT)									
	10	15	17	19	21	23	25	27	29	31
260	%N1	84.5	89.2	90.9						
	MACH	.453	.492	.508						
	KIAS	251	248	246						
	FF/ENG	5792	5756	5759						
240	%N1	82.1	86.8	88.6	90.4	92.1				
	MACH	.438	.476	.492	.508	.525				
	KIAS	242	240	238	237	235				
	FF/ENG	5337	5288	5273	5275	5290				
220	%N1	79.5	84.1	86.0	87.8	89.6	91.4	93.3		
	MACH	.421	.459	.475	.491	.508	.525	.543		
	KIAS	232	231	230	228	227	225	224		
	FF/ENG	4886	4841	4810	4793	4791	4806	4864		
200	%N1	76.8	81.4	83.1	85.0	86.8	88.6	90.5	92.7	
	MACH	.403	.441	.456	.473	.489	.506	.526	.548	
	KIAS	223	221	220	219	218	217	216	216	
	FF/ENG	4448	4391	4371	4333	4309	4314	4361	4463	
180	%N1	73.8	78.4	80.0	81.8	83.9	85.9	87.9	89.9	92.1
	MACH	.384	.420	.436	.452	.470	.489	.509	.531	.554
	KIAS	212	211	210	210	209	209	209	209	
	FF/ENG	4011	3934	3926	3975	3941	3878	3931	3984	4071
160	%N1	70.7	75.6	77.2	79.0	81.1	83.2	85.1	87.1	89.2
	MACH	.366	.403	.419	.436	.454	.472	.492	.513	.535
	KIAS	202	202	202	202	202	202	202	202	202
	FF/ENG	3693	3613	3608	3609	3595	3563	3512	3564	3604
140	%N1	67.8	72.7	74.4	76.1	78.1	80.2	82.2	84.1	86.1
	MACH	.352	.387	.403	.419	.436	.454	.473	.493	.515
	KIAS	194	194	194	194	194	194	194	194	194
	FF/ENG	3358	3267	3255	3251	3245	3228	3206	3208	3194

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	
322	287	258	235	216	200	189	178	169	160	153	
655	584	522	474	434	400	377	357	338	321	306	
992	882	788	714	653	600	566	535	507	482	460	
1332	1183	1055	954	872	800	755	713	676	642	612	
1675	1485	1323	1195	1091	1000	943	891	844	802	765	
2021	1790	1592	1436	1310	1200	1131	1069	1012	962	917	
2371	2096	1862	1678	1529	1400	1320	1246	1180	1121	1069	
2725	2406	2134	1921	1749	1600	1508	1424	1348	1280	1221	
3081	2717	2407	2164	1969	1800	1696	1601	1515	1439	1372	
3442	3031	2681	2408	2190	2000	1884	1778	1683	1598	1523	
3805	3346	2956	2653	2410	2200	2072	1955	1850	1756	1674	
4172	3664	3233	2899	2631	2400	2260	2132	2017	1914	1824	
4543	3985	3512	3145	2853	2600	2447	2308	2183	2072	1974	
4919	4308	3791	3392	3074	2800	2635	2485	2349	2229	2124	
5298	4634	4073	3640	3296	3000	2822	2661	2515	2386	2273	
5681	4963	4355	3889	3519	3200	3010	2837	2681	2543	2422	
6069	5294	4639	4138	3742	3400	3197	3012	2846	2699	2570	
6460	5627	4925	4388	3965	3600	3384	3188	3012	2855	2719	
6856	5963	5212	4639	4188	3800	3571	3363	3177	3011	2867	
7255	6302	5500	4891	4412	4000	3758	3538	3341	3166	3014	

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	6.6	0:46	6.0	0:45	5.2	0:43	4.9	0:42	4.7	0:40
400	13.2	1:36	12.1	1:32	10.7	1:25	10.1	1:22	9.7	1:17
600	19.7	2:25	18.2	2:18	16.3	2:08	15.3	2:01	14.8	1:54
800	26.2	3:15	24.3	3:05	21.9	2:50	20.5	2:41	19.8	2:32
1000	32.7	4:05	30.3	3:51	27.4	3:33	25.7	3:21	24.9	3:09
1200	38.9	4:57	36.1	4:40	32.7	4:17	30.6	4:02	29.5	3:47
1400	45.1	5:49	41.9	5:29	38.0	5:01	35.5	4:43	34.2	4:26
1600	51.3	6:41	47.6	6:18	43.3	5:45	40.4	5:24	38.9	5:04
1800	57.5	7:33	53.4	7:06	48.6	6:29	45.4	6:05	43.6	5:42
2000	63.7	8:26	59.1	7:55	53.9	7:13	50.3	6:46	48.3	6:21
2200	69.3	9:21	64.4	8:47	58.7	7:59	54.8	7:29	52.7	7:01
2400	75.0	10:17	69.7	9:38	63.6	8:46	59.4	8:12	57.0	7:41
2600	80.7	11:12	75.0	10:30	68.4	9:32	64.0	8:55	61.4	8:21
2800	86.3	12:08	80.3	11:22	73.3	10:18	68.6	9:38	65.7	9:01
3000	92.0	13:03	85.6	12:13	78.2	11:05	73.2	10:21	70.1	9:41
3200	97.2	14:03	90.5	13:08	82.7	11:53	77.4	11:07	74.0	10:23
3400	102.3	15:02	95.3	14:03	87.1	12:42	81.7	11:52	78.0	11:05
3600	107.5	16:01	100.2	14:57	91.6	13:31	85.9	12:37	82.0	11:47
3800	112.7	17:00	105.0	15:52	96.1	14:20	90.2	13:22	86.0	12:29
4000	117.8	17:59	109.9	16:47	100.6	15:08	94.4	14:07	90.0	13:10

GEAR DOWN**Long Range Cruise Enroute Fuel and Time****Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	160	180	200	220	240
10	-0.7	-0.3	0.0	0.9	2.0
20	-1.6	-0.8	0.0	1.7	3.8
30	-2.6	-1.2	0.0	2.5	5.4
40	-3.6	-1.7	0.0	3.2	6.9
50	-4.5	-2.2	0.0	3.9	8.3
60	-5.5	-2.7	0.0	4.5	9.7
70	-6.6	-3.2	0.0	5.1	10.9
80	-7.6	-3.7	0.0	5.7	12.0
90	-8.7	-4.2	0.0	6.2	13.0
100	-9.7	-4.7	0.0	6.7	13.9
110	-10.8	-5.3	0.0	7.1	14.7
120	-11.9	-5.9	0.0	7.5	15.4
130	-13.0	-6.5	0.0	7.9	15.9

Based on Long Range Cruise and VREF30+80 descent.

Descent at VREF30 + 80

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	40	44	48	52	56	60	64	68	72	76
TIME (MINUTES)	11	12	13	13	14	15	16	16	17	18

GEAR DOWN**Holding
Flaps Up**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)							
	1500	5000	10000	15000	20000	25000	30000	35000
260	%N1	75.2	78	82.5	87.6	92.7		
	KIAS	236	236	236	236	236		
	FF/ENG	5840	5660	5660	5700	5850		
240	%N1	73.2	76.1	80.3	85.4	90.5		
	KIAS	229	229	229	229	229		
	FF/ENG	5440	5300	5260	5280	5360		
220	%N1	71.2	73.9	78.1	83	88	93.2	
	KIAS	223	223	223	223	223		
	FF/ENG	5060	4950	4880	4880	4900	5090	
200	%N1	69	71.7	75.8	80.6	85.5	90.5	
	KIAS	216	216	216	216	216		
	FF/ENG	4680	4610	4510	4480	4470	4580	
180	%N1	66.7	69.3	73.3	78.2	82.8	87.9	93.4
	KIAS	209	209	209	209	209	209	
	FF/ENG	4320	4260	4150	4090	4150	4130	4340
160	%N1	64.2	66.8	70.7	75.6	79.9	85.1	90.2
	KIAS	202	202	202	202	202	202	
	FF/ENG	4030	3990	3880	3790	3790	3690	3810
140	%N1	61.5	64.1	67.8	72.7	77	82.2	87.1
	KIAS	194	194	194	194	194	194	194
	FF/ENG	3660	3630	3530	3430	3410	3370	3570

Flaps 1

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	1500	5000	10000	15000	20000	
260	%N1	73.8	76.7	81.2	86.4	91.5
	KIAS	216	216	216	216	216
	FF/ENG	5530	5380	5380	5440	5530
240	%N1	71.6	74.5	78.9	84.0	89.1
	KIAS	209	209	209	209	209
	FF/ENG	5130	5020	4980	5020	5060
220	%N1	69.3	72.1	76.5	81.5	86.6
	KIAS	203	203	203	203	203
	FF/ENG	4730	4670	4600	4600	4600
200	%N1	66.8	69.6	73.9	78.9	83.8
	KIAS	196	196	196	196	196
	FF/ENG	4330	4310	4210	4180	4170
180	%N1	64.2	66.9	71.1	76.2	80.8
	KIAS	189	189	189	189	189
	FF/ENG	4030	4010	3910	3860	3870
160	%N1	61.4	64.1	68.1	73.2	77.7
	KIAS	182	182	182	182	182
	FF/ENG	3650	3630	3530	3470	3480
140	%N1	58.4	61.0	64.9	69.9	74.4
	KIAS	174	174	174	174	174
	FF/ENG	3270	3250	3160	3100	3100

These tables include 5% additional fuel for holding in a racetrack pattern.

Performance Inflight

Gear Down, Engine INOP

Chapter PI

Section 15

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 KG)	VREF + 80 DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
220	208	221	4700	
200	190	214	9400	6200
180	172	208	13000	11000
160	154	200	16400	14900
				12800

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
200	6400	4100	
180	11700	8200	5900
160	15200	13600	11200
140	18700	17700	15800

Long Range Cruise Control

WEIGHT (1000 KG)	PRESSURE ALTITUDE (1000 FT)					
	5	7	9	11	13	15
200	%N1	92.5	94.5	96.5		
	MACH	.358	.371	.385		
	KIAS	216	216	216		
	FF/ENG	8649	8653	8728		
180	%N1	89.6	91.6	93.6	95.6	97.9
	MACH	.346	.359	.373	.387	.402
	KIAS	209	209	209	209	209
	FF/ENG	7860	7852	7900	7957	8109
160	%N1	86.5	88.5	90.5	92.5	94.5
	MACH	.334	.346	.359	.373	.388
	KIAS	202	202	202	202	202
	FF/ENG	7101	7080	7111	7147	7207
140	%N1	83.1	85.1	87.1	89.1	91.1
	MACH	.321	.333	.345	.359	.373
	KIAS	194	194	194	194	194
	FF/ENG	6375	6348	6356	6373	6409
						6461

GEAR DOWN

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
349	305	269	241	219	200	186	174	163	154	146
529	462	406	363	329	300	279	261	244	230	218
710	620	544	486	440	400	372	347	325	306	289
891	777	681	608	550	500	465	433	405	381	361
1074	936	819	730	660	600	557	519	486	457	432
1258	1095	957	853	771	700	650	606	567	533	504
1443	1255	1096	976	881	800	743	692	647	608	575
1629	1415	1235	1099	992	900	836	778	727	683	646
1815	1576	1374	1222	1102	1000	928	864	808	759	717
2003	1737	1515	1346	1213	1100	1021	950	888	834	788
2191	1900	1655	1470	1324	1200	1114	1036	968	909	859
2381	2062	1795	1593	1435	1300	1206	1122	1048	984	930
2571	2226	1936	1717	1546	1400	1298	1207	1127	1058	1000
2763	2390	2077	1841	1658	1500	1391	1293	1207	1133	1070
2955	2554	2219	1966	1769	1600	1483	1379	1287	1207	1140

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
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	6.6	0:54	6.3	0:53	6.1	0:51	5.8	0:51	5.7	0:49
300	10.0	1:21	9.6	1:19	9.3	1:16	9.0	1:15	8.8	1:13
400	13.4	1:47	12.9	1:45	12.6	1:42	12.2	1:39	11.9	1:37
500	16.7	2:15	16.2	2:11	15.7	2:07	15.3	2:04	15.0	2:01
600	20.0	2:42	19.4	2:37	18.9	2:33	18.3	2:29	18.0	2:25
700	23.3	3:09	22.6	3:04	22.0	2:58	21.4	2:54	21.0	2:49
800	26.6	3:36	25.8	3:30	25.1	3:24	24.4	3:19	24.0	3:13
900	29.7	4:04	28.9	3:57	28.1	3:50	27.4	3:44	26.9	3:37
1000	32.9	4:32	32.0	4:24	31.1	4:16	30.3	4:09	29.8	4:02
1100	36.1	5:00	35.0	4:51	34.1	4:43	33.2	4:35	32.6	4:27
1200	39.2	5:28	38.0	5:18	37.1	5:09	36.1	5:00	35.4	4:51
1300	42.2	5:57	41.0	5:46	40.0	5:36	38.9	5:26	38.2	5:16
1400	45.3	6:25	44.0	6:14	42.9	6:02	41.8	5:52	41.0	5:42
1500	48.3	6:54	46.9	6:42	45.7	6:29	44.6	6:18	43.7	6:07
1600	51.3	7:23	49.8	7:09	48.5	6:56	47.3	6:44	46.4	6:32

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time
Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)					
	140	160	180	200	220	240
5	-0.6	-0.3	0.0	0.5	1.1	1.7
10	-1.2	-0.6	0.0	1.0	2.2	3.5
15	-1.8	-0.9	0.0	1.5	3.3	5.2
20	-2.4	-1.2	0.0	1.9	4.3	6.8
25	-2.9	-1.5	0.0	2.3	5.2	8.3
30	-3.5	-1.8	0.0	2.7	6.1	9.7
35	-4.1	-2.1	0.0	3.1	6.8	11.1
40	-4.7	-2.4	0.0	3.4	7.6	12.3
45	-5.3	-2.7	0.0	3.7	8.2	13.4
50	-5.9	-3.0	0.0	4.0	8.8	14.4
55	-6.4	-3.3	0.0	4.3	9.3	15.3

Based on Long Range Cruise and VREF30+80 descent. Includes APU fuel burn.

Holding
Flaps Up

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)			
	1500	5000	10000	15000
200	%N1	89.0	92.5	
	KIAS	216	216	
	FF/ENG	9240	9080	
180	%N1	86.1	89.6	94.6
	KIAS	209	209	209
	FF/ENG	8370	8250	8320
160	%N1	83.2	86.5	91.5
	KIAS	202	202	202
	FF/ENG	7540	7460	7480
140	%N1	80.1	83.1	88.2
	KIAS	194	194	194
	FF/ENG	6740	6690	6680

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

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Performance Inflight**Text****Chapter PI****Section 16****Introduction**

This chapter contains information to supplement performance data from the Flight Management Computer. 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 Flight Manual, the Flight Manual shall always take precedence.

General**FMC Takeoff Speeds**

FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. 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 may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Clearway and Stopway V1 Adjustments

Takeoff speed corrections are to be applied to V1 when using takeoff weights based on the use of clearway and stopway.

Adjust V1 by the amount shown in the table. The adjusted V1 must not exceed VR. If V1 is greater than VR, VR may be increased to equal V1. The resultant V2 will be increased by the same amount that VR was increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

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

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 13mm (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 is determined as follows:

- (1) Determine the dry field/obstacle limit weight for the takeoff flap setting.
- (2) 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.
- (3) Adjust field length available for temperature by amount shown on chart.

- (4) Enter the V1(MCG) Limit Weight table with the field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

- (1) Determine takeoff speeds V1, VR and V2 for actual brake release weight using Takeoff Speeds from the Performance Dispatch chapter or from the FMC.
- (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

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. Good reported braking action denotes wet runway conditions or runways covered by compact snow. Similarly, poor braking action denotes runways covered with wet ice. Performance is based on reversers operating and a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than the minimum V1 for control on the ground, V1(MCG). It is therefore necessary to compare the adjusted V1 to V1(MCG). To find V1(MCG), enter the V1(MCG) table with 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 weight adjustment is required provided that the field length available exceeds the minimum field length required shown in the Field and Climb Limit Weight table.

Go-Around %N1

To find Go-Around %N1 based on normal engine bleed for packs on and anti-ice off, enter the Go-Around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. %N1 adjustments are shown for engine bleeds for various conditions.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body 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 may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

All Engines

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 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, .84 Mach approximates the Long Range Cruise Mach schedule.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .84/310/250 descent. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table 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.

Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

Descent at .84/310/250

Distance and time for descent are shown for a .84/310/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing Flaps 30 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 for the selected flap setting. Flaps 1 is based on VREF30 + 60 speed schedule. 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

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. Landing distances for slippery runways are 115% of the actual landing distances.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. 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.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing 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 corrections for off-reference landing weight, altitude, wind, slope, and speed conditions. Each correction is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the 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.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy 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, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

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 Mach number of .84 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 engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude 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/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Long Range Cruise Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the following table. These increments include the APU fuel flow and the effect of increased drag from the APU door.

PRESSURE ALTITUDE (1000 FT)	APU FUEL FLOW PENALTY (KG/HR)				
	GROSS WEIGHT (1000 KG)				
	300	260	220	180	140
43				160	140
39			180	160	145
35		200	190	170	140
31	230	220	195	165	140
25	230	220	195	175	155
20	235	230	205	185	165
15	235	235	215	200	185
10	240	240	230	220	200
5	270	270	255	240	220

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 .84/310/250 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 corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. 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 will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

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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777 Flight Crew Operations Manual

Performance Inflight

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Section 20

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DRAFT

Intentionally
Blank

Performance Inflight

General

Chapter PI

Section 20

Maximum Allowable Clearway

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	170
2000	210
2500	250
3000	300
3500	340
4000	380
4500	430

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)			
	100	120	140	160
300	-3	-3	-3	-4
200	-3	-3	-3	-3
100	-2	-1	-1	-1
0	0	0	0	0
-100	3	2	2	1
-200	5	4	3	3
-300	6	4	4	4

VREF**Flaps 30**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
300	164	164	165	165	165	166
280	159	159	159	160	160	161
260	154	154	154	154	155	155
240	148	148	148	148	148	149
220	142	142	142	142	142	142
200	135	135	135	135	135	135
180	128	128	128	128	128	128
160	123	121	121	121	121	121
140	123	121	118	116	114	113

Flaps 25

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
300	172	172	173	173	173	173
280	167	167	167	167	167	168
260	162	162	162	162	162	162
240	155	155	156	156	156	156
220	149	149	149	149	149	149
200	142	142	142	142	142	142
180	134	134	134	135	135	135
160	127	127	127	127	127	127
140	123	121	118	118	118	118

Flaps 20

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
300	178	178	179	179	180	181
280	173	173	173	173	174	174
260	167	167	168	168	168	168
240	161	161	161	161	161	162
220	154	154	154	154	154	154
200	147	147	147	147	147	147
180	139	139	139	139	139	139
160	131	131	131	131	131	131
140	123	122	122	123	123	123

Flap Maneuver Speed

FLAP POSITION	MANEUVER SPEED
FLAPS 0	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

DRAFT

ADVISORY INFORMATION**Slush/Standing Water Takeoff****Maximum Reverse Thrust****Weight Adjustment (1000 KG)**

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH							
	3 mm (0.08 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)	
	PRESS ALT (FT)		PRESS ALT (FT)			PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-32.9	-38.0	-43.0	-38.5	-43.6	-48.7	-50.7	-55.8
300	-30.9	-36.0	-41.0	-35.8	-40.8	-45.9	-46.2	-51.3
280	-28.6	-33.7	-38.8	-32.8	-37.9	-43.0	-41.7	-46.8
260	-26.1	-31.2	-36.3	-29.6	-34.7	-39.8	-37.0	-42.0
240	-23.4	-28.5	-33.5	-26.2	-31.3	-36.4	-32.1	-37.2
220	-20.4	-25.4	-30.5	-22.6	-27.6	-32.7	-27.2	-32.3
200	-17.1	-22.2	-27.3	-18.7	-23.8	-28.9	-22.1	-27.2
180	-13.6	-18.6	-23.7	-14.6	-19.7	-24.8	-16.9	-22.0
160	-9.8	-14.9	-19.9	-10.3	-15.4	-20.5	-11.6	-16.7
140	-5.9	-11.0	-16.1	-5.9	-11.0	-16.1	-6.2	-11.3

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1800	109.8			123.7			109.3	
2000				162.3	117.5		147.5	103.3
2200	148.5	103.7					185.9	141.5
2400	187.4	142.4		201.6	156.2	111.4	225.4	179.8
2600	227.7	181.2	136.3	242.3	195.3	150.1	266.0	219.1
2800	269.7	221.2	175.0	284.4	235.7	189.0	307.9	259.5
3000	313.5	262.9	214.8	328.3	277.7	229.2	350.8	301.2
3200	358.6	306.5	256.2	372.5	321.3	270.9		344.0
3400		351.4	299.4			314.3		294.5
3600			344.3			358.6		337.2

1. Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water adjustment.
2. Adjust field length available by -55 m/+55 m for every 5°C above/below 4°C.
3. Find V1(MCG) limited 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)		PRESS ALT (FT)		PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-18	-10	-13	-9	-5	-5	-1	3			
300	-19	-11	-14	-10	-6	-4	0	4			
280	-20	-12	-16	-12	-8	-5	-1	3			
260	-22	-14	-18	-14	-10	-8	-4	0			
240	-24	-20	-20	-16	-12	-11	-7	-3			
220	-25	-21	-22	-18	-14	-15	-11	-7			
200	-26	-22	-23	-19	-15	-18	-14	-10			
180	-26	-22	-24	-20	-16	-20	-16	-12			
160	-26	-22	-24	-20	-16	-20	-16	-12			
140	-26	-22	-24	-20	-16	-20	-16	-12			

1. Obtain V1, VR and V2 for the actual weight.
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 Adjustment (1000 KG)**

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)		PRESS ALT (FT)			PRESS ALT (FT)			
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
320	-45.2	-51.2	-57.2	-51.6	-57.6	-63.5	-65.3	-71.3	-77.2
300	-42.0	-48.0	-54.0	-47.3	-53.3	-59.3	-58.7	-64.7	-70.7
280	-38.7	-44.7	-50.7	-43.1	-49.1	-55.1	-52.4	-58.4	-64.4
260	-35.2	-41.2	-47.2	-38.8	-44.8	-50.8	-46.3	-52.3	-58.3
240	-31.6	-37.6	-43.6	-34.5	-40.5	-46.4	-40.5	-46.4	-52.4
220	-27.9	-33.9	-39.9	-30.1	-36.1	-42.1	-34.8	-40.8	-46.8
200	-24.0	-30.0	-36.0	-25.7	-31.7	-37.7	-29.4	-35.4	-41.3
180	-20.0	-26.0	-32.0	-21.3	-27.2	-33.2	-24.2	-30.1	-36.1
160	-15.9	-21.9	-27.9	-16.8	-22.8	-28.8	-19.2	-25.1	-31.1
140	-11.7	-17.7	-23.7	-12.3	-18.3	-24.3	-14.2	-20.2	-26.2

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
2600							113.4		
2800							158.1	109.0	
3000			132.3				203.1	153.7	104.6
3200	131.8			180.4	127.6		248.9	198.6	149.3
3400	182.1	126.9		229.4	175.6	122.9	295.6	244.4	194.2
3600	233.3	177.2	122.0	279.7	224.6	170.9	343.2	291.0	239.9
3800	286.0	228.3	172.2	331.4	274.7	219.7		338.5	286.4
4000	339.8	280.7	223.2		326.3	269.8			333.8
4200		334.5	275.5			321.2			
4400			329.2						

- Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water adjustment.
- Adjust field length available by -75 m/+70 m for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- 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								
	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.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
300	-30	-24	-18	-23	-17	-11	-8	-2	0
280	-32	-26	-20	-26	-20	-14	-11	-5	0
260	-34	-28	-22	-29	-23	-17	-15	-9	-3
240	-37	-31	-25	-32	-26	-20	-20	-14	-8
220	-39	-33	-27	-35	-29	-23	-25	-19	-13
200	-41	-35	-29	-38	-32	-26	-30	-24	-18
180	-42	-36	-30	-40	-34	-28	-34	-28	-22
160	-43	-37	-31	-41	-35	-29	-37	-31	-25
140	-44	-38	-32	-42	-36	-30	-39	-33	-27

1. Obtain V1, VR and V2 for the actual weight.
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 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
320	0.0	-1.5	-2.9	-14.9	-16.3	-17.8	-31.3	-32.8	-34.2
300	0.0	-1.5	-2.9	-16.3	-17.7	-19.2	-31.2	-32.7	-34.1
280	-0.4	-1.9	-3.3	-17.1	-18.5	-20.0	-30.6	-32.0	-33.5
260	-1.9	-3.4	-4.8	-17.3	-18.7	-20.2	-29.3	-30.7	-32.2
240	-2.9	-4.4	-5.8	-16.8	-18.3	-19.7	-27.4	-28.8	-30.3
220	-3.4	-4.9	-6.3	-15.7	-17.2	-18.6	-24.9	-26.3	-27.8
200	-3.4	-4.9	-6.3	-14.0	-15.4	-16.9	-21.8	-23.2	-24.7
180	-2.9	-4.4	-5.8	-11.6	-13.1	-14.5	-18.1	-19.5	-21.0
160	-1.9	-3.3	-4.8	-8.6	-10.1	-11.5	-13.8	-15.2	-16.7
140	-0.6	-2.0	-3.5	-5.3	-6.8	-8.2	-9.2	-10.6	-12.1

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1400	104.2							
1600	182.9	135.0						
1800	258.6	212.9	165.8					
2000	330.7	287.1	242.3	146.3	100.0			
2200		358.5	315.2	201.1	154.3	108.0		
2400				257.7	209.3	162.3	114.1	
2600				316.4	266.2	217.5	148.1	104.6
2800				376.2	325.2	274.7	182.5	138.6
3000						333.9	218.3	172.7
3200							256.0	208.1
3400							295.9	245.2
3600							338.1	284.5
3800								326.2
4000								368.6
								314.3

- Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.
- Adjust "Good" field length available by -30 m/+30 m for every 5°C above/below 4°C.
Adjust "Medium" field length available by -40 m/+40 m for every 5°C above/below 4°C.
Adjust "Poor" field length available by -60 m/+60 m for every 5°C above/below 4°C.
- Find V1(MCG) limited weight for adjusted field length and pressure altitude.
- Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION**Slippery Runway Takeoff**
Maximum Reverse Thrust
V1 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)		PRESS ALT (FT)		PRESS ALT (FT)			S.L.	4000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
320	-3	-1	1	-12	-10	-8	-24	-22	-20
300	-4	-2	0	-14	-12	-10	-27	-25	-23
280	-6	-4	-2	-16	-14	-12	-30	-28	-26
260	-7	-5	-3	-19	-17	-15	-33	-31	-29
240	-9	-7	-5	-21	-19	-17	-36	-34	-32
220	-10	-8	-6	-23	-21	-19	-39	-37	-35
200	-11	-9	-7	-25	-23	-21	-41	-39	-37
180	-12	-10	-8	-26	-24	-22	-43	-41	-39
160	-13	-11	-9	-27	-25	-23	-44	-42	-40
140	-14	-12	-10	-28	-26	-24	-45	-43	-41

1. Obtain V1, VR and V2 for the actual weight.
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 Adjustment (1000 KG)**

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
320	-1.4	-2.5	-3.6	-24.7	-25.8	-26.8	-44.3	-45.4	-46.5
300	-4.2	-5.3	-6.4	-25.7	-26.8	-27.9	-42.6	-43.7	-44.8
280	-6.4	-7.4	-8.5	-26.1	-27.2	-28.3	-40.6	-41.7	-42.8
260	-7.9	-9.0	-10.1	-25.9	-27.0	-28.0	-38.4	-39.5	-40.5
240	-8.9	-10.0	-11.0	-24.9	-26.0	-27.1	-35.8	-36.9	-38.0
220	-9.2	-10.3	-11.4	-23.2	-24.3	-25.4	-33.0	-34.1	-35.2
200	-8.9	-10.0	-11.1	-20.9	-22.0	-23.1	-29.8	-30.9	-32.0
180	-8.0	-9.1	-10.2	-17.9	-19.0	-20.1	-26.4	-27.5	-28.6
160	-6.5	-7.6	-8.7	-14.2	-15.3	-16.3	-22.7	-23.8	-24.9
140	-4.8	-5.9	-7.0	-10.2	-11.3	-12.4	-18.9	-20.0	-21.1

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1800	133.8								
2000	263.1	202.4	118.1						
2200	347.5	303.6	253.6						
2400			339.9						
2600				100.3					
2800				218.2	133.5				
3000				307.3	244.4	166.7			
3200					328.1	268.7			
3400						348.8			
3800							119.9		
4000							172.3	111.6	
4200							226.9	164.0	103.3
4400							285.2	218.1	155.7
4600							347.6	275.8	209.3
4800								337.6	266.4
5000									327.7

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 -30 m/+30 m for every 5°C above/below 4°C.
Adjust "Medium" field length available by -50 m/+45 m for every 5°C above/below 4°C.
Adjust "Poor" field length available by -75 m/+70 m for every 5°C above/below 4°C.
3. Find V1(MCG) limited 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)		PRESS ALT (FT)	S.L.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
300	-7	-3	0	-21	-17	-13	-41	-37	-33
280	-9	-5	-1	-24	-20	-16	-46	-42	-38
260	-11	-7	-3	-27	-23	-19	-50	-46	-42
240	-13	-9	-5	-31	-27	-23	-55	-51	-47
220	-15	-11	-7	-34	-30	-26	-59	-55	-51
200	-17	-13	-9	-37	-33	-29	-63	-59	-55
180	-19	-15	-11	-41	-37	-33	-67	-63	-59
160	-21	-17	-13	-44	-40	-36	-70	-66	-62
140	-23	-19	-15	-47	-43	-39	-72	-68	-64

1. Obtain V1, VR and V2 for the actual weight.
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.

Minimum Control Speeds

V1(MCG), Minimum VR

Max Takeoff Thrust

TEMP	PRESSURE ALTITUDE (FT)						
	0		4000		8000		
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	109	111	106	108		
50	122	112	114	106	108	101	104
40	104	118	119	109	110	101	104
30	86	122	123	113	114	104	106
20	68	123	123	115	117	107	109
-60	-76	124	124	116	117	109	110

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Go-around EPR**Based on engine bleed for packs on and anti-ice off**

REPORTED OAT		TAT	AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F	°C	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
66	150	70	1.269	1.282	1.284	1.287	1.289	1.290	1.290	1.289	1.287	1.284	1.281	1.278
56	133	60	1.316	1.324	1.328	1.332	1.335	1.337	1.339	1.339	1.338	1.336	1.334	1.332
51	124	55	1.347	1.356	1.356	1.355	1.359	1.361	1.363	1.365	1.364	1.362	1.361	1.359
46	115	50	1.380	1.390	1.392	1.392	1.388	1.387	1.388	1.390	1.389	1.388	1.388	1.387
41	106	45	1.406	1.429	1.428	1.428	1.421	1.416	1.416	1.416	1.415	1.414	1.414	1.414
36	97	40	1.431	1.461	1.461	1.460	1.453	1.446	1.445	1.445	1.444	1.443	1.442	1.441
31	88	35	1.443	1.492	1.491	1.491	1.483	1.477	1.475	1.474	1.473	1.473	1.472	1.471
26	79	30	1.443	1.498	1.511	1.518	1.512	1.505	1.506	1.505	1.504	1.504	1.502	1.502
21	70	25	1.443	1.498	1.511	1.521	1.526	1.531	1.527	1.529	1.528	1.527	1.525	1.525
17	62	20	1.443	1.498	1.511	1.521	1.526	1.531	1.535	1.539	1.545	1.546	1.541	1.539
12	53	15	1.443	1.498	1.511	1.521	1.526	1.531	1.535	1.539	1.547	1.555	1.563	1.561
8 & BELOW	46 & BELOW	12 & BELOW	1.443	1.498	1.511	1.521	1.526	1.531	1.535	1.539	1.547	1.555	1.563	1.571

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
PACKS OFF	0.003	0.003	0.003	0.003	0.004	0.004	0.005
1 PACK ON - 2 BLEED SOURCES	-0.003	-0.003	-0.003	-0.003	-0.004	-0.004	-0.005
1 PACK ON - 1 BLEED SOURCE	-0.003	-0.003	-0.003	-0.003	-0.004	-0.004	-0.005
WING ANTI-ICE ON	-0.002	-0.004	-0.004	-0.005	-0.005	-0.006	-0.006

Max Climb EPR**Based on engine bleed for packs on and anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)/SPEED (IAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	1.132	1.122	1.127	1.146	1.166	1.159	1.152	1.174	1.178	1.170
50	1.168	1.161	1.147	1.146	1.166	1.159	1.152	1.174	1.178	1.170
40	1.209	1.205	1.191	1.184	1.173	1.159	1.152	1.174	1.178	1.170
30	1.217	1.253	1.243	1.237	1.228	1.196	1.157	1.174	1.178	1.170
20	1.217	1.253	1.284	1.298	1.292	1.259	1.228	1.191	1.178	1.170
10	1.217	1.253	1.284	1.329	1.364	1.337	1.307	1.273	1.260	1.257
0	1.217	1.253	1.284	1.329	1.374	1.399	1.402	1.367	1.351	1.348
-10	1.217	1.253	1.284	1.329	1.374	1.399	1.434	1.482	1.468	1.465
-15 & BELOW	1.217	1.253	1.284	1.329	1.374	1.399	1.434	1.506	1.521	1.518

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
ENGINE ONLY	-0.008	-0.010	-0.015	-0.015	-0.006	-0.005	-0.003	-0.003	-0.004	-0.005
ENGINE & WING*	-0.010	-0.012	-0.018	-0.020	-0.012	-0.012	-0.011	-0.014	-0.017	-0.019
ENGINE & WING**	-0.012	-0.014	-0.021	-0.025	-0.018	-0.019	-0.020	-0.024	-0.029	-0.033

*Wing anti-ice on, packs on.

**Wing anti-ice on, single bleed source and both packs off.

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

Climb**Flaps Up, Set Max Climb Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)			
		160	200	240	280
40000 (.82M)	PITCH ATT	4.0	3.5		
	V/S (FT/MIN)	1600	800		
30000 (280 KIAS)	PITCH ATT	4.5	4.5	4.0	4.5
	V/S (FT/MIN)	2300	1600	1100	700
20000 (270 KIAS)	PITCH ATT	7.5	7.0	6.5	6.5
	V/S (FT/MIN)	3700	2700	2100	1600
10000 (270 KIAS)	PITCH ATT	10.0	8.5	8.0	8.0
	V/S (FT/MIN)	4500	3400	2700	2100
SEA LEVEL (270 KIAS)	PITCH ATT	12.0	10.5	9.5	9.0
	V/S (FT/MIN)	5100	3900	3100	2500

Cruise**Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)			
		160	200	240	280
40000 (.82 M)	PITCH ATT	2.0	2.5		
	EPR (Alt Mode %N1)	1.129 (79.0)	1.249 (83.4)		
35000 (280 KIAS)	PITCH ATT	1.5	2.0	2.5	3.0
	EPR (Alt Mode %N1)	1.065 (76.7)	1.118 (78.9)	1.203 (82.3)	1.356 (87.2)
30000 (280 KIAS)	PITCH ATT	1.5	2.0	3.0	3.5
	EPR (Alt Mode %N1)	1.021 (73.1)	1.059 (75.2)	1.119 (78.2)	1.196 (81.7)
25000 (280 KIAS)	PITCH ATT	1.5	2.0	3.0	3.5
	EPR (Alt Mode %N1)	0.997 (69.7)	1.024 (71.7)	1.067 (74.4)	1.124 (77.5)
20000 (270 KIAS)	PITCH ATT	2.0	2.5	3.0	4.0
	EPR (Alt Mode %N1)	0.986 (65.2)	1.008 (67.7)	1.039 (70.5)	1.081 (73.6)
15000 (270 KIAS)	PITCH ATT	1.5	2.5	3.0	4.0
	EPR (Alt Mode %N1)	0.977 (61.8)	0.994 (64.0)	1.018 (66.8)	1.048 (70.0)

Descent**Flaps Up, Set Idle Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)			
		160	200	240	280
40000 (.82M)	PITCH ATT	-1.0	-0.5		
	V/S (FT/MIN)	-2500	-2400		
30000 (280 KIAS)	PITCH ATT	-1.5	-0.5	0.5	1.0
	V/S (FT/MIN)	-2200	-1900	-1900	-1900
20000 (270 KIAS)	PITCH ATT	-1.0	0.0	0.5	1.5
	V/S (FT/MIN)	-1800	-1600	-1600	-1600
10000 (270 KIAS)	PITCH ATT	-1.5	-0.5	0.5	1.5
	V/S (FT/MIN)	-1700	-1500	-1400	-1400
SEA LEVEL (270 KIAS)	PITCH ATT	-1.5	-0.5	0.5	1.5
	V/S (FT/MIN)	-1500	-1400	-1300	-1300

Flight With Unreliable Airspeed / Turbulent Air Penetration**Altitude and/or vertical speed indications may also be unreliable.****Holding****Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)			
		160	200	240	280
10000	PITCH ATT	4.0	4.5	5.0	5.0
	EPR	1.004	1.017	1.029	1.040
	(Alt Mode %N1)	(51.3)	(56.8)	(61.7)	(65.9)
5000	KIAS	202	216	234	253
	PITCH ATT	4.0	4.5	5.0	5.0
	EPR	0.999	1.009	1.019	1.027
5000	(Alt Mode %N1)	(47.4)	(52.6)	(57.4)	(61.8)
	KIAS	202	216	233	251

Terminal Area (5000 FT)**Set Thrust for Level Flight**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		160	200	240	280
FLAPS 0 (GEAR UP) (VREF30 + 80)	PITCH ATT	4.5	5.0	5.5	5.5
	EPR	1.000	1.010	1.020	1.040
	(Alt Mode %N1)	(48.3)	(53.9)	(58.8)	(63.2)
FLAPS 1 (GEAR UP) (VREF30 + 60)	KIAS	201	216	229	241
	PITCH ATT	6.0	6.5	7.0	7.0
	EPR	1.020	1.030	1.050	1.060
FLAPS 5 (GEAR UP) (VREF30 + 40)	(Alt Mode %N1)	(49.5)	(55.4)	(60.9)	(65.4)
	KIAS	181	196	209	221
	PITCH ATT	5.0	5.5	5.5	6.0
FLAPS 15 (GEAR UP) (VREF30 + 20)	EPR	1.030	1.050	1.070	1.090
	(Alt Mode %N1)	(50.1)	(57.2)	(62.4)	(66.7)
	KIAS	161	176	189	201
FLAPS 20 (GEAR DOWN) (VREF30 + 20)	PITCH ATT	6.0	6.0	6.5	6.5
	EPR	1.040	1.060	1.090	1.110
	(Alt Mode %N1)	(51.5)	(58.9)	(64.4)	(68.9)
FLAPS 20 (GEAR DOWN) (VREF30 + 20)	KIAS	141	156	169	181
	PITCH ATT	4.0	4.5	5.0	5.0
	EPR	1.070	1.100	1.130	1.170
FLAPS 20 (GEAR DOWN) (VREF30 + 20)	(Alt Mode %N1)	(58.6)	(65.7)	(70.6)	(74.9)
	KIAS	141	156	169	181

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

Final Approach (1500 FT)

Gear Down, Set Thrust for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)			
		160	200	240	280
FLAPS 20 (VREF20 + 10)	PITCH ATT	1.0	1.5	1.5	1.5
	EPR (Alt Mode %N1)	1.010 (34.7)	1.010 (40.2)	1.020 (45.0)	1.020 (49.3)
	KIAS	142	157	172	185
FLAPS 25 (VREF25 + 10)	PITCH ATT	0.0	0.5	0.5	0.5
	EPR (Alt Mode %N1)	1.030 (44.1)	1.040 (50.7)	1.050 (56.2)	1.070 (60.6)
	KIAS	138	153	166	179
FLAPS 30 (VREF30 + 10)	PITCH ATT	-0.5	0.0	0.0	0.0
	EPR (Alt Mode %N1)	1.050 (50.5)	1.070 (56.9)	1.090 (62.4)	1.110 (66.8)
	KIAS	131	146	159	171

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Intentionally
Blank

Performance Inflight**All Engine****Chapter PI****Section 21****Long Range Cruise Maximum Operating Altitude****Max Climb 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°)
300	30300	-1	33500*	33500*	33500*	33400	31900
290	31100	-3	34300*	34300*	34300*	34100	32700
280	31800	-5	35200*	35200*	35200*	34900	33400
270	32600	-7	36100*	36100*	36100*	35600	34200
260	33400	-8	36800*	36800*	36800*	36400	35000
250	34200	-10	37600*	37600*	37600*	37200	35800
240	35100	-12	38400*	38400*	38400*	38100	36600
230	36000	-14	39300*	39300*	39300*	39000	37500
220	36900	-14	40200*	40200*	40200*	39900	38500
210	37900	-14	41100*	41100*	41100*	40900	39400
200	38900	-14	42100*	42100*	42100*	41900	40400
190	40000	-14	43000	43000	43000	42900	41500
180	41100	-14	43000	43000	43000	43000	42600
170	42300	-14	43000	43000	43000	43000	43000
160	43000	-14	43000	43000	43000	43000	43000
150	43000	-14	43000	43000	43000	43000	43000
140	43000	-14	43000	43000	43000	43000	43000

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°)
300	30300	4	32500*	32500*	32500*	32500*	31900
290	31100	3	33400*	33400*	33400*	33400*	32700
280	31800	1	34300*	34300*	34300*	34300*	33400
270	32600	-1	35200*	35200*	35200*	35200*	34200
260	33400	-3	36100*	36100*	36100*	36100*	35000
250	34200	-5	36900*	36900*	36900*	36900*	35800
240	35100	-7	37700*	37700*	37700*	37700*	36600
230	36000	-9	38600*	38600*	38600*	38600*	37500
220	36900	-9	39500*	39500*	39500*	39500*	38500
210	37900	-9	40400*	40400*	40400*	40400*	39400
200	38900	-9	41400*	41400*	41400*	41400*	40400
190	40000	-9	42400*	42400*	42400*	42400*	41500
180	41100	-9	43000	43000	43000	43000	42600
170	42300	-9	43000	43000	43000	43000	43000
160	43000	-9	43000	43000	43000	43000	43000
150	43000	-9	43000	43000	43000	43000	43000
140	43000	-9	43000	43000	43000	43000	43000

*Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.

Long Range Cruise Maximum Operating Altitude**Max Climb Thrust****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°)
300	30300	10	31100*	31100*	31100*	31100*	31100*
290	31100	8	32100*	32100*	32100*	32100*	32100*
280	31800	7	33100*	33100*	33100*	33100*	33100*
270	32600	5	34100*	34100*	34100*	34100*	34100*
260	33400	3	35100*	35100*	35100*	35100*	35000
250	34200	1	36100*	36100*	36100*	36100*	35800
240	35100	-1	36800*	36800*	36800*	36800*	36600
230	36000	-3	37700*	37700*	37700*	37700*	37500
220	36900	-3	38600*	38600*	38600*	38600*	38500
210	37900	-3	39500*	39500*	39500*	39500*	39400
200	38900	-3	40500*	40500*	40500*	40500*	40400
190	40000	-3	41500*	41500*	41500*	41500*	41500
180	41100	-3	42600*	42600*	42600*	42600*	42600
170	42300	-3	43000	43000	43000	43000	43000
160	43000	-3	43000	43000	43000	43000	43000
150	43000	-3	43000	43000	43000	43000	43000
140	43000	-3	43000	43000	43000	43000	43000

*Denotes altitude thrust limited in level flight, 300 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
300	EPR	1.106	1.131	1.168	1.229	1.326				
	MACH	.772	.802	.834	.840	.838				
	KIAS	325	325	325	314	300				
	FF/ENG	4499	4533	4621	4641	4746				
280	EPR	1.083	1.106	1.135	1.182	1.247	1.365			
	MACH	.772	.802	.834	.841	.839	.838			
	KIAS	325	325	325	314	300	287			
	FF/ENG	4289	4321	4375	4343	4305	4482			
260	EPR	1.064	1.085	1.111	1.142	1.193	1.266	1.412		
	MACH	.770	.796	.821	.838	.841	.839	.839		
	KIAS	324	322	319	313	301	287	274		
	FF/ENG	4095	4094	4085	4045	3988	3985	4261		
240	EPR	1.047	1.066	1.088	1.115	1.148	1.201	1.284		
	MACH	.746	.772	.799	.823	.839	.840	.839		
	KIAS	313	312	310	307	300	287	274		
	FF/ENG	3762	3759	3758	3747	3705	3645	3691		
220	EPR	1.033	1.048	1.068	1.090	1.118	1.153	1.209	1.297	
	MACH	.721	.746	.773	.800	.825	.840	.840	.839	
	KIAS	302	300	299	297	294	287	274	261	
	FF/ENG	3437	3429	3427	3425	3413	3372	3337	3416	
200	EPR	1.021	1.033	1.048	1.068	1.090	1.118	1.155	1.212	1.300
	MACH	.695	.719	.745	.772	.799	.825	.840	.840	.839
	KIAS	290	289	287	286	284	281	274	262	249
	FF/ENG	3123	3108	3100	3098	3095	3085	3065	3054	3127
180	EPR	1.009	1.020	1.032	1.047	1.066	1.089	1.117	1.153	1.208
	MACH	.667	.690	.714	.740	.768	.796	.822	.839	.840
	KIAS	278	276	275	273	272	270	268	262	250
	FF/ENG	2881	2853	2834	2775	2772	2770	2779	2784	2773
160	EPR	1.000	1.008	1.018	1.030	1.044	1.063	1.085	1.114	1.147
	MACH	.636	.659	.682	.707	.733	.761	.790	.817	.837
	KIAS	264	263	261	260	259	257	256	254	249
	FF/ENG	2589	2558	2532	2463	2454	2449	2464	2494	2505

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitude

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
283	262	243	226	213	200	191	182	174	167	161
567	524	485	453	425	400	382	366	351	337	324
851	786	729	680	638	600	573	549	526	505	486
1136	1050	974	908	851	800	764	732	701	673	648
1423	1314	1218	1136	1064	1000	956	914	876	842	810
1711	1580	1463	1364	1277	1200	1147	1097	1052	1010	972
2000	1846	1709	1592	1491	1400	1337	1279	1226	1177	1133
2290	2112	1954	1820	1704	1600	1528	1462	1401	1345	1295
2581	2380	2201	2049	1918	1800	1720	1645	1576	1513	1456
2874	2649	2449	2279	2132	2000	1910	1827	1751	1680	1617

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	3.6	0:39	3.1	0:37	2.6	0:36	2.3	0:35	2.0	0:34
400	7.6	1:14	6.8	1:11	5.9	1:06	5.3	1:04	4.8	1:01
600	11.5	1:50	10.5	1:44	9.1	1:37	8.4	1:33	7.6	1:29
800	15.4	2:26	14.2	2:18	12.4	2:09	11.4	2:03	10.4	1:57
1000	19.4	3:02	17.9	2:53	15.6	2:40	14.4	2:33	13.2	2:26
1200	23.3	3:38	21.5	3:27	18.8	3:12	17.4	3:03	16.0	2:54
1400	27.1	4:15	25.1	4:02	21.9	3:44	20.3	3:33	18.7	3:23
1600	31.0	4:53	28.7	4:37	25.1	4:16	23.2	4:03	21.5	3:51
1800	34.7	5:30	32.2	5:13	28.2	4:48	26.1	4:34	24.2	4:20
2000	38.5	6:08	35.7	5:49	31.2	5:21	29.0	5:04	26.9	4:49

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
5	-0.3	-0.2	0.0	0.2	0.5	0.7	1.0	1.2
10	-0.7	-0.4	0.0	0.5	1.1	1.6	2.2	2.7
15	-1.1	-0.6	0.0	0.8	1.7	2.5	3.4	4.2
20	-1.6	-0.8	0.0	1.1	2.2	3.4	4.5	5.7
25	-2.0	-1.0	0.0	1.4	2.8	4.2	5.7	7.1
30	-2.5	-1.2	0.0	1.6	3.3	5.0	6.7	8.5
35	-3.0	-1.4	0.0	1.8	3.8	5.7	7.8	9.9
40	-3.4	-1.7	0.0	2.0	4.2	6.5	8.8	11.3

**Long Range Cruise Enroute Fuel and Time - High Altitude
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	
525	495	467	442	420	400	383	368	353	340	328	
1045	985	931	883	840	800	767	737	709	683	659	
1566	1477	1396	1324	1259	1200	1152	1107	1065	1026	991	
2089	1970	1862	1766	1679	1600	1536	1476	1420	1369	1322	
2614	2465	2329	2208	2100	2000	1920	1845	1776	1712	1653	
3141	2961	2797	2651	2520	2400	2304	2215	2131	2054	1984	
3670	3458	3265	3094	2941	2800	2688	2584	2486	2397	2315	
4201	3957	3735	3538	3362	3200	3072	2952	2842	2739	2645	
4734	4457	4206	3983	3783	3600	3456	3321	3196	3081	2975	
5269	4959	4677	4428	4205	4000	3840	3690	3551	3423	3305	
5806	5463	5151	4874	4627	4400	4223	4058	3905	3764	3634	
6346	5968	5625	5321	5049	4800	4607	4426	4259	4104	3962	
6888	6475	6100	5768	5471	5200	4990	4794	4612	4444	4290	
7433	6984	6576	6216	5894	5600	5373	5161	4964	4783	4617	
7981	7495	7054	6665	6317	6000	5756	5528	5316	5121	4943	
8532	8008	7533	7114	6741	6400	6138	5894	5668	5460	5269	
9086	8523	8013	7565	7165	6800	6521	6261	6020	5797	5594	
9643	9041	8496	8017	7589	7200	6903	6627	6370	6134	5918	
10204	9561	8980	8469	8014	7600	7285	6992	6721	6470	6241	
10769	10084	9465	8922	8440	8000	7667	7357	7070	6806	6564	

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	29		31		33		35		37 & ABOVE	
	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	4.7	1:01	4.5	0:60	4.4	0:59	4.2	0:58	4.1	0:57
800	10.2	1:56	9.9	1:53	9.6	1:51	9.3	1:49	9.0	1:47
1200	15.6	2:52	15.1	2:48	14.7	2:44	14.3	2:40	13.9	2:38
1600	21.0	3:49	20.3	3:43	19.7	3:37	19.2	3:32	18.7	3:28
2000	26.4	4:45	25.4	4:38	24.7	4:31	24.0	4:24	23.5	4:19
2400	31.6	5:44	30.3	5:35	29.5	5:26	28.7	5:18	28.1	5:10
2800	36.7	6:42	35.3	6:31	34.3	6:21	33.4	6:11	32.6	6:02
3200	41.8	7:41	40.1	7:29	39.0	7:16	38.0	7:05	37.1	6:54
3600	46.7	8:41	44.9	8:27	43.6	8:13	42.4	7:60	41.5	7:47
4000	51.7	9:42	49.6	9:25	48.2	9:09	46.9	8:55	45.8	8:40
4400	56.4	10:44	54.2	10:25	52.7	10:08	51.3	9:51	50.1	9:35
4800	61.2	11:46	58.8	11:25	57.2	11:06	55.6	10:47	54.4	10:29
5200	65.8	12:49	63.3	12:26	61.6	12:05	59.9	11:45	58.5	11:24
5600	70.4	13:53	67.8	13:28	65.8	13:05	64.1	12:43	62.6	12:20
6000	74.9	14:57	72.2	14:30	70.1	14:05	68.2	13:41	66.7	13:16
6400	79.4	16:04	76.4	15:34	74.2	15:07	72.2	14:41	70.6	14:14
6800	83.9	17:11	80.7	16:39	78.3	16:09	76.2	15:40	74.4	15:11
7200	88.3	18:19	84.9	17:44	82.4	17:12	80.1	16:41	78.3	16:10
7600	92.6	19:28	89.0	18:50	86.3	18:16	83.9	17:43	82.0	17:09
8000	96.9	20:38	93.2	19:57	90.3	19:20	87.8	18:45	85.7	18:09

Long Range Cruise Enroute Fuel and Time - High Altitude**Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
10	-1.1	-0.5	0.0	0.6	2.1	6.3	12.7	21.3
20	-2.1	-1.1	0.0	1.1	4.0	9.5	17.3	27.5
30	-3.1	-1.6	0.0	1.7	5.7	12.3	21.4	32.9
40	-4.2	-2.1	0.0	2.4	7.4	14.9	24.9	37.5
50	-5.3	-2.7	0.0	3.1	8.8	17.1	28.0	41.4
60	-6.4	-3.2	0.0	3.8	10.2	19.1	30.5	44.5
70	-7.5	-3.8	0.0	4.5	11.4	20.7	32.6	46.8
80	-8.6	-4.3	0.0	5.1	12.4	22.1	34.1	48.4
90	-9.7	-4.9	0.0	5.6	13.4	23.2	35.1	49.2
100	-10.9	-5.4	0.0	6.1	14.1	24.0	35.7	49.2

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)						
	260	240	220	200	180	160	140
43				43	10	0	7
41			42	12	0	3	19
39		38	12	0	2	14	33
37	32	10	0	1	11	28	49
35	7	0	1	10	24	43	64
33	0	2	10	23	39	58	78
31	3	10	22	37	54	72	91
29	12	23	36	52	68	85	102
27	24	37	51	66	81	97	112
25	38	51	65	79	93	107	121

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. Read wind factors for present and new altitudes from table.
2. Determine difference (new altitude wind factor minus present altitude wind factor);
This difference may be negative or positive.
3. Break-even wind at new altitude is present altitude wind plus difference from step 2.

Descent at .84/310/250 KIAS

PRESSURE ALT (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	93	100	107	114	119	124	130	136	142	148
TIME (MINUTES)	19	20	21	22	23	23	24	25	25	26

**Holding
Flaps Up**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
300	EPR	1.023	1.031	1.047	1.059	1.075	1.123	1.198		
	KIAS	260	260	262	277	302	306	311		
	FF/ENG	4350	4320	4190	4230	4440	4530	4710		
280	EPR	1.020	1.027	1.040	1.055	1.067	1.108	1.169	1.356	
	KIAS	251	251	253	261	286	295	299	279	
	FF/ENG	4060	4020	3890	3890	4060	4180	4300	4550	
260	EPR	1.017	1.023	1.034	1.052	1.063	1.092	1.145	1.265	
	KIAS	242	242	243	246	266	283	287	279	
	FF/ENG	3770	3720	3690	3580	3740	3830	3920	4060	
240	EPR	1.014	1.019	1.029	1.045	1.059	1.074	1.124	1.203	
	KIAS	232	233	234	235	247	272	275	279	
	FF/ENG	3560	3510	3460	3350	3380	3490	3560	3710	
220	EPR	1.011	1.015	1.024	1.037	1.055	1.066	1.105	1.167	1.357
	KIAS	222	223	224	224	230	251	262	266	249
	FF/ENG	3280	3230	3170	3140	3050	3160	3220	3310	3590
200	EPR	1.006	1.010	1.018	1.030	1.048	1.061	1.084	1.138	1.249
	KIAS	215	215	215	215	215	229	249	253	249
	FF/ENG	3010	2960	2890	2850	2760	2800	2880	2950	3130
180	EPR	1.002	1.005	1.011	1.020	1.034	1.056	1.068	1.113	1.186
	KIAS	208	208	208	208	208	209	230	239	242
	FF/ENG	2810	2690	2630	2580	2550	2470	2570	2600	2770
160	EPR	0.997	0.999	1.003	1.009	1.021	1.038	1.062	1.088	1.147
	KIAS	203	203	203	203	203	203	206	224	227
	FF/ENG	2570	2510	2390	2330	2290	2270	2220	2320	2440
140	EPR	0.991	0.992	0.994	0.998	1.006	1.017	1.035	1.068	1.115
	KIAS	203	203	203	203	203	203	203	203	211
	FF/ENG	2400	2330	2250	2130	2090	2050	1980	1980	2100

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

**Holding
Flaps 1**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
300	EPR	1.060	1.073	1.100	1.140	1.199
	KIAS	224	224	224	224	224
	FF/ENG	4700	4560	4540	4560	4600
280	EPR	1.052	1.064	1.086	1.121	1.172
	KIAS	219	219	219	219	219
	FF/ENG	4370	4330	4200	4210	4230
260	EPR	1.044	1.054	1.073	1.103	1.147
	KIAS	214	214	214	214	214
	FF/ENG	4040	3990	3860	3860	3940
240	EPR	1.037	1.046	1.062	1.087	1.125
	KIAS	208	208	208	208	208
	FF/ENG	3720	3680	3630	3590	3600
220	EPR	1.030	1.038	1.052	1.072	1.105
	KIAS	202	202	202	202	202
	FF/ENG	3480	3440	3380	3270	3270
200	EPR	1.024	1.030	1.043	1.059	1.085
	KIAS	195	195	195	195	195
	FF/ENG	3180	3130	3080	3040	2950
180	EPR	1.018	1.023	1.034	1.047	1.067
	KIAS	188	188	188	188	188
	FF/ENG	2950	2840	2780	2730	2640
160	EPR	1.012	1.016	1.023	1.034	1.050
	KIAS	183	183	183	183	183
	FF/ENG	2680	2620	2500	2450	2420
140	EPR	1.005	1.008	1.013	1.021	1.033
	KIAS	183	183	183	183	183
	FF/ENG	2470	2400	2280	2230	2180

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

Performance Inflight Advisory Information

Chapter PI Section 22

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

	REF DIST	LANDING DISTANCE AND ADJUSTMENTS (M)						
		WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD / TAIL WIND	DOWN / UP HILL	ABOVE / BELOW ISA	PER 5 KTS ABOVE VREF30	ONE REV NO REV

Dry Runway

MAX MANUAL	885	+25/-5	20	-35/+125	+10/-10	+20/-20	35	10	25
AUTOBRAKE MAX	1180	+20/-5	25	-50/+175	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1455	+25/-10	40	-70/+245	0/-5	+40/-40	80	0	0
AUTOBRAKE 3	1735	+30/-10	45	-90/+305	+10/-10	+50/-50	95	0	0
AUTOBRAKE 2	1940	+40/-20	55	-100/+355	+15/-30	+55/-55	95	5	5
AUTOBRAKE 1	2090	+45/-25	65	-115/+395	+40/-55	+60/-60	85	90	90

Good Reported Braking Action

MAX MANUAL	1220	+20/-10	30	-60/+215	+30/-25	+30/-30	50	55	125
AUTOBRAKE MAX	1300	+25/-10	35	-65/+225	+25/-20	+30/-30	60	55	130
AUTOBRAKE 4	1460	+25/-10	40	-70/+250	+10/-5	+40/-40	80	5	25
AUTOBRAKE 3	1735	+30/-10	45	-90/+305	+10/-10	+50/-50	95	0	0
AUTOBRAKE 2	1940	+40/-20	55	-100/+355	+15/-30	+55/-55	95	5	5
AUTOBRAKE 1	2090	+45/-25	65	-115/+395	+40/-55	+60/-60	85	90	90

Medium Reported Braking Action

MAX MANUAL	1640	+35/-20	50	-95/+350	+75/-60	+40/-40	65	160	390
AUTOBRAKE MAX	1650	+35/-15	50	-95/+355	+70/-50	+40/-40	75	150	385
AUTOBRAKE 4	1670	+35/-15	50	-95/+355	+75/-55	+45/-45	70	165	400
AUTOBRAKE 3	1825	+35/-15	50	-105/+375	+50/-30	+50/-50	95	80	285
AUTOBRAKE 2	1990	+40/-20	55	-110/+400	+45/-45	+55/-55	95	45	180
AUTOBRAKE 1	2115	+45/-25	65	-120/+425	+65/-65	+60/-60	85	110	185

Poor Reported Braking Action

MAX MANUAL	2100	+45/-30	70	-140/+550	+175/-115	+55/-55	75	345	945
AUTOBRAKE MAX	2105	+50/-30	70	-140/+550	+175/-115	+55/-55	75	345	945
AUTOBRAKE 4	2120	+50/-30	70	-140/+550	+175/-120	+55/-55	75	350	955
AUTOBRAKE 3	2140	+50/-25	70	-140/+555	+175/-100	+55/-55	85	345	950
AUTOBRAKE 2	2225	+50/-30	70	-145/+565	+150/-100	+60/-60	95	260	860
AUTOBRAKE 1	2300	+50/-30	75	-150/+580	+155/-110	+60/-60	85	285	800

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 60 m.

For autobrake and manual speedbrakes, increase reference landing distance by 50 m.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Normal Configuration Landing Distance****Flaps 25**

LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF25	ONE REV NO REV

Dry Runway

MAX MANUAL	925	+25/-10	20	-35/+130	+10/-10	+20/-20	35	15	30
AUTOBRAKE MAX	1260	+20/-15	30	-55/+180	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1565	+30/-20	40	-75/+255	0/-5	+40/-40	85	0	0
AUTOBRAKE 3	1875	+35/-25	50	-95/+315	+10/-10	+55/-55	100	0	0
AUTOBRAKE 2	2080	+45/-35	60	-105/+365	+25/-40	+60/-60	90	30	30
AUTOBRAKE 1	2215	+50/-40	70	-120/+410	+50/-60	+60/-60	85	145	150

Good Reported Braking Action

MAX MANUAL	1280	+25/-15	35	-60/+220	+30/-25	+30/-30	50	65	145
AUTOBRAKE MAX	1370	+25/-15	35	-65/+230	+25/-25	+35/-35	60	70	155
AUTOBRAKE 4	1570	+30/-20	40	-75/+260	+10/-5	+40/-40	85	5	25
AUTOBRAKE 3	1875	+35/-25	50	-95/+315	+10/-10	+55/-55	100	0	0
AUTOBRAKE 2	2080	+45/-35	60	-105/+365	+25/-40	+60/-60	90	30	30
AUTOBRAKE 1	2215	+50/-40	70	-120/+410	+50/-60	+60/-60	85	145	150

Medium Reported Braking Action

MAX MANUAL	1720	+35/-30	50	-95/+360	+75/-60	+45/-45	65	180	460
AUTOBRAKE MAX	1735	+35/-25	50	-95/+360	+70/-55	+45/-45	75	175	450
AUTOBRAKE 4	1760	+35/-25	50	-100/+360	+75/-50	+45/-45	75	180	465
AUTOBRAKE 3	1960	+40/-25	55	-105/+390	+50/-35	+55/-55	100	80	305
AUTOBRAKE 2	2130	+45/-35	65	-115/+415	+55/-55	+60/-60	90	70	215
AUTOBRAKE 1	2240	+50/-40	70	-125/+435	+75/-70	+65/-65	85	170	250

Poor Reported Braking Action

MAX MANUAL	2200	+50/-40	70	-145/+560	+175/-115	+55/-55	75	390	1105
AUTOBRAKE MAX	2205	+50/-40	75	-145/+560	+180/-120	+60/-60	75	390	1105
AUTOBRAKE 4	2220	+50/-40	75	-145/+560	+175/-120	+60/-60	75	395	1115
AUTOBRAKE 3	2255	+50/-35	75	-145/+565	+170/-95	+60/-60	95	370	1095
AUTOBRAKE 2	2360	+50/-40	75	-150/+580	+155/-105	+65/-65	90	290	985
AUTOBRAKE 1	2430	+55/-45	80	-155/+590	+165/-115	+65/-65	85	345	935

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 60 m.

For autobrake and manual speedbrakes, increase reference landing distance by 50 m.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Normal Configuration Landing Distance**
Flaps 20

	REF DIST	LANDING DISTANCE AND ADJUSTMENTS (M)							
		WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LANDING WT	PER 5000 KG ABOVE/BELLOW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN / UP HILL	ABOVE/BELLOW ISA	PER 5 KTS ABOVE VREF20	ONE REV	NO REV

Dry Runway

MAX MANUAL	965	+30/-15	20	-40/+130	+10/-10	+20/-20	35	15	35
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1655	+30/-30	45	-75/+260	0/-5	+45/-45	90	0	0
AUTOBRAKE 3	1990	+40/-35	55	-95/+330	+5/-10	+55/-55	105	0	0
AUTOBRAKE 2	2215	+45/-45	65	-110/+380	+20/-40	+65/-65	100	30	30
AUTOBRAKE 1	2365	+55/-50	75	-125/+425	+50/-65	+65/-65	95	145	150

Good Reported Braking Action

MAX MANUAL	1345	+25/-20	35	-65/+225	+35/-30	+30/-35	50	75	170
AUTOBRAKE MAX	1435	+25/-25	40	-65/+235	+30/-25	+35/-35	60	75	180
AUTOBRAKE 4	1660	+30/-30	45	-80/+270	+5/-5	+45/-45	90	5	30
AUTOBRAKE 3	1990	+40/-35	55	-95/+330	+5/-10	+55/-55	105	0	0
AUTOBRAKE 2	2215	+45/-45	65	-110/+380	+20/-40	+65/-65	100	30	30
AUTOBRAKE 1	2365	+55/-50	75	-125/+425	+50/-65	+65/-65	95	145	150

Medium Reported Braking Action

MAX MANUAL	1820	+40/-35	55	-100/+370	+80/-65	+45/-45	65	210	540
AUTOBRAKE MAX	1830	+40/-35	55	-100/+370	+80/-60	+50/-50	75	200	530
AUTOBRAKE 4	1865	+40/-35	55	-100/+370	+75/-55	+50/-50	80	205	545
AUTOBRAKE 3	2080	+40/-35	60	-110/+400	+45/-35	+55/-60	105	90	370
AUTOBRAKE 2	2265	+45/-45	65	-120/+425	+55/-55	+65/-65	100	70	250
AUTOBRAKE 1	2390	+55/-50	80	-130/+450	+75/-75	+70/-70	95	170	265

Poor Reported Braking Action

MAX MANUAL	2335	+55/-50	80	-150/+575	+185/-125	+60/-60	75	450	1305
AUTOBRAKE MAX	2340	+55/-50	80	-150/+575	+190/-125	+60/-60	75	450	1310
AUTOBRAKE 4	2355	+55/-50	80	-150/+575	+185/-125	+60/-60	80	455	1320
AUTOBRAKE 3	2400	+55/-50	80	-150/+580	+175/-105	+65/-65	95	425	1295
AUTOBRAKE 2	2505	+55/-50	80	-155/+595	+160/-110	+70/-70	100	330	1185
AUTOBRAKE 1	2585	+60/-55	85	-160/+605	+170/-125	+70/-70	95	370	1100

Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 65 m.

For autobrake and manual speedbrakes, increase reference landing distance by 50 m.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ANTISKID - Flaps 25****VREF25**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1720	+35/-30	50	-95/+360	+75/-60	+45/-45	65	180	460
AUTOBRAKE MAX									Autobrake inoperative
AUTOBRAKE 2									Autobrake inoperative

Good Reported Braking Action

MAX MANUAL	1720	+35/-30	50	-95/+360	+75/-60	+45/-45	65	180	460
AUTOBRAKE MAX									Autobrake inoperative
AUTOBRAKE 2									Autobrake inoperative

Medium Reported Braking Action

MAX MANUAL	2200	+50/-40	70	-145/+560	+175/-115	+55/-55	75	390	1105
AUTOBRAKE MAX									Autobrake inoperative
AUTOBRAKE 3									Autobrake inoperative

Poor Reported Braking Action

MAX MANUAL	3010	+75/-60	110	-250/+1110	+1695/-280	+75/-75	80	1055	5000
AUTOBRAKE MAX									Autobrake inoperative
AUTOBRAKE 3									Autobrake inoperative

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ANTISKID - Flaps 30

VREF30

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1640	+35/-20	50	-95/+350	+75/-60	+40/-40	65	160	390
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Good Reported Braking Action

MAX MANUAL	1640	+35/-20	50	-95/+350	+75/-60	+40/-40	65	160	390
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Medium Reported Braking Action

MAX MANUAL	2100	+45/-30	70	-140/+550	+175/-115	+55/-55	75	345	945
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Poor Reported Braking Action

MAX MANUAL	2895	+70/-50	100	-245/+1095	+1635/-275	+75/-75	80	965	5000
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ENG SHUTDOWN L, R - Flaps 20****VREF20**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	975	+30/-15	20	-40/+135	+15/-10	+20/-20	35	0	20
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2240	+45/-40	65	-110/+380	+10/-10	+65/-65	125	0	0

Good Reported Braking Action

MAX MANUAL	1405	+25/-25	35	-70/+235	+40/-35	+35/-35	55	0	95
AUTOBRAKE MAX	1495	+25/-25	40	-70/+245	+35/-30	+40/-40	65	0	100
AUTOBRAKE 2	2240	+45/-40	65	-110/+380	+10/-10	+65/-65	125	0	0

Medium Reported Braking Action

MAX MANUAL	1990	+40/-40	60	-110/+400	+105/-85	+55/-55	75	0	310
AUTOBRAKE MAX	1995	+40/-40	60	-110/+400	+105/-75	+55/-55	85	0	305
AUTOBRAKE 3	2135	+45/-40	65	-115/+415	+80/-50	+60/-60	105	0	250

Poor Reported Braking Action

MAX MANUAL	2685	+60/-55	90	-170/+650	+270/-170	+75/-75	90	0	775
AUTOBRAKE MAX	2690	+65/-60	90	-170/+650	+275/-175	+75/-75	90	0	775
AUTOBRAKE 3	2725	+65/-60	90	-175/+655	+275/-175	+75/-75	90	0	785

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ENG SHUTDOWN L, R - Flaps 30

VREF30

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	890	+25/-5	20	-35/+125	+10/-10	+20/-20	35	0 15
AUTOBRAKE MAX	1180	+20/-5	25	-50/+175	0/0	+30/-30	65	0 0
AUTOBRAKE 2	1940	+40/-10	55	-105/+355	+10/-10	+55/-55	115	0 0

Good Reported Braking Action

MAX MANUAL	1255	+20/-10	30	-65/+225	+35/-30	+30/-30	55	0 65
AUTOBRAKE MAX	1345	+25/-10	35	-65/+235	+30/-25	+35/-35	65	0 70
AUTOBRAKE 2	1940	+40/-10	55	-105/+355	+10/-10	+55/-55	115	0 0

Medium Reported Braking Action

MAX MANUAL	1760	+35/-20	50	-105/+380	+95/-75	+45/-45	70	0 215
AUTOBRAKE MAX	1765	+35/-15	50	-105/+380	+90/-65	+50/-50	85	0 215
AUTOBRAKE 3	1875	+40/-15	55	-110/+390	+75/-45	+50/-50	95	0 180

Poor Reported Braking Action

MAX MANUAL	2355	+55/-35	75	-160/+615	+240/-150	+65/-65	85	0 540
AUTOBRAKE MAX	2360	+55/-35	75	-160/+615	+245/-155	+65/-65	85	0 540
AUTOBRAKE 3	2390	+55/-35	75	-160/+615	+245/-155	+65/-65	85	0 545

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAP / SLAT CONTROL - Flaps 20****VREF20**

LANDING DISTANCES AND ADJUSTMENTS (M)									
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	955	+30/-15	20	-40/+130	+10/-10	+20/-20	35	15	35
AUTOBRAKE MAX	1320	+25/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2200	+45/-45	65	-110/+375	+25/-45	+60/-60	95	40	40

Good Reported Braking Action

MAX MANUAL	1335	+25/-20	35	-65/+225	+30/-30	+30/-30	50	70	165
AUTOBRAKE MAX	1425	+25/-25	35	-65/+235	+30/-25	+35/-35	60	75	175
AUTOBRAKE 2	2200	+45/-45	65	-110/+375	+25/-45	+60/-60	95	40	40

Medium Reported Braking Action

MAX MANUAL	1800	+40/-35	55	-100/+365	+80/-65	+45/-45	65	200	515
AUTOBRAKE MAX	1810	+40/-35	55	-100/+365	+75/-55	+45/-45	75	195	505
AUTOBRAKE 3	2070	+40/-35	60	-110/+400	+50/-35	+55/-55	100	80	335

Poor Reported Braking Action

MAX MANUAL	2300	+55/-50	75	-145/+570	+180/-120	+60/-60	75	430	1235
AUTOBRAKE MAX	2305	+55/-50	80	-145/+570	+185/-125	+60/-60	75	430	1240
AUTOBRAKE 3	2370	+55/-45	75	-150/+575	+175/-100	+65/-65	100	400	1220

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS DRIVE - (Flaps ≤ 5)****VREF30+40**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1180	+40/-10	30	-45/+155	+15/-15	+25/-25	40	30	70
AUTOBRAKE MAX	1710	+25/-5	45	-65/+215	0/0	+45/-45	75	0	0
AUTOBRAKE 2	2870	+55/-40	95	-130/+430	+50/-70	+85/-85	105	190	190

Good Reported Braking Action

MAX MANUAL	1595	+25/-15	45	-70/+240	+35/-30	+40/-40	50	110	270
AUTOBRAKE MAX	1775	+30/-10	50	-75/+260	+15/-10	+45/-45	75	75	245
AUTOBRAKE 2	2870	+55/-40	95	-130/+430	+50/-70	+85/-85	105	190	190

Medium Reported Braking Action

MAX MANUAL	2185	+45/-25	70	-110/+395	+90/-70	+60/-60	70	320	865
AUTOBRAKE MAX	2220	+45/-25	70	-110/+395	+80/-65	+60/-60	75	310	850
AUTOBRAKE 3	2740	+50/-30	85	-130/+455	+50/-60	+80/-80	110	120	495

Poor Reported Braking Action

MAX MANUAL	2810	+65/-40	100	-160/+610	+200/-135	+75/-75	80	670	2145
AUTOBRAKE MAX	2825	+65/-40	100	-160/+610	+205/-135	+75/-75	85	670	2155
AUTOBRAKE 3	3015	+65/-40	100	-165/+630	+175/-115	+85/-85	105	535	2035

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS DRIVE - (5 < Flaps < 20)****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1020	+30/-5	25	-40/+135	+15/-10	+20/-20	35	20	45
AUTOBRAKE MAX	1430	+25/-5	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2420	+50/-30	75	-115/+395	+25/-45	+70/-70	105	65	65

Good Reported Braking Action

MAX MANUAL	1435	+25/-10	40	-65/+235	+35/-30	+35/-35	55	90	215
AUTOBRAKE MAX	1525	+25/-10	40	-70/+240	+30/-20	+40/-40	65	95	225
AUTOBRAKE 2	2420	+50/-30	75	-115/+395	+25/-45	+70/-70	105	65	65

Medium Reported Braking Action

MAX MANUAL	1940	+40/-25	60	-105/+375	+85/-65	+50/-50	70	255	685
AUTOBRAKE MAX	1960	+40/-20	60	-105/+380	+85/-65	+50/-50	75	250	675
AUTOBRAKE 3	2280	+40/-20	65	-115/+420	+40/-40	+65/-65	105	90	455

Poor Reported Braking Action

MAX MANUAL	2485	+60/-35	85	-150/+585	+190/-130	+65/-65	80	540	1660
AUTOBRAKE MAX	2500	+60/-35	85	-155/+585	+195/-130	+65/-65	80	545	1670
AUTOBRAKE 3	2595	+55/-30	85	-155/+595	+170/-110	+70/-70	100	490	1635

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

FLAPS DRIVE - (Flaps \geq 20)

VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	965	+30/-15	20	-40/+130	+10/-10	+20/-20	35	15 35
AUTOBRAKE MAX	1320	+20/-20	30	-55/+185	0/0	+30/-30	65	0 0
AUTOBRAKE 2	2215	+45/-45	65	-110/+380	+20/-40	+65/-65	100	30 30

Good Reported Braking Action

MAX MANUAL	1345	+25/-20	35	-65/+225	+35/-30	+30/-35	50	75 170
AUTOBRAKE MAX	1435	+25/-25	40	-65/+235	+30/-25	+35/-35	60	75 180
AUTOBRAKE 2	2215	+45/-45	65	-110/+380	+20/-40	+65/-65	100	30 30

Medium Reported Braking Action

MAX MANUAL	1820	+40/-35	55	-100/+370	+80/-65	+45/-45	65	210 540
AUTOBRAKE MAX	1830	+40/-35	55	-100/+370	+80/-60	+50/-50	75	200 530
AUTOBRAKE 3	2080	+40/-35	60	-110/+400	+45/-35	+55/-60	105	90 370

Poor Reported Braking Action

MAX MANUAL	2335	+55/-50	80	-150/+575	+185/-125	+60/-60	75	450 1305
AUTOBRAKE MAX	2340	+55/-50	80	-150/+575	+190/-125	+60/-60	75	450 1310
AUTOBRAKE 3	2400	+55/-50	80	-150/+580	+175/-105	+65/-65	95	425 1295

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS PRIMARY FAIL - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1085	+25/-15	25	-45/+145	+15/-15	+25/-25	45	20	45
AUTOBRAKE MAX	1320	+20/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2255	+45/-45	65	-115/+385	0/-20	+65/-65	120	5	5

Good Reported Braking Action

MAX MANUAL	1485	+25/-25	40	-70/+240	+40/-35	+35/-35	60	90	210
AUTOBRAKE MAX	1500	+30/-25	40	-70/+245	+35/-30	+35/-35	70	85	205
AUTOBRAKE 2	2255	+45/-45	65	-115/+385	0/-20	+65/-65	120	5	5

Medium Reported Braking Action

MAX MANUAL	1980	+40/-40	60	-105/+390	+90/-70	+50/-50	75	245	645
AUTOBRAKE MAX	1980	+40/-40	60	-105/+385	+95/-75	+50/-50	80	245	640
AUTOBRAKE 3	2115	+40/-35	60	-115/+405	+60/-35	+60/-60	110	140	545

Poor Reported Braking Action

MAX MANUAL	2515	+60/-55	85	-155/+595	+205/-135	+65/-65	90	515	1550
AUTOBRAKE MAX	2515	+60/-55	85	-155/+595	+210/-140	+65/-65	90	515	1555
AUTOBRAKE 3	2535	+60/-50	85	-155/+600	+200/-125	+70/-70	100	510	1555

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

FLIGHT CONTROL MODE - Flaps 20

VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1110	+25/-15	25	-45/+150	+15/-15	+25/-25	50	25 50
AUTOBRAKE MAX	1320	+20/-20	30	-55/+185	0/0	+30/-30	65	0 0
AUTOBRAKE 2	2260	+45/-40	65	-115/+385	0/-10	+65/-65	130	0 0

Good Reported Braking Action

MAX MANUAL	1530	+30/-25	40	-70/+250	+40/-35	+35/-35	65	100 235
AUTOBRAKE MAX	1530	+30/-25	40	-70/+245	+35/-30	+40/-40	70	95 225
AUTOBRAKE 2	2260	+45/-40	65	-115/+385	0/-10	+65/-65	130	0 0

Medium Reported Braking Action

MAX MANUAL	2050	+45/-40	65	-110/+395	+95/-75	+55/-55	85	275 735
AUTOBRAKE MAX	2050	+45/-40	65	-110/+395	+105/-85	+55/-55	85	270 725
AUTOBRAKE 3	2135	+45/-40	65	-115/+410	+75/-35	+60/-60	110	200 665

Poor Reported Braking Action

MAX MANUAL	2605	+65/-55	90	-160/+610	+215/-145	+70/-70	95	575 1780
AUTOBRAKE MAX	2610	+65/-55	90	-160/+610	+225/-150	+70/-70	95	575 1785
AUTOBRAKE 3	2615	+65/-55	90	-160/+610	+225/-135	+70/-70	105	575 1785

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS C - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1085	+25/-15	25	-45/+145	+15/-15	+25/-25	45	20	45
AUTOBRAKE MAX	1320	+20/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2255	+45/-45	65	-115/+385	0/-20	+65/-65	120	5	5

Good Reported Braking Action

MAX MANUAL	1485	+25/-25	40	-70/+240	+40/-35	+35/-35	60	90	210
AUTOBRAKE MAX	1500	+30/-25	40	-70/+245	+35/-30	+35/-35	70	85	205
AUTOBRAKE 2	2255	+45/-45	65	-115/+385	0/-20	+65/-65	120	5	5

Medium Reported Braking Action

MAX MANUAL	1980	+40/-40	60	-105/+390	+90/-70	+50/-50	75	245	645
AUTOBRAKE MAX	1980	+40/-40	60	-105/+385	+95/-75	+50/-50	80	245	640
AUTOBRAKE 3	2115	+40/-35	60	-115/+405	+60/-35	+60/-60	110	140	545

Poor Reported Braking Action

MAX MANUAL	2515	+60/-55	85	-155/+595	+205/-135	+65/-65	90	515	1550
AUTOBRAKE MAX	2515	+60/-55	85	-155/+595	+210/-140	+65/-65	90	515	1555
AUTOBRAKE 3	2535	+60/-50	85	-155/+600	+200/-125	+70/-70	100	510	1555

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS L - Flaps 25

VREF25

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	985	+25/-10	20	-40/+140	+15/-15	+20/-20	40	0 20
AUTOBRAKE MAX	1260	+20/-15	30	-55/+180	0/0	+30/-30	65	0 0
AUTOBRAKE 2	2130	+40/-30	60	-110/+370	0/-10	+60/-60	120	0 0

Good Reported Braking Action

MAX MANUAL	1425	+25/-20	40	-70/+245	+45/-35	+35/-35	65	0 100
AUTOBRAKE MAX	1485	+25/-20	40	-70/+250	+35/-30	+40/-40	70	0 105
AUTOBRAKE 2	2130	+40/-30	60	-110/+370	0/-10	+60/-60	120	0 0

Medium Reported Braking Action

MAX MANUAL	2030	+40/-30	60	-115/+420	+120/-90	+55/-55	85	0 340
AUTOBRAKE MAX	2030	+40/-30	60	-115/+420	+125/-95	+55/-55	85	0 340
AUTOBRAKE 3	2100	+45/-30	60	-120/+430	+110/-65	+60/-60	100	0 340

Poor Reported Braking Action

MAX MANUAL	2770	+60/-50	90	-185/+705	+320/-195	+80/-80	100	0 870
AUTOBRAKE MAX	2780	+60/-50	90	-185/+705	+325/-200	+80/-80	100	0 870
AUTOBRAKE 3	2810	+65/-50	90	-185/+705	+320/-200	+80/-80	100	0 880

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS L - Flaps 30****VREF30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	940	+25/-5	20	-40/+135	+15/-10	+20/-20	40	0	15
AUTOBRAKE MAX	1180	+20/-5	25	-50/+175	0/0	+30/-30	65	0	0
AUTOBRAKE 2	1970	+40/-10	55	-105/+355	0/-10	+55/-55	115	0	0

Good Reported Braking Action

MAX MANUAL	1350	+25/-10	35	-70/+240	+40/-35	+35/-35	65	0	85
AUTOBRAKE MAX	1405	+25/-10	35	-70/+245	+35/-30	+35/-35	70	0	85
AUTOBRAKE 2	1970	+40/-10	55	-105/+355	0/-10	+55/-55	115	0	0

Medium Reported Braking Action

MAX MANUAL	1930	+40/-20	55	-115/+415	+115/-90	+50/-50	85	0	290
AUTOBRAKE MAX	1930	+40/-20	55	-115/+415	+120/-90	+55/-55	85	0	290
AUTOBRAKE 3	1990	+40/-20	60	-115/+420	+115/-75	+55/-55	90	0	300

Poor Reported Braking Action

MAX MANUAL	2645	+60/-35	85	-180/+695	+320/-190	+75/-75	100	0	750
AUTOBRAKE MAX	2655	+60/-35	85	-180/+695	+325/-195	+75/-75	100	0	755
AUTOBRAKE 3	2685	+60/-35	85	-180/+695	+315/-195	+75/-75	100	0	765

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS L+C - Flaps 20****VREF30+20**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1240	+30/-5	30	-50/+165	+20/-20	+30/-30	55	0	35
AUTOBRAKE MAX	1430	+25/-5	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2485	+45/-10	70	-120/+405	0/0	+75/-75	140	0	0

Good Reported Braking Action

MAX MANUAL	1795	+30/-10	50	-80/+285	+60/-50	+45/-45	80	0	170
AUTOBRAKE MAX	1795	+30/-10	50	-80/+280	+55/-45	+50/-50	90	0	160
AUTOBRAKE 2	2485	+45/-10	70	-120/+405	0/0	+75/-75	140	0	0

Medium Reported Braking Action

MAX MANUAL	2550	+50/-25	80	-135/+475	+160/-120	+70/-70	105	0	545
AUTOBRAKE MAX	2550	+50/-25	80	-135/+475	+165/-125	+70/-70	110	0	540
AUTOBRAKE 3	2565	+55/-25	80	-135/+480	+160/-105	+75/-75	110	0	550

Poor Reported Braking Action

MAX MANUAL	3455	+75/-45	115	-210/+785	+410/-250	+100/-100	125	0	1380
AUTOBRAKE MAX	3465	+80/-45	120	-210/+785	+420/-260	+100/-100	125	0	1380
AUTOBRAKE 3	3470	+80/-45	120	-210/+785	+420/-250	+100/-100	130	0	1385

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS L+R - Flaps 20****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1340	+20/-5	35	-55/+190	+30/-25	+35/-35	65	0	0
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Good Reported Braking Action

MAX MANUAL	2105	+35/-10	60	-105/+355	+105/-85	+60/-60	100	0	0
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Medium Reported Braking Action

MAX MANUAL	3310	+60/-25	95	-185/+655	+355/-235	+100/-100	140	0	0
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Poor Reported Braking Action

MAX MANUAL	5110	+95/-45	140	-335/+1240	+1455/-590	+165/-165	170	0	0
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS R - Flaps 25

VREF25

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1085	+20/-10	25	-45/+160	+20/-20	+25/-25	50	0	35
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Good Reported Braking Action

MAX MANUAL	1565	+30/-20	45	-80/+285	+55/-45	+40/-40	70	0	145
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Medium Reported Braking Action

MAX MANUAL	2195	+45/-35	65	-130/+480	+150/-110	+60/-60	85	0	430
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Poor Reported Braking Action

MAX MANUAL	2940	+65/-55	95	-205/+795	+425/-225	+85/-85	100	0	1035
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS R - Flaps 30****VREF30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1030	+15/-5	25	-45/+155	+20/-15	+25/-25	45	0	25
AUTOBRAKE MAX							Autobrake inoperative		
AUTOBRAKE 2							Autobrake inoperative		

Good Reported Braking Action

MAX MANUAL	1465	+25/-10	40	-75/+275	+55/-45	+40/-40	65	0	115
AUTOBRAKE MAX							Autobrake inoperative		
AUTOBRAKE 2							Autobrake inoperative		

Medium Reported Braking Action

MAX MANUAL	2045	+40/-25	60	-125/+465	+145/-105	+55/-55	85	0	350
AUTOBRAKE MAX							Autobrake inoperative		
AUTOBRAKE 3							Autobrake inoperative		

Poor Reported Braking Action

MAX MANUAL	2740	+60/-35	85	-195/+775	+400/-215	+75/-75	95	0	840
AUTOBRAKE MAX							Autobrake inoperative		
AUTOBRAKE 3							Autobrake inoperative		

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS R+C - Flaps 20

VREF30+20

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1540	+25/-5	40	-65/+220	+40/-35	+40/-40	75	0	95
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Good Reported Braking Action

MAX MANUAL	2210	+40/-15	65	-110/+380	+105/-85	+60/-60	100	0	345
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Medium Reported Braking Action

MAX MANUAL	3050	+65/-35	100	-170/+625	+265/-185	+85/-85	120	0	950
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Poor Reported Braking Action

MAX MANUAL	4015	+95/-55	140	-265/+1015	+760/-355	+115/-115	135	0	2165
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****PITCH UP AUTHORITY - (Flaps ≤ 15)****VREF30+40**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10°C	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1150	+40/-10	25	-45/+150	+15/-15	+25/-25	40	25	60
AUTOBRAKE MAX	1710	+25/-5	45	-65/+215	0/0	+45/-45	75	0	0
AUTOBRAKE 2	2750	+55/-40	90	-125/+420	+65/-70	+80/-80	85	245	265

Good Reported Braking Action

MAX MANUAL	1580	+25/-15	45	-70/+240	+35/-30	+40/-40	50	100	235
AUTOBRAKE MAX	1790	+30/-10	50	-75/+260	+20/-15	+45/-45	80	65	210
AUTOBRAKE 2	2750	+55/-40	90	-125/+420	+65/-70	+80/-80	85	245	265

Medium Reported Braking Action

MAX MANUAL	2130	+40/-25	65	-105/+390	+85/-70	+55/-55	65	275	720
AUTOBRAKE MAX	2205	+45/-25	70	-110/+395	+75/-60	+60/-60	75	275	725
AUTOBRAKE 3	2660	+50/-35	80	-125/+445	+65/-65	+75/-75	95	140	420

Poor Reported Braking Action

MAX MANUAL	2710	+60/-40	95	-155/+600	+190/-130	+75/-75	75	560	1675
AUTOBRAKE MAX	2735	+60/-40	95	-155/+600	+190/-125	+75/-75	80	555	1680
AUTOBRAKE 3	2930	+60/-40	100	-165/+620	+175/-125	+80/-80	90	445	1535

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

PITCH UP AUTHORITY - (Flaps ≥ 20)

VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	995	+30/-5	20	-40/+135	+10/-10	+20/-20	35	15	35
AUTOBRAKE MAX	1430	+25/-5	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2345	+50/-30	75	-115/+390	+40/-55	+65/-65	85	95	95

Good Reported Braking Action

MAX MANUAL	1385	+25/-10	35	-65/+225	+30/-30	+35/-35	50	75	170
AUTOBRAKE MAX	1515	+25/-5	40	-70/+240	+25/-15	+40/-40	70	75	180
AUTOBRAKE 2	2345	+50/-30	75	-115/+390	+40/-55	+65/-65	85	95	95

Medium Reported Braking Action

MAX MANUAL	1875	+40/-20	55	-100/+370	+80/-65	+50/-50	60	210	525
AUTOBRAKE MAX	1920	+40/-20	60	-100/+375	+70/-55	+50/-50	75	205	520
AUTOBRAKE 3	2235	+40/-20	65	-115/+415	+50/-45	+60/-65	95	80	305

Poor Reported Braking Action

MAX MANUAL	2395	+55/-35	80	-150/+575	+180/-120	+65/-65	70	440	1255
AUTOBRAKE MAX	2400	+55/-35	80	-150/+575	+185/-120	+65/-65	75	440	1255
AUTOBRAKE 3	2520	+55/-30	80	-155/+585	+160/-105	+70/-70	95	360	1185

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****PRIMARY FLIGHT COMPUTERS - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1110	+25/-15	25	-45/+150	+15/-15	+25/-25	50	25	50
AUTOBRAKE MAX	1320	+20/-20	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2260	+45/-40	65	-115/+385	0/-10	+65/-65	130	0	0

Good Reported Braking Action

MAX MANUAL	1530	+30/-25	40	-70/+250	+40/-35	+35/-35	65	100	235
AUTOBRAKE MAX	1530	+30/-25	40	-70/+245	+35/-30	+40/-40	70	95	225
AUTOBRAKE 2	2260	+45/-40	65	-115/+385	0/-10	+65/-65	130	0	0

Medium Reported Braking Action

MAX MANUAL	2050	+45/-40	65	-110/+395	+95/-75	+55/-55	85	275	735
AUTOBRAKE MAX	2050	+45/-40	65	-110/+395	+105/-85	+55/-55	85	270	725
AUTOBRAKE 3	2135	+45/-40	65	-115/+410	+75/-35	+60/-60	110	200	665

Poor Reported Braking Action

MAX MANUAL	2605	+65/-55	90	-160/+610	+215/-145	+70/-70	95	575	1780
AUTOBRAKE MAX	2610	+65/-55	90	-160/+610	+225/-150	+70/-70	95	575	1785
AUTOBRAKE 3	2615	+65/-55	90	-160/+610	+225/-135	+70/-70	105	575	1785

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****SLATS DRIVE - Flaps 20****VREF30+30**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1115	+30/-5	25	-40/+145	+15/-15	+25/-25	40	25	50
AUTOBRAKE MAX	1565	+25/-5	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2585	+50/-35	85	-120/+410	+50/-60	+75/-75	90	135	135

Good Reported Braking Action

MAX MANUAL	1555	+25/-15	45	-70/+245	+40/-35	+40/-40	55	95	225
AUTOBRAKE MAX	1675	+30/-10	45	-75/+255	+30/-20	+45/-45	70	100	240
AUTOBRAKE 2	2585	+50/-35	85	-120/+410	+50/-60	+75/-75	90	135	135

Medium Reported Braking Action

MAX MANUAL	2090	+40/-25	65	-110/+390	+90/-70	+55/-55	65	255	660
AUTOBRAKE MAX	2125	+45/-25	65	-110/+395	+80/-65	+55/-55	80	255	650
AUTOBRAKE 3	2470	+45/-25	75	-120/+435	+60/-50	+70/-70	100	105	400

Poor Reported Braking Action

MAX MANUAL	2640	+60/-40	90	-155/+600	+200/-135	+70/-70	75	520	1510
AUTOBRAKE MAX	2645	+60/-40	90	-155/+600	+200/-135	+70/-70	80	520	1510
AUTOBRAKE 3	2775	+60/-35	95	-160/+610	+180/-115	+75/-75	100	430	1430

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****STABILIZER - Flaps 20****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	200000 KG LDG WT	PER 5000 KG ABV/BLW 200000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1035	+30/-5	25	-40/+140	+15/-10	+25/-25	40	20	45
AUTOBRAKE MAX	1430	+25/-5	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2390	+50/-30	75	-115/+395	+35/-55	+70/-70	90	70	70

Good Reported Braking Action

MAX MANUAL	1445	+25/-10	40	-65/+235	+35/-30	+35/-35	55	85	200
AUTOBRAKE MAX	1545	+25/-10	40	-70/+245	+30/-25	+40/-40	65	90	210
AUTOBRAKE 2	2390	+50/-30	75	-115/+395	+35/-55	+70/-70	90	70	70

Medium Reported Braking Action

MAX MANUAL	1945	+40/-25	60	-105/+380	+85/-70	+50/-50	65	230	600
AUTOBRAKE MAX	1965	+40/-20	60	-105/+380	+80/-60	+50/-50	75	225	585
AUTOBRAKE 3	2255	+45/-20	65	-115/+415	+50/-40	+65/-65	100	90	380

Poor Reported Braking Action

MAX MANUAL	2475	+55/-35	85	-150/+585	+190/-130	+65/-65	75	480	1395
AUTOBRAKE MAX	2480	+55/-35	85	-150/+585	+195/-130	+65/-65	75	480	1400
AUTOBRAKE 3	2565	+55/-30	85	-155/+595	+180/-110	+70/-70	100	430	1355

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 25 or 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	258.6	243.7				
52	126	264.6	249.6				
50	122	270.9	255.3	236.3			
48	118	277.2	261.0	242.0			
46	115	283.6	266.6	247.5	227.9		
44	111	289.9	272.9	253.0	232.3		
42	108	294.5	279.4	258.3	236.5	219.7	
40	104	298.9	285.7	263.4	240.9	223.4	
38	100	303.1	290.9	268.8	244.9	226.8	209.6
36	97	307.2	296.1	273.9	249.0	230.3	212.9
34	93	311.2	300.9	278.2	253.1	233.7	216.1
32	90	311.3	305.3	282.4	256.9	237.2	219.3
30	86	311.3	309.7	286.6	260.6	240.8	222.4
28	82	311.4	309.7	290.4	264.4	244.5	225.8
26	79	311.4	309.7	294.1	267.9	248.0	229.2
24	75	311.5	309.8	294.9	271.1	251.4	232.5
22	72	311.6	309.8	294.9	274.2	253.5	234.1
20	68	311.6	309.9	294.9	274.8	254.5	235.5
18	64	311.6	309.9	295.0	274.9	255.6	237.2
16	61	311.6	310.0	295.1	274.9	256.1	239.0
14	57	311.7	310.0	295.1	275.0	256.1	240.5
12	54	311.7	310.1	295.2	275.0	256.2	240.6
10	50	311.8	310.2	295.2	275.1	256.2	240.7
-40	-40	312.9	311.5	296.6	276.3	257.3	241.7

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

With engine bleed for packs off, increase weight by 900 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 is below 10°C, decrease weight by 20800 kg.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Reference Brake Energy (Millions of Foot Pounds)**

WEIGHT (1000 KG)	OAT (°C)	BRAKES ON SPEED (KIAS)															
		80			100			120			140			160			
		PRESSURE ALTITUDE (1000 FT)															
300	0	17.3	19.1	21.2	26.1	29.1	32.6	36.4	40.8	46.0	47.9	53.9	61.0	60.4	68.1	77.1	
	10	17.9	19.7	21.8	27.0	30.0	33.7	37.6	42.1	47.5	49.5	55.7	63.0	62.4	70.4	79.6	75.6
	15	18.2	20.0	22.2	27.4	30.5	34.2	38.2	42.9	48.3	50.3	56.7	64.1	63.5	71.5	80.8	76.8
	20	18.4	20.3	22.5	27.9	31.0	34.8	38.9	43.6	49.1	51.2	57.6	65.1	64.5	72.7	82.1	78.0
	30	18.8	20.8	23.1	28.6	31.8	35.7	39.9	44.7	50.5	52.6	59.2	66.9	66.3	74.7	84.3	80.2
	40	19.1	21.0	23.4	29.0	32.4	36.3	40.6	45.6	51.5	53.7	60.5	68.4	67.8	76.4	86.3	82.0
280	0	16.4	18.0	20.0	24.7	27.4	30.7	34.3	38.4	43.2	45.1	50.7	57.3	56.9	64.1	72.6	69.0
	10	16.9	18.6	20.6	25.5	28.3	31.7	35.4	39.7	44.7	46.6	52.4	59.3	58.8	66.3	74.9	71.3
	15	17.2	18.9	20.9	25.9	28.8	32.2	36.0	40.4	45.5	47.4	53.3	60.3	59.8	67.4	76.2	72.5
	20	17.4	19.2	21.3	26.3	29.3	32.8	36.6	41.0	46.2	48.2	54.2	61.2	60.7	68.5	77.3	73.6
	30	17.8	19.6	21.8	27.0	30.0	33.6	37.6	42.1	47.5	49.5	55.7	63.0	62.5	70.4	79.5	75.7
	40	18.0	19.8	22.0	27.4	30.5	34.2	38.3	42.9	48.4	50.5	56.9	64.4	63.8	72.0	81.3	77.4
260	0	15.5	17.0	18.8	23.2	25.8	28.8	32.2	36.0	40.5	42.3	47.5	53.7	53.3	60.0	67.9	64.7
	10	15.9	17.5	19.4	24.0	26.6	29.7	33.3	37.2	41.9	43.7	49.1	55.5	55.0	62.0	70.2	66.9
	15	16.2	17.8	19.7	24.4	27.0	30.2	33.8	37.8	42.6	44.4	49.9	56.4	56.0	63.1	71.3	68.0
	20	16.5	18.1	20.0	24.8	27.5	30.7	34.4	38.5	43.3	45.2	50.8	57.3	56.9	64.1	72.5	69.1
	30	16.8	18.5	20.4	25.4	28.2	31.5	35.3	39.5	44.5	46.4	52.2	58.9	58.5	65.9	74.5	71.0
	40	17.0	18.7	20.7	25.7	28.6	32.0	35.9	40.2	45.3	47.3	53.3	60.2	59.8	67.4	76.2	72.6
240	0	14.6	15.9	17.6	21.8	24.1	26.9	30.1	33.6	37.8	39.4	44.2	49.9	49.6	55.8	63.2	60.3
	10	15.0	16.4	18.1	22.5	24.9	27.8	31.1	34.7	39.0	40.7	45.7	51.6	51.2	57.7	65.3	62.3
	15	15.2	16.7	18.4	22.8	25.3	28.3	31.6	35.3	39.7	41.4	46.5	52.5	52.1	58.7	66.3	63.3
	20	15.5	16.9	18.7	23.2	25.7	28.7	32.1	35.9	40.3	42.1	47.3	53.3	53.0	59.7	67.4	64.4
	30	15.8	17.3	19.2	23.7	26.3	29.4	32.9	36.8	41.4	43.2	48.6	54.8	54.4	61.3	69.3	66.2
	40	15.9	17.5	19.4	24.1	26.7	29.9	33.5	37.5	42.2	44.1	49.6	56.0	55.6	62.7	70.9	67.7
220	0	13.6	14.9	16.4	20.3	22.4	25.0	28.0	31.2	35.0	36.5	40.9	46.1	45.8	51.6	58.3	55.7
	10	14.1	15.4	16.9	20.9	23.2	25.8	28.9	32.2	36.1	37.7	42.3	47.7	47.3	53.3	60.2	57.6
	15	14.3	15.6	17.2	21.3	23.5	26.2	29.4	32.7	36.7	38.4	43.0	48.5	48.2	54.2	61.2	58.5
	20	14.5	15.9	17.5	21.6	23.9	26.7	29.8	33.3	37.3	39.0	43.7	49.3	49.0	55.1	62.2	59.5
	30	14.8	16.2	17.9	22.1	24.5	27.3	30.6	34.1	38.3	40.0	44.9	50.6	50.3	56.6	64.0	61.2
	40	14.9	16.3	18.1	22.4	24.8	27.7	31.1	34.7	39.0	40.8	45.8	51.7	51.3	57.9	65.4	62.5
200	0	12.7	13.9	15.3	18.8	20.8	23.1	25.8	28.7	32.2	33.6	37.5	42.3	42.0	47.2	53.3	51.0
	10	13.1	14.3	15.7	19.4	21.4	23.8	26.6	29.6	33.2	34.7	38.8	43.7	43.4	48.8	55.1	52.7
	15	13.3	14.5	16.0	19.7	21.8	24.2	27.1	30.1	33.8	35.2	39.5	44.4	44.1	49.6	56.0	53.6
	20	13.5	14.8	16.3	20.0	22.1	24.6	27.5	30.6	34.3	35.8	40.1	45.2	44.9	50.4	56.9	54.5
	30	13.8	15.1	16.6	20.5	22.6	25.2	28.2	31.4	35.2	36.8	41.2	46.4	46.1	51.8	58.5	56.0
	40	13.9	15.2	16.8	20.8	22.9	25.6	28.6	31.9	35.8	37.4	42.0	47.3	47.0	52.9	59.8	57.2
180	0	11.8	12.9	14.1	17.4	19.1	21.2	23.6	26.2	29.3	30.6	34.1	38.4	38.1	42.7	48.2	46.1
	10	12.2	13.3	14.6	17.9	19.7	21.9	24.4	27.1	30.3	31.6	35.3	39.6	39.3	44.1	49.8	47.6
	15	12.4	13.5	14.8	18.2	20.0	22.2	24.8	27.5	30.8	32.1	35.9	40.3	40.0	44.9	50.7	48.5
	20	12.6	13.7	15.0	18.5	20.3	22.6	25.2	28.0	31.3	32.6	36.4	41.0	40.7	45.6	51.5	49.2
	30	12.8	14.0	15.3	18.9	20.8	23.1	25.8	28.7	32.1	33.5	37.4	42.1	41.8	46.9	52.9	50.6
	40	12.9	14.1	15.5	19.1	21.1	23.4	26.2	29.1	32.6	34.0	38.1	42.9	42.6	47.8	54.0	51.7

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus the tailwind.

If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Event Adjusted Brake Energy (Millions of Foot Pounds)****No Reverse Thrust**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90
	MAX MAN	6.3	15.6	24.9	34.0	43.2	52.3	61.6	70.9	80.4
	MAX AUTO	6.1	14.4	22.8	31.3	40.0	49.0	58.2	67.7	77.6
	AUTOBRAKE 4	5.9	13.6	21.2	29.1	37.1	45.5	54.2	63.3	73.0
	AUTOBRAKE 3	5.6	12.7	19.7	26.9	34.2	41.9	49.8	58.3	67.3
	AUTOBRAKE 2	5.3	11.8	18.2	24.8	31.5	38.4	45.6	53.3	61.5
	AUTOBRAKE 1	5.2	11.0	16.8	22.8	28.9	35.2	41.9	48.9	56.4

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
EVENT		10	20	30	40	50	60	70	80	90
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90
	MAX MAN	5.8	14.7	23.4	32.0	40.4	48.8	57.2	65.6	74.2
	MAX AUTO	4.3	11.6	18.9	26.4	34.1	42.0	50.2	58.9	68.0
	AUTOBRAKE 4	3.6	9.2	15.0	21.1	27.5	34.4	41.7	49.6	58.2
	AUTOBRAKE 3	2.5	6.6	11.1	15.9	21.0	26.7	32.8	39.5	46.8
	AUTOBRAKE 2	1.4	4.4	7.6	11.3	15.3	19.7	24.5	29.8	35.6
	AUTOBRAKE 1	1.0	3.0	5.3	7.8	10.6	13.9	17.5	21.7	26.4

Cooling Time (Minutes)

		EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
16 & BELOW		17	18	20	24	28	32	35	36 TO 44	45 & ABOVE
GEAR DOWN INFLIGHT	NO SPECIAL PROCEDURE	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE
GROUND	REQUIRED	11	18	26	42	55	66	73		
BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9	5.0 TO 6.3	6.3 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

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 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not 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 EICAS 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. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

DRAFT

Intentionally
Blank

Performance Inflight

Engine Inoperative

Chapter PI

Section 23

ENGINE INOP

Initial Max Continuous EPR

Based on .84M, engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20 & ABOVE	1.243	1.234	1.226	1.211	1.192	1.183	1.181	1.175	1.170
	1.284	1.275	1.263	1.250	1.232	1.222	1.220	1.216	1.212
	1.327	1.319	1.307	1.288	1.273	1.264	1.262	1.259	1.257
5	1.364	1.366	1.354	1.337	1.314	1.306	1.304	1.302	1.300
0	1.364	1.402	1.406	1.388	1.368	1.355	1.354	1.351	1.349
-5	1.364	1.402	1.439	1.444	1.424	1.412	1.411	1.408	1.406
-10	1.364	1.402	1.439	1.473	1.482	1.471	1.469	1.467	1.465
-15	1.364	1.402	1.439	1.473	1.506	1.523	1.523	1.521	1.518
-20 & BELOW	1.364	1.402	1.439	1.473	1.506	1.523	1.523	1.521	1.518

Max Continuous EPR

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

37000 FT to 29000 FT Pressure Altitudes

37000 FT PRESS ALT			TAT (°C)											
KIAS	M		-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.63	1.531	1.531	1.531	1.531	1.531	1.489	1.436	1.385	1.341	1.302	1.263	1.233	
240	0.74	1.534	1.534	1.534	1.534	1.534	1.534	1.517	1.455	1.402	1.349	1.308	1.268	
280	0.86	1.506	1.506	1.506	1.506	1.506	1.506	1.506	1.506	1.469	1.413	1.356	1.304	
35000 FT PRESS ALT			TAT (°C)											
KIAS	M		-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.60	1.517	1.517	1.517	1.517	1.517	1.486	1.433	1.385	1.341	1.304	1.267	1.234	
240	0.71	1.514	1.514	1.514	1.514	1.514	1.514	1.502	1.444	1.394	1.344	1.305	1.266	
280	0.82	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.519	1.476	1.417	1.362	1.311	
33000 FT PRESS ALT			TAT (°C)											
KIAS	M		-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
200	0.58	1.499	1.499	1.499	1.499	1.499	1.499	1.447	1.401	1.358	1.323	1.290	1.257	
240	0.68	1.491	1.491	1.491	1.491	1.491	1.491	1.491	1.452	1.402	1.355	1.314	1.278	
280	0.79	1.489	1.489	1.489	1.489	1.489	1.489	1.489	1.489	1.472	1.414	1.363	1.314	
320	0.89	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.389	1.338	
31000 FT PRESS ALT			TAT (°C)											
KIAS	M		-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
200	0.55	1.480	1.480	1.480	1.480	1.480	1.461	1.414	1.372	1.332	1.303	1.274	1.245	
240	0.66	1.471	1.471	1.471	1.471	1.471	1.471	1.461	1.410	1.365	1.322	1.291	1.260	
280	0.76	1.459	1.459	1.459	1.459	1.459	1.459	1.459	1.459	1.415	1.366	1.321	1.281	
320	0.85	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.406	1.353	1.306	
29000 FT PRESS ALT			TAT (°C)											
KIAS	M		-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
200	0.53	1.493	1.493	1.493	1.493	1.493	1.454	1.411	1.369	1.334	1.302	1.270	1.252	
240	0.63	1.475	1.475	1.475	1.475	1.475	1.475	1.441	1.395	1.352	1.315	1.286	1.255	
280	0.73	1.446	1.446	1.446	1.446	1.446	1.446	1.446	1.426	1.378	1.334	1.293	1.259	
320	0.82	1.413	1.413	1.413	1.413	1.413	1.413	1.413	1.413	1.413	1.362	1.317	1.273	
360	0.91	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.351	1.330	1.284	

ENGINE INOP**Max Continuous EPR**

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

37000 FT to 29000 FT Pressure Altitudes

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	37	35	33	31	29
ENGINE ONLY	-0.004	-0.003	-0.003	-0.003	-0.003
ENGINE & WING*	-0.015	-0.014	-0.013	-0.012	-0.012
ENGINE & WING**	-0.026	-0.024	-0.022	-0.021	-0.020

* Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

27000 FT to 20000 Pressure Altitudes

27000 FT PRESS ALT			TAT (°C)												
KIAS	M		-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	
200	0.51	1.507	1.507	1.507	1.507	1.507	1.499	1.452	1.409	1.368	1.336	1.302	1.268		
240	0.60	1.488	1.488	1.488	1.488	1.488	1.488	1.483	1.434	1.391	1.349	1.317	1.286		
280	0.70	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.443	1.398	1.355	1.314	1.279		
320	0.79	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.368	1.323	1.282		
360	0.88	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.330	1.325	1.281		

25000 FT PRESS ALT			TAT (°C)												
KIAS	M		-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	
200	0.49	1.521	1.521	1.521	1.521	1.521	1.496	1.450	1.407	1.369	1.337	1.303	1.278		
240	0.58	1.502	1.502	1.502	1.502	1.502	1.502	1.477	1.431	1.389	1.350	1.316	1.282		
280	0.67	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.430	1.384	1.344	1.305	1.273		
320	0.76	1.386	1.386	1.386	1.386	1.386	1.386	1.386	1.386	1.380	1.335	1.296	1.257		
360	0.85	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.319	1.288	1.249		

24000 FT PRESS ALT			TAT (°C)												
KIAS	M		-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	
200	0.48	1.523	1.523	1.523	1.523	1.523	1.512	1.465	1.420	1.379	1.346	1.312	1.278		
240	0.57	1.502	1.502	1.502	1.502	1.502	1.502	1.490	1.443	1.399	1.357	1.324	1.289		
280	0.66	1.455	1.455	1.455	1.455	1.455	1.455	1.455	1.447	1.400	1.358	1.316	1.283		
320	0.75	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.350	1.309	1.269		
360	0.83	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.324	1.300	1.259		

22000 FT PRESS ALT			TAT (°C)												
KIAS	M		-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	
200	0.46	1.523	1.523	1.523	1.523	1.523	1.496	1.449	1.404	1.364	1.330	1.295	1.271		
240	0.55	1.505	1.505	1.505	1.505	1.505	1.505	1.473	1.426	1.380	1.341	1.307	1.273		
280	0.63	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.433	1.387	1.342	1.302	1.269		
320	0.72	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.385	1.340	1.297	1.255		
360	0.80	1.336	1.336	1.336	1.336	1.336	1.336	1.336	1.336	1.336	1.329	1.287	1.246		

20000 FT PRESS ALT			TAT (°C)												
KIAS	M		-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	
200	0.44	1.519	1.519	1.519	1.519	1.519	1.519	1.477	1.429	1.383	1.346	1.311	1.275		
240	0.53	1.512	1.512	1.512	1.512	1.512	1.512	1.509	1.461	1.413	1.366	1.329	1.294		
280	0.61	1.469	1.469	1.469	1.469	1.469	1.469	1.469	1.465	1.417	1.368	1.321	1.287		
320	0.69	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.376	1.329	1.283		
360	0.77	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.350	1.317	1.274		

ENGINE INOP

Max Continuous EPR

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

27000 FT to 20000 Pressure Altitudes

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	27	25	24	22	20
ENGINE ONLY	-0.004	-0.005	-0.006	-0.007	-0.006
ENGINE & WING*	-0.012	-0.012	-0.012	-0.013	-0.012
ENGINE & WING**	-0.019	-0.019	-0.019	-0.019	-0.018

* Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

ENGINE INOP**Max Continuous EPR**

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

18000 FT to 5000 FT Pressure Altitudes

18000 FT PRESS ALT			TAT (°C)										
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.42	1.511	1.511	1.511	1.511	1.511	1.500	1.455	1.411	1.369	1.337	1.305	1.275
240	0.51	1.515	1.515	1.515	1.515	1.515	1.515	1.495	1.449	1.403	1.362	1.328	1.293
280	0.59	1.472	1.472	1.472	1.472	1.472	1.472	1.472	1.447	1.400	1.354	1.313	1.282
320	0.67	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.424	1.402	1.356	1.311	1.269
360	0.75	1.362	1.362	1.362	1.362	1.362	1.362	1.362	1.362	1.362	1.349	1.305	1.262
16000 FT PRESS ALT			TAT (°C)										
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
200	0.41	1.504	1.504	1.504	1.504	1.504	1.504	1.479	1.438	1.396	1.360	1.332	1.304
240	0.49	1.511	1.511	1.511	1.511	1.511	1.511	1.511	1.477	1.432	1.389	1.354	1.322
280	0.57	1.474	1.474	1.474	1.474	1.474	1.474	1.474	1.474	1.432	1.387	1.344	1.310
320	0.64	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.427	1.384	1.340	1.296
360	0.72	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.372	1.337	1.294
14000 FT PRESS ALT			TAT (°C)										
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
200	0.39	1.488	1.488	1.488	1.488	1.488	1.488	1.452	1.413	1.373	1.343	1.315	1.288
240	0.47	1.491	1.491	1.491	1.491	1.491	1.491	1.484	1.444	1.402	1.361	1.330	1.298
280	0.54	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.449	1.407	1.365	1.324	1.293
320	0.62	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.400	1.357	1.315	1.275
360	0.69	1.368	1.368	1.368	1.368	1.368	1.368	1.368	1.368	1.368	1.354	1.313	1.272
12000 FT PRESS ALT			TAT (°C)										
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
200	0.38	1.475	1.475	1.475	1.475	1.475	1.468	1.431	1.393	1.355	1.329	1.302	1.276
240	0.45	1.473	1.473	1.473	1.473	1.473	1.473	1.453	1.415	1.375	1.339	1.308	1.277
280	0.52	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.424	1.385	1.344	1.308	1.275
320	0.60	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.407	1.373	1.333	1.292	1.257
360	0.67	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.359	1.327	1.288	1.248
10000 FT PRESS ALT			TAT (°C)										
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
200	0.36	1.462	1.462	1.462	1.462	1.462	1.462	1.444	1.408	1.371	1.338	1.311	1.284
240	0.43	1.452	1.452	1.452	1.452	1.452	1.452	1.452	1.421	1.383	1.345	1.313	1.283
280	0.51	1.438	1.438	1.438	1.438	1.438	1.438	1.438	1.433	1.397	1.358	1.318	1.286
320	0.58	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.382	1.344	1.305	1.265
360	0.65	1.344	1.344	1.344	1.344	1.344	1.344	1.344	1.344	1.344	1.332	1.295	1.258
5000 FT PRESS ALT			TAT (°C)										
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
200	0.33	1.422	1.422	1.422	1.422	1.422	1.422	1.422	1.399	1.367	1.334	1.306	1.282
240	0.40	1.400	1.400	1.400	1.400	1.400	1.400	1.400	1.394	1.361	1.328	1.295	1.269
280	0.46	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.365	1.330	1.295	1.263
320	0.53	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.323	1.288	1.253
360	0.59	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.303	1.270	1.237

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	18	16	14	12	10	5
ENGINE ONLY	-0.010	-0.013	-0.015	-0.015	-0.015	-0.010
ENGINE & WING*	-0.015	-0.018	-0.019	-0.019	-0.018	-0.012
ENGINE & WING**	-0.021	-0.024	-0.024	-0.023	-0.022	-0.014

* Wing anti-ice on, packs on.

** Wing anti-ice on, packs off.

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	290	282	17500	16100	14600
280	271	273	19400	18000	16600
260	252	264	21300	20000	18600
240	232	253	23300	22100	20700
220	213	243	25400	24200	22900
200	194	231	27400	26200	25100
180	174	219	29500	28300	27200
160	154	206	32200	30600	29500

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	
136	127	119	112	106	100	95	90	86	82	79	
272	254	238	224	211	200	190	181	173	165	158	
407	380	356	335	317	300	285	271	259	248	238	
541	505	474	447	422	400	380	362	346	331	317	
675	631	592	558	527	500	475	453	433	414	397	
808	755	709	669	633	600	571	544	520	498	477	
940	880	827	780	738	700	666	635	607	581	558	
1072	1004	944	890	843	800	761	726	694	665	638	
1204	1128	1061	1001	948	900	857	817	782	749	719	
1335	1251	1177	1112	1053	1000	952	909	869	833	799	
1467	1375	1294	1222	1158	1100	1048	1000	957	917	880	
1598	1499	1411	1333	1263	1200	1143	1091	1044	1001	961	
1729	1622	1527	1443	1368	1300	1239	1183	1132	1085	1042	
1860	1746	1644	1554	1473	1400	1334	1274	1219	1169	1122	
1992	1869	1761	1664	1578	1500	1429	1365	1306	1253	1203	
2123	1993	1878	1775	1683	1600	1525	1456	1394	1336	1284	
2255	2117	1995	1886	1788	1700	1620	1548	1481	1420	1364	
2388	2241	2112	1997	1893	1800	1716	1639	1568	1504	1445	

ENGINE INOP**MAX CONTINUOUS THRUST****Driftdown/LRC Cruise Range Capability****Driftdown/Cruise Fuel and Time**

AIR DIST (NM)	FUEL REQUIRED (1000 KG)								TIME (HR:MIN)	
	WEIGHT AT START OF DRIFTDOWN (1000 KG)									
	160	180	200	220	240	260	280	300		
100	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	0:16	
200	2.5	2.6	2.8	2.9	3.1	3.2	3.3	3.4	0:32	
300	3.8	4.1	4.4	4.7	5.0	5.2	5.5	5.7	0:47	
400	5.1	5.6	6.0	6.5	6.9	7.4	7.8	8.2	1:03	
500	6.4	7.0	7.6	8.2	8.9	9.4	10.0	10.6	1:18	
600	7.7	8.4	9.1	9.9	10.7	11.4	12.1	12.9	1:33	
700	8.9	9.8	10.6	11.5	12.5	13.3	14.2	15.1	1:47	
800	10.1	11.1	12.1	13.1	14.2	15.2	16.3	17.3	2:02	
900	11.3	12.5	13.6	14.7	16.0	17.2	18.3	19.5	2:16	
1000	12.5	13.8	15.1	16.4	17.7	19.1	20.4	21.6	2:31	
1100	13.6	15.1	16.5	18.0	19.5	20.9	22.4	23.8	2:45	
1200	14.8	16.4	18.0	19.5	21.2	22.8	24.4	25.9	2:59	
1300	16.0	17.7	19.4	21.1	22.9	24.7	26.4	28.1	3:14	
1400	17.1	19.0	20.8	22.7	24.6	26.5	28.4	30.2	3:28	
1500	18.3	20.3	22.3	24.2	26.3	28.3	30.3	32.3	3:42	
1600	19.4	21.6	23.7	25.8	28.0	30.1	32.3	34.4	3:57	
1700	20.6	22.8	25.1	27.3	29.7	32.0	34.2	36.5	4:11	
1800	21.7	24.1	26.5	28.8	31.3	33.7	36.2	38.5	4:26	

Includes APU fuel burn.

Driftdown at optimum driftdown speed and cruise at LRC speed.

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
300	15000	12700	10300
290	15700	13600	11200
280	16300	14400	12000
270	17000	15300	13000
260	18100	16500	14600
250	19200	17600	15800
240	20300	18800	17000
230	21400	20000	18200
220	22500	21100	19400
210	23600	22300	20700
200	24800	23500	22000
190	26000	24800	23400
180	27300	26000	24800
170	28600	27300	26100
160	30000	28600	27400

ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)							
		10	15	17	19	21	23	25	27
300	EPR	1.259	1.366						
	MACH	.585	.641						
	KIAS	325	325						
	FF/ENG	8919	9092						
280	EPR	1.236	1.333	1.383					
	MACH	.585	.641	.665					
	KIAS	325	325	325					
	FF/ENG	8548	8681	8780					
260	EPR	1.213	1.297	1.341	1.398				
	MACH	.577	.627	.651	.680				
	KIAS	321	318	318	320				
	FF/ENG	8069	8080	8152	8331				
240	EPR	1.188	1.260	1.298	1.344	1.402			
	MACH	.558	.606	.627	.652	.681			
	KIAS	310	307	306	306	308			
	FF/ENG	7412	7389	7412	7482	7658			
220	EPR	1.164	1.226	1.258	1.297	1.343	1.402		
	MACH	.538	.585	.605	.626	.651	.681		
	KIAS	298	296	294	294	294	296		
	FF/ENG	6764	6736	6728	6748	6810	6972		
200	EPR	1.141	1.195	1.223	1.254	1.293	1.339	1.398	
	MACH	.516	.562	.581	.601	.623	.648	.677	
	KIAS	286	284	283	282	281	281	282	
	FF/ENG	6126	6094	6085	6077	6089	6140	6273	
180	EPR	1.119	1.166	1.189	1.217	1.247	1.284	1.330	1.386
	MACH	.492	.537	.556	.576	.596	.617	.642	.671
	KIAS	272	271	270	269	268	267	267	268
	FF/ENG	5490	5462	5451	5443	5434	5438	5475	5573
160	EPR	1.098	1.139	1.158	1.181	1.207	1.237	1.272	1.316
	MACH	.466	.510	.529	.548	.568	.588	.609	.633
	KIAS	258	257	256	256	255	254	253	252
	FF/ENG	4862	4838	4827	4817	4809	4800	4796	4817

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	
287	264	244	227	213	200	191	182	174	167	160	
576	530	489	455	426	400	381	364	348	334	321	
865	796	735	684	640	600	572	546	522	501	482	
1156	1064	982	913	853	800	763	729	698	669	643	
1448	1332	1229	1142	1067	1000	953	910	871	835	803	
1742	1602	1477	1372	1281	1200	1144	1092	1045	1002	963	
2036	1871	1725	1602	1495	1400	1335	1274	1219	1168	1122	
2332	2141	1973	1831	1709	1600	1525	1456	1392	1334	1282	
2629	2414	2223	2062	1924	1800	1715	1637	1565	1500	1441	

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	3.4	0:40	3.0	0:38	2.6	0:37	2.4	0:36	2.1	0:34
400	7.1	1:17	6.5	1:13	6.0	1:10	5.5	1:07	5.2	1:03
600	10.9	1:54	10.0	1:48	9.3	1:43	8.7	1:38	8.2	1:33
800	14.5	2:31	13.5	2:24	12.6	2:17	11.8	2:10	11.2	2:02
1000	18.2	3:09	16.9	2:59	15.8	2:51	14.9	2:42	14.2	2:32
1200	21.8	3:47	20.3	3:35	19.1	3:25	17.9	3:14	17.1	3:02
1400	25.3	4:26	23.7	4:12	22.2	3:59	20.9	3:47	20.0	3:33
1600	28.8	5:05	27.0	4:48	25.4	4:33	23.9	4:19	22.9	4:03
1800	32.3	5:44	30.3	5:25	28.5	5:08	26.9	4:52	25.7	4:34

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
2	-0.1	-0.1	0.0	0.1	0.3	0.4	0.6	0.7
4	-0.4	-0.2	0.0	0.4	0.7	1.1	1.5	1.9
6	-0.6	-0.3	0.0	0.6	1.2	1.8	2.4	3.1
8	-0.9	-0.4	0.0	0.8	1.6	2.5	3.4	4.3
10	-1.1	-0.5	0.0	1.0	2.1	3.2	4.3	5.4
12	-1.3	-0.7	0.0	1.2	2.5	3.8	5.2	6.6
14	-1.6	-0.8	0.0	1.4	2.9	4.5	6.1	7.7
16	-1.8	-0.9	0.0	1.6	3.3	5.1	6.9	8.8
18	-2.0	-1.0	0.0	1.8	3.7	5.7	7.8	10.0
20	-2.3	-1.1	0.0	2.0	4.1	6.3	8.6	11.1
22	-2.5	-1.2	0.0	2.2	4.5	6.9	9.5	12.1
24	-2.8	-1.4	0.0	2.4	4.9	7.5	10.3	13.2
26	-3.0	-1.5	0.0	2.5	5.2	8.1	11.1	14.3
28	-3.2	-1.6	0.0	2.7	5.6	8.7	11.9	15.4
30	-3.5	-1.7	0.0	2.9	5.9	9.2	12.7	16.4
32	-3.7	-1.8	0.0	3.0	6.2	9.7	13.5	17.4
34	-3.9	-2.0	0.0	3.1	6.6	10.3	14.2	18.5

ENGINE INOP

MAX CONTINUOUS THRUST

Holding
Flaps up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
300	EPR	1.163	1.200	1.271	1.363	
	KIAS	260	260	262	277	
	FF/ENG	8080	8090	8160	8510	
280	EPR	1.147	1.179	1.242	1.327	1.460
	KIAS	251	251	253	261	286
	FF/ENG	7480	7480	7530	7730	8420
260	EPR	1.131	1.159	1.215	1.294	1.401
	KIAS	242	242	243	246	266
	FF/ENG	6890	6900	6910	7010	7430
240	EPR	1.116	1.141	1.189	1.259	1.352
	KIAS	232	233	234	235	247
	FF/ENG	6310	6310	6320	6370	6620
220	EPR	1.102	1.124	1.165	1.225	1.310
	KIAS	222	223	224	224	251
	FF/ENG	5750	5740	5740	5760	5880
200	EPR	1.088	1.106	1.142	1.193	1.269
	KIAS	215	215	215	215	229
	FF/ENG	5230	5190	5190	5180	5230
180	EPR	1.075	1.090	1.119	1.161	1.225
	KIAS	208	208	208	208	209
	FF/ENG	4840	4680	4650	4650	4670
160	EPR	1.061	1.074	1.097	1.133	1.183
	KIAS	203	203	203	203	203
	FF/ENG	4360	4310	4160	4160	4180
140	EPR	1.047	1.058	1.076	1.105	1.146
	KIAS	203	203	203	203	203
	FF/ENG	3960	3910	3760	3740	3750

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

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available

Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	550	460				
50	600	510	380			
48	650	550	420			
46	690	600	470	310		
44	720	650	510	340		
42	760	690	550	370	230	
40	790	730	580	400	260	
38	820	760	610	440	290	150
36	840	800	650	470	320	180
34	840	830	680	500	350	200
32	850	850	710	530	380	230
30	850	850	730	550	410	260
20	870	870	760	620	480	340
10	890	890	770	630	490	360
0	900	900	790	650	500	370
-20	940	940	820	670	520	390
-40	990	990	860	710	550	400

Rate of climb capability shown is valid for 200000 kg, gear down at VREF20 + 5.

Decrease rate of climb 40 ft/min per 5000 kg greater than 200000 kg.

Increase rate of climb 60 ft/min per 5000 kg less than 200000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	50	-50				
50	90	-10	-140			
48	130	30	-100			
46	170	80	-60	-220		
44	200	120	-20	-190		
42	230	160	20	-160	-290	
40	260	190	50	-130	-270	
38	290	230	80	-100	-240	-380
36	310	260	110	-70	-220	-360
34	310	290	130	-40	-190	-340
32	320	310	160	-20	-170	-310
30	320	310	180	10	-140	-290
20	320	320	200	60	-80	-220
10	330	330	210	70	-80	-210
0	340	330	210	70	-80	-210
-20	360	350	220	70	-80	-210
-40	380	370	240	80	-80	-220

Rate of climb capability shown is valid for 200000 kg, gear down at VREF30 + 5.

Decrease rate of climb 40 ft/min per 5000 kg greater than 200000 kg.

Increase rate of climb 60 ft/min per 5000 kg less than 200000 kg.

Performance Inflight**Alternate Mode EEC****Chapter PI****Section 24****ALTERNATE MODE EEC****Limit Weight**

PERFORMANCE LIMIT	ALTERNATE MODE EEC LIMIT WEIGHT (1000 KG)									
	PRIMARY MODE PERFORMANCE LIMIT WEIGHT (1000 KG)									
	140	160	180	200	220	240	260	280	300	320
FIELD	134.5	153.0	171.5	190.0	208.5	227.0	245.5	264.0	282.5	301.0
CLIMB	127.9	146.2	164.5	182.8	201.1	219.4	237.6	255.9	274.2	292.5
OBSTACLE	130.0	148.1	166.2	184.3	202.4	220.5	238.6	256.7	274.8	292.9
NET LEVEL OFF WEIGHT	130.0	148.4	166.9	185.3	203.8	222.2	240.7	259.1	277.5	296.0
LANDING CLIMB	127.2	145.6	164.1	182.5	200.9	219.4	237.8	256.2	274.6	293.1

Takeoff Speed Adjustment

TAKEOFF SPEEDS	TAKEOFF SPEED ADJUSTMENT (KTS)
V1	+1
VR	0
V2	0

Max Takeoff %N1

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

		AIRPORT PRESSURE ALTITUDE (FT)										
°C	°F	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
55	131	92.4	92.7	92.9	93.1	93.3	93.4	93.4	93.4	93.3	93.2	93.1
50	122	93.4	93.9	93.9	93.9	93.9	94.0	94.1	94.1	94.0	94.0	93.9
45	113	94.4	95.0	95.0	95.0	94.8	94.7	94.7	94.7	94.7	94.6	94.6
40	104	94.9	96.3	96.1	96.1	95.7	95.4	95.3	95.3	95.3	95.3	95.2
35	95	95.4	96.9	97.0	96.9	96.5	96.1	96.1	96.0	96.0	96.0	96.0
30	86	94.9	98.0	97.8	97.8	97.4	97.0	96.9	96.9	96.8	96.8	96.7
25	77	94.1	97.4	97.8	98.2	97.9	97.6	97.8	97.7	97.6	97.6	97.6
20	68	93.3	96.6	97.0	97.4	97.6	97.8	97.7	97.8	97.9	97.8	97.8
15	59	92.5	95.7	96.1	96.6	96.8	96.9	97.2	97.4	97.8	98.0	97.9
10	50	91.7	94.9	95.3	95.7	95.9	96.1	96.3	96.5	96.9	97.3	97.5
5	41	90.9	94.0	94.4	94.9	95.1	95.2	95.5	95.7	96.1	96.5	96.6
0	32	90.1	93.2	93.6	94.0	94.2	94.4	94.6	94.8	95.2	95.6	95.8
-10	14	88.4	91.5	91.9	92.3	92.5	92.6	92.9	93.1	93.5	93.8	94.0
-20	-4	86.7	89.7	90.1	90.5	90.7	90.9	91.1	91.3	91.7	92.0	92.2
-30	-22	85.0	87.9	88.3	88.7	88.9	89.0	89.3	89.5	89.8	90.2	90.3
-40	-40	83.2	86.1	86.5	86.9	87.0	87.2	87.4	87.6	88.0	88.3	88.5
-50	-58	81.4	84.2	84.6	85.0	85.1	85.3	85.5	85.7	86.1	86.4	86.5

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
PACKS OFF	0.1	0.2	0.2	0.2	0.2	0.2
WING ANTI-ICE ON	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3

ALTERNATE MODE EEC**Max Climb %N1**

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

TAT (°C)	PRESSURE ALTITUDE (FT) / SPEED (KIAS OR MACH)									
	0	5000	10000	15000	20000	25000	30000	35000	40000	43000
60	83.9	84.6	86.7	89.4	92.2	93.4	94.5	96.1	96.3	96.0
50	85.4	86.2	86.7	88.1	90.8	92.0	93.1	94.7	94.9	94.5
40	86.8	87.5	88.0	88.9	89.8	90.6	91.6	93.2	93.4	93.1
30	85.9	88.8	89.4	90.2	91.0	90.8	90.5	91.7	91.9	91.6
20	84.5	87.3	89.8	91.3	92.1	91.8	91.9	90.9	90.3	90.0
15	83.7	86.6	89.1	91.7	92.6	92.5	92.3	91.5	91.1	90.9
10	83.0	85.8	88.3	90.9	93.2	93.1	92.9	92.1	91.7	91.5
5	82.3	85.1	87.5	90.1	92.8	93.9	93.6	92.5	92.2	92.1
0	81.5	84.3	86.7	89.3	92.0	93.9	94.5	93.3	92.8	92.7
-5	80.8	83.5	85.9	88.5	91.1	93.0	94.6	94.3	93.8	93.7
-10	80.0	82.7	85.1	87.7	90.3	92.1	93.7	95.4	94.9	94.8
-15	79.3	81.9	84.3	86.8	89.4	91.2	92.9	95.4	96.0	95.9
-20	78.5	81.1	83.5	86.0	88.5	90.4	91.9	94.5	95.0	94.9
-25	77.7	80.3	82.7	85.1	87.7	89.5	91.0	93.5	94.1	94.0
-30	76.9	79.5	81.8	84.3	86.8	88.5	90.1	92.6	93.1	93.0
-35	76.1	78.7	81.0	83.4	85.9	87.6	89.2	91.6	92.2	92.1
-40	75.3	77.9	80.1	82.5	85.0	86.7	88.2	90.7	91.2	91.1

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)									
	0	5000	10000	15000	20000	25000	30000	35000	40000	43000
ENGINE ANTI-ICE ON	-0.4	-0.5	-0.7	-0.6	-0.3	-0.2	-0.1	-0.1	-0.1	-0.2
ENGINE & WING ANTI-ICE ON	-0.5	-0.6	-0.8	-0.8	-0.5	-0.5	-0.4	-0.5	-0.6	-0.7

Max Cruise %N1

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

TAT (°C)	PRESSURE ALTITUDE (FT)									
	25000	27000	29000	31000	33000	35000	37000	39000	41000	43000
25	89.6	89.4	89.5	89.9	89.2	89.3	89.6	89.5	89.3	89.1
20	90.1	90.0	90.1	90.4	89.9	89.2	88.9	88.8	88.6	88.4
15	90.7	90.5	90.6	90.9	90.5	89.9	89.5	89.5	89.3	89.2
10	91.1	91.0	91.1	91.4	90.9	90.4	90.1	90.1	90.0	89.9
5	91.7	91.5	91.6	91.9	91.4	90.8	90.6	90.5	90.5	90.4
0	91.5	91.9	92.2	92.5	92.0	91.4	91.1	91.0	91.0	90.9
-5	90.7	91.1	91.8	92.6	92.7	92.1	91.8	91.7	91.7	91.6
-10	89.8	90.2	91.0	91.7	92.6	92.9	92.6	92.5	92.5	92.4
-15	89.0	89.4	90.1	90.8	91.7	92.7	93.2	93.1	93.1	93.0
-20	88.1	88.5	89.2	89.9	90.8	91.8	92.2	92.2	92.2	92.1
-25	87.2	87.6	88.3	89.0	89.9	90.9	91.3	91.3	91.3	91.2
-30	86.3	86.7	87.5	88.1	89.0	89.9	90.4	90.4	90.3	90.3
-35	85.4	85.8	86.5	87.2	88.1	89.0	89.5	89.4	89.4	89.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)				
	25000	30000	35000	40000	43000
ENGINE ANTI-ICE ON	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING ANTI-ICE ON	-0.4	-0.4	-0.5	-0.5	-0.6

ALTERNATE MODE EEC**Go-Around %N1**

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

AIRPORT OAT		TAT (°C)	PRESSURE ALTITUDE (FT)											
°C	°F		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
51	124	55	93.4	93.9	93.9	93.8	94.0	94.2	94.3	94.3	94.3	94.2	94.1	94.1
46	115	50	94.4	95.0	95.1	95.1	94.9	94.8	94.9	95.0	94.9	94.9	94.9	94.8
41	106	45	95.1	96.2	96.1	96.1	95.8	95.6	95.6	95.6	95.5	95.5	95.5	95.5
36	97	40	95.5	97.0	97.0	96.9	96.6	96.2	96.2	96.2	96.1	96.1	96.0	96.0
31	88	35	95.3	97.7	97.7	97.7	97.3	97.0	96.9	96.9	96.8	96.8	96.8	96.7
26	79	30	94.6	97.3	98.0	98.4	98.0	97.7	97.7	97.6	97.6	97.6	97.5	97.5
21	70	25	93.8	96.5	97.2	97.8	98.1	98.3	98.1	98.2	98.2	98.1	98.0	98.0
17	62	20	93.0	95.7	96.4	97.0	97.2	97.5	97.8	98.0	98.3	98.3	98.1	97.9
12	53	15	92.2	94.9	95.5	96.1	96.4	96.7	96.9	97.1	97.6	98.0	98.3	98.3
7	45	10	91.4	94.0	94.7	95.3	95.6	95.9	96.1	96.3	96.7	97.1	97.5	97.9
2	36	5	90.6	93.2	93.9	94.4	94.7	95.0	95.2	95.4	95.9	96.3	96.6	97.0
-3	27	0	89.8	92.4	93.0	93.6	93.9	94.1	94.4	94.6	95.0	95.4	95.8	96.1
-13	9	-10	88.1	90.7	91.3	91.9	92.1	92.4	92.6	92.8	93.3	93.6	94.0	94.3
-23	-9	-20	86.4	88.9	89.5	90.1	90.4	90.6	90.8	91.0	91.5	91.8	92.2	92.5
-33	-27	-30	84.7	87.1	87.8	88.3	88.6	88.8	89.0	89.2	89.6	90.0	90.3	90.7
-43	-45	-40	82.9	85.3	85.9	86.5	86.7	87.0	87.2	87.4	87.8	88.1	88.5	88.8
-53	-63	-50	81.1	83.5	84.1	84.6	84.8	85.1	85.3	85.5	85.9	86.2	86.5	86.9

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)						
	-2000	0	2000	4000	6000	8000	10000
PACKS OFF	0.1	0.1	0.2	0.2	0.2	0.2	0.2
1 PACK ON	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
WING ANTI-ICE ON	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3

DRAFT

Intentionally
Blank

Performance Inflight**Alternate Mode EEC, Engine INOP****Chapter PI****Section 25****ALTERNATE MODE EEC****ENGINE INOP****Initial Max Continuous %N1****Based on .84M, engine bleed for packs on or off and anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	92.7	92.4	92.1	91.6	90.9	90.5	90.5	90.2	90.0
15	93.2	92.9	92.5	92.1	91.5	91.2	91.1	91.0	90.9
10	93.7	93.5	93.1	92.5	92.1	91.8	91.7	91.6	91.5
5	94.1	94.1	93.7	93.2	92.5	92.3	92.2	92.1	92.1
0	93.2	94.4	94.6	94.0	93.3	92.9	92.9	92.8	92.8
-5	92.4	93.6	94.8	94.9	94.3	93.9	93.9	93.8	93.7
-10	91.5	92.7	93.9	95.1	95.4	95.0	95.0	94.9	94.8
-15	90.6	91.8	93.0	94.2	95.4	96.0	96.0	95.9	95.9
-20	89.7	90.9	92.1	93.3	94.5	95.1	95.1	95.0	94.9
-25	88.9	90.0	91.2	92.3	93.6	94.1	94.1	94.1	94.0
-30	88.0	89.1	90.3	91.4	92.6	93.2	93.2	93.1	93.0
-35	87.0	88.2	89.3	90.5	91.6	92.2	92.2	92.1	92.1
-40	86.1	87.2	88.4	89.5	90.7	91.3	91.2	91.2	91.1

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
ENGINE ONLY	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2
ENGINE & WING*	-0.4	-0.4	-0.4	-0.4	-0.5	-0.5	-0.6	-0.6	-0.7
ENGINE & WING**	-0.6	-0.6	-0.7	-0.8	-0.9	-0.9	-1.0	-1.1	-1.2

*Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

Max Continuous %N1**Based on engine bleed for packs on or off and anti-ice off****320 KIAS**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	93.6	94.2	94.1	93.7	93.4	92.7	92.1	91.6	91.2	91.1	90.9	91.0	91.0	90.5	90.8	91.9
25	92.9	95.0	95.0	94.6	94.3	93.5	92.9	92.2	91.7	91.6	91.6	91.7	91.7	91.3	91.5	92.3
20	92.1	94.6	95.6	95.6	95.3	94.5	93.8	93.0	92.3	92.1	92.0	92.2	92.2	91.8	92.0	92.7
15	91.3	93.8	94.8	95.5	96.3	95.6	94.9	93.8	93.0	92.7	92.6	92.7	92.7	92.3	92.5	93.2
10	90.5	93.0	94.0	94.7	95.5	95.7	96.0	94.8	93.7	93.3	93.2	93.3	93.2	92.9	93.0	93.8
5	89.7	92.2	93.1	93.9	94.6	94.9	95.1	94.8	94.5	94.1	94.0	94.0	93.8	93.5	93.7	94.6
0	88.9	91.3	92.3	93.0	93.8	94.0	94.3	93.9	93.6	93.5	94.1	94.8	94.6	94.3	94.5	95.4
-5	88.1	90.5	91.4	92.2	92.9	93.1	93.4	93.1	92.8	92.7	93.2	93.9	94.4	94.7	95.5	95.9
-10	87.2	89.6	90.6	91.3	92.0	92.3	92.5	92.2	91.9	91.8	92.3	93.0	93.5	93.8	94.6	95.0
-15	86.4	88.8	89.7	90.4	91.2	91.4	91.7	91.3	91.0	90.9	91.4	92.2	92.6	92.9	93.7	94.1
-20	85.6	87.9	88.8	89.6	90.3	90.5	90.8	90.4	90.1	90.0	90.6	91.3	91.7	92.0	92.8	93.2
-25	84.7	87.1	88.0	88.7	89.4	89.6	89.9	89.5	89.2	89.1	89.7	90.4	90.8	91.1	91.9	92.2
-30	83.9	86.2	87.1	87.8	88.5	88.7	89.0	88.6	88.3	88.2	88.7	89.4	89.9	90.2	91.0	91.3
-35	83.0	85.3	86.2	86.9	87.6	87.8	88.0	87.7	87.4	87.3	87.8	88.5	89.0	89.2	90.0	90.4
-40	82.1	84.4	85.3	85.9	86.6	86.8	87.1	86.8	86.5	86.4	86.9	87.6	88.0	88.3	89.1	89.4

ALTERNATE MODE EEC

ENGINE INOP

Max Continuous %N1

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

320 KIAS

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.4	-0.6	-0.6	-0.6	-0.6	-0.4	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.8	-0.8	-0.8	-0.8	-0.6	-0.5	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.5	-0.4
ENGINE & WING**	-0.6	-0.9	-1.0	-1.0	-1.0	-0.9	-0.8	-0.8	-0.7	-0.7	-0.7	-0.7	-0.7	-0.8	-0.8	-0.8

*Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

280 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	93.2	93.6	93.4	92.9	92.6	91.8	91.1	90.7	90.3	90.1	89.9	90.0	90.4	91.1	91.8	91.8
25	93.2	94.5	94.3	93.8	93.2	92.3	91.7	91.4	91.1	90.8	90.1	89.6	89.6	90.3	91.1	91.0
20	92.4	95.4	95.3	94.8	94.3	93.2	92.2	91.9	91.5	91.4	90.8	90.3	90.2	90.4	90.5	90.6
15	91.7	94.8	95.8	95.9	95.5	94.3	93.3	92.6	92.0	91.8	91.2	90.9	90.8	91.0	91.2	91.3
10	90.9	94.0	94.9	95.8	96.6	95.6	94.6	93.6	92.8	92.5	91.8	91.3	91.3	91.6	91.8	91.9
5	90.0	93.1	94.1	94.9	95.7	95.8	95.8	94.8	93.7	93.3	92.5	92.0	91.9	92.1	92.3	92.3
0	89.2	92.3	93.3	94.1	94.8	95.0	95.2	95.2	94.9	94.3	93.4	92.9	92.7	92.9	93.1	93.0
-5	88.4	91.4	92.4	93.2	94.0	94.1	94.3	94.4	94.4	94.3	94.4	93.9	93.7	93.9	94.1	94.0
-10	87.6	90.6	91.5	92.3	93.1	93.2	93.4	93.5	93.5	93.4	93.5	93.8	94.5	95.0	95.2	95.0
-15	86.8	89.7	90.7	91.5	92.2	92.3	92.5	92.6	92.6	92.5	92.6	92.9	93.6	94.7	95.8	95.5
-20	85.9	88.8	89.8	90.6	91.3	91.4	91.6	91.7	91.7	91.6	91.7	92.0	92.7	93.8	94.9	94.5
-25	85.1	88.0	88.9	89.7	90.4	90.5	90.7	90.8	90.8	90.7	90.8	91.1	91.8	92.8	93.9	93.6
-30	84.2	87.1	88.0	88.8	89.5	89.6	89.8	89.9	89.9	89.8	89.9	90.2	90.8	91.9	93.0	92.6
-35	83.3	86.2	87.1	87.8	88.6	88.7	88.8	88.9	88.9	88.9	89.0	89.3	89.9	91.0	92.0	91.7
-40	82.4	85.3	86.2	86.9	87.6	87.7	87.9	88.0	88.0	87.9	88.0	88.3	89.0	90.0	91.0	90.7

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	0.4	-0.7	-0.7	-0.7	-0.6	-0.4	-0.3	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.8	-0.9	-0.9	-0.8	-0.7	-0.5	-0.6	-0.5	-0.5	-0.5	-0.5	-0.4	-0.4	-0.5	-0.5
ENGINE & WING**	-0.6	-1.0	-1.0	-1.1	-1.1	-0.9	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.7	-0.7	-0.9	-1.0

*Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

ALTERNATE MODE EEC

ENGINE INOP

Max Continuous %N1**Based on engine bleed for packs on or off and anti-ice off****240 KIAS**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	92.1	91.9	91.9	91.8	91.8	90.7	89.4	89.4	90.0	90.4	90.5	90.3	90.3	90.6	91.1	91.6
25	92.8	92.9	92.8	92.4	92.4	91.5	90.4	89.8	89.5	89.6	89.7	89.6	89.6	89.8	90.3	90.8
20	92.3	93.8	93.7	93.4	93.1	92.2	91.2	90.6	90.3	90.1	89.4	88.8	88.8	89.0	89.6	90.0
15	91.5	94.4	94.7	94.5	94.3	93.2	91.9	91.3	90.9	90.8	90.0	89.2	88.5	88.3	88.8	89.3
10	90.7	93.6	94.9	95.6	95.6	94.5	93.1	92.1	91.5	91.4	90.4	89.6	89.1	88.8	88.7	89.1
5	89.9	92.7	94.0	95.1	96.4	95.9	94.6	93.3	92.4	92.1	90.9	89.9	89.5	89.4	89.4	89.8
0	89.1	91.9	93.2	94.3	95.5	96.0	95.9	94.6	93.5	93.1	91.7	90.5	89.8	89.9	90.0	90.4
-5	88.3	91.1	92.3	93.4	94.6	95.1	95.2	95.1	94.7	94.3	92.7	91.4	90.6	90.6	90.6	91.1
-10	87.4	90.2	91.4	92.5	93.7	94.2	94.3	94.3	94.4	94.5	93.9	92.5	91.5	91.6	91.6	92.3
-15	86.6	89.4	90.6	91.7	92.8	93.3	93.4	93.4	93.5	93.6	93.3	93.0	92.8	92.8	92.8	93.4
-20	85.8	88.5	89.7	90.8	91.9	92.4	92.5	92.4	92.6	92.7	92.4	92.1	92.3	93.5	94.1	94.8
-25	84.9	87.6	88.8	89.9	91.0	91.5	91.6	91.5	91.6	91.8	91.4	91.2	91.4	92.5	93.7	94.6
-30	84.1	86.7	87.9	89.0	90.1	90.5	90.6	90.6	90.7	90.8	90.5	90.3	90.5	91.6	92.7	93.6
-35	83.2	85.8	87.0	88.0	89.2	89.6	89.7	89.7	89.8	89.9	89.6	89.4	89.5	90.6	91.7	92.7
-40	82.3	84.9	86.1	87.1	88.2	88.7	88.8	88.7	88.8	89.0	88.6	88.4	88.6	89.7	90.8	91.7

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.4	-0.7	-0.7	-0.7	-0.6	-0.5	-0.3	-0.3	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.8	-0.9	-0.9	-0.8	-0.7	-0.5	-0.6	-0.6	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.6
ENGINE & WING**	-0.6	-1.0	-1.0	-1.2	-1.1	-1.0	-0.8	-0.9	-0.9	-0.8	-0.8	-0.8	-0.9	-0.9	-0.9	-1.0

*Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

ALTERNATE MODE EEC

ENGINE INOP

Max Continuous %N1

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

200 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	91.6	90.6	90.3	89.8	89.4	88.2	87.9	88.7	89.3	89.6	89.3	89.2	89.3	89.7	89.9	90.4
25	92.4	91.4	90.9	90.4	90.1	89.1	87.8	87.9	88.6	88.9	88.6	88.5	88.6	89.0	89.1	89.7
20	92.7	92.3	91.8	91.1	90.7	89.9	88.9	88.4	87.9	88.1	87.8	87.7	87.9	88.2	88.4	88.9
15	91.9	93.2	92.7	92.1	91.5	90.5	89.8	89.3	88.8	88.6	87.3	87.0	87.1	87.5	87.6	88.2
10	91.1	93.2	93.6	93.0	92.5	91.6	90.6	90.0	89.5	89.3	88.2	87.1	86.3	86.7	86.8	87.4
5	90.3	92.4	93.2	93.9	93.6	92.7	91.8	90.9	90.1	89.9	88.8	87.8	86.9	86.6	86.1	86.6
0	89.4	91.6	92.3	93.0	93.9	94.0	93.2	92.1	91.1	90.6	89.3	88.3	87.4	87.3	86.8	87.1
-5	88.6	90.7	91.5	92.2	93.1	93.6	94.3	93.5	92.3	91.7	90.2	88.9	87.8	87.8	87.5	87.8
-10	87.8	89.9	90.6	91.3	92.2	92.8	93.4	93.8	93.6	93.0	91.3	89.8	88.5	88.3	88.0	88.4
-15	87.0	89.0	89.7	90.4	91.3	91.9	92.5	92.9	93.2	93.3	92.6	90.8	89.4	89.2	88.9	89.3
-20	86.1	88.1	88.9	89.6	90.4	91.0	91.6	92.0	92.3	92.4	92.1	91.7	90.6	90.3	90.0	90.5
-25	85.3	87.3	88.0	88.7	89.5	90.1	90.7	91.1	91.4	91.5	91.1	90.8	90.5	91.6	91.3	91.8
-30	84.4	86.4	87.1	87.8	88.6	89.2	89.8	90.2	90.4	90.5	90.2	89.9	89.6	90.7	91.7	92.6
-35	83.5	85.5	86.2	86.9	87.7	88.3	88.8	89.2	89.5	89.6	89.3	89.0	88.7	89.7	90.7	91.6
-40	82.6	84.6	85.3	86.0	86.8	87.3	87.9	88.3	88.6	88.7	88.3	88.0	87.8	88.8	89.8	90.6

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.4	-0.7	-0.7	-0.7	-0.6	-0.5	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1
ENGINE & WING*	-0.5	-0.8	-0.9	-0.9	-0.9	-0.7	-0.5	-0.6	-0.5	-0.5	-0.6	-0.5	-0.5	-0.5	-0.6	-0.6
ENGINE & WING**	-0.6	-1.0	-1.1	-1.1	-1.1	-1.0	-0.8	-0.9	-0.9	-0.8	-0.9	-0.9	-0.9	-1.0	-1.0	-1.0

*Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

Performance Inflight

Gear Down

Chapter PI

Section 26

GEAR DOWN

220 KIAS Max Climb EPR

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	1.187	1.185	1.206	1.210	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
50	1.204	1.199	1.206	1.210	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
45	1.223	1.219	1.206	1.210	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
40	1.243	1.239	1.229	1.218	1.216	1.222	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
35	1.264	1.262	1.253	1.243	1.233	1.223	1.232	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
30	1.280	1.286	1.276	1.268	1.259	1.250	1.243	1.244	1.254	1.262	1.260	1.251	1.246	1.235	1.225
25	1.280	1.311	1.303	1.293	1.284	1.276	1.271	1.267	1.259	1.262	1.260	1.251	1.246	1.235	1.225
20	1.280	1.323	1.331	1.321	1.312	1.304	1.299	1.296	1.290	1.280	1.260	1.251	1.246	1.235	1.225
15	1.280	1.323	1.360	1.350	1.342	1.334	1.329	1.326	1.321	1.313	1.293	1.264	1.246	1.235	1.225
10	1.280	1.323	1.366	1.377	1.373	1.366	1.362	1.359	1.352	1.345	1.325	1.295	1.270	1.246	1.225
5	1.280	1.323	1.366	1.377	1.391	1.399	1.396	1.394	1.389	1.380	1.359	1.326	1.298	1.276	1.256
0	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.431	1.426	1.419	1.397	1.359	1.325	1.306	1.292
-5	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.468	1.461	1.439	1.401	1.363	1.337	1.327
-10	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.474	1.495	1.484	1.444	1.406	1.381	1.369
-15	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.474	1.495	1.501	1.491	1.454	1.427	1.417
-20	1.280	1.323	1.366	1.377	1.391	1.406	1.428	1.452	1.474	1.495	1.501	1.491	1.480	1.480	1.469

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	
ENGINE ONLY	-0.008	-0.010	-0.015	-0.014	-0.006	-0.005	-0.003	-0.003
ENGINE AND WING*	-0.010	-0.012	-0.018	-0.019	-0.012	-0.012	-0.011	-0.013
ENGINE AND WING**	-0.012	-0.014	-0.021	-0.024	-0.018	-0.019	-0.020	-0.023

*Wing anti-ice on, packs on.

**Wing anti-ice on, single bleed source and both packs off.

Long Range Cruise Altitude Capability

Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
300	13000	10400	7300
280	16200	13700	11000
260	19500	17200	14600
240	22500	20500	18200
220	25300	23600	21700
200	27300	26100	25000
180	29400	28200	27100
160	32100	30500	29300
140	35700	34000	32300

GEAR DOWN**Long Range Cruise Control**

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
300	EPR	1.240									
	MACH	.488									
	KIAS	270									
	FF/ENG	7412									
280	EPR	1.216	1.292	1.334							
	MACH	.474	.518	.538							
	KIAS	262	261	261							
	FF/ENG	6899	6901	6969							
260	EPR	1.192	1.261	1.295	1.338						
	MACH	.458	.501	.519	.540						
	KIAS	253	252	252	252						
	FF/ENG	6367	6344	6363	6431						
240	EPR	1.169	1.231	1.261	1.296	1.340	1.395				
	MACH	.441	.484	.501	.520	.541	.563				
	KIAS	244	243	243	242	242	242				
	FF/ENG	5839	5818	5811	5829	5893	5962				
220	EPR	1.147	1.202	1.229	1.259	1.295	1.339	1.394			
	MACH	.422	.465	.482	.500	.519	.541	.563			
	KIAS	233	234	233	233	232	232	232			
	FF/ENG	5304	5300	5291	5283	5299	5356	5419			
200	EPR	1.127	1.174	1.197	1.224	1.255	1.290	1.334	1.389		
	MACH	.402	.445	.462	.480	.498	.517	.538	.561		
	KIAS	222	223	223	223	222	222	222	222		
	FF/ENG	4772	4784	4779	4771	4763	4773	4820	4879		
180	EPR	1.110	1.147	1.167	1.190	1.218	1.247	1.281	1.324	1.378	
	MACH	.387	.422	.439	.457	.475	.493	.512	.534	.557	
	KIAS	213	212	212	212	212	211	211	211	211	
	FF/ENG	4327	4262	4268	4264	4257	4249	4252	4286	4341	
160	EPR	1.094	1.125	1.141	1.160	1.185	1.211	1.240	1.275	1.317	1.369
	MACH	.372	.403	.419	.436	.454	.472	.492	.513	.535	.558
	KIAS	205	202	202	202	202	202	202	202	202	202
	FF/ENG	3925	3818	3812	3805	3799	3797	3802	3815	3845	3887
140	EPR	1.079	1.106	1.120	1.136	1.157	1.180	1.205	1.233	1.267	1.308
	MACH	.352	.387	.403	.419	.436	.454	.473	.493	.515	.537
	KIAS	194	194	194	194	194	194	194	194	194	194
	FF/ENG	3474	3496	3491	3486	3475	3468	3407	3409	3419	3444

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	189	179	170	161	154	
656	584	523	474	435	400	378	357	339	323	308	
991	882	788	714	653	600	567	536	509	484	462	
1329	1181	1053	953	871	800	755	714	677	644	615	
1670	1482	1320	1193	1090	1000	943	892	845	804	767	
2014	1785	1589	1434	1309	1200	1132	1070	1014	964	919	
2362	2091	1859	1676	1528	1400	1320	1248	1182	1123	1071	
2715	2400	2130	1919	1748	1600	1508	1425	1349	1282	1223	
3073	2711	2403	2163	1968	1800	1696	1602	1517	1441	1373	
3434	3026	2678	2407	2189	2000	1884	1779	1684	1599	1524	
3799	3343	2954	2652	2410	2200	2072	1955	1850	1756	1674	
4169	3662	3232	2898	2631	2400	2259	2132	2016	1914	1824	
4542	3984	3511	3145	2853	2600	2447	2308	2183	2071	1974	
4921	4309	3792	3393	3075	2800	2635	2485	2349	2229	2123	
5303	4637	4074	3641	3297	3000	2822	2661	2515	2386	2272	
5689	4968	4358	3890	3519	3200	3010	2837	2681	2542	2421	
6081	5301	4643	4140	3742	3400	3197	3012	2846	2698	2569	
6477	5638	4930	4391	3966	3600	3384	3188	3011	2854	2717	
6877	5977	5220	4643	4190	3800	3571	3363	3176	3010	2865	
7283	6320	5510	4896	4414	4000	3758	3538	3340	3165	3012	

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	6.7	0:49	6.1	0:47	5.3	0:44	4.8	0:42	4.4	0:40
400	13.9	1:37	12.9	1:31	11.5	1:24	10.7	1:20	10.1	1:16
600	21.0	2:25	19.5	2:17	17.5	2:06	16.4	1:59	15.6	1:53
800	27.9	3:15	26.0	3:04	23.4	2:48	22.0	2:39	20.9	2:30
1000	34.7	4:04	32.4	3:51	29.3	3:30	27.5	3:19	26.2	3:07
1200	41.3	4:55	38.6	4:40	35.0	4:14	32.9	3:59	31.3	3:45
1400	47.8	5:46	44.7	5:28	40.6	4:58	38.2	4:40	36.3	4:23
1600	54.2	6:38	50.8	6:17	46.2	5:42	43.4	5:22	41.3	5:02
1800	60.5	7:31	56.7	7:07	51.7	6:27	48.5	6:03	46.1	5:41
2000	66.7	8:24	62.6	7:57	57.2	7:12	53.6	6:45	51.0	6:20
2200	72.9	9:19	68.3	8:48	62.4	7:58	58.5	7:28	55.6	7:00
2400	79.0	10:14	74.0	9:39	67.7	8:44	63.4	8:11	60.2	7:39
2600	85.1	11:10	79.5	10:31	72.8	9:31	68.2	8:54	64.8	8:20
2800	91.0	12:07	85.0	11:24	77.8	10:18	73.0	9:38	69.2	9:01
3000	96.9	13:04	90.4	12:17	82.8	11:06	77.7	10:22	73.6	9:41
3200	102.5	14:03	95.7	13:12	87.6	11:54	82.3	11:07	77.9	10:23
3400	108.1	15:02	101.0	14:06	92.4	12:43	86.8	11:53	82.2	11:05
3600	113.6	16:02	106.2	15:02	97.1	13:33	91.3	12:38	86.4	11:47
3800	119.0	17:04	111.3	15:58	101.7	14:23	95.6	13:24	90.5	12:30
4000	124.4	18:05	116.4	16:54	106.3	15:13	100.0	14:11	94.7	13:13

GEAR DOWN**Long Range Cruise Enroute Fuel and Time****Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)							
	160	180	200	220	240	260	280	300
10	-1.4	-0.7	0.0	0.8	2.0	3.5	5.4	7.6
20	-2.1	-1.1	0.0	1.6	3.7	6.3	9.4	13.1
30	-2.9	-1.5	0.0	2.3	5.3	8.9	13.2	18.1
40	-3.7	-1.9	0.0	3.0	6.8	11.4	16.6	22.7
50	-4.6	-2.4	0.0	3.7	8.2	13.6	19.8	26.8
60	-5.4	-2.8	0.0	4.3	9.5	15.6	22.6	30.5
70	-6.3	-3.3	0.0	4.9	10.7	17.5	25.1	33.7
80	-7.2	-3.7	0.0	5.5	11.8	19.1	27.4	36.5
90	-8.1	-4.2	0.0	6.0	12.8	20.6	29.3	38.8
100	-9.1	-4.7	0.0	6.4	13.7	21.9	30.9	40.7
110	-10.1	-5.1	0.0	6.9	14.5	22.9	32.1	42.1
120	-11.1	-5.6	0.0	7.3	15.2	23.8	33.1	43.1
130	-12.1	-6.1	0.0	7.6	15.8	24.5	33.8	43.6

Based on Long Range Cruise and VREF30+80 descent.

Descent at VREF30+80

PRESSURE ALT (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	41	45	49	53	57	61	65	69	73	78
TIME (MINUTES)	12	12	13	14	15	16	16	17	18	18

GEAR DOWN**Holding
Flaps Up**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)						
	1500	5000	10000	15000	20000	25000	30000
300	EPR	1.138	1.167	1.227	1.313		
	KIAS	244	244	244	244		
	FF/ENG	7090	7090	7110	7210		
280	EPR	1.123	1.150	1.203	1.278		
	KIAS	239	239	239	239		
	FF/ENG	6610	6620	6620	6670		
260	EPR	1.110	1.134	1.179	1.247	1.345	
	KIAS	234	234	234	234	234	
	FF/ENG	6160	6150	6150	6180	6300	
240	EPR	1.097	1.119	1.158	1.217	1.302	
	KIAS	228	228	228	228	228	
	FF/ENG	5720	5690	5690	5690	5750	
220	EPR	1.086	1.104	1.140	1.190	1.263	1.376
	KIAS	222	222	222	222	222	222
	FF/ENG	5290	5260	5240	5230	5250	5390
200	EPR	1.076	1.092	1.123	1.166	1.230	1.322
	KIAS	215	215	215	215	215	215
	FF/ENG	5000	4840	4810	4790	4800	4860
180	EPR	1.067	1.081	1.106	1.144	1.199	1.277
	KIAS	208	208	208	208	208	208
	FF/ENG	4600	4440	4390	4380	4370	4390
160	EPR	1.059	1.071	1.093	1.126	1.173	1.242
	KIAS	203	203	203	203	203	203
	FF/ENG	4270	4220	4060	4040	4030	4100
140	EPR	1.053	1.064	1.084	1.114	1.157	1.219
	KIAS	203	203	203	203	203	203
	FF/ENG	4110	4060	3900	3870	3910	3830

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

GEAR DOWN**Holding
Flaps 1**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
300	EPR	1.140	1.168	1.225	1.307
	KIAS	224	224	224	224
	FF/ENG	6760	6760	6760	6820
280	EPR	1.126	1.153	1.202	1.276
	KIAS	219	219	219	219
	FF/ENG	6320	6310	6300	6330
260	EPR	1.113	1.137	1.181	1.247
	KIAS	214	214	214	214
	FF/ENG	5890	5870	5860	5880
240	EPR	1.101	1.122	1.161	1.218
	KIAS	208	208	208	208
	FF/ENG	5460	5430	5420	5410
220	EPR	1.090	1.107	1.143	1.191
	KIAS	202	202	202	202
	FF/ENG	5030	4990	4970	4960
200	EPR	1.080	1.095	1.125	1.167
	KIAS	195	195	195	195
	FF/ENG	4730	4570	4530	4530
180	EPR	1.069	1.083	1.107	1.144
	KIAS	188	188	188	188
	FF/ENG	4310	4270	4110	4100
160	EPR	1.059	1.072	1.093	1.125
	KIAS	183	183	183	183
	FF/ENG	3960	3920	3770	3800
140	EPR	1.053	1.064	1.083	1.111
	KIAS	183	183	183	183
	FF/ENG	3770	3720	3640	3600

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



**Performance Inflight
Gear Down, Engine INOP**

**Chapter PI
Section 27**

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 KG)	VREF + 80 DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
260	246	233	2200	
240	228	227	5600	3300
220	210	221	8500	6600
200	191	214	11300	9700
180	172	208	14100	12500
160	153	200	16800	15400
140	134	192	19500	18100
				16500

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
240	3500		
220	6900	4800	1700
200	10100	8100	5800
180	13000	11300	9300
160	15900	14400	12500
140	18700	17200	15700

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
240	EPR	1.394						
	MACH	.379						
	KIAS	229						
	FF/ENG	10859						
230	EPR	1.372	1.420					
	MACH	.374	.388					
	KIAS	226	226					
	FF/ENG	10399	10514					
220	EPR	1.350	1.395					
	MACH	.369	.382					
	KIAS	223	223					
	FF/ENG	9949	10039					
210	EPR	1.330	1.371	1.420				
	MACH	.363	.377	.391				
	KIAS	220	220	220				
	FF/ENG	9514	9582	9688				
200	EPR	1.310	1.348	1.393	1.447			
	MACH	.358	.371	.385	.400			
	KIAS	216	216	216	216			
	FF/ENG	9096	9139	9222	9351			
190	EPR	1.291	1.326	1.367	1.417	1.478		
	MACH	.352	.365	.379	.393	.408		
	KIAS	213	213	213	213	213		
	FF/ENG	8689	8712	8774	8870	9037		
180	EPR	1.273	1.305	1.343	1.388	1.442		
	MACH	.346	.359	.373	.387	.402		
	KIAS	209	209	209	209	209		
	FF/ENG	8291	8303	8340	8414	8529		
170	EPR	1.255	1.285	1.320	1.361	1.409	1.470	
	MACH	.340	.353	.366	.380	.395	.410	
	KIAS	206	206	206	206	206	206	
	FF/ENG	7892	7901	7919	7971	8055	8200	
160	EPR	1.238	1.266	1.298	1.335	1.379	1.432	1.500
	MACH	.334	.346	.359	.373	.388	.403	.419
	KIAS	202	202	202	202	202	202	202
	FF/ENG	7496	7504	7513	7541	7605	7701	7882
150	EPR	1.221	1.247	1.276	1.310	1.350	1.397	1.456
	MACH	.327	.340	.353	.366	.380	.395	.411
	KIAS	198	198	198	198	198	198	198
	FF/ENG	7109	7109	7116	7129	7168	7238	7355
140	EPR	1.205	1.228	1.256	1.287	1.323	1.365	1.416
	MACH	.321	.333	.345	.359	.373	.387	.403
	KIAS	194	194	194	194	194	194	194
	FF/ENG	6729	6721	6725	6732	6750	6799	6877

GEAR DOWN
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	
170	150	132	119	109	100	93	88	83	78	75	
349	305	269	241	219	200	187	175	164	154	146	
529	462	406	363	329	300	279	260	244	230	218	
710	620	544	486	440	400	372	347	325	306	290	
892	778	681	608	550	500	465	433	406	381	361	
1075	936	819	730	660	600	558	520	487	458	433	
1259	1096	958	853	771	700	651	606	567	533	504	
1444	1256	1097	976	882	800	743	692	647	608	575	
1630	1416	1236	1100	992	900	836	778	727	683	646	
1817	1577	1375	1223	1103	1000	928	864	808	759	717	

Reference Fuel and Time Required at Check Point

AIR DIST(NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	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)
100	3.3	0:28	3.1	0:27	2.9	0:27	2.7	0:26	2.6	0:26
200	6.9	0:54	6.6	0:53	6.4	0:52	6.1	0:50	5.9	0:49
300	10.5	1:21	10.1	1:19	9.8	1:17	9.5	1:15	9.2	1:13
400	14.1	1:48	13.6	1:45	13.2	1:42	12.8	1:39	12.5	1:36
500	17.6	2:15	17.0	2:11	16.5	2:07	16.1	2:04	15.7	2:00
600	21.1	2:42	20.4	2:37	19.8	2:33	19.3	2:29	18.9	2:24
700	24.6	3:09	23.8	3:04	23.1	2:59	22.5	2:54	22.0	2:49
800	28.0	3:37	27.1	3:31	26.3	3:25	25.6	3:19	25.1	3:13
900	31.3	4:05	30.4	3:58	29.5	3:51	28.8	3:44	28.1	3:37
1000	34.7	4:33	33.6	4:25	32.7	4:17	31.8	4:09	31.2	4:02

GEAR DOWN**ENGINE INOP****MAX CONTINUOUS THRUST****Long Range Cruise Diversion Fuel and Time****Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)					
	140	160	180	200	220	240
4	-0.4	-0.2	0.0	0.3	0.8	1.3
6	-0.7	-0.3	0.0	0.5	1.2	2.0
8	-0.9	-0.5	0.0	0.7	1.6	2.7
10	-1.2	-0.6	0.0	0.9	2.0	3.3
12	-1.4	-0.7	0.0	1.0	2.4	4.0
14	-1.7	-0.8	0.0	1.2	2.7	4.6
16	-1.9	-1.0	0.0	1.4	3.1	5.2
18	-2.1	-1.1	0.0	1.5	3.5	5.8
20	-2.4	-1.2	0.0	1.7	3.8	6.4
22	-2.6	-1.3	0.0	1.8	4.1	7.0
24	-2.9	-1.4	0.0	2.0	4.5	7.5
26	-3.1	-1.6	0.0	2.1	4.8	8.0
28	-3.3	-1.7	0.0	2.3	5.1	8.5
30	-3.6	-1.8	0.0	2.4	5.4	9.0
32	-3.8	-1.9	0.0	2.6	5.7	9.5
34	-4.1	-2.0	0.0	2.7	6.0	10.0
36	-4.3	-2.2	0.0	2.8	6.2	10.4

Based on Long Range Cruise and VREF30+80 descent. Includes APU fuel burn.

**Holding
Flaps Up**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	
240	EPR	1.319	1.390		
	KIAS	228	228		
	FF/ENG	11170	11310		
220	EPR	1.285	1.347		
	KIAS	222	222		
	FF/ENG	10300	10360		
200	EPR	1.253	1.307	1.414	
	KIAS	215	215	215	
	FF/ENG	9440	9470	9650	
180	EPR	1.223	1.270	1.360	
	KIAS	208	208	208	
	FF/ENG	8620	8620	8700	
160	EPR	1.199	1.240	1.319	1.437
	KIAS	203	203	203	203
	FF/ENG	7950	7940	7970	8170
140	EPR	1.185	1.222	1.295	1.401
	KIAS	203	203	203	203
	FF/ENG	7590	7570	7590	7720

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

Performance Inflight**Text****Chapter PI****Section 28****Introduction**

This chapter contains information to supplement performance data from the Flight Management Computer. 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 Flight Manual, the Flight Manual shall always take precedence.

General**FMC Takeoff Speeds**

FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. 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 may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Clearway and Stopway V1 Adjustments

Takeoff speed corrections are to be applied to V1 when using takeoff weights based on the use of clearway and stopway.

Adjust V1 by the amount shown in the table. The adjusted V1 must not exceed VR. If V1 is greater than VR, VR may be increased to equal V1. The resultant V2 will be increased by the same amount that VR was increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

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

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 13mm (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 is determined as follows:

- (1) Determine the dry field/obstacle limit weight for the takeoff flap setting.
- (2) 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.
- (3) Adjust field length available for temperature by amount shown on chart.

- (4) Enter the V1(MCG) Limit Weight table with the field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

- (1) Determine takeoff speeds V1, VR and V2 for actual brake release weight using Takeoff Speeds from the Performance Dispatch chapter or from the FMC.
- (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

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. Good reported braking action denotes wet runway conditions or runways covered by compact snow. Similarly, poor braking action denotes runways covered with wet ice. Performance is based on reversers operating and a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR 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 Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Go-Around EPR

To find Go-Around EPR based on normal engine bleed for packs on and anti-ice off, enter the Go-Around EPR table with airport pressure altitude and reported OAT or TAT and read EPR. EPR adjustments are shown for engine bleeds for various conditions.

Max Climb EPR

This table shows Max Climb EPR for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read EPR. EPR adjustments are shown for anti-ice operation.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body attitude and average EPR 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 may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

All Engines

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Control

These tables provide target EPR, 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, .84 Mach approximates the Long Range Cruise Mach schedule.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .84/310/250 descent. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table 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.

Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

Descent at .84/310/250

Distance and time for descent are shown for a .84/310/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing Flaps 30 at the outer marker.

Holding

Target EPR, 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 for the selected flap setting. Flaps 1 is based on VREF30+60 speed schedule. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read EPR, IAS and fuel flow per engine.

Advisory Information

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. 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.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing 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 corrections for off-reference landing weight, altitude, wind, slope, and speed conditions. Each correction is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the 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.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy 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, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

Engine Inoperative

Initial Max Continuous EPR

The Initial Max Continuous EPR setting for use following an engine failure is shown. The table is based on the typical all engine cruise Mach number of .84 to provide a target EPR setting at the start of driftdown. Once driftdown is established, the Max Continuous EPR table should be used to determine EPR for the given conditions.

Max Continuous EPR

Power setting is based on one engine operating with one bleed source for pack(s) operating and all anti-ice bleeds off. Enter the table for appropriate pressure altitude with IAS or Mach and TAT to read Max Continuous EPR. Apply the anti-ice corrections below the table as required.

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/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Long Range Cruise Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target EPR, 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 PENALTY (KG/HR)				
	GROSS WEIGHT (1000 KG)				
	300	260	220	180	140
43				160	140
39			180	160	145
35		200	190	170	140
31	230	220	195	165	140
25	230	220	195	175	155
20	235	230	205	185	165
15	235	235	215	200	185
10	240	240	230	220	200
5	270	270	255	240	220

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 .84/310/250 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 corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Alternate Mode EEC

Limit Weight

A simplified method which conservatively accounts for the effects of EEC in the ALTERNATE mode is to reduce the PRIMARY mode (normal) performance limited weights. The Limit Weight table provides takeoff field, climb, obstacle, net level off and landing climb weights. To determine limit weights for operations with the EEC in the ALTERNATE mode, enter the table with the limit weights for PRIMARY mode EEC operation and read the associated limit weight for each performance condition. The most limiting of the takeoff weights must be used. The ALTERNATE Mode EEC Landing Climb limit must be compared to the Landing Field Length limit and the more limiting of the two must be used as the landing limit weight. 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 Adjustments Table. The adjusted V1 should not exceed the adjusted VR.

NOTE: The FMC does incorporate ALTERNATE Mode EEC performance in its takeoff speeds calculations.

Max Takeoff %N1

Takeoff power settings are presented for normal air condition bleed. Max Takeoff %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule with anti-ice off. Enter the table with pressure altitude and TAT to read Max Climb %N1. Apply bleed adjustments as required.

Max Cruise %N1

Maximum Cruise %N1 is presented for .84M, which approximates Long Range Cruise speed. Enter the table with pressure altitude and TAT to read Max Cruise %N1. Appropriate bleed adjustments are shown.

Go-Around %N1

Go-Around power setting for ALTERNATE MODE EEC operation is presented for normal engine bleed for packs on. Go-Around %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Alternate Mode EEC, Engine Inoperative

Initial Max Continuous %N1

Initial Max Continuous %N1 settings for use following an engine failure are presented. The table is based on the typical all engine cruise Mach number of .84 to provide a target %N1 setting at the start of driftdown. Appropriate bleed adjustments are shown. Once driftdown is established, the Max Continuous %N1 table should be used to determine %N1 for the given conditions.

Max Continuous %N1

Max Continuous %N1 settings are presented as a function of pressure altitude and TAT for engine inoperative speeds of 320, 280, 240, and 200 KIAS. Power settings may be interpolated for intermediate airspeeds. Apply bleed adjustments as required.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. 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 will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain

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accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

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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General

Chapter PI

Section 30

Maximum Allowable Clearway

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	175
2000	220
2500	260
3000	300
3500	340
4000	400
4500	450

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
300	-2	-3	-3	-3				
200	-2	-3	-3	-2				
100	-2	-2	-1	-1				
0	0	0	0	0	0	0	0	0
-100	4	4	3	2	3	2	2	1
-200	7	6	5	4	5	4	4	3
-300	7	6	5	5	7	6	5	4

VREF**Flaps 30**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	184	184	184	184	184	184
340	180	180	180	180	180	180
320	173	173	173	173	173	173
300	164	164	164	164	164	165
280	158	158	158	158	158	158
260	149	149	149	150	150	150
240	143	144	144	144	144	144
220	137	137	138	138	138	138
200	137	134	131	131	131	131
180	137	134	130	126	124	124
160	137	134	130	126	121	117

Flaps 25

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	183	183	183	183	183	183
340	180	180	180	180	181	181
320	175	175	175	175	175	176
300	169	170	170	170	170	170
280	164	164	164	164	164	164
260	158	158	158	158	158	158
240	152	152	152	152	152	152
220	145	145	146	146	146	146
200	139	139	139	139	139	139
180	137	134	131	131	131	132
160	137	134	130	126	124	124

Flaps 20

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	193	193	193	193	194	195
340	190	190	190	191	191	192
320	185	185	185	185	185	186
300	179	179	179	179	180	180
280	173	173	173	173	174	174
260	167	167	167	167	167	167
240	160	160	161	161	161	161
220	154	154	154	154	154	154
200	147	147	147	147	147	147
180	139	139	139	139	139	139
160	137	134	131	131	131	131

Flap Maneuver Speed

FLAP POSITION	MANEUVER SPEED
FLAPS 0	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

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ADVISORY INFORMATION**Slush/Standing Water Takeoff****Maximum Reverse Thrust****Weight Adjustment (1000 KG)**

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)		PRESS ALT (FT)			PRESS ALT (FT)			
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
360	-36.7	-41.6	-46.5	-43.6	-48.5	-53.4	-55.0	-59.9	-64.8
340	-34.6	-39.5	-44.4	-40.8	-45.7	-50.6	-51.0	-55.9	-60.8
320	-32.3	-37.2	-42.1	-37.8	-42.7	-47.6	-46.8	-51.7	-56.6
300	-29.7	-34.6	-39.5	-34.5	-39.4	-44.3	-42.4	-47.3	-52.2
280	-26.8	-31.7	-36.6	-31.0	-35.9	-40.8	-37.8	-42.7	-47.6
260	-23.7	-28.6	-33.5	-27.3	-32.2	-37.1	-32.9	-37.8	-42.7
240	-20.4	-25.3	-30.2	-23.3	-28.2	-33.1	-27.9	-32.8	-37.7
220	-16.9	-21.7	-26.6	-19.1	-24.0	-28.9	-22.6	-27.5	-32.4
200	-13.0	-17.9	-22.8	-14.7	-19.6	-24.5	-17.1	-22.0	-26.9
180	-9.0	-13.9	-18.8	-10.0	-14.9	-19.8	-11.4	-16.3	-21.2
160	-4.9	-9.7	-14.6	-5.3	-10.2	-15.1	-5.6	-10.5	-15.4

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
2200				134.1			155.7		
2400	155.7			168.7			190.4		
2600	190.1			203.4	137.9		225.3	159.5	
2800	224.7	159.5		238.4	172.5		260.5	194.2	128.6
3000	259.8	193.9	128.9	273.8	207.2	141.7	296.0	229.2	163.3
3200	295.3	228.6	163.3	309.5	242.3	176.3	331.8	264.4	198.0
3400	331.3	263.7	197.7	345.7	277.7	211.1	367.9	299.9	233.0
3600	367.8	299.3	232.4	382.2	313.5	246.1		335.8	268.3
3800		335.3	267.6		349.7	281.6		371.9	303.9
4000		371.8	303.2			317.4			339.7
4200			339.3			353.7			375.9
4400			375.8						

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 -65 m/+60 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.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
360	-26	-24	-22	-22	-20	-18	-14	-12	-10
340	-28	-26	-24	-23	-21	-19	-15	-13	-11
320	-29	-27	-25	-25	-23	-21	-16	-14	-12
300	-30	-28	-26	-26	-24	-22	-18	-16	-14
280	-31	-29	-27	-27	-25	-23	-20	-18	-16
260	-31	-29	-27	-28	-26	-24	-21	-19	-17
240	-31	-29	-27	-29	-27	-25	-23	-21	-19
220	-31	-29	-27	-29	-27	-25	-24	-22	-20
200	-31	-29	-27	-29	-27	-25	-25	-23	-21
180	-30	-28	-26	-28	-26	-24	-25	-23	-21
160	-29	-27	-25	-28	-26	-24	-25	-23	-21

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 Adjustment (1000 KG)**

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)		PRESS ALT (FT)			PRESS ALT (FT)			
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
360	-49.8	-54.9	-60.0	-57.7	-62.8	-67.9	-70.5	-75.6	-80.7
340	-46.7	-51.8	-56.8	-53.7	-58.8	-63.9	-64.9	-70.0	-75.1
320	-43.4	-48.4	-53.5	-49.6	-54.7	-59.8	-59.3	-64.3	-69.4
300	-39.9	-45.0	-50.0	-45.3	-50.4	-55.5	-53.6	-58.7	-63.8
280	-36.2	-41.3	-46.4	-40.9	-46.0	-51.1	-47.9	-53.0	-58.1
260	-32.4	-37.5	-42.6	-36.4	-41.4	-46.5	-42.2	-47.2	-52.3
240	-28.4	-33.5	-38.6	-31.7	-36.7	-41.8	-36.4	-41.5	-46.6
220	-24.3	-29.4	-34.4	-26.8	-31.9	-37.0	-30.6	-35.7	-40.8
200	-20.0	-25.0	-30.1	-21.8	-26.9	-32.0	-24.8	-29.9	-35.0
180	-15.5	-20.6	-25.7	-16.7	-21.8	-26.9	-19.0	-24.1	-29.1
160	-11.0	-16.0	-21.1	-11.5	-16.6	-21.7	-13.1	-18.2	-23.3

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
3200							128.5		
3400							177.1		
3600							223.7	125.0	
3800				165.6			266.2	173.6	
4000	132.1			221.2			305.4	220.5	121.5
4200	198.7			268.3	161.3		341.9	263.3	170.1
4400	253.1	127.2		309.7	217.5		376.6	302.6	217.3
4600	298.2	194.2		347.0	265.1	157.1		339.4	260.3
4800	337.4	249.6	122.4	382.0	306.8	213.7		374.2	299.9
5000	372.9	295.1	189.6		344.4	261.9			336.8
5200		334.7	246.0		379.5	304.0			371.7
5400		370.4	292.1			341.8			
5600				332.0			377.0		
5800				367.8					

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 -100 m/+95 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****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.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
360	-42	-38	-34	-36	-32	-28	-23	-19	-15
340	-44	-40	-36	-38	-34	-30	-25	-21	-17
320	-45	-41	-37	-40	-36	-32	-27	-23	-19
300	-46	-42	-38	-41	-37	-33	-29	-25	-21
280	-47	-43	-39	-43	-39	-35	-32	-28	-24
260	-47	-43	-39	-44	-40	-36	-35	-31	-27
240	-48	-44	-40	-45	-41	-37	-37	-33	-29
220	-48	-44	-40	-45	-41	-37	-40	-36	-32
200	-48	-44	-40	-46	-42	-38	-41	-37	-33
180	-48	-44	-40	-46	-42	-38	-42	-38	-34
160	-48	-44	-40	-46	-42	-38	-43	-39	-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
Maximum 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
360	0.0	-1.5	-2.9	-21.4	-22.9	-24.3	-38.0	-39.5	-40.9
340	-1.6	-3.1	-4.5	-21.4	-22.8	-24.3	-36.4	-37.9	-39.3
320	-4.0	-5.5	-6.9	-21.3	-22.7	-24.2	-34.9	-36.3	-37.8
300	-5.4	-6.8	-8.3	-21.0	-22.5	-23.9	-33.3	-34.8	-36.2
280	-5.8	-7.3	-8.7	-20.5	-21.9	-23.4	-31.6	-33.1	-34.5
260	-5.8	-7.2	-8.7	-19.2	-20.7	-22.1	-29.1	-30.6	-32.0
240	-5.2	-6.7	-8.1	-17.2	-18.7	-20.1	-25.9	-27.3	-28.8
220	-4.2	-5.7	-7.2	-14.5	-15.9	-17.4	-21.9	-23.3	-24.8
200	-2.8	-4.2	-5.7	-11.0	-12.4	-13.9	-17.1	-18.5	-20.0
180	-0.8	-2.3	-3.7	-6.7	-8.2	-9.7	-11.5	-12.9	-14.4
160	0.0	-0.2	-1.6	-2.2	-3.7	-5.1	-5.6	-7.0	-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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1600	143.2							
1800	210.7	144.9						
2000	277.9	212.3	146.5	121.3				
2200	344.9	279.5	213.9	169.0				
2400	411.7	346.5	281.1	217.0	152.7			
2600		413.3	348.1	266.5	200.4	136.4	140.9	
2800				317.9	249.4	184.0	172.2	
3000				371.1	300.1	232.4	203.7	140.5
3200					352.7	282.5	236.1	171.8
3400						334.5	269.6	203.3
3600						388.1	304.3	235.7
3800							340.2	269.2
4000							377.5	303.8
4200								235.3
4400								339.8
4600								268.8
4800								377.0
								303.4
								339.4
								376.6

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 -50 m/+45 m for every 5°C above/below 4°C.
Adjust "Poor" field length available by -65 m/+60 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 Adjustments (KIAS)**

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)		PRESS ALT (FT)	PRESS ALT (FT)		PRESS ALT (FT)	PRESS ALT (FT)		PRESS ALT (FT)
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
360	-6	-4	-2	-18	-16	-14	-33	-31	-29
340	-9	-7	-5	-21	-19	-17	-36	-34	-32
320	-10	-8	-6	-23	-21	-19	-39	-37	-35
300	-12	-10	-8	-25	-23	-21	-41	-39	-37
280	-13	-11	-9	-27	-25	-23	-42	-40	-38
260	-14	-12	-10	-28	-26	-24	-44	-42	-40
240	-14	-12	-10	-29	-27	-25	-45	-43	-41
220	-15	-13	-11	-30	-28	-26	-45	-43	-41
200	-15	-13	-11	-30	-28	-26	-46	-44	-42
180	-16	-14	-12	-30	-28	-26	-46	-44	-42
160	-16	-14	-12	-30	-28	-26	-46	-44	-42

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 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
360	-6.0	-7.1	-8.2	-33.7	-34.8	-35.9	-54.8	-55.9	-56.9
340	-8.4	-9.5	-10.6	-32.9	-34.0	-35.1	-51.6	-52.7	-53.8
320	-10.2	-11.3	-12.4	-32.1	-33.2	-34.3	-48.9	-50.0	-51.0
300	-11.4	-12.5	-13.6	-31.5	-32.6	-33.6	-46.5	-47.6	-48.7
280	-12.0	-13.1	-14.1	-30.6	-31.7	-32.8	-44.2	-45.3	-46.3
260	-11.9	-13.0	-14.1	-28.8	-29.9	-31.0	-41.1	-42.2	-43.3
240	-11.1	-12.2	-13.3	-26.1	-27.2	-28.3	-37.3	-38.4	-39.5
220	-9.7	-10.8	-11.9	-22.5	-23.5	-24.6	-32.8	-33.9	-35.0
200	-7.6	-8.7	-9.8	-17.9	-19.0	-20.1	-27.5	-28.6	-29.7
180	-4.9	-6.0	-7.1	-12.4	-13.5	-14.6	-21.4	-22.5	-23.6
160	-1.9	-3.0	-4.1	-6.5	-7.6	-8.7	-15.1	-16.2	-17.3

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
2000	160.9							
2200	267.5	171.1						
2400	351.0	275.4	181.3					
2600		357.5	283.1					
2800			364.0					
3200				221.8				
3400					316.2	183.1		
3600					385.4	293.6	138.0	
3800						366.8	268.7	
4000							348.1	
4800								121.1
5000								195.4
5200							267.3	
5400							335.7	143.0
5600								216.9
5800								287.7
6000								164.8
							355.3	238.1
								307.9

- Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.
- Adjust "Good" field length available by -40 m/+35 m for every 5°C above/below 4°C.
Adjust "Medium" field length available by -60 m/+55 m for every 5°C above/below 4°C.
Adjust "Poor" field length available by -95 m/+90 m for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- 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)		S.L.	PRESS ALT (FT)		S.L.	PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
360	-10	-6	-2	-27	-23	-19	-54	-50	-46
340	-12	-8	-4	-31	-27	-23	-58	-54	-50
320	-14	-10	-6	-34	-30	-26	-62	-58	-54
300	-16	-12	-8	-37	-33	-29	-65	-61	-57
280	-18	-14	-10	-39	-35	-31	-68	-64	-60
260	-19	-15	-11	-41	-37	-33	-71	-67	-63
240	-21	-17	-13	-43	-39	-35	-73	-69	-65
220	-22	-18	-14	-45	-41	-37	-75	-71	-67
200	-23	-19	-15	-48	-44	-40	-77	-73	-69
180	-24	-20	-16	-50	-46	-42	-77	-73	-69
160	-25	-21	-17	-52	-48	-44	-78	-74	-70

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**TO1 Slush/Standing Water Takeoff****10% Thrust Reduction****Maximum Reverse Thrust****Weight Adjustment (1000 KG)**

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)		PRESS ALT (FT)		PRESS ALT (FT)		PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
360	-35.0	-39.9	-44.8	-42.0	-46.9	-51.8	-53.6	-58.5	-63.4
340	-33.2	-38.1	-43.0	-39.5	-44.4	-49.3	-50.1	-55.0	-59.9
320	-31.5	-36.4	-41.3	-37.2	-42.1	-46.9	-46.6	-51.5	-56.4
300	-29.4	-34.3	-39.2	-34.5	-39.4	-44.3	-42.8	-47.7	-52.6
280	-27.1	-32.0	-36.9	-31.5	-36.4	-41.3	-38.7	-43.6	-48.5
260	-24.4	-29.3	-34.2	-28.3	-33.2	-38.1	-34.4	-39.3	-44.2
240	-21.5	-26.4	-31.3	-24.7	-29.6	-34.5	-29.8	-34.7	-39.6
220	-18.3	-23.2	-28.1	-20.9	-25.8	-30.7	-24.8	-29.7	-34.6
200	-14.8	-19.7	-24.6	-16.7	-21.6	-26.5	-19.6	-24.5	-29.4
180	-11.0	-15.9	-20.8	-12.3	-17.2	-22.1	-14.2	-19.1	-24.0
160	-6.9	-11.7	-16.6	-7.6	-12.5	-17.4	-8.4	-13.3	-18.2

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)		PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
2000				123.0			144.4		
2200	146.8			159.7			181.3		
2400	183.4			196.6	127.0		218.5	148.5	
2600	220.5	150.8		234.2	163.7		256.3	185.4	
2800	258.5	187.4		272.4	200.7	131.0	294.7	222.6	152.6
3000	297.3	224.7	154.8	311.5	238.4	167.8	333.8	260.5	189.4
3200	336.9	262.7	191.5	351.3	276.7	204.8	373.5	299.0	226.8
3400	377.4	301.6	228.8		315.8	242.5		338.1	264.7
3600		341.3	266.9		355.7	281.0		377.9	303.2
3800		381.8	305.9			320.2			342.5
4000			345.8			360.1			382.3
4200			386.3						

1. Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -65 m/+60 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**TO1 Slush/Standing Water Takeoff****10% Thrust Reduction****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.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
360	-24	-22	-20	-20	-18	-16	-11	-9	-7
340	-26	-24	-22	-21	-19	-17	-12	-10	-8
320	-28	-26	-24	-23	-21	-19	-13	-11	-9
300	-29	-27	-25	-25	-23	-21	-15	-13	-11
280	-30	-28	-26	-26	-24	-22	-17	-15	-13
260	-30	-28	-26	-27	-25	-23	-19	-17	-15
240	-30	-28	-26	-27	-25	-23	-21	-19	-17
220	-30	-28	-26	-27	-25	-23	-22	-20	-18
200	-29	-27	-25	-27	-25	-23	-23	-21	-19
180	-28	-26	-24	-27	-25	-23	-23	-21	-19
160	-28	-26	-24	-26	-24	-22	-23	-21	-19

- Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
- 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**TO1 Slush/Standing Water Takeoff****10% Thrust Reduction****No Reverse Thrust****Weight Adjustment (1000 KG)**

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)		PRESS ALT (FT)		PRESS ALT (FT)				
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
360	-48.6	-53.7	-58.8	-56.8	-61.9	-67.0	-70.5	-75.6	-80.7
340	-45.8	-50.8	-55.9	-53.1	-58.2	-63.3	-65.2	-70.3	-75.3
320	-42.9	-48.0	-53.0	-49.5	-54.6	-59.6	-59.9	-65.0	-70.1
300	-39.8	-44.9	-50.0	-45.6	-50.7	-55.8	-54.6	-59.6	-64.7
280	-36.6	-41.6	-46.7	-41.6	-46.7	-51.8	-49.2	-54.2	-59.3
260	-33.1	-38.2	-43.3	-37.4	-42.5	-47.5	-43.7	-48.8	-53.9
240	-29.4	-34.5	-39.6	-33.0	-38.1	-43.1	-38.2	-43.3	-48.3
220	-25.5	-30.6	-35.7	-28.4	-33.5	-38.6	-32.6	-37.7	-42.7
200	-21.5	-26.5	-31.6	-23.6	-28.7	-33.8	-26.9	-32.0	-37.1
180	-17.2	-22.2	-27.3	-18.7	-23.8	-28.8	-21.2	-26.3	-31.4
160	-12.7	-17.7	-22.8	-13.5	-18.6	-23.7	-15.4	-20.4	-25.5

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
3000							139.9	
3200							194.3	
3400				135.9			245.1	136.0
3600				202.7			291.9	190.4
3800	187.8			260.6	131.0		335.8	241.6
4000	254.6			310.8	198.1		377.7	288.7
4200	308.8	182.1		356.1	256.8	126.2		332.7
4400	355.8	250.3			307.4	193.5		374.7
4600		305.1	176.3		353.0	252.8		329.6
4800		352.6	246.0			304.0		
5000			301.5			349.9		
5200			349.3					371.7

1. Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -100 m/+95 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**TO1 Slush/Standing Water Takeoff****10% Thrust Reduction****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.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
360	-39	-35	-31	-32	-28	-24	-17	-13	-9
340	-41	-37	-33	-34	-30	-26	-19	-15	-11
320	-42	-38	-34	-36	-32	-28	-21	-17	-13
300	-44	-40	-36	-38	-34	-30	-24	-20	-16
280	-44	-40	-36	-39	-35	-31	-27	-23	-19
260	-45	-41	-37	-41	-37	-33	-31	-27	-23
240	-45	-41	-37	-42	-38	-34	-33	-29	-25
220	-45	-41	-37	-42	-38	-34	-36	-32	-28
200	-45	-41	-37	-43	-39	-35	-38	-34	-30
180	-45	-41	-37	-43	-39	-35	-39	-35	-31
160	-46	-42	-38	-44	-40	-36	-40	-36	-32

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**TO1 Slippery Runway Takeoff****10% Thrust Reduction****Maximum Reverse Thrust****Weight Adjustments (1000 KG)**

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	0.0	-1.5	-2.9	-19.0	-20.5	-21.9	-35.7	-37.1	-38.6
340	0.0	-1.5	-2.9	-19.1	-20.6	-22.0	-34.4	-35.8	-37.3
320	-1.5	-2.9	-4.4	-19.4	-20.9	-22.3	-33.2	-34.7	-36.1
300	-3.9	-5.3	-6.8	-19.5	-21.0	-22.4	-32.0	-33.5	-35.0
280	-5.1	-6.6	-8.0	-19.5	-21.0	-22.4	-30.9	-32.4	-33.8
260	-5.5	-6.9	-8.4	-19.1	-20.5	-22.0	-29.4	-30.8	-32.3
240	-5.4	-6.8	-8.3	-17.8	-19.3	-20.7	-27.0	-28.4	-29.9
220	-4.7	-6.2	-7.6	-15.7	-17.2	-18.6	-23.7	-25.2	-26.6
200	-3.6	-5.1	-6.5	-12.8	-14.3	-15.7	-19.6	-21.0	-22.5
180	-2.0	-3.4	-4.9	-9.1	-10.6	-12.1	-14.6	-16.0	-17.5
160	0.0	-1.4	-2.8	-4.7	-6.2	-7.6	-8.8	-10.3	-11.7

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1600	172.9								
1800	243.8	174.6							
2000	314.4	245.5	176.3	147.3					
2200	384.9	316.1	247.2	197.6	130.1				
2400		386.6	317.8	249.2	180.3		130.1		
2600			388.3	302.8	231.3	163.2	163.1		
2800				358.6	284.3	213.7	196.3	129.7	
3000					339.3	265.9	230.4	162.7	
3200					396.1	320.2	265.7	195.9	129.3
3400						376.6	302.3	230.0	162.3
3600							340.5	265.2	195.5
3800							380.0	301.9	229.5
4000								340.0	264.8
4200								379.6	301.4
4400									339.5
4600									379.1

1. Enter Weight Adjustment table with reported braking action and TO1 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 -50 m/+45 m for every 5°C above/below 4°C.
Adjust "Poor" field length available by -65 m/+60 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**TO1 Slippery Runway Takeoff****10% Thrust Reduction****Maximum Reverse Thrust****V1 Adjustments (KIAS)**

WEIGHT (1000 KG)	REPORTED BRAKING ACTION									
	GOOD			MEDIUM			POOR			
	PRESS ALT (FT)		S.L.	4000	8000	S.L.	4000	8000	S.L.	4000
360	-7	-5	-3	-18	-16	-14	-31	-29	-27	
340	-9	-7	-5	-20	-18	-16	-34	-32	-30	
320	-11	-9	-7	-22	-20	-18	-36	-34	-32	
300	-12	-10	-8	-24	-22	-20	-38	-36	-34	
280	-13	-11	-9	-26	-24	-22	-40	-38	-36	
260	-14	-12	-10	-27	-25	-23	-41	-39	-37	
240	-14	-12	-10	-27	-25	-23	-42	-40	-38	
220	-15	-13	-11	-28	-26	-24	-43	-41	-39	
200	-15	-13	-11	-28	-26	-24	-43	-41	-39	
180	-16	-14	-12	-29	-27	-25	-43	-41	-39	
160	-16	-14	-12	-29	-27	-25	-44	-42	-40	

- Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
- 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**TO1 Slippery Runway Takeoff****10% Thrust Reduction****No Reverse Thrust****Weight Adjustment (1000 KG)**

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)	PRESS ALT (FT)	PRESS ALT (FT)	S.L.	4000	8000	S.L.	4000	8000
360	-2.5	-3.5	-4.6	-31.1	-32.2	-33.3	-52.9	-54.0	-55.1
340	-5.1	-6.2	-7.3	-30.5	-31.6	-32.7	-50.0	-51.1	-52.2
320	-7.6	-8.7	-9.8	-30.0	-31.1	-32.2	-47.4	-48.5	-49.6
300	-9.5	-10.6	-11.7	-29.7	-30.7	-31.8	-45.1	-46.2	-47.3
280	-10.7	-11.8	-12.9	-29.3	-30.4	-31.5	-43.3	-44.4	-45.4
260	-11.3	-12.4	-13.5	-28.6	-29.7	-30.8	-41.2	-42.3	-43.4
240	-11.1	-12.2	-13.3	-26.8	-27.9	-29.0	-38.4	-39.4	-40.5
220	-10.3	-11.4	-12.4	-24.0	-25.1	-26.2	-34.6	-35.7	-36.8
200	-8.7	-9.8	-10.9	-20.2	-21.3	-22.4	-30.0	-31.1	-32.2
180	-6.4	-7.5	-8.6	-15.4	-16.5	-17.6	-24.6	-25.7	-26.8
160	-3.5	-4.6	-5.7	-9.6	-10.7	-11.8	-18.3	-19.4	-20.5

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.	4000	8000	S.L.	4000	8000
2000	232.8								
2200	329.7	242.2	130.8						
2400		337.0	251.3						
2600			344.3						
3000				230.6					
3200				328.5	190.7				
3400					305.1	141.9			
3600					382.1	279.1			
3800						361.8			
4600							183.2		
4800							262.8		
5000							338.3	125.4	
5200								207.1	
5400									149.5
5600									359.8
5800									230.5
									307.7
									381.2

1. Enter Weight Adjustment table with reported braking action and TO1 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust "Good" field length available by -40 m/+35 m for every 5°C above/below 4°C.
Adjust "Medium" field length available by -60 m/+55 m for every 5°C above/below 4°C.
Adjust "Poor" field length available by -95 m/+90 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**TO1 Slippery Runway Takeoff****10% Thrust Reduction****No Reverse Thrust****V1 Adjustment (KIAS)**

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)		S.L.	4000	8000	S.L.	4000	8000	S.L.
360	-10	-6	-2	-26	-22	-18	-50	-46	-42
340	-12	-8	-4	-29	-25	-21	-54	-50	-46
320	-14	-10	-6	-31	-27	-23	-57	-53	-49
300	-16	-12	-8	-34	-30	-26	-61	-57	-53
280	-17	-13	-9	-36	-32	-28	-64	-60	-56
260	-18	-14	-10	-38	-34	-30	-66	-62	-58
240	-20	-16	-12	-40	-36	-32	-68	-64	-60
220	-21	-17	-13	-42	-38	-34	-70	-66	-62
200	-22	-18	-14	-44	-40	-36	-71	-67	-63
180	-23	-19	-15	-46	-42	-38	-72	-68	-64
160	-24	-20	-16	-48	-44	-40	-73	-69	-65

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**TO2 Slush/Standing Water Takeoff****20% Thrust Reduction****Maximum Reverse Thrust****Weight Adjustment (1000 KG)**

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)	PRESS ALT (FT)	PRESS ALT (FT)	S.L.	4000	8000	S.L.	4000	8000
360	-33.8	-38.7	-43.6	-40.8	-45.7	-50.6	-52.6	-57.5	-62.4
340	-31.8	-36.7	-41.6	-38.1	-43.0	-47.9	-48.9	-53.8	-58.7
320	-30.0	-34.9	-39.8	-35.9	-40.8	-45.7	-45.6	-50.5	-55.4
300	-28.6	-33.5	-38.4	-33.8	-38.7	-43.6	-42.5	-47.4	-52.3
280	-26.8	-31.7	-36.6	-31.5	-36.4	-41.3	-39.1	-44.0	-48.9
260	-24.7	-29.6	-34.5	-28.7	-33.6	-38.5	-35.3	-40.2	-45.1
240	-22.2	-27.1	-32.0	-25.7	-30.6	-35.5	-31.2	-36.1	-41.0
220	-19.4	-24.3	-29.2	-22.2	-27.1	-32.0	-26.7	-31.6	-36.5
200	-16.2	-21.1	-26.0	-18.4	-23.3	-28.2	-21.8	-26.7	-31.6
180	-12.6	-17.5	-22.4	-14.3	-19.2	-24.1	-16.7	-21.6	-26.5
160	-8.7	-13.6	-18.5	-9.8	-14.6	-19.5	-11.1	-16.0	-20.9

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.	4000	8000	S.L.	4000	8000
1800							131.5		
2000	137.0			149.8			171.4		
2200	176.6			189.8			211.6	135.9	
2400	217.0	141.3		230.6	154.2		252.7	175.8	
2600	258.5	181.0		272.5	194.2		294.7	216.1	140.3
2800	301.3	221.5	145.7	315.5	235.2	158.6	337.8	257.3	180.2
3000	345.3	263.2	185.4	359.7	277.2	198.7	381.9	299.4	220.6
3200	390.5	306.1	226.0		320.3	239.7		342.6	261.9
3400		350.3	267.8		364.6	281.8		386.8	304.1
3600			310.9			325.1			347.4
3800			355.2			369.6			391.7

- Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
- Adjust field length available by -65 m/+60 m for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION**TO2 Slush/Standing Water Takeoff****20% Thrust Reduction****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)		PRESS ALT (FT)		PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	-21	-19	-17	-16	-14	-12	-6	-4	-2		
340	-23	-21	-19	-18	-16	-14	-7	-5	-3		
320	-25	-23	-21	-20	-18	-16	-9	-7	-5		
300	-26	-24	-22	-21	-19	-17	-11	-9	-7		
280	-27	-25	-23	-23	-21	-19	-13	-11	-9		
260	-27	-25	-23	-24	-22	-20	-15	-13	-11		
240	-27	-25	-23	-24	-22	-20	-17	-15	-13		
220	-27	-25	-23	-24	-22	-20	-18	-16	-14		
200	-26	-24	-22	-24	-22	-20	-19	-17	-15		
180	-26	-24	-22	-24	-22	-20	-19	-17	-15		
160	-25	-23	-21	-23	-21	-19	-19	-17	-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**TO2 Slush/Standing Water Takeoff****20% Thrust Reduction****No Reverse Thrust****Weight Adjustment (1000 KG)**

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)	PRESS ALT (FT)	PRESS ALT (FT)	S.L.	4000	8000	S.L.	4000	8000
360	-48.0	-53.1	-58.1	-56.4	-61.5	-66.6	-70.9	-76.0	-81.1
340	-45.0	-50.1	-55.1	-52.7	-57.7	-62.8	-65.6	-70.7	-75.8
320	-42.2	-47.2	-52.3	-49.1	-54.1	-59.2	-60.4	-65.5	-70.6
300	-39.5	-44.5	-49.6	-45.6	-50.7	-55.7	-55.3	-60.4	-65.5
280	-36.5	-41.6	-46.7	-41.9	-47.0	-52.0	-50.1	-55.2	-60.3
260	-33.4	-38.5	-43.6	-38.0	-43.1	-48.1	-44.9	-50.0	-55.0
240	-30.0	-35.1	-40.2	-33.9	-38.9	-44.0	-39.5	-44.6	-49.7
220	-26.4	-31.5	-36.5	-29.5	-34.6	-39.7	-34.1	-39.2	-44.3
200	-22.5	-27.6	-32.7	-25.0	-30.0	-35.1	-28.6	-33.7	-38.7
180	-18.4	-23.5	-28.6	-20.2	-25.3	-30.4	-23.0	-28.1	-33.1
160	-14.0	-19.1	-24.2	-15.2	-20.2	-25.3	-17.2	-22.3	-27.4

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.	4000	8000	S.L.	4000	8000
2800							153.7		
3000							217.1		
3200				178.3			275.0	149.0	
3400	174.6			251.6			328.7	212.7	
3600	257.5			313.2	172.5		379.7	271.0	144.4
3800	322.4	167.6		368.2	246.8			324.9	208.2
4000	379.1	252.3		309.0	166.6			376.1	266.9
4200		318.1	160.7		364.3	242.0			321.2
4400		375.1	247.1			304.8			372.4
4600			313.8			360.5			
4800			371.1						

- Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
- Adjust field length available by -100 m/+95 m for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION**TO2 Slush/Standing Water Takeoff****20% Thrust Reduction****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)		PRESS ALT (FT)	PRESS ALT (FT)		PRESS ALT (FT)
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
360	-34	-30	-26	-25	-21	-17	-7	-3	0
340	-36	-32	-28	-28	-24	-20	-10	-6	-2
320	-38	-34	-30	-30	-26	-22	-13	-9	-5
300	-39	-35	-31	-32	-28	-24	-16	-12	-8
280	-40	-36	-32	-34	-30	-26	-20	-16	-12
260	-41	-37	-33	-36	-32	-28	-24	-20	-16
240	-41	-37	-33	-37	-33	-29	-27	-23	-19
220	-41	-37	-33	-38	-34	-30	-30	-26	-22
200	-41	-37	-33	-39	-35	-31	-32	-28	-24
180	-41	-37	-33	-39	-35	-31	-34	-30	-26
160	-41	-37	-33	-39	-35	-31	-34	-30	-26

- Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
- 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**TO2 Slippery Runway Takeoff****20% Thrust Reduction****Maximum Reverse Thrust****Weight Adjustments (1000 KG)**

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	0.0	-1.5	-2.9	-17.6	-19.1	-20.5	-34.9	-36.3	-37.8
340	0.0	-1.5	-2.9	-17.6	-19.1	-20.6	-33.3	-34.7	-36.2
320	0.0	-1.5	-2.9	-17.8	-19.2	-20.7	-32.0	-33.4	-34.9
300	-1.5	-2.9	-4.4	-18.1	-19.5	-21.0	-30.9	-32.4	-33.8
280	-3.8	-5.2	-6.7	-18.3	-19.7	-21.2	-29.9	-31.3	-32.8
260	-4.9	-6.3	-7.8	-18.3	-19.7	-21.2	-28.8	-30.3	-31.7
240	-5.2	-6.6	-8.1	-17.7	-19.2	-20.6	-27.2	-28.6	-30.1
220	-4.9	-6.4	-7.8	-16.3	-17.7	-19.2	-24.6	-26.0	-27.5
200	-4.1	-5.6	-7.1	-14.0	-15.4	-16.9	-21.1	-22.5	-24.0
180	-2.8	-4.3	-5.7	-10.8	-12.2	-13.7	-16.7	-18.1	-19.6
160	-1.0	-2.4	-3.9	-6.7	-8.2	-9.6	-11.3	-12.7	-14.2

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION							
	GOOD			MEDIUM			POOR	
	PRESS ALT (FT)	S.L.	4000	8000	PRESS ALT (FT)	S.L.	4000	8000
1400	130.8							
1600	205.8	132.6						
1800	280.6	207.6	134.4	123.3				
2000	355.4	282.4	209.3	176.5				
2200		357.2	284.2	230.5	158.3			
2400			359.0	286.8	211.8	140.1	153.4	
2600				345.5	267.3	193.3	188.6	
2800					325.1	248.1	224.6	153.0
3000					385.4	305.1	262.1	188.2
3200						364.6	301.2	224.2
3400							342.0	261.7
3600							384.4	300.7
3800								152.5
4000								187.7
4200								223.8
4400								261.2
								383.4
								300.2
								341.0
								383.4

- Enter Weight Adjustment table with reported braking action and TO2 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
- Adjust "Good" field length available by -35 m/+30 m for every 5°C above/below 4°C.
Adjust "Medium" field length available by -50 m/+45 m for every 5°C above/below 4°C.
Adjust "Poor" field length available by -65 m/+60 m for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION**TO2 Slippery Runway Takeoff****20% Thrust Reduction****Maximum Reverse Thrust****V1 Adjustments (KIAS)**

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)		PRESS ALT (FT)	PRESS ALT (FT)		PRESS ALT (FT)	PRESS ALT (FT)		PRESS ALT (FT)
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
360	-7	-5	-3	-16	-14	-12	-28	-26	-24
340	-9	-7	-5	-19	-17	-15	-31	-29	-27
320	-10	-8	-6	-20	-18	-16	-33	-31	-29
300	-11	-9	-7	-22	-20	-18	-35	-33	-31
280	-12	-10	-8	-23	-21	-19	-37	-35	-33
260	-13	-11	-9	-24	-22	-20	-38	-36	-34
240	-13	-11	-9	-25	-23	-21	-39	-37	-35
220	-14	-12	-10	-25	-23	-21	-39	-37	-35
200	-14	-12	-10	-26	-24	-22	-40	-38	-36
180	-14	-12	-10	-26	-24	-22	-40	-38	-36
160	-15	-13	-11	-26	-24	-22	-40	-38	-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**TO2 Slippery Runway Takeoff****20% Thrust Reduction****No Reverse Thrust****Weight Adjustment (1000 KG)**

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
360	0.0	-0.4	-1.5	-29.9	-30.9	-32.0	-52.6	-53.7	-54.8
340	-2.0	-3.0	-4.1	-29.0	-30.1	-31.2	-49.6	-50.7	-51.8
320	-4.6	-5.7	-6.8	-28.4	-29.5	-30.6	-46.8	-47.8	-48.9
300	-7.1	-8.2	-9.3	-28.0	-29.1	-30.2	-44.2	-45.3	-46.4
280	-9.0	-10.1	-11.2	-27.7	-28.8	-29.9	-42.1	-43.2	-44.3
260	-10.2	-11.3	-12.4	-27.4	-28.5	-29.6	-40.3	-41.4	-42.5
240	-10.6	-11.7	-12.8	-26.6	-27.7	-28.7	-38.2	-39.3	-40.4
220	-10.3	-11.4	-12.5	-24.6	-25.7	-26.7	-35.2	-36.3	-37.4
200	-9.2	-10.3	-11.4	-21.5	-22.6	-23.7	-31.3	-32.3	-33.4
180	-7.4	-8.5	-9.6	-17.3	-18.4	-19.5	-26.4	-27.5	-28.6
160	-4.8	-5.9	-7.0	-12.0	-13.1	-14.2	-20.5	-21.6	-22.7

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1800	185.5								
2000	302.0	197.2							
2200	394.2	310.5	208.5						
2400			318.9						
2800				238.7					
3000				341.3	196.9				
3200					316.7	144.0			
3400					399.1	289.6			
3600						376.8			
4200							164.7		
4400							253.5		
4600							337.5	191.3	
4800								278.7	127.5
5000								361.3	217.6
5200									303.5
5400									385.1

- Enter Weight Adjustment table with reported braking action and TO2 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
- Adjust "Good" field length available by -40 m/+35 m for every 5°C above/below 4°C.
Adjust "Medium" field length available by -60 m/+55 m for every 5°C above/below 4°C.
Adjust "Poor" field length available by -95 m/+90 m for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION**TO2 Slippery Runway Takeoff****20% Thrust Reduction****No Reverse Thrust****V1 Adjustment (KIAS)**

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)		PRESS ALT (FT)	PRESS ALT (FT)		PRESS ALT (FT)	PRESS ALT (FT)		PRESS ALT (FT)
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
360	-9	-5	-1	-23	-19	-15	-45	-41	-37
340	-11	-7	-3	-26	-22	-18	-49	-45	-41
320	-13	-9	-5	-28	-24	-20	-52	-48	-44
300	-14	-10	-6	-30	-26	-22	-55	-51	-47
280	-16	-12	-8	-32	-28	-24	-58	-54	-50
260	-17	-13	-9	-34	-30	-26	-60	-56	-52
240	-18	-14	-10	-36	-32	-28	-62	-58	-54
220	-18	-14	-10	-38	-34	-30	-64	-60	-56
200	-19	-15	-11	-39	-35	-31	-65	-61	-57
180	-20	-16	-12	-41	-37	-33	-66	-62	-58
160	-21	-17	-13	-43	-39	-35	-66	-62	-58

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.

Minimum Control Speeds**V1(MCG)****Max Takeoff Thrust**

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	125	121	119	117		
50	122	128	125	119	117	115	110
40	104	136	133	127	122	116	110
30	86	138	137	133	127	122	115
20	68	138	138	134	130	126	119
-60	-76	140	139	135	131	127	121

TO1 V1(MCG)**10% Thrust Reduction**

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	118	115	112	111		
50	122	122	118	113	111	109	105
40	104	129	126	120	115	110	105
30	86	130	130	126	120	115	109
20	68	130	130	127	123	119	113
-60	-76	132	132	128	124	120	115

TO2 V1(MCG)**20% Thrust Reduction**

TEMP		PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
60	140	112	108	106	104		
50	122	115	112	106	104	103	99
40	104	121	119	113	108	104	99
30	86	122	122	118	113	108	102
20	68	123	122	119	116	112	106
-60	-76	125	124	121	117	113	108

Go-around %N1

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

REPORTED OAT			TAT											AIRPORT PRESSURE ALTITUDE (1000 FT)										
°C	°F	°C	-2	-1	0	1	2	3	4	5	6	7	8	9	10									
66	150	70	93.2	93.3	93.6	93.4	93.3	93.3	93.3	93.4	93.3	92.6	91.5	90.5	89.6									
56	133	60	95.9	96.1	96.4	96.2	96.1	96.1	96.1	96.2	96.1	95.4	94.3	93.4	92.5									
51	124	55	97.2	97.6	97.9	97.7	97.5	97.5	97.5	97.5	97.4	96.7	95.7	94.7	93.9									
46	115	50	98.5	98.9	99.3	99.2	98.9	98.8	98.8	98.8	98.7	98.0	97.0	96.1	95.2									
41	106	45	99.6	100.1	100.6	100.5	100.2	100.2	100.1	100.2	100.0	99.3	98.3	97.3	96.5									
36	97	40	100.4	101.6	102.4	102.3	101.9	101.8	101.7	101.7	101.3	100.5	99.5	98.6	97.8									
31	88	35	99.6	101.2	103.2	104.4	103.9	103.7	103.6	103.5	102.7	101.7	100.6	99.7	98.9									
26	79	30	98.8	100.4	102.3	103.8	105.1	105.9	105.9	106.1	105.0	103.4	101.9	100.8	100.0									
21	70	25	97.9	99.5	101.5	102.9	104.2	105.2	106.3	107.2	106.8	105.7	104.0	102.3	101.3									
16	61	20	97.1	98.7	100.6	102.0	103.3	104.3	105.4	106.5	106.8	106.3	105.2	104.2	103.3									
11	53	15	96.3	97.9	99.8	101.2	102.4	103.4	104.5	105.6	105.9	105.5	104.9	104.4	104.0									
7	44	10	95.4	97.0	98.9	100.3	101.5	102.5	103.6	104.6	105.0	104.6	104.0	103.5	103.4									
2	35	5	94.6	96.1	98.0	99.4	100.6	101.6	102.7	103.7	104.1	103.7	103.1	102.5	102.5									
-3	26	0	93.7	95.3	97.1	98.5	99.7	100.7	101.7	102.8	103.1	102.7	102.1	101.6	101.6									
-13	8	-10	92.0	93.5	95.3	96.7	97.9	98.8	99.8	100.9	101.2	100.8	100.3	99.7	99.7									
-23	-10	-20	90.2	91.7	93.5	94.8	96.0	96.9	97.9	98.9	99.3	98.9	98.3	97.8	97.8									
-33	-27	-30	88.4	89.9	91.7	92.9	94.1	95.0	96.0	97.0	97.3	96.9	96.4	95.9	95.8									
-43	-45	-40	86.6	88.0	89.7	91.0	92.1	93.0	94.0	95.0	95.3	94.9	94.4	93.9	93.9									
-53	-63	-50	84.7	86.1	87.8	89.0	90.1	91.0	91.9	92.9	93.2	92.9	92.3	91.8	91.8									

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)												
	-2	-1	0	1	2	3	4	5	6	7	8	9	10
PACKS OFF	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
1 PACK ON	-0.2	-0.2	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3
WING ANTI-ICE ON	-0.2	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

Max Climb %N1**Based on engine bleed for packs on or off and anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	.84	.84	.84
60	88.3	88.1	90.3	91.0	93.1	96.7	99.6	101.7	101.8	101.3
50	90.6	90.4	90.2	89.6	91.7	95.3	98.0	100.1	100.2	99.7
40	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
30	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6
20	90.1	92.5	95.1	95.8	95.9	95.9	96.9	95.9	95.5	95.0
15	89.3	91.7	94.3	96.9	96.9	96.9	97.8	96.6	95.8	95.4
10	88.6	90.9	93.5	96.1	98.4	98.1	98.8	97.2	96.5	96.0
5	87.8	90.1	92.7	95.2	98.1	99.6	100.1	98.1	97.2	96.8
0	87.0	89.3	91.8	94.4	97.3	99.9	101.5	99.3	98.1	97.6
-5	86.2	88.5	91.0	93.5	96.4	99.0	101.9	100.5	99.5	98.8
-10	85.4	87.7	90.1	92.6	95.5	98.1	100.9	101.3	100.5	100.0
-15	84.6	86.8	89.3	91.7	94.5	97.1	100.0	101.0	100.9	100.5
-20	83.7	86.0	88.4	90.8	93.6	96.2	99.0	100.1	99.9	99.5
-25	82.9	85.1	87.5	89.9	92.7	95.2	98.0	99.1	98.9	98.5
-30	82.1	84.3	86.7	89.0	91.8	94.3	97.0	98.1	97.9	97.5
-35	81.2	83.4	85.8	88.1	90.8	93.3	96.0	97.0	96.9	96.5
-40	80.4	82.5	84.9	87.2	89.8	92.3	95.0	96.0	95.9	95.5

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.3	-0.4	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.3	-0.4	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6

*Packs on or packs off with 2 bleed sources.

**Packs off with 1 bleed source.

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

Climb**Flaps Up, Set Max Climb Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	PITCH ATT V/S (FT/MIN)	5.0 2500	4.5 1500			
30000 (280 KIAS)	PITCH ATT V/S (FT/MIN)	6.5 3700	5.5 2600	5.5 1800	5.0 1300	4.5 900
20000 (270 KIAS)	PITCH ATT V/S (FT/MIN)	9.5 5000	8.5 3600	8.0 2700	7.5 2000	7.5 1400
10000 (270 KIAS)	PITCH ATT V/S (FT/MIN)	14.0 6700	11.5 4900	10.0 3700	9.5 2900	9.5 2200
SEA LEVEL (270 KIAS)	PITCH ATT V/S (FT/MIN)	17.5 7800	14.5 5700	12.5 4400	11.5 3500	11.0 2800

Cruise**Flaps Up, %N1 for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	PITCH ATT %N1	2.0 78.6	3.0 83.2			
35000 (.82M)	PITCH ATT %N1	1.5 76.5	2.0 78.9	3.0 82.8	3.5 88.0	
30000 (280 KIAS)	PITCH ATT %N1	1.5 72.6	2.5 74.7	3.0 78.1	3.5 82.4	3.5 87.3
25000 (280 KIAS)	PITCH ATT %N1	1.5 68.6	2.5 70.7	3.5 73.8	4.0 77.7	4.0 82.3
20000 (270 KIAS)	PITCH ATT %N1	2.0 63.4	2.5 65.8	3.5 69.0	4.5 72.8	5.5 77.4
15000 (270 KIAS)	PITCH ATT %N1	1.5 59.6	2.5 61.8	3.5 65.0	4.5 68.2	5.5 72.5

Descent**Flaps Up, Set Idle Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	PITCH ATT V/S (FT/MIN)	-1.5 -2900	0.0 -2600			
30000 (280 KIAS)	PITCH ATT V/S (FT/MIN)	-1.5 -2500	-0.5 -2000	0.5 -1900	1.0 -1900	0.5 -2400
20000 (270 KIAS)	PITCH ATT V/S (FT/MIN)	-1.0 -1900	0.5 -1600	1.5 -1500	2.5 -1400	3.0 -1400
10000 (270 KIAS)	PITCH ATT V/S (FT/MIN)	-1.5 -1700	0.0 -1400	1.0 -1300	2.0 -1300	3.0 -1300
SEA LEVEL (270 KIAS)	PITCH ATT V/S (FT/MIN)	-2.0 -1500	-0.5 -1300	1.0 -1200	2.0 -1200	3.0 -1200

In shaded areas, data reflects the minimum speed limitation of 15 knots above minimum maneuvering speed.

Flight With Unreliable Airspeed / Turbulent Air Penetration**Altitude and/or vertical speed indications may also be unreliable.****Holding****Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		150	200	250	300	350
10000	PITCH ATT	3.0	4.5	5.5	6.0	6.0
	%N1	50.2	54.4	59.1	63.9	68.2
	KIAS	216	216	226	244	262
5000	PITCH ATT	3.0	4.5	5.5	6.0	6.0
	%N1	46.6	50.9	55.4	59.7	64.2
	KIAS	216	216	226	244	262

Terminal Area (5000 FT)**%N1 for Level Flight**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS UP GEAR UP (VREF 30 + 80)	PITCH ATT	3.5	5.0	6.0	6.5	6.5
	%N1	47.7	52.3	57.2	61.9	66.4
	KIAS	217	217	225	243	263
FLAPS 1 GEAR UP (VREF 30 + 60)	PITCH ATT	5.0	6.5	8.0	8.0	8.0
	%N1	48.5	53.4	58.8	63.9	68.2
	KIAS	197	197	205	223	243
FLAPS 5 GEAR UP (VREF 30 + 40)	PITCH ATT	3.5	5.5	7.0	7.0	6.5
	%N1	48.8	54.0	59.7	64.7	69.0
	KIAS	177	177	185	203	223
FLAPS 15 GEAR UP (VREF 30 + 20)	PITCH ATT	3.5	6.5	8.0	7.5	7.0
	%N1	49.0	55.2	61.9	66.8	71.2
	KIAS	157	157	165	183	203
FLAPS 20 GEAR DOWN (VREF 30 + 20)	PITCH ATT	2.0	4.5	6.5	6.0	5.5
	%N1	56.2	61.4	67.3	73.1	78.1
	KIAS	157	157	165	183	203

Final Approach (1500 FT)**Gear Down, %N1 for 3° Glideslope**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS 20 (VREF 20 + 10)	PITCH ATT	0.0	2.0	2.0	2.5	2.5
	%N1	36.8	40.7	45.1	49.3	52.6
	KIAS	147	155	172	187	201
FLAPS 25 (VREF 25 + 10)	PITCH ATT	1.0	2.0	2.0	2.5	2.5
	%N1	51.5	49.8	54.7	59.2	63.3
	KIAS	147	147	163	178	191
FLAPS 30 (VREF 30 + 10)	PITCH ATT	0.0	1.0	2.0	1.5	
	%N1	56.9	55.6	60.2	65.3	
	KIAS	147	147	155	172	

Performance Inflight

All Engine

Chapter PI

Section 31

Long Range Cruise Maximum Operating Altitude

Max Climb Thrust

ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30(39°)	1.40(44°)	1.50(48°)
360	27300	5	30400	28800	27200
350	27900	4	31000	29400	27800
340	28500	3	31700	30000	28500
330	29200	1	32200	30500	29000
320	29900	0	32700	31000	29500
310	30600	-2	33200	31600	30000
300	31300	-4	33700	32100	30600
290	32000	-5	34300	32700	31200
280	32800	-7	34900	33300	31800
270	33600	-9	35500	33900	32400
260	34400	-11	36100	34500	33100
250	35200	-12	36800	35200	33800
240	36000	-14	37500	35900	34500
230	36900	-15	38200	36600	35200
220	37800	-15	39000	37400	36000
210	38800	-15	39800	38200	36800
200	39800	-15	40600	39000	37700
190	40900	-15	41500	39900	38600
180	42000	-15	42500	40900	39600
170	43100	-15	43100	42100	40800
160	43100	-15	43100	43100	42000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	11	30400	28800	27200
350	27900	10	31000	29400	27800
340	28500	8	31700	30000	28500
330	29200	7	32200	30500	29000
320	29900	5	32700	31000	29500
310	30600	4	33200	31600	30000
300	31300	2	33700	32100	30600
290	32000	0	34300	32700	31200
280	32800	-1	34900	33300	31800
270	33600	-3	35500	33900	32400
260	34400	-5	36100	34500	33100
250	35200	-7	36800	35200	33800
240	36000	-9	37500	35900	34500
230	36900	-9	38200	36600	35200
220	37800	-9	39000	37400	36000
210	38800	-9	39800	38200	36800
200	39800	-9	40600	39000	37700
190	40900	-9	41500	39900	38600
180	42000	-9	42500	40900	39600
170	43100	-9	43100	42100	40800
160	43100	-9	43100	43100	42000

Long Range Cruise Maximum Operating Altitude**Max Climb Thrust****ISA + 20°C**

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	17	30400	28800	27200
350	27900	15	31000	29400	27800
340	28500	14	31700	30000	28500
330	29200	12	32200	30500	29000
320	29900	11	32700	31000	29500
310	30600	9	33200	31600	30000
300	31300	8	33700	32100	30600
290	32000	6	34300	32700	31200
280	32800	4	34900	33300	31800
270	33600	3	35500	33900	32400
260	34400	1	36100	34500	33100
250	35200	-1	36800	35200	33800
240	36000	-3	37500	35900	34500
230	36900	-3	38200	36600	35200
220	37800	-3	39000	37400	36000
210	38800	-3	39800	38200	36800
200	39800	-3	40600	39000	37700
190	40900	-3	41500	39900	38600
180	42000	-3	42500	40900	39600
170	43100	-3	43100	42100	40800
160	43100	-3	43100	43100	42000

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		25	27	29	31	33	35	37	39	41	43
360	%N1	84.0	86.0	87.6	90.1						
	MACH	.819	.840	.837	.830						
	KIAS	346	342	326	310						
	FF/ENG	5139	5211	5162	5303						
340	%N1	83.0	84.7	86.1	88.1						
	MACH	.819	.839	.840	.835						
	KIAS	346	341	328	312						
	FF/ENG	4943	4959	4875	4910						
320	%N1	81.9	83.1	84.6	86.0	88.3					
	MACH	.818	.833	.840	.839	.833					
	KIAS	346	339	327	313	297					
	FF/ENG	4735	4662	4585	4523	4633					
300	%N1	80.2	81.8	82.9	84.5	86.1					
	MACH	.800	.823	.836	.840	.837					
	KIAS	337	334	326	314	299					
	FF/ENG	4416	4391	4316	4248	4232					
280	%N1	78.4	80.1	81.6	82.9	84.4	86.2				
	MACH	.775	.806	.827	.838	.840	.836				
	KIAS	326	326	322	313	300	285				
	FF/ENG	4088	4112	4069	4004	3948	3972				
260	%N1	76.6	78.3	80.0	81.3	82.8	84.2	86.6			
	MACH	.746	.780	.810	.830	.839	.839	.834			
	KIAS	313	315	315	309	300	287	272			
	FF/ENG	3751	3796	3803	3758	3703	3653	3726			
240	%N1	74.7	76.3	78.0	79.7	81.0	82.5	84.3			
	MACH	.720	.749	.783	.813	.831	.839	.839			
	KIAS	302	302	303	303	297	287	274			
	FF/ENG	3448	3464	3501	3503	3460	3406	3378			
220	%N1	73.1	74.2	75.8	77.6	79.3	80.6	82.5	84.7		
	MACH	.701	.721	.750	.785	.815	.832	.840	.838		
	KIAS	293	289	289	291	290	284	274	261		
	FF/ENG	3203	3158	3175	3207	3211	3165	3130	3132		
200	%N1	71.1	72.5	73.6	75.2	77.0	78.8	80.4	82.7	84.9	
	MACH	.680	.700	.719	.748	.784	.814	.832	.840	.838	
	KIAS	284	280	277	276	278	277	271	262	249	
	FF/ENG	2958	2915	2872	2886	2917	2918	2888	2878	2879	
180	%N1	68.6	70.2	71.7	72.8	74.4	76.2	78.4	80.4	82.7	84.8
	MACH	.648	.675	.697	.715	.744	.780	.812	.831	.839	.839
	KIAS	270	270	267	263	263	264	264	259	250	238
	FF/ENG	2673	2665	2631	2592	2599	2622	2636	2634	2624	2609
160	%N1	65.8	67.4	69.1	70.7	71.9	73.3	75.5	78.1	80.2	82.5
	MACH	.612	.639	.667	.691	.710	.735	.772	.806	.828	.838
	KIAS	254	254	255	253	250	248	249	250	246	238
	FF/ENG	2392	2386	2375	2356	2321	2308	2335	2372	2379	2356

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitude**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
282	261	242	226	213	200	191	182	174	167	160
559	519	482	451	424	400	382	366	351	337	325
837	777	723	677	637	600	574	550	528	508	489
1115	1035	964	902	849	800	766	734	705	678	653
1395	1295	1206	1129	1061	1000	957	918	881	848	817
1675	1555	1447	1354	1273	1200	1149	1101	1057	1017	980
1956	1815	1689	1581	1486	1400	1340	1285	1234	1187	1144
2237	2075	1931	1807	1698	1600	1532	1469	1410	1356	1307
2520	2338	2174	2034	1911	1800	1723	1652	1586	1525	1470
2803	2599	2417	2260	2124	2000	1915	1835	1762	1695	1633

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	3.8	0:38	3.3	0:37	2.8	0:35	2.5	0:35	2.2	0:34
400	7.9	1:11	7.2	1:09	6.3	1:04	5.7	1:02	5.3	1:00
600	11.9	1:45	11.0	1:40	9.8	1:33	9.0	1:30	8.4	1:26
800	15.9	2:19	14.8	2:13	13.2	2:02	12.2	1:58	11.5	1:52
1000	19.9	2:53	18.6	2:45	16.6	2:31	15.4	2:26	14.5	2:19
1200	23.8	3:27	22.3	3:17	20.0	3:01	18.6	2:54	17.5	2:45
1400	27.8	4:02	26.0	3:50	23.4	3:31	21.8	3:23	20.5	3:12
1600	31.6	4:37	29.7	4:23	26.8	4:01	24.9	3:51	23.5	3:39
1800	35.5	5:12	33.3	4:56	30.1	4:31	28.1	4:19	26.5	4:06
2000	39.3	5:47	36.9	5:30	33.4	5:01	31.2	4:48	29.4	4:33

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	150	200	250	300	350
5	-0.7	-0.4	0.0	0.4	1.1
10	-1.6	-0.8	0.0	1.1	2.5
15	-2.5	-1.3	0.0	1.7	3.9
20	-3.3	-1.7	0.0	2.3	5.2
25	-4.1	-2.2	0.0	2.9	6.5
30	-4.9	-2.6	0.0	3.6	7.8
35	-5.7	-3.1	0.0	4.2	9.0
40	-6.4	-3.5	0.0	4.8	10.2

Long Range Cruise Enroute Fuel and Time - High Altitude
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	
649	613	580	551	524	500	479	459	441	424	409	
1286	1217	1154	1098	1047	1000	959	921	886	853	823	
1926	1824	1730	1646	1570	1500	1439	1383	1330	1282	1237	
2569	2432	2307	2195	2094	2000	1920	1845	1775	1710	1651	
3215	3043	2886	2745	2617	2500	2400	2306	2219	2139	2065	
3864	3656	3466	3296	3142	3000	2880	2768	2664	2568	2479	
4516	4271	4047	3847	3666	3500	3360	3229	3108	2996	2893	
5170	4888	4630	4400	4192	4000	3840	3691	3552	3424	3306	
5826	5506	5214	4953	4717	4500	4320	4152	3996	3852	3719	
6485	6126	5798	5506	5242	5000	4800	4613	4440	4279	4132	
7146	6748	6384	6061	5768	5500	5280	5074	4883	4706	4545	
7809	7371	6972	6616	6295	6000	5759	5534	5326	5133	4956	
8474	7996	7559	7171	6821	6500	6238	5994	5768	5558	5367	
9144	8624	8149	7728	7348	7000	6717	6454	6209	5983	5776	
9818	9255	8741	8286	7876	7500	7196	6912	6649	6406	6184	
10496	9889	9335	8845	8404	8000	7674	7371	7089	6829	6591	
11179	10526	9932	9406	8933	8500	8153	7829	7528	7251	6997	
11866	11167	10530	9968	9462	9000	8631	8286	7966	7671	7401	
12559	11811	11131	10531	9993	9500	9108	8742	8403	8090	7804	
13256	12459	11735	11096	10523	10000	9585	9198	8839	8508	8206	

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)
500	6.9	1:10	6.7	1:10	6.5	1:10	6.4	1:10	6.4	1:11
1000	14.3	2:17	13.8	2:13	13.5	2:12	13.2	2:12	13.2	2:13
1500	21.6	3:23	21.0	3:17	20.4	3:15	20.1	3:14	20.0	3:15
2000	29.0	4:29	28.2	4:21	27.4	4:17	26.9	4:17	26.8	4:18
2500	36.0	5:37	35.1	5:27	34.2	5:21	33.5	5:19	33.2	5:20
3000	43.1	6:46	42.0	6:33	40.9	6:25	40.0	6:22	39.7	6:22
3500	49.9	7:56	48.6	7:41	47.4	7:30	46.3	7:25	45.8	7:25
4000	56.7	9:06	55.2	8:49	53.8	8:35	52.7	8:29	52.0	8:27
4500	63.2	10:18	61.6	9:59	60.1	9:42	58.7	9:34	57.9	9:31
5000	69.7	11:30	68.0	11:09	66.3	10:50	64.8	10:38	63.9	10:34
5500	76.0	12:44	74.1	12:21	72.3	11:59	70.7	11:45	69.6	11:38
6000	82.3	13:57	80.2	13:32	78.3	13:09	76.5	12:52	75.3	12:42
6500	88.4	15:13	86.1	14:46	84.1	14:21	82.1	14:01	80.7	13:48
7000	94.5	16:28	92.0	15:59	89.8	15:32	87.8	15:10	86.2	14:54
7500	100.4	17:46	97.7	17:14	95.4	16:46	93.2	16:21	91.5	16:02
8000	106.2	19:05	103.4	18:30	100.9	17:59	98.6	17:32	96.8	17:10
8500	112.0	20:26	109.0	19:47	106.3	19:14	103.8	18:45	101.9	18:20
9000	117.7	21:48	114.5	21:05	111.7	20:29	109.0	19:58	106.9	19:30
9500	123.3	23:12	119.9	22:26	116.9	21:46	114.1	21:13	111.8	20:43
10000	129.0	24:37	125.3	23:47	122.0	23:03	119.1	22:28	116.7	21:55

Long Range Cruise Enroute Fuel and Time - High Altitude**Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	150	200	250	300	350
10	-2.3	-1.2	0.0	3.2	13.1
20	-4.4	-2.4	0.0	5.4	18.3
30	-6.5	-3.6	0.0	7.4	23.1
40	-8.6	-4.8	0.0	9.3	27.5
50	-10.8	-5.9	0.0	11.1	31.4
60	-13.0	-7.0	0.0	12.7	35.0
70	-15.2	-8.1	0.0	14.2	38.1
80	-17.5	-9.2	0.0	15.6	40.9
90	-19.8	-10.3	0.0	16.8	43.2
100	-22.1	-11.3	0.0	18.0	45.1
110	-24.4	-12.3	0.0	19.0	46.6
120	-26.8	-13.3	0.0	19.8	47.7
130	-29.2	-14.3	0.0	20.6	48.4

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)										
	360	340	320	300	280	260	240	220	200	180	160
43						120	55	17	1	3	
41					105	50	17	2	1	12	
39				87	43	15	2	1	10	25	
37			119	68	33	11	1	1	9	22	40
35		89	50	24	8	1	1	9	21	36	54
33	64	35	15	4	0	2	9	21	35	50	67
31	22	9	2	0	4	11	21	34	49	64	79
29	4	0	1	5	13	23	35	48	62	76	89
27	0	3	8	16	25	36	48	61	74	86	97
25	5	11	19	28	38	50	61	73	84	94	104

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. Read wind factors for present and new altitudes from table.
2. Determine difference (new altitude wind factor minus present altitude wind factor);
This difference may be negative or positive.
3. Break-even wind at new altitude is present altitude wind plus difference from step 2.

Descent at .84M/310/250

PRESSURE ALTITUDE (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	96	103	110	117	123	128	133	139	145	150
TIME (MINUTES)	20	21	22	23	24	24	25	26	26	27

Holding

Flaps Up

WEIGHT (1000 KG)	%N1	PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	40000
360	%N1	62.0	64.9	69.0	73.3	78.3	83.1	88.2		
	KIAS	264	264	265	269	308	312	310		
	FF/ENG	4660	4620	4570	4590	4840	5020	5300		
340	%N1	60.5	63.4	67.5	71.7	76.7	81.6	86.4		
	KIAS	260	260	260	260	299	302	307		
	FF/ENG	4410	4360	4310	4310	4540	4680	4890		
320	%N1	58.8	61.5	65.7	69.8	74.9	79.6	84.4	91.3	
	KIAS	253	253	253	253	289	293	297	278	
	FF/ENG	4130	4080	4030	4020	4210	4320	4480	4980	
300	%N1	57.2	59.7	63.9	67.9	72.6	77.6	82.3	88.0	
	KIAS	244	244	244	244	259	283	287	278	
	FF/ENG	3860	3810	3760	3740	3800	3990	4130	4430	
280	%N1	55.6	58.0	62.1	66.1	70.7	75.7	80.5	85.6	
	KIAS	238	238	238	238	238	272	276	278	
	FF/ENG	3630	3570	3510	3480	3500	3690	3810	4030	
260	%N1	53.9	56.3	60.1	64.3	68.6	73.7	78.5	83.5	93.7
	KIAS	229	229	229	229	229	262	265	269	247
	FF/ENG	3390	3330	3270	3230	3240	3400	3500	3630	4260
240	%N1	52.2	54.5	58.2	62.3	66.5	71.1	76.2	81.2	88.6
	KIAS	223	223	223	223	223	228	254	258	247
	FF/ENG	3180	3110	3030	2990	2990	3010	3190	3290	3640
220	%N1	50.4	52.7	56.2	60.1	64.3	68.7	73.9	78.9	85.6
	KIAS	217	217	217	217	217	217	242	246	231
	FF/ENG	2970	2890	2800	2760	2740	2740	2890	2980	3530
200	%N1	48.4	50.9	54.4	58.0	62.2	66.3	71.3	76.3	82.8
	KIAS	217	217	217	217	217	217	226	233	231
	FF/ENG	2790	2710	2610	2570	2530	2520	2570	2670	2830
180	%N1	46.6	49.1	52.7	56.2	60.1	64.3	68.7	73.4	79.9
	KIAS	217	217	217	217	217	217	217	220	226
	FF/ENG	2630	2550	2450	2400	2360	2380	2320	2370	2500
160	%N1	45.1	47.4	51.0	54.5	58.2	62.3	66.5	71.0	77.1
	KIAS	217	217	217	217	217	217	217	217	217
	FF/ENG	2560	2470	2370	2300	2250	2220	2170	2160	2230

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

**Holding
Flaps 1**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
360	%N1	64.8	67.6	72.3	76.7
	KIAS	244	244	244	244
	FF/ENG	5150	5130	5110	5150
340	%N1	63.2	66.0	70.3	74.9
	KIAS	240	240	240	240
	FF/ENG	4840	4810	4790	4810
320	%N1	61.5	64.4	68.5	73.1
	KIAS	233	233	233	233
	FF/ENG	4540	4510	4480	4490
300	%N1	59.7	62.6	66.6	71.3
	KIAS	224	224	224	224
	FF/ENG	4250	4220	4190	4190
280	%N1	57.9	60.6	64.7	69.1
	KIAS	218	218	218	218
	FF/ENG	3970	3930	3890	3880
260	%N1	56.1	58.6	62.8	66.9
	KIAS	209	209	209	209
	FF/ENG	3700	3650	3600	3600
240	%N1	54.2	56.6	60.6	64.6
	KIAS	203	203	203	203
	FF/ENG	3430	3370	3310	3300
220	%N1	52.1	54.5	58.2	62.3
	KIAS	197	197	197	197
	FF/ENG	3170	3100	3030	3010
200	%N1	50.1	52.3	55.9	59.8
	KIAS	197	197	197	197
	FF/ENG	2940	2860	2770	2730
180	%N1	47.9	50.3	53.8	57.4
	KIAS	197	197	197	197
	FF/ENG	2740	2650	2550	2510
160	%N1	45.9	48.4	51.8	55.2
	KIAS	197	197	197	197
	FF/ENG	2630	2540	2430	2380

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

Performance Inflight

Advisory Information

Chapter PI

Section 32

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

	REF DIST	LANDING DISTANCE AND ADJUSTMENTS (M)						
		WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD / TAIL WIND	DOWN / UP HILL	ABOVE / BELOW ISA	PER 5 KTS ABOVE VREF30	ONE REV NO REV

Dry Runway

MAX MANUAL	910	+25/0	20	-35/+125	+10/-10	+20/-20	35	20	40
AUTOBRAKE MAX	1215	+25/0	25	-50/+180	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1575	+35/0	40	-75/+255	0/0	+40/-40	90	0	0
AUTOBRAKE 3	1855	+45/-10	45	-90/+315	0/-10	+50/-50	100	0	0
AUTOBRAKE 2	2045	+50/-20	60	-105/+365	+25/-45	+55/-55	80	65	65
AUTOBRAKE 1	2205	+55/-25	70	-120/+420	+65/-70	+60/-60	80	250	305

Good Reported Braking Action

MAX MANUAL	1270	+25/-5	30	-60/+220	+30/-25	+30/-30	50	80	195
AUTOBRAKE MAX	1320	+25/-5	35	-65/+225	+30/-20	+30/-30	60	85	205
AUTOBRAKE 4	1580	+35/0	40	-75/+260	+10/-5	+40/-40	90	5	35
AUTOBRAKE 3	1855	+45/-10	45	-90/+315	+5/-10	+50/-50	100	0	0
AUTOBRAKE 2	2045	+50/-20	60	-105/+365	+25/-45	+55/-55	80	65	65
AUTOBRAKE 1	2205	+55/-25	70	-120/+420	+65/-70	+60/-60	80	250	305

Medium Reported Braking Action

MAX MANUAL	1695	+40/-15	50	-95/+350	+75/-60	+45/-45	60	215	575
AUTOBRAKE MAX	1695	+40/-15	50	-95/+350	+75/-60	+45/-45	65	210	570
AUTOBRAKE 4	1755	+40/-5	50	-100/+360	+60/-35	+50/-50	90	195	565
AUTOBRAKE 3	1955	+45/-10	50	-105/+385	+40/-35	+55/-55	100	85	390
AUTOBRAKE 2	2095	+50/-20	60	-115/+405	+55/-65	+60/-60	80	115	310
AUTOBRAKE 1	2210	+55/-25	70	-125/+435	+90/-70	+60/-65	80	275	415

Poor Reported Braking Action

MAX MANUAL	2145	+50/-25	70	-140/+540	+165/-110	+60/-60	70	445	1380
AUTOBRAKE MAX	2150	+55/-25	70	-140/+540	+170/-115	+60/-60	70	445	1385
AUTOBRAKE 4	2150	+55/-20	70	-140/+540	+170/-110	+60/-60	75	445	1385
AUTOBRAKE 3	2220	+55/-20	70	-140/+545	+140/-90	+65/-65	100	395	1340
AUTOBRAKE 2	2320	+55/-25	75	-145/+560	+145/-115	+65/-65	80	345	1265
AUTOBRAKE 1	2380	+60/-30	80	-150/+570	+170/-120	+70/-70	80	440	1220

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 65 m.

For autobrake and manual speedbrakes, increase reference landing distance by 50 m.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Normal Configuration Landing Distance****Flaps 25**

LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF25	ONE REV NO REV

Dry Runway

MAX MANUAL	940	+20/-5	20	-35/+130	+10/-10	+20/-20	35	20	45
AUTOBRAKE MAX	1285	+20/-5	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 4	1670	+30/-10	45	-80/+265	0/0	+45/-45	95	0	0
AUTOBRAKE 3	1975	+35/-15	55	-95/+330	0/-15	+55/-55	100	5	5
AUTOBRAKE 2	2165	+40/-25	70	-110/+375	+30/-50	+60/-60	85	90	90
AUTOBRAKE 1	2330	+50/-30	80	-125/+435	+75/-75	+65/-65	80	295	365

Good Reported Braking Action

MAX MANUAL	1325	+20/-10	35	-65/+225	+30/-30	+35/-35	50	90	215
AUTOBRAKE MAX	1380	+25/-10	35	-65/+230	+30/-20	+35/-35	65	95	225
AUTOBRAKE 4	1680	+30/-10	45	-80/+270	+10/-5	+45/-45	95	5	35
AUTOBRAKE 3	1975	+35/-15	55	-95/+330	+5/-15	+55/-55	100	5	5
AUTOBRAKE 2	2165	+40/-25	70	-110/+375	+30/-50	+60/-60	85	90	90
AUTOBRAKE 1	2330	+50/-30	80	-125/+435	+75/-75	+65/-65	80	295	365

Medium Reported Braking Action

MAX MANUAL	1775	+35/-20	55	-100/+360	+75/-60	+50/-50	60	235	635
AUTOBRAKE MAX	1775	+35/-20	55	-100/+360	+80/-60	+50/-50	65	235	630
AUTOBRAKE 4	1855	+35/-10	55	-100/+370	+55/-35	+50/-50	95	195	610
AUTOBRAKE 3	2075	+35/-20	60	-110/+395	+40/-40	+60/-60	100	90	410
AUTOBRAKE 2	2220	+40/-25	70	-120/+420	+65/-70	+65/-65	85	145	350
AUTOBRAKE 1	2340	+50/-30	80	-125/+445	+95/-80	+65/-65	80	315	480

Poor Reported Braking Action

MAX MANUAL	2250	+45/-30	80	-145/+550	+170/-115	+65/-65	70	485	1535
AUTOBRAKE MAX	2255	+50/-30	80	-145/+550	+175/-120	+65/-65	70	490	1535
AUTOBRAKE 4	2255	+50/-30	80	-145/+550	+175/-110	+65/-65	80	490	1535
AUTOBRAKE 3	2350	+45/-25	80	-145/+560	+145/-95	+70/-70	100	415	1470
AUTOBRAKE 2	2445	+50/-35	85	-150/+575	+155/-120	+70/-70	80	390	1395
AUTOBRAKE 1	2510	+55/-35	90	-155/+585	+175/-125	+75/-75	80	490	1360

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 65 m.

For autobrake and manual speedbrakes, increase reference landing distance by 55 m.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Normal Configuration Landing Distance****Flaps 20**

	REF DIST	LANDING DISTANCE AND ADJUSTMENTS (M)						
		WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LANDING WT	PER 5000 KG ABOVE/BELOW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN / UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF20	ONE REV NO REV

Dry Runway

MAX MANUAL	1005	+25/-10	25	-40/+135	+10/-10	+20/-20	35	25	55
AUTOBRAKE MAX	1390	+20/-15	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 4	1820	+30/-20	50	-80/+280	0/0	+50/-50	100	0	0
AUTOBRAKE 3	2160	+40/-30	65	-100/+345	+5/-15	+60/-60	105	5	5
AUTOBRAKE 2	2370	+45/-40	75	-115/+395	+35/-55	+70/-70	90	105	105
AUTOBRAKE 1	2560	+55/-45	90	-135/+455	+80/-85	+75/-75	90	345	420

Good Reported Braking Action

MAX MANUAL	1430	+25/-20	40	-65/+230	+35/-30	+35/-35	50	105	250
AUTOBRAKE MAX	1485	+25/-20	40	-70/+240	+30/-20	+40/-40	65	105	265
AUTOBRAKE 4	1825	+30/-20	50	-85/+285	+10/0	+50/-50	100	10	40
AUTOBRAKE 3	2160	+40/-30	65	-100/+345	+5/-15	+60/-60	105	5	5
AUTOBRAKE 2	2370	+45/-40	75	-115/+395	+35/-55	+70/-70	90	105	105
AUTOBRAKE 1	2560	+55/-45	90	-135/+455	+80/-85	+75/-75	90	345	420

Medium Reported Braking Action

MAX MANUAL	1925	+35/-30	65	-105/+375	+85/-65	+55/-55	65	275	750
AUTOBRAKE MAX	1925	+40/-30	65	-105/+375	+85/-65	+55/-55	70	270	745
AUTOBRAKE 4	2010	+40/-25	65	-105/+385	+60/-40	+55/-60	100	225	710
AUTOBRAKE 3	2260	+40/-35	70	-115/+415	+45/-45	+65/-65	105	100	490
AUTOBRAKE 2	2425	+50/-40	80	-125/+440	+65/-75	+70/-70	90	160	410
AUTOBRAKE 1	2565	+55/-45	95	-135/+470	+100/-90	+75/-75	90	370	550

Poor Reported Braking Action

MAX MANUAL	2450	+55/-45	90	-150/+570	+185/-125	+70/-70	75	565	1815
AUTOBRAKE MAX	2455	+55/-45	90	-150/+570	+190/-130	+70/-70	75	565	1815
AUTOBRAKE 4	2455	+55/-40	90	-150/+570	+190/-120	+70/-70	80	565	1815
AUTOBRAKE 3	2550	+55/-40	90	-155/+580	+160/-100	+75/-75	105	480	1740
AUTOBRAKE 2	2665	+55/-45	95	-160/+595	+165/-125	+80/-80	90	445	1650
AUTOBRAKE 1	2745	+60/-50	100	-165/+610	+190/-140	+80/-80	85	565	1600

Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 70 m.

For autobrake and manual speedbrakes, increase reference landing distance by 55 m.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ANTISKID - Flaps 25****VREF25**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10° C	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1775	+35/-20	55	-100/+360	+75/-60	+50/-50	60	235	635
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Good Reported Braking Action

MAX MANUAL	1775	+35/-20	55	-100/+360	+75/-60	+50/-50	60	235	635
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Medium Reported Braking Action

MAX MANUAL	2250	+45/-30	80	-145/+550	+170/-115	+65/-65	70	485	1535
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Poor Reported Braking Action

MAX MANUAL	3005	+70/-50	115	-235/+1010	+900/-260	+90/-90	80	1335	5000
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ANTISKID - Flaps 30****VREF30**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1695	+40/-15	50	-95/+350	+75/-60	+45/-45	60	215	575
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Good Reported Braking Action

MAX MANUAL	1695	+40/-15	50	-95/+350	+75/-60	+45/-45	60	215	575
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Medium Reported Braking Action

MAX MANUAL	2145	+50/-25	70	-140/+540	+165/-110	+60/-60	70	445	1380
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Poor Reported Braking Action

MAX MANUAL	2865	+75/-40	105	-230/+990	+865/-250	+85/-85	80	1240	5000
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ENG SHUTDOWN L, R - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10°C	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1015	+30/-10	25	-40/+135	+15/-10	+25/-25	40	0	30
AUTOBRAKE MAX	1390	+20/-15	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2470	+45/-35	75	-120/+405	+5/-25	+75/-75	125	0	0

Good Reported Braking Action

MAX MANUAL	1495	+25/-20	40	-70/+245	+40/-35	+40/-40	60	0	140
AUTOBRAKE MAX	1560	+25/-20	45	-70/+250	+40/-35	+40/-40	65	0	150
AUTOBRAKE 2	2470	+45/-35	75	-120/+405	+5/-25	+75/-75	125	0	0

Medium Reported Braking Action

MAX MANUAL	2115	+40/-35	65	-115/+410	+110/-85	+60/-60	75	0	430
AUTOBRAKE MAX	2115	+40/-35	70	-115/+410	+115/-80	+60/-60	85	0	430
AUTOBRAKE 3	2315	+45/-30	70	-120/+435	+70/-50	+70/-70	115	0	320

Poor Reported Braking Action

MAX MANUAL	2835	+60/-50	100	-175/+655	+275/-180	+85/-85	95	0	1060
AUTOBRAKE MAX	2835	+60/-50	100	-175/+655	+275/-180	+85/-85	95	0	1060
AUTOBRAKE 3	2865	+60/-50	100	-175/+660	+265/-165	+85/-85	105	0	1070

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ENG SHUTDOWN L, R - Flaps 30****VREF30**

LANDING DISTANCES AND ADJUSTMENTS (M)									
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	915	+25/0	20	-35/+125	+10/-10	+20/-20	35	0	20
AUTOBRAKE MAX	1215	+25/0	25	-50/+180	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2100	+50/-10	55	-110/+370	+10/-20	+60/-60	115	0	0

Good Reported Braking Action

MAX MANUAL	1315	+25/-5	30	-65/+230	+35/-30	+35/-35	55	0	105
AUTOBRAKE MAX	1375	+30/-5	35	-65/+235	+35/-30	+35/-35	60	0	115
AUTOBRAKE 2	2100	+50/-10	55	-110/+370	+10/-20	+60/-60	115	0	0

Medium Reported Braking Action

MAX MANUAL	1830	+40/-15	50	-105/+380	+95/-75	+50/-50	70	0	325
AUTOBRAKE MAX	1835	+45/-10	55	-105/+380	+95/-70	+50/-50	80	0	320
AUTOBRAKE 3	1995	+45/-5	55	-110/+400	+65/-50	+55/-55	100	0	250

Poor Reported Braking Action

MAX MANUAL	2430	+60/25	80	-160/+610	+235/-150	+70/-70	85	0	790
AUTOBRAKE MAX	2435	+60/25	80	-160/+610	+240/-155	+70/-70	85	0	790
AUTOBRAKE 3	2465	+60/-20	80	-160/+615	+230/-145	+75/-75	90	0	800

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAP / SLAT CONTROL - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1005	+25/-10	25	-40/+135	+10/-10	+20/-20	35	25	55
AUTOBRAKE MAX	1390	+20/-15	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2375	+45/-40	75	-115/+395	+35/-55	+70/-70	90	105	105

Good Reported Braking Action

MAX MANUAL	1430	+25/-20	40	-65/+230	+35/-30	+35/-35	50	105	250
AUTOBRAKE MAX	1485	+25/-20	40	-70/+240	+30/-20	+40/-40	65	105	265
AUTOBRAKE 2	2375	+45/-40	75	-115/+395	+35/-55	+70/-70	90	105	105

Medium Reported Braking Action

MAX MANUAL	1925	+35/-30	60	-105/+375	+85/-65	+55/-55	65	275	750
AUTOBRAKE MAX	1925	+35/-30	65	-105/+375	+85/-65	+55/-55	70	270	745
AUTOBRAKE 3	2260	+40/-35	70	-115/+415	+45/-45	+65/-65	105	100	490

Poor Reported Braking Action

MAX MANUAL	2450	+55/-45	90	-150/+570	+185/-125	+70/-70	75	565	1815
AUTOBRAKE MAX	2455	+55/-45	90	-150/+570	+190/-130	+70/-70	75	565	1815
AUTOBRAKE 3	2550	+55/-40	90	-155/+580	+160/-100	+75/-75	105	480	1740

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS DRIVE - (Flaps ≤ 5)****VREF30+40**

LANDING DISTANCES AND ADJUSTMENTS (M)									
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1155	+45/-5	25	-40/+140	+15/-10	+25/-25	35	35	75
AUTOBRAKE MAX	1760	+30/0	45	-65/+220	0/0	+50/-50	80	0	0
AUTOBRAKE 2	2950	+65/-35	100	-130/+440	+60/-70	+85/-85	100	295	295

Good Reported Braking Action

MAX MANUAL	1675	+30/-10	45	-70/+250	+40/-35	+45/-45	50	145	360
AUTOBRAKE MAX	1830	+30/0	45	-75/+260	+15/-10	+50/-50	80	75	300
AUTOBRAKE 2	2950	+65/-35	100	-130/+440	+60/-70	+85/-85	100	295	295

Medium Reported Braking Action

MAX MANUAL	2280	+45/-20	75	-110/+400	+90/-75	+65/-65	65	385	1120
AUTOBRAKE MAX	2280	+50/-20	75	-110/+400	+95/-70	+65/-65	75	380	1110
AUTOBRAKE 3	2830	+55/-25	85	-130/+460	+65/-60	+85/-85	110	170	675

Poor Reported Braking Action

MAX MANUAL	2915	+65/-35	105	-160/+605	+200/-140	+85/-85	80	790	2805
AUTOBRAKE MAX	2915	+65/-35	110	-160/+605	+205/-140	+85/-85	80	790	2800
AUTOBRAKE 3	3120	+70/-35	110	-170/+625	+180/-120	+95/-95	105	615	2620

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS DRIVE - (5 < Flaps < 20)****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1050	+35/-5	20	-40/+135	+15/-10	+25/-25	35	30	65
AUTOBRAKE MAX	1470	+25/0	35	-60/+200	0/0	+40/-40	70	0	0
AUTOBRAKE 2	2520	+55/-25	80	-120/+405	+35/-50	+75/-75	100	125	125

Good Reported Braking Action

MAX MANUAL	1500	+30/-10	40	-70/+235	+35/-30	+40/-40	55	120	290
AUTOBRAKE MAX	1555	+30/0	40	-70/+240	+30/-15	+40/-40	70	115	295
AUTOBRAKE 2	2520	+55/-25	80	-120/+405	+35/-50	+75/-75	100	125	125

Medium Reported Braking Action

MAX MANUAL	2030	+45/-20	65	-105/+380	+85/-70	+55/-55	70	315	890
AUTOBRAKE MAX	2030	+45/-15	65	-105/+380	+90/-70	+55/-55	70	310	885
AUTOBRAKE 3	2395	+50/-15	65	-120/+425	+45/-45	+70/-70	110	110	590

Poor Reported Braking Action

MAX MANUAL	2590	+60/-30	90	-155/+585	+190/-130	+75/-75	80	650	2190
AUTOBRAKE MAX	2590	+60/-30	90	-155/+585	+195/-135	+75/-75	80	650	2195
AUTOBRAKE 3	2695	+65/-25	90	-160/+595	+175/-105	+80/-80	105	550	2095

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS DRIVE - (Flaps ≥ 20)****VREF20**

LANDING DISTANCES AND ADJUSTMENTS (M)									
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1005	+25/-10	25	-40/+135	+10/-10	+20/-20	35	25	55
AUTOBRAKE MAX	1390	+20/-15	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2375	+45/-40	75	-115/+395	+35/-55	+70/-70	90	105	105

Good Reported Braking Action

MAX MANUAL	1430	+25/-20	40	-65/+230	+35/-30	+35/-35	50	105	250
AUTOBRAKE MAX	1485	+25/-20	40	-70/+240	+30/-20	+40/-40	65	105	265
AUTOBRAKE 2	2375	+45/-40	75	-115/+395	+35/-55	+70/-70	90	105	105

Medium Reported Braking Action

MAX MANUAL	1925	+35/-30	60	-105/+375	+85/-65	+55/-55	65	275	750
AUTOBRAKE MAX	1925	+35/-30	65	-105/+375	+85/-65	+55/-55	70	270	745
AUTOBRAKE 3	2260	+40/-35	70	-115/+415	+45/-45	+65/-65	105	100	490

Poor Reported Braking Action

MAX MANUAL	2450	+55/-45	90	-150/+570	+185/-125	+70/-70	75	565	1815
AUTOBRAKE MAX	2455	+55/-45	90	-150/+570	+190/-130	+70/-70	75	565	1815
AUTOBRAKE 3	2550	+55/-40	90	-155/+580	+160/-100	+75/-75	105	480	1740

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS PRIMARY FAIL - Flaps 20****VREF20**

LANDING DISTANCES AND ADJUSTMENTS (M)									
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1150	+25/-10	25	-45/+150	+15/-15	+25/-25	45	30	75
AUTOBRAKE MAX	1390	+20/-15	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2435	+45/-40	75	-120/+400	+20/-35	+70/-70	115	40	40

Good Reported Braking Action

MAX MANUAL	1600	+25/-20	45	-70/+250	+40/-35	+40/-40	65	130	320
AUTOBRAKE MAX	1600	+25/-20	45	-70/+250	+40/-35	+40/-40	70	125	310
AUTOBRAKE 2	2435	+45/-40	75	-120/+400	+20/-35	+70/-70	115	40	40

Medium Reported Braking Action

MAX MANUAL	2115	+40/-35	70	-110/+395	+95/-75	+60/-60	80	325	925
AUTOBRAKE MAX	2115	+40/-35	70	-110/+395	+100/-80	+60/-60	80	325	915
AUTOBRAKE 3	2305	+40/-30	70	-120/+420	+55/-40	+65/-65	115	145	730

Poor Reported Braking Action

MAX MANUAL	2650	+55/-45	95	-160/+595	+205/-140	+75/-75	90	655	2195
AUTOBRAKE MAX	2650	+60/-45	100	-160/+595	+210/-145	+75/-75	90	655	2190
AUTOBRAKE 3	2690	+55/-45	95	-160/+600	+195/-125	+80/-80	105	610	2150

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLIGHT CONTROL MODE - Flaps 20****VREF20**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1160	+25/-10	25	-45/+150	+15/-15	+25/-25	50	35	75
AUTOBRAKE MAX	1390	+20/-15	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2455	+45/-40	75	-120/+405	+15/-35	+70/-70	120	25	25

Good Reported Braking Action

MAX MANUAL	1625	+25/-20	45	-75/+255	+45/-35	+40/-40	65	135	340
AUTOBRAKE MAX	1625	+25/-20	45	-75/+250	+45/-35	+40/-40	70	130	330
AUTOBRAKE 2	2455	+45/-40	75	-120/+405	+15/-35	+70/-70	120	25	25

Medium Reported Braking Action

MAX MANUAL	2155	+40/-35	70	-110/+400	+100/-80	+60/-60	80	350	995
AUTOBRAKE MAX	2155	+40/-35	70	-110/+400	+105/-85	+60/-60	85	345	985
AUTOBRAKE 3	2315	+40/-30	70	-120/+420	+65/-40	+65/-70	120	180	820

Poor Reported Braking Action

MAX MANUAL	2710	+60/-50	100	-160/+605	+210/-145	+80/-80	95	695	2385
AUTOBRAKE MAX	2710	+60/-50	100	-160/+605	+220/-150	+80/-80	90	695	2380
AUTOBRAKE 3	2735	+60/-45	100	-160/+605	+205/-130	+80/-80	105	665	2350

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS C - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1150	+25/-10	25	-45/+150	+15/-15	+25/-25	45	30	75
AUTOBRAKE MAX	1390	+20/-15	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2435	+45/-40	75	-120/+400	+20/-35	+70/-70	115	40	40

Good Reported Braking Action

MAX MANUAL	1600	+25/-20	45	-70/+250	+40/-35	+40/-40	65	130	320
AUTOBRAKE MAX	1600	+25/-20	45	-70/+250	+40/-35	+40/-40	70	125	310
AUTOBRAKE 2	2435	+45/-40	75	-120/+400	+20/-35	+70/-70	115	40	40

Medium Reported Braking Action

MAX MANUAL	2115	+40/-35	70	-110/+395	+95/-75	+60/-60	80	325	925
AUTOBRAKE MAX	2115	+40/-35	70	-110/+395	+100/-80	+60/-60	80	325	915
AUTOBRAKE 3	2305	+40/-30	70	-120/+420	+55/-40	+65/-65	115	145	730

Poor Reported Braking Action

MAX MANUAL	2650	+55/-45	95	-160/+595	+205/-140	+75/-75	90	655	2195
AUTOBRAKE MAX	2650	+60/-45	100	-160/+595	+210/-145	+75/-75	90	655	2190
AUTOBRAKE 3	2690	+55/-45	95	-160/+600	+195/-125	+80/-80	105	610	2150

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance**

HYD PRESS SYS L - Flaps 25

VREF25

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1015	+20/-5	25	-40/+140	+15/-15	+25/-25	45	0	30
AUTOBRAKE MAX	1285	+20/-5	30	-55/+185	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2260	+40/-15	65	-115/+385	0/0	+65/-65	135	0	0

Good Reported Braking Action

MAX MANUAL	1500	+25/-10	40	-75/+255	+45/-40	+40/-40	65	0	155
AUTOBRAKE MAX	1530	+25/-10	45	-75/+255	+40/-35	+40/-40	70	0	160
AUTOBRAKE 2	2260	+40/-15	65	-115/+385	0/0	+65/-65	135	0	0

Medium Reported Braking Action

MAX MANUAL	2140	+40/-20	70	-120/+435	+125/-95	+60/-60	85	0	485
AUTOBRAKE MAX	2140	+40/-20	70	-120/+435	+130/-100	+60/-60	85	0	485
AUTOBRAKE 3	2200	+40/-15	70	-125/+445	+110/-60	+65/-65	115	0	475

Poor Reported Braking Action

MAX MANUAL	2925	+60/-35	105	-190/+735	+345/-205	+90/-90	100	0	1270
AUTOBRAKE MAX	2935	+60/-35	105	-190/+735	+350/-210	+90/-90	100	0	1275
AUTOBRAKE 3	2935	+60/-35	105	-190/+735	+350/-205	+90/-90	105	0	1275

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS L - Flaps 30****VREF30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	975	+25/0	20	-40/+135	+15/-15	+20/-20	45	0	30
AUTOBRAKE MAX	1215	+25/0	25	-50/+180	0/0	+30/-30	65	0	0
AUTOBRAKE 2	2115	+50/0	55	-110/+370	0/0	+60/-60	130	0	0

Good Reported Braking Action

MAX MANUAL	1440	+30/-5	35	-70/+250	+45/-40	+35/-35	65	0	140
AUTOBRAKE MAX	1460	+30/-5	35	-70/+250	+40/-35	+40/-40	70	0	145
AUTOBRAKE 2	2115	+50/0	55	-110/+370	0/0	+60/-60	130	0	0

Medium Reported Braking Action

MAX MANUAL	2050	+45/-15	60	-120/+425	+125/-95	+55/-60	85	0	445
AUTOBRAKE MAX	2050	+45/-15	60	-120/+425	+125/-95	+60/-60	85	0	445
AUTOBRAKE 3	2085	+50/-5	60	-120/+430	+115/-65	+60/-60	105	0	450

Poor Reported Braking Action

MAX MANUAL	2795	+65/-25	95	-185/+720	+335/-200	+85/-85	100	0	1170
AUTOBRAKE MAX	2805	+65/-25	95	-185/+720	+340/-205	+85/-85	100	0	1175
AUTOBRAKE 3	2805	+65/-25	95	-185/+720	+340/-200	+85/-85	100	0	1175

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS L+C - Flaps 20****VREF30+20**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1315	+30/0	30	-50/+165	+20/-20	+30/-30	60	0	55
AUTOBRAKE MAX	1470	+25/0	35	-60/+200	0/0	+40/-40	70	0	0
AUTOBRAKE 2	2655	+55/0	70	-125/+420	0/0	+80/-80	145	0	0

Good Reported Braking Action

MAX MANUAL	1930	+35/-5	50	-85/+295	+65/-55	+50/-50	85	0	255
AUTOBRAKE MAX	1930	+35/-5	50	-85/+290	+70/-55	+50/-50	90	0	240
AUTOBRAKE 2	2655	+55/0	70	-125/+420	0/0	+80/-80	145	0	0

Medium Reported Braking Action

MAX MANUAL	2715	+60/-15	85	-140/+495	+170/-130	+80/-80	110	0	760
AUTOBRAKE MAX	2715	+60/-15	85	-140/+495	+180/-135	+80/-80	110	0	750
AUTOBRAKE 3	2715	+60/-10	85	-140/+495	+175/-115	+80/-80	115	0	755

Poor Reported Braking Action

MAX MANUAL	3645	+85/-35	130	-220/+810	+435/-260	+110/-110	125	0	1895
AUTOBRAKE MAX	3645	+85/-35	130	-220/+810	+445/-270	+110/-110	125	0	1895
AUTOBRAKE 3	3645	+85/-35	130	-220/+810	+445/-270	+110/-110	125	0	1895

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS L+R - Flaps 20****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 1% PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1415	+30/0	35	-60/+195	+35/-30	+35/-35	70	0	0
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Good Reported Braking Action

MAX MANUAL	2330	+45/0	60	-110/+385	+125/-100	+70/-70	110	0	0
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Medium Reported Braking Action

MAX MANUAL	3730	+70/-10	110	-205/+725	+435/-280	+115/-115	150	0	0
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Poor Reported Braking Action

MAX MANUAL	6005	+100/-20	185	-395/+1490	+2470/-760	+195/-195	185	0	0
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS R - Flaps 25****VREF25**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1115	+15/-5	25	-45/+160	+20/-20	+25/-25	50	0	50
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Good Reported Braking Action

MAX MANUAL	1645	+25/-15	45	-85/+290	+60/-50	+45/-45	70	0	210
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Medium Reported Braking Action

MAX MANUAL	2305	+45/-25	75	-135/+495	+160/-115	+65/-65	90	0	610
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Poor Reported Braking Action

MAX MANUAL	3095	+60/-40	115	-210/+825	+450/-240	+95/-95	100	0	1530
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS R - Flaps 30****VREF30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10°C	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1065	+20/0	25	-45/+155	+20/-15	+25/-25	45	0	45
AUTOBRAKE MAX							Autobrake inoperative		
AUTOBRAKE 2							Autobrake inoperative		

Good Reported Braking Action

MAX MANUAL	1555	+30/-5	40	-80/+285	+55/-45	+40/-40	65	0	185
AUTOBRAKE MAX							Autobrake inoperative		
AUTOBRAKE 2							Autobrake inoperative		

Medium Reported Braking Action

MAX MANUAL	2165	+50/-15	65	-130/+480	+150/-110	+60/-60	85	0	530
AUTOBRAKE MAX							Autobrake inoperative		
AUTOBRAKE 3							Autobrake inoperative		

Poor Reported Braking Action

MAX MANUAL	2890	+65/-30	100	-205/+800	+420/-225	+85/-85	95	0	1320
AUTOBRAKE MAX							Autobrake inoperative		
AUTOBRAKE 3							Autobrake inoperative		

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS R+C - Flaps 20****VREF30+20**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1610	+30/0	40	-65/+225	+40/-35	+40/-40	75	0	130
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Good Reported Braking Action

MAX MANUAL	2345	+50/-10	70	-115/+390	+110/-90	+65/-65	100	0	480
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Medium Reported Braking Action

MAX MANUAL	3210	+70/-25	110	-180/+645	+275/-190	+95/-95	120	0	1280
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Poor Reported Braking Action

MAX MANUAL	4200	+100/-45	160	-275/+1055	+810/-370	+130/-130	135	0	3045
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****PITCH UP AUTHORITY - (Flaps ≤ 15)****VREF30+40**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1190	+40/-5	25	-45/+145	+15/-15	+30/-30	35	35	80
AUTOBRAKE MAX	1760	+30/0	45	-65/+220	0/0	+50/-50	80	0	0
AUTOBRAKE 2	2875	+60/-35	95	-130/+430	+70/-75	+85/-85	85	325	345

Good Reported Braking Action

MAX MANUAL	1705	+30/-10	45	-75/+250	+40/-35	+45/-45	55	145	355
AUTOBRAKE MAX	1845	+30/0	50	-75/+265	+20/-15	+50/-50	80	90	310
AUTOBRAKE 2	2875	+60/-35	95	-130/+430	+70/-75	+85/-85	85	325	345

Medium Reported Braking Action

MAX MANUAL	2280	+45/-20	75	-110/+400	+90/-75	+65/-65	65	360	1010
AUTOBRAKE MAX	2290	+50/-20	75	-110/+400	+90/-70	+65/-65	75	360	1010
AUTOBRAKE 3	2800	+55/-30	85	-130/+455	+70/-75	+80/-80	90	205	640

Poor Reported Braking Action

MAX MANUAL	2870	+65/-35	105	-160/+600	+200/-140	+85/-85	75	710	2350
AUTOBRAKE MAX	2875	+65/-35	105	-160/+600	+200/-140	+85/-85	75	710	2350
AUTOBRAKE 3	3090	+70/-35	105	-165/+625	+175/-135	+90/-90	90	575	2200

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****PITCH UP AUTHORITY - (Flaps ≥ 20)****VREF30+20**

LANDING DISTANCES AND ADJUSTMENTS (M)									
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	1060	+30/-5	25	-40/+135	+15/-10	+25/-25	35	25	60
AUTOBRAKE MAX	1470	+25/0	35	-60/+200	0/0	+40/-40	70	0	0
AUTOBRAKE 2	2480	+55/-25	75	-120/+400	+45/-60	+70/-70	85	160	160

Good Reported Braking Action

MAX MANUAL	1500	+30/-10	40	-70/+240	+35/-30	+40/-40	55	110	270
AUTOBRAKE MAX	1565	+30/0	40	-70/+245	+30/-15	+40/-40	70	110	280
AUTOBRAKE 2	2480	+55/-25	75	-120/+400	+45/-60	+70/-70	85	160	160

Medium Reported Braking Action

MAX MANUAL	2010	+45/-20	60	-105/+380	+85/-70	+55/-55	65	285	785
AUTOBRAKE MAX	2010	+45/-15	60	-105/+380	+90/-65	+55/-55	70	285	780
AUTOBRAKE 3	2385	+50/-20	70	-120/+425	+55/-55	+70/-70	100	120	500

Poor Reported Braking Action

MAX MANUAL	2535	+60/-30	90	-150/+575	+185/-130	+75/-75	75	580	1855
AUTOBRAKE MAX	2540	+60/-30	90	-150/+575	+190/-130	+75/-75	75	580	1855
AUTOBRAKE 3	2675	+60/-30	90	-155/+590	+160/-110	+80/-80	100	475	1760

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****PRIMARY FLIGHT COMPUTERS - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1160	+25/-10	25	-45/+150	+15/-15	+25/-25	50	35	75
AUTOBRAKE MAX	1390	+20/-15	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2455	+45/-40	75	-120/+405	+15/-35	+70/-70	120	25	25

Good Reported Braking Action

MAX MANUAL	1625	+25/-20	45	-75/+255	+45/-35	+40/-40	65	135	340
AUTOBRAKE MAX	1625	+25/-20	45	-75/+250	+45/-35	+40/-40	70	130	330
AUTOBRAKE 2	2455	+45/-40	75	-120/+405	+15/-35	+70/-70	120	25	25

Medium Reported Braking Action

MAX MANUAL	2155	+40/-35	70	-110/+400	+100/-80	+60/-60	80	350	995
AUTOBRAKE MAX	2155	+40/-35	70	-110/+400	+105/-85	+60/-60	85	345	985
AUTOBRAKE 3	2315	+40/-30	70	-120/+420	+65/-40	+65/-70	120	180	820

Poor Reported Braking Action

MAX MANUAL	2710	+60/-50	100	-160/+605	+210/-145	+80/-80	95	695	2385
AUTOBRAKE MAX	2710	+60/-50	100	-160/+605	+220/-150	+80/-80	90	695	2380
AUTOBRAKE 3	2735	+60/-45	100	-160/+605	+205/-130	+80/-80	105	665	2350

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****SLATS DRIVE - Flaps 20****VREF30+30**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1135	+35/-5	25	-40/+145	+15/-15	+25/-25	40	30	75
AUTOBRAKE MAX	1610	+30/0	40	-65/+210	0/0	+45/-45	75	0	0
AUTOBRAKE 2	2675	+55/-30	85	-125/+415	+60/-70	+80/-80	85	230	240

Good Reported Braking Action

MAX MANUAL	1615	+30/-10	45	-70/+245	+40/-35	+40/-40	55	125	310
AUTOBRAKE MAX	1710	+30/0	45	-75/+255	+25/-15	+45/-45	75	110	305
AUTOBRAKE 2	2675	+55/-30	85	-125/+415	+60/-70	+80/-80	85	230	240

Medium Reported Braking Action

MAX MANUAL	2160	+45/-20	70	-110/+390	+90/-75	+60/-60	65	320	875
AUTOBRAKE MAX	2165	+45/-20	70	-110/+395	+90/-70	+60/-60	75	320	870
AUTOBRAKE 3	2600	+55/-25	75	-125/+440	+65/-70	+75/-75	90	160	555

Poor Reported Braking Action

MAX MANUAL	2715	+65/-35	95	-155/+590	+195/-135	+80/-80	75	635	2020
AUTOBRAKE MAX	2720	+65/-35	95	-155/+590	+200/-135	+80/-80	75	635	2025
AUTOBRAKE 3	2895	+65/-35	100	-165/+610	+170/-130	+85/-85	90	510	1905

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****STABILIZER - Flaps 20****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10°C	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	220000 KG LDG WT	PER 5000 KG ABV/BLW 220000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1060	+30/-5	25	-40/+135	+15/-10	+25/-25	35	25	60
AUTOBRAKE MAX	1470	+25/0	35	-60/+200	0/0	+40/-40	70	0	0
AUTOBRAKE 2	2480	+55/-25	75	-120/+400	+45/-60	+70/-70	85	160	160

Good Reported Braking Action

MAX MANUAL	1500	+30/-10	40	-70/+240	+35/-30	+40/-40	55	110	270
AUTOBRAKE MAX	1565	+30/0	40	-70/+245	+30/-15	+40/-40	70	110	280
AUTOBRAKE 2	2480	+55/-25	75	-120/+400	+45/-60	+70/-70	85	160	160

Medium Reported Braking Action

MAX MANUAL	2010	+45/-20	60	-105/+380	+85/-70	+55/-55	65	285	785
AUTOBRAKE MAX	2010	+45/-15	60	-105/+380	+90/-65	+55/-55	70	285	780
AUTOBRAKE 3	2385	+50/-20	70	-120/+425	+55/-55	+70/-70	100	120	500

Poor Reported Braking Action

MAX MANUAL	2535	+60/-30	90	-150/+575	+185/-130	+75/-75	75	580	1855
AUTOBRAKE MAX	2540	+60/-30	90	-150/+575	+190/-130	+75/-75	75	580	1855
AUTOBRAKE 3	2675	+60/-30	90	-155/+590	+160/-110	+80/-80	100	475	1760

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Landing Climb Limit Weight**

Valid for approach with flaps 20 and landing with flaps 30

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	297.3	279.1				
52	126	306.3	287.0				
50	122	315.2	294.5	269.7			
48	118	323.5	303.4	276.9			
46	115	331.8	312.4	284.1	259.6		
44	111	340.4	321.1	291.5	267.7		
42	108	352.1	329.0	299.1	275.0	251.6	
40	104	359.1	337.3	307.2	281.4	257.0	
38	100	366.2	349.6	316.0	287.8	262.8	233.8
36	97	369.0	356.4	323.2	293.4	269.2	238.4
34	93	369.3	363.2	330.4	299.7	274.4	243.0
32	90	369.5	365.7	338.2	306.4	278.7	247.1
30	86	369.8	365.9	346.1	312.9	282.9	250.9
28	82	370.1	366.0	352.5	318.7	287.3	254.6
26	79	370.3	366.1	352.7	322.6	292.2	258.2
24	75	370.6	366.3	352.8	326.0	297.0	263.1
22	72	370.8	366.4	352.9	327.4	300.3	268.1
20	68	371.1	366.5	352.9	327.5	302.5	272.4
18	64	371.3	366.7	353.0	327.6	304.7	275.2
16	61	371.6	366.8	353.1	327.6	304.7	276.9
14	57	371.8	366.9	353.2	327.7	304.8	278.5
12	54	372.0	367.0	353.3	327.8	304.9	278.6
10	50	372.2	367.2	353.3	327.9	304.9	278.7
8	46	372.3	367.3	353.4	327.9	304.9	278.7
6	43	372.5	367.4	350.4	328.0	304.9	272.8
4	40	372.6	367.4	341.5	313.7	286.7	254.9
2	36	372.7	367.5	341.6	313.8	286.8	254.9
0	32	372.8	367.5	341.6	313.8	286.8	255.0
-40	-40	373.4	367.8	341.6	313.8	286.8	255.0

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

With engine bleed for packs off, increase weight by 1250 kg.

With engine and wing anti-ice on, decrease weight by 2350 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 26950 kg.

ADVISORY INFORMATION**Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 25**

AIRPORT OAT	°C	°F	LANDING CLIMB LIMIT WEIGHT (1000 KG)					
			-2000	0	2000	4000	6000	8000
54	129	302.7	284.5					
52	126	310.0	292.5					
50	122	317.6	300.2	275.6				
48	118	325.1	307.8	282.4				
46	115	332.9	315.3	289.8	267.1			
44	111	340.7	322.9	297.4	273.6			
42	108	351.0	330.3	304.4	280.1	258.9		
40	104	357.8	337.9	311.1	286.7	264.5		
38	100	365.0	348.4	318.5	293.4	269.9		241.1
36	97	367.8	355.1	325.0	299.2	275.1	245.9	
34	93	368.0	361.9	331.6	305.0	279.9	250.6	
32	90	368.3	364.3	338.6	310.6	284.3	254.9	
30	86	368.5	364.5	345.5	315.9	288.7	259.0	
28	82	368.8	364.6	351.2	320.8	293.2	262.9	
26	79	369.1	364.8	351.4	324.4	298.1	266.5	
24	75	369.3	364.9	351.5	327.7	302.6	270.7	
22	72	369.6	365.0	351.6	329.0	305.5	274.7	
20	68	369.8	365.2	351.6	329.1	307.3	278.2	
18	64	370.1	365.3	351.7	329.1	309.0	281.0	
16	61	370.3	365.4	351.8	329.2	309.1	282.8	
14	57	370.5	365.5	351.9	329.3	309.1	284.4	
12	54	370.7	365.7	351.9	329.3	309.2	284.5	
10	50	370.9	365.8	352.0	329.4	309.2	284.5	
8	46	371.1	365.9	352.1	329.5	309.3	284.6	
6	43	371.2	366.0	352.1	329.5	309.3	284.5	
4	40	371.3	366.0	352.2	329.6	309.3	278.4	
2	36	371.4	366.1	352.2	329.6	309.4	278.4	
0	32	371.5	366.1	352.3	329.7	309.4	278.4	
-40	-40	372.1	366.4	352.4	329.8	309.5	278.5	

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

With engine bleed for packs off, increase weight by 1400 kg.

With engine and wing anti-ice on, decrease weight by 2300 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 24500 kg.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Reference Brake Energy (Millions of Foot Pounds)**

WEIGHT (1000 KG)	OAT (°C)	BRAKES ON SPEED (KIAS)																	
		PRESSURE ALTITUDE (1000 FT)																	
		80			100			120			140			160			180		
360	0	23.3	25.7	28.3	33.8	37.7	41.9	46.1	51.6	57.8	59.8	67.3	75.6	74.5	84.0	94.5	89.8	101.1	113.6
	10	23.9	26.4	29.2	34.8	38.8	43.2	47.5	53.2	59.6	61.7	69.4	78.0	76.9	86.6	97.4	92.6	104.1	116.9
	15	24.4	26.9	29.7	35.5	39.5	44.0	48.4	54.2	60.7	62.8	70.6	79.4	78.3	88.1	99.1	94.2	105.9	118.8
	20	24.8	27.4	30.2	36.1	40.2	44.8	49.2	55.2	61.8	63.9	71.9	80.8	79.6	89.6	100.8	95.8	107.6	120.6
	30	25.5	28.1	31.0	37.1	41.3	46.1	50.6	56.7	63.6	65.8	74.0	83.1	81.9	92.2	103.6	98.5	110.6	123.9
	40	25.7	28.4	31.4	37.7	42.0	46.8	51.5	57.8	64.8	67.1	75.5	84.9	83.7	94.2	105.8	100.7	113.0	126.4
340	0	22.2	24.5	27.0	32.3	35.9	39.9	43.9	49.1	55.0	56.9	64.0	71.9	71.0	79.9	90.0	85.6	96.4	108.4
	10	22.9	25.2	27.8	32.3	37.0	41.1	45.2	50.6	56.7	58.7	66.0	74.2	73.2	82.4	92.8	88.3	99.3	111.6
	15	23.3	25.7	28.3	33.9	37.7	41.9	46.1	51.6	57.7	59.8	67.2	75.5	74.5	83.9	94.4	89.8	101.0	113.4
	20	23.7	26.2	28.8	34.5	38.4	42.7	46.9	52.5	58.8	60.8	68.4	76.8	75.8	85.4	96.0	91.3	102.7	115.3
	30	24.3	26.8	29.6	35.4	39.4	43.9	48.2	54.0	60.5	62.6	70.3	79.0	78.0	87.8	98.7	94.0	105.6	118.4
	40	24.6	27.1	30.0	35.9	40.0	44.6	49.0	55.0	61.6	63.8	71.8	80.7	79.7	89.7	100.8	96.0	107.9	120.9
320	0	21.2	23.4	25.7	30.7	34.2	37.9	41.7	46.6	52.2	54.0	60.7	68.1	67.3	75.8	85.3	81.3	91.5	103.0
	10	21.8	24.0	26.5	31.6	35.2	39.1	43.0	48.1	53.8	55.7	62.6	70.3	69.5	78.2	88.0	83.8	94.4	106.1
	15	22.2	24.5	27.0	32.2	35.8	39.8	43.8	49.0	54.8	56.7	63.7	71.5	70.7	79.6	89.5	85.3	96.0	107.9
	20	22.6	24.9	27.5	32.8	36.5	40.5	44.6	49.8	55.7	57.7	64.8	72.8	72.0	81.0	91.1	86.8	97.6	109.7
	30	23.2	25.6	28.2	33.7	37.5	41.6	45.8	51.2	57.3	59.4	66.7	74.9	74.0	83.3	93.7	89.3	100.4	112.7
	40	23.4	25.8	28.5	34.2	38.0	42.3	46.6	52.2	58.4	60.5	68.0	76.5	75.6	85.1	95.7	91.2	102.6	115.1
300	0	20.2	22.2	24.5	29.2	32.4	36.0	39.5	44.1	49.3	51.1	57.3	64.3	63.7	71.6	80.6	76.8	86.6	97.5
	10	20.8	22.9	25.1	30.0	33.4	37.0	40.7	45.5	50.8	52.7	59.1	66.4	65.7	73.9	83.1	79.3	89.3	100.4
	15	21.2	23.3	25.6	30.6	34.0	37.7	41.5	46.3	51.8	53.6	60.2	67.6	66.8	75.2	84.6	80.7	90.8	102.1
	20	21.6	23.7	26.1	31.2	34.6	38.4	42.2	47.2	52.7	54.6	61.3	68.8	68.0	76.5	86.1	82.1	92.4	103.8
	30	22.1	24.3	26.8	32.0	35.5	39.4	43.4	48.5	54.2	56.1	63.0	70.7	70.0	78.8	88.5	84.4	95.0	106.7
	40	22.3	24.6	27.1	32.4	36.0	40.1	44.1	49.3	55.2	57.4	64.3	72.2	71.4	80.4	90.5	86.3	97.1	109.0
260	0	18.2	20.0	21.9	26.1	28.9	32.0	35.1	39.1	43.6	45.2	50.6	56.6	56.1	63.1	70.9	67.7	76.2	85.8
	10	18.7	20.6	22.5	26.9	29.7	32.9	36.2	40.3	44.9	46.5	52.1	58.4	57.9	65.1	73.1	69.8	78.6	88.5
	15	19.1	20.9	23.0	27.4	30.3	33.6	36.8	41.1	45.8	47.4	53.1	59.5	58.9	66.2	74.4	71.1	80.0	90.0
	20	19.4	21.3	23.4	27.9	30.9	34.2	37.5	41.8	46.6	48.3	54.1	60.6	60.0	67.4	75.7	72.4	81.4	91.6
	30	19.9	21.9	24.0	28.6	31.7	35.1	38.5	43.0	47.9	49.6	55.6	62.3	61.7	69.4	77.9	74.4	83.8	94.2
	40	20.1	22.1	24.2	28.9	32.1	35.6	39.1	43.7	48.7	50.5	56.6	63.5	62.9	70.8	79.6	76.0	85.6	96.2
220	0	16.3	17.8	19.5	23.1	25.4	28.1	30.7	34.1	37.9	39.2	43.7	48.9	48.4	54.2	60.8	58.2	65.4	73.5
	10	16.7	18.3	20.0	23.7	26.2	28.9	31.6	35.1	39.0	40.3	45.1	50.4	49.9	55.9	62.7	60.0	67.4	75.8
	15	17.1	17.8	20.4	24.2	26.7	29.4	32.2	35.8	39.8	41.1	45.9	51.3	50.8	57.0	63.9	61.1	68.7	77.2
	20	17.4	19.0	20.8	24.6	27.1	30.0	32.8	36.4	40.5	41.8	46.7	52.2	51.7	58.0	65.0	62.2	69.9	78.5
	30	17.8	19.5	21.3	25.2	27.8	30.7	33.7	37.4	41.6	43.0	48.1	53.7	53.2	59.6	66.9	63.9	71.9	80.8
	40	17.9	19.6	21.5	25.5	28.2	31.1	34.1	38.0	42.3	43.7	48.9	54.7	54.1	60.8	68.2	65.2	73.4	82.5
180	0	14.4	15.7	17.1	20.0	22.0	24.2	26.3	29.1	32.2	33.1	36.8	41.0	40.4	45.2	50.5	48.2	54.0	60.6
	10	14.8	16.1	17.6	20.6	22.6	24.9	27.0	29.9	33.1	34.1	37.9	42.2	41.6	46.5	52.0	49.7	55.7	62.5
	15	15.1	16.4	17.9	21.0	23.0	25.3	27.5	30.5	33.7	34.7	38.6	43.0	42.4	47.4	53.0	50.6	56.7	63.6
	20	15.4	16.7	18.2	21.3	23.5	25.8	28.0	31.0	34.4	35.3	39.3	43.8	43.2	48.3	53.9	51.5	57.8	64.8
	30	15.7	17.1	18.7	21.9	24.1	26.5	28.8	31.8	35.3	36.3	40.4	45.0	44.4	49.6	55.5	53.0	59.4	66.6
	40	15.8	17.2	18.8	22.1	24.3	26.8	29.1	32.3	35.8	36.8	41.0	45.7	45.1	50.5	56.5	53.9	60.5	68.0

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.

If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Event Adjusted Brake Energy (Millions of Foot Pounds)****No Reverse Thrust**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	3.6	13.6	23.5	33.2	42.8	52.3	61.8	71.4	81.0	90.6	100.5	110.4
	MAX AUTO	3.5	12.5	21.4	30.2	39.0	47.8	56.8	66.0	75.5	85.5	95.9	106.8
	AUTOBRAKE 4	3.2	11.7	20.0	28.0	36.0	44.0	52.2	60.6	69.4	78.7	88.6	99.2
	AUTOBRAKE 3	2.7	11.0	18.8	26.3	33.7	41.0	48.4	56.1	64.2	72.8	82.0	92.2
	AUTOBRAKE 2	2.3	10.2	17.5	24.5	31.2	37.9	44.6	51.5	58.9	66.7	75.2	84.6
	AUTOBRAKE 1	1.9	9.0	15.6	21.8	27.8	33.8	39.8	45.9	52.4	59.4	66.9	75.1

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	3.4	12.0	21.2	30.6	39.7	48.6	57.4	65.9	74.4	82.8	91.3	99.7
	MAX AUTO	2.0	8.8	15.9	23.2	30.5	38.0	45.7	53.7	62.1	71.0	80.6	90.9
	AUTOBRAKE 4	1.3	5.6	10.9	16.6	22.5	28.3	34.3	40.7	47.5	54.9	63.0	72.0
	AUTOBRAKE 3	0.8	3.1	7.0	11.6	16.2	20.9	25.8	30.9	36.6	42.7	49.6	57.3
	AUTOBRAKE 2	0.0	2.3	5.0	7.8	10.8	14.0	17.4	21.2	25.6	30.4	36.0	42.4
	AUTOBRAKE 1	0.0	1.6	3.3	5.2	7.2	9.4	11.8	14.4	17.4	20.8	24.7	29.2

Cooling Time (Minutes)

		EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
16 & BELOW		17	18	20	24	28	32	35	36 TO 44	45 & ABOVE	
GEAR DOWN	NO SPECIAL PROCEDURE	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE	
INFLIGHT	REQUIRED	11	18	26	42	55	66	73			
GROUND	BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9	5.0 TO 6.3	6.3 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

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 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not 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 EICAS 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. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

Performance Inflight

Engine Inoperative

Chapter PI

Section 33

ENGINE INOP

Initial Max Continuous %N1

Based on .84M, engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	97.4	97.0	96.7	96.3	95.9	95.9	95.6	95.3	95.0
15	98.2	97.8	97.3	97.0	96.6	96.3	96.0	95.7	95.4
10	99.2	98.9	98.3	97.7	97.2	97.0	96.6	96.3	96.0
5	100.2	100.1	99.7	98.8	98.1	97.8	97.4	97.1	96.8
0	99.3	100.9	101.0	99.9	99.3	98.8	98.3	97.9	97.6
-5	98.4	99.9	101.2	101.3	100.5	100.2	99.7	99.3	98.8
-10	97.4	99.0	100.3	101.6	101.3	101.3	100.7	100.3	100.0
-15	96.5	98.1	99.3	100.6	101.0	102.0	101.1	100.8	100.5
-20	95.6	97.1	98.3	99.6	100.1	101.0	100.1	99.8	99.5
-25	94.6	96.1	97.4	98.6	99.1	100.0	99.1	98.8	98.5
-30	93.7	95.2	96.4	97.6	98.1	99.0	98.1	97.8	97.5
-35	92.7	94.2	95.4	96.6	97.0	97.9	97.1	96.8	96.5
-40	91.7	93.2	94.4	95.6	96.0	96.9	96.1	95.8	95.5

ENGINE INOP**Max Continuous %N1**

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

37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.86	94.3	95.4	96.4	97.4	98.4	99.5	100.5	101.4	101.2	100.2	98.9	97.7
240	0.74	96.1	97.2	98.3	99.3	100.4	101.4	102.1	101.9	100.9	99.5	98.1	97.1
200	0.63	95.7	96.7	97.8	98.8	99.9	100.8	101.4	100.9	100.0	98.5	97.0	96.3
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.82	94.6	95.6	96.6	97.7	98.7	99.7	100.7	101.7	101.4	100.4	99.2	98.1
240	0.71	95.1	96.2	97.2	98.3	99.3	100.3	101.3	101.8	100.9	99.8	98.3	97.2
200	0.60	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.0	100.2	98.8	97.1	96.1
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
320	0.89	91.4	92.4	93.4	94.4	95.4	96.4	97.4	98.3	99.3	100.2	99.8	98.8
280	0.79	95.0	96.0	97.1	98.1	99.2	100.2	101.2	102.2	102.4	101.0	100.0	98.7
240	0.68	95.6	96.7	97.8	98.8	99.8	100.9	101.9	102.4	101.8	100.2	98.9	97.5
200	0.58	95.9	97.0	98.0	99.1	100.1	101.1	101.6	101.6	101.0	99.3	97.9	96.4
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
320	0.85	92.7	93.8	94.8	95.7	96.7	97.7	98.7	99.6	100.5	100.8	99.7	98.4
280	0.76	96.3	97.4	98.4	99.5	100.5	101.5	102.5	103.5	102.0	100.6	99.1	98.0
240	0.66	97.4	98.4	99.5	100.5	101.5	102.6	103.3	103.0	101.0	99.5	98.1	96.9
200	0.55	97.6	98.7	99.7	100.8	101.8	102.6	102.8	102.0	100.7	98.7	97.2	96.1
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
320	0.82	93.8	94.8	95.8	96.8	97.8	98.7	99.7	100.6	101.6	100.1	98.9	97.8
280	0.73	96.6	97.6	98.6	99.6	100.6	101.6	102.6	102.5	101.0	99.5	98.1	97.1
240	0.63	98.1	99.2	100.2	101.3	102.3	103.3	103.1	101.6	99.8	98.4	97.1	96.0
200	0.53	98.6	99.7	100.7	101.7	102.7	103.2	102.7	101.2	99.4	97.7	96.3	96.2
27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
360	0.88	90.2	91.2	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.2	98.1
320	0.79	93.4	94.4	95.3	96.3	97.3	98.2	99.2	100.1	101.1	100.6	99.2	98.1
280	0.70	95.4	96.4	97.4	98.4	99.4	100.4	101.3	102.3	101.3	99.7	98.2	97.1
240	0.60	97.2	98.2	99.2	100.3	101.3	102.3	103.0	102.0	99.9	98.5	97.2	96.2
200	0.51	98.4	99.4	100.4	101.5	102.5	103.2	102.7	101.8	99.9	98.1	96.5	95.6

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION		PRESSURE ALTITUDE (1000 FT)					
		37	35	33	31	29	27
ENGINE A/I ON		-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON		-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
WING A/I ON - PACKS OFF		-0.6	-0.5	-0.5	-0.5	-0.5	-0.4

ENGINE INOP**Max Continuous %N1****Based on engine bleed for packs on or off and anti-ice off****25000 FT to 18000 FT Pressure Altitudes**

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.85	91.2	92.2	93.1	94.1	95.0	95.9	96.8	97.7	98.6	99.5	98.9	98.1
320	0.76	93.9	94.8	95.8	96.8	97.7	98.7	99.6	100.5	101.1	99.6	98.5	97.6
280	0.67	95.5	96.5	97.5	98.5	99.4	100.4	101.3	101.5	100.4	98.8	97.5	96.7
240	0.58	97.4	98.5	99.5	100.5	101.5	102.4	102.3	100.9	99.3	97.8	96.7	95.9
200	0.49	99.3	100.3	101.4	102.4	103.4	103.1	102.0	100.6	98.5	97.1	96.1	95.9
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.83	91.3	92.3	93.2	94.2	95.1	96.0	96.9	97.8	98.7	99.6	99.4	98.4
320	0.75	93.6	94.6	95.6	96.5	97.5	98.4	99.4	100.3	101.2	100.0	98.8	97.8
280	0.66	95.4	96.4	97.4	98.3	99.3	100.3	101.2	101.8	100.7	99.1	97.8	96.9
240	0.57	97.3	98.3	99.3	100.3	101.3	102.2	102.6	101.4	99.8	98.3	97.1	96.2
200	0.48	98.8	99.9	100.9	101.9	102.9	103.4	102.3	101.0	98.9	97.4	96.3	95.6
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.80	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.4	100.0	99.0	98.3
320	0.72	94.3	95.3	96.3	97.2	98.1	99.1	100.0	100.9	100.7	99.3	98.2	97.5
280	0.63	96.1	97.1	98.1	99.0	100.0	100.9	101.9	101.3	99.8	98.4	97.3	96.6
240	0.55	97.7	98.7	99.7	100.7	101.7	102.7	102.3	100.9	99.3	97.7	96.8	96.1
200	0.46	99.5	100.5	101.5	102.5	103.5	103.0	101.5	99.9	97.9	96.8	95.9	95.8
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.77	93.7	94.6	95.6	96.5	97.4	98.4	99.3	100.2	101.1	102.0	101.3	100.1
320	0.69	95.9	96.9	97.8	98.8	99.7	100.7	101.6	102.6	103.5	101.8	100.4	99.1
280	0.61	97.7	98.7	99.6	100.6	101.6	102.6	103.5	104.3	102.8	100.9	99.4	98.3
240	0.53	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.1	102.4	100.7	98.7	97.2
200	0.44	98.0	99.0	99.9	100.9	101.9	102.9	103.8	102.6	100.5	98.0	96.2	95.3
18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.75	94.4	95.4	96.3	97.2	98.2	99.1	100	100.9	101.8	102.0	100.6	99.4
320	0.67	96.7	97.7	98.6	99.6	100.5	101.4	102.4	103.3	102.9	101.2	99.7	98.6
280	0.59	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.0	102.3	100.4	98.9	97.8
240	0.51	99.6	100.6	101.6	102.6	103.6	104.5	104.9	103.9	101.9	100.0	98.4	97.2
200	0.42	97.2	98.2	99.2	100.1	101.1	101.9	102.0	100.8	98.8	97.3	95.8	94.4

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.3	-0.3	-0.3	-0.2	-0.3
WING A/I ON - PACKS OFF	-0.4	-0.4	-0.4	-0.3	-0.5

ENGINE INOP**Max Continuous %N1**

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

16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.72	94.8	95.8	96.7	97.6	98.6	99.5	100.4	101.3	102.2	103.1	101.7	100.2
320	0.64	96.9	97.9	98.8	99.8	100.7	101.7	102.6	103.5	104.4	102.7	100.9	99.4
280	0.57	98.7	99.7	100.7	101.6	102.6	103.5	104.5	105.4	104.1	102.2	100.3	98.8
240	0.49	99.1	100.1	101.1	102.0	103.0	104.0	104.9	104.5	103.0	100.9	99.2	97.9
200	0.41	96.2	97.2	98.1	99.1	100.0	100.9	101.5	101.3	99.8	98.3	97.0	95.4
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
360	0.69	94.9	95.9	96.8	97.7	98.6	99.5	100.4	101.3	102.2	102.2	100.8	99.5
320	0.62	97.1	98.1	99.0	99.9	100.9	101.8	102.7	103.6	103.4	101.5	100.0	98.9
280	0.54	99.2	100.1	101.1	102.1	103.0	103.9	104.9	104.9	103.0	101.0	99.5	98.4
240	0.47	97.3	98.2	99.2	100.1	101.0	102.0	102.7	102.5	100.6	99.0	97.8	96.7
200	0.39	96.1	97.0	98.0	98.9	99.8	100.7	101.4	100.7	99.0	97.6	96.5	95.6
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.67	95.4	96.3	97.2	98.1	99.0	99.9	100.8	101.6	102.5	101.3	100.0	99.0
320	0.60	97.3	98.2	99.2	100.1	101.0	101.9	102.8	103.7	102.3	100.6	99.4	98.4
280	0.52	99.7	100.6	101.6	102.5	103.5	104.4	105.3	104.0	102.0	100.2	99.1	98.1
240	0.45	96.5	97.4	98.3	99.3	100.2	101.1	101.4	100.6	99.2	98.0	96.9	96.0
200	0.38	96.7	97.7	98.6	99.5	100.4	101.2	101.3	100.2	98.7	97.4	96.4	95.8
10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.65	94.2	95.2	96.1	96.9	97.8	98.7	99.6	100.4	101.3	101.5	100.2	99.1
320	0.58	96.1	97.1	98.0	98.9	99.8	100.7	101.6	102.4	102.6	101.0	99.7	98.6
280	0.51	98.5	99.4	100.4	101.3	102.2	103.1	104.0	104.6	102.3	100.5	99.4	98.4
240	0.43	95.6	96.6	97.5	98.4	99.3	100.2	101.0	101.1	100.3	99.1	97.8	96.9
200	0.36	96.6	97.5	98.4	99.3	100.2	101.1	101.6	101.2	100.1	98.5	97.5	96.6
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
360	0.59	92.6	93.5	94.3	95.2	96.0	96.9	97.7	98.5	99.4	100.2	99.3	98.5
320	0.53	94.0	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.9	100.1	99.1	98.2
280	0.46	95.0	95.9	96.8	97.6	98.5	99.4	100.2	101.1	100.9	99.8	98.8	97.8
240	0.40	95.7	96.6	97.5	98.4	99.3	100.2	101.0	101.6	100.5	99.4	98.3	97.4
200	0.33	97.0	97.9	98.8	99.7	100.6	101.5	102.4	101.7	100.3	99.1	98.1	97.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	16	14	12	10	5
ENGINE A/I ON	-0.3	-0.2	-0.4	-0.5	-0.5
WING A/I ON - PACKS ON	-0.4	-0.5	-0.6	-0.7	-0.8
WING A/I ON - PACKS OFF	-0.6	-0.7	-0.8	-0.9	-1.1

ENGINE INOP**MAX CONTINUOUS THRUST****Driftdown Speed/Level Off Altitude****100 ft/min residual rate of climb****Includes APU fuel burn**

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	350	301	18000	16900	15700
340	331	293	19500	18400	17300
320	312	285	20900	20200	19100
300	291	276	22400	21500	20600
280	272	266	24200	23200	22000
260	252	257	26200	25300	24000
240	233	248	28500	27700	26300
220	214	238	30500	30000	28900
200	195	227	32300	32000	31300
180	175	215	34300	34100	33800
160	155	203	36500	36400	36200

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	
134	125	118	111	105	100	95	90	86	82	79	
268	251	236	222	210	200	190	181	173	166	159	
402	376	354	333	316	300	285	272	260	249	239	
535	501	471	445	421	400	380	363	347	332	319	
668	626	588	555	526	500	476	454	434	416	399	
800	750	706	666	631	600	571	545	521	499	479	
932	874	823	777	736	700	666	636	608	583	560	
1064	998	940	888	841	800	762	727	696	667	640	
1196	1122	1057	998	946	900	857	818	783	751	721	
1327	1246	1173	1109	1051	1000	952	910	870	835	801	
1459	1369	1290	1220	1156	1100	1048	1001	958	918	882	
1590	1493	1407	1330	1262	1200	1143	1092	1045	1002	963	
1722	1617	1524	1441	1367	1300	1239	1183	1133	1086	1043	
1854	1741	1641	1552	1472	1400	1334	1275	1220	1170	1124	
1986	1865	1758	1662	1577	1500	1430	1366	1307	1254	1205	
2118	1989	1875	1773	1682	1600	1525	1457	1395	1338	1285	
2250	2113	1992	1884	1787	1700	1620	1548	1482	1421	1365	
2383	2238	2109	1995	1892	1800	1716	1639	1569	1505	1446	

ENGINE INOP**MAX CONTINUOUS THRUST****Driftdown/LRC Cruise Range Capability****Driftdown/Cruise Fuel and Time**

AIR DIST (NM)	FUEL REQUIRED (1000 KG)											TIME (HR:MIN)	
	WEIGHT AT START OF DRIFTDOWN (1000 KG)												
	160	180	200	220	240	260	280	300	320	340	360		
100	1.0	1.1	1.2	1.4	1.4	1.6	1.7	1.7	1.8	1.9	2.0	0:15	
200	2.3	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.1	4.3	4.5	0:31	
300	3.6	3.9	4.4	4.8	5.1	5.4	5.8	6.1	6.5	6.9	7.2	0:46	
400	4.9	5.4	6.0	6.6	7.0	7.5	7.9	8.4	8.9	9.5	10.0	1:01	
500	6.2	6.8	7.5	8.2	8.8	9.4	10.0	10.6	11.2	11.9	12.6	1:16	
600	7.4	8.1	9.0	9.8	10.6	11.3	12.0	12.7	13.4	14.3	15.2	1:30	
700	8.6	9.4	10.4	11.4	12.3	13.1	13.9	14.8	15.6	16.6	17.7	1:45	
800	9.7	10.7	11.9	13.0	14.0	14.9	15.9	16.8	17.8	19.0	20.2	1:59	
900	10.9	12.0	13.3	14.5	15.6	16.8	17.8	18.9	20.0	21.3	22.7	2:14	
1000	12.1	13.3	14.7	16.1	17.3	18.5	19.7	20.9	22.1	23.6	25.2	2:28	
1100	13.2	14.6	16.1	17.6	19.0	20.3	21.6	22.9	24.3	25.9	27.6	2:43	
1200	14.4	15.9	17.5	19.1	20.6	22.1	23.5	24.9	26.4	28.1	30.0	2:57	
1300	15.5	17.2	18.9	20.6	22.3	23.8	25.4	26.9	28.5	30.4	32.4	3:11	
1400	16.6	18.4	20.3	22.1	23.9	25.6	27.2	28.9	30.6	32.6	34.8	3:26	
1500	17.7	19.6	21.7	23.6	25.5	27.3	29.1	30.9	32.7	34.8	37.2	3:40	
1600	18.8	20.9	23.0	25.1	27.1	29.0	30.9	32.8	34.8	37.0	39.5	3:55	
1700	19.9	22.1	24.4	26.6	28.7	30.7	32.8	34.8	36.8	39.2	41.9	4:10	
1800	21.0	23.3	25.7	28.0	30.2	32.4	34.6	36.7	38.9	41.4	44.2	4:24	

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
360	15600	14200	12700
350	16000	14700	13200
340	16900	15200	13700
330	17800	16300	14600
320	18800	17300	15600
310	19800	18300	16600
300	20500	19300	17700
290	21100	20200	18700
280	21800	20800	19800
270	22700	21500	20600
260	23600	22300	21200
250	24600	23400	21900
240	25800	24600	23100
230	27100	25900	24300
220	28500	27300	25600
210	29900	28600	27100
200	30900	30000	28500
190	31900	31200	30100
180	32900	32500	31400
170	34000	33700	32800
160	35200	35100	34300

With engine anti-ice on, no altitude capability adjustment is required.

With engine and wing anti-ice on, decrease altitude capability by 300 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
360	%N1	90.9	96.3								
	MACH	.602	.664								
	KIAS	334	337								
	FF/ENG	10070	10778								
340	%N1	89.9	94.9	97.6							
	MACH	.602	.664	.683							
	KIAS	334	337	335							
	FF/ENG	9696	10338	10505							
320	%N1	88.7	92.9	94.8	97.7						
	MACH	.602	.653	.670	.689						
	KIAS	334	332	328	325						
	FF/ENG	9267	9589	9644	9735						
300	%N1	86.8	91.0	92.7	94.7	97.9					
	MACH	.592	.638	.657	.674	.694					
	KIAS	329	324	321	317	315					
	FF/ENG	8693	8874	8919	8944	9073					
280	%N1	85.0	89.2	90.8	92.6	94.8	98.3				
	MACH	.574	.622	.641	.660	.677	.700				
	KIAS	319	315	313	310	306	305				
	FF/ENG	8068	8218	8264	8284	8332	8544				
260	%N1	82.9	87.2	88.8	90.5	92.3	94.7	98.4			
	MACH	.557	.605	.623	.643	.662	.679	.704			
	KIAS	309	306	304	302	299	295	294			
	FF/ENG	7484	7593	7619	7642	7676	7747	8011			
240	%N1	80.8	84.8	86.8	88.3	90.0	91.8	94.5	98.3		
	MACH	.540	.585	.605	.624	.644	.663	.681	.707		
	KIAS	299	296	295	293	291	288	284	283		
	FF/ENG	6926	6949	7005	7013	7041	7088	7163	7427		
220	%N1	78.6	82.5	84.2	86.1	87.7	89.4	91.2	93.8	97.8	
	MACH	.522	.564	.584	.604	.623	.644	.663	.681	.708	
	KIAS	289	285	284	283	281	279	276	272	272	
	FF/ENG	6372	6314	6372	6413	6419	6456	6501	6563	6820	
200	%N1	76.2	79.9	81.7	83.4	85.3	86.9	88.6	90.4	93.0	96.9
	MACH	.503	.543	.561	.581	.601	.621	.642	.661	.680	.706
	KIAS	278	274	272	271	270	268	267	264	260	260
	FF/ENG	5827	5717	5752	5795	5829	5836	5870	5906	5957	6195
180	%N1	73.8	77.2	78.9	80.7	82.3	84.2	85.8	87.5	89.3	91.9
	MACH	.484	.521	.538	.556	.575	.596	.616	.638	.658	.677
	KIAS	268	263	261	259	258	257	256	254	251	248
	FF/ENG	5301	5135	5167	5198	5215	5244	5254	5279	5309	5352
160	%N1	71.0	74.3	76.0	77.6	79.3	81.0	82.7	84.5	86.1	88.0
	MACH	.464	.498	.514	.530	.548	.567	.589	.609	.631	.652
	KIAS	257	251	249	247	246	244	243	242	240	238
	FF/ENG	4797	4574	4596	4632	4637	4636	4658	4673	4689	4716

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	
284	263	244	227	213	200	190	181	173	166	159	
565	523	485	453	425	400	381	364	348	334	321	
847	784	728	680	638	600	572	546	522	501	482	
1129	1045	970	906	850	800	763	729	698	669	643	
1413	1308	1214	1133	1063	1000	954	911	872	836	804	
1697	1570	1457	1361	1276	1200	1145	1094	1047	1004	965	
1982	1834	1701	1588	1489	1400	1336	1276	1221	1171	1125	
2268	2097	1945	1815	1702	1600	1526	1458	1395	1338	1286	
2554	2362	2190	2043	1915	1800	1717	1640	1569	1505	1446	
2842	2626	2434	2270	2128	2000	1908	1822	1743	1671	1606	

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	3.8	0:39	3.3	0:38	3.0	0:36	2.7	0:36	2.5	0:35
400	8.0	1:13	7.3	1:10	6.8	1:08	6.4	1:05	6.1	1:03
600	12.1	1:48	11.2	1:44	10.6	1:39	10.0	1:35	9.7	1:32
800	16.2	2:23	15.1	2:17	14.3	2:11	13.6	2:06	13.2	2:01
1000	20.2	2:59	18.9	2:50	18.0	2:43	17.1	2:36	16.7	2:30
1200	24.2	3:34	22.7	3:24	21.7	3:15	20.7	3:06	20.2	2:59
1400	28.2	4:10	26.5	3:58	25.3	3:47	24.1	3:37	23.6	3:29
1600	32.1	4:46	30.2	4:33	28.9	4:19	27.6	4:08	26.9	3:58
1800	36.0	5:22	33.8	5:07	32.4	4:52	31.0	4:39	30.2	4:28
2000	39.8	5:59	37.5	5:42	36.0	5:25	34.4	5:10	33.5	4:58

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
5	-1.0	-0.8	-0.6	-0.4	-0.2	0.0	0.3	0.7	1.1	1.7	2.4
10	-2.1	-1.7	-1.3	-0.9	-0.4	0.0	0.7	1.5	2.5	3.7	5.0
15	-3.3	-2.6	-2.0	-1.3	-0.7	0.0	1.0	2.3	3.8	5.6	7.6
20	-4.4	-3.5	-2.7	-1.8	-0.9	0.0	1.4	3.1	5.1	7.4	9.9
25	-5.5	-4.4	-3.4	-2.2	-1.1	0.0	1.8	3.9	6.3	9.1	12.2
30	-6.7	-5.4	-4.0	-2.7	-1.3	0.0	2.1	4.6	7.5	10.7	14.3
35	-7.8	-6.3	-4.7	-3.2	-1.6	0.0	2.5	5.3	8.6	12.2	16.2
40	-8.9	-7.2	-5.4	-3.6	-1.8	0.0	2.8	6.0	9.7	13.7	18.1

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
360	%N1	80.5	83.9	88.6	93.4		
	KIAS	264	264	265	269		
	FF/ENG	9070	9130	9370	9670		
340	%N1	78.7	81.9	86.7	91.4	100.4	
	KIAS	260	260	260	260	299	
	FF/ENG	8520	8560	8730	8950	10320	
320	%N1	76.7	79.7	84.6	89.2	96.4	
	KIAS	253	253	253	253	289	
	FF/ENG	7930	7940	8050	8210	9240	
300	%N1	74.7	77.7	82.3	87.1	92.4	
	KIAS	244	244	244	244	259	
	FF/ENG	7380	7360	7430	7550	8120	
280	%N1	72.8	75.7	80.1	85.0	90.1	
	KIAS	238	238	238	238	238	
	FF/ENG	6880	6850	6880	6950	7350	
260	%N1	70.7	73.6	77.8	82.8	87.8	95.1
	KIAS	229	229	229	229	229	262
	FF/ENG	6380	6340	6330	6380	6690	7470
240	%N1	68.5	71.5	75.6	80.3	85.4	90.5
	KIAS	223	223	223	223	223	228
	FF/ENG	5910	5870	5820	5850	6110	6420
220	%N1	66.2	69.1	73.2	77.7	82.8	87.7
	KIAS	217	217	217	217	217	242
	FF/ENG	5440	5400	5330	5350	5530	5760
200	%N1	64.1	66.7	71.0	75.3	80.1	85.0
	KIAS	217	217	217	217	217	226
	FF/ENG	5010	4970	4910	4900	5040	5200
180	%N1	62.0	64.6	68.6	72.9	77.6	82.5
	KIAS	217	217	217	217	217	217
	FF/ENG	4630	4580	4520	4500	4630	4730
160	%N1	59.9	62.6	66.3	70.7	75.2	80.0
	KIAS	217	217	217	217	217	217
	FF/ENG	4300	4240	4160	4140	4250	4340

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

ENGINE INOP**ADVISORY INFORMATION****Gear Down Landing Rate of Climb Available****Flaps 20**

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	460	370				
50	510	420	260			
48	560	470	310			
46	600	510	360	210		
44	650	560	400	260		
42	690	610	450	300	150	
40	720	660	490	340	190	
38	730	700	540	380	220	20
36	730	720	580	410	250	50
34	730	730	610	450	280	80
32	740	730	650	490	310	100
30	740	730	650	520	350	130
20	760	750	660	550	420	240
10	780	770	620	440	300	150
0	800	780	610	410	210	-30
-20	830	810	630	430	220	-30
-40	870	850	650	440	220	-30

Rate of climb capability shown is valid for 220000 kg, gear down at VREF20 + 5.

Decrease rate of climb 40 ft/min per 5000 kg greater than 220000 kg.

Increase rate of climb 50 ft/min per 5000 kg less than 220000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-100	-190				
50	-50	-150	-300			
48	-10	-110	-260			
46	30	-60	-220	-360		
44	70	-20	-180	-320		
42	110	20	-140	-280	-420	
40	140	60	-100	-250	-400	
38	150	100	-60	-210	-370	-560
36	150	130	-30	-190	-340	-540
34	150	130	10	-150	-320	-510
32	150	130	30	-120	-290	-490
30	150	140	50	-90	-260	-470
20	160	140	50	-60	-190	-370
10	170	150	10	-110	-220	-610
0	180	150	-20	-210	-410	-640
-20	180	160	-30	-220	-420	-660
-40	190	160	-30	-230	-440	-690

Rate of climb capability shown is valid for 220000 kg, gear down at VREF30 + 5.

Decrease rate of climb 40 ft/min per 5000 kg greater than 220000 kg.

Increase rate of climb 40 ft/min per 5000 kg less than 220000 kg.

DRAFT

Intentionally
Blank

Performance Inflight**Alternate Mode EEC****Chapter PI****Section 34****ALTERNATE MODE EEC****Alternate Mode EEC Max Takeoff %N1**

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

AIRPORT OAT °C	°F	AIRPORT PRESSURE ALTITUDE (FT)											
		-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
55	131	95.7	96.0	96.2	96.1	96.0	96.1	96.1	96.1	96.1	95.5	94.6	94.2
50	122	97.1	97.5	98.0	97.3	97.4	97.5	97.5	97.5	97.4	96.8	95.9	95.6
45	113	98.5	98.9	99.4	99.1	98.8	98.7	98.8	98.8	98.7	98.2	97.3	96.9
40	104	99.6	100.2	100.9	100.4	100.2	100.0	99.9	100.0	99.9	99.4	98.6	98.2
35	95	99.3	100.8	102.8	102.3	101.8	101.4	101.2	101.3	101.0	100.4	99.6	99.3
30	86	98.5	99.9	102.7	104.0	104.0	103.8	103.4	103.4	102.6	101.5	100.7	100.3
25	77	97.7	99.1	101.8	103.1	104.4	105.5	105.8	106.3	105.3	103.8	102.4	101.8
20	68	96.9	98.3	101.0	102.3	103.5	104.6	105.8	106.8	106.8	105.9	104.8	104.3
15	59	96.0	97.4	100.1	101.4	102.6	103.7	104.9	105.9	106.4	106.1	105.6	105.3
10	50	95.2	96.6	99.2	100.5	101.7	102.8	103.9	105.0	105.5	105.2	104.9	104.8
5	41	94.4	95.7	98.4	99.6	100.8	101.9	103.0	104.1	104.5	104.2	104.0	103.8
0	32	93.5	94.9	97.5	98.7	99.9	101.0	102.1	103.1	103.6	103.3	103.0	102.9
-10	14	91.8	93.1	95.7	96.9	98.1	99.1	100.2	101.2	101.7	101.4	101.1	101.0
-20	-4	90.0	91.3	93.8	95.0	96.2	97.2	98.3	99.3	99.7	99.4	99.2	99.0
-30	-22	88.2	89.5	92.0	93.1	94.3	95.3	96.3	97.3	97.7	97.5	97.2	97.1
-40	-40	86.4	87.6	90.1	91.2	92.3	93.3	94.3	95.3	95.7	95.4	95.2	95.1
-50	-58	84.5	85.7	88.1	89.2	90.3	91.3	92.3	93.2	93.6	93.4	93.1	93.0

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)											
	-2	-1	0	1	2	3	4	5	6	7	8	8.4
PACKS OFF	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3
WING ANTI-ICE ON	-0.2	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

DRAFT

Intentionally
Blank

Performance Inflight

Gear Down

Chapter PI

Section 35

GEAR DOWN

220 KIAS Max Climb %N1

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	88.2	88.3	91.4	91.1	92.1	91.3	94.0	95.2	95.4	98.1	99.9	101.1	102.4	102.9	103.4
50	89.5	88.8	90.7	90.4	91.4	92.1	93.3	94.5	94.7	97.3	99.2	100.3	101.6	102.1	102.6
45	90.5	90.1	90.0	89.7	90.7	91.4	92.6	93.8	93.9	96.6	98.4	99.6	100.8	101.3	101.8
40	91.6	91.2	91.2	89.7	89.9	90.7	91.9	93.0	93.2	95.8	97.6	98.8	100.0	100.5	101.0
35	92.6	92.3	92.2	92.1	90.6	89.9	91.1	92.3	92.5	95.0	96.8	98.0	99.2	99.7	100.2
30	93.0	93.2	93.2	93.0	92.2	91.2	90.9	91.5	91.7	94.3	96.0	97.2	98.4	98.9	99.4
25	92.2	94.2	94.1	94.0	93.7	92.8	92.1	92.0	91.1	93.5	95.2	96.4	97.6	98.0	98.5
20	91.4	94.2	95.1	95.0	94.9	94.4	93.4	93.0	92.8	93.6	94.4	95.6	96.8	97.2	97.7
15	90.7	93.4	96.7	96.4	96.3	96.1	94.8	94.1	94.5	94.8	95.2	95.3	96.0	96.4	96.9
10	89.9	92.6	96.3	97.9	98.1	98.1	96.8	95.5	96.5	96.2	96.4	96.4	96.1	96.1	96.0
5	89.1	91.7	95.4	97.1	98.9	100.3	99.0	97.9	98.2	97.8	97.8	97.9	97.9	97.3	96.8
0	88.3	90.9	94.6	96.2	98.0	100.1	100.8	100.3	100.1	99.7	99.4	99.4	99.5	98.6	98.1
-5	87.4	90.1	93.7	95.3	97.1	99.1	99.9	100.8	101.9	101.5	101.1	101.1	101.1	100.2	99.6
-10	86.6	89.2	92.8	94.4	96.1	98.2	98.9	99.8	101.4	102.8	102.6	102.6	103.0	101.6	100.8
-15	85.8	88.4	91.9	93.5	95.2	97.3	98.0	98.9	100.4	101.8	102.5	103.2	103.8	102.5	101.4
-20	85.0	87.5	91.1	92.6	94.3	96.3	97.0	97.9	99.4	100.8	101.5	102.2	103.3	102.4	101.3

Anti-ice Adjustment

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5

* Packs on or off with 2 bleed sources.

** Packs off with 1 bleed source.

GEAR DOWN**Long Range Cruise Altitude Capability****Max Climb Thrust, 300 ft/min residual rate of climb**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18500	16600	14200
350	19200	17300	14800
340	19700	18000	15500
330	20600	18900	16300
320	21700	20100	17600
310	22800	21300	19000
300	23900	22400	20300
290	25000	23500	21800
280	26000	24600	23000
270	27100	25900	24300
260	28200	27200	25700
250	29400	28600	27100
240	30400	30000	28500
230	31200	30800	29900
220	32000	31700	31000
210	32800	32600	32000
200	33500	33200	32700
190	34000	33900	33400
180	34600	34500	34100
170	35200	35100	34700
160	35800	35700	35300

GEAR DOWN**Long Range Cruise Control**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (1000 FT)									
	10	15	17	19	21	23	25	27	29	31
360	%N1	84.4	88.7	90.7	93.0					
	MACH	.488	.535	.556	.578					
	KIAS	270	270	270	270					
	FF/ENG	7524	7653	7775	7993					
340	%N1	83.5	87.8	89.7	91.8					
	MACH	.488	.535	.556	.578					
	KIAS	270	270	270	270					
	FF/ENG	7296	7405	7486	7646					
320	%N1	82.6	86.7	88.3	90.0	92.1				
	MACH	.488	.534	.550	.568	.588				
	KIAS	270	269	267	265	264				
	FF/ENG	7058	7105	7101	7142	7267				
300	%N1	81.2	84.9	86.6	88.2	89.9	92.1			
	MACH	.481	.520	.537	.554	.572	.594			
	KIAS	266	262	260	258	257	256			
	FF/ENG	6725	6632	6624	6623	6679	6806			
280	%N1	79.3	83.1	84.9	86.4	87.9	89.7	92.3		
	MACH	.468	.507	.523	.540	.557	.576	.598		
	KIAS	259	255	253	252	250	248	248		
	FF/ENG	6283	6189	6167	6168	6164	6230	6361		
260	%N1	77.2	81.1	82.9	84.6	86.0	87.6	89.4	92.3	96.7
	MACH	.453	.492	.508	.525	.542	.559	.579	.602	.628
	KIAS	251	248	246	244	243	241	239	239	239
	FF/ENG	5831	5754	5724	5709	5711	5706	5778	5910	6239
240	%N1	75.0	79.0	80.8	82.4	84.1	85.5	87.1	89.0	92.0
	MACH	.438	.476	.492	.508	.525	.543	.561	.581	.605
	KIAS	242	240	238	237	235	233	231	230	230
	FF/ENG	5377	5317	5292	5266	5254	5253	5252	5320	5450
220	%N1	72.6	76.7	78.4	80.2	81.7	83.4	84.9	86.4	88.4
	MACH	.421	.459	.475	.491	.508	.525	.543	.561	.582
	KIAS	232	231	230	228	227	225	224	222	221
	FF/ENG	4925	4872	4859	4836	4811	4800	4799	4799	4859
200	%N1	69.9	74.1	75.8	77.5	79.3	80.9	82.7	84.4	86.3
	MACH	.403	.441	.456	.473	.489	.506	.526	.548	.571
	KIAS	223	221	220	219	218	217	217	216	217
	FF/ENG	4476	4425	4418	4408	4384	4360	4387	4432	4481
180	%N1	67.8	72.2	74.1	75.9	77.9	79.8	81.5	83.3	85.1
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571
	KIAS	217	217	217	217	217	217	217	216	217
	FF/ENG	4152	4138	4141	4159	4170	4182	4208	4249	4283
160	%N1	66.8	71.3	73.1	74.9	76.9	78.7	80.5	82.4	84.1
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571
	KIAS	217	217	217	217	217	217	217	216	217
	FF/ENG	4013	3995	3994	4006	4019	4031	4053	4088	4125

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	
310	280	254	233	216	200	189	179	170	162	155
622	562	510	467	431	400	378	358	340	324	311
936	845	766	702	648	600	567	538	511	487	466
1253	1131	1024	937	864	800	757	718	682	650	621
1573	1418	1283	1173	1081	1000	946	897	852	812	776
1896	1706	1542	1409	1298	1200	1135	1076	1022	973	930
2222	1997	1803	1646	1515	1400	1324	1254	1191	1134	1084
2552	2291	2066	1884	1733	1600	1513	1433	1361	1296	1238
2883	2586	2329	2122	1951	1800	1702	1612	1530	1457	1392
3215	2881	2593	2361	2169	2000	1890	1790	1699	1618	1545
3547	3177	2857	2600	2387	2200	2079	1968	1868	1778	1699
3880	3472	3120	2838	2604	2400	2268	2147	2038	1940	1853
4213	3768	3384	3076	2822	2600	2457	2326	2207	2101	2007
4545	4063	3648	3315	3040	2800	2646	2505	2377	2262	2161
4878	4359	3912	3554	3258	3000	2835	2683	2546	2424	2315
5211	4655	4176	3792	3476	3200	3023	2862	2716	2585	2468
5544	4951	4440	4031	3694	3400	3212	3041	2885	2746	2622
5876	5246	4703	4269	3912	3600	3401	3220	3055	2907	2776
6209	5541	4967	4507	4130	3800	3590	3398	3224	3068	2930
6542	5837	5230	4746	4348	4000	3778	3576	3393	3229	3084

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	7.4	0:46	6.7	0:44	5.8	0:42	5.3	0:41	5.0	0:39
400	15.0	1:29	13.9	1:25	12.4	1:20	11.6	1:17	11.1	1:13
600	22.6	2:13	21.1	2:06	19.0	1:58	17.9	1:53	17.2	1:48
800	30.0	2:57	28.0	2:48	25.4	2:37	24.0	2:30	23.0	2:23
1000	37.3	3:42	34.9	3:30	31.8	3:15	30.1	3:07	28.9	2:57
1200	44.4	4:28	41.6	4:14	38.0	3:55	35.9	3:44	34.5	3:33
1400	51.5	5:14	48.3	4:57	44.1	4:35	41.8	4:22	40.1	4:09
1600	58.3	6:01	54.7	5:41	50.1	5:15	47.5	5:00	45.6	4:45
1800	65.1	6:49	61.2	6:26	56.1	5:56	53.1	5:38	51.0	5:21
2000	71.7	7:37	67.5	7:11	61.9	6:37	58.7	6:17	56.3	5:57
2200	78.3	8:25	73.7	7:56	67.7	7:18	64.2	6:55	61.6	6:33
2400	84.8	9:13	79.9	8:41	73.4	7:59	69.6	7:34	66.8	7:09
2600	91.3	10:00	86.0	9:26	79.1	8:40	75.0	8:12	72.0	7:45
2800	97.6	10:48	92.0	10:11	84.6	9:21	80.3	8:51	77.1	8:21
3000	104.0	11:36	98.0	10:56	90.2	10:02	85.6	9:29	82.1	8:57
3200	110.2	12:24	103.9	11:41	95.7	10:43	90.8	10:08	87.1	9:33
3400	116.5	13:12	109.8	12:27	101.1	11:24	96.0	10:46	92.1	10:09
3600	122.6	14:00	115.6	13:12	106.5	12:05	101.1	11:25	97.0	10:45
3800	128.7	14:48	121.4	13:57	111.9	12:46	106.2	12:03	101.9	11:21
4000	134.8	15:36	127.2	14:42	117.2	13:27	111.3	12:42	106.8	11:57

GEAR DOWN**Long Range Cruise Enroute Fuel and Time****Fuel Required Adjustment (1000 KG)**

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
10	-1.8	-1.6	-1.3	-0.9	-0.4	0.0	0.8	1.8	2.9	4.1	5.5
20	-3.6	-3.2	-2.6	-1.8	-0.9	0.0	1.6	3.4	5.5	7.9	10.5
30	-5.3	-4.7	-3.8	-2.7	-1.4	0.0	2.2	4.9	7.9	11.3	15.1
40	-6.8	-6.0	-5.0	-3.5	-1.8	0.0	2.9	6.2	10.1	14.4	19.2
50	-8.3	-7.3	-6.0	-4.2	-2.2	0.0	3.4	7.4	12.0	17.1	22.9
60	-9.5	-8.4	-6.9	-4.9	-2.5	0.0	3.9	8.4	13.7	19.6	26.1
70	-10.7	-9.5	-7.8	-5.5	-2.8	0.0	4.3	9.3	15.1	21.6	28.9
80	-11.7	-10.4	-8.5	-6.1	-3.1	0.0	4.6	10.1	16.3	23.4	31.2
90	-12.6	-11.2	-9.2	-6.5	-3.4	0.0	4.9	10.7	17.3	24.8	33.1
100	-13.4	-11.9	-9.8	-7.0	-3.7	0.0	5.1	11.1	18.0	25.9	34.6
110	-14.1	-12.5	-10.3	-7.3	-3.9	0.0	5.2	11.4	18.5	26.6	35.6
120	-14.6	-12.9	-10.7	-7.6	-4.0	0.0	5.3	11.6	18.8	27.0	36.1
130	-15.0	-13.3	-11.0	-7.9	-4.2	0.0	5.3	11.6	18.8	27.0	36.2
140	-15.2	-13.5	-11.2	-8.1	-4.3	0.0	5.2	11.5	18.6	26.7	35.8

Based on Long Range Cruise and VREF30+80 descent.

Descent at VREF30 + 80

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	35	40	44	48	52	57	61	65	69	74
TIME (MINUTES)	11	12	13	14	15	15	16	17	18	18

GEAR DOWN**Holding
Flaps Up**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)						
	1500	5000	10000	15000	20000	25000	30000
360	%N1	76.1					
	KIAS	264					
	FF/ENG	7750					
340	%N1	74.6	77.7				
	KIAS	260	260				
	FF/ENG	7360	7350				
320	%N1	72.8	75.8				
	KIAS	253	253				
	FF/ENG	6890	6870				
300	%N1	70.6	73.7	78.1			
	KIAS	244	244	244			
	FF/ENG	6380	6370	6340			
280	%N1	68.8	72.0	76.3			
	KIAS	238	238	238			
	FF/ENG	5970	5960	5920			
260	%N1	66.7	69.7	74.1	78.6		
	KIAS	229	229	229	229		
	FF/ENG	5520	5510	5470	5490		
240	%N1	64.9	67.7	72.2	76.7		
	KIAS	223	223	223	223		
	FF/ENG	5150	5130	5100	5100		
220	%N1	63.1	65.8	70.1	74.6	79.4	
	KIAS	217	217	217	217	217	
	FF/ENG	4800	4770	4730	4730	4770	
200	%N1	61.9	64.7	68.8	73.3	78.0	82.7
	KIAS	217	217	217	217	217	217
	FF/ENG	4610	4570	4520	4520	4550	4610
180	%N1	61.0	63.8	67.8	72.2	76.9	81.5
	KIAS	217	217	217	217	217	217
	FF/ENG	4450	4410	4360	4350	4370	4420
160	%N1	60.1	62.9	66.8	71.3	75.9	80.5
	KIAS	217	217	217	217	217	217
	FF/ENG	4320	4270	4210	4190	4210	4260
							84.9

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

GEAR DOWN**Holding
Flaps 1**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
360	%N1	75.9	79.0	83.8	88.3
	KIAS	244	244	244	244
	FF/ENG	7660	7700	7690	7810
340	%N1	74.3	77.4	82.1	86.8
	KIAS	240	240	240	240
	FF/ENG	7240	7260	7250	7350
320	%N1	72.5	75.5	80.0	84.9
	KIAS	233	233	233	233
	FF/ENG	6770	6780	6770	6830
300	%N1	70.3	73.4	77.8	82.9
	KIAS	224	224	224	224
	FF/ENG	6270	6270	6270	6320
280	%N1	68.3	71.5	75.8	80.6
	KIAS	218	218	218	218
	FF/ENG	5840	5840	5820	5870
260	%N1	66.0	69.1	73.5	78.1
	KIAS	209	209	209	209
	FF/ENG	5380	5370	5340	5400
240	%N1	64.1	66.9	71.4	75.9
	KIAS	203	203	203	203
	FF/ENG	4980	4960	4930	4970
220	%N1	62.0	64.7	69.0	73.6
	KIAS	197	197	197	197
	FF/ENG	4600	4570	4530	4550
200	%N1	60.5	63.2	67.3	71.8
	KIAS	197	197	197	197
	FF/ENG	4350	4310	4260	4270
180	%N1	59.1	61.8	65.8	70.3
	KIAS	197	197	197	197
	FF/ENG	4140	4100	4040	4050
160	%N1	57.9	60.7	64.6	69.0
	KIAS	197	197	197	197
	FF/ENG	3970	3920	3860	3860

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

DRAFT

Intentionally
Blank

Performance Inflight

Gear Down, Engine INOP

Chapter PI

Section 36

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
320	307	254	5600	4400	2200
300	288	246	7700	6800	5300
280	269	238	9800	9100	8100
260	250	230	12100	11400	10300
240	230	223	14000	13500	12400
220	210	217	15900	15400	14400
200	191	216	17300	16700	15700
180	172	216	18500	18100	16900
160	153	216	19700	19400	18200

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
340	1800		
330	3300	1000	
320	4500	2700	
310	5700	4400	1900
300	6800	5700	3800
290	7800	7000	5300
280	8800	8100	6700
270	9800	9100	8100
260	11100	10400	9300
250	12100	11400	10300
240	13100	12500	11300
230	14000	13600	12400
220	15100	14600	13600
210	15900	15400	14400
200	16700	16100	15100
190	17400	16700	15800
180	18000	17500	16400
170	18700	18200	16900
160	19300	18900	17700

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
300	%N1	94.3	96.8					
	MACH	.403	.418					
	KIAS	244	244					
	FF/ENG	12328	12507					
280	%N1	92.3	94.1	96.8				
	MACH	.393	.407	.422				
	KIAS	238	238	238				
	FF/ENG	11514	11566	11807				
260	%N1	90.5	91.6	93.6	96.4			
	MACH	.385	.393	.408	.423			
	KIAS	233	229	229	229			
	FF/ENG	10870	10626	10714	10945			
240	%N1	88.9	89.8	91.3	93.4	96.5		
	MACH	.379	.385	.397	.412	.428		
	KIAS	229	225	223	223	223		
	FF/ENG	10228	9966	9915	10023	10245		
220	%N1	86.6	88.0	89.1	90.9	93.1	96.4	
	MACH	.368	.377	.387	.401	.417	.433	
	KIAS	223	220	217	217	217	217	
	FF/ENG	9452	9309	9167	9222	9323	9542	
200	%N1	84.2	86.0	87.8	89.5	91.4	94.0	98.1
	MACH	.358	.371	.385	.400	.415	.431	.448
	KIAS	217	217	217	217	217	217	217
	FF/ENG	8693	8698	8718	8773	8844	8956	9300
180	%N1	82.9	84.7	86.7	88.4	90.2	92.3	95.5
	MACH	.358	.371	.385	.400	.415	.431	.448
	KIAS	217	217	217	217	217	217	217
	FF/ENG	8330	8328	8342	8399	8458	8533	8740
160	%N1	81.7	83.6	85.4	87.3	89.0	90.9	93.5
	MACH	.358	.371	.385	.400	.415	.431	.448
	KIAS	217	217	217	217	217	217	217
	FF/ENG	8019	8011	8010	8058	8115	8168	8310

GEAR DOWN

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	
165	145	129	118	108	100	95	90	84	78	73	
332	295	263	238	218	200	187	175	165	155	147	
500	444	396	358	327	300	280	262	246	233	221	
669	593	528	477	436	400	374	350	329	310	294	
837	742	661	597	545	500	467	437	410	387	367	
1007	893	795	718	655	600	560	524	492	464	440	
1177	1043	928	838	764	700	653	611	574	541	513	
1347	1193	1061	958	873	800	746	698	655	618	586	
1519	1344	1195	1078	983	900	839	785	737	695	659	
1691	1496	1329	1198	1092	1000	933	873	819	772	731	

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
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)	
100	4.0	0:27	3.8	0:26	3.5	0:26	3.4	0:25	3.3	0:25
200	8.2	0:51	7.8	0:50	7.5	0:49	7.3	0:48	7.2	0:47
300	12.3	1:15	11.8	1:14	11.4	1:12	11.1	1:10	11.1	1:09
400	16.4	1:40	15.8	1:38	15.3	1:36	14.9	1:33	14.9	1:30
500	20.5	2:04	19.7	2:02	19.1	1:59	18.7	1:56	18.7	1:53
600	24.5	2:29	23.6	2:27	22.9	2:23	22.5	2:19	22.4	2:15
700	28.5	2:53	27.5	2:51	26.7	2:46	26.1	2:42	26.0	2:37
800	32.5	3:18	31.3	3:16	30.4	3:10	29.8	3:05	29.6	2:59
900	36.4	3:43	35.1	3:40	34.1	3:34	33.4	3:28	33.2	3:22
1000	40.3	4:08	38.8	4:05	37.8	3:58	37.0	3:51	36.7	3:44

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	150	200	250	300	350
5	-0.8	-0.5	0.0	1.6	2.6
10	-1.8	-1.1	0.0	3.0	5.6
15	-2.8	-1.6	0.0	4.4	8.6
20	-3.7	-2.2	0.0	5.6	11.6
25	-4.5	-2.7	0.0	6.8	14.4
30	-5.4	-3.2	0.0	7.8	17.3
35	-6.2	-3.7	0.0	8.7	20.0
40	-7.0	-4.2	0.0	9.5	22.7
45	-7.7	-4.7	0.0	10.2	25.3

Based on Long Range Cruise and VREF30+80 descent. Includes APU fuel burn.

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

**Holding
Flaps Up**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)			
	1500	5000	10000	15000
340	%N1	95.5		
	KIAS	260		
	FF/ENG	14970		
320	%N1	93.4	97.2	
	KIAS	253	253	
	FF/ENG	13980	14120	
300	%N1	91.1	94.3	
	KIAS	244	244	
	FF/ENG	12970	12940	
280	%N1	89.3	92.3	98.8
	KIAS	238	238	238
	FF/ENG	12100	12090	12660
260	%N1	86.8	90.0	94.8
	KIAS	229	229	229
	FF/ENG	11100	11180	11340
240	%N1	84.6	88.0	92.2
	KIAS	223	223	223
	FF/ENG	10310	10380	10460
220	%N1	82.3	85.7	90.0
	KIAS	217	217	217
	FF/ENG	9540	9590	9650
200	%N1	80.8	84.2	88.6
	KIAS	217	217	217
	FF/ENG	9080	9130	9180
180	%N1	79.6	82.9	87.5
	KIAS	217	217	217
	FF/ENG	8700	8750	8780
160	%N1	78.6	81.7	86.4
	KIAS	217	217	217
	FF/ENG	8380	8420	8430

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

Performance Inflight Text

Chapter PI Section 37

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer. 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 Flight Manual, the Flight Manual shall always take precedence.

General

FMC Takeoff Speeds

FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. 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. 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. This typically occurs at full rated thrust and light weights and is shown in the Minimum Takeoff Weight tables provided in the Performance Dispatch Takeoff section. The options are to select a smaller flaps setting, use reduced takeoff thrust and/or add weight (fuel). Selecting derate thrust is the preferred method of reduced takeoff thrust as this will reduce the minimum control speeds.

Clearway and Stopway V1 Adjustments

Takeoff speed corrections are to be applied to V1 when using takeoff weights based on the use of clearway and stopway.

Adjust V1 by the amount shown in the table. The adjusted V1 must not exceed VR. If V1 is greater than VR, VR may be increased to equal V1. The resultant V2 will be increased by the same amount that VR was increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

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

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 13mm (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 is determined as follows:

- (1) Determine the dry field/obstacle limit weight for the takeoff flap setting.
- (2) 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.
- (3) Adjust field length available for temperature by amount shown on chart.

- (4) Enter the V1(MCG) Limit Weight table with the field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

- (1) Determine takeoff speeds V1, VR and V2 for actual brake release weight using Takeoff Speeds from the Performance Dispatch chapter or from the FMC.
- (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

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. Good reported braking action denotes wet runway conditions or runways covered by compact snow. Similarly, poor braking action denotes runways covered with wet ice. Performance is based on reversers operating and a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than the minimum V1 for control on the ground, V1(MCG). It is therefore necessary to compare the adjusted V1 to V1(MCG). To find V1(MCG), enter the V1(MCG) table with 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 weight adjustment is required provided that the field length available exceeds the minimum field length required shown in the Field and Climb Limit Weight table.

Go-Around %N1

To find Go-Around %N1 based on normal engine bleed for packs on and anti-ice off, enter the Go-Around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. %N1 adjustments are shown for engine bleeds for various conditions.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body 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 may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

All Engines

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of approximately 1.3g (39° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 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, .84 Mach approximates the Long Range Cruise Mach schedule.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .84/310/250 descent. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table 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.

Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

Descent at .84/310/250

Distance and time for descent are shown for a .84/310/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing Flaps 30 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 for the selected flap setting. Flaps 1 is based on VREF30 + 60 speed schedule. 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

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. 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.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing 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 corrections for off-reference landing weight, altitude, wind, slope, and speed conditions. Each correction is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the 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.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy 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, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

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 Mach number of .84 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 engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude 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/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Long Range Cruise Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the following table. These increments include the APU fuel flow and the effect of increased drag from the APU door.

PRESSURE ALTITUDE (1000 FT)	APU FUEL FLOW PENALTY (KG/HR)				
	GROSS WEIGHT (1000 KG)				
	300	260	220	180	140
43				160	140
39			180	160	145
35		200	190	170	140
31	230	220	195	165	140
25	230	220	195	175	155
20	235	230	205	185	165
15	235	235	215	200	185
10	240	240	230	220	200
5	270	270	255	240	220

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 .84/310/250 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 corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Alternate Mode EEC

No takeoff speed adjustments or other performance adjustments are required for operation of EEC in the ALTERNATE mode. Power setting adjustments are only required for the takeoff thrust rating.

Max Takeoff %N1

Takeoff power settings are presented for normal air condition bleed. Max Takeoff %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. 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 will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

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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Maximum Allowable Clearway

FIELD LENGTH (M)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (M)
1500	170
2000	210
2500	255
3000	300
3500	340
4000	385
4500	430

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (M)	NORMAL V1 (KIAS)							
	DRY RUNWAY				WET RUNWAY			
	100	120	140	160	100	120	140	160
300	-3	-3	-3	-3				
200	-3	-3	-3	-3				
100	-1	-1	-1	-1				
0	0	0	0	0	0	0	0	0
-100	5	4	3	2	4	2	2	2
-200	7	6	5	4	5	4	4	4
-300	7	6	5	5	7	6	5	4

VREF**Flaps 30**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	186	186	186	186	187	187
340	180	180	180	180	180	180
320	173	173	173	173	173	173
300	164	164	164	164	164	165
280	158	158	158	158	158	158
260	149	149	149	150	150	150
240	143	144	144	144	144	144
220	137	137	138	138	138	138
200	137	134	131	131	131	131
180	137	134	130	126	124	124
160	137	134	130	126	121	117

Flaps 25

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	185	185	185	185	185	185
340	180	180	180	180	181	181
320	175	175	175	175	175	176
300	169	170	170	170	170	170
280	164	164	164	164	164	164
260	158	158	158	158	158	158
240	152	152	152	152	152	152
220	145	145	146	146	146	146
200	139	139	139	139	139	139
180	137	134	131	131	131	132
160	137	134	130	126	124	124

Flaps 20

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)					
	0	2000	4000	6000	8000	10000
360	195	195	195	196	196	198
340	190	190	190	191	191	192
320	185	185	185	185	185	186
300	179	179	179	179	180	180
280	173	173	173	173	174	174
260	167	167	167	167	167	167
240	160	160	161	161	161	161
220	154	154	154	154	154	154
200	147	147	147	147	147	147
180	139	139	139	139	139	139
160	137	134	131	131	131	131

Flap Maneuver Speed

FLAP POSITION	MANEUVER SPEED
FLAPS 0	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

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ADVISORY INFORMATION**Slush/Standing Water Takeoff****Maximum Reverse Thrust****Weight Adjustment (1000 KG)**

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)		PRESS ALT (FT)			PRESS ALT (FT)			
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
400	-46.6	-52.1	-57.5	-54.5	-60.0	-65.4	-68.0	-73.4	-78.9
380	-43.7	-49.1	-54.6	-51.1	-56.5	-61.9	-63.3	-68.8	-74.2
360	-40.8	-46.2	-51.7	-47.6	-53.0	-58.5	-58.7	-64.2	-69.6
340	-37.8	-43.2	-48.7	-44.0	-49.5	-54.9	-54.0	-59.5	-64.9
320	-34.7	-40.1	-45.6	-40.3	-45.7	-51.2	-49.2	-54.6	-60.0
300	-31.4	-36.8	-42.3	-36.3	-41.8	-47.2	-44.1	-49.6	-55.0
280	-27.9	-33.4	-38.8	-32.2	-37.7	-43.1	-38.9	-44.3	-49.8
260	-24.4	-29.8	-35.2	-27.9	-33.3	-38.8	-33.5	-38.9	-44.4
240	-20.6	-26.0	-31.5	-23.4	-28.8	-34.3	-27.9	-33.4	-38.8
220	-16.7	-22.1	-27.6	-18.7	-24.1	-29.5	-22.2	-27.6	-33.1
200	-12.6	-18.1	-23.5	-13.8	-19.2	-24.6	-16.3	-21.7	-27.1
180	-8.4	-13.9	-19.3	-8.6	-14.1	-19.5	-10.2	-15.6	-21.1
160	-4.2	-9.6	-15.0	-3.5	-8.9	-14.4	-4.0	-9.4	-14.9

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
2200			133.1			154.8			
2400	154.6		167.7			189.4			
2600	188.9	124.0	202.3	136.9		224.3	158.6		
2800	223.6	158.3	237.3	171.5		259.5	193.2	127.8	
3000	258.7	192.7	272.7	206.1	140.7	295.1	228.1	162.4	
3200	294.3	227.4	308.6	241.2	175.3	331.1	263.4	197.0	
3400	330.4	262.6	196.5	345.0	276.7	210.0	367.5	299.0	232.0
3600	367.0	298.3	231.3	381.7	312.6	245.0		335.1	267.3
3800		334.4	266.5		349.0	280.6		371.5	303.0
4000		371.1	302.2		385.8	316.6			339.1
4200			338.5			353.0			375.5
4400			375.1			389.8			

- Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
- Adjust field length available by -65 m/+65 m for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- 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.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
360	-29	-27	-25	-25	-23	-21	-16	-14	-12
340	-31	-29	-27	-26	-24	-22	-17	-15	-13
320	-32	-30	-28	-27	-25	-23	-18	-16	-14
300	-32	-30	-28	-28	-26	-24	-19	-17	-15
280	-32	-30	-28	-28	-26	-24	-20	-18	-16
260	-32	-30	-28	-28	-26	-24	-22	-20	-18
240	-31	-29	-27	-29	-27	-25	-23	-21	-19
220	-31	-29	-27	-29	-27	-25	-24	-22	-20
200	-31	-29	-27	-29	-27	-25	-25	-23	-21
180	-31	-29	-27	-30	-28	-26	-26	-24	-22
160	-32	-30	-28	-30	-28	-26	-27	-25	-23

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 Adjustment (1000 KG)**

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3 mm (0.12 INCHES)			6 mm (0.25 INCHES)			13 mm (0.50 INCHES)		
	PRESS ALT (FT)		PRESS ALT (FT)			PRESS ALT (FT)			
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
400	-61.2	-66.6	-72.1	-70.8	-76.3	-81.7	-86.6	-92.0	-97.5
380	-57.3	-62.8	-68.2	-66.2	-71.6	-77.0	-80.3	-85.7	-91.2
360	-53.5	-59.0	-64.4	-61.5	-66.9	-72.4	-74.0	-79.4	-84.9
340	-49.7	-55.1	-60.5	-56.7	-62.2	-67.6	-67.7	-73.1	-78.6
320	-45.7	-51.1	-56.5	-51.9	-57.4	-62.8	-61.4	-66.8	-72.3
300	-41.5	-47.0	-52.4	-47.0	-52.4	-57.9	-55.1	-60.5	-66.0
280	-37.3	-42.7	-48.1	-42.0	-47.4	-52.8	-48.8	-54.3	-59.7
260	-32.9	-38.3	-43.8	-36.8	-42.3	-47.7	-42.6	-48.0	-53.5
240	-28.3	-33.8	-39.2	-31.6	-37.0	-42.5	-36.3	-41.8	-47.2
220	-23.7	-29.1	-34.6	-26.2	-31.7	-37.1	-30.1	-35.5	-41.0
200	-18.9	-24.3	-29.8	-20.8	-26.2	-31.7	-23.9	-29.3	-34.8
180	-14.0	-19.4	-24.9	-15.3	-20.7	-26.1	-17.7	-23.1	-28.6
160	-9.0	-14.5	-19.9	-9.7	-15.1	-20.6	-11.5	-16.9	-22.4

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
3200						130.5		
3400						177.6		
3600						223.1	127.1	
3800				166.4			265.4	174.2
4000	133.8			220.4			304.9	220.0
4200	198.1			267.2	162.3		342.1	262.4
4400	251.9	129.2		308.9	216.8		377.7	302.1
4600	297.1	193.7		347.0	264.0	158.3		339.5
4800	336.8	248.3	124.5	382.7	306.1	213.1		259.5
5000	372.9	294.0	189.3		344.3	260.8		375.2
5200		334.1	244.8		380.1	303.2		299.3
5400		370.4	290.9			341.7		
5600			331.3			377.6		

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 -100 m/+100 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****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.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
360	-45	-41	-37	-39	-35	-31	-26	-22	-18
340	-47	-43	-39	-40	-36	-32	-27	-23	-19
320	-47	-43	-39	-42	-38	-34	-29	-25	-21
300	-48	-44	-40	-43	-39	-35	-31	-27	-23
280	-48	-44	-40	-43	-39	-35	-33	-29	-25
260	-48	-44	-40	-44	-40	-36	-35	-31	-27
240	-47	-43	-39	-44	-40	-36	-37	-33	-29
220	-47	-43	-39	-45	-41	-37	-39	-35	-31
200	-48	-44	-40	-46	-42	-38	-41	-37	-33
180	-48	-44	-40	-47	-43	-39	-43	-39	-35
160	-49	-45	-41	-48	-44	-40	-44	-40	-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
Maximum Reverse Thrust
Weight Adjustments (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
400	0.0	-0.1	-1.9	-20.7	-22.5	-24.4	-40.6	-42.4	-44.2
380	-1.2	-3.0	-4.8	-22.4	-24.2	-26.0	-40.6	-42.4	-44.2
360	-4.1	-6.0	-7.8	-24.1	-25.9	-27.7	-40.6	-42.4	-44.2
340	-6.6	-8.4	-10.2	-25.3	-27.1	-28.9	-40.2	-42.0	-43.8
320	-7.8	-9.6	-11.5	-25.1	-27.0	-28.8	-38.6	-40.4	-42.3
300	-7.8	-9.6	-11.4	-23.8	-25.6	-27.4	-36.0	-37.8	-39.6
280	-6.9	-8.7	-10.5	-21.4	-23.2	-25.1	-32.6	-34.4	-36.2
260	-5.9	-7.7	-9.6	-19.1	-20.9	-22.7	-29.1	-30.9	-32.7
240	-5.0	-6.8	-8.6	-16.8	-18.6	-20.4	-25.5	-27.4	-29.2
220	-4.1	-5.9	-7.8	-14.5	-16.3	-18.1	-22.0	-23.8	-25.6
200	-3.3	-5.1	-6.9	-12.2	-14.0	-15.8	-18.4	-20.2	-22.0
180	-2.5	-4.3	-6.1	-9.9	-11.7	-13.5	-14.8	-16.6	-18.4
160	-1.6	-3.5	-5.3	-7.7	-9.5	-11.3	-11.1	-13.0	-14.8

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
1600	142.0								
1800	209.7	143.6							
2000	277.1	211.3	145.2						
2200	344.2	278.7	212.9	167.0					
2400		345.8	280.3	215.2	150.7				
2600			347.4	265.0	198.6	134.3	138.0		
2800				316.4	247.8	182.2	169.4		
3000				369.7	298.6	230.8	201.0	137.6	
3200					351.3	281.0	233.5	169.0	
3400						333.1	267.0	200.6	137.2
3600						386.8	301.7	233.1	168.7
3800							337.7	266.6	200.2
4000							374.9	301.3	232.7
4200								337.2	266.2
4400								374.5	300.8

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/+35 m for every 5°C above/below 4°C.
Adjust "Medium" field length available by -45 m/+45 m for every 5°C above/below 4°C.
Adjust "Poor" field length available by -65 m/+65 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 Adjustments (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)		S.L.	PRESS ALT (FT)		S.L.	PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
360	-9	-7	-5	-21	-19	-17	-36	-34	-32
340	-11	-9	-7	-24	-22	-20	-39	-37	-35
320	-13	-11	-9	-26	-24	-22	-41	-39	-37
300	-13	-11	-9	-27	-25	-23	-42	-40	-38
280	-14	-12	-10	-28	-26	-24	-43	-41	-39
260	-14	-12	-10	-28	-26	-24	-44	-42	-40
240	-14	-12	-10	-29	-27	-25	-45	-43	-41
220	-15	-13	-11	-29	-27	-25	-45	-43	-41
200	-16	-14	-12	-30	-28	-26	-46	-44	-42
180	-17	-15	-13	-32	-30	-28	-47	-45	-43
160	-18	-16	-14	-33	-31	-29	-48	-46	-44

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 Adjustment (1000 KG)**

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000
400	-5.8	-7.7	-9.5	-36.3	-38.1	-39.9	-61.5	-63.3	-65.1
380	-8.4	-10.2	-12.0	-36.6	-38.4	-40.2	-59.5	-61.3	-63.1
360	-11.0	-12.8	-14.6	-36.9	-38.7	-40.5	-57.5	-59.3	-61.1
340	-13.1	-14.9	-16.7	-36.8	-38.7	-40.5	-55.2	-57.0	-58.9
320	-14.1	-15.9	-17.7	-35.9	-37.7	-39.5	-52.3	-54.1	-55.9
300	-13.9	-15.7	-17.5	-33.9	-35.7	-37.5	-48.6	-50.5	-52.3
280	-12.9	-14.7	-16.5	-31.2	-33.1	-34.9	-44.5	-46.3	-48.1
260	-11.8	-13.6	-15.4	-28.5	-30.3	-32.1	-40.3	-42.1	-43.9
240	-10.6	-12.4	-14.2	-25.6	-27.4	-29.2	-36.0	-37.8	-39.6
220	-9.4	-11.2	-13.0	-22.6	-24.4	-26.2	-31.6	-33.5	-35.3
200	-8.1	-9.9	-11.7	-19.5	-21.3	-23.1	-27.3	-29.1	-30.9
180	-6.8	-8.6	-10.4	-16.2	-18.1	-19.9	-22.8	-24.6	-26.4
160	-5.5	-7.3	-9.1	-13.0	-14.8	-16.6	-18.4	-20.2	-22.0

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (M)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000
2000	160.6								
2200	267.0	170.8							
2400	350.7	274.9	180.9						
2600									
2800									
3200									
3400					315.4	182.3			
3600					385.0	292.7	138.1		
3800						366.4	267.6		
4000							347.5		
5000								193.4	
5200								265.6	140.7
5400								334.4	215.0
5600								286.2	162.6

- Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.
- Adjust "Good" field length available by -35 m/+35 m for every 5°C above/below 4°C.
Adjust "Medium" field length available by -60 m/+60 m for every 5°C above/below 4°C.
Adjust "Poor" field length available by -90 m/+90 m for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- 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)		PRESS ALT (FT)	PRESS ALT (FT)		PRESS ALT (FT)
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
360	-13	-9	-5	-31	-27	-23	-57	-53	-49
340	-15	-11	-7	-33	-29	-25	-61	-57	-53
320	-16	-12	-8	-36	-32	-28	-64	-60	-56
300	-18	-14	-10	-38	-34	-30	-67	-63	-59
280	-19	-15	-11	-40	-36	-32	-69	-65	-61
260	-20	-16	-12	-42	-38	-34	-71	-67	-63
240	-21	-17	-13	-43	-39	-35	-73	-69	-65
220	-22	-18	-14	-45	-41	-37	-75	-71	-67
200	-23	-19	-15	-47	-43	-39	-77	-73	-69
180	-24	-20	-16	-50	-46	-42	-79	-75	-71
160	-26	-22	-18	-53	-49	-45	-81	-77	-73

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.

Minimum Control Speeds**V1(MCG), Minimum VR****Max Takeoff Thrust**

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	125	127	121	124	119	122	117	120	115	118	111	114
50	122	129	131	125	128	119	122	117	120	117	120	111	114
40	104	136	138	133	135	127	130	122	125	117	120	111	114
30	86	138	140	138	140	133	136	128	130	122	125	115	118
20	68	139	140	138	140	134	137	131	133	126	129	119	123
-60	-76	140	140	139	140	136	137	132	133	127	129	121	124

DRAFT

Go-around %N1

REPORTED OAT		TAT	AIRPORT PRESSURE ALTITUDE (1000 FT)												
°C	°F		-2	-1	0	1	2	3	4	5	6	7	8	9	10
66	150	70	93.2	93.3	93.6	93.4	93.3	93.3	93.4	93.3	92.6	91.5	90.5	89.6	
56	133	60	95.9	96.1	96.4	96.2	96.1	96.1	96.2	96.1	95.4	94.3	93.4	92.5	
51	124	55	97.2	97.6	97.9	97.7	97.5	97.5	97.5	97.5	96.7	95.7	94.7	93.9	
46	115	50	98.5	98.9	99.3	99.2	98.9	98.8	98.8	98.8	98.7	98.0	97.0	96.1	95.2
41	106	45	99.6	100.1	100.6	100.5	100.2	100.2	100.1	100.2	100.0	99.3	98.3	97.3	96.5
36	97	40	100.4	101.6	102.4	102.3	101.9	101.8	101.7	101.7	101.3	100.5	99.5	98.6	97.8
31	88	35	99.6	101.2	103.2	104.4	103.9	103.7	103.6	103.5	102.7	101.7	100.6	99.7	98.9
26	79	30	98.8	100.4	102.3	103.8	105.1	105.9	105.9	106.1	105.0	103.4	101.9	100.8	100.0
21	70	25	97.9	99.5	101.5	102.9	104.2	105.2	106.3	107.2	106.8	105.7	104.0	102.3	101.3
16	61	20	97.1	98.7	100.6	102.0	103.3	104.3	105.4	106.5	106.8	106.3	105.2	104.2	103.3
11	53	15	96.3	97.9	99.8	101.2	102.4	103.4	104.5	105.6	105.9	105.5	104.9	104.4	104.0
7	44	10	95.4	97.0	98.9	100.3	101.5	102.5	103.6	104.6	105.0	104.6	104.0	103.5	103.4
2	35	5	94.6	96.1	98.0	99.4	100.6	101.6	102.7	103.7	104.1	103.7	103.1	102.5	102.5
-3	26	0	93.7	95.3	97.1	98.5	99.7	100.7	101.7	102.8	103.1	102.7	102.1	101.6	101.6
-13	8	-10	92.0	93.5	95.3	96.7	97.9	98.8	99.8	100.9	101.2	100.8	100.3	99.7	99.7
-23	-10	-20	90.2	91.7	93.5	94.8	96.0	96.9	97.9	98.9	99.3	98.9	98.3	97.8	97.8
-33	-27	-30	88.4	89.9	91.7	92.9	94.1	95.0	96.0	97.0	97.3	96.9	96.4	95.9	95.8
-43	-45	-40	86.6	88.0	89.7	91.0	92.1	93.0	94.0	95.0	95.3	94.9	94.4	93.9	93.9
-53	-63	-50	84.7	86.1	87.8	89.0	90.1	91.0	91.9	92.9	93.2	92.9	92.3	91.8	91.8

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)												
	-2	-1	0	1	2	3	4	5	6	7	8	9	10
PACKS OFF	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
1 PACK ON	-0.2	-0.2	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3
WING ANTI-ICE ON	-0.2	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

Max Climb %N1**Based on engine bleed for packs on or off and anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	.84	.84	.84
60	88.3	88.1	90.3	91.0	93.1	96.7	99.6	101.7	101.8	101.3
50	90.6	90.4	90.2	89.6	91.7	95.3	98.0	100.1	100.2	99.7
40	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
30	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6
20	90.1	92.5	95.1	95.8	95.9	95.9	96.9	95.9	95.5	95.0
15	89.3	91.7	94.3	96.9	96.9	96.9	97.8	96.6	95.8	95.4
10	88.6	90.9	93.5	96.1	98.4	98.1	98.8	97.2	96.5	96.0
5	87.8	90.1	92.7	95.2	98.1	99.6	100.1	98.1	97.2	96.8
0	87.0	89.3	91.8	94.4	97.3	99.9	101.5	99.3	98.1	97.6
-5	86.2	88.5	91.0	93.5	96.4	99.0	101.9	100.5	99.5	98.8
-10	85.4	87.7	90.1	92.6	95.5	98.1	100.9	101.3	100.5	100.0
-15	84.6	86.8	89.3	91.7	94.5	97.1	100.0	101.0	100.9	100.5
-20	83.7	86.0	88.4	90.8	93.6	96.2	99.0	100.1	99.9	99.5
-25	82.9	85.1	87.5	89.9	92.7	95.2	98.0	99.1	98.9	98.5
-30	82.1	84.3	86.7	89.0	91.8	94.3	97.0	98.1	97.9	97.5
-35	81.2	83.4	85.8	88.1	90.8	93.3	96.0	97.0	96.9	96.5
-40	80.4	82.5	84.9	87.2	89.8	92.3	95.0	96.0	95.9	95.5

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.3	-0.4	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.3	-0.4	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6

*Packs on or packs off with 2 bleed sources.

**Packs off with 1 bleed source.

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

Climb**Flaps Up, Set Max Climb Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	PITCH ATT	5.0	4.5			
	V/S (FT/MIN)	2500	1500			
30000 (280 KIAS)	PITCH ATT	6.5	5.5	5.5	5.0	4.5
	V/S (FT/MIN)	3700	2600	1800	1300	900
20000 (270 KIAS)	PITCH ATT	9.5	8.5	8.0	7.5	7.5
	V/S (FT/MIN)	5000	3600	2700	2000	1400
10000 (270 KIAS)	PITCH ATT	14.0	11.5	10.0	9.5	9.5
	V/S (FT/MIN)	6700	4900	3700	2900	2200
SEA LEVEL (270 KIAS)	PITCH ATT	17.5	14.5	12.5	11.5	11.0
	V/S (FT/MIN)	7800	5700	4400	3500	2800

Cruise**Flaps Up, %N1 for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	PITCH ATT	2.0	3.0			
	%N1	78.6	83.2			
35000 (.82M)	PITCH ATT	1.5	2.0	3.0	3.5	
	%N1	76.5	78.9	82.8	88.0	
30000 (280 KIAS)	PITCH ATT	1.5	2.5	3.0	3.5	3.5
	%N1	72.6	74.7	78.1	82.4	87.3
25000 (280 KIAS)	PITCH ATT	1.5	2.5	3.5	4.0	4.0
	%N1	68.6	70.7	73.8	77.7	82.3
20000 (270 KIAS)	PITCH ATT	2.0	2.5	3.5	4.5	5.5
	%N1	63.4	65.8	69.0	72.8	77.4
15000 (270 KIAS)	PITCH ATT	1.5	2.5	3.5	4.5	5.5
	%N1	59.6	61.8	65.0	68.2	72.5

Descent**Flaps Up, Set Idle Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		150	200	250	300	350
40000 (.82M)	PITCH ATT	-1.5	0.0			
	V/S (FT/MIN)	-2900	-2600			
30000 (280 KIAS)	PITCH ATT	-1.5	-0.5	0.5	1.0	0.5
	V/S (FT/MIN)	-2500	-2000	-1900	-1900	-2400
20000 (270 KIAS)	PITCH ATT	-1.0	0.5	1.5	2.5	3.0
	V/S (FT/MIN)	-1900	-1600	-1500	-1400	-1400
10000 (270 KIAS)	PITCH ATT	-1.5	0.0	1.0	2.0	3.0
	V/S (FT/MIN)	-1700	-1400	-1300	-1300	-1300
SEA LEVEL (270 KIAS)	PITCH ATT	-2.0	-0.5	1.0	2.0	3.0
	V/S (FT/MIN)	-1500	-1300	-1200	-1200	-1200

In shaded areas, data reflects the minimum speed limitation of 15 knots above minimum maneuvering speed.

Flight With Unreliable Airspeed / Turbulent Air Penetration

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

Holding

Flaps Up, Set Thrust for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		150	200	250	300	350
10000	PITCH ATT	3.0	4.5	5.5	6.0	6.0
	%N1	50.2	54.4	59.1	63.9	68.2
	KIAS	216	216	226	244	262
5000	PITCH ATT	3.0	4.5	5.5	6.0	6.0
	%N1	46.6	50.9	55.4	59.7	64.2
	KIAS	216	216	226	244	262

Terminal Area (5000 FT)

%N1 for Level Flight

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS UP GEAR UP (VREF 30 + 80)	PITCH ATT	3.5	5.0	6.0	6.5	6.5
	%N1	47.7	52.3	57.2	61.9	66.4
	KIAS	217	217	225	243	263
FLAPS 1 GEAR UP (VREF 30 + 60)	PITCH ATT	5.0	6.5	8.0	8.0	8.0
	%N1	48.5	53.4	58.8	63.9	68.2
	KIAS	197	197	205	223	243
FLAPS 5 GEAR UP (VREF 30 + 40)	PITCH ATT	3.5	5.5	7.0	7.0	6.5
	%N1	48.8	54.0	59.7	64.7	69.0
	KIAS	177	177	185	203	223
FLAPS 15 GEAR UP (VREF 30 + 20)	PITCH ATT	3.5	6.5	8.0	7.5	7.0
	%N1	49.0	55.2	61.9	66.8	71.2
	KIAS	157	157	165	183	203
FLAPS 20 GEAR DOWN (VREF 30 + 20)	PITCH ATT	2.0	4.5	6.5	6.0	5.5
	%N1	56.2	61.4	67.3	73.1	78.1
	KIAS	157	157	165	183	203

Final Approach (1500 FT)

Gear Down, %N1 for 3° Glideslope

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 KG)				
		150	200	250	300	350
FLAPS 20 (VREF 20 + 10)	PITCH ATT	0.0	2.0	2.0	2.5	2.5
	%N1	36.8	40.7	45.1	49.3	52.6
	KIAS	147	155	172	187	201
FLAPS 25 (VREF 25 + 10)	PITCH ATT	1.0	2.0	2.0	2.5	2.5
	%N1	51.5	49.8	54.7	59.2	63.3
	KIAS	147	147	163	178	191
FLAPS 30 (VREF 30 + 10)	PITCH ATT	0.0	1.0	2.0	1.5	
	%N1	56.9	55.6	60.2	65.3	
	KIAS	147	147	155	172	

Performance Inflight

All Engine

Chapter PI

Section 41

Long Range Cruise Maximum Operating Altitude

Max Climb Thrust

ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30(39°)	1.40(44°)	1.50(48°)
360	27300	5	30400	28800	27200
350	27900	4	31000	29400	27800
340	28500	3	31700	30000	28500
330	29200	1	32200	30500	29000
320	29900	0	32700	31000	29500
310	30600	-2	33200	31600	30000
300	31300	-4	33700	32100	30600
290	32000	-5	34300	32700	31200
280	32800	-7	34900	33300	31800
270	33600	-9	35500	33900	32400
260	34400	-11	36100	34500	33100
250	35200	-12	36800	35200	33800
240	36000	-14	37500	35900	34500
230	36900	-15	38200	36600	35200
220	37800	-15	39000	37400	36000
210	38800	-15	39800	38200	36800
200	39800	-15	40600	39000	37700
190	40900	-15	41500	39900	38600
180	42000	-15	42500	40900	39600
170	43100	-15	43100	42100	40800
160	43100	-15	43100	43100	42000

ISA + 15°C

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	11	30400	28800	27200
350	27900	10	31000	29400	27800
340	28500	8	31700	30000	28500
330	29200	7	32200	30500	29000
320	29900	5	32700	31000	29500
310	30600	4	33200	31600	30000
300	31300	2	33700	32100	30600
290	32000	0	34300	32700	31200
280	32800	-1	34900	33300	31800
270	33600	-3	35500	33900	32400
260	34400	-5	36100	34500	33100
250	35200	-7	36800	35200	33800
240	36000	-9	37500	35900	34500
230	36900	-9	38200	36600	35200
220	37800	-9	39000	37400	36000
210	38800	-9	39800	38200	36800
200	39800	-9	40600	39000	37700
190	40900	-9	41500	39900	38600
180	42000	-9	42500	40900	39600
170	43100	-9	43100	42100	40800
160	43100	-9	43100	43100	42000

Long Range Cruise Maximum Operating Altitude**Max Climb Thrust****ISA + 20°C**

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
360	27300	17	30400	28800	27200
350	27900	15	31000	29400	27800
340	28500	14	31700	30000	28500
330	29200	12	32200	30500	29000
320	29900	11	32700	31000	29500
310	30600	9	33200	31600	30000
300	31300	8	33700	32100	30600
290	32000	6	34300	32700	31200
280	32800	4	34900	33300	31800
270	33600	3	35500	33900	32400
260	34400	1	36100	34500	33100
250	35200	-1	36800	35200	33800
240	36000	-3	37500	35900	34500
230	36900	-3	38200	36600	35200
220	37800	-3	39000	37400	36000
210	38800	-3	39800	38200	36800
200	39800	-3	40600	39000	37700
190	40900	-3	41500	39900	38600
180	42000	-3	42500	40900	39600
170	43100	-3	43100	42100	40800
160	43100	-3	43100	43100	42000

Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		25	27	29	31	33	35	37	39	41	43
360	%N1	84.0	86.0	87.6	90.1						
	MACH	.819	.840	.837	.830						
	KIAS	346	342	326	310						
	FF/ENG	5139	5211	5162	5303						
340	%N1	83.0	84.7	86.1	88.1						
	MACH	.819	.839	.840	.835						
	KIAS	346	341	328	312						
	FF/ENG	4943	4959	4875	4910						
320	%N1	81.9	83.1	84.6	86.0	88.3					
	MACH	.818	.833	.840	.839	.833					
	KIAS	346	339	327	313	297					
	FF/ENG	4735	4662	4585	4523	4633					
300	%N1	80.2	81.8	82.9	84.5	86.1					
	MACH	.800	.823	.836	.840	.837					
	KIAS	337	334	326	314	299					
	FF/ENG	4416	4391	4316	4248	4232					
280	%N1	78.4	80.1	81.6	82.9	84.4	86.2				
	MACH	.775	.806	.827	.838	.840	.836				
	KIAS	326	326	322	313	300	285				
	FF/ENG	4088	4112	4069	4004	3948	3972				
260	%N1	76.6	78.3	80.0	81.3	82.8	84.2	86.6			
	MACH	.746	.780	.810	.830	.839	.839	.834			
	KIAS	313	315	315	309	300	287	272			
	FF/ENG	3751	3796	3803	3758	3703	3653	3726			
240	%N1	74.7	76.3	78.0	79.7	81.0	82.5	84.3			
	MACH	.720	.749	.783	.813	.831	.839	.839			
	KIAS	302	302	303	303	297	287	274			
	FF/ENG	3448	3464	3501	3503	3460	3406	3378			
220	%N1	73.1	74.2	75.8	77.6	79.3	80.6	82.5	84.7		
	MACH	.701	.721	.750	.785	.815	.832	.840	.838		
	KIAS	293	289	289	291	290	284	274	261		
	FF/ENG	3203	3158	3175	3207	3211	3165	3130	3132		
200	%N1	71.1	72.5	73.6	75.2	77.0	78.8	80.4	82.7	84.9	
	MACH	.680	.700	.719	.748	.784	.814	.832	.840	.838	
	KIAS	284	280	277	276	278	277	271	262	249	
	FF/ENG	2958	2915	2872	2886	2917	2918	2888	2878	2879	
180	%N1	68.6	70.2	71.7	72.8	74.4	76.2	78.4	80.4	82.7	84.8
	MACH	.648	.675	.697	.715	.744	.780	.812	.831	.839	.839
	KIAS	270	270	267	263	263	264	264	259	250	238
	FF/ENG	2673	2665	2631	2592	2599	2622	2636	2634	2624	2609
160	%N1	65.8	67.4	69.1	70.7	71.9	73.3	75.5	78.1	80.2	82.5
	MACH	.612	.639	.667	.691	.710	.735	.772	.806	.828	.838
	KIAS	254	254	255	253	250	248	249	250	246	238
	FF/ENG	2392	2386	2375	2356	2321	2308	2335	2372	2379	2356

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitude

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
282	261	242	226	213	200	191	182	174	167	160
559	519	482	451	424	400	382	366	351	337	325
837	777	723	677	637	600	574	550	528	508	489
1115	1035	964	902	849	800	766	734	705	678	653
1395	1295	1206	1129	1061	1000	957	918	881	848	817
1675	1555	1447	1354	1273	1200	1149	1101	1057	1017	980
1956	1815	1689	1581	1486	1400	1340	1285	1234	1187	1144
2237	2075	1931	1807	1698	1600	1532	1469	1410	1356	1307
2520	2338	2174	2034	1911	1800	1723	1652	1586	1525	1470
2803	2599	2417	2260	2124	2000	1915	1835	1762	1695	1633

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	3.8	0:38	3.3	0:37	2.8	0:35	2.5	0:35	2.2	0:34
400	7.9	1:11	7.2	1:09	6.3	1:04	5.7	1:02	5.3	1:00
600	11.9	1:45	11.0	1:40	9.8	1:33	9.0	1:30	8.4	1:26
800	15.9	2:19	14.8	2:13	13.2	2:02	12.2	1:58	11.5	1:52
1000	19.9	2:53	18.6	2:45	16.6	2:31	15.4	2:26	14.5	2:19
1200	23.8	3:27	22.3	3:17	20.0	3:01	18.6	2:54	17.5	2:45
1400	27.8	4:02	26.0	3:50	23.4	3:31	21.8	3:23	20.5	3:12
1600	31.6	4:37	29.7	4:23	26.8	4:01	24.9	3:51	23.5	3:39
1800	35.5	5:12	33.3	4:56	30.1	4:31	28.1	4:19	26.5	4:06
2000	39.3	5:47	36.9	5:30	33.4	5:01	31.2	4:48	29.4	4:33

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	150	200	250	300	350
5	-0.7	-0.4	0.0	0.4	1.1
10	-1.6	-0.8	0.0	1.1	2.5
15	-2.5	-1.3	0.0	1.7	3.9
20	-3.3	-1.7	0.0	2.3	5.2
25	-4.1	-2.2	0.0	2.9	6.5
30	-4.9	-2.6	0.0	3.6	7.8
35	-5.7	-3.1	0.0	4.2	9.0
40	-6.4	-3.5	0.0	4.8	10.2

Long Range Cruise Enroute Fuel and Time - High Altitude
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	
649	613	580	551	524	500	479	459	441	424	409	
1286	1217	1154	1098	1047	1000	959	921	886	853	823	
1926	1824	1730	1646	1570	1500	1439	1383	1330	1282	1237	
2569	2432	2307	2195	2094	2000	1920	1845	1775	1710	1651	
3215	3043	2886	2745	2617	2500	2400	2306	2219	2139	2065	
3864	3656	3466	3296	3142	3000	2880	2768	2664	2568	2479	
4516	4271	4047	3847	3666	3500	3360	3229	3108	2996	2893	
5170	4888	4630	4400	4192	4000	3840	3691	3552	3424	3306	
5826	5506	5214	4953	4717	4500	4320	4152	3996	3852	3719	
6485	6126	5798	5506	5242	5000	4800	4613	4440	4279	4132	
7146	6748	6384	6061	5768	5500	5280	5074	4883	4706	4545	
7809	7371	6972	6616	6295	6000	5759	5534	5326	5133	4956	
8474	7996	7559	7171	6821	6500	6238	5994	5768	5558	5367	
9144	8624	8149	7728	7348	7000	6717	6454	6209	5983	5776	
9818	9255	8741	8286	7876	7500	7196	6912	6649	6406	6184	
10496	9889	9335	8845	8404	8000	7674	7371	7089	6829	6591	
11179	10526	9932	9406	8933	8500	8153	7829	7528	7251	6997	
11866	11167	10530	9968	9462	9000	8631	8286	7966	7671	7401	
12559	11811	11131	10531	9993	9500	9108	8742	8403	8090	7804	
13256	12459	11735	11096	10523	10000	9585	9198	8839	8508	8206	

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)
500	6.9	1:10	6.7	1:10	6.5	1:10	6.4	1:10	6.4	1:11
1000	14.3	2:17	13.8	2:13	13.5	2:12	13.2	2:12	13.2	2:13
1500	21.6	3:23	21.0	3:17	20.4	3:15	20.1	3:14	20.0	3:15
2000	29.0	4:29	28.2	4:21	27.4	4:17	26.9	4:17	26.8	4:18
2500	36.0	5:37	35.1	5:27	34.2	5:21	33.5	5:19	33.2	5:20
3000	43.1	6:46	42.0	6:33	40.9	6:25	40.0	6:22	39.7	6:22
3500	49.9	7:56	48.6	7:41	47.4	7:30	46.3	7:25	45.8	7:25
4000	56.7	9:06	55.2	8:49	53.8	8:35	52.7	8:29	52.0	8:27
4500	63.2	10:18	61.6	9:59	60.1	9:42	58.7	9:34	57.9	9:31
5000	69.7	11:30	68.0	11:09	66.3	10:50	64.8	10:38	63.9	10:34
5500	76.0	12:44	74.1	12:21	72.3	11:59	70.7	11:45	69.6	11:38
6000	82.3	13:57	80.2	13:32	78.3	13:09	76.5	12:52	75.3	12:42
6500	88.4	15:13	86.1	14:46	84.1	14:21	82.1	14:01	80.7	13:48
7000	94.5	16:28	92.0	15:59	89.8	15:32	87.8	15:10	86.2	14:54
7500	100.4	17:46	97.7	17:14	95.4	16:46	93.2	16:21	91.5	16:02
8000	106.2	19:05	103.4	18:30	100.9	17:59	98.6	17:32	96.8	17:10
8500	112.0	20:26	109.0	19:47	106.3	19:14	103.8	18:45	101.9	18:20
9000	117.7	21:48	114.5	21:05	111.7	20:29	109.0	19:58	106.9	19:30
9500	123.3	23:12	119.9	22:26	116.9	21:46	114.1	21:13	111.8	20:43
10000	129.0	24:37	125.3	23:47	122.0	23:03	119.1	22:28	116.7	21:55

Long Range Cruise Enroute Fuel and Time - High Altitude

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	150	200	250	300	350
10	-2.3	-1.2	0.0	3.2	13.1
20	-4.4	-2.4	0.0	5.4	18.3
30	-6.5	-3.6	0.0	7.4	23.1
40	-8.6	-4.8	0.0	9.3	27.5
50	-10.8	-5.9	0.0	11.1	31.4
60	-13.0	-7.0	0.0	12.7	35.0
70	-15.2	-8.1	0.0	14.2	38.1
80	-17.5	-9.2	0.0	15.6	40.9
90	-19.8	-10.3	0.0	16.8	43.2
100	-22.1	-11.3	0.0	18.0	45.1
110	-24.4	-12.3	0.0	19.0	46.6
120	-26.8	-13.3	0.0	19.8	47.7
130	-29.2	-14.3	0.0	20.6	48.4

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)										
	360	340	320	300	280	260	240	220	200	180	160
43						120	55	17	1	3	
41						105	50	17	2	1	12
39					87	43	15	2	1	10	25
37			119	68	33	11	1	1	9	22	40
35		89	50	24	8	1	1	9	21	36	54
33	64	35	15	4	0	2	9	21	35	50	67
31	22	9	2	0	4	11	21	34	49	64	79
29	4	0	1	5	13	23	35	48	62	76	89
27	0	3	8	16	25	36	48	61	74	86	97
25	5	11	19	28	38	50	61	73	84	94	104

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. Read wind factors for present and new altitudes from table.
2. Determine difference (new altitude wind factor minus present altitude wind factor);
This difference may be negative or positive.
3. Break-even wind at new altitude is present altitude wind plus difference from step 2.

Descent at .84M/310/250

PRESSURE ALTITUDE (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	96	103	110	117	123	128	133	139	145	150
TIME (MINUTES)	20	21	22	23	24	24	25	26	26	27

**Holding
Flaps Up**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
360	%N1	62.0	64.9	69.0	73.3	78.3	83.1	88.2		
	KIAS	264	264	265	269	308	312	310		
	FF/ENG	4660	4620	4570	4590	4840	5020	5300		
340	%N1	60.5	63.4	67.5	71.7	76.7	81.6	86.4		
	KIAS	260	260	260	260	299	302	307		
	FF/ENG	4410	4360	4310	4310	4540	4680	4890		
320	%N1	58.8	61.5	65.7	69.8	74.9	79.6	84.4	91.3	
	KIAS	253	253	253	253	289	293	297	278	
	FF/ENG	4130	4080	4030	4020	4210	4320	4480	4980	
300	%N1	57.2	59.7	63.9	67.9	72.6	77.6	82.3	88.0	
	KIAS	244	244	244	244	259	283	287	278	
	FF/ENG	3860	3810	3760	3740	3800	3990	4130	4430	
280	%N1	55.6	58.0	62.1	66.1	70.7	75.7	80.5	85.6	
	KIAS	238	238	238	238	238	272	276	278	
	FF/ENG	3630	3570	3510	3480	3500	3690	3810	4030	
260	%N1	53.9	56.3	60.1	64.3	68.6	73.7	78.5	83.5	93.7
	KIAS	229	229	229	229	229	262	265	269	247
	FF/ENG	3390	3330	3270	3230	3240	3400	3500	3630	4260
240	%N1	52.2	54.5	58.2	62.3	66.5	71.1	76.2	81.2	88.6
	KIAS	223	223	223	223	223	228	254	258	247
	FF/ENG	3180	3110	3030	2990	2990	3010	3190	3290	3640
220	%N1	50.4	52.7	56.2	60.1	64.3	68.7	73.9	78.9	85.6
	KIAS	217	217	217	217	217	217	242	246	231
	FF/ENG	2970	2890	2800	2760	2740	2740	2890	2980	3530
200	%N1	48.4	50.9	54.4	58.0	62.2	66.3	71.3	76.3	82.8
	KIAS	217	217	217	217	217	217	226	233	231
	FF/ENG	2790	2710	2610	2570	2530	2520	2570	2670	2830
180	%N1	46.6	49.1	52.7	56.2	60.1	64.3	68.7	73.4	79.9
	KIAS	217	217	217	217	217	217	217	220	226
	FF/ENG	2630	2550	2450	2400	2360	2380	2320	2370	2500
160	%N1	45.1	47.4	51.0	54.5	58.2	62.3	66.5	71.0	77.1
	KIAS	217	217	217	217	217	217	217	217	217
	FF/ENG	2560	2470	2370	2300	2250	2220	2170	2160	2230

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

**Holding
Flaps 1**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
360	%N1	64.8	67.6	72.3	76.7
	KIAS	244	244	244	244
	FF/ENG	5150	5130	5110	5150
340	%N1	63.2	66.0	70.3	74.9
	KIAS	240	240	240	240
	FF/ENG	4840	4810	4790	4810
320	%N1	61.5	64.4	68.5	73.1
	KIAS	233	233	233	233
	FF/ENG	4540	4510	4480	4490
300	%N1	59.7	62.6	66.6	71.3
	KIAS	224	224	224	224
	FF/ENG	4250	4220	4190	4190
280	%N1	57.9	60.6	64.7	69.1
	KIAS	218	218	218	218
	FF/ENG	3970	3930	3890	3880
260	%N1	56.1	58.6	62.8	66.9
	KIAS	209	209	209	209
	FF/ENG	3700	3650	3600	3600
240	%N1	54.2	56.6	60.6	64.6
	KIAS	203	203	203	203
	FF/ENG	3430	3370	3310	3300
220	%N1	52.1	54.5	58.2	62.3
	KIAS	197	197	197	197
	FF/ENG	3170	3100	3030	3010
200	%N1	50.1	52.3	55.9	59.8
	KIAS	197	197	197	197
	FF/ENG	2940	2860	2770	2730
180	%N1	47.9	50.3	53.8	57.4
	KIAS	197	197	197	197
	FF/ENG	2740	2650	2550	2510
160	%N1	45.9	48.4	51.8	55.2
	KIAS	197	197	197	197
	FF/ENG	2630	2540	2430	2380

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

Performance Inflight

Advisory Information

Chapter PI

Section 42

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

	REF DIST	LANDING DISTANCE AND ADJUSTMENTS (M)						
		WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD / TAIL WIND	DOWN / UP HILL	ABOVE / BELOW ISA	PER 5 KTS ABOVE VREF30	ONE REV NO REV

Dry Runway

MAX MANUAL	990	+25/-5	20	-40/+130	+10/-10	+20/-20	35	20	45
AUTOBRAKE MAX	1335	+25/-5	35	-55/+190	0/0	+35/-35	65	0	0
AUTOBRAKE 4	1740	+40/-5	45	-80/+270	0/0	+45/-50	95	0	0
AUTOBRAKE 3	2065	+45/-15	60	-100/+335	0/-5	+60/-60	115	0	0
AUTOBRAKE 2	2315	+50/-25	70	-115/+390	+20/-50	+65/-65	90	45	45
AUTOBRAKE 1	2530	+60/-30	85	-130/+455	+75/-80	+75/-75	90	245	285

Good Reported Braking Action

MAX MANUAL	1620	+35/-10	45	-75/+265	+40/-35	+40/-40	65	100	230
AUTOBRAKE MAX	1680	+35/-10	45	-80/+270	+35/-30	+40/-40	70	105	245
AUTOBRAKE 4	2010	+45/-5	60	-90/+315	+10/-5	+60/-60	110	5	40
AUTOBRAKE 3	2375	+50/-15	70	-115/+385	0/-5	+70/-70	130	0	0
AUTOBRAKE 2	2660	+60/-30	80	-130/+450	+25/-60	+75/-75	105	50	50
AUTOBRAKE 1	2910	+70/-35	100	-150/+525	+85/-90	+85/-85	105	280	330

Medium Reported Braking Action

MAX MANUAL	2195	+45/-25	70	-120/+430	+100/-80	+60/-60	80	265	690
AUTOBRAKE MAX	2200	+45/-25	70	-120/+430	+105/-80	+60/-60	80	265	690
AUTOBRAKE 4	2260	+50/-10	70	-120/+435	+85/-50	+65/-65	110	255	690
AUTOBRAKE 3	2505	+60/-15	75	-130/+470	+50/-40	+75/-75	130	115	475
AUTOBRAKE 2	2730	+60/-30	85	-145/+500	+70/-80	+75/-80	105	115	350
AUTOBRAKE 1	2920	+70/-35	100	-155/+535	+115/-100	+85/-85	105	305	455

Poor Reported Braking Action

MAX MANUAL	2825	+65/-35	100	-180/+665	+230/-155	+80/-80	90	550	1650
AUTOBRAKE MAX	2835	+65/-35	105	-180/+665	+230/-155	+80/-80	90	560	1655
AUTOBRAKE 4	2835	+65/-30	105	-180/+665	+230/-150	+80/-80	100	560	1655
AUTOBRAKE 3	2900	+70/-30	100	-180/+680	+200/-120	+85/-85	125	520	1620
AUTOBRAKE 2	3040	+70/-35	105	-185/+690	+195/-150	+85/-85	105	425	1505
AUTOBRAKE 1	3150	+75/-40	110	-190/+715	+225/-160	+90/-90	105	525	1430

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 75 m.

For autobrake and manual speedbrakes, increase reference landing distance by 60 m.

Distances for GOOD, MEDIUM, and POOR are increased by 15%.

Includes distance from 50 ft above threshold (305 meters of unfactored air distance).

ADVISORY INFORMATION**Normal Configuration Landing Distance****Flaps 25**

LANDING DISTANCE AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADI PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF25	ONE REV NO REV

Dry Runway

MAX MANUAL	1045	+25/-10	25	-40/+135	+15/-10	+25/-25	35	25	50
AUTOBRAKE MAX	1445	+20/-10	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 4	1900	+30/-15	50	-85/+285	0/0	+55/-55	100	0	0
AUTOBRAKE 3	2265	+35/-25	65	-105/+350	0/-15	+65/-65	110	0	0
AUTOBRAKE 2	2510	+40/-35	80	-120/+405	+30/-60	+70/-70	90	80	80
AUTOBRAKE 1	2735	+50/-40	95	-140/+470	+85/-90	+80/-80	90	295	370

Good Reported Braking Action

MAX MANUAL	1725	+25/-15	45	-80/+275	+45/-40	+45/-45	65	110	265
AUTOBRAKE MAX	1800	+30/-15	50	-80/+280	+40/-30	+45/-45	75	115	280
AUTOBRAKE 4	2195	+35/-15	65	-100/+335	+10/-5	+65/-65	115	5	45
AUTOBRAKE 3	2605	+40/-30	75	-120/+400	0/-15	+75/-75	125	0	0
AUTOBRAKE 2	2885	+45/-40	90	-140/+465	+35/-70	+80/-80	105	90	90
AUTOBRAKE 1	3145	+60/-45	110	-160/+540	+100/-105	+90/-90	105	340	425

Medium Reported Braking Action

MAX MANUAL	2350	+40/-30	75	-120/+450	+105/-85	+65/-65	80	295	775
AUTOBRAKE MAX	2350	+40/-30	75	-125/+450	+110/-80	+65/-65	85	295	775
AUTOBRAKE 4	2450	+40/-25	75	-125/+455	+80/-50	+70/-70	115	260	755
AUTOBRAKE 3	2735	+40/-30	80	-140/+490	+50/-50	+80/-80	125	115	500
AUTOBRAKE 2	2955	+50/-40	90	-150/+520	+80/-90	+85/-85	105	155	410
AUTOBRAKE 1	3155	+60/-45	110	-160/+560	+125/-110	+90/-90	105	360	560

Poor Reported Braking Action

MAX MANUAL	3020	+60/-40	110	-185/+685	+235/-160	+85/-85	90	615	1855
AUTOBRAKE MAX	3030	+60/-40	110	-185/+685	+240/-165	+85/-85	90	615	1865
AUTOBRAKE 4	3030	+60/-40	110	-185/+685	+240/-155	+85/-85	105	620	1865
AUTOBRAKE 3	3140	+60/-40	110	-185/+695	+200/-130	+90/-90	125	540	1795
AUTOBRAKE 2	3275	+60/-45	115	-190/+715	+215/-160	+100/-100	105	490	1680
AUTOBRAKE 1	3390	+65/-50	120	-195/+730	+240/-175	+100/-100	105	590	1620

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 80 m.

For autobrake and manual speedbrakes, increase reference landing distance by 65 m.

Distances for GOOD, MEDIUM, and POOR are increased by 15%.

Includes distance from 50 ft above threshold (305 meters of unfactored air distance).

ADVISORY INFORMATION

Normal Configuration Landing Distance Flaps 20

REF DIST	WEIGHT ADJ	ALT ADJ	LANDING DISTANCE AND ADJUSTMENTS (M)					APP SPD ADJ	REVERSE THRUST ADJ
			WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	DOWN / UP HILL	ABOVE / BELOW ISA		
BRAKING CONFIGURATION	260000 KG LANDING WT	PER 5000 KG ABOVE / BELOW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD / TAIL WIND	DOWN / UP HILL	ABOVE / BELOW ISA	PER 5 KTS ABOVE VREF20	ONE REV	NO REV

Dry Runway

MAX MANUAL	1120	+30/-10	25	-40/+140	+15/-15	+25/-25	40	25	60
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 4	2080	+30/-25	60	-90/+295	0/0	+60/-60	105	0	0
AUTOBRAKE 3	2480	+40/-35	70	-110/+370	0/-15	+75/-75	120	0	0
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95
AUTOBRAKE 1	3010	+55/-50	105	-145/+495	+90/-100	+90/-90	100	350	425

Good Reported Braking Action

MAX MANUAL	1870	+30/-25	50	-80/+290	+45/-40	+45/-45	65	130	310
AUTOBRAKE MAX	1945	+30/-25	60	-85/+295	+40/-30	+50/-50	80	140	330
AUTOBRAKE 4	2400	+35/-30	70	-105/+350	+10/0	+70/-70	120	10	50
AUTOBRAKE 3	2850	+45/-40	80	-125/+425	0/-15	+85/-85	140	0	0
AUTOBRAKE 2	3175	+50/-50	105	-145/+490	+40/-70	+90/-90	115	110	110
AUTOBRAKE 1	3460	+65/-60	120	-165/+570	+105/-115	+105/-105	115	400	490

Medium Reported Braking Action

MAX MANUAL	2560	+45/-40	85	-130/+465	+115/-90	+70/-70	85	345	920
AUTOBRAKE MAX	2560	+45/-40	85	-130/+465	+120/-90	+75/-75	85	345	915
AUTOBRAKE 4	2660	+45/-35	85	-130/+475	+85/-60	+75/-75	120	300	885
AUTOBRAKE 3	2990	+45/-45	90	-145/+510	+60/-50	+85/-85	140	130	590
AUTOBRAKE 2	3245	+60/-50	105	-155/+545	+85/-100	+100/-100	115	180	475
AUTOBRAKE 1	3475	+65/-60	120	-175/+585	+130/-120	+105/-105	115	430	640

Poor Reported Braking Action

MAX MANUAL	3300	+65/-50	120	-190/+715	+260/-180	+100/-100	100	720	2200
AUTOBRAKE MAX	3305	+65/-50	120	-190/+715	+265/-180	+100/-100	100	720	2200
AUTOBRAKE 4	3305	+65/-50	120	-190/+715	+265/-165	+100/-100	105	720	2200
AUTOBRAKE 3	3425	+65/-50	120	-195/+725	+220/-140	+105/-105	130	625	2120
AUTOBRAKE 2	3580	+65/-60	125	-200/+740	+225/-175	+110/-110	115	565	1995
AUTOBRAKE 1	3720	+70/-65	140	-205/+765	+260/-190	+110/-110	110	690	1910

Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 85 m.

For autobrake and manual speedbrakes, increase reference landing distance by 70 m.

Distances for GOOD, MEDIUM, and POOR are increased by 15%.

Includes distance from 50 ft above threshold (305 meters of unfactored air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ANTISKID - Flaps 25****VREF25**

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10°C	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	2045	+35/-25	65	-105/+390	+90/-75	+55/-55	70	255	675
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Good Reported Braking Action

MAX MANUAL	2045	+35/-25	65	-105/+390	+90/-75	+55/-55	70	255	675
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Medium Reported Braking Action

MAX MANUAL	2625	+50/-35	95	-160/+595	+205/-140	+75/-75	80	535	1615
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Poor Reported Braking Action

MAX MANUAL	3565	+75/-60	140	-265/+1110	+1265/-315	+110/-110	90	1435	5000
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ANTISKID - Flaps 30

VREF30

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1910	+40/-20	60	-105/+375	+85/-70	+50/-50	70	230	600
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Good Reported Braking Action

MAX MANUAL	1910	+40/-20	60	-105/+375	+85/-70	+50/-50	70	230	600
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Medium Reported Braking Action

MAX MANUAL	2455	+55/-30	85	-155/+580	+200/-135	+70/-70	80	480	1435
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Poor Reported Braking Action

MAX MANUAL	3345	+80/-45	130	-255/+1090	+1220/-305	+100/-100	90	1320	5000
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****ENG SHUTDOWN L, R - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1130	+35/-10	25	-45/+145	+15/-15	+25/-25	40	0	30
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2840	+45/-40	85	-130/+435	+5/-20	+85/-85	140	0	0

Good Reported Braking Action

MAX MANUAL	1700	+25/-20	50	-75/+265	+50/-45	+45/-45	60	0	150
AUTOBRAKE MAX	1775	+25/-25	50	-80/+270	+45/-40	+50/-50	70	0	160
AUTOBRAKE 2	2840	+45/-40	85	-130/+435	+5/-20	+85/-85	140	0	0

Medium Reported Braking Action

MAX MANUAL	2445	+40/-35	80	-125/+445	+135/-105	+70/-70	85	0	460
AUTOBRAKE MAX	2450	+40/-35	80	-125/+445	+135/-95	+70/-70	95	0	455
AUTOBRAKE 3	2675	+45/-35	85	-135/+465	+90/-60	+80/-80	125	0	345

Poor Reported Braking Action

MAX MANUAL	3325	+60/-55	115	-195/+710	+330/-215	+100/-100	105	0	1125
AUTOBRAKE MAX	3330	+60/-55	120	-195/+710	+335/-215	+100/-100	105	0	1130
AUTOBRAKE 3	3365	+65/-55	120	-195/+715	+320/-205	+100/-105	110	0	1140

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

ENG SHUTDOWN L, R - Flaps 30

VREF30

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	995	+30/-5	20	-40/+135	+15/-10	+20/-20	40	0	25
AUTOBRAKE MAX	1335	+25/-5	35	-55/+190	0/0	+35/-35	65	0	0
AUTOBRAKE 2	2345	+55/-15	70	-115/+390	+10/-15	+70/-70	125	0	0

Good Reported Braking Action

MAX MANUAL	1460	+30/-10	40	-70/+245	+40/-35	+40/-40	60	0	110
AUTOBRAKE MAX	1525	+30/-10	40	-70/+250	+40/-35	+40/-40	65	0	120
AUTOBRAKE 2	2345	+55/-15	70	-115/+390	+10/-15	+70/-70	125	0	0

Medium Reported Braking Action

MAX MANUAL	2070	+45/-20	65	-115/+410	+110/-85	+60/-60	80	0	340
AUTOBRAKE MAX	2070	+45/-15	65	-115/+410	+115/-80	+60/-60	85	0	340
AUTOBRAKE 3	2235	+50/-15	70	-120/+425	+80/-55	+65/-65	110	0	270

Poor Reported Braking Action

MAX MANUAL	2790	+65/-30	95	-175/+655	+280/-180	+85/-85	95	0	825
AUTOBRAKE MAX	2795	+65/-30	95	-175/+655	+285/-180	+85/-85	95	0	830
AUTOBRAKE 3	2830	+65/-30	95	-175/+660	+270/-180	+85/-85	95	0	840

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAP / SLAT CONTROL - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10°C	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1120	+30/-10	25	-40/+140	+15/-15	+25/-25	40	25	60
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95

Good Reported Braking Action

MAX MANUAL	1625	+25/-20	45	-70/+250	+40/-35	+40/-40	55	115	270
AUTOBRAKE MAX	1690	+25/-20	50	-75/+255	+35/-25	+45/-45	70	120	285
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95

Medium Reported Braking Action

MAX MANUAL	2225	+40/-35	75	-115/+405	+100/-80	+60/-60	75	300	800
AUTOBRAKE MAX	2225	+40/-35	75	-115/+405	+105/-80	+65/-65	75	300	795
AUTOBRAKE 3	2600	+40/-40	80	-125/+445	+50/-45	+75/-75	120	115	515

Poor Reported Braking Action

MAX MANUAL	2870	+55/-45	105	-165/+620	+225/-155	+85/-85	85	625	1915
AUTOBRAKE MAX	2875	+55/-45	105	-165/+620	+230/-155	+85/-85	85	625	1915
AUTOBRAKE 3	2980	+55/-45	105	-170/+630	+190/-120	+90/-90	115	545	1845

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

FLAPS DRIVE - (Flaps ≤ 5)

VREF30+40

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1300	+55/-10	45	-45/+205	+20/-15	+40/-35	55	55	130
AUTOBRAKE MAX	1910	+35/-5	50	-70/+230	0/0	+50/-50	80	0	0
AUTOBRAKE 2	3345	+70/-40	115	-140/+470	+60/-75	+100/-100	115	225	225

Good Reported Braking Action

MAX MANUAL	1850	+30/-15	55	-75/+265	+45/-40	+50/-50	55	155	375
AUTOBRAKE MAX	1995	+35/-5	55	-80/+275	+20/-15	+55/-55	80	95	330
AUTOBRAKE 2	3345	+70/-40	115	-140/+470	+60/-75	+100/-100	115	225	225

Medium Reported Braking Action

MAX MANUAL	2570	+50/-25	90	-120/+425	+110/-90	+75/-75	75	415	1170
AUTOBRAKE MAX	2570	+50/-25	90	-120/+425	+110/-80	+75/-75	80	410	1160
AUTOBRAKE 3	3160	+60/-30	100	-140/+485	+60/-60	+95/-95	120	150	690

Poor Reported Braking Action

MAX MANUAL	3335	+70/-40	130	-175/+655	+245/-170	+100/-100	90	870	2925
AUTOBRAKE MAX	3335	+70/-40	130	-175/+655	+245/-170	+100/-100	90	870	2925
AUTOBRAKE 3	3530	+75/-40	130	-185/+670	+215/-140	+105/-110	120	690	2750

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS DRIVE - (5 < Flaps < 20)****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10°C	TEMP ADJ PER 5 KTS	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1135	+40/-5	25	-40/+145	+15/-15	+25/-25	40	30	65
AUTOBRAKE MAX	1605	+30/-5	40	-65/+210	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2845	+60/-30	90	-130/+435	+35/-50	+85/-85	115	85	85

Good Reported Braking Action

MAX MANUAL	1660	+30/-10	50	-75/+250	+40/-35	+45/-45	60	125	305
AUTOBRAKE MAX	1715	+35/-5	50	-75/+255	+35/-25	+45/-45	70	125	315
AUTOBRAKE 2	2845	+60/-30	90	-130/+435	+35/-50	+85/-85	115	85	85

Medium Reported Braking Action

MAX MANUAL	2290	+50/-20	75	-115/+410	+105/-85	+65/-65	75	340	930
AUTOBRAKE MAX	2290	+50/-20	75	-115/+410	+105/-85	+65/-65	75	335	925
AUTOBRAKE 3	2665	+55/-20	80	-130/+450	+50/-45	+80/-80	125	120	625

Poor Reported Braking Action

MAX MANUAL	2965	+65/-35	110	-170/+630	+230/-160	+85/-85	90	710	2280
AUTOBRAKE MAX	2970	+65/-35	110	-170/+630	+235/-160	+90/-90	90	710	2285
AUTOBRAKE 3	3055	+70/-30	110	-170/+640	+210/-125	+90/-90	120	630	2205

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

FLAPS DRIVE - (Flaps ≥ 20)

VREF20

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1120	+30/-10	25	-40/+140	+15/-15	+25/-25	40	25	60
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95

Good Reported Braking Action

MAX MANUAL	1625	+25/-20	45	-70/+250	+40/-35	+40/-40	55	115	270
AUTOBRAKE MAX	1690	+25/-20	50	-75/+255	+35/-25	+45/-45	70	120	285
AUTOBRAKE 2	2760	+45/-45	90	-125/+425	+35/-60	+80/-80	100	95	95

Medium Reported Braking Action

MAX MANUAL	2225	+40/-35	75	-115/+405	+100/-80	+60/-60	75	300	800
AUTOBRAKE MAX	2225	+40/-35	75	-115/+405	+105/-80	+65/-65	75	300	795
AUTOBRAKE 3	2600	+40/-40	80	-125/+445	+50/-45	+75/-75	120	115	515

Poor Reported Braking Action

MAX MANUAL	2870	+55/-45	105	-165/+620	+225/-155	+85/-85	85	625	1915
AUTOBRAKE MAX	2875	+55/-45	105	-165/+620	+230/-155	+85/-85	85	625	1915
AUTOBRAKE 3	2980	+55/-45	105	-170/+630	+190/-120	+90/-90	115	545	1845

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****FLAPS PRIMARY FAIL - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1280	+30/-15	30	-45/+155	+15/-15	+30/-30	50	35	80
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2825	+45/-45	85	-130/+430	+15/-35	+85/-85	125	30	30

Good Reported Braking Action

MAX MANUAL	1820	+25/-25	50	-80/+270	+50/-45	+45/-45	70	140	340
AUTOBRAKE MAX	1820	+25/-25	55	-80/+270	+50/-40	+50/-50	75	140	335
AUTOBRAKE 2	2825	+45/-45	85	-130/+430	+15/-35	+85/-85	125	30	30

Medium Reported Braking Action

MAX MANUAL	2445	+40/-35	80	-120/+430	+115/-90	+70/-70	85	360	985
AUTOBRAKE MAX	2445	+40/-35	80	-120/+425	+120/-95	+70/-70	85	360	975
AUTOBRAKE 3	2640	+40/-35	80	-130/+450	+70/-45	+80/-80	130	180	795

Poor Reported Braking Action

MAX MANUAL	3110	+60/-50	115	-175/+650	+250/-170	+90/-90	100	725	2315
AUTOBRAKE MAX	3110	+60/-50	115	-175/+650	+255/-175	+90/-90	100	725	2315
AUTOBRAKE 3	3135	+60/-50	115	-175/+650	+245/-150	+95/-95	115	700	2285

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

FLIGHT CONTROL MODE - Flaps 20

VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1295	+30/-15	30	-50/+160	+20/-15	+30/-30	50	35	85
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2845	+45/-45	85	-130/+435	+5/-30	+85/-85	135	10	10

Good Reported Braking Action

MAX MANUAL	1850	+30/-25	55	-80/+275	+50/-45	+50/-50	75	150	365
AUTOBRAKE MAX	1850	+30/-25	55	-80/+270	+50/-45	+50/-50	75	145	355
AUTOBRAKE 2	2845	+45/-45	85	-130/+435	+5/-30	+85/-85	135	10	10

Medium Reported Braking Action

MAX MANUAL	2495	+45/-35	85	-125/+435	+120/-95	+70/-70	90	385	1060
AUTOBRAKE MAX	2495	+45/-35	85	-120/+435	+125/-100	+70/-70	90	380	1050
AUTOBRAKE 3	2650	+40/-35	80	-130/+450	+80/-45	+80/-80	130	225	895

Poor Reported Braking Action

MAX MANUAL	3180	+60/-50	120	-180/+655	+260/-175	+95/-95	105	775	2515
AUTOBRAKE MAX	3180	+60/-50	120	-180/+655	+265/-185	+95/-95	105	775	2515
AUTOBRAKE 3	3195	+60/-50	120	-180/+660	+260/-160	+95/-95	115	760	2500

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS C - Flaps 20****VREF20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1280	+30/-15	30	-45/+155	+15/-15	+30/-30	50	35	80
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2825	+45/-45	85	-130/+430	+15/-35	+85/-85	125	30	30

Good Reported Braking Action

MAX MANUAL	1820	+25/-25	50	-80/+270	+50/-45	+45/-45	70	140	340
AUTOBRAKE MAX	1820	+25/-25	55	-80/+270	+50/-40	+50/-50	75	140	335
AUTOBRAKE 2	2825	+45/-45	85	-130/+430	+15/-35	+85/-85	125	30	30

Medium Reported Braking Action

MAX MANUAL	2445	+40/-35	80	-120/+430	+115/-90	+70/-70	85	360	985
AUTOBRAKE MAX	2445	+40/-35	80	-120/+425	+120/-95	+70/-70	85	360	975
AUTOBRAKE 3	2640	+40/-35	80	-130/+450	+70/-45	+80/-80	130	180	795

Poor Reported Braking Action

MAX MANUAL	3110	+60/-50	115	-175/+650	+250/-170	+90/-90	100	725	2315
AUTOBRAKE MAX	3110	+60/-50	115	-175/+650	+255/-175	+90/-90	100	725	2315
AUTOBRAKE 3	3135	+60/-50	115	-175/+650	+245/-150	+95/-95	115	700	2285

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS L - Flaps 25

VREF25

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/Below ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1125	+25/-10	25	-45/+150	+15/-15	+25/-25	45	0	35
AUTOBRAKE MAX	1445	+20/-10	35	-60/+195	0/0	+35/-35	70	0	0
AUTOBRAKE 2	2595	+40/-25	75	-125/+415	0/0	+75/-75	145	0	0

Good Reported Braking Action

MAX MANUAL	1700	+25/-15	50	-80/+270	+55/-45	+45/-45	70	0	160
AUTOBRAKE MAX	1740	+25/-15	50	-80/+275	+50/-40	+45/-45	75	0	165
AUTOBRAKE 2	2595	+40/-25	75	-125/+415	0/0	+75/-75	145	0	0

Medium Reported Braking Action

MAX MANUAL	2460	+40/-30	80	-130/+465	+150/-115	+70/-70	90	0	510
AUTOBRAKE MAX	2465	+40/-30	80	-130/+465	+155/-115	+70/-70	95	0	510
AUTOBRAKE 3	2530	+40/-25	80	-135/+470	+130/-70	+75/-75	125	0	500

Poor Reported Braking Action

MAX MANUAL	3395	+60/-45	120	-210/+780	+400/-245	+105/-105	110	0	1310
AUTOBRAKE MAX	3405	+60/-45	125	-210/+780	+405/-245	+105/-105	110	0	1310
AUTOBRAKE 3	3405	+60/-45	125	-210/+780	+405/-235	+105/-105	120	0	1310

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS L - Flaps 30****VREF30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1060	+30/-5	25	-40/+145	+15/-15	+25/-25	45	0	30
AUTOBRAKE MAX	1335	+25/-5	35	-55/+190	0/0	+35/-35	65	0	0
AUTOBRAKE 2	2360	+55/-10	70	-115/+395	0/0	+70/-70	140	0	0

Good Reported Braking Action

MAX MANUAL	1595	+30/-10	45	-75/+265	+50/-45	+40/-40	70	0	145
AUTOBRAKE MAX	1620	+35/-10	45	-75/+265	+45/-40	+45/-45	75	0	145
AUTOBRAKE 2	2360	+55/-10	70	-115/+395	0/0	+70/-70	140	0	0

Medium Reported Braking Action

MAX MANUAL	2305	+50/-20	75	-125/+455	+145/-110	+65/-65	90	0	460
AUTOBRAKE MAX	2305	+50/-20	75	-125/+455	+145/-110	+65/-65	95	0	460
AUTOBRAKE 3	2345	+55/-15	75	-130/+455	+135/-75	+70/-70	110	0	465

Poor Reported Braking Action

MAX MANUAL	3185	+70/-35	115	-200/+760	+385/-230	+95/-95	110	0	1190
AUTOBRAKE MAX	3195	+70/-35	115	-200/+760	+390/-235	+95/-95	110	0	1195
AUTOBRAKE 3	3195	+70/-35	115	-200/+760	+390/-230	+95/-95	110	0	1195

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS L+C - Flaps 20

VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1420	+40/-5	35	-50/+175	+25/-20	+35/-35	65	0	55
AUTOBRAKE MAX	1605	+30/-5	40	-65/+210	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2930	+60/-10	85	-130/+440	0/0	+90/-90	155	0	0

Good Reported Braking Action

MAX MANUAL	2125	+40/-10	60	-90/+310	+75/-65	+60/-60	90	0	255
AUTOBRAKE MAX	2125	+40/-10	60	-90/+305	+80/-60	+60/-60	95	0	245
AUTOBRAKE 2	2930	+60/-10	85	-130/+440	0/0	+90/-90	155	0	0

Medium Reported Braking Action

MAX MANUAL	3040	+65/-25	100	-150/+525	+195/-150	+90/-90	120	0	770
AUTOBRAKE MAX	3040	+65/-25	100	-150/+520	+205/-155	+90/-90	120	0	760
AUTOBRAKE 3	3040	+65/-20	100	-150/+520	+205/-140	+90/-90	125	0	765

Poor Reported Braking Action

MAX MANUAL	4140	+90/-45	155	-235/+860	+500/-305	+125/-125	140	0	1920
AUTOBRAKE MAX	4140	+90/-45	155	-235/+860	+515/-315	+130/-130	140	0	1915
AUTOBRAKE 3	4140	+90/-45	155	-235/+860	+515/-315	+130/-130	140	0	1915

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS L+R - Flaps 20****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10°C	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1530	+40/-5	40	-60/+205	+35/-30	+40/-40	70	0	0
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Good Reported Braking Action

MAX MANUAL	2545	+50/-10	75	-120/+400	+135/-110	+75/-75	115	0	0
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 2					Autobrake inoperative				

Medium Reported Braking Action

MAX MANUAL	4095	+75/-20	125	-215/+745	+470/-305	+130/-130	160	0	0
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Poor Reported Braking Action

MAX MANUAL	6545	+110/-35	210	-400/+1475	+2250/-810	+210/-210	200	0	0
AUTOBRAKE MAX					Autobrake inoperative				
AUTOBRAKE 3					Autobrake inoperative				

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS R - Flaps 25

VREF25

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1245	+20/-10	30	-50/+170	+25/-20	+30/-30	50	0	50
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Good Reported Braking Action

MAX MANUAL	1870	+30/-20	55	-90/+310	+70/-60	+50/-50	75	0	220
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Medium Reported Braking Action

MAX MANUAL	2660	+45/-30	90	-145/+525	+185/-135	+80/-80	95	0	640
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Poor Reported Braking Action

MAX MANUAL	3595	+65/-50	130	-230/+875	+515/-280	+110/-110	110	0	1565
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****HYD PRESS SYS R - Flaps 30****VREF30**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 5 KTS	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1165	+20/-5	30	-50/+165	+20/-20	+30/-30	50	0	45
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Good Reported Braking Action

MAX MANUAL	1730	+35/-10	50	-85/+300	+65/-55	+45/-45	75	0	190
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Medium Reported Braking Action

MAX MANUAL	2440	+55/-20	80	-140/+505	+170/-125	+70/-70	90	0	545
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Poor Reported Braking Action

MAX MANUAL	3295	+70/-35	120	-220/+845	+480/-260	+100/-100	105	0	1330
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

HYD PRESS SYS R+C - Flaps 20

VREF30+20

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1755	+30/-5	50	-70/+235	+45/-40	+45/-45	80	0	130
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Good Reported Braking Action

MAX MANUAL	2605	+55/-15	80	-120/+410	+130/-105	+75/-75	110	0	480
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 2						Autobrake inoperative			

Medium Reported Braking Action

MAX MANUAL	3625	+80/-35	130	-190/+680	+325/-225	+110/-110	135	0	1295
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Poor Reported Braking Action

MAX MANUAL	4795	+105/-55	185	-295/+1110	+915/-430	+150/-150	150	0	3035
AUTOBRAKE MAX						Autobrake inoperative			
AUTOBRAKE 3						Autobrake inoperative			

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****PITCH UP AUTHORITY - (Flaps ≤ 15)****VREF30+40**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1290	+50/-5	35	-45/+175	+15/-15	+30/-30	40	40	85
AUTOBRAKE MAX	1910	+35/-5	50	-70/+230	0/0	+50/-50	80	0	0
AUTOBRAKE 2	3265	+65/-40	110	-140/+460	+70/-85	+95/-95	100	280	290

Good Reported Braking Action

MAX MANUAL	1880	+35/-15	55	-80/+265	+45/-40	+50/-50	60	150	365
AUTOBRAKE MAX	2010	+35/-10	55	-80/+280	+25/-20	+55/-55	80	110	335
AUTOBRAKE 2	3265	+65/-40	110	-140/+460	+70/-85	+95/-95	100	280	290

Medium Reported Braking Action

MAX MANUAL	2570	+50/-25	85	-120/+430	+110/-90	+75/-75	75	385	1050
AUTOBRAKE MAX	2580	+50/-25	90	-120/+430	+105/-85	+75/-75	80	385	1050
AUTOBRAKE 3	3135	+60/-30	100	-140/+485	+75/-75	+95/-95	105	185	640

Poor Reported Braking Action

MAX MANUAL	3285	+70/-40	125	-175/+650	+240/-165	+100/-100	85	775	2450
AUTOBRAKE MAX	3290	+70/-40	125	-175/+650	+240/-170	+100/-100	85	775	2450
AUTOBRAKE 3	3505	+75/-40	125	-180/+670	+210/-155	+105/-105	105	620	2295

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

PITCH UP AUTHORITY - (Flaps ≥ 20)

VREF30+20

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1145	+40/-5	25	-45/+145	+15/-15	+25/-25	40	30	65
AUTOBRAKE MAX	1605	+30/-5	40	-65/+210	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2805	+60/-30	90	-130/+430	+40/-65	+80/-80	95	120	120

Good Reported Braking Action

MAX MANUAL	1660	+30/-10	45	-75/+250	+45/-35	+45/-45	55	115	280
AUTOBRAKE MAX	1725	+35/-5	50	-75/+260	+40/-25	+45/-45	75	120	295
AUTOBRAKE 2	2805	+60/-30	90	-130/+430	+40/-65	+80/-80	95	120	120

Medium Reported Braking Action

MAX MANUAL	2265	+45/-20	75	-115/+405	+100/-80	+65/-65	75	310	815
AUTOBRAKE MAX	2265	+50/-20	75	-115/+405	+105/-75	+65/-65	80	305	815
AUTOBRAKE 3	2660	+55/-25	80	-130/+450	+55/-55	+80/-80	115	120	520

Poor Reported Braking Action

MAX MANUAL	2905	+65/-35	105	-165/+620	+225/-155	+85/-85	85	630	1925
AUTOBRAKE MAX	2910	+65/-35	105	-165/+625	+230/-155	+85/-85	85	630	1930
AUTOBRAKE 3	3035	+65/-35	105	-170/+635	+190/-130	+90/-90	110	540	1845

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****PRIMARY FLIGHT COMPUTERS - Flaps 20**

VREF20

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1295	+30/-15	30	-50/+160	+20/-15	+30/-30	50	35	85
AUTOBRAKE MAX	1570	+20/-20	40	-60/+205	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2845	+45/-45	85	-130/+435	+5/-30	+85/-85	135	10	10

Good Reported Braking Action

MAX MANUAL	1850	+30/-25	55	-80/+275	+50/-45	+50/-50	75	150	365
AUTOBRAKE MAX	1850	+30/-25	55	-80/+270	+50/-45	+50/-50	75	145	355
AUTOBRAKE 2	2845	+45/-45	85	-130/+435	+5/-30	+85/-85	135	10	10

Medium Reported Braking Action

MAX MANUAL	2495	+45/-35	85	-125/+435	+120/-95	+70/-70	90	385	1060
AUTOBRAKE MAX	2495	+45/-35	85	-120/+435	+125/-100	+70/-70	90	380	1050
AUTOBRAKE 3	2650	+40/-35	80	-130/+450	+80/-45	+80/-80	130	225	895

Poor Reported Braking Action

MAX MANUAL	3180	+60/-50	120	-180/+655	+260/-175	+95/-95	105	775	2515
AUTOBRAKE MAX	3180	+60/-50	120	-180/+655	+265/-185	+95/-95	105	775	2515
AUTOBRAKE 3	3195	+60/-50	120	-180/+660	+260/-160	+95/-95	115	760	2500

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).



ADVISORY INFORMATION

Non-Normal Configuration Landing Distance

SLATS DRIVE - Flaps 20

VREF30+30

LANDING DISTANCES AND ADJUSTMENTS (M)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1230	+45/-5	30	-45/+150	+15/-15	+30/-30	40	35	75
AUTOBRAKE MAX	1750	+30/-5	45	-65/+220	0/0	+45/-45	80	0	0
AUTOBRAKE 2	3030	+60/-35	100	-135/+445	+60/-75	+90/-90	95	190	190

Good Reported Braking Action

MAX MANUAL	1785	+30/-15	50	-75/+260	+45/-40	+50/-50	60	135	320
AUTOBRAKE MAX	1875	+35/-5	55	-80/+270	+35/-20	+50/-50	80	130	325
AUTOBRAKE 2	3030	+60/-35	100	-135/+445	+60/-75	+90/-90	95	190	190

Medium Reported Braking Action

MAX MANUAL	2430	+50/-25	80	-120/+420	+110/-85	+70/-70	75	340	905
AUTOBRAKE MAX	2440	+50/-25	80	-120/+420	+110/-80	+70/-70	80	340	905
AUTOBRAKE 3	2905	+55/-30	90	-135/+470	+65/-70	+85/-85	105	150	565

Poor Reported Braking Action

MAX MANUAL	3110	+65/-40	115	-170/+640	+235/-160	+90/-90	85	685	2100
AUTOBRAKE MAX	3115	+65/-40	115	-170/+640	+240/-165	+95/-95	85	690	2100
AUTOBRAKE 3	3280	+70/-40	115	-175/+655	+200/-150	+100/-100	105	565	1990

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****STABILIZER - Flaps 20****VREF30+20**

	LANDING DISTANCES AND ADJUSTMENTS (M)							
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10°C	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	260000 KG LDG WT	PER 5000 KG ABV/BLW 260000 KG	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF	ONE REV NO REV

Dry Runway

MAX MANUAL	1145	+40/-5	25	-45/+145	+15/-15	+25/-25	40	30	65
AUTOBRAKE MAX	1605	+30/-5	40	-65/+210	0/0	+40/-40	75	0	0
AUTOBRAKE 2	2805	+60/-30	90	-130/+430	+40/-65	+80/-80	95	120	120

Good Reported Braking Action

MAX MANUAL	1660	+30/-10	45	-75/+250	+45/-35	+45/-45	55	115	280
AUTOBRAKE MAX	1725	+35/-5	50	-75/+260	+40/-25	+45/-45	75	120	295
AUTOBRAKE 2	2805	+60/-30	90	-130/+430	+40/-65	+80/-80	95	120	120

Medium Reported Braking Action

MAX MANUAL	2265	+45/-20	75	-115/+405	+100/-80	+65/-65	75	310	815
AUTOBRAKE MAX	2265	+50/-20	75	-115/+405	+105/-75	+65/-65	80	305	815
AUTOBRAKE 3	2660	+55/-25	80	-130/+450	+55/-55	+80/-80	115	120	520

Poor Reported Braking Action

MAX MANUAL	2905	+65/-35	105	-165/+620	+225/-155	+85/-85	85	630	1925
AUTOBRAKE MAX	2910	+65/-35	105	-165/+625	+230/-155	+85/-85	85	630	1930
AUTOBRAKE 3	3035	+65/-35	105	-170/+635	+190/-130	+90/-90	110	540	1845

Reference distance is for sea level, standard day, no wind or slope, and maximum available reverse thrust.

Max Manual assumes maximum achievable manual braking.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (305 meters of air distance).

ADVISORY INFORMATION

Landing Climb Limit Weight

Valid for approach with flaps 20 and landing with flaps 30

AIRPORT OAT	°C °F	LANDING CLIMB LIMIT WEIGHT (1000 KG)					
		AIRPORT PRESSURE ALTITUDE (FT)					
-2000	0	2000	4000	6000	8000		
54	129	297.3	279.1				
52	126	306.3	287.0				
50	122	315.2	294.5	269.7			
48	118	323.5	303.4	276.9			
46	115	331.8	312.4	284.1	259.6		
44	111	340.4	321.1	291.5	267.7		
42	108	349.8	329.0	299.1	275.0	251.6	
40	104	356.7	337.3	307.2	281.4	257.0	
38	100	363.8	347.0	316.0	287.8	262.8	233.8
36	97	366.6	354.0	323.2	293.4	269.2	238.4
34	93	366.8	360.8	330.4	299.7	274.4	243.0
32	90	367.1	363.3	337.6	306.4	278.7	247.1
30	86	367.3	363.4	344.5	312.9	282.9	250.9
28	82	367.6	363.6	350.2	318.7	287.3	254.6
26	79	367.9	363.7	350.4	322.6	292.2	258.2
24	75	368.1	363.9	350.5	326.0	297.0	263.1
22	72	368.4	364.0	350.5	327.4	300.3	268.1
20	68	368.6	364.1	350.6	327.5	302.5	272.4
18	64	368.9	364.3	350.7	327.6	304.7	275.2
16	61	369.2	364.4	350.8	327.6	304.7	276.9
14	57	369.4	364.5	350.8	327.7	304.8	278.5
12	54	369.6	364.6	350.9	327.8	304.9	278.6
10	50	369.8	364.7	351.0	327.9	304.9	278.7
8	46	369.9	364.8	351.1	327.9	304.9	278.7
6	43	370.0	364.9	349.7	328.0	304.9	272.8
4	40	370.1	365.0	341.5	313.7	286.7	254.9
2	36	370.2	365.1	341.5	313.8	286.8	254.9
0	32	370.3	365.1	341.5	313.8	286.8	255.0
-40	-40	371.0	365.4	341.6	313.8	286.8	255.0

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

With engine bleed for packs off, increase weight by 1250 kg.

With engine anti-ice on, decrease weight by 150 kg.

With engine and wing anti-ice on, decrease weight by 2350 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 24600 kg.

ADVISORY INFORMATION**Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 25**

AIRPORT OAT	°C	°F	LANDING CLIMB LIMIT WEIGHT (1000 KG)					
			-2000	0	2000	4000	6000	8000
54	129	302.7	284.5					
52	126	310.0	292.5					
50	122	317.6	300.2	275.6				
48	118	325.1	307.8	282.4				
46	115	332.9	315.3	289.8	267.1			
44	111	340.7	322.9	297.4	273.6			
42	108	348.8	330.3	304.4	280.1	258.9		
40	104	355.6	337.9	311.1	286.7	264.5		
38	100	362.7	345.9	318.5	293.4	269.9		241.1
36	97	365.5	352.9	325.0	299.2	275.1	245.9	
34	93	365.7	359.6	331.6	305.0	279.9	250.6	
32	90	366.0	362.1	338.2	310.6	284.3	254.9	
30	86	366.3	362.2	344.3	315.9	288.7	259.0	
28	82	366.5	362.4	349.1	320.8	293.2	262.9	
26	79	366.8	362.5	349.3	324.4	298.1	266.5	
24	75	367.0	362.7	349.4	327.7	302.6	270.7	
22	72	367.3	362.8	349.4	329.0	305.5	274.7	
20	68	367.5	362.9	349.5	329.1	307.3	278.2	
18	64	367.8	363.0	349.6	329.1	309.0	281.0	
16	61	368.1	363.2	349.7	329.2	309.1	282.8	
14	57	368.3	363.3	349.7	329.3	309.1	284.4	
12	54	368.5	363.4	349.8	329.3	309.2	284.5	
10	50	368.6	363.5	349.9	329.4	309.2	284.5	
8	46	368.8	363.6	350.0	329.5	309.3	284.6	
6	43	368.9	363.7	350.0	329.5	309.3	284.5	
4	40	369.0	363.8	350.1	329.6	309.3	278.4	
2	36	369.1	363.8	350.1	329.6	309.4	278.4	
0	32	369.2	363.9	350.1	329.7	309.4	278.4	
-40	-40	369.8	364.1	350.3	329.8	309.6	278.5	

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

With engine bleed for packs off, increase weight by 1400 kg.

With engine anti-ice on, decrease weight by 100 kg.

With engine and wing anti-ice on, decrease weight by 2300 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 22400 kg.

ADVISORY INFORMATION

Recommended Brake Cooling Schedule
Reference Brake Energy (Millions of Foot Pounds)

WEIGHT (1000 KG)	OAT (°C)	BRAKES ON SPEED (KIAS)																	
		PRESSURE ALTITUDE (1000 FT)																	
		80			100			120			140			160			180		
360	0	23.3	25.7	28.3	33.8	37.7	41.9	46.1	51.6	57.8	59.8	67.3	75.6	74.5	84.0	94.5	89.8	101.1	113.6
	10	23.9	26.4	29.2	34.8	38.8	43.2	47.5	53.2	59.6	61.7	69.4	78.0	76.9	86.6	97.4	92.6	104.1	116.9
	15	24.4	26.9	29.7	35.5	39.5	44.0	48.4	54.2	60.7	62.8	70.6	79.4	78.3	88.1	99.1	94.2	105.9	118.8
	20	24.8	27.4	30.2	36.1	40.2	44.8	49.2	55.2	61.8	63.9	71.9	80.8	79.6	89.6	100.8	95.8	107.6	120.6
	30	25.5	28.1	31.0	37.1	41.3	46.1	50.6	56.7	63.6	65.8	74.0	83.1	81.9	92.2	103.6	98.5	110.6	123.9
	40	25.7	28.4	31.4	37.7	42.0	46.8	51.5	57.8	64.8	67.1	75.5	84.9	83.7	94.2	105.8	100.7	113.0	126.4
340	0	22.2	24.5	27.0	32.3	35.9	39.9	43.9	49.1	55.0	56.9	64.0	71.9	71.0	79.9	90.0	85.6	96.4	108.4
	10	22.9	25.2	27.8	32.3	37.0	41.1	45.2	50.6	56.7	58.7	66.0	74.2	73.2	82.4	92.8	88.3	99.3	111.6
	15	23.3	25.7	28.3	33.9	37.7	41.9	46.1	51.6	57.7	59.8	67.2	75.5	74.5	83.9	94.4	89.8	101.0	113.4
	20	23.7	26.2	28.8	34.5	38.4	42.7	46.9	52.5	58.8	60.8	68.4	76.8	75.8	85.4	96.0	91.3	102.7	115.3
	30	24.3	26.8	29.6	35.4	39.4	43.9	48.2	54.0	60.5	62.6	70.3	79.0	78.0	87.8	98.7	94.0	105.6	118.4
	40	24.6	27.1	30.0	35.9	40.0	44.6	49.0	55.0	61.6	63.8	71.8	80.7	79.7	89.7	100.8	96.0	107.9	120.9
320	0	21.2	23.4	25.7	30.7	34.2	37.9	41.7	46.6	52.2	54.0	60.7	68.1	67.3	75.8	85.3	81.3	91.5	103.0
	10	21.8	24.0	26.5	31.6	35.2	39.1	43.0	48.1	53.8	55.7	62.6	70.3	69.5	78.2	88.0	83.8	94.4	106.1
	15	22.2	24.5	27.0	32.2	35.8	39.8	43.8	49.0	54.8	56.7	63.7	71.5	70.7	79.6	89.5	85.3	96.0	107.9
	20	22.6	24.9	27.5	32.8	36.5	40.5	44.6	49.8	55.7	57.7	64.8	72.8	72.0	81.0	91.1	86.8	97.6	109.7
	30	23.2	25.6	28.2	33.7	37.5	41.6	45.8	51.2	57.3	59.4	66.7	74.9	74.0	83.3	93.7	89.3	100.4	112.7
	40	23.4	25.8	28.5	34.2	38.0	42.3	46.6	52.2	58.4	60.5	68.0	76.5	75.6	85.1	95.7	91.2	102.6	115.1
300	0	20.2	22.2	24.5	29.2	32.4	36.0	39.5	44.1	49.3	51.1	57.3	64.3	63.7	71.6	80.6	76.8	86.6	97.5
	10	20.8	22.9	25.1	30.0	33.4	37.0	40.7	45.5	50.8	52.7	59.1	66.4	65.7	73.9	83.1	79.3	89.3	100.4
	15	21.2	23.3	25.6	30.6	34.0	37.7	41.5	46.3	51.8	53.6	60.2	67.6	66.8	75.2	84.6	80.7	90.8	102.1
	20	21.6	23.7	26.1	31.2	34.6	38.4	42.2	47.2	52.7	54.6	61.3	68.8	68.0	76.5	86.1	82.1	92.4	103.8
	30	22.1	24.3	26.8	32.0	35.5	39.4	43.4	48.5	54.2	56.1	63.0	70.7	70.0	78.8	88.5	84.4	95.0	106.7
	40	22.3	24.6	27.1	32.4	36.0	40.1	44.1	49.3	55.2	57.2	64.3	72.2	71.4	80.4	90.5	86.3	97.1	109.0
260	0	18.2	20.0	21.9	26.1	28.9	32.0	35.1	39.1	43.6	45.2	50.6	56.6	56.1	63.1	70.9	67.7	76.2	85.8
	10	18.7	20.6	22.5	26.9	29.7	32.9	36.2	40.3	44.9	46.5	52.1	58.4	57.9	65.1	73.1	69.8	78.6	88.5
	15	19.1	20.9	23.0	27.4	30.3	33.6	36.8	41.1	45.8	47.4	53.1	59.5	58.9	66.2	74.4	71.1	80.0	90.0
	20	19.4	21.3	23.4	27.9	30.9	34.2	37.5	41.8	46.6	48.3	54.1	60.6	60.0	67.4	75.7	72.4	81.4	91.6
	30	19.9	21.9	24.0	28.6	31.7	35.1	38.5	43.0	47.9	49.6	55.6	62.3	61.7	69.4	77.9	74.4	83.8	94.2
	40	20.1	22.1	24.2	28.9	32.1	35.6	39.1	43.7	48.7	50.5	56.6	63.5	62.9	70.8	79.6	76.0	85.6	96.2
220	0	16.3	17.8	19.5	23.1	25.4	28.1	30.7	34.1	37.9	39.2	43.7	48.9	48.4	54.2	60.8	58.2	65.4	73.5
	10	16.7	18.3	20.0	23.7	26.2	28.9	31.6	35.1	39.0	40.3	45.1	50.4	49.9	55.9	62.7	60.0	67.4	75.8
	15	17.1	17.8	20.4	24.2	26.7	29.4	32.2	35.8	39.8	41.1	45.9	51.3	50.8	57.0	63.9	61.1	68.7	77.2
	20	17.4	19.0	20.8	24.6	27.1	30.0	32.8	36.4	40.5	41.8	46.7	52.2	51.7	58.0	65.0	62.2	69.9	78.5
	30	17.8	19.5	21.3	25.2	27.8	30.7	33.7	37.4	41.6	43.0	48.1	53.7	53.2	59.6	66.9	63.9	71.9	80.8
	40	17.9	19.6	21.5	25.5	28.2	31.1	34.1	38.0	42.3	43.7	48.9	54.7	54.1	60.8	68.2	65.2	73.4	82.5
180	0	14.4	15.7	17.1	20.0	22.0	24.2	26.3	29.1	32.2	33.1	36.8	41.0	40.4	45.2	50.5	48.2	54.0	60.6
	10	14.8	16.1	17.6	20.6	22.6	24.9	27.0	29.9	33.1	34.1	37.9	42.2	41.6	46.5	52.0	49.7	55.7	62.5
	15	15.1	16.4	17.9	21.0	23.0	25.3	27.5	30.5	33.7	34.7	38.6	43.0	42.4	47.4	53.0	50.6	56.7	63.6
	20	15.4	16.7	18.2	21.3	23.5	25.8	28.0	31.0	34.4	35.3	39.3	43.8	43.2	48.3	53.9	51.5	57.8	64.8
	30	15.7	17.1	18.7	21.9	24.1	26.5	28.8	31.8	35.3	36.3	40.4	45.0	44.4	49.6	55.5	53.0	59.4	66.6
	40	15.8	17.2	18.8	22.1	24.3	26.8	29.1	32.3	35.8	36.8	41.0	45.7	45.1	50.5	56.5	53.9	60.5	68.0

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.

If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Event Adjusted Brake Energy (Millions of Foot Pounds)****No Reverse Thrust**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	3.6	13.6	23.5	33.2	42.8	52.3	61.8	71.4	81.0	90.6	100.5	110.4
	MAX AUTO	3.5	12.5	21.4	30.2	39.0	47.8	56.8	66.0	75.5	85.5	95.9	106.8
	AUTOBRAKE 4	3.2	11.7	20.0	28.0	36.0	44.0	52.2	60.6	69.4	78.7	88.6	99.2
	AUTOBRAKE 3	2.7	11.0	18.8	26.3	33.7	41.0	48.4	56.1	64.2	72.8	82.0	92.2
	AUTOBRAKE 2	2.3	10.2	17.5	24.5	31.2	37.9	44.6	51.5	58.9	66.7	75.2	84.6
	AUTOBRAKE 1	1.9	9.0	15.6	21.8	27.8	33.8	39.8	45.9	52.4	59.4	66.9	75.1

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	3.4	12.0	21.2	30.6	39.7	48.6	57.4	65.9	74.4	82.8	91.3	99.7
	MAX AUTO	2.0	8.8	15.9	23.2	30.5	38.0	45.7	53.7	62.1	71.0	80.6	90.9
	AUTOBRAKE 4	1.3	5.6	10.9	16.6	22.5	28.3	34.3	40.7	47.5	54.9	63.0	72.0
	AUTOBRAKE 3	0.8	3.1	7.0	11.6	16.2	20.9	25.8	30.9	36.6	42.7	49.6	57.3
	AUTOBRAKE 2	0.0	2.3	5.0	7.8	10.8	14.0	17.4	21.2	25.6	30.4	36.0	42.4
	AUTOBRAKE 1	0.0	1.6	3.3	5.2	7.2	9.4	11.8	14.4	17.4	20.8	24.7	29.2

Cooling Time (Minutes)

		EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)									
16 & BELOW		17	18	20	24	28	32	35	36 TO 44	45 & ABOVE	
GEAR DOWN	NO SPECIAL PROCEDURE	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE	
INFLIGHT	REQUIRED	11	18	26	42	55	66	73			
GROUND	BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9	5.0 TO 6.3	6.3 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

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 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not 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 EICAS 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. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

**Performance Inflight
Engine Inoperative**

**Chapter PI
Section 43**

ENGINE INOP

Initial Max Continuous %N1

Based on .84M, engine bleed for packs on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	97.4	97.0	96.7	96.3	95.9	95.9	95.6	95.3	95.0
15	98.2	97.8	97.3	97.0	96.6	96.3	96.0	95.7	95.4
10	99.2	98.9	98.3	97.7	97.2	97.0	96.6	96.3	96.0
5	100.2	100.1	99.7	98.8	98.1	97.8	97.4	97.1	96.8
0	99.3	100.9	101.0	99.9	99.3	98.8	98.3	97.9	97.6
-5	98.4	99.9	101.2	101.3	100.5	100.2	99.7	99.3	98.8
-10	97.4	99.0	100.3	101.6	101.3	101.3	100.7	100.3	100.0
-15	96.5	98.1	99.3	100.6	101.0	102.0	101.1	100.8	100.5
-20	95.6	97.1	98.3	99.6	100.1	101.0	100.1	99.8	99.5
-25	94.6	96.1	97.4	98.6	99.1	100.0	99.1	98.8	98.5
-30	93.7	95.2	96.4	97.6	98.1	99.0	98.1	97.8	97.5
-35	92.7	94.2	95.4	96.6	97.0	97.9	97.1	96.8	96.5
-40	91.7	93.2	94.4	95.6	96.0	96.9	96.1	95.8	95.5

ENGINE INOP**Max Continuous %N1**

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

37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.86	94.3	95.4	96.4	97.4	98.4	99.5	100.5	101.4	101.2	100.2	98.9	97.7
240	0.74	96.1	97.2	98.3	99.3	100.4	101.4	102.1	101.9	100.9	99.5	98.1	97.1
200	0.63	95.7	96.7	97.8	98.8	99.9	100.8	101.4	100.9	100.0	98.5	97.0	96.3
35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.82	94.6	95.6	96.6	97.7	98.7	99.7	100.7	101.7	101.4	100.4	99.2	98.1
240	0.71	95.1	96.2	97.2	98.3	99.3	100.3	101.3	101.8	100.9	99.8	98.3	97.2
200	0.60	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.0	100.2	98.8	97.1	96.1
33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
320	0.89	91.4	92.4	93.4	94.4	95.4	96.4	97.4	98.3	99.3	100.2	99.8	98.8
280	0.79	95.0	96.0	97.1	98.1	99.2	100.2	101.2	102.2	102.4	101.0	100.0	98.7
240	0.68	95.6	96.7	97.8	98.8	99.8	100.9	101.9	102.4	101.8	100.2	98.9	97.5
200	0.58	95.9	97.0	98.0	99.1	100.1	101.1	101.6	101.6	101.0	99.3	97.9	96.4
31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
320	0.85	92.7	93.8	94.8	95.7	96.7	97.7	98.7	99.6	100.5	100.8	99.7	98.4
280	0.76	96.3	97.4	98.4	99.5	100.5	101.5	102.5	103.5	102.0	100.6	99.1	98.0
240	0.66	97.4	98.4	99.5	100.5	101.5	102.6	103.3	103.0	101.0	99.5	98.1	96.9
200	0.55	97.6	98.7	99.7	100.8	101.8	102.6	102.8	102.0	100.7	98.7	97.2	96.1
29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
320	0.82	93.8	94.8	95.8	96.8	97.8	98.7	99.7	100.6	101.6	100.1	98.9	97.8
280	0.73	96.6	97.6	98.6	99.6	100.6	101.6	102.6	102.5	101.0	99.5	98.1	97.1
240	0.63	98.1	99.2	100.2	101.3	102.3	103.3	103.1	101.6	99.8	98.4	97.1	96.0
200	0.53	98.6	99.7	100.7	101.7	102.7	103.2	102.7	101.2	99.4	97.7	96.3	96.2
27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
360	0.88	90.2	91.2	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.2	98.1
320	0.79	93.4	94.4	95.3	96.3	97.3	98.2	99.2	100.1	101.1	100.6	99.2	98.1
280	0.70	95.4	96.4	97.4	98.4	99.4	100.4	101.3	102.3	101.3	99.7	98.2	97.1
240	0.60	97.2	98.2	99.2	100.3	101.3	102.3	103.0	102.0	99.9	98.5	97.2	96.2
200	0.51	98.4	99.4	100.4	101.5	102.5	103.2	102.7	101.8	99.9	98.1	96.5	95.6

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION		PRESSURE ALTITUDE (1000 FT)					
		37	35	33	31	29	27
ENGINE A/I ON		-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON		-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
WING A/I ON - PACKS OFF		-0.6	-0.5	-0.5	-0.5	-0.5	-0.4

ENGINE INOP**Max Continuous %N1****Based on engine bleed for packs on or off and anti-ice off****25000 FT to 18000 FT Pressure Altitudes**

25000 FT PRESS ALT			TAT (°C)											
KIAS	M		-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.85	91.2	92.2	93.1	94.1	95.0	95.9	96.8	97.7	98.6	99.5	98.9	98.1	
320	0.76	93.9	94.8	95.8	96.8	97.7	98.7	99.6	100.5	101.1	99.6	98.5	97.6	
280	0.67	95.5	96.5	97.5	98.5	99.4	100.4	101.3	101.5	100.4	98.8	97.5	96.7	
240	0.58	97.4	98.5	99.5	100.5	101.5	102.4	102.3	100.9	99.3	97.8	96.7	95.9	
200	0.49	99.3	100.3	101.4	102.4	103.4	103.1	102.0	100.6	98.5	97.1	96.1	95.9	
24000 FT PRESS ALT			TAT (°C)											
KIAS	M		-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.83	91.3	92.3	93.2	94.2	95.1	96.0	96.9	97.8	98.7	99.6	99.4	98.4	
320	0.75	93.6	94.6	95.6	96.5	97.5	98.4	99.4	100.3	101.2	100.0	98.8	97.8	
280	0.66	95.4	96.4	97.4	98.3	99.3	100.3	101.2	101.8	100.7	99.1	97.8	96.9	
240	0.57	97.3	98.3	99.3	100.3	101.3	102.2	102.6	101.4	99.8	98.3	97.1	96.2	
200	0.48	98.8	99.9	100.9	101.9	102.9	103.4	102.3	101.0	98.9	97.4	96.3	95.6	
22000 FT PRESS ALT			TAT (°C)											
KIAS	M		-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.80	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.4	100.0	99.0	98.3	
320	0.72	94.3	95.3	96.3	97.2	98.1	99.1	100.0	100.9	100.7	99.3	98.2	97.5	
280	0.63	96.1	97.1	98.1	99.0	100.0	100.9	101.9	101.3	99.8	98.4	97.3	96.6	
240	0.55	97.7	98.7	99.7	100.7	101.7	102.7	102.3	100.9	99.3	97.7	96.8	96.1	
200	0.46	99.5	100.5	101.5	102.5	103.5	103.0	101.5	99.9	97.9	96.8	95.9	95.3	
20000 FT PRESS ALT			TAT (°C)											
KIAS	M		-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.77	93.7	94.6	95.6	96.5	97.4	98.4	99.3	100.2	101.1	102.0	101.3	100.1	
320	0.69	95.9	96.9	97.8	98.8	99.7	100.7	101.6	102.6	103.5	101.8	100.4	99.1	
280	0.61	97.7	98.7	99.6	100.6	101.6	102.6	103.5	104.3	102.8	100.9	99.4	98.3	
240	0.53	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.1	102.4	100.7	98.7	97.2	
200	0.44	98.0	99.0	99.9	100.9	101.9	102.9	103.8	102.6	100.5	98.0	96.2	95.3	
18000 FT PRESS ALT			TAT (°C)											
KIAS	M		-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.75	94.4	95.4	96.3	97.2	98.2	99.1	100	100.9	101.8	102.0	100.6	99.4	
320	0.67	96.7	97.7	98.6	99.6	100.5	101.4	102.4	103.3	102.9	101.2	99.7	98.6	
280	0.59	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.0	102.3	100.4	98.9	97.8	
240	0.51	99.6	100.6	101.6	102.6	103.6	104.5	104.9	103.9	101.9	100.0	98.4	97.2	
200	0.42	97.2	98.2	99.2	100.1	101.1	101.9	102.0	100.8	98.8	97.3	95.8	94.4	

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.3	-0.3	-0.3	-0.2	-0.3
WING A/I ON - PACKS OFF	-0.4	-0.4	-0.4	-0.3	-0.5

ENGINE INOP**Max Continuous %N1**

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

16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.72	94.8	95.8	96.7	97.6	98.6	99.5	100.4	101.3	102.2	103.1	101.7	100.2
320	0.64	96.9	97.9	98.8	99.8	100.7	101.7	102.6	103.5	104.4	102.7	100.9	99.4
280	0.57	98.7	99.7	100.7	101.6	102.6	103.5	104.5	105.4	104.1	102.2	100.3	98.8
240	0.49	99.1	100.1	101.1	102.0	103.0	104.0	104.9	104.5	103.0	100.9	99.2	97.9
200	0.41	96.2	97.2	98.1	99.1	100.0	100.9	101.5	101.3	99.8	98.3	97.0	95.4
14000 FT PRESS ALT		TAT (°C)											
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
360	0.69	94.9	95.9	96.8	97.7	98.6	99.5	100.4	101.3	102.2	102.2	100.8	99.5
320	0.62	97.1	98.1	99.0	99.9	100.9	101.8	102.7	103.6	103.4	101.5	100.0	98.9
280	0.54	99.2	100.1	101.1	102.1	103.0	103.9	104.9	104.9	103.0	101.0	99.5	98.4
240	0.47	97.3	98.2	99.2	100.1	101.0	102.0	102.7	102.5	100.6	99.0	97.8	96.7
200	0.39	96.1	97.0	98.0	98.9	99.8	100.7	101.4	100.7	99.0	97.6	96.5	95.6
12000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.67	95.4	96.3	97.2	98.1	99.0	99.9	100.8	101.6	102.5	101.3	100.0	99.0
320	0.60	97.3	98.2	99.2	100.1	101.0	101.9	102.8	103.7	102.3	100.6	99.4	98.4
280	0.52	99.7	100.6	101.6	102.5	103.5	104.4	105.3	104.0	102.0	100.2	99.1	98.1
240	0.45	96.5	97.4	98.3	99.3	100.2	101.1	101.4	100.6	99.2	98.0	96.9	96.0
200	0.38	96.7	97.7	98.6	99.5	100.4	101.2	101.3	100.2	98.7	97.4	96.4	95.8
10000 FT PRESS ALT		TAT (°C)											
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.65	94.2	95.2	96.1	96.9	97.8	98.7	99.6	100.4	101.3	101.5	100.2	99.1
320	0.58	96.1	97.1	98.0	98.9	99.8	100.7	101.6	102.4	102.6	101.0	99.7	98.6
280	0.51	98.5	99.4	100.4	101.3	102.2	103.1	104.0	104.6	102.3	100.5	99.4	98.4
240	0.43	95.6	96.6	97.5	98.4	99.3	100.2	101.0	101.1	100.3	99.1	97.8	96.9
200	0.36	96.6	97.5	98.4	99.3	100.2	101.1	101.6	101.2	100.1	98.5	97.5	96.6
5000 FT PRESS ALT		TAT (°C)											
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
360	0.59	92.6	93.5	94.3	95.2	96.0	96.9	97.7	98.5	99.4	100.2	99.3	98.5
320	0.53	94.0	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.9	100.1	99.1	98.2
280	0.46	95.0	95.9	96.8	97.6	98.5	99.4	100.2	101.1	100.9	99.8	98.8	97.8
240	0.40	95.7	96.6	97.5	98.4	99.3	100.2	101.0	101.6	100.5	99.4	98.3	97.4
200	0.33	97.0	97.9	98.8	99.7	100.6	101.5	102.4	101.7	100.3	99.1	98.1	97.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	16	14	12	10	5
ENGINE A/I ON	-0.3	-0.2	-0.4	-0.5	-0.5
WING A/I ON - PACKS ON	-0.4	-0.5	-0.6	-0.7	-0.8
WING A/I ON - PACKS OFF	-0.6	-0.7	-0.8	-0.9	-1.1

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	350	301	18000	16900	15700
340	331	293	19500	18400	17300
320	312	285	20900	20200	19100
300	291	276	22400	21500	20600
280	272	266	24200	23200	22000
260	252	257	26200	25300	24000
240	233	248	28500	27700	26300
220	214	238	30500	30000	28900
200	195	227	32300	32000	31300
180	175	215	34300	34100	33800
160	155	203	36500	36400	36200

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	
134	125	118	111	105	100	95	90	86	82	79	
268	251	236	222	210	200	190	181	173	166	159	
402	376	354	333	316	300	285	272	260	249	239	
535	501	471	445	421	400	380	363	347	332	319	
668	626	588	555	526	500	476	454	434	416	399	
800	750	706	666	631	600	571	545	521	499	479	
932	874	823	777	736	700	666	636	608	583	560	
1064	998	940	888	841	800	762	727	696	667	640	
1196	1122	1057	998	946	900	857	818	783	751	721	
1327	1246	1173	1109	1051	1000	952	910	870	835	801	
1459	1369	1290	1220	1156	1100	1048	1001	958	918	882	
1590	1493	1407	1330	1262	1200	1143	1092	1045	1002	963	
1722	1617	1524	1441	1367	1300	1239	1183	1133	1086	1043	
1854	1741	1641	1552	1472	1400	1334	1275	1220	1170	1124	
1986	1865	1758	1662	1577	1500	1430	1366	1307	1254	1205	
2118	1989	1875	1773	1682	1600	1525	1457	1395	1338	1285	
2250	2113	1992	1884	1787	1700	1620	1548	1482	1421	1365	
2383	2238	2109	1995	1892	1800	1716	1639	1569	1505	1446	

ENGINE INOP**MAX CONTINUOUS THRUST****Driftdown/LRC Cruise Range Capability****Driftdown/Cruise Fuel and Time**

AIR DIST (NM)	FUEL REQUIRED (1000 KG)										TIME (HR:MIN)	
	WEIGHT AT START OF DRIFTDOWN (1000 KG)											
	160	180	200	220	240	260	280	300	320	340	360	
100	1.0	1.1	1.2	1.4	1.4	1.6	1.7	1.7	1.8	1.9	2.0	0:15
200	2.3	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.1	4.3	4.5	0:31
300	3.6	3.9	4.4	4.8	5.1	5.4	5.8	6.1	6.5	6.9	7.2	0:46
400	4.9	5.4	6.0	6.6	7.0	7.5	7.9	8.4	8.9	9.5	10.0	1:01
500	6.2	6.8	7.5	8.2	8.8	9.4	10.0	10.6	11.2	11.9	12.6	1:16
600	7.4	8.1	9.0	9.8	10.6	11.3	12.0	12.7	13.4	14.3	15.2	1:30
700	8.6	9.4	10.4	11.4	12.3	13.1	13.9	14.8	15.6	16.6	17.7	1:45
800	9.7	10.7	11.9	13.0	14.0	14.9	15.9	16.8	17.8	19.0	20.2	1:59
900	10.9	12.0	13.3	14.5	15.6	16.8	17.8	18.9	20.0	21.3	22.7	2:14
1000	12.1	13.3	14.7	16.1	17.3	18.5	19.7	20.9	22.1	23.6	25.2	2:28
1100	13.2	14.6	16.1	17.6	19.0	20.3	21.6	22.9	24.3	25.9	27.6	2:43
1200	14.4	15.9	17.5	19.1	20.6	22.1	23.5	24.9	26.4	28.1	30.0	2:57
1300	15.5	17.2	18.9	20.6	22.3	23.8	25.4	26.9	28.5	30.4	32.4	3:11
1400	16.6	18.4	20.3	22.1	23.9	25.6	27.2	28.9	30.6	32.6	34.8	3:26
1500	17.7	19.6	21.7	23.6	25.5	27.3	29.1	30.9	32.7	34.8	37.2	3:40
1600	18.8	20.9	23.0	25.1	27.1	29.0	30.9	32.8	34.8	37.0	39.5	3:55
1700	19.9	22.1	24.4	26.6	28.7	30.7	32.8	34.8	36.8	39.2	41.9	4:10
1800	21.0	23.3	25.7	28.0	30.2	32.4	34.6	36.7	38.9	41.4	44.2	4:24

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
360	15600	14200	12700
350	16000	14700	13200
340	16900	15200	13700
330	17800	16300	14600
320	18800	17300	15600
310	19800	18300	16600
300	20500	19300	17700
290	21100	20200	18700
280	21800	20800	19800
270	22700	21500	20600
260	23600	22300	21200
250	24600	23400	21900
240	25800	24600	23100
230	27100	25900	24300
220	28500	27300	25600
210	29900	28600	27100
200	30900	30000	28500
190	31900	31200	30100
180	32900	32500	31400
170	34000	33700	32800
160	35200	35100	34300

With engine anti-ice on, no altitude capability adjustment is required.

With engine and wing anti-ice on, decrease altitude capability by 300 ft.

ENGINE INOP**MAX CONTINUOUS THRUST****Long Range Cruise Control**

WEIGHT (1000 KG)	%N1	PRESSURE ALTITUDE (1000 FT)									
		10	15	17	19	21	23	25	27	29	31
360	%N1	90.9	96.3								
	MACH	.602	.664								
	KIAS	334	337								
	FF/ENG	10070	10778								
340	%N1	89.9	94.9	97.6							
	MACH	.602	.664	.683							
	KIAS	334	337	335							
	FF/ENG	9696	10338	10505							
320	%N1	88.7	92.9	94.8	97.7						
	MACH	.602	.653	.670	.689						
	KIAS	334	332	328	325						
	FF/ENG	9267	9589	9644	9735						
300	%N1	86.8	91.0	92.7	94.7	97.9					
	MACH	.592	.638	.657	.674	.694					
	KIAS	329	324	321	317	315					
	FF/ENG	8693	8874	8919	8944	9073					
280	%N1	85.0	89.2	90.8	92.6	94.8	98.3				
	MACH	.574	.622	.641	.660	.677	.700				
	KIAS	319	315	313	310	306	305				
	FF/ENG	8068	8218	8264	8284	8332	8544				
260	%N1	82.9	87.2	88.8	90.5	92.3	94.7	98.4			
	MACH	.557	.605	.623	.643	.662	.679	.704			
	KIAS	309	306	304	302	299	295	294			
	FF/ENG	7484	7593	7619	7642	7676	7747	8011			
240	%N1	80.8	84.8	86.8	88.3	90.0	91.8	94.5	98.3		
	MACH	.540	.585	.605	.624	.644	.663	.681	.707		
	KIAS	299	296	295	293	291	288	284	283		
	FF/ENG	6926	6949	7005	7013	7041	7088	7163	7427		
220	%N1	78.6	82.5	84.2	86.1	87.7	89.4	91.2	93.8	97.8	
	MACH	.522	.564	.584	.604	.623	.644	.663	.681	.708	
	KIAS	289	285	284	283	281	279	276	272	272	
	FF/ENG	6372	6314	6372	6413	6419	6456	6501	6563	6820	
200	%N1	76.2	79.9	81.7	83.4	85.3	86.9	88.6	90.4	93.0	96.9
	MACH	.503	.543	.561	.581	.601	.621	.642	.661	.680	.706
	KIAS	278	274	272	271	270	268	267	264	260	260
	FF/ENG	5827	5717	5752	5795	5829	5836	5870	5906	5957	6195
180	%N1	73.8	77.2	78.9	80.7	82.3	84.2	85.8	87.5	89.3	91.9
	MACH	.484	.521	.538	.556	.575	.596	.616	.638	.658	.677
	KIAS	268	263	261	259	258	257	256	254	251	248
	FF/ENG	5301	5135	5167	5198	5215	5244	5254	5279	5309	5352
160	%N1	71.0	74.3	76.0	77.6	79.3	81.0	82.7	84.5	86.1	88.0
	MACH	.464	.498	.514	.530	.548	.567	.589	.609	.631	.652
	KIAS	257	251	249	247	246	244	243	242	240	238
	FF/ENG	4797	4574	4596	4632	4637	4636	4658	4673	4689	4716

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	
284	263	244	227	213	200	190	181	173	166	159	
565	523	485	453	425	400	381	364	348	334	321	
847	784	728	680	638	600	572	546	522	501	482	
1129	1045	970	906	850	800	763	729	698	669	643	
1413	1308	1214	1133	1063	1000	954	911	872	836	804	
1697	1570	1457	1361	1276	1200	1145	1094	1047	1004	965	
1982	1834	1701	1588	1489	1400	1336	1276	1221	1171	1125	
2268	2097	1945	1815	1702	1600	1526	1458	1395	1338	1286	
2554	2362	2190	2043	1915	1800	1717	1640	1569	1505	1446	
2842	2626	2434	2270	2128	2000	1908	1822	1743	1671	1606	

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	3.8	0:39	3.3	0:38	3.0	0:36	2.7	0:36	2.5	0:35
400	8.0	1:13	7.3	1:10	6.8	1:08	6.4	1:05	6.1	1:03
600	12.1	1:48	11.2	1:44	10.6	1:39	10.0	1:35	9.7	1:32
800	16.2	2:23	15.1	2:17	14.3	2:11	13.6	2:06	13.2	2:01
1000	20.2	2:59	18.9	2:50	18.0	2:43	17.1	2:36	16.7	2:30
1200	24.2	3:34	22.7	3:24	21.7	3:15	20.7	3:06	20.2	2:59
1400	28.2	4:10	26.5	3:58	25.3	3:47	24.1	3:37	23.6	3:29
1600	32.1	4:46	30.2	4:33	28.9	4:19	27.6	4:08	26.9	3:58
1800	36.0	5:22	33.8	5:07	32.4	4:52	31.0	4:39	30.2	4:28
2000	39.8	5:59	37.5	5:42	36.0	5:25	34.4	5:10	33.5	4:58

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
5	-1.0	-0.8	-0.6	-0.4	-0.2	0.0	0.3	0.7	1.1	1.7	2.4
10	-2.1	-1.7	-1.3	-0.9	-0.4	0.0	0.7	1.5	2.5	3.7	5.0
15	-3.3	-2.6	-2.0	-1.3	-0.7	0.0	1.0	2.3	3.8	5.6	7.6
20	-4.4	-3.5	-2.7	-1.8	-0.9	0.0	1.4	3.1	5.1	7.4	9.9
25	-5.5	-4.4	-3.4	-2.2	-1.1	0.0	1.8	3.9	6.3	9.1	12.2
30	-6.7	-5.4	-4.0	-2.7	-1.3	0.0	2.1	4.6	7.5	10.7	14.3
35	-7.8	-6.3	-4.7	-3.2	-1.6	0.0	2.5	5.3	8.6	12.2	16.2
40	-8.9	-7.2	-5.4	-3.6	-1.8	0.0	2.8	6.0	9.7	13.7	18.1

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
360	%N1	80.5	83.9	88.6	93.4		
	KIAS	264	264	265	269		
	FF/ENG	9070	9130	9370	9670		
340	%N1	78.7	81.9	86.7	91.4	100.4	
	KIAS	260	260	260	260	299	
	FF/ENG	8520	8560	8730	8950	10320	
320	%N1	76.7	79.7	84.6	89.2	96.4	
	KIAS	253	253	253	253	289	
	FF/ENG	7930	7940	8050	8210	9240	
300	%N1	74.7	77.7	82.3	87.1	92.4	
	KIAS	244	244	244	244	259	
	FF/ENG	7380	7360	7430	7550	8120	
280	%N1	72.8	75.7	80.1	85.0	90.1	
	KIAS	238	238	238	238	238	
	FF/ENG	6880	6850	6880	6950	7350	
260	%N1	70.7	73.6	77.8	82.8	87.8	95.1
	KIAS	229	229	229	229	229	262
	FF/ENG	6380	6340	6330	6380	6690	7470
240	%N1	68.5	71.5	75.6	80.3	85.4	90.5
	KIAS	223	223	223	223	223	228
	FF/ENG	5910	5870	5820	5850	6110	6420
220	%N1	66.2	69.1	73.2	77.7	82.8	87.7
	KIAS	217	217	217	217	217	217
	FF/ENG	5440	5400	5330	5350	5530	5760
200	%N1	64.1	66.7	71.0	75.3	80.1	85.0
	KIAS	217	217	217	217	217	226
	FF/ENG	5010	4970	4910	4900	5040	5200
180	%N1	62.0	64.6	68.6	72.9	77.6	82.5
	KIAS	217	217	217	217	217	217
	FF/ENG	4630	4580	4520	4500	4630	4730
160	%N1	59.9	62.6	66.3	70.7	75.2	80.0
	KIAS	217	217	217	217	217	217
	FF/ENG	4300	4240	4160	4140	4250	4340

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

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available

Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	170	80				
50	220	130	-10			
48	260	170	30			
46	300	220	70	-70		
44	340	260	110	-30		
42	380	300	150	10	-130	
40	400	340	190	40	-100	
38	400	380	230	80	-70	-260
36	410	390	270	110	-50	-230
34	410	400	300	150	-20	-210
32	410	400	320	180	10	-180
30	420	400	320	200	40	-160
20	430	410	330	220	100	-70
10	440	420	290	170	60	-310
0	450	430	270	80	-110	-320
-20	470	450	280	90	-110	-330
-40	500	470	290	90	-110	-350

Rate of climb capability shown is valid for 260000 kg, gear down at VREF20 + 5.

Decrease rate of climb 30 ft/min per 5000 kg greater than 260000 kg.

Increase rate of climb 40 ft/min per 5000 kg less than 260000 kg.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-400	-490				
50	-360	-450	-600			
48	-320	-410	-560			
46	-290	-380	-520	-660		
44	-250	-340	-490	-620		
42	-220	-300	-450	-590	-730	
40	-190	-260	-420	-560	-700	
38	-190	-230	-380	-530	-680	-860
36	-190	-210	-350	-500	-660	-840
34	-190	-210	-330	-470	-630	-820
32	-190	-210	-300	-450	-610	-800
30	-190	-210	-290	-430	-580	-780
20	-180	-210	-300	-410	-530	-700
10	-180	-210	-310	-540	-690	-840
0	-180	-210	-380	-550	-740	-960
-20	-190	-220	-390	-570	-770	-990
-40	-190	-230	-410	-600	-800	-1030

Rate of climb capability shown is valid for 260000 kg, gear down at VREF30 + 5.

Decrease rate of climb 40 ft/min per 5000 kg greater than 260000 kg.

Increase rate of climb 40 ft/min per 5000 kg less than 260000 kg.

DRAFT

Intentionally
Blank

Performance Inflight
Alternate Mode EEC

Chapter PI
Section 44

ALTERNATE MODE EEC

Alternate Mode EEC Max Takeoff %N1

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

AIRPORT OAT °C	°F	AIRPORT PRESSURE ALTITUDE (FT)											
		-2000	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000	8400
55	131	95.7	96.0	96.2	96.1	96.0	96.1	96.1	96.1	96.1	95.5	94.6	94.2
50	122	97.1	97.5	98.0	97.3	97.4	97.5	97.5	97.5	97.4	96.8	95.9	95.6
45	113	98.5	98.9	99.4	99.1	98.8	98.7	98.8	98.8	98.7	98.2	97.3	96.9
40	104	99.6	100.2	100.9	100.4	100.2	100.0	99.9	100.0	99.9	99.4	98.6	98.2
35	95	99.3	100.8	102.8	102.3	101.8	101.4	101.2	101.3	101.0	100.4	99.6	99.3
30	86	98.5	99.9	102.7	104.0	104.0	103.8	103.4	103.4	102.6	101.5	100.7	100.3
25	77	97.7	99.1	101.8	103.1	104.4	105.5	105.8	106.3	105.3	103.8	102.4	101.8
20	68	96.9	98.3	101.0	102.3	103.5	104.6	105.8	106.8	106.8	105.9	104.8	104.3
15	59	96.0	97.4	100.1	101.4	102.6	103.7	104.9	105.9	106.4	106.1	105.6	105.3
10	50	95.2	96.6	99.2	100.5	101.7	102.8	103.9	105.0	105.5	105.2	104.9	104.8
5	41	94.4	95.7	98.4	99.6	100.8	101.9	103.0	104.1	104.5	104.2	104.0	103.8
0	32	93.5	94.9	97.5	98.7	99.9	101.0	102.1	103.1	103.6	103.3	103.0	102.9
-10	14	91.8	93.1	95.7	96.9	98.1	99.1	100.2	101.2	101.7	101.4	101.1	101.0
-20	-4	90.0	91.3	93.8	95.0	96.2	97.2	98.3	99.3	99.7	99.4	99.2	99.0
-30	-22	88.2	89.5	92.0	93.1	94.3	95.3	96.3	97.3	97.7	97.5	97.2	97.1
-40	-40	86.4	87.6	90.1	91.2	92.3	93.3	94.3	95.3	95.7	95.4	95.2	95.1
-50	-58	84.5	85.7	88.1	89.2	90.3	91.3	92.3	93.2	93.6	93.4	93.1	93.0

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)											
	-2	-1	0	1	2	3	4	5	6	7	8	8.4
PACKS OFF	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3
WING ANTI-ICE ON	-0.2	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

DRAFT

Intentionally
Blank

Performance Inflight

Gear Down

Chapter PI

Section 45

GEAR DOWN

220 KIAS Max Climb %N1

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	88.2	88.3	91.4	91.1	92.1	91.3	94.0	95.2	95.4	98.1	99.9	101.1	102.4	102.9	103.4
50	89.5	88.8	90.7	90.4	91.4	92.1	93.3	94.5	94.7	97.3	99.2	100.3	101.6	102.1	102.6
45	90.5	90.1	90.0	89.7	90.7	91.4	92.6	93.8	93.9	96.6	98.4	99.6	100.8	101.3	101.8
40	91.6	91.2	91.2	89.7	89.9	90.7	91.9	93.0	93.2	95.8	97.6	98.8	100.0	100.5	101.0
35	92.6	92.3	92.2	92.1	90.6	89.9	91.1	92.3	92.5	95.0	96.8	98.0	99.2	99.7	100.2
30	93.0	93.2	93.2	93.0	92.2	91.2	90.9	91.5	91.7	94.3	96.0	97.2	98.4	98.9	99.4
25	92.2	94.2	94.1	94.0	93.7	92.8	92.1	92.0	91.1	93.5	95.2	96.4	97.6	98.0	98.5
20	91.4	94.2	95.1	95.0	94.9	94.4	93.4	93.0	92.8	93.6	94.4	95.6	96.8	97.2	97.7
15	90.7	93.4	96.7	96.4	96.3	96.1	94.8	94.1	94.5	94.8	95.2	95.3	96.0	96.4	96.9
10	89.9	92.6	96.3	97.9	98.1	98.1	96.8	95.5	96.5	96.2	96.4	96.4	96.1	96.0	
5	89.1	91.7	95.4	97.1	98.9	100.3	99.0	97.9	98.2	97.8	97.8	97.9	97.9	97.3	96.8
0	88.3	90.9	94.6	96.2	98.0	100.1	100.8	100.3	100.1	99.7	99.4	99.4	99.5	98.6	98.1
-5	87.4	90.1	93.7	95.3	97.1	99.1	99.9	100.8	101.9	101.5	101.1	101.1	101.1	100.2	99.6
-10	86.6	89.2	92.8	94.4	96.1	98.2	98.9	99.8	101.4	102.8	102.6	102.6	103.0	101.6	100.8
-15	85.8	88.4	91.9	93.5	95.2	97.3	98.0	98.9	100.4	101.8	102.5	103.2	103.8	102.5	101.4
-20	85.0	87.5	91.1	92.6	94.3	96.3	97.0	97.9	99.4	100.8	101.5	102.2	103.3	102.4	101.3

Anti-ice Adjustment

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2
ENGINE AND WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4
ENGINE AND WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5

* Packs on or off with 2 bleed sources.

** Packs off with 1 bleed source.

GEAR DOWN**Long Range Cruise Altitude Capability****Max Climb Thrust, 300 ft/min residual rate of climb**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
360	18500	16600	14200
350	19200	17300	14800
340	19700	18000	15500
330	20600	18900	16300
320	21700	20100	17600
310	22800	21300	19000
300	23900	22400	20300
290	25000	23500	21800
280	26000	24600	23000
270	27100	25900	24300
260	28200	27200	25700
250	29400	28600	27100
240	30400	30000	28500
230	31200	30800	29900
220	32000	31700	31000
210	32800	32600	32000
200	33500	33200	32700
190	34000	33900	33400
180	34600	34500	34100
170	35200	35100	34700
160	35800	35700	35300

GEAR DOWN**Long Range Cruise Control**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (1000 FT)									
	10	15	17	19	21	23	25	27	29	31
360	%N1	84.4	88.7	90.7	93.0					
	MACH	.488	.535	.556	.578					
	KIAS	270	270	270	270					
	FF/ENG	7524	7653	7775	7993					
340	%N1	83.5	87.8	89.7	91.8					
	MACH	.488	.535	.556	.578					
	KIAS	270	270	270	270					
	FF/ENG	7296	7405	7486	7646					
320	%N1	82.6	86.7	88.3	90.0	92.1				
	MACH	.488	.534	.550	.568	.588				
	KIAS	270	269	267	265	264				
	FF/ENG	7058	7105	7101	7142	7267				
300	%N1	81.2	84.9	86.6	88.2	89.9	92.1			
	MACH	.481	.520	.537	.554	.572	.594			
	KIAS	266	262	260	258	257	256			
	FF/ENG	6725	6632	6624	6623	6679	6806			
280	%N1	79.3	83.1	84.9	86.4	87.9	89.7	92.3		
	MACH	.468	.507	.523	.540	.557	.576	.598		
	KIAS	259	255	253	252	250	248	248		
	FF/ENG	6283	6189	6167	6168	6164	6230	6361		
260	%N1	77.2	81.1	82.9	84.6	86.0	87.6	89.4	92.3	96.7
	MACH	.453	.492	.508	.525	.542	.559	.579	.602	.628
	KIAS	251	248	246	244	243	241	239	239	239
	FF/ENG	5831	5754	5724	5709	5711	5706	5778	5910	6239
240	%N1	75.0	79.0	80.8	82.4	84.1	85.5	87.1	89.0	92.0
	MACH	.438	.476	.492	.508	.525	.543	.561	.581	.605
	KIAS	242	240	238	237	235	233	231	230	230
	FF/ENG	5377	5317	5292	5266	5254	5253	5252	5320	5450
220	%N1	72.6	76.7	78.4	80.2	81.7	83.4	84.9	86.4	88.4
	MACH	.421	.459	.475	.491	.508	.525	.543	.561	.582
	KIAS	232	231	230	228	227	225	224	222	221
	FF/ENG	4925	4872	4859	4836	4811	4800	4799	4799	4859
200	%N1	69.9	74.1	75.8	77.5	79.3	80.9	82.7	84.4	86.3
	MACH	.403	.441	.456	.473	.489	.506	.526	.548	.571
	KIAS	223	221	220	219	218	217	217	216	217
	FF/ENG	4476	4425	4418	4408	4384	4360	4387	4432	4481
180	%N1	67.8	72.2	74.1	75.9	77.9	79.8	81.5	83.3	85.1
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571
	KIAS	217	217	217	217	217	217	217	216	217
	FF/ENG	4152	4138	4141	4159	4170	4182	4208	4249	4283
160	%N1	66.8	71.3	73.1	74.9	76.9	78.7	80.5	82.4	84.1
	MACH	.392	.431	.448	.466	.485	.505	.526	.548	.571
	KIAS	217	217	217	217	217	217	217	216	217
	FF/ENG	4013	3995	3994	4006	4019	4031	4053	4088	4125

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	
310	280	254	233	216	200	189	179	170	162	155
622	562	510	467	431	400	378	358	340	324	311
936	845	766	702	648	600	567	538	511	487	466
1253	1131	1024	937	864	800	757	718	682	650	621
1573	1418	1283	1173	1081	1000	946	897	852	812	776
1896	1706	1542	1409	1298	1200	1135	1076	1022	973	930
2222	1997	1803	1646	1515	1400	1324	1254	1191	1134	1084
2552	2291	2066	1884	1733	1600	1513	1433	1361	1296	1238
2883	2586	2329	2122	1951	1800	1702	1612	1530	1457	1392
3215	2881	2593	2361	2169	2000	1890	1790	1699	1618	1545
3547	3177	2857	2600	2387	2200	2079	1968	1868	1778	1699
3880	3472	3120	2838	2604	2400	2268	2147	2038	1940	1853
4213	3768	3384	3076	2822	2600	2457	2326	2207	2101	2007
4545	4063	3648	3315	3040	2800	2646	2505	2377	2262	2161
4878	4359	3912	3554	3258	3000	2835	2683	2546	2424	2315
5211	4655	4176	3792	3476	3200	3023	2862	2716	2585	2468
5544	4951	4440	4031	3694	3400	3212	3041	2885	2746	2622
5876	5246	4703	4269	3912	3600	3401	3220	3055	2907	2776
6209	5541	4967	4507	4130	3800	3590	3398	3224	3068	2930
6542	5837	5230	4746	4348	4000	3778	3576	3393	3229	3084

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	7.4	0:46	6.7	0:44	5.8	0:42	5.3	0:41	5.0	0:39
400	15.0	1:29	13.9	1:25	12.4	1:20	11.6	1:17	11.1	1:13
600	22.6	2:13	21.1	2:06	19.0	1:58	17.9	1:53	17.2	1:48
800	30.0	2:57	28.0	2:48	25.4	2:37	24.0	2:30	23.0	2:23
1000	37.3	3:42	34.9	3:30	31.8	3:15	30.1	3:07	28.9	2:57
1200	44.4	4:28	41.6	4:14	38.0	3:55	35.9	3:44	34.5	3:33
1400	51.5	5:14	48.3	4:57	44.1	4:35	41.8	4:22	40.1	4:09
1600	58.3	6:01	54.7	5:41	50.1	5:15	47.5	5:00	45.6	4:45
1800	65.1	6:49	61.2	6:26	56.1	5:56	53.1	5:38	51.0	5:21
2000	71.7	7:37	67.5	7:11	61.9	6:37	58.7	6:17	56.3	5:57
2200	78.3	8:25	73.7	7:56	67.7	7:18	64.2	6:55	61.6	6:33
2400	84.8	9:13	79.9	8:41	73.4	7:59	69.6	7:34	66.8	7:09
2600	91.3	10:00	86.0	9:26	79.1	8:40	75.0	8:12	72.0	7:45
2800	97.6	10:48	92.0	10:11	84.6	9:21	80.3	8:51	77.1	8:21
3000	104.0	11:36	98.0	10:56	90.2	10:02	85.6	9:29	82.1	8:57
3200	110.2	12:24	103.9	11:41	95.7	10:43	90.8	10:08	87.1	9:33
3400	116.5	13:12	109.8	12:27	101.1	11:24	96.0	10:46	92.1	10:09
3600	122.6	14:00	115.6	13:12	106.5	12:05	101.1	11:25	97.0	10:45
3800	128.7	14:48	121.4	13:57	111.9	12:46	106.2	12:03	101.9	11:21
4000	134.8	15:36	127.2	14:42	117.2	13:27	111.3	12:42	106.8	11:57

GEAR DOWN

Long Range Cruise Enroute Fuel and Time Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)										
	150	170	190	210	230	250	270	290	310	330	350
10	-1.8	-1.6	-1.3	-0.9	-0.4	0.0	0.8	1.8	2.9	4.1	5.5
20	-3.6	-3.2	-2.6	-1.8	-0.9	0.0	1.6	3.4	5.5	7.9	10.5
30	-5.3	-4.7	-3.8	-2.7	-1.4	0.0	2.2	4.9	7.9	11.3	15.1
40	-6.8	-6.0	-5.0	-3.5	-1.8	0.0	2.9	6.2	10.1	14.4	19.2
50	-8.3	-7.3	-6.0	-4.2	-2.2	0.0	3.4	7.4	12.0	17.1	22.9
60	-9.5	-8.4	-6.9	-4.9	-2.5	0.0	3.9	8.4	13.7	19.6	26.1
70	-10.7	-9.5	-7.8	-5.5	-2.8	0.0	4.3	9.3	15.1	21.6	28.9
80	-11.7	-10.4	-8.5	-6.1	-3.1	0.0	4.6	10.1	16.3	23.4	31.2
90	-12.6	-11.2	-9.2	-6.5	-3.4	0.0	4.9	10.7	17.3	24.8	33.1
100	-13.4	-11.9	-9.8	-7.0	-3.7	0.0	5.1	11.1	18.0	25.9	34.6
110	-14.1	-12.5	-10.3	-7.3	-3.9	0.0	5.2	11.4	18.5	26.6	35.6
120	-14.6	-12.9	-10.7	-7.6	-4.0	0.0	5.3	11.6	18.8	27.0	36.1
130	-15.0	-13.3	-11.0	-7.9	-4.2	0.0	5.3	11.6	18.8	27.0	36.2
140	-15.2	-13.5	-11.2	-8.1	-4.3	0.0	5.2	11.5	18.6	26.7	35.8

Based on Long Range Cruise and VREF30+80 descent.

Descent at VREF30 + 80

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	35	40	44	48	52	57	61	65	69	74
TIME (MINUTES)	11	12	13	14	15	15	16	17	18	18

GEAR DOWN**Holding
Flaps Up**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)						
	1500	5000	10000	15000	20000	25000	30000
360	%N1	76.1					
	KIAS	264					
	FF/ENG	7750					
340	%N1	74.6	77.7				
	KIAS	260	260				
	FF/ENG	7360	7350				
320	%N1	72.8	75.8				
	KIAS	253	253				
	FF/ENG	6890	6870				
300	%N1	70.6	73.7	78.1			
	KIAS	244	244	244			
	FF/ENG	6380	6370	6340			
280	%N1	68.8	72.0	76.3			
	KIAS	238	238	238			
	FF/ENG	5970	5960	5920			
260	%N1	66.7	69.7	74.1	78.6		
	KIAS	229	229	229	229		
	FF/ENG	5520	5510	5470	5490		
240	%N1	64.9	67.7	72.2	76.7		
	KIAS	223	223	223	223		
	FF/ENG	5150	5130	5100	5100		
220	%N1	63.1	65.8	70.1	74.6	79.4	
	KIAS	217	217	217	217	217	
	FF/ENG	4800	4770	4730	4730	4770	
200	%N1	61.9	64.7	68.8	73.3	78.0	82.7
	KIAS	217	217	217	217	217	217
	FF/ENG	4610	4570	4520	4520	4550	4610
180	%N1	61.0	63.8	67.8	72.2	76.9	81.5
	KIAS	217	217	217	217	217	217
	FF/ENG	4450	4410	4360	4350	4370	4420
160	%N1	60.1	62.9	66.8	71.3	75.9	80.5
	KIAS	217	217	217	217	217	217
	FF/ENG	4320	4270	4210	4190	4210	4260

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

GEAR DOWN**Holding
Flaps 1**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
360	%N1	75.9	79.0	83.8	88.3
	KIAS	244	244	244	244
	FF/ENG	7660	7700	7690	7810
340	%N1	74.3	77.4	82.1	86.8
	KIAS	240	240	240	240
	FF/ENG	7240	7260	7250	7350
320	%N1	72.5	75.5	80.0	84.9
	KIAS	233	233	233	233
	FF/ENG	6770	6780	6770	6830
300	%N1	70.3	73.4	77.8	82.9
	KIAS	224	224	224	224
	FF/ENG	6270	6270	6270	6320
280	%N1	68.3	71.5	75.8	80.6
	KIAS	218	218	218	218
	FF/ENG	5840	5840	5820	5870
260	%N1	66.0	69.1	73.5	78.1
	KIAS	209	209	209	209
	FF/ENG	5380	5370	5340	5400
240	%N1	64.1	66.9	71.4	75.9
	KIAS	203	203	203	203
	FF/ENG	4980	4960	4930	4970
220	%N1	62.0	64.7	69.0	73.6
	KIAS	197	197	197	197
	FF/ENG	4600	4570	4530	4550
200	%N1	60.5	63.2	67.3	71.8
	KIAS	197	197	197	197
	FF/ENG	4350	4310	4260	4270
180	%N1	59.1	61.8	65.8	70.3
	KIAS	197	197	197	197
	FF/ENG	4140	4100	4040	4050
160	%N1	57.9	60.7	64.6	69.0
	KIAS	197	197	197	197
	FF/ENG	3970	3920	3860	3860

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

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**Performance Inflight
Gear Down, Engine INOP****Chapter PI
Section 46****GEAR DOWN**
ENGINE INOP
MAX CONTINUOUS THRUST**Driftdown Speed/Level Off Altitude****100 ft/min residual rate of climb****Includes APU fuel burn**

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
320	307	254	5600	4400	2200
300	288	246	7700	6800	5300
280	269	238	9800	9100	8100
260	250	230	12100	11400	10300
240	230	223	14000	13500	12400
220	210	217	15900	15400	14400
200	191	216	17300	16700	15700
180	172	216	18500	18100	16900
160	153	216	19700	19400	18200

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
340	1800		
330	3300	1000	
320	4500	2700	
310	5700	4400	1900
300	6800	5700	3800
290	7800	7000	5300
280	8800	8100	6700
270	9800	9100	8100
260	11100	10400	9300
250	12100	11400	10300
240	13100	12500	11300
230	14000	13600	12400
220	15100	14600	13600
210	15900	15400	14400
200	16700	16100	15100
190	17400	16700	15800
180	18000	17500	16400
170	18700	18200	16900
160	19300	18900	17700

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
300	%N1	94.3	96.8					
	MACH	.403	.418					
	KIAS	244	244					
	FF/ENG	12328	12507					
280	%N1	92.3	94.1	96.8				
	MACH	.393	.407	.422				
	KIAS	238	238	238				
	FF/ENG	11514	11566	11807				
260	%N1	90.5	91.6	93.6	96.4			
	MACH	.385	.393	.408	.423			
	KIAS	233	229	229	229			
	FF/ENG	10870	10626	10714	10945			
240	%N1	88.9	89.8	91.3	93.4	96.5		
	MACH	.379	.385	.397	.412	.428		
	KIAS	229	225	223	223	223		
	FF/ENG	10228	9966	9915	10023	10245		
220	%N1	86.6	88.0	89.1	90.9	93.1	96.4	
	MACH	.368	.377	.387	.401	.417	.433	
	KIAS	223	220	217	217	217	217	
	FF/ENG	9452	9309	9167	9222	9323	9542	
200	%N1	84.2	86.0	87.8	89.5	91.4	94.0	98.1
	MACH	.358	.371	.385	.400	.415	.431	.448
	KIAS	217	217	217	217	217	217	217
	FF/ENG	8693	8698	8718	8773	8844	8956	9300
180	%N1	82.9	84.7	86.7	88.4	90.2	92.3	95.5
	MACH	.358	.371	.385	.400	.415	.431	.448
	KIAS	217	217	217	217	217	217	217
	FF/ENG	8330	8328	8342	8399	8458	8533	8740
160	%N1	81.7	83.6	85.4	87.3	89.0	90.9	93.5
	MACH	.358	.371	.385	.400	.415	.431	.448
	KIAS	217	217	217	217	217	217	217
	FF/ENG	8019	8011	8010	8058	8115	8168	8310

GEAR DOWN
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	
165	145	129	118	108	100	95	90	84	78	73	
332	295	263	238	218	200	187	175	165	155	147	
500	444	396	358	327	300	280	262	246	233	221	
669	593	528	477	436	400	374	350	329	310	294	
837	742	661	597	545	500	467	437	410	387	367	
1007	893	795	718	655	600	560	524	492	464	440	
1177	1043	928	838	764	700	653	611	574	541	513	
1347	1193	1061	958	873	800	746	698	655	618	586	
1519	1344	1195	1078	983	900	839	785	737	695	659	
1691	1496	1329	1198	1092	1000	933	873	819	772	731	

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
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)	
100	4.0	0:27	3.8	0:26	3.5	0:26	3.4	0:25	3.3	0:25
200	8.2	0:51	7.8	0:50	7.5	0:49	7.3	0:48	7.2	0:47
300	12.3	1:15	11.8	1:14	11.4	1:12	11.1	1:10	11.1	1:09
400	16.4	1:40	15.8	1:38	15.3	1:36	14.9	1:33	14.9	1:30
500	20.5	2:04	19.7	2:02	19.1	1:59	18.7	1:56	18.7	1:53
600	24.5	2:29	23.6	2:27	22.9	2:23	22.5	2:19	22.4	2:15
700	28.5	2:53	27.5	2:51	26.7	2:46	26.1	2:42	26.0	2:37
800	32.5	3:18	31.3	3:16	30.4	3:10	29.8	3:05	29.6	2:59
900	36.4	3:43	35.1	3:40	34.1	3:34	33.4	3:28	33.2	3:22
1000	40.3	4:08	38.8	4:05	37.8	3:58	37.0	3:51	36.7	3:44

Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)				
	150	200	250	300	350
5	-0.8	-0.5	0.0	1.6	2.6
10	-1.8	-1.1	0.0	3.0	5.6
15	-2.8	-1.6	0.0	4.4	8.6
20	-3.7	-2.2	0.0	5.6	11.6
25	-4.5	-2.7	0.0	6.8	14.4
30	-5.4	-3.2	0.0	7.8	17.3
35	-6.2	-3.7	0.0	8.7	20.0
40	-7.0	-4.2	0.0	9.5	22.7
45	-7.7	-4.7	0.0	10.2	25.3

Based on Long Range Cruise and VREF30+80 descent. Includes APU fuel burn.

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

**Holding
Flaps Up**

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)			
	1500	5000	10000	15000
340	%N1	95.5		
	KIAS	260		
	FF/ENG	14970		
320	%N1	93.4	97.2	
	KIAS	253	253	
	FF/ENG	13980	14120	
300	%N1	91.1	94.3	
	KIAS	244	244	
	FF/ENG	12970	12940	
280	%N1	89.3	92.3	98.8
	KIAS	238	238	238
	FF/ENG	12100	12090	12660
260	%N1	86.8	90.0	94.8
	KIAS	229	229	229
	FF/ENG	11100	11180	11340
240	%N1	84.6	88.0	92.2
	KIAS	223	223	223
	FF/ENG	10310	10380	10460
220	%N1	82.3	85.7	90.0
	KIAS	217	217	217
	FF/ENG	9540	9590	9650
200	%N1	80.8	84.2	88.6
	KIAS	217	217	217
	FF/ENG	9080	9130	9180
180	%N1	79.6	82.9	87.5
	KIAS	217	217	217
	FF/ENG	8700	8750	8780
160	%N1	78.6	81.7	86.4
	KIAS	217	217	217
	FF/ENG	8380	8420	8430

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

Performance Inflight**Text****Chapter PI****Section 47****Introduction**

This chapter contains information to supplement performance data from the Flight Management Computer. 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 Flight Manual, the Flight Manual shall always take precedence.

General**FMC Takeoff Speeds**

FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. 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. 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. This typically occurs at full rated thrust and light weights and is shown in the Minimum Takeoff Weight tables provided in the Performance Dispatch Takeoff section. The options are to select a smaller flaps setting, use reduced takeoff thrust and/or add weight (fuel). Selecting derate thrust is the preferred method of reduced takeoff thrust as this will reduce the minimum control speeds.

Clearway and Stopway V1 Adjustments

Takeoff speed corrections are to be applied to V1 when using takeoff weights based on the use of clearway and stopway.

Adjust V1 by the amount shown in the table. The adjusted V1 must not exceed VR. If V1 is greater than VR, VR may be increased to equal V1. The resultant V2 will be increased by the same amount that VR was increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

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

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 13mm (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 is determined as follows:

- (1) Determine the dry field/obstacle limit weight for the takeoff flap setting.
- (2) 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.
- (3) Adjust field length available for temperature by amount shown on chart.

- (4) Enter the V1(MCG) Limit Weight table with the field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

- (1) Determine takeoff speeds V1, VR and V2 for actual brake release weight using Takeoff Speeds from the Performance Dispatch chapter or from the FMC.
- (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

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. Good reported braking action denotes wet runway conditions or runways covered by compact snow. Similarly, poor braking action denotes runways covered with wet ice. Performance is based on reversers operating and a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR 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 Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Go-Around %N1

To find Go-Around %N1 based on normal engine bleed for packs on and anti-ice off, enter the Go-Around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. %N1 adjustments are shown for engine bleeds for various conditions.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body 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 may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

All Engines

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of approximately 1.3g (39° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 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, .84 Mach approximates the Long Range Cruise Mach schedule.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .84/310/250 descent. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table 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.

Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

Descent at .84/310/250

Distance and time for descent are shown for a .84/310/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing Flaps 30 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 for the selected flap setting. Flaps 1 is based on VREF30 + 60 speed schedule. 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

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. Landing distances for slippery runways are 115% of the actual landing distances.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. 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.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing 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 corrections for off-reference landing weight, altitude, wind, slope, and speed conditions. Each correction is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the 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.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy 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, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

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 Mach number of .84 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 engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude 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/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Long Range Cruise Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the following table. These increments include the APU fuel flow and the effect of increased drag from the APU door.

PRESSURE ALTITUDE (1000 FT)	APU FUEL FLOW PENALTY (KG/HR)				
	GROSS WEIGHT (1000 KG)				
	300	260	220	180	140
43				160	140
39			180	160	145
35		200	190	170	140
31	230	220	195	165	140
25	230	220	195	175	155
20	235	230	205	185	165
15	235	235	215	200	185
10	240	240	230	220	200
5	270	270	255	240	220

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 .84/310/250 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 corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Alternate Mode EEC

No takeoff speed adjustments or other performance adjustments are required for operation of EEC in the ALTERNATE mode. Power setting adjustments are only required for the takeoff thrust rating.

Max Takeoff %N1

Takeoff power settings are presented for normal air condition bleed. Max Takeoff %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. 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 will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

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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General

Chapter PI

Section 50

Maximum Allowable Clearway

FIELD LENGTH (FT)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	400
6000	550
8000	650
10000	750
12000	850
14000	950
16000	1050

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)				
	100	120	140	160	180
600	-1	-1	-1	-1	-1
400	0	0	-1	-1	-1
200	0	0	0	0	0
0	0	0	0	0	0
-200	4	3	3	2	1
-400	5	4	3	2	1
-600	6	5	4	3	2
-800	6	6	5	4	2

VREF

WEIGHT (1000 LB)	FLAPS		
	30	25	20
660	169	174	183
640	165	172	181
620	163	169	178
600	160	167	175
580	157	164	172
560	155	161	169
540	152	158	166
520	149	155	163
500	146	152	160
480	143	149	157
460	140	146	154
440	137	143	150
420	133	139	147
400	130	136	143
380	126	132	139
360	123	128	135
340	119	124	131

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Flap Maneuver Speed

FLAP POSITION	MANEUVER SPEED
FLAPS 0	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

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ADVISORY INFORMATION**Slush/Standing Water Takeoff****Maximum Reverse Thrust****Weight Adjustment (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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
700	-73.7	-84.1	-94.5	-85.8	-96.2	-106.6	-112.4	-122.8	-133.2
660	-72.0	-82.4	-92.8	-83.4	-93.8	-104.2	-108.1	-118.5	-128.9
620	-69.1	-79.5	-89.9	-79.6	-90.0	-100.4	-102.3	-112.7	-123.1
580	-65.1	-75.5	-85.9	-74.5	-84.9	-95.3	-94.8	-105.2	-115.6
540	-59.8	-70.2	-80.6	-68.1	-78.5	-88.9	-85.9	-96.3	-106.7
500	-53.4	-63.8	-74.2	-60.4	-70.8	-81.2	-75.4	-85.8	-96.2
460	-45.7	-56.1	-66.5	-51.4	-61.8	-72.2	-63.3	-73.7	-84.1
420	-36.9	-47.3	-57.7	-41.0	-51.4	-61.8	-49.7	-60.1	-70.5
380	-26.9	-37.3	-47.7	-29.3	-39.7	-50.1	-34.5	-44.9	-55.3

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
5800							315.4		
6200							389.7		
6600	359.2	332.9	306.7	320.3	399.0	372.3	346.0	364.4	339.7
7000	440.8	412.7	385.4	482.6	454.0	426.0	559.0	527.9	498.1
7400	529.9	499.1	469.3	572.8	541.7	511.6	661.0	625.0	590.9
7800	628.9	594.4	561.3	671.3	637.2	604.3	777.0	737.8	698.6
8200	740.6	702.2	664.4	777.2	741.7	706.1			
8600			778.5						

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 -125ft/+125ft 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
660	-17	-13	-9	-12	-8	-4	-2	2	6
620	-19	-15	-11	-13	-9	-5	-3	1	5
580	-21	-17	-13	-15	-11	-7	-4	0	4
540	-23	-19	-15	-18	-14	-10	-7	-3	1
500	-25	-21	-17	-20	-16	-12	-10	-6	-2
460	-27	-23	-19	-23	-19	-15	-13	-9	-5
420	-28	-24	-20	-24	-20	-16	-16	-12	-8
380	-28	-24	-20	-25	-21	-17	-19	-15	-11
340	-28	-24	-20	-26	-22	-18	-21	-17	-13

1. Obtain V1, VR and V2 for the actual weight.
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 Adjustment (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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
700	-103.0	-115.0	-127.0	-121.9	-133.9	-145.9	-154.2	-166.2	-178.2
660	-97.5	-109.5	-121.5	-114.7	-126.7	-138.7	-143.6	-155.6	-167.6
620	-91.4	-103.4	-115.4	-106.8	-118.8	-130.8	-132.2	-144.2	-156.2
580	-84.5	-96.5	-108.5	-98.2	-110.2	-122.2	-120.1	-132.1	-144.1
540	-77.0	-89.0	-101.0	-88.8	-100.8	-112.8	-107.2	-119.2	-131.2
500	-68.9	-80.9	-92.9	-78.6	-90.6	-102.6	-93.5	-105.5	-117.5
460	-60.0	-72.0	-84.0	-67.6	-79.6	-91.6	-79.1	-91.1	-103.1
420	-50.5	-62.5	-74.5	-55.9	-67.9	-79.9	-64.0	-76.0	-88.0
380	-40.3	-52.3	-64.3	-43.5	-55.5	-67.5	-48.1	-60.1	-72.1
340	-29.4	-41.4	-53.4	-30.3	-42.3	-54.3	-31.4	-43.4	-55.4

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
8200							268.7		
8600							377.1	268.7	
9000							492.1	377.1	268.7
9400				334.6			619.2	492.1	377.1
9800				476.5	334.6		761.0	619.2	492.1
10200	369.2			647.8	476.5	334.6		761.0	619.2
10600	624.9	369.2			647.8	476.5			761.0
11000		624.9	369.2			647.8			
11400			624.9						

1. Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water adjustment.
2. Adjust field length available by -190 ft/+180 ft for every 5°C above/below 4°C.
3. Find V1(MCG) limited 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
660	-30	-24	-18	-21	-15	-9	-7	-1	0
620	-33	-27	-21	-24	-18	-12	-9	-3	0
580	-36	-30	-24	-27	-21	-15	-12	-6	0
540	-39	-33	-27	-31	-25	-19	-15	-9	-3
500	-42	-36	-30	-35	-29	-23	-20	-14	-8
460	-45	-39	-33	-39	-33	-27	-25	-19	-13
420	-47	-41	-35	-43	-37	-31	-31	-25	-19
380	-49	-43	-37	-45	-39	-33	-36	-30	-24
340	-51	-45	-39	-47	-41	-35	-43	-37	-31

1. Obtain V1, VR and V2 for the actual weight.
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.

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ADVISORY INFORMATION**Slippery Runway Takeoff**
Maximum 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	0.0	-4.0	-8.0	-31.1	-35.1	-39.1	-67.5	-71.5
660	0.0	-4.0	-8.0	-35.8	-39.8	-43.8	-68.9	-72.9
620	-1.9	-5.9	-9.9	-38.8	-42.8	-46.8	-68.8	-72.8
580	-5.8	-9.8	-13.8	-40.3	-44.3	-48.3	-67.1	-71.1
540	-8.4	-12.4	-16.4	-40.0	-44.0	-48.0	-63.9	-67.9
500	-9.6	-13.6	-17.6	-38.2	-42.2	-46.2	-59.1	-63.1
460	-9.3	-13.3	-17.3	-34.7	-38.7	-42.7	-52.8	-56.8
420	-7.6	-11.6	-15.6	-29.6	-33.6	-37.6	-45.0	-49.0
380	-4.6	-8.6	-12.6	-22.9	-26.9	-30.9	-35.7	-39.7

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
4600	424.1	304.8						
5000	590.2	494.7	386.0					
5400	730.2	648.4	559.5					
5800			703.3					
6200				397.2				
6600				517.4	397.2			
7000				642.2	517.4	397.2		
7400				771.0	642.2	517.4		
7800				771.0	642.2	321.8		
8200					771.0	383.8		
8600						449.5	340.2	
9000						520.4	403.0	
9400						598.0	470.1	358.7
9800						684.8	542.9	422.6
10200						778.6	623.0	491.3
10600							712.9	566.1
11000								648.8
11400								741.0

- Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.
- Adjust "Good" field length available by -70ft/+70ft for every 5°C above/below 4°C.
Adjust "Medium" field length available by -100ft/+100ft for every 5°C above/below 4°C.
Adjust "Poor" field length available by -135ft/+135ft for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION**Slippery Runway Takeoff****Maximum Reverse Thrust****V1 Adjustments (KIAS)**

WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
660	-3	-1	1	-12	-10	-8	-25	-23	-21
620	-4	-2	0	-15	-13	-11	-28	-26	-24
580	-6	-4	-2	-17	-15	-13	-31	-29	-27
540	-8	-6	-4	-20	-18	-16	-35	-33	-31
500	-9	-7	-5	-22	-20	-18	-38	-36	-34
460	-10	-8	-6	-25	-23	-21	-41	-39	-37
420	-11	-9	-7	-26	-24	-22	-44	-42	-40
380	-12	-10	-8	-28	-26	-24	-46	-44	-42
340	-12	-10	-8	-29	-27	-25	-48	-46	-44

1. Obtain V1, VR and V2 for the actual weight.
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 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)		PRESS ALT (FT)		PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	-7.4	-11.4	-15.4	-57.1	-61.1	-65.1	-100.6	-104.6	-108.6		
660	-12.9	-16.9	-20.9	-60.0	-64.0	-68.0	-97.9	-101.9	-105.9		
620	-17.1	-21.1	-25.1	-61.3	-65.3	-69.3	-94.4	-98.4	-102.4		
580	-20.3	-24.3	-28.3	-61.2	-65.2	-69.2	-89.9	-93.9	-97.9		
540	-22.2	-26.2	-30.2	-59.5	-63.5	-67.5	-84.5	-88.5	-92.5		
500	-23.1	-27.1	-31.1	-56.2	-60.2	-64.2	-78.1	-82.1	-86.1		
460	-22.7	-26.7	-30.7	-51.4	-55.4	-59.4	-70.9	-74.9	-78.9		
420	-21.2	-25.2	-29.2	-45.1	-49.1	-53.1	-62.8	-66.8	-70.8		
380	-18.6	-22.6	-26.6	-37.3	-41.3	-45.3	-53.7	-57.7	-61.7		
340	-14.8	-18.8	-22.8	-28.0	-32.0	-36.0	-43.8	-47.8	-51.8		

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)		PRESS ALT (FT)		PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
5800	686.4	601.9	452.4								
6200			722.1								
8600				716.0	531.6						
9000					772.9	632.7					
12600							409.4				
13000							621.4	275.1			
13400									496.1		
13800									701.9	364.9	
14200										580.3	

- Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.
- Adjust "Good" field length available by -90 ft/+80 ft for every 5°C above/below 4°C.
Adjust "Medium" field length available by -130 ft/+120 ft for every 5°C above/below 4°C.
Adjust "Poor" field length available by -200 ft/+190 ft for every 5°C above/below 4°C.
- Find V1(MCG) limited weight for adjusted field length and pressure altitude.
- 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)		S.L.	PRESS ALT (FT)		S.L.	PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
660	-6	0	0	-19	-13	-7	-40	-34	-28
620	-8	-2	0	-23	-17	-11	-45	-39	-33
580	-10	-4	0	-26	-20	-14	-50	-44	-38
540	-12	-6	0	-30	-24	-18	-56	-50	-44
500	-15	-9	-3	-34	-28	-22	-61	-55	-49
460	-17	-11	-5	-38	-32	-26	-66	-60	-54
420	-19	-13	-7	-42	-36	-30	-72	-66	-60
380	-21	-15	-9	-46	-40	-34	-77	-71	-65
340	-24	-18	-12	-50	-44	-38	-81	-75	-69

1. Obtain V1, VR and V2 for the actual weight.
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**TO1 Slush/Standing Water Takeoff****10% Thrust Reduction****Maximum Reverse Thrust****Weight Adjustment (1000 LB)**

TO1 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.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
700	-63.3	-72.0	-80.6	-74.6	-83.3	-91.9	-99.8	-108.4	-116.8
660	-62.1	-70.7	-79.0	-72.6	-80.9	-89.1	-95.0	-103.3	-111.5
620	-59.5	-67.8	-76.0	-69.0	-77.2	-85.5	-89.6	-97.9	-106.1
580	-56.0	-64.2	-72.5	-64.6	-73.0	-81.5	-83.9	-92.5	-101.1
540	-53.2	-61.7	-70.3	-61.1	-69.7	-78.8	-78.9	-88.1	-97.4
500	-50.5	-59.8	-69.1	-57.9	-67.2	-76.4	-73.6	-83.2	-93.0
460	-46.6	-56.3	-66.1	-52.9	-62.6	-72.3	-66.2	-76.0	-85.7
420	-40.1	-49.8	-59.6	-44.8	-54.6	-64.3	-55.0	-64.7	-74.4
380	-30.8	-40.6	-50.3	-34.0	-43.7	-53.5	-40.8	-50.5	-60.2

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.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
5400							314.4		
5800				333.2			402.4	305.6	
6200	384.0			424.5	324.1		496.6	393.4	
6600	478.2	374.9		520.6	415.2	315.0	601.0	486.8	384.5
7000	580.1	468.4	365.9	623.0	510.7	406.0	721.1	590.0	477.1
7400	693.4	569.5	458.8	733.5	612.4	509.9		708.4	579.1
7800		681.4	559.0		722.3	601.9			695.8
8200			669.6			711.1			

1. Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -125ft/+125ft 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.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
660	-13	-9	-4	-8	-3	1	3	7	12
620	-15	-11	-7	-9	-5	-1	2	6	11
580	-17	-13	-9	-11	-7	-3	0	5	9
540	-20	-15	-11	-14	-10	-5	-2	2	6
500	-22	-18	-14	-17	-13	-8	-6	-1	3
460	-24	-20	-16	-20	-16	-12	-9	-5	-1
420	-26	-22	-17	-22	-18	-14	-13	-9	-4
380	-27	-23	-18	-24	-19	-15	-17	-12	-8
340	-27	-23	-19	-24	-20	-16	-20	-16	-11

1. Obtain V1, VR and V2 for the actual weight.
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.

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ADVISORY INFORMATION**TO1 Slush/Standing Water Takeoff****10% Thrust Reduction****No Reverse Thrust****Weight Adjustment (1000 LB)**

TO1 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.	4000	8000	S.L.	4000	8000
700	-102.5	-114.5	-126.5	-121.9	-133.9	-145.9	-155.8	-167.8	-179.8
660	-96.9	-108.9	-120.9	-114.6	-126.6	-138.6	-145.0	-157.0	-169.0
620	-91.0	-103.0	-115.0	-107.0	-119.0	-131.0	-133.8	-145.8	-157.8
580	-84.5	-96.5	-108.5	-98.7	-110.7	-122.7	-121.9	-133.9	-145.9
540	-77.2	-89.2	-101.2	-89.5	-101.5	-113.5	-109.3	-121.3	-133.3
500	-69.3	-81.3	-93.3	-79.6	-91.6	-103.6	-95.9	-107.9	-119.9
460	-60.6	-72.6	-84.6	-69.0	-81.0	-93.0	-81.8	-93.8	-105.8
420	-51.3	-63.3	-75.3	-57.5	-69.5	-81.5	-66.8	-78.8	-90.8
380	-41.3	-53.3	-65.3	-45.3	-57.3	-69.3	-51.1	-63.1	-75.1
340	-30.7	-42.7	-54.7	-32.4	-44.4	-56.4	-34.8	-46.8	-58.8

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.	4000	8000	S.L.	4000	8000
7800							345.5		
8200							477.7		
8600				346.6			631.3		
9000								345.5	
9400	551.9	551.9	551.9	531.0	346.6	346.6			477.7
9800					531.0	531.0			631.3
10200									631.3

- Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water adjustment.
- Adjust field length available by -190 ft/+180 ft for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- 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.	4000	8000	S.L.	4000	8000
660	-24	-18	-12	-15	-9	-3	-1	0	0
620	-27	-21	-15	-18	-12	-6	-3	0	0
580	-30	-24	-18	-21	-15	-9	-6	0	0
540	-33	-27	-21	-25	-19	-13	-9	-3	0
500	-36	-30	-24	-29	-23	-17	-14	-8	-2
460	-39	-33	-27	-33	-27	-21	-19	-13	-7
420	-41	-35	-29	-37	-31	-25	-25	-19	-13
380	-43	-37	-31	-39	-33	-27	-31	-25	-19
340	-45	-39	-33	-41	-35	-29	-37	-31	-25

- Obtain V1, VR and V2 for the actual weight.
- 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.

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ADVISORY INFORMATION**TO1 Slippery Runway Takeoff****10% Thrust Reduction****Maximum Reverse Thrust****Weight Adjustment (1000 LB)**

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)		PRESS ALT (FT)		PRESS ALT (FT)		S.L.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
700	0.0	-3.7	-7.5	-23.9	-27.6	-31.4	-61.3	-65.1	-68.8
660	0.0	-3.7	-7.5	-29.1	-32.9	-36.6	-63.3	-67.0	-70.8
620	0.0	-3.7	-7.5	-33.7	-37.5	-41.2	-64.6	-68.3	-72.1
580	-2.3	-6.0	-9.8	-36.6	-40.4	-44.1	-64.3	-68.0	-71.8
540	-6.0	-9.8	-13.5	-37.8	-41.5	-45.3	-62.4	-66.1	-69.9
500	-8.3	-12.0	-15.8	-37.2	-40.9	-44.7	-58.8	-62.5	-66.3
460	-9.0	-12.7	-16.5	-34.9	-38.6	-42.4	-53.6	-57.3	-61.1
420	-8.2	-12.0	-15.7	-30.8	-34.6	-38.3	-46.8	-50.5	-54.2
380	-6.0	-9.7	-13.5	-25.0	-28.8	-32.5	-38.3	-42.0	-45.8

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.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
4200	361.3								
4600	550.9	443.0	317.4						
5000	705.0	615.7	516.5						
5400		762.4	676.1						
5800				390.6					
6200				518.3	390.6				
6600				651.0	518.3	390.6			
7000				651.0	518.3	518.3			
7400				651.0	333.4				
7800							399.6		
8200							470.4	353.0	
8600							547.4	420.3	307.3
9000							632.6	492.8	372.7
9400							728.4	572.0	441.4
9800								660.1	515.8
10200								758.1	597.4
10600									688.9

- Enter Weight Adjustment table with reported braking action and TO1 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
- Adjust “Good” field length available by -70ft/+70ft for every 5°C above/below 4°C.
Adjust “Medium” field length available by -100ft/+100ft for every 5°C above/below 4°C.
Adjust “Poor” field length available by -135ft/+135ft for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION**TO1 Slippery Runway Takeoff****10% Thrust Reduction****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.	4000	8000	S.L.	4000	8000
660	-4	-2	0	-11	-10	-8	-22	-20	-18
620	-5	-3	-2	-13	-11	-10	-25	-23	-21
580	-6	-4	-3	-15	-14	-12	-28	-26	-24
540	-7	-6	-4	-17	-16	-14	-31	-29	-27
500	-9	-7	-6	-20	-18	-17	-34	-33	-31
460	-10	-9	-7	-22	-21	-19	-38	-36	-34
420	-12	-10	-8	-25	-23	-21	-41	-39	-37
380	-13	-11	-9	-26	-24	-23	-43	-41	-39
340	-13	-11	-10	-27	-25	-24	-45	-43	-41

1. Obtain V1, VR and V2 for the actual weight.
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**TO1 Slippery Runway Takeoff****10% Thrust Reduction****No Reverse Thrust****Weight Adjustment (1000 LB)**

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	REPORTED BRAKING ACTION										
	GOOD			MEDIUM			POOR				
	PRESS ALT (FT)		PRESS ALT (FT)		PRESS ALT (FT)		PRESS ALT (FT)		PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
700	-1.1	-5.1	-9.1	-50.9	-54.9	-58.9	-98.0	-102.0	-106.0		
660	-7.0	-11.0	-15.0	-54.2	-58.2	-62.2	-95.4	-99.4	-103.4		
620	-12.4	-16.4	-20.4	-56.8	-60.8	-64.8	-92.3	-96.3	-100.3		
580	-16.5	-20.5	-24.5	-57.8	-61.8	-65.8	-88.2	-92.2	-96.2		
540	-19.4	-23.4	-27.4	-57.1	-61.1	-65.1	-83.3	-87.3	-91.3		
500	-21.0	-25.0	-29.0	-54.9	-58.9	-62.9	-77.4	-81.4	-85.4		
460	-21.5	-25.5	-29.5	-51.0	-55.0	-59.0	-70.5	-74.5	-78.5		
420	-20.6	-24.6	-28.6	-45.5	-49.5	-53.5	-62.7	-66.7	-70.7		
380	-18.5	-22.5	-26.5	-38.3	-42.3	-46.3	-53.9	-57.9	-61.9		
340	-15.2	-19.2	-23.2	-29.6	-33.6	-37.6	-44.3	-48.3	-52.3		

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)		PRESS ALT (FT)		PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
5400	683.1	588.7	721.8								
5800				594.3							
7800											
8200					674.4		736.4				
8600											
11800							450.2				
12200								672.8			
12600									307.8		
13000									541.4		
13400									757.8		
										403.5	
										629.7	

1. Enter Weight Adjustment table with reported braking action and TO1 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust "Good" field length available by -90 ft/+80 ft for every 5°C above/below 4°C.
Adjust "Medium" field length available by -130 ft/+120 ft for every 5°C above/below 4°C.
Adjust "Poor" field length available by -200 ft/+190 ft for every 5°C above/below 4°C.
3. Find V1(MCG) limited 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**TO1 Slippery Runway Takeoff****10% Thrust Reduction****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.	4000	8000	S.L.	4000	8000
660	-5	0	0	-16	-10	-4	-34	-28	-22
620	-7	-1	0	-19	-13	-7	-39	-33	-27
580	-9	-3	0	-23	-17	-11	-44	-38	-32
540	-11	-5	0	-26	-20	-14	-49	-43	-37
500	-13	-7	-1	-29	-23	-17	-54	-48	-42
460	-15	-9	-3	-33	-27	-21	-59	-53	-47
420	-17	-11	-5	-37	-31	-25	-64	-58	-52
380	-18	-12	-6	-40	-34	-28	-69	-63	-57
340	-20	-14	-8	-44	-38	-32	-74	-68	-62

1. Obtain V1, VR and V2 for the actual weight.
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.

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ADVISORY INFORMATION

TO2 Slush/Standing Water Takeoff

20% Thrust Reduction

Maximum Reverse Thrust

Weight Adjustment (1000 LB)

TO2 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
700	-53.0	-59.8	-66.7	-63.5	-70.4	-77.2	-87.2	-94.1	-101.0
660	-51.7	-58.6	-65.5	-61.5	-68.4	-75.3	-83.5	-90.4	-97.2
620	-50.5	-57.4	-64.2	-59.6	-66.5	-73.3	-79.8	-86.7	-93.4
580	-49.3	-55.8	-61.9	-57.1	-63.2	-69.3	-73.5	-79.6	-85.7
540	-44.0	-50.0	-56.1	-50.7	-56.8	-62.8	-65.4	-71.5	-78.2
500	-40.3	-47.1	-53.8	-46.9	-53.6	-60.3	-61.0	-68.5	-76.7
460	-41.5	-49.6	-57.7	-47.9	-56.0	-64.3	-61.6	-70.5	-79.6
420	-40.6	-49.6	-58.7	-46.1	-55.1	-64.2	-57.8	-66.8	-75.9
380	-34.3	-43.4	-52.4	-38.2	-47.3	-56.3	-46.5	-55.6	-64.6

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
5000						312.9			
5400	311.7			351.0		420.3	301.9		
5800	417.0	300.9		458.3	340.3	532.6	409.5		
6200	525.7	406.4		568.6	447.5	329.4	656.1	521.0	398.7
6600	642.1	514.6	395.8	684.3	557.4	436.7		643.0	509.5
7000	767.5	630.0	503.5		672.4	546.2		778.2	630.1
7400		755.0	618.0			660.6			764.8
7800			742.5			779.0			

- Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
- Adjust field length available by -125ft/+125ft for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
660	-8	-3	2	-2	3	8	11	15	20
620	-10	-5	-1	-4	1	6	9	14	19
580	-13	-8	-3	-6	-1	4	7	12	17
540	-15	-10	-6	-9	-4	1	5	10	14
500	-18	-13	-8	-12	-7	-2	1	6	11
460	-20	-15	-11	-16	-11	-6	-3	1	6
420	-23	-18	-13	-19	-14	-9	-8	-4	1
380	-24	-19	-14	-20	-15	-10	-12	-7	-2
340	-24	-19	-14	-21	-16	-11	-15	-10	-5

- Obtain V1, VR and V2 for the actual weight.
- 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**TO2 Slush/Standing Water Takeoff****20% Thrust Reduction****No Reverse Thrust****Weight Adjustment (1000 LB)**

TO2 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.	4000	8000	S.L.	4000	8000
700	-98.7	-110.7	-122.7	-118.4	-130.4	-142.4	-153.8	-165.8	-177.8
660	-93.5	-105.5	-117.5	-111.6	-123.6	-135.6	-143.5	-155.5	-167.5
620	-88.2	-100.2	-112.2	-104.7	-116.7	-128.7	-133.2	-145.2	-157.2
580	-82.9	-94.9	-106.9	-97.8	-109.8	-121.8	-122.8	-134.8	-146.8
540	-76.9	-88.9	-100.9	-90.0	-102.0	-114.0	-111.6	-123.6	-135.6
500	-70.1	-82.1	-94.1	-81.4	-93.4	-105.4	-99.5	-111.5	-123.5
460	-62.5	-74.5	-86.5	-71.8	-83.8	-95.8	-86.5	-98.5	-110.5
420	-54.1	-66.1	-78.1	-61.4	-73.4	-85.4	-72.5	-84.5	-96.5
380	-44.9	-56.9	-68.9	-50.0	-62.0	-74.0	-57.7	-69.7	-81.7
340	-34.8	-46.8	-58.8	-37.7	-49.7	-61.7	-42.0	-54.0	-66.0

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.	4000	8000	S.L.	4000	8000
7000							310.7		
7400							468.9		
7800				376.4			661.7		
8200	336.9				632.5	376.4			
8600	740.6	336.9			632.5	376.4			
9000		740.6	336.9			632.5			
9400			740.6					661.7	468.9
									661.7

- Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water adjustment.
- Adjust field length available by -190 ft/+180 ft for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- 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.	4000	8000	S.L.	4000	8000
660	-15	-9	-3	-5	0	0	0	0	0
620	-19	-13	-7	-8	-2	0	0	0	0
580	-22	-16	-10	-13	-7	-1	0	0	0
540	-26	-20	-14	-17	-11	-5	0	0	0
500	-30	-24	-18	-22	-16	-10	-4	0	0
460	-33	-27	-21	-27	-21	-15	-10	-4	0
420	-36	-30	-24	-31	-25	-19	-16	-10	-4
380	-38	-32	-26	-34	-28	-22	-23	-17	-11
340	-40	-34	-28	-36	-30	-24	-31	-25	-19

- Obtain V1, VR and V2 for the actual weight.
- 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.

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ADVISORY INFORMATION**TO2 Slippery Runway Takeoff****20% Thrust Reduction****Maximum Reverse Thrust****Weight Adjustment (1000 LB)**

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)		PRESS ALT (FT)		PRESS ALT (FT)		S.L.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
700	0.0	-3.4	-6.8	-15.1	-18.5	-21.8	-52.9	-56.3	-59.6
660	0.0	-3.4	-6.8	-20.3	-23.7	-27.1	-54.8	-58.2	-61.6
620	0.0	-3.4	-6.8	-25.6	-29.0	-32.4	-57.0	-60.4	-63.8
580	0.0	-3.4	-6.8	-30.6	-34.0	-37.4	-58.9	-62.3	-65.8
540	-2.3	-5.8	-9.2	-33.7	-37.2	-40.6	-59.0	-62.5	-66.0
500	-6.0	-9.4	-12.9	-34.9	-38.4	-41.9	-57.3	-60.8	-64.3
460	-8.0	-11.5	-14.9	-34.3	-37.8	-41.3	-53.8	-57.3	-60.9
420	-8.3	-11.9	-15.4	-31.7	-35.2	-38.7	-48.5	-52.0	-55.6
380	-7.1	-10.7	-14.2	-27.2	-30.8	-34.3	-41.4	-44.9	-48.5

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.	4000	8000
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
4200	503.1	377.3							
4600	676.7	576.8	463.5						
5000		738.7	644.6						
5400				384.7					
5800				521.3	371.3				
6200				663.2	507.5	358.0			
6600					648.8	493.7			
7000						634.4	347.4		
7400						779.7	418.2		
7800							494.7	368.1	
8200							578.3	440.5	319.7
8600							671.8	518.9	389.3
9000								774.8	605.2
9400									463.3
9800									702.5
10200									543.8
									633.0
									733.5

1. Enter Weight Adjustment table with reported braking action and TO2 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust "Good" field length available by -70ft/+70ft for every 5°C above/below 4°C.
Adjust "Medium" field length available by -100ft/+100ft for every 5°C above/below 4°C.
Adjust "Poor" field length available by -135ft/+135ft 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**TO2 Slippery Runway Takeoff****20% Thrust Reduction****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.	4000	8000	S.L.	4000	8000
660	-4	-3	-2	-10	-9	-7	-19	-17	-16
620	-5	-4	-2	-12	-10	-9	-21	-20	-18
580	-6	-5	-3	-13	-12	-11	-24	-22	-21
540	-7	-6	-4	-15	-14	-12	-27	-25	-23
500	-8	-7	-5	-17	-16	-14	-29	-28	-26
460	-9	-8	-7	-19	-18	-16	-33	-31	-29
420	-11	-10	-9	-22	-21	-19	-36	-35	-33
380	-12	-11	-9	-23	-22	-20	-38	-37	-35
340	-12	-11	-9	-24	-22	-21	-39	-38	-36

1. Obtain V1, VR and V2 for the actual weight.
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**TO2 Slippery Runway Takeoff****20% Thrust Reduction****No Reverse Thrust****Weight Adjustment (1000 LB)**

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)		PRESS ALT (FT)	PRESS ALT (FT)		PRESS ALT (FT)	PRESS ALT (FT)		PRESS ALT (FT)
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
700	0.0	0.0	-2.1	-43.0	-47.0	-51.0	-93.5	-97.5	-101.5
660	0.0	-4.0	-8.0	-46.4	-50.4	-54.4	-91.1	-95.1	-99.1
620	-5.9	-9.9	-13.9	-49.8	-53.8	-57.8	-88.5	-92.5	-96.5
580	-11.3	-15.3	-19.3	-52.5	-56.5	-60.5	-85.5	-89.5	-93.5
540	-15.4	-19.4	-23.4	-53.5	-57.5	-61.5	-81.5	-85.5	-89.5
500	-18.2	-22.2	-26.2	-52.7	-56.7	-60.7	-76.5	-80.5	-84.5
460	-19.7	-23.7	-27.7	-50.2	-54.2	-58.2	-70.4	-74.4	-78.4
420	-19.8	-23.8	-27.8	-45.9	-49.9	-53.9	-63.4	-67.4	-71.4
380	-18.5	-22.5	-26.5	-39.9	-43.9	-47.9	-55.2	-59.2	-63.2
340	-16.0	-20.0	-24.0	-32.1	-36.1	-40.1	-46.1	-50.1	-54.1

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)		PRESS ALT (FT)	PRESS ALT (FT)		PRESS ALT (FT)
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
5000	668.1	554.0	711.3						
5400				708.9					
7400									
7800					775.3	604.2			
11000							495.5		
11400							730.9	344.1	
11800									592.0
12200									445.9
12600									685.2

1. Enter Weight Adjustment table with reported braking action and TO2 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust “Good” field length available by -90 ft/+80 ft for every 5°C above/below 4°C.
Adjust “Medium” field length available by -130 ft/+120 ft for every 5°C above/below 4°C.
Adjust “Poor” field length available by -200 ft/+190 ft for every 5°C above/below 4°C.
3. Find V1(MCG) limited 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**TO2 Slippery Runway Takeoff****20% Thrust Reduction****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.	4000	8000	S.L.	4000	8000
660	-6	0	0	-15	-9	-3	-30	-24	-18
620	-8	-2	0	-17	-11	-5	-34	-28	-22
580	-9	-3	0	-20	-14	-8	-38	-32	-26
540	-10	-4	0	-23	-17	-11	-42	-36	-30
500	-12	-6	0	-26	-20	-14	-47	-41	-35
460	-14	-8	-2	-29	-23	-17	-52	-46	-40
420	-15	-9	-3	-32	-26	-20	-56	-50	-44
380	-17	-11	-5	-35	-29	-23	-61	-55	-49
340	-18	-12	-6	-38	-32	-26	-65	-59	-53

1. Obtain V1, VR and V2 for the actual weight.
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.

Minimum Control Speeds**V1(MCG), Minimum VR****Max Takeoff Thrust**

TEMP		PRESSURE ALTITUDE (FT)					
		0		4000		8000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	97	103	95	100		
50	122	100	105	95	100	91	97
40	104	106	111	98	103	91	97
30	86	110	115	102	107	94	99
20	68	110	115	103	108	95	100
-60	-76	111	115	104	109	97	102

TO1 V1(MCG), Minimum VR**10% Thrust Reduction**

TEMP		PRESSURE ALTITUDE (FT)					
		0		4000		8000	
°C	°F	V1(MCG)	Min VR	V1(MCG)	Min VR	V1(MCG)	Min VR
60	140	93	98	90	95		
50	122	95	101	90	95	87	92
40	104	100	105	93	98	87	92
30	86	104	109	97	102	89	95
20	68	105	109	98	103	90	96
-60	-76	106	110	99	104	92	97

TO2 V1(MCG), Minimum VR**20% Thrust Reduction**

TEMP		PRESSURE ALTITUDE (FT)					
		0		4000		8000	
°C	°F	V1(MCG)	MinVR	V1(MCG)	MinVR	V1(MCG)	MinVR
60	140	89	94	86	91		
50	122	91	96	86	91	82	88
40	104	95	100	88	94	82	88
30	86	99	104	91	97	85	90
20	68	99	104	93	98	86	91
-60	-76	100	104	94	99	88	93

Go-around EPR**Based on engine bleed for packs on and anti-ice off**

REPORTED OAT		TAT	AIRPORT PRESSURE ALTITUDE (FT)										
°C	°F	°C	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000
56	133	60	1.276	1.274	1.275	1.276	1.278	1.279	1.281	1.293	1.284	1.286	1.289
51	124	55	1.309	1.306	1.306	1.303	1.305	1.308	1.310	1.313	1.315	1.318	1.322
46	115	50	1.346	1.345	1.344	1.341	1.341	1.339	1.340	1.343	1.345	1.350	1.355
41	106	45	1.387	1.387	1.387	1.385	1.383	1.382	1.381	1.380	1.377	1.382	1.388
36	97	40	1.401	1.433	1.430	1.430	1.429	1.426	1.430	1.427	1.427	1.426	1.421
31	88	35	1.401	1.472	1.471	1.470	1.468	1.470	1.469	1.467	1.468	1.459	1.454
26	79	30	1.401	1.481	1.494	1.500	1.495	1.496	1.493	1.492	1.490	1.481	1.472
21	70	25	1.401	1.481	1.494	1.507	1.514	1.512	1.510	1.508	1.506	1.499	1.492
16	61	20	1.401	1.481	1.494	1.507	1.517	1.527	1.526	1.524	1.522	1.515	1.507
11	52	15	1.401	1.481	1.494	1.507	1.517	1.527	1.533	1.539	1.538	1.531	1.524
7	45	10	1.401	1.481	1.494	1.507	1.517	1.527	1.533	1.539	1.545	1.546	1.541
2 & BELOW	36 & BELOW	5 & BELOW	1.401	1.481	1.494	1.507	1.517	1.527	1.533	1.539	1.545	1.546	1.546

EPR Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)						
	-1000	0	2000	4000	6000	8000	10000
PACKS OFF	0.013	0.013	0.014	0.016	0.017	0.018	0.020
2 PACK ON - 2 BLEED SOURCES	0	0	0	0	0	0	0
2 PACK ON - 1 BLEED SOURCES	-0.013	-0.014	-0.015	-0.016	-0.016	-0.018	-0.020
1 PACK ON - 2 BLEED SOURCE	-0.013	-0.014	-0.015	-0.016	-0.016	-0.018	-0.020
1 PACK ON - 1 BLEED SOURCE	-0.013	-0.014	-0.015	-0.016	-0.016	-0.018	-0.020
WING ANTI-ICE ON	0.006	0.006	0.008	0.008	0.008	0.009	0.010

Max Climb EPR**Based on engine bleed for packs on and anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)/SPEED (IAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	1.148	1.134	1.141	1.151	1.154	1.104	1.100	1.171	1.186	1.201
50	1.186	1.171	1.158	1.151	1.154	1.104	1.100	1.171	1.186	1.201
40	1.210	1.212	1.198	1.186	1.161	1.104	1.100	1.171	1.186	1.201
30	1.210	1.234	1.252	1.241	1.209	1.153	1.113	1.171	1.186	1.201
20	1.210	1.234	1.264	1.301	1.277	1.248	1.223	1.193	1.186	1.201
10	1.210	1.234	1.264	1.301	1.330	1.382	1.338	1.294	1.281	1.289
0	1.210	1.234	1.264	1.301	1.330	1.410	1.441	1.401	1.384	1.384
-10	1.210	1.234	1.264	1.301	1.330	1.410	1.458	1.487	1.474	1.472
-15 & BELOW	1.210	1.234	1.264	1.301	1.330	1.410	1.458	1.503	1.505	1.504

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)					
	0	10	20	30	40	43
ENGINE ONLY	-0.016	-0.015	-0.017	-0.019	-0.019	-0.021
ENGINE & WING*	-0.022	-0.025	-0.030	-0.034	-0.038	-0.042
ENGINE & WING**	-0.029	-0.035	-0.043	-0.048	-0.056	-0.063

*Wing anti-ice on, packs on.

**Wing anti-ice on, single bleed source and both packs off.

Flight With Unreliable Airspeed / Turbulent Air Penetration**Altitude and/or vertical speed indications may also be unreliable.****Climb****Flaps Up, Set Max Climb Thrust**

PRESSURE ALTITUDE (FT) (SPEED)	WEIGHT (1000 LB)			
	400	500	600	700
40000 (.82M)	PITCH ATT V/S (FT/MIN) 3.5 800			
30000 (280 KIAS)	PITCH ATT V/S (FT/MIN) 4.0 1800	4.0 1200	4.0 700	
20000 (270 KIAS)	PITCH ATT V/S (FT/MIN) 6.5 2900	6.0 2100	6.0 1500	6.5 1000
10000 (270 KIAS)	PITCH ATT V/S (FT/MIN) 9.0 3900	8.0 2900	8.0 2200	8.0 1700
SEA LEVEL (270 KIAS)	PITCH ATT V/S (FT/MIN) 11.5 4700	10.5 3600	9.5 2800	9.5 2300

Cruise**Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)	WEIGHT (1000 LB)			
	400	500	600	700
40000 (.82M)	PITCH ATT EPR (Alt Mode %N1) 2.5 1.211 (83.6)			
35000 (280 KIAS)	PITCH ATT EPR (Alt Mode %N1) 1.5 1.092 (79.8)	2.0 1.18 (83.1)	3.0 1.370 (89.7)	
30000 (280 KIAS)	PITCH ATT EPR (Alt Mode %N1) 2.0 1.027 (76.3)	2.5 1.082 (79.0)	3.0 1.168 (82.8)	4.0 1.336 (89.2)
25000 (280 KIAS)	PITCH ATT EPR (Alt Mode %N1) 2.0 0.988 (72.5)	2.5 1.024 (75.2)	3.5 1.084 (78.6)	4.0 1.162 (82.4)
20000 (270 KIAS)	PITCH ATT EPR (Alt Mode %N1) 2.0 0.973 (68.0)	3.0 1.001 (70.6)	4.0 1.042 (74.5)	5.0 1.101 (78.5)
15000 (270 KIAS)	PITCH ATT EPR (Alt Mode %N1) 2.0 0.969 (64.9)	3.0 0.988 (67.3)	4.0 1.018 (70.2)	5.0 1.057 (74.1)

Descent**Flaps Up, Set Idle Thrust**

PRESSURE ALTITUDE (FT) (SPEED)	WEIGHT (1000 LB)			
	400	500	600	700
40000 (.82M)	PITCH ATT V/S (FT/MIN) -0.5 -2500			
30000 (280 KIAS)	PITCH ATT V/S (FT/MIN) -1.0 -2100	0.0 -1900	1.0 -1900	
20000 (270 KIAS)	PITCH ATT V/S (FT/MIN) -0.5 -1700	0.5 -1600	1.5 -1600	2.0 -1600
10000 (270 KIAS)	PITCH ATT V/S (FT/MIN) -1.0 -1600	0.0 -1500	1.0 -1400	2.0 -1400
SEA LEVEL (270 KIAS)	PITCH ATT V/S (FT/MIN) -1.5 -1600	-0.5 -1400	1.0 -1400	2.0 -1400

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

Holding**Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)			
		400	500	600	700
10000	PITCH ATT	4.5	5.0	5.0	4.5
	EPR (Alt Mode %N1)	1.002 (55.8)	1.012 (61.5)	1.019 (66.3)	1.028 (70.0)
	KIAS	210	227	249	271
5000	PITCH ATT	4.0	4.5	5.0	5.0
	EPR (Alt Mode %N1)	0.998 (51.5)	1.006 (57.2)	1.010 (62.2)	1.016 (66.3)
	KIAS	210	226	248	268

Terminal Area (5000 FT)**Set Thrust for Level Flight**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)			
		400	500	600	700
FLAPS 0 (GEAR UP) (VREF30 + 80)	PITCH ATT	4.5	5.0	5.5	5.5
	EPR (Alt Mode %N1)	1.000 (52.3)	1.010 (58.1)	1.020 (63.5)	1.030 (67.9)
	KIAS	210	226	240	255
FLAPS 1 (GEAR UP) (VREF30 + 60)	PITCH ATT	6.0	6.5	7.0	7.0
	EPR (Alt Mode %N1)	1.010 (52.7)	1.020 (59.0)	1.040 (64.6)	1.060 (69.5)
	KIAS	190	206	220	235
FLAPS 5 (GEAR UP) (VREF30 + 40)	PITCH ATT	5.0	5.5	6.0	6.0
	EPR (Alt Mode %N1)	1.030 (54.0)	1.040 (60.7)	1.060 (66.1)	1.080 (70.8)
	KIAS	170	186	200	215
FLAPS 15 (GEAR UP) (VREF30 + 20)	PITCH ATT	5.5	6.0	6.5	6.5
	EPR (Alt Mode %N1)	1.040 (55.6)	1.060 (62.5)	1.090 (68.1)	1.110 (72.5)
	KIAS	150	166	180	195
FLAPS 20 (GEAR DOWN) (VREF30 + 20)	PITCH ATT	4.5	5.0	5.5	5.0
	EPR (Alt Mode %N1)	1.070 (62.4)	1.100 (69.2)	1.140 (74.4)	1.170 (79.0)
	KIAS	150	166	180	195

Flight With Unreliable Airspeed / Turbulent Air Penetration**Altitude and/or vertical speed indications may also be unreliable.****Final Approach (1500 FT)****Gear Down, Set Thrust for 3° Glideslope**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)			
		400	500	600	700
FLAPS 20 (VREF20 + 10)	PITCH ATT	1.0	1.5	1.5	1.5
	EPR (Alt Mode %N1)	1.000 (41.3)	1.010 (45.7)	1.010 (49.9)	1.020 (53.5)
	KIAS	153	170	185	198
FLAPS 25 (VREF25 + 10)	PITCH ATT	1.0	1.0	1.0	1.5
	EPR (Alt Mode %N1)	1.030 (50.6)	1.040 (56.1)	1.060 (60.9)	1.070 (65.0)
	KIAS	146	162	176	189
FLAPS 30 (VREF30 + 10)	PITCH ATT	0.5	0.5	0.5	0.5
	EPR (Alt Mode %N1)	1.050 (55.6)	1.070 (61.1)	1.090 (65.9)	1.110 (70.7)
	KIAS	140	156	170	184

Performance Inflight**All Engine****Chapter PI****Section 51****Long Range Cruise Maximum Operating Altitude****Max Climb 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°)
660	29500	0	32800*	32800*	32800*	32800*	32200
640	30100	-1	33600*	33600*	33600*	33600*	32900
620	30800	-3	34300*	34300*	34300*	34300*	33500
600	31500	-4	35100*	35100*	35100*	35100*	34200
580	32300	-6	35800*	35800*	35800*	35800*	35000
560	33000	-8	36300*	36300*	36300*	36300*	35700
540	33800	-9	37000*	37000*	37000*	37000*	36400
520	34600	-11	37800*	37800*	37800*	37800*	37200
500	35400	-13	38600*	38600*	38600*	38600*	38000
480	36300	-14	39400*	39400*	39400*	39400*	38900
460	37200	-14	40200*	40200*	40200*	40200*	39800
440	38100	-14	41100*	41100*	41100*	41100*	40700
420	39100	-14	42000*	42000*	42000*	42000*	41700
400	40100	-14	43000*	43000*	43000*	43000*	42700
380	41100	-14	43100	43100	43100	43100	43100
360	42300	-14	43100	43100	43100	43100	43100
340	43100	-14	43100	43100	43100	43100	43100

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°)
660	29500	6	31800*	31800*	31800*	31800*	31800*
640	30100	5	32600*	32600*	32600*	32600*	32600*
620	30800	3	33400*	33400*	33400*	33400*	33400*
600	31500	1	34300*	34300*	34300*	34300*	34200
580	32300	0	35100*	35100*	35100*	35100*	35000
560	33000	-2	35800*	35800*	35800*	35800*	35700
540	33800	-4	36400*	36400*	36400*	36400*	36400
520	34600	-5	37200*	37200*	37200*	37200*	37200
500	35400	-7	38000*	38000*	38000*	38000*	38000
480	36300	-9	38800*	38800*	38800*	38800*	38800*
460	37200	-9	39600*	39600*	39600*	39600*	39600*
440	38100	-9	40500*	40500*	40500*	40500*	40500*
420	39100	-9	41400*	41400*	41400*	41400*	41400*
400	40100	-9	42300*	42300*	42300*	42300*	42300*
380	41100	-9	43100	43100	43100	43100	43100
360	42300	-9	43100	43100	43100	43100	43100
340	43100	-9	43100	43100	43100	43100	43100

*Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.

Long Range Cruise Maximum Operating Altitude**Max Climb Thrust****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°)
660	29500	12	30300*	30300*	30300*	30300*	30300*
640	30100	10	31200*	31200*	31200*	31200*	31200*
620	30800	9	32100*	32100*	32100*	32100*	32100*
600	31500	7	33000*	33000*	33000*	33000*	33000*
580	32300	6	34000*	34000*	34000*	34000*	34000*
560	33000	4	34900*	34900*	34900*	34900*	34900*
540	33800	2	35600*	35600*	35600*	35600*	35600*
520	34600	0	36200*	36200*	36200*	36200*	36200*
500	35400	-2	37000*	37000*	37000*	37000*	37000*
480	36300	-3	37800*	37800*	37800*	37800*	37800*
460	37200	-3	38700*	38700*	38700*	38700*	38700*
440	38100	-3	39500*	39500*	39500*	39500*	39500*
420	39100	-3	40400*	40400*	40400*	40400*	40400*
400	40100	-3	41300*	41300*	41300*	41300*	41300*
380	41100	-3	42300*	42300*	42300*	42300*	42300*
360	42300	-3	43100	43100	43100	43100	43100
340	43100	-3	43100	43100	43100	43100	43100

*Denotes altitude thrust limited in level flight, 300 fpm residual rate of climb.

DRAFT

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		25	27	29	31	33	35	37	39	41	43
660	EPR	1.090	1.125	1.172	1.250	1.370					
	MACH	.772	.802	.834	.841	.839					
	KIAS	325	325	325	314	300					
	FF/ENG	9724	9828	10065	10189	10650					
620	EPR	1.069	1.100	1.140	1.199	1.286					
	MACH	.772	.802	.834	.841	.841					
	KIAS	325	325	325	314	301					
	FF/ENG	9343	9405	9586	9535	9619					
580	EPR	1.052	1.079	1.111	1.157	1.224	1.325				
	MACH	.772	.802	.828	.838	.841	.840				
	KIAS	325	325	322	313	301	287				
	FF/ENG	9022	9054	9067	8966	8903	9099				
540	EPR	1.036	1.061	1.088	1.123	1.174	1.249	1.367			
	MACH	.754	.785	.813	.831	.839	.841	.839			
	KIAS	317	317	316	310	300	288	274			
	FF/ENG	8469	8495	8493	8410	8316	8291	8668			
500	EPR	1.021	1.041	1.067	1.095	1.134	1.189	1.273	1.408		
	MACH	.726	.758	.789	.816	.833	.840	.841	.838		
	KIAS	304	305	306	304	297	287	275	261		
	FF/ENG	7809	7842	7861	7848	7760	7673	7734	8277		
460	EPR	1.006	1.024	1.045	1.072	1.101	1.143	1.204	1.294		
	MACH	.699	.728	.760	.792	.818	.834	.840	.841		
	KIAS	292	292	294	294	292	285	274	262		
	FF/ENG	7189	7184	7218	7225	7205	7121	7087	7227		
420	EPR	.994	1.007	1.026	1.047	1.074	1.105	1.150	1.216	1.307	
	MACH	.672	.698	.727	.760	.792	.819	.835	.840	.841	
	KIAS	280	280	280	281	282	279	272	262	250	
	FF/ENG	6616	6566	6564	6590	6589	6571	6533	6548	6696	
380	EPR	.985	.994	1.007	1.026	1.047	1.073	1.108	1.155	1.219	1.310
	MACH	.645	.669	.695	.724	.757	.791	.818	.834	.840	.841
	KIAS	268	267	266	267	268	268	266	260	250	239
	FF/ENG	6060	5995	5947	5941	5960	5969	5979	5987	6000	6133
340	EPR	.977	.984	.993	1.006	1.023	1.044	1.072	1.108	1.153	1.216
	MACH	.615	.639	.663	.689	.718	.751	.785	.815	.832	.840
	KIAS	255	254	253	253	253	254	254	253	247	239
	FF/ENG	5608	5553	5380	5332	5314	5332	5371	5422	5433	5443

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitude

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	
283	262	243	226	213	200	191	182	174	167	161
423	392	364	340	319	300	286	274	262	252	243
564	522	485	453	425	400	382	366	351	337	325
705	653	606	566	531	500	478	457	439	422	407
846	783	727	680	638	600	574	549	527	507	489
987	914	849	793	744	700	670	642	616	592	570
1128	1044	970	906	850	800	766	734	704	677	652
1271	1176	1092	1020	957	900	861	825	792	762	734
1413	1308	1214	1133	1063	1000	957	917	880	846	816
1555	1439	1335	1247	1170	1100	1053	1009	968	931	898
1698	1571	1458	1361	1276	1200	1148	1101	1056	1016	979
1841	1703	1580	1475	1383	1300	1244	1192	1145	1101	1061
1984	1835	1702	1589	1489	1400	1340	1284	1233	1185	1142
2128	1968	1825	1703	1596	1500	1436	1376	1321	1270	1224
2272	2100	1948	1817	1703	1600	1532	1468	1409	1355	1305
2417	2234	2070	1931	1809	1700	1627	1559	1497	1439	1387
2562	2367	2193	2045	1916	1800	1723	1651	1584	1524	1468
2707	2500	2316	2159	2023	1900	1818	1742	1672	1608	1549
2852	2634	2439	2274	2129	2000	1914	1834	1760	1692	1630

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	8.9	0:39	7.6	0:37	6.2	0:35	5.4	0:34	4.8	0:33
300	13.6	0:56	12.0	0:53	10.0	0:50	9.0	0:48	8.2	0:46
400	18.4	1:13	16.3	1:10	13.9	1:05	12.7	1:02	11.6	1:00
500	23.1	1:30	20.7	1:26	17.7	1:20	16.2	1:17	15.0	1:13
600	27.8	1:48	25.1	1:42	21.6	1:35	19.8	1:31	18.3	1:26
700	32.5	2:05	29.5	1:59	25.4	1:50	23.4	1:45	21.7	1:39
800	37.2	2:23	33.9	2:15	29.2	2:05	26.9	1:59	25.0	1:53
900	41.9	2:41	38.2	2:32	33.0	2:20	30.4	2:13	28.3	2:06
1000	46.6	2:58	42.5	2:48	36.7	2:36	34.0	2:28	31.7	2:19
1100	51.2	3:16	46.8	3:05	40.6	2:51	37.5	2:42	34.9	2:33
1200	55.9	3:34	51.1	3:22	44.4	3:06	41.0	2:57	38.2	2:46
1300	60.5	3:52	55.4	3:39	48.2	3:21	44.4	3:11	41.5	3:00
1400	65.1	4:11	59.7	3:56	52.0	3:37	47.9	3:26	44.8	3:13
1500	69.7	4:29	63.9	4:13	55.7	3:52	51.4	3:40	48.0	3:27
1600	74.3	4:47	68.1	4:30	59.5	4:08	54.8	3:55	51.2	3:41
1700	78.8	5:06	72.3	4:47	63.2	4:23	58.2	4:10	54.5	3:55
1800	83.3	5:24	76.5	5:04	66.9	4:39	61.7	4:24	57.7	4:08
1900	87.8	5:43	80.7	5:22	70.6	4:55	65.1	4:39	60.9	4:22
2000	92.3	6:02	84.9	5:39	74.3	5:10	68.5	4:54	64.0	4:36

Long Range Cruise Enroute Fuel and Time - Low Altitude
Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)							
	300	350	400	450	500	550	600	650
10	-1.3	-1.1	-0.6	-0.3	0.0	0.4	0.8	1.3
20	-3.4	-2.4	-1.5	-0.8	0.0	1.0	2.0	3.1
30	-5.5	-3.8	-2.4	-1.2	0.0	1.5	3.2	4.9
40	-7.6	-5.3	-3.3	-1.6	0.0	2.1	4.3	6.7
50	-9.6	-6.8	-4.2	-2.1	0.0	2.7	5.5	8.5
60	-11.8	-8.3	-5.2	-2.6	0.0	3.3	6.7	10.2
70	-13.9	-9.9	-6.2	-3.0	0.0	3.9	7.8	11.9
80	-16.1	-11.5	-7.3	-3.5	0.0	4.4	9.0	13.6
90	-18.3	-13.1	-8.4	-4.0	0.0	5.0	10.2	15.3
100	-20.4	-14.8	-9.5	-4.5	0.0	5.6	11.3	17.0

Long Range Cruise Enroute Fuel and Time - High Altitude

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	20
521	492	465	441	419	400	383	367	352	339	327
1032	976	925	879	838	800	767	736	708	682	658
1545	1462	1386	1318	1257	1200	1151	1106	1064	1025	990
2059	1949	1848	1758	1676	1600	1535	1475	1419	1368	1321
2576	2438	2311	2198	2095	2000	1920	1844	1775	1711	1652
3095	2928	2775	2638	2514	2400	2304	2214	2131	2054	1983
3616	3419	3239	3079	2934	2800	2688	2583	2486	2397	2315
4139	3912	3705	3520	3353	3200	3072	2953	2842	2739	2645
4664	4407	4172	3963	3774	3600	3456	3322	3197	3082	2976
5192	4904	4640	4406	4194	4000	3840	3691	3552	3424	3306
5721	5401	5109	4849	4615	4400	4224	4059	3906	3765	3636
6253	5901	5579	5294	5036	4800	4607	4428	4261	4107	3965
6787	6402	6051	5739	5458	5200	4991	4796	4615	4448	4295
7324	6905	6523	6185	5880	5600	5375	5164	4969	4789	4623
7863	7410	6997	6631	6302	6000	5758	5532	5322	5128	4951
8405	7917	7472	7078	6724	6400	6141	5899	5674	5467	5277
8950	8426	7949	7526	7147	6800	6523	6266	6026	5805	5603
9497	8936	8426	7975	7571	7200	6906	6632	6378	6143	5929
10048	9449	8905	8425	7994	7600	7289	6998	6729	6480	6253
10601	9964	9385	8875	8418	8000	7671	7364	7079	6817	6577

Reference Fuel And Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	29		31		33		35			
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	11.9	0:57	11.5	0:56	11.1	0:56	11.0	0:57	11.1	0:58
800	24.7	1:51	23.9	1:48	23.2	1:47	22.8	1:47	22.8	1:47
1200	37.5	2:44	36.3	2:40	35.3	2:37	34.7	2:37	34.6	2:37
1600	50.3	3:38	48.7	3:32	47.4	3:28	46.5	3:27	46.3	3:27
2000	63.0	4:32	61.1	4:24	59.5	4:18	58.4	4:17	58.1	4:17
2400	75.3	5:27	73.0	5:17	71.1	5:10	69.7	5:07	69.2	5:07
2800	87.6	6:23	85.0	6:11	82.7	6:02	81.0	5:58	80.4	5:56
3200	99.6	7:19	96.7	7:05	94.1	6:54	92.1	6:49	91.2	6:47
3600	111.4	8:17	108.2	8:00	105.2	7:48	102.9	7:40	101.9	7:37
4000	123.2	9:14	119.7	8:56	116.3	8:41	113.8	8:32	112.5	8:28
4400	134.6	10:14	130.7	9:53	127.1	9:36	124.2	9:25	122.6	9:19
4800	146.0	11:13	141.7	10:50	137.8	10:31	134.6	10:18	132.8	10:10
5200	157.2	12:13	152.5	11:49	148.3	11:27	144.9	11:12	142.8	11:02
5600	168.3	13:15	163.1	12:48	158.6	12:24	154.9	12:06	152.5	11:55
6000	179.3	14:16	173.7	13:47	168.9	13:21	164.9	13:01	162.3	12:47
6400	190.1	15:20	184.1	14:49	178.8	14:20	174.5	13:58	171.6	13:41
6800	200.8	16:24	194.4	15:50	188.7	15:19	184.2	14:55	181.0	14:35
7200	211.4	17:29	204.6	16:52	198.5	16:19	193.6	15:52	190.2	15:31
7600	221.7	18:35	214.7	17:56	208.2	17:20	202.9	16:51	199.2	16:27
8000	232.0	19:41	224.7	18:59	218.0	18:21	212.1	17:50	208.2	17:23

Long Range Cruise Enroute Fuel and Time - High Altitude

Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)							
	300	350	400	450	500	550	600	650
10	-1.9	-1.9	-1.4	-0.7	0.0	1.9	5.8	11.7
20	-3.8	-3.3	-2.5	-1.2	0.0	2.9	8.2	15.9
30	-5.8	-4.8	-3.5	-1.7	0.0	3.8	10.5	20.0
40	-7.8	-6.2	-4.4	-2.2	0.0	4.7	12.7	23.8
50	-9.9	-7.7	-5.4	-2.7	0.0	5.6	14.8	27.5
60	-11.9	-9.2	-6.3	-3.2	0.0	6.5	16.9	31.1
70	-14.1	-10.8	-7.3	-3.8	0.0	7.3	18.8	34.4
80	-16.2	-12.3	-8.3	-4.3	0.0	8.2	20.7	37.6
90	-18.4	-13.9	-9.3	-4.8	0.0	9.0	22.5	40.6
100	-20.6	-15.5	-10.3	-5.3	0.0	9.7	24.2	43.5
110	-22.9	-17.1	-11.4	-5.9	0.0	10.5	25.9	46.1
120	-25.2	-18.7	-12.4	-6.4	0.0	11.2	27.4	48.6
130	-27.5	-20.4	-13.5	-6.9	0.0	11.9	28.9	50.9
140	-29.8	-22.1	-14.5	-7.5	0.0	12.6	30.3	53.1
150	-32.2	-23.8	-15.6	-8.0	0.0	13.2	31.6	55.0
160	-34.6	-25.5	-16.7	-8.6	0.0	13.9	32.8	56.8
170	-37.1	-27.3	-17.8	-9.1	0.0	14.5	33.9	58.4
180	-39.6	-29.1	-19.0	-9.7	0.0	15.1	35.0	59.8
190	-42.1	-30.9	-20.1	-10.2	0.0	15.6	36.0	61.1
200	-44.7	-32.7	-21.3	-10.8	0.0	16.2	36.9	62.2
210	-47.3	-34.5	-22.4	-11.3	0.0	16.7	37.7	63.1
220	-49.9	-36.4	-23.6	-11.9	0.0	17.2	38.4	63.8
230	-52.6	-38.3	-24.8	-12.4	0.0	17.6	39.1	64.3
240	-55.2	-40.2	-26.0	-13.0	0.0	18.1	39.6	64.7

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 LB)								
	660	620	580	540	500	460	420	380	340
43							44	10	0
41						42	11	0	3
39				80	36	10	0	2	14
37			64	28	8	0	2	12	29
35		47	20	5	0	2	12	26	44
33	33	13	2	0	3	12	25	42	59
31	7	0	0	5	13	26	40	56	73
29	0	1	7	15	27	40	55	70	85
27	3	9	18	29	41	55	69	82	96
25	12	21	32	43	56	68	81	93	104

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. Read wind factors for present and new altitudes from table.
2. Determine difference (new altitude wind factor minus present altitude wind factor);
This difference may be negative or positive.
3. Break-even wind at new altitude is present altitude wind plus difference from step 2.

Descent at .84/310/250

PRESSURE ALT (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	97	104	111	119	125	130	135	141	147	152
TIME (MINUTES)	19	20	21	22	23	23	24	25	26	26

**Holding
Flaps Up**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)									
	1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
660	EPR	1.009	1.013	1.025	1.033	1.041	1.100	1.204		
	KIAS	259	260	261	277	302	306	310		
	FF/ENG	9660	9510	9380	9290	9550	9750	10250		
620	EPR	1.007	1.011	1.021	1.033	1.034	1.082	1.169		
	KIAS	251	252	253	262	287	296	300		
	FF/ENG	9060	8960	8820	8660	8830	9080	9430		
580	EPR	1.006	1.010	1.017	1.032	1.034	1.066	1.139	1.321	
	KIAS	243	244	245	248	269	285	289	279	
	FF/ENG	8610	8540	8390	8190	8100	8430	8670	9270	
540	EPR	1.005	1.008	1.014	1.027	1.034	1.049	1.113	1.241	
	KIAS	234	235	236	237	252	275	278	279	
	FF/ENG	8050	7950	7850	7630	7560	7790	7960	8400	
500	EPR	1.003	1.006	1.012	1.022	1.034	1.039	1.090	1.188	
	KIAS	226	226	227	228	235	259	267	271	
	FF/ENG	7500	7370	7300	7090	6930	7090	7290	7600	
460	EPR	1.000	1.003	1.008	1.016	1.032	1.039	1.068	1.147	1.350
	KIAS	220	220	220	220	220	238	255	259	249
	FF/ENG	6970	6830	6750	6560	6380	6400	6660	6850	7580
420	EPR	.996	.999	1.004	1.010	1.021	1.037	1.047	1.112	1.248
	KIAS	213	213	213	213	213	220	243	246	249
	FF/ENG	6430	6310	6180	6040	5900	5880	6020	6150	6670
380	EPR	.993	.996	1.000	1.005	1.012	1.031	1.041	1.081	1.182
	KIAS	206	206	206	206	206	206	221	233	237
	FF/ENG	5900	5790	5660	5530	5420	5310	5420	5510	5850
340	EPR	.991	.993	.996	1.000	1.005	1.019	1.039	1.054	1.130
	KIAS	199	199	199	199	199	199	199	219	225
	FF/ENG	5400	5280	5160	5020	4960	4800	4770	4930	5110

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

Holding

Flaps 1

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
660	EPR	1.038	1.050	1.071	1.108
	KIAS	229	229	229	229
	FF/ENG	10050	9940	9850	9600
620	EPR	1.034	1.044	1.063	1.094
	KIAS	222	222	222	222
	FF/ENG	9420	9320	9250	9000
580	EPR	1.028	1.037	1.054	1.079
	KIAS	217	217	217	217
	FF/ENG	8950	8840	8740	8520
540	EPR	1.023	1.030	1.045	1.065
	KIAS	212	212	212	212
	FF/ENG	8360	8230	8140	7930
500	EPR	1.019	1.025	1.037	1.054
	KIAS	206	206	206	206
	FF/ENG	7760	7630	7540	7360
460	EPR	1.014	1.020	1.030	1.044
	KIAS	200	200	200	200
	FF/ENG	7160	7050	6940	6790
420	EPR	1.009	1.015	1.024	1.035
	KIAS	193	193	193	193
	FF/ENG	6570	6470	6360	6230
380	EPR	1.005	1.010	1.018	1.027
	KIAS	186	186	186	186
	FF/ENG	5990	5890	5790	5670
340	EPR	1.001	1.005	1.012	1.020
	KIAS	179	179	179	179
	FF/ENG	5420	5320	5240	5140

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

DRAFT

Intentionally
Blank

Performance Inflight

Advisory Information

Chapter PI

Section 52

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

	REF DIST	LANDING DISTANCE AND ADJUSTMENTS (FT)						
		WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	520000 LB LANDING WT	PER 10000 LB ABOVE / BELOW 520000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE / BELOW ISA	PER 5 KTS ABOVE VREF30	ONE REV NO REV

Dry Runway

MAX MANUAL	3330	+80/-40	80	-130/+460	+50/-40	+70/-70	120	70	160
AUTOBRAKE MAX	4400	+60/-60	110	-180/+620	+10/0	+110/-110	230	0	0
AUTOBRAKE 4	5500	+80/-80	150	-250/+870	+10/-20	+150/-150	290	0	0
AUTOBRAKE 3	6610	+100/-100	190	-320/+1080	+30/-50	+190/-190	340	0	0
AUTOBRAKE 2	7330	+120/-120	220	-370/+1250	+90/-130	+210/-210	310	120	120
AUTOBRAKE 1	7870	+140/-140	250	-410/+1400	+160/-200	+230/-230	310	450	510

Good Reported Braking Action

MAX MANUAL	4510	+70/-70	120	-210/+760	+120/-100	+110/-110	180	240	540
AUTOBRAKE MAX	4820	+70/-70	130	-220/+790	+100/-80	+120/-120	220	250	560
AUTOBRAKE 4	5520	+80/-80	150	-260/+890	+30/-30	+150/-150	290	20	90
AUTOBRAKE 3	6610	+100/-100	190	-320/+1080	+30/-50	+190/-190	340	0	0
AUTOBRAKE 2	7330	+120/-120	220	-370/+1250	+90/-130	+210/-210	310	120	120
AUTOBRAKE 1	7870	+140/-140	250	-410/+1400	+160/-200	+230/-230	310	450	510

Medium Reported Braking Action

MAX MANUAL	6130	+100/-100	190	-340/+1240	+290/-230	+170/-160	220	640	1560
AUTOBRAKE MAX	6190	+110/-100	190	-340/+1240	+280/-200	+170/-170	260	620	1530
AUTOBRAKE 4	6290	+100/-100	190	-340/+1250	+280/-190	+170/-170	270	610	1550
AUTOBRAKE 3	6940	+110/-110	200	-370/+1330	+200/-130	+200/-200	340	320	1040
AUTOBRAKE 2	7510	+120/-130	230	-400/+1420	+210/-190	+220/-210	310	280	760
AUTOBRAKE 1	7960	+140/-140	250	-430/+1500	+260/-240	+240/-230	310	530	850

Poor Reported Braking Action

MAX MANUAL	7930	+150/-140	270	-510/+1940	+680/-450	+230/-220	260	1350	3610
AUTOBRAKE MAX	7950	+150/-140	270	-510/+1940	+690/-450	+230/-220	260	1360	3620
AUTOBRAKE 4	8000	+150/-140	270	-510/+1950	+680/-460	+230/-220	260	1370	3640
AUTOBRAKE 3	8160	+150/-140	270	-510/+1960	+640/-390	+240/-230	330	1250	3540
AUTOBRAKE 2	8440	+150/-150	280	-520/+2000	+630/-420	+240/-240	310	1100	3240
AUTOBRAKE 1	8680	+160/-160	290	-540/+2030	+630/-430	+250/-250	300	1220	3110

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing by 200 ft.

For autobrake 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.)

ADVISORY INFORMATION**Normal Configuration Landing Distance****Flaps 25**

LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	520000 LB LANDING WT	PER 10000 LB ABOVE / BELOW 520000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN / UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF25	ONE REV NO REV

Dry Runway

MAX MANUAL	3500	+80/-50	80	-140/+480	+50/-50	+80/-80	130	90	190
AUTOBRAKE MAX	4660	+70/-70	110	-190/+640	+10/0	+120/-120	230	0	0
AUTOBRAKE 4	5870	+90/-90	160	-270/+900	+10/-20	+160/-160	300	0	0
AUTOBRAKE 3	7060	+110/-110	200	-330/+1120	+40/-70	+200/-200	330	0	0
AUTOBRAKE 2	7770	+130/-140	240	-380/+1290	+120/-160	+230/-230	310	220	220
AUTOBRAKE 1	8290	+150/-150	270	-420/+1440	+190/-220	+250/-240	310	600	710

Good Reported Braking Action

MAX MANUAL	4690	+70/-70	130	-220/+770	+120/-100	+120/-120	170	270	630
AUTOBRAKE MAX	5050	+70/-70	140	-230/+800	+100/-70	+130/-130	230	280	650
AUTOBRAKE 4	5890	+90/-90	160	-270/+920	+30/-30	+160/-160	300	20	90
AUTOBRAKE 3	7060	+110/-110	200	-330/+1120	+40/-70	+200/-200	330	0	0
AUTOBRAKE 2	7770	+130/-140	240	-380/+1290	+120/-160	+230/-230	310	220	220
AUTOBRAKE 1	8290	+150/-150	270	-420/+1440	+190/-220	+250/-240	310	600	710

Medium Reported Braking Action

MAX MANUAL	6380	+110/-110	200	-350/+1260	+290/-230	+180/-170	220	730	1810
AUTOBRAKE MAX	6460	+110/-110	200	-350/+1260	+280/-210	+180/-180	260	710	1770
AUTOBRAKE 4	6610	+110/-110	200	-350/+1280	+260/-180	+190/-180	290	640	1740
AUTOBRAKE 3	7390	+120/-120	220	-380/+1370	+190/-150	+210/-210	330	320	1130
AUTOBRAKE 2	7950	+130/-140	250	-410/+1450	+230/-210	+230/-230	310	380	910
AUTOBRAKE 1	8380	+150/-150	280	-440/+1530	+280/-270	+250/-240	310	680	1070

Poor Reported Braking Action

MAX MANUAL	8230	+150/-150	280	-510/+1960	+680/-450	+240/-230	260	1520	4170
AUTOBRAKE MAX	8260	+150/-150	290	-510/+1960	+690/-460	+240/-230	260	1520	4180
AUTOBRAKE 4	8310	+150/-150	290	-510/+1970	+690/-460	+240/-230	260	1530	4210
AUTOBRAKE 3	8560	+150/-150	290	-520/+1990	+630/-410	+250/-240	320	1330	4010
AUTOBRAKE 2	8840	+160/-160	300	-530/+2030	+640/-430	+260/-250	310	1250	3710
AUTOBRAKE 1	9090	+170/-170	310	-550/+2060	+640/-440	+260/-260	310	1380	3590

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing by 210 ft.

For autobrake and manual speedbrakes, increase reference landing distance by 180 ft.

Actual (unfactored) distances are shown.

Includes distance from 50 ft above threshold (1000 ft of air distance.)

ADVISORY INFORMATION

Normal Configuration Landing Distance Flaps 20

REF DIST	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	PER 10000 LB ABOVE/BELOW 520000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN / UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF20	ONE REV	NO REV

Dry Runway

MAX MANUAL	3760	+90/-50	90	-150/+510	+50/-50	+90/-90	140	110	230
AUTOBRAKE MAX	5010	+70/-70	130	-200/+670	0/0	+130/-130	230	0	0
AUTOBRAKE 4	6370	+90/-100	180	-280/+940	0/-20	+180/-180	310	0	0
AUTOBRAKE 3	7710	+120/-130	220	-350/+1180	+40/-80	+230/-230	350	0	0
AUTOBRAKE 2	8500	+140/-150	270	-400/+1350	+130/-170	+250/-250	340	240	240
AUTOBRAKE 1	9080	+160/-170	310	-450/+1510	+210/-240	+280/-270	340	680	760

Good Reported Braking Action

MAX MANUAL	5050	+80/-80	140	-230/+800	+130/-110	+130/-130	180	320	740
AUTOBRAKE MAX	5410	+80/-80	150	-240/+830	+100/-70	+140/-140	240	320	750
AUTOBRAKE 4	6390	+90/-100	180	-280/+960	+20/-30	+180/-180	310	20	100
AUTOBRAKE 3	7710	+120/-130	220	-350/+1180	+40/-80	+230/-230	350	0	0
AUTOBRAKE 2	8500	+140/-150	270	-400/+1350	+130/-170	+250/-250	340	240	240
AUTOBRAKE 1	9080	+160/-170	310	-450/+1510	+210/-240	+280/-270	340	680	760

Medium Reported Braking Action

MAX MANUAL	6920	+120/-120	220	-360/+1310	+320/-260	+190/-190	240	860	2140
AUTOBRAKE MAX	6980	+120/-120	230	-360/+1310	+310/-230	+200/-190	270	830	2090
AUTOBRAKE 4	7170	+120/-120	230	-370/+1330	+280/-200	+200/-200	300	740	2060
AUTOBRAKE 3	8040	+130/-130	240	-400/+1430	+200/-160	+230/-230	350	370	1360
AUTOBRAKE 2	8680	+150/-150	270	-430/+1520	+240/-230	+260/-250	340	410	1050
AUTOBRAKE 1	9160	+160/-170	310	-460/+1600	+300/-280	+280/-270	340	770	1190

Poor Reported Braking Action

MAX MANUAL	8960	+170/-160	320	-540/+2040	+740/-490	+260/-250	280	1770	4960
AUTOBRAKE MAX	8970	+170/-160	320	-540/+2040	+750/-500	+260/-250	280	1780	4970
AUTOBRAKE 4	9040	+170/-170	320	-540/+2040	+740/-500	+260/-250	280	1790	5000
AUTOBRAKE 3	9310	+170/-170	320	-550/+2070	+680/-440	+270/-270	340	1560	4790
AUTOBRAKE 2	9630	+180/-170	330	-560/+2110	+690/-460	+280/-270	330	1430	4450
AUTOBRAKE 1	9900	+180/-180	350	-570/+2150	+690/-470	+290/-280	330	1590	4240

Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing by 220 ft.

For autobrake 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 DISTANCES AND ADJUSTMENTS (FT)										
EICAS MESSAGE	VREF	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
ANTISKID (FLAPS 25)	VREF25	5630	110/-110	180	-320/1210	260/-200	80/-80	410	660	1680
ANTISKID (FLAPS 30)	VREF30	5420	100/-100	170	-310/1190	250/-190	80/-80	410	580	1450
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	3300	100/-50	80	-130/480	50/-40	40/-40	270	-	100
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	2980	80/-40	70	-120/450	40/-40	40/-40	250	-	70
FLAPS DRIVE (FLAPS \leq 5)	VREF30+40	3970	130/-70	120	-150/600	60/-50	50/-50	290	160	390
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	3400	100/-40	80	-130/490	50/-40	40/-40	260	110	250
FLAPS DRIVE (FLAPS \geq 20)	VREF20	3240	90/-50	80	-130/470	50/-40	40/-40	250	90	190
FLAPS PRIMARY FAIL	VREF20	3630	90/-50	90	-140/500	50/-40	50/-40	290	100	220
FLAP/SLAT CONTROL	VREF20	3220	90/-50	80	-130/470	50/-40	40/-40	240	90	190
FLIGHT CONTROL MODE	VREF20	3730	90/-50	90	-140/500	50/-50	50/-50	310	110	240
HYD PRESS SYS C	VREF20	3630	90/-50	90	-140/500	50/-40	50/-40	290	100	220
HYD PRESS SYS L+C	VREF30+20	4140	100/-60	100	-160/550	70/-60	50/-50	380	-	160
HYD PRESS SYS L+R	VREF30+20	4840	80/-70	130	-210/720	130/-110	70/-70	480	-	-
HYD PRESS SYS R+C	VREF30+20	5140	70/-80	140	-220/750	130/-110	70/-70	500	-	380
HYD PRESS SYS L (FLAPS 25)	VREF25	3270	90/-50	80	-140/480	50/-50	40/-40	280	-	100
HYD PRESS SYS L (FLAPS 30)	VREF30	3150	80/-40	70	-130/470	50/-40	40/-40	280	-	90
HYD PRESS SYS R (FLAPS 25)	VREF25	3810	60/-60	100	-170/590	80/-70	50/-50	340	-	180
HYD PRESS SYS R (FLAPS 30)	VREF30	3640	60/-60	90	-160/580	70/-60	50/-50	340	-	150
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	3870	120/-60	110	-150/570	60/-50	50/-50	270	140	320
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	3340	100/-40	80	-130/480	50/-40	40/-40	250	90	200
PRI FLIGHT COMPUTERS	VREF20	3730	90/-50	90	-140/500	50/-50	50/-50	310	110	240
SLATS DRIVE	VREF30+30	3690	110/-50	100	-140/510	50/-50	50/-50	260	120	260
STABILIZER	VREF30+20	3440	90/-50	80	-140/480	50/-40	40/-40	260	100	220

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance Good Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (FT)							
EICAS MESSAGE	VREF	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
EICAS MESSAGE	VREF	450000 LB LDG WT	PER 10000 LB ABV/BLW 450000 LB	PER 1000 FT ABV S.L.	HEAD/TAIL WIND	DOWN/UP HILL	ABV/BLW ISA	PER 10 KTS ABV VREF	ONE REV NO REV
ANTISKID (FLAPS 25)	VREF25	5630	110/-110	180	-320/1210	260/-200	80/-80	410	660 1680
ANTISKID (FLAPS 30)	VREF30	5420	100/-100	170	-310/1190	250/-190	80/-80	410	580 1450
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	4740	80/-80	130	-220/810	140/-110	70/-70	380	- 370
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	4210	70/-70	110	-200/760	120/-100	60/-60	350	- 270
FLAPS DRIVE (FLAPS \leq 5)	VREF30+40	5290	80/-80	160	-220/820	120/-100	80/-70	330	420 1020
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	4750	80/-80	140	-210/780	120/-100	70/-60	340	360 850
FLAPS DRIVE (FLAPS \geq 20)	VREF20	4510	80/-80	130	-210/760	120/-100	60/-60	340	290 680
FLAPS PRIMARY FAIL	VREF20	4970	80/-90	140	-220/820	130/-110	70/-70	410	350 820
FLAP/SLAT CONTROL	VREF20	4460	80/-80	120	-210/760	110/-90	60/-60	330	280 650
FLIGHT CONTROL MODE	VREF20	5120	90/-90	150	-230/840	140/-120	70/-70	440	380 920
HYD PRESS SYS C	VREF20	4970	80/-90	140	-220/820	130/-110	70/-70	410	350 820
HYD PRESS SYS L+C	VREF30+20	5980	100/-90	180	-270/960	210/-160	90/-90	540	- 640
HYD PRESS SYS L+R	VREF30+20	6320	90/-100	190	-300/1030	270/-220	100/-100	610	- -
HYD PRESS SYS R+C	VREF30+20	6140	100/-100	180	-280/970	220/-180	90/-90	590	- 700
HYD PRESS SYS L (FLAPS 25)	VREF25	4710	80/-80	130	-230/830	150/-120	70/-70	410	- 400
HYD PRESS SYS L (FLAPS 30)	VREF30	4530	80/-80	130	-220/820	140/-120	60/-60	420	- 350
HYD PRESS SYS R (FLAPS 25)	VREF25	4710	80/-80	130	-230/830	150/-120	70/-70	410	- 400
HYD PRESS SYS R (FLAPS 30)	VREF30	4480	80/-70	120	-220/810	140/-120	60/-60	410	- 340
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	5220	80/-80	150	-220/810	120/-100	80/-70	310	390 930
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	4590	70/-70	130	-210/770	110/-90	60/-60	310	280 660
PRI FLIGHT COMPUTERS	VREF20	5120	90/-90	150	-230/840	140/-120	70/-70	440	380 920
SLATS DRIVE	VREF30+30	5150	80/-80	150	-220/820	130/-110	70/-70	350	370 860
STABILIZER	VREF30+20	4790	80/-80	140	-220/790	120/-100	70/-70	350	330 760

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****Medium Reported Braking Action**

		LANDING DISTANCES AND ADJUSTMENTS (FT)							
EICAS MESSAGE	VREF	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
		450000 LB LDG WT	PER 10000 LB ABV/BLW 450000 LB	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV NO REV
ANTISKID (FLAPS 25)	VREF25	7180	150/-150	250	-460/1900	610/-380	110/-100	470	1370 3890
ANTISKID (FLAPS 30)	VREF30	6930	150/-140	230	-460/1880	610/-380	110/-100	470	1230 3380
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	6720	130/-130	210	-360/1380	380/-280	110/-100	500	- 1130
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	5870	110/-110	180	-340/1290	330/-240	90/-90	460	- 810
FLAPS DRIVE (FLAPS \leq 5)	VREF30+40	7240	130/-130	250	-350/1340	310/-240	110/-110	440	1130 3070
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	6400	120/-120	210	-340/1280	290/-220	100/-90	440	940 2510
FLAPS DRIVE (FLAPS \geq 20)	VREF20	6090	120/-120	200	-330/1260	290/-210	90/-90	430	770 1980
FLAPS PRIMARY FAIL	VREF20	6610	130/-130	220	-350/1320	320/-240	100/-90	500	900 2370
FLAP/SLAT CONTROL	VREF20	6000	120/-110	190	-320/1240	280/-210	90/-90	420	740 1890
FLIGHT CONTROL MODE	VREF20	6840	140/-130	230	-360/1350	350/-260	100/-100	550	1000 2680
HYD PRESS SYS C	VREF20	6610	130/-130	220	-350/1320	320/-240	100/-90	500	900 2370
HYD PRESS SYS L+C	VREF30+20	8480	150/-150	290	-440/1620	570/-400	140/-130	700	- 1940
HYD PRESS SYS L+R	VREF30+20	9960	160/-160	330	-530/1920	920/-620	170/-170	840	- -
HYD PRESS SYS R+C	VREF30+20	8660	160/-160	300	-450/1640	580/-420	140/-140	730	- 2070
HYD PRESS SYS L (FLAPS 25)	VREF25	6710	130/-130	220	-380/1430	410/-300	100/-100	540	- 1230
HYD PRESS SYS L (FLAPS 30)	VREF30	6450	120/-120	210	-370/1410	410/-300	100/-100	550	- 1070
HYD PRESS SYS R (FLAPS 25)	VREF25	6660	120/-120	220	-380/1430	410/-300	100/-100	530	- 1200
HYD PRESS SYS R (FLAPS 30)	VREF30	6300	120/-120	200	-370/1390	390/-280	100/-100	520	- 1000
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	7020	130/-120	230	-340/1310	290/-220	110/-100	400	990 2610
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	6190	110/-110	200	-330/1250	280/-210	90/-90	400	750 1900
PRI FLIGHT COMPUTERS	VREF20	6840	140/-130	230	-360/1350	350/-260	100/-100	550	1000 2680
SLATS DRIVE	VREF30+30	6890	130/-120	230	-350/1320	310/-240	110/-100	440	920 2360
STABILIZER	VREF30+20	6430	120/-120	210	-340/1280	300/-220	100/-90	440	840 2150

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance Poor Reported Braking Action

		LANDING DISTANCES AND ADJUSTMENTS (FT)								
		REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
EICAS MESSAGE	VREF	450000 LB LDG WT	PER 10000 LB ABV/BLW 450000 LB	PER 1000 FT ABV S.L.	HEAD/TAIL WIND	DOWN/UP HILL	ABV/BLW ISA	PER 10 KTS ABV VREF	ONE REV	NO REV
ANTISKID (FLAPS 25)	VREF25	9800	230/-210	350	-800/3800	2900/-910	150/-140	520	3630	15000
ANTISKID (FLAPS 30)	VREF30	9490	220/-210	340	-790/3770	2800/-900	150/-140	520	3340	15000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	9060	190/-190	310	-560/2240	1020/-580	150/-140	600	-	2730
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	7860	170/-160	260	-520/2100	900/-500	130/-120	550	-	1930
FLAPS DRIVE (FLAPS \leq 5)	VREF30+40	9310	190/-180	350	-520/2080	740/-460	150/-140	520	2330	7390
FLAPS DRIVE (5 < FLAPS $<$ 20)	VREF30+20	8160	170/-160	300	-490/1990	700/-420	130/-120	510	1900	5880
FLAPS DRIVE (FLAPS \geq 20)	VREF20	7790	170/-160	280	-480/1960	690/-410	120/-110	500	1600	4620
FLAPS PRIMARY FAIL	VREF20	8360	180/-180	300	-510/2040	760/-500	130/-120	570	1830	5480
FLAP/SLAT CONTROL	VREF20	7670	170/-160	270	-480/1950	670/-400	120/-110	480	1530	4380
FLIGHT CONTROL MODE	VREF20	8680	190/-180	320	-520/2080	810/-480	140/-130	620	2030	6270
HYD PRESS SYS C	VREF20	8360	180/-180	300	-510/2040	760/-500	130/-120	570	1830	5480
HYD PRESS SYS L+C	VREF30+20	11510	230/-220	440	-690/2690	1580/-830	190/-180	820	-	4770
HYD PRESS SYS L+R	VREF30+20	15410	250/-240	570	-960/3630	3590/-1580	270/-270	1050	-	-
HYD PRESS SYS R+C	VREF30+20	11670	230/-230	450	-700/2710	1530/-850	200/-190	840	-	4970
HYD PRESS SYS L (FLAPS 25)	VREF25	9150	190/-180	330	-600/2420	1160/-640	150/-140	640	-	3050
HYD PRESS SYS L (FLAPS 30)	VREF30	8830	180/-170	320	-600/2390	1150/-640	140/-140	650	-	2690
HYD PRESS SYS R (FLAPS 25)	VREF25	9040	180/-180	330	-600/2400	1130/-630	150/-140	630	-	2940
HYD PRESS SYS R (FLAPS 30)	VREF30	8510	170/-170	300	-580/2340	1080/-600	140/-130	600	-	2420
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	8890	180/-170	330	-500/2030	690/-420	140/-130	470	1970	5900
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	7910	160/-160	280	-480/1960	670/-400	120/-120	470	1550	4390
PRI FLIGHT COMPUTERS	VREF20	8680	190/-180	320	-520/2080	810/-480	140/-130	620	2030	6270
SLATS DRIVE	VREF30+30	8720	180/-170	320	-510/2040	730/-440	140/-130	500	1820	5240
STABILIZER	VREF30+20	8170	170/-160	290	-500/2000	720/-430	130/-120	500	1690	4870

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION**Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 25 or 30**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 LB)			
		AIRPORT PRESSURE ALTITUDE (FT)			
°C	°F	0	1000	2000	3000
54	129	509.5			
52	126	524.1	504.0		
50	122	539.1	519.0	497.5	
48	118	555.3	533.9	512.5	493.3
46	115	571.0	549.5	526.9	506.8
44	111	586.0	564.3	541.8	520.4
42	108	600.7	578.4	555.9	533.9
40	104	614.6	591.8	569.1	546.8
38	100	628.0	604.4	581.5	559.3
36	97	640.3	616.1	592.9	570.6
34	93	651.1	627.0	603.2	581.0
32	90	660.2	636.1	612.5	588.7
30	86	668.7	644.0	619.6	596.1
28	82	668.8	651.9	625.1	601.9
26	79	668.9	652.0	630.4	606.1
24	75	669.0	652.2	633.1	610.0
22	72	669.2	652.3	633.3	612.9
20	68	669.3	652.4	633.4	615.3
18	64	669.4	652.5	633.5	615.4
16	61	669.5	652.6	633.6	615.5
14	57	669.6	652.8	633.7	615.6
12	54	669.8	652.9	633.8	615.7
10 & BELOW	50 & BELOW	669.9	653.0	634.0	615.9

Based on engine bleed for 2 packs on and engine anti-ice off and wing anti-ice off.

With engine bleed for packs off, increase weight by 4800 lb.

With engine anti-ice on, decrease weight by 1100 lb.

With engine and wing anti-ice on, decrease weight by 4800 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 43300 lb.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Reference Brake Energy (Millions of Foot Pounds)**

WEIGHT (1000 LB)	OAT (°C)	BRAKES ON SPEED (KIAS)											
		PRESSURE ALTITUDE (1000 FT)											
		80		100		120		140		160		180	
0	0	0	2	4	0	2	4	0	2	4	0	2	4
680	0	19.3	20.2	21.0	28.6	30.1	31.5	39.3	41.5	43.7	51.2	54.2	57.3
	10	19.8	20.7	21.6	29.4	31.0	32.5	40.5	42.8	45.0	52.8	55.9	59.1
	15	20.2	21.1	22.0	30.0	31.6	33.1	41.2	43.6	45.9	53.8	56.9	60.2
	20	20.6	21.5	22.4	30.5	32.1	33.6	41.9	44.3	46.7	54.7	57.9	61.2
	30	21.0	22.0	22.9	31.3	32.9	34.5	43.1	45.5	47.9	56.2	59.5	62.8
640	0	18.5	19.3	20.1	27.3	28.7	30.0	37.4	39.5	41.6	48.7	51.6	54.4
	10	19.0	19.8	20.6	28.1	29.5	30.9	38.6	40.7	42.8	50.2	53.2	56.1
	15	19.3	20.2	21.0	28.6	30.1	31.5	39.3	41.5	43.6	51.1	54.2	57.1
	20	19.6	20.5	21.4	29.1	30.6	32.0	39.9	42.2	44.4	52.0	55.1	58.1
	30	20.1	21.0	21.8	29.8	31.3	32.8	41.0	43.3	45.6	53.4	56.6	59.7
600	0	17.6	18.4	19.1	26.0	27.3	28.5	35.5	37.5	39.4	46.2	48.8	51.5
	10	18.1	18.9	19.6	26.7	28.0	29.4	36.6	38.6	40.6	47.6	50.4	53.1
	15	18.4	19.2	20.0	27.2	28.5	29.9	37.3	39.3	41.4	48.5	51.3	54.1
	20	18.7	19.5	20.3	27.7	29.0	30.4	37.9	40.0	42.1	49.3	52.2	55.0
	30	19.2	20.0	20.8	28.3	29.8	31.2	38.9	41.0	43.2	50.6	53.6	56.5
560	0	16.8	17.5	18.2	24.6	25.8	27.0	33.6	35.4	37.2	43.6	46.1	48.6
	10	17.2	17.9	18.7	25.3	26.6	27.8	34.6	36.5	38.4	44.9	47.5	50.1
	15	17.5	18.3	19.0	25.8	27.1	28.3	35.3	37.2	39.1	45.8	48.4	51.0
	20	17.8	18.6	19.3	26.3	27.5	28.8	35.9	37.8	39.7	46.6	49.2	51.9
	30	18.2	19.0	19.8	26.9	28.2	29.5	36.8	38.8	40.8	47.8	50.6	53.3
520	0	16.3	17.1	17.9	27.1	28.5	29.8	37.3	39.3	41.4	48.6	51.4	54.5
	10	16.8	17.5	18.2	27.0	28.3	29.6	37.0	39.8	41.9	48.6	51.4	54.2
	15	17.2	17.9	18.7	27.5	28.8	30.1	37.5	39.7	41.8	48.3	51.5	54.7
	20	17.5	18.3	19.0	28.0	29.3	30.6	38.0	40.2	42.3	49.0	52.1	55.3
	30	17.8	18.6	19.3	28.5	29.8	31.1	38.5	40.7	42.8	49.5	52.6	55.7
480	0	15.9	16.6	17.2	23.3	24.4	25.5	31.7	33.4	35.1	41.0	43.3	45.6
	10	16.4	17.0	17.7	24.0	25.1	26.3	32.6	34.4	36.1	42.3	44.7	47.1
	15	16.7	17.3	18.0	24.4	25.6	26.8	33.2	35.0	36.8	43.1	45.5	47.9
	20	17.0	17.6	18.3	24.8	26.0	27.2	33.8	35.6	37.4	43.8	46.3	48.7
	30	17.3	18.0	18.7	25.4	26.6	27.9	34.7	36.5	38.4	44.9	47.5	50.1
440	0	15.1	15.7	16.3	22.0	23.0	24.0	29.8	31.3	32.9	38.4	40.5	42.6
	10	15.5	16.1	16.7	22.6	23.7	24.7	30.6	32.2	33.8	39.5	41.7	44.0
	15	15.8	16.4	17.0	23.0	24.1	25.2	31.2	32.8	34.5	40.3	42.5	44.8
	20	16.1	16.7	17.3	23.4	24.5	25.6	31.8	33.4	35.1	41.0	43.2	45.5
	30	16.4	17.1	17.7	24.0	25.1	26.2	32.5	34.2	36.0	42.0	44.4	46.7

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.

If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Event Adjusted Brake Energy (Millions of Foot Pounds)****No Reverse Thrust**

EVENT		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)									
		10	20	30	40	50	60	70	80	90	100
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100
	MAX MAN	5.1	14.1	23.1	32.1	41.2	50.3	59.5	68.8	78.3	87.9
	MAX AUTO	5.1	13.1	21.2	29.6	38.1	46.9	56.0	65.5	75.3	85.6
	AUTOBRAKE 4	4.9	12.4	19.9	27.5	35.4	43.5	52.1	61.1	70.6	80.8
	AUTOBRAKE 3	4.6	11.6	18.5	25.5	32.7	40.1	47.9	56.2	65.0	74.5
	AUTOBRAKE 2	4.3	10.8	17.2	23.6	30.1	36.9	43.9	51.4	59.4	68.0
	AUTOBRAKE 1	4.2	10.1	15.9	21.8	27.7	33.8	40.3	47.1	54.5	62.4

2 Engine Reverse Thrust

EVENT		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)									
		10	20	30	40	50	60	70	80	90	100
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100
	MAX MAN	4.4	13.0	21.4	29.7	37.9	46.1	54.3	62.6	71.1	79.7
	MAX AUTO	2.4	9.4	16.4	23.5	30.9	38.6	46.6	55.0	64.0	73.5
	AUTOBRAKE 4	1.9	7.2	12.7	18.4	24.5	31.0	37.9	45.5	53.6	62.5
	AUTOBRAKE 3	1.1	4.9	9.0	13.4	18.2	23.4	29.0	35.2	42.0	49.3
	AUTOBRAKE 2	0.3	3.1	6.1	9.4	13.0	16.9	21.3	26.1	31.4	37.2
	AUTOBRAKE 1	0.1	2.3	4.6	7.1	9.8	12.7	16.1	19.9	24.2	29.2

Cooling Time (Minutes)

EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)										
16 & BELOW	17	18	20	24	28	32	35	36 TO 44	45 & ABOVE	
GEAR DOWN INFLIGHT	NO SPECIAL PROCEDURE	1.0	1.6	2.6	4.2	5.5	6.6	7.3	CAUTION	FUSE PLUG MELT ZONE
GROUND	REQUIRED	10	16	26	42	55	66	73		
BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9	5.0 TO 6.3	6.3 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

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 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not 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 EICAS may be used 12 to 15 minutes after airplane has come to a complete stop, or inflight with gear retracted, to determine recommended cooling schedule. (Inflight gear extended, the BTMS indications may vary between individual brakes, due to airstream effects, gear tilt, and position of the gear temperature probes.)

Performance Inflight

Engine Inoperative

Chapter PI

Section 53

ENGINE INOP

Initial Max Continuous EPR

Based on .84M, engine bleed for packs on or off and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	1.260	1.236	1.217	1.204	1.193	1.176	1.182	1.192	1.203
15	1.320	1.295	1.272	1.256	1.244	1.224	1.229	1.237	1.245
10	1.376	1.351	1.328	1.311	1.295	1.275	1.280	1.285	1.290
5	1.378	1.404	1.382	1.365	1.352	1.329	1.333	1.335	1.337
0	1.378	1.420	1.431	1.415	1.402	1.381	1.385	1.385	1.384
-5	1.378	1.420	1.460	1.460	1.488	1.429	1.433	1.431	1.430
-10	1.378	1.420	1.460	1.482	1.488	1.472	1.475	1.473	1.472
-15	1.378	1.420	1.460	1.482	1.504	1.505	1.506	1.505	1.504
-20	1.378	1.420	1.460	1.482	1.504	1.505	1.506	1.505	1.504
-25	1.378	1.420	1.460	1.482	1.504	1.505	1.506	1.505	1.504
-30	1.378	1.420	1.460	1.482	1.504	1.505	1.506	1.505	1.504
-35	1.378	1.420	1.460	1.482	1.504	1.505	1.506	1.505	1.504
-40	1.378	1.420	1.460	1.482	1.504	1.505	1.506	1.505	1.504

Max Continuous EPR

37000 FT to 31000 FT Pressure Altitudes

37000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
150	0.48	1.480	1.480	1.480	1.477	1.464	1.445	1.421	1.392	1.359	1.326	1.324	1.324
200	0.63	1.495	1.495	1.495	1.495	1.495	1.480	1.453	1.419	1.379	1.336	1.292	1.258
250	0.77	1.530	1.530	1.530	1.530	1.530	1.530	1.530	1.499	1.460	1.416	1.367	1.316
300	0.91	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.434	1.393	1.346

35000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
150	0.46	1.479	1.479	1.479	1.479	1.464	1.445	1.421	1.392	1.362	1.332	1.323	1.323
200	0.60	1.484	1.484	1.484	1.484	1.484	1.473	1.451	1.421	1.385	1.350	1.315	1.283
250	0.74	1.528	1.528	1.528	1.528	1.528	1.528	1.528	1.498	1.459	1.413	1.360	1.303
300	0.87	1.480	1.480	1.480	1.480	1.480	1.480	1.480	1.480	1.480	1.448	1.404	1.355

33000 FT PRESS ALT		TAT (°C)											
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
150	0.44	1.486	1.486	1.486	1.486	1.480	1.460	1.435	1.407	1.375	1.345	1.317	1.317
200	0.58	1.493	1.493	1.493	1.493	1.493	1.493	1.471	1.444	1.409	1.372	1.336	1.299
250	0.71	1.530	1.530	1.530	1.530	1.530	1.530	1.530	1.516	1.478	1.430	1.370	1.301
300	0.84	1.482	1.482	1.482	1.482	1.482	1.482	1.482	1.482	1.482	1.460	1.415	1.365
330	0.91	1.439	1.439	1.439	1.439	1.439	1.439	1.439	1.439	1.439	1.439	1.426	1.383

31000 FT PRESS ALT		TAT (°C)											
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
150	0.42	1.492	1.492	1.492	1.492	1.478	1.453	1.425	1.393	1.362	1.333	1.315	1.315
200	0.55	1.506	1.506	1.506	1.506	1.506	1.497	1.470	1.438	1.400	1.361	1.322	1.284
250	0.68	1.530	1.530	1.530	1.530	1.530	1.530	1.530	1.498	1.454	1.395	1.326	1.262
300	0.81	1.482	1.482	1.482	1.482	1.482	1.482	1.482	1.482	1.477	1.435	1.386	1.334
333	0.88	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.385	1.335

ENGINE INOP**Max Continuous EPR****37000 FT to 31000 FT Pressure Altitudes****EPR Adjustments for Engine Bleed**

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	31	33	35	37
ENGINE ONLY	-0.018	-0.017	-0.016	-0.017
ENGINE & WING *	-0.033	-0.032	-0.032	-0.034
ENGINE & WING **	-0.048	-0.047	-0.048	-0.051

*Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

29000 FT to 24000 FT Pressure Altitudes

29000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
150	0.40	1.504	1.504	1.504	1.504	1.488	1.459	1.429	1.394	1.363	1.334	1.326	1.326
200	0.53	1.509	1.509	1.509	1.509	1.509	1.497	1.464	1.427	1.388	1.350	1.313	1.293
250	0.65	1.504	1.504	1.504	1.504	1.504	1.504	1.504	1.457	1.405	1.350	1.294	1.251
300	0.78	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.450	1.397	1.340	1.281
330	0.85	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.417	1.406	1.354	1.298
27000 FT PRESS ALT		TAT (°C)											
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
150	0.38	1.523	1.523	1.523	1.523	1.523	1.505	1.473	1.440	1.404	1.372	1.343	1.343
200	0.51	1.512	1.512	1.512	1.512	1.512	1.512	1.496	1.458	1.416	1.376	1.341	1.306
250	0.63	1.479	1.479	1.479	1.479	1.479	1.479	1.479	1.474	1.423	1.372	1.325	1.285
300	0.75	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.450	1.417	1.350	1.288
330	0.81	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.395	1.370	1.311
25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
150	0.37	1.540	1.540	1.540	1.540	1.540	1.522	1.488	1.451	1.415	1.380	1.360	1.360
200	0.49	1.511	1.511	1.511	1.511	1.511	1.511	1.490	1.447	1.404	1.366	1.332	1.307
250	0.60	1.461	1.461	1.461	1.461	1.461	1.461	1.461	1.451	1.400	1.354	1.315	1.282
300	0.72	1.429	1.429	1.429	1.429	1.429	1.429	1.429	1.429	1.429	1.371	1.302	1.248
330	0.78	1.375	1.375	1.375	1.375	1.375	1.375	1.375	1.375	1.375	1.375	1.327	1.260
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
150	0.36	1.536	1.536	1.536	1.536	1.536	1.530	1.494	1.459	1.421	1.387	1.355	1.355
200	0.48	1.507	1.507	1.507	1.507	1.507	1.507	1.497	1.455	1.412	1.372	1.339	1.307
250	0.59	1.463	1.463	1.463	1.463	1.463	1.463	1.463	1.453	1.408	1.363	1.324	1.289
300	0.70	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.432	1.424	1.381	1.310	1.257
333	0.77	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.382	1.378	1.336	1.270

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	24	25	27	29
ENGINE ONLY	-0.022	-0.023	-0.021	-0.020
ENGINE & WING*	-0.037	-0.038	-0.036	-0.035
ENGINE & WING**	-0.051	-0.053	-0.051	-0.050

*Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

ENGINE INOP**Max Continuous EPR****22000 FT to 16000 FT Pressure Altitudes**

22000 FT PRESS ALT			TAT (°C)											
KIAS	M		-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
150	0.35	1.529	1.529	1.529	1.529	1.529	1.529	1.511	1.474	1.399	1.399	1.367	1.346	1.346
200	0.46	1.500	1.500	1.500	1.500	1.500	1.500	1.496	1.470	1.428	1.389	1.353	1.322	1.301
250	0.57	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.455	1.423	1.380	1.339	1.302	1.270
300	0.68	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.424	1.387	1.325	1.273	1.234
330	0.74	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.392	1.386	1.347	1.283	1.228
20000 FT PRESS ALT			TAT (°C)											
KIAS	M		-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
150	0.33	1.523	1.523	1.523	1.523	1.523	1.523	1.523	1.493	1.453	1.412	1.378	1.347	1.336
200	0.44	1.492	1.492	1.492	1.492	1.492	1.492	1.492	1.484	1.444	1.404	1.365	1.334	1.305
250	0.55	1.465	1.465	1.465	1.465	1.465	1.465	1.465	1.465	1.435	1.395	1.355	1.317	1.285
300	0.65	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.393	1.338	1.291	1.250
330	0.71	1.394	1.394	1.394	1.394	1.394	1.394	1.394	1.394	1.394	1.394	1.351	1.291	1.238
18000 FT PRESS ALT			TAT (°C)											
KIAS	M		-25	-20	-15	-10	-5	0	5	10	15	20	25	30
150	0.32	1.496	1.496	1.496	1.496	1.496	1.496	1.494	1.455	1.415	1.380	1.351	1.322	1.321
200	0.42	1.474	1.474	1.474	1.474	1.474	1.474	1.471	1.452	1.409	1.369	1.336	1.309	1.283
250	0.53	1.498	1.498	1.498	1.498	1.498	1.498	1.498	1.485	1.429	1.373	1.325	1.288	1.260
300	0.63	1.461	1.461	1.461	1.461	1.461	1.461	1.461	1.461	1.461	1.398	1.337	1.285	1.238
330	0.69	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.426	1.352	1.293	1.240
16000 FT PRESS ALT			TAT (°C)											
KIAS	M		-25	-20	-15	-10	-5	0	5	10	15	20	25	30
150	0.31	1.473	1.473	1.473	1.473	1.473	1.473	1.472	1.456	1.418	1.383	1.353	1.326	1.306
200	0.41	1.454	1.454	1.454	1.454	1.454	1.454	1.454	1.442	1.412	1.375	1.342	1.314	1.288
250	0.51	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.465	1.408	1.354	1.309	1.273
300	0.60	1.465	1.465	1.465	1.465	1.465	1.465	1.465	1.465	1.465	1.436	1.375	1.318	1.271
330	0.66	1.423	1.423	1.423	1.423	1.423	1.423	1.423	1.423	1.423	1.423	1.381	1.321	1.267

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION		PRESSURE ALTITUDE (1000 FT)			
		16	18	20	22
ENGINE ONLY		-0.011	-0.014	-0.018	-0.020
ENGINE & WING*		-0.022	-0.026	-0.031	-0.034
ENGINE & WING**		-0.033	-0.038	-0.044	-0.047

*Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

ENGINE INOP**Max Continuous EPR****14000 FT to 5000 FT Pressure Altitudes**

14000 FT PRESS ALT			TAT (°C)										
KIAS	M	-20	-15	-10	-5	0	5	10	15	20	25	30	35
150	0.29	1.446	1.446	1.446	1.446	1.446	1.443	1.417	1.381	1.351	1.325	1.301	1.290
200	0.39	1.437	1.437	1.437	1.437	1.437	1.437	1.407	1.372	1.341	1.315	1.291	1.267
250	0.49	1.490	1.490	1.490	1.490	1.490	1.490	1.435	1.379	1.329	1.286	1.252	
300	0.58	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.466	1.410	1.350	1.300	1.256
330	0.64	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.425	1.416	1.354	1.298	1.250
12000 FT PRESS ALT			TAT (°C)										
KIAS	M	-15	-10	-5	0	5	10	15	20	25	30	35	40
150	0.28	1.444	1.444	1.444	1.444	1.444	1.431	1.415	1.388	1.351	1.317	1.285	1.278
200	0.38	1.433	1.433	1.433	1.433	1.433	1.430	1.415	1.397	1.367	1.325	1.285	1.247
250	0.47	1.478	1.478	1.478	1.478	1.478	1.478	1.462	1.416	1.371	1.329	1.289	1.252
300	0.56	1.471	1.471	1.471	1.471	1.471	1.471	1.471	1.453	1.393	1.338	1.293	1.254
330	0.62	1.439	1.439	1.439	1.439	1.439	1.439	1.439	1.439	1.403	1.344	1.294	1.251
10000 FT PRESS ALT			TAT (°C)										
KIAS	M	-15	-10	5	0	5	10	15	20	25	30	35	40
150	0.27	1.425	1.425	1.425	1.425	1.425	1.422	1.403	1.384	1.355	1.320	1.299	1.280
200	0.36	1.401	1.401	1.401	1.401	1.401	1.401	1.394	1.380	1.358	1.323	1.291	1.270
250	0.45	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.387	1.353	1.318	1.282	1.252
300	0.54	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.411	1.372	1.323	1.282	1.254
330	0.59	1.383	1.383	1.383	1.383	1.383	1.383	1.383	1.383	1.382	1.327	1.285	1.246
5000 FT PRESS ALT			TAT (°C)										
KIAS	M	-10	-5	0	5	10	15	20	25	30	35	40	45
150	0.25	1.385	1.385	1.385	1.385	1.385	1.385	1.377	1.348	1.323	1.302	1.281	1.260
200	0.33	1.367	1.367	1.367	1.367	1.367	1.367	1.367	1.353	1.336	1.316	1.291	1.265
250	0.41	1.341	1.341	1.341	1.341	1.341	1.341	1.341	1.341	1.326	1.311	1.287	1.253
300	0.49	1.333	1.333	1.333	1.333	1.333	1.333	1.333	1.333	1.327	1.289	1.254	1.221
330	0.54	1.311	1.311	1.311	1.311	1.311	1.311	1.311	1.311	1.311	1.289	1.252	1.218

EPR Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)			
	5	10	12	14
ENGINE ONLY	-0.015	-0.015	-0.013	-0.010
ENGINE & WING*	-0.023	-0.025	-0.023	-0.020
ENGINE & WING**	-0.031	-0.035	-0.033	-0.030

*Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

ENGINE INOP**MAX CONTINUOUS THRUST****Driftdown Speed/Level Off Altitude****100 ft/min residual rate of climb****Includes APU fuel burn**

WEIGHT (1000 LB)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
START DRIFT DOWN	LEVEL OFF		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
660	638	281	16200	14700	13100
620	600	273	17700	16300	14700
580	562	264	19000	18000	16400
540	522	255	20400	19600	18300
500	483	246	22300	21700	20500
460	444	236	24300	24100	22900
420	406	226	26400	26200	25300
380	367	215	28700	28300	27500
340	329	204	31200	30600	29900

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	
134	125	118	111	105	100	95	91	87	83	80	
274	255	239	224	211	200	190	181	172	165	158	
413	384	359	337	317	300	284	270	258	246	236	
551	512	479	449	423	400	379	360	343	328	314	
688	640	598	561	529	500	474	451	429	410	393	
825	768	717	674	635	600	569	541	516	492	471	
961	895	836	785	740	700	664	631	602	575	550	
1097	1021	955	897	846	800	759	722	688	658	629	
1233	1148	1074	1009	951	900	854	812	775	740	709	
1368	1274	1192	1121	1057	1000	949	903	861	823	788	
1503	1401	1311	1232	1162	1100	1044	993	947	906	867	
1639	1527	1430	1344	1268	1200	1139	1084	1034	988	947	
1774	1654	1548	1456	1373	1300	1234	1174	1120	1071	1026	
1910	1781	1667	1567	1479	1400	1329	1265	1207	1153	1105	
2047	1908	1786	1679	1585	1500	1424	1355	1293	1236	1184	
2184	2035	1906	1792	1690	1600	1519	1445	1379	1318	1263	
2321	2163	2025	1904	1796	1700	1614	1536	1465	1400	1341	
2460	2292	2145	2016	1902	1800	1708	1626	1550	1482	1419	

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 LB)									TIME (HR:MIN)	
	WEIGHT AT START OF DRIFTDOWN (1000 LB)										
	340	380	420	460	500	540	580	620	660		
100	2.1	2.3	2.5	2.8	3.0	3.2	3.2	3.4	3.6	0:15	
200	4.9	5.4	5.8	6.3	6.8	7.2	7.5	8.0	8.6	0:32	
300	8.0	8.8	9.5	10.3	11.1	11.9	12.5	13.4	14.2	0:49	
400	11.2	12.3	13.4	14.5	15.6	16.7	17.7	18.9	20.1	1:06	
500	14.2	15.7	17.1	18.5	20.0	21.4	22.6	24.2	25.8	1:22	
600	17.2	19.0	20.7	22.4	24.1	25.9	27.4	29.3	31.2	1:38	
700	20.2	22.2	24.2	26.2	28.3	30.4	32.2	34.4	36.5	1:54	
800	23.1	25.4	27.7	30.0	32.4	34.8	36.9	39.4	41.8	2:10	
900	26.0	28.6	31.2	33.8	36.4	39.1	41.6	44.4	47.1	2:26	
1000	28.8	31.7	34.6	37.5	40.5	43.4	46.2	49.4	52.3	2:41	
1100	31.6	34.8	38.0	41.2	44.4	47.7	50.8	54.2	57.5	2:57	
1200	34.4	37.9	41.4	44.8	48.4	51.9	55.3	59.1	62.6	3:13	
1300	37.1	40.9	44.7	48.4	52.2	56.1	59.8	63.8	67.7	3:29	
1400	39.8	43.9	47.9	52.0	56.1	60.2	64.2	68.6	72.7	3:44	
1500	42.5	46.9	51.2	55.5	59.9	64.3	68.6	73.3	77.6	4:00	
1600	45.1	49.8	54.4	59.0	63.7	68.4	73.0	77.9	82.5	4:17	
1700	47.8	52.7	57.6	62.5	67.4	72.4	77.3	82.5	87.4	4:33	
1800	50.3	55.5	60.7	65.9	71.1	76.4	81.5	87.0	92.2	4:50	

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
660	13200	12000	7600
640	14000	12800	9700
620	14800	13600	12200
600	15700	14400	13000
580	16500	15300	13800
560	17400	16200	14700
540	18300	17100	15600
520	19000	18000	16600
500	19700	18800	17600
480	20600	19600	18600
460	21600	20700	19700
440	22700	22000	20900
420	23700	23300	22200
400	24900	24800	23600
380	26100	25900	24900
360	27400	27100	26200
340	28800	28400	27500

ENGINE INOP**MAX CONTINUOUS THRUST****Long Range Cruise Control**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	13	15	17	19	21	23	25	27	29
660	EPR	1.263	1.355								
	MACH	.577	.615								
	KIAS	321	323								
	FF/ENG	20270	21145								
620	EPR	1.235	1.302	1.379							
	MACH	.567	.591	.622							
	KIAS	315	310	315							
	FF/ENG	19027	19136	20113							
580	EPR	1.209	1.263	1.315	1.404						
	MACH	.555	.575	.595	.628						
	KIAS	308	302	301	306						
	FF/ENG	17754	17668	17936	19053						
540	EPR	1.185	1.233	1.270	1.327	1.426					
	MACH	.541	.564	.577	.599	.633					
	KIAS	300	296	292	292	.297					
	FF/ENG	16495	16470	16382	16765	17916					
500	EPR	1.164	1.204	1.236	1.274	1.336					
	MACH	.526	.549	.564	.578	.601					
	KIAS	292	288	285	281	281					
	FF/ENG	15293	15222	15189	15142	15546					
460	EPR	1.145	1.179	1.205	1.235	1.274	1.342				
	MACH	.512	.532	.548	.564	.577	.601				
	KIAS	284	279	277	274	270	.270				
	FF/ENG	14164	14013	13947	13934	13868	14271				
420	EPR	1.127	1.157	1.178	1.201	1.233	1.273	1.342	1.448		
	MACH	.497	.516	.530	.546	.563	.576	.599	.634		
	KIAS	275	270	267	265	263	.259	.258	.263		
	FF/ENG	13077	12883	12744	12662	12641	12582	12936	13947		
380	EPR	1.110	1.136	1.154	1.172	1.198	1.231	1.274	1.333	1.440	
	MACH	.482	.499	.513	.527	.543	.559	.574	.594	.630	
	KIAS	267	261	258	255	253	.251	.247	.246	.250	
	FF/ENG	12119	11793	11631	11445	11375	11331	11311	11574	12465	
340	EPR	1.092	1.116	1.131	1.146	1.168	1.193	1.227	1.267	1.321	1.419
	MACH	.461	.483	.495	.508	.522	.537	.554	.570	.587	.620
	KIAS	255	253	249	246	243	.240	.238	.235	.233	.236
	FF/ENG	11113	10789	10555	10335	10202	10115	10047	10033	10187	10906

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	
288	265	245	228	213	200	190	181	173	165	158	
573	528	489	455	426	400	380	362	346	331	318	
860	793	734	683	639	600	571	544	519	497	477	
1147	1057	978	911	852	800	761	725	692	662	635	
1435	1323	1224	1139	1066	1000	951	906	865	828	794	
1724	1589	1469	1367	1279	1200	1141	1086	1037	992	952	
2014	1856	1716	1596	1493	1400	1331	1268	1210	1157	1109	
2305	2123	1962	1825	1706	1600	1521	1448	1381	1321	1266	
2596	2391	2208	2054	1920	1800	1710	1628	1552	1484	1423	

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	10		14		18		22	
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	8.6	0:40	7.5	0:39	6.8	0:38	6.5	0:36
300	13.1	0:58	11.9	0:56	11.0	0:54	10.9	0:51
400	17.7	1:16	16.2	1:13	15.2	1:11	15.2	1:06
500	22.3	1:34	20.6	1:31	19.4	1:28	19.4	1:22
600	26.8	1:52	24.9	1:48	23.5	1:44	23.6	1:37
700	31.3	2:10	29.2	2:05	27.6	2:01	27.8	1:53
800	35.8	2:29	33.4	2:23	31.7	2:18	31.9	2:08
900	40.2	2:47	37.7	2:41	35.7	2:35	35.9	2:24
1000	44.6	3:05	41.9	2:58	39.8	2:52	40.0	2:40
1100	49.0	3:24	46.1	3:16	43.8	3:09	43.9	2:56
1200	53.4	3:42	50.2	3:34	47.8	3:26	47.9	3:12
1300	57.8	4:01	54.4	3:52	51.7	3:43	51.8	3:28
1400	62.1	4:19	58.5	4:09	55.7	4:00	55.7	3:44
1500	66.4	4:38	62.6	4:27	59.6	4:17	59.5	4:01
1600	70.7	4:57	66.7	4:45	63.5	4:34	63.3	4:17
1700	75.0	5:16	70.7	5:03	67.3	4:52	67.0	4:33
1800	79.2	5:35	74.8	5:22	71.2	5:09	70.8	4:50

ENGINE INOP**MAX CONTINUOUS THRUST****Long Range Cruise Diversion Fuel and Time****Fuel Required Adjustment (1000 LB)**

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)							
	300	350	400	450	500	550	600	650
5	-0.7	-0.6	-0.4	-0.2	0.0	0.5	0.8	1.2
10	-1.7	-1.4	-1.0	-0.5	0.0	1.3	2.3	3.1
15	-2.8	-2.2	-1.5	-0.8	0.0	2.1	3.7	5.1
20	-3.8	-3.0	-2.1	-1.1	0.0	2.8	5.2	7.0
25	-4.9	-3.8	-2.6	-1.3	0.0	3.6	6.6	9.0
30	-5.9	-4.6	-3.1	-1.6	0.0	4.3	8.0	10.9
35	-6.9	-5.3	-3.6	-1.9	0.0	5.1	9.3	12.9
40	-7.9	-6.1	-4.2	-2.1	0.0	5.8	10.7	14.8
45	-9.0	-6.9	-4.7	-2.4	0.0	6.5	12.0	16.7
50	-10.0	-7.6	-5.2	-2.7	0.0	7.1	13.4	18.7
55	-11.0	-8.4	-5.7	-2.9	0.0	7.8	14.7	20.6
60	-12.0	-9.1	-6.2	-3.2	0.0	8.5	16.0	22.5
65	-13.0	-9.9	-6.6	-3.4	0.0	9.1	17.2	24.4
70	-14.0	-10.6	-7.1	-3.7	0.0	9.7	18.5	26.4
75	-15.0	-11.3	-7.6	-3.9	0.0	10.3	19.7	28.3
80	-16.0	-12.0	-8.0	-4.2	0.0	10.9	20.9	30.2

APU fuel included

DRY

ENGINE INOP**MAX CONTINUOUS THRUST**

Holding
Flaps Up

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)					
		1500	5000	10000	15000	20000	25000
660	EPR	1.150	1.186	1.256	1.382		
	KIAS	259	260	261	277		
	FF/ENG	17910	17770	18030	19530		
620	EPR	1.136	1.168	1.231	1.333		
	KIAS	251	252	253	262		
	FF/ENG	16750	16610	16750	17560		
580	EPR	1.122	1.152	1.208	1.294		
	KIAS	243	244	245	248		
	FF/ENG	15690	15450	15560	15900		
540	EPR	1.109	1.136	1.186	1.261	1.400	
	KIAS	234	235	236	237	252	
	FF/ENG	14630	14330	14410	14510	16030	
500	EPR	1.097	1.120	1.165	1.229	1.334	
	KIAS	226	226	227	228	235	
	FF/ENG	13600	13270	13270	13280	14050	
460	EPR	1.085	1.105	1.144	1.199	1.283	1.470
	KIAS	220	220	220	220	220	238
	FF/ENG	12610	12350	12200	12140	12400	14260
420	EPR	1.073	1.090	1.124	1.171	1.241	1.371
	KIAS	213	213	213	213	213	220
	FF/ENG	11610	11430	11230	11090	11140	12000
380	EPR	1.061	1.076	1.105	1.145	1.201	1.303
	KIAS	206	206	206	206	206	206
	FF/ENG	10630	10450	10290	10050	10030	10340
340	EPR	1.051	1.063	1.087	1.121	1.164	1.252
	KIAS	199	199	199	199	199	199
	FF/ENG	9660	9480	9370	9050	9000	9150

ENGINE INOP
ADVISORY INFORMATION**Gear Down Landing Rate of Climb Available**
Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	290	160				
50	340	210	70			
48	400	260	120			
46	450	310	170	30		
44	500	360	220	80		
42	550	410	270	130	-20	
40	600	460	310	170	20	
38	620	510	360	210	60	
36	620	550	400	250	100	-60
34	620	590	430	280	130	-20
32	620	620	460	320	160	-10
30	630	650	490	340	180	0
20	640	660	550	410	240	60
10	650	680	560	430	280	100
0	670	690	570	440	290	120
-20	700	720	600	460	300	130
-40	730	750	620	480	320	130

Rate of climb capability shown is valid for 450000 lb, gear down at VREF20 + 5.

Decrease rate of climb 40 ft/min per 10000 lb greater than 450000 lb.

Increase rate of climb 50 ft/min per 10000 lb less than 450000 lb.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-200	-330				
50	-150	-290	-420			
48	-100	-240	-380			
46	-50	-190	-330	-470		
44	-10	-150	-290	-430		
42	40	-110	-250	-390	-540	
40	80	-60	-210	-350	-500	
38	90	-20	-170	-320	-460	-620
36	90	20	-130	-280	-430	-590
34	90	50	-100	-250	-400	-560
32	90	80	-70	-220	-380	-550
30	90	110	-50	-200	-360	-540
20	100	110	-10	-150	-320	-500
10	100	110	-10	-140	-290	-460
0	110	110	-10	-140	-290	-460
-20	110	120	-10	-140	-300	-470
-40	120	130	0	-150	-310	-490

Rate of climb capability shown is valid for 450000 lb, gear down at VREF30 + 5.

Decrease rate of climb 40 ft/min per 10000 lb greater than 450000 lb.

Increase rate of climb 50 ft/min per 10000 lb less than 450000 lb.

Performance Inflight

Alternate Mode EEC

Chapter PI

Section 54

ALTERNATE MODE EEC

Limit Weight

PERFORMANCE LIMIT	ALTERNATE MODE EEC LIMIT WEIGHT (1000 LB)							
	PRIMARY MODE PERFORMANCE LIMIT WEIGHT (1000 LB)							
	350	400	450	500	550	600	650	700
FIELD CLIMB	322.5	368.5	416.5	462.0	508.5	555.5	584.5	653.0
OBSTACLE NET LEVEL OFF WEIGHT LANDING CLIMB	301.5	344.5	387.0	431.0	474.5	517.5	562.0	605.0
	312.0	356.0	398.5	441.0	485.5	528.0	572.0	615.0
		333.5	378.0	423.5	469.0	514.0	559.0	604.5
			404.5	454.5	503.5	553.0	603.0	655.0

Takeoff Speed Adjustment

TAKEOFF SPEEDS	TAKEOFF SPEED ADJUSTMENT (KTS)
V1	+2
VR	+1
V2	0

Max Takeoff %N1

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

		AIRPORT PRESSURE ALTITUDE (FT)											
°C	°F	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
55	131	88.6	88.5	88.5	88.7	88.7	88.8	88.9	89.0	89.0	89.0	89.3	89.5
50	122	90.3	90.3	90.1	90.1	90.1	90.2	90.3	90.5	90.5	90.6	90.9	91.2
45	113	92.2	92.2	92.1	92.0	92.0	91.9	91.8	91.9	92.0	92.2	92.6	92.9
40	104	94.1	94.1	94.2	94.2	94.1	94.0	93.8	93.9	93.7	93.7	94.1	94.6
35	95	94.4	96.8	96.4	96.5	96.4	96.2	96.7	96.3	96.1	96.0	95.6	96.0
30	86	94.3	98.5	98.2	98.2	97.8	97.8	97.8	97.6	97.6	97.1	96.6	96.3
25	77	93.7	98.5	98.8	98.8	98.4	98.2	98.0	97.9	97.8	97.4	96.9	96.5
20	68	92.9	98.4	98.8	98.8	98.8	98.4	98.2	98.1	98.0	97.5	97.1	96.6
15	59	92.1	97.6	98.2	98.8	98.6	98.5	98.4	98.3	98.2	97.7	97.3	96.8
10	50	91.3	96.7	97.3	97.9	98.4	98.5	98.5	98.4	98.4	97.9	97.5	97.0
5	41	90.5	95.9	96.5	97.1	97.5	98.0	98.4	98.4	98.4	98.1	97.7	97.2
0	32	89.7	95.0	95.6	96.2	96.7	97.1	97.5	97.9	98.2	98.1	97.7	97.3
-10	14	88.0	93.2	93.8	94.4	94.9	95.3	95.7	96.0	96.4	96.5	96.5	96.6
-20	-4	86.4	91.5	92.0	92.6	93.0	93.5	93.9	94.2	94.6	94.6	94.7	94.7
-30	-22	84.6	89.6	90.2	90.7	91.2	91.6	92.0	92.3	92.7	92.7	92.8	92.8
-40	-40	82.9	87.8	88.3	88.9	89.3	89.7	90.1	90.4	90.8	90.8	90.8	90.9
-50	-58	81.1	85.9	86.4	86.9	87.4	87.8	88.1	88.4	88.8	88.8	88.9	88.9

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)						
	-1000	0	2000	4000	6000	8000	9000
PACKS OFF	0.8	0.8	0.9	1.0	1.0	1.1	1.1
WING ANTI-ICE ON	-0.4	-0.4	-0.5	-0.5	-0.5	-0.6	-0.6

ALTERNATE MODE EEC**Max Climb %N1**

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

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
310	310	310	310	310	310	310	0.84	0.84	0.84	0.84
60	85.1	85.5	87.4	89.5	90.9	89.6	90.6	93.8	94.5	95.1
50	86.3	86.6	87.1	88.1	89.6	88.3	89.3	92.4	93.0	93.6
40	86.6	87.6	88.0	88.6	88.5	86.9	87.9	91.0	91.6	92.2
30	85.2	87.5	89.4	89.9	89.4	87.8	87.0	89.5	90.1	90.7
20	83.7	86.0	88.6	91.4	91.0	90.4	89.9	88.8	88.6	89.2
15	83.0	85.3	87.8	90.7	92.2	92.0	91.3	90.0	89.6	90.0
10	82.3	84.5	87.1	89.9	91.7	94.0	92.7	91.1	90.6	90.9
5	81.6	83.8	86.3	89.1	90.8	94.3	93.8	92.3	91.7	91.8
0	80.8	83.0	85.5	88.3	90.0	93.5	95.0	93.3	92.7	92.6
-5	80.1	82.3	84.7	87.5	89.2	92.6	94.8	94.4	93.7	93.6
-10	79.3	81.5	83.9	86.6	88.4	91.8	93.9	95.2	94.6	94.5
-15	78.6	80.7	83.1	85.8	87.5	90.9	93.0	94.9	95.0	95.0
-20	77.8	79.9	82.3	85.0	86.7	90.0	92.1	94.0	94.1	94.0
-25	77.0	79.1	81.5	84.1	85.8	89.1	91.2	93.1	93.2	93.1
-30	76.3	78.3	80.7	83.3	84.9	88.2	90.3	92.1	92.2	92.2
-35	75.5	77.5	79.8	82.4	84.1	87.3	89.3	91.2	91.3	91.2
-40	74.7	76.7	79.0	81.5	83.2	86.4	88.4	90.2	90.3	90.2

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
ENGINE ANTI-ICE ON	-1.0	-0.9	-0.8	-0.4	-0.7	-0.8	-0.8	-0.7	-0.8	-0.9
ENGINE & WING ANTI-ICE ON	-1.4	-1.3	-1.3	-1.0	-1.3	-1.4	-1.5	-1.3	-1.6	-1.7

Max Cruise %N1

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

TAT (°C)	PRESSURE ALTITUDE (FT)									
	25000	27000	29000	31000	33000	35000	37000	39000	41000	43000
25	87.0	86.7	86.9	86.7	86.3	86.9	87.1	87.3	87.6	87.9
20	88.2	88.0	88.1	87.6	87.3	86.9	86.3	86.5	86.9	87.2
15	89.4	89.3	89.3	88.6	88.1	87.7	87.1	87.3	87.5	87.7
10	91.0	90.4	90.2	89.6	89.1	88.6	87.9	88.1	88.3	88.4
5	91.1	91.6	91.1	90.5	90.0	89.6	88.8	89.0	89.0	89.1
0	90.3	91.1	91.8	91.3	90.7	90.3	89.7	89.8	89.8	89.8
-5	89.5	90.3	91.0	91.4	91.4	91.0	90.4	90.5	90.4	90.4
-10	88.6	89.4	90.1	90.5	91.3	91.5	90.9	91.0	91.0	90.9
-15	87.8	88.6	89.2	89.7	90.4	91.2	91.3	91.4	91.3	91.3
-20	86.9	87.7	88.4	88.8	89.5	90.3	90.4	90.5	90.4	90.4
-25	86.1	86.8	87.5	87.9	88.6	89.4	89.5	89.6	89.5	89.5
-30	85.2	85.9	86.6	87.0	87.7	88.5	88.6	88.7	88.6	88.6
-35	84.3	85.1	85.7	86.1	86.8	87.6	87.7	87.7	87.7	87.7

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)									
	25000	27000	29000	31000	33000	35000	37000	39000	41000	43000
ENGINE ANTI-ICE ON	-0.7	-0.6	-0.6	-0.6	-0.5	-0.5	-0.5	-0.6	-0.6	-0.6
ENGINE & WING ANTI-ICE ON	-1.1	-1.1	-1.0	-1.0	-1.0	-1.0	-1.0	-1.1	-1.2	-1.3

ALTERNATE MODE EEC**Go-Around %N1**

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

AIRPORT OAT		TAT (°C)	PRESSURE ALTITUDE (FT)											
°C	°F		-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000
51	124	55	90.4	90.2	90.2	90.0	90.2	90.3	90.5	90.7	90.8	91.0	91.3	91.4
46	115	50	92.1	92.1	92.0	91.8	91.8	91.7	91.7	91.9	92.1	92.4	92.7	92.9
41	106	45	94.0	94.0	94.0	93.9	93.8	93.7	93.7	93.6	93.4	93.7	94.1	94.4
36	97	40	94.7	96.2	96.0	96.0	95.9	95.7	96.0	95.8	95.8	95.7	95.4	95.7
31	88	35	94.6	97.8	97.7	97.7	97.5	97.7	97.6	97.5	97.5	97.0	96.7	96.4
26	79	30	94.1	98.1	98.6	98.7	98.4	98.5	98.3	98.2	98.1	97.5	97.0	96.6
21	70	25	93.4	98.0	98.5	98.8	98.9	98.7	98.5	98.4	98.2	97.8	97.4	96.9
16	61	20	92.6	97.3	98.1	98.8	98.8	98.9	98.8	98.6	98.5	98.0	97.5	97.1
11	52	15	91.8	96.4	97.3	98.1	98.7	98.9	98.9	98.9	98.7	98.2	97.8	97.3
7	45	10	91.0	95.6	96.4	97.3	97.9	98.6	98.8	98.8	98.8	98.5	98.0	97.5
2	36	5	90.2	94.7	95.6	96.4	97.1	97.7	98.1	98.5	98.8	98.4	98.1	97.7
-3	27	0	89.4	93.9	94.7	95.5	96.2	96.9	97.2	97.6	98.0	98.0	98.0	97.7
-13	9	-10	87.7	92.1	93.0	93.8	94.4	95.1	95.4	95.8	96.2	96.2	96.3	96.3
-23	-9	-20	86.0	90.4	91.2	92.0	92.6	93.3	93.6	94.0	94.4	94.4	94.4	94.5
-33	-27	-30	84.3	88.6	89.4	90.1	90.8	91.4	91.7	92.1	92.5	92.5	92.5	92.6
-43	-45	-40	82.6	86.7	87.5	88.3	88.9	89.5	89.8	90.2	90.6	90.6	90.6	90.7
-53	-63	-50	80.8	84.9	85.6	86.4	86.9	87.6	87.9	88.2	88.6	88.6	88.7	88.7

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (FT)						
	-1000	0	2000	4000	6000	8000	9000
PACKS OFF	0.8	0.8	0.9	1.0	1.0	1.1	1.1
WING ANTI-ICE ON	-0.4	-0.4	-0.5	-0.5	-0.5	-0.6	-0.6

DRAFT

Intentionally
Blank

Performance Inflight**Alternate Mode EEC, Engine INOP****Chapter PI****Section 55**

ALTERNATE MODE EEC

ENGINE INOP

Initial Max Continuous %N1**Based on .84M, engine bleed for packs on or off and anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	91.4	90.5	89.8	89.3	88.9	88.2	88.4	88.8	89.2
15	92.9	91.9	91.1	90.5	90.0	89.3	89.5	89.8	90.1
10	94.1	93.2	92.3	91.7	91.1	90.4	90.6	90.8	90.9
5	93.3	94.2	93.4	92.8	92.3	91.5	91.7	91.7	91.8
0	92.4	94.1	94.6	93.9	93.3	92.5	92.7	92.7	92.7
-5	91.6	93.2	94.9	94.9	94.4	93.6	93.7	93.7	93.6
-10	90.7	92.3	94.0	95.0	95.2	94.5	94.7	94.6	94.5
-15	89.9	91.5	93.1	94.0	95.0	95.0	95.1	95.0	95.0
-20	89.0	90.6	92.2	93.1	94.0	94.1	94.1	94.1	94.0
-25	88.1	89.7	91.3	92.2	93.1	93.2	93.2	93.2	93.1
-30	87.2	88.8	90.4	91.3	92.2	92.2	92.3	92.2	92.2
-35	86.3	87.8	89.5	90.3	91.2	91.3	91.3	91.3	91.2
-40	85.4	86.9	88.5	89.4	90.2	90.3	90.3	90.3	90.3

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
ENGINE ONLY	-0.7	-0.9	-0.8	-0.7	-0.6	-0.6	-0.6	-0.7	-0.7
ENGINE & WING*	-1.2	-1.4	-1.4	-1.2	-1.2	-1.2	-1.2	-1.4	-1.4
ENGINE & WING**	-1.7	-1.9	-1.9	-1.8	-1.7	-1.8	-1.9	-2.1	-2.2

*Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

Max Continuous %N1**Based on engine bleed for packs on or off and anti-ice off****320 KIAS**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	92.3	93.5	94.8	93.0	91.7	90.6	89.3									
25	91.5	95.2	96.6	94.7	93.3	92.3	90.2	90.0	89.5	89.1						
20	90.8	95.0	98.1	96.6	95.0	93.9	91.6	91.4	91.0	90.7	90.6	90.2				
15	90.0	94.2	97.3	96.9	96.8	95.7	93.1	93.1	92.8	92.5	92.2	91.7	91.3	91.3	91.6	92.0
10	89.2	93.4	96.5	96.0	96.0	96.1	94.8	94.2	94.2	94.4	93.6	93.0	92.5	92.2	92.5	92.9
5	88.4	92.6	95.6	95.2	95.1	95.3	93.9	94.0	93.8	93.7	94.7	94.1	93.5	93.1	93.4	93.7
0	87.6	91.7	94.7	94.3	94.2	94.4	93.1	93.2	93.0	92.8	93.8	94.6	94.6	93.9	94.3	94.6
-5	86.8	90.9	93.9	93.5	93.4	93.6	92.2	92.3	92.1	92.0	92.9	93.7	94.5	94.4	94.9	95.1
-10	86.0	90.0	93.0	92.6	92.5	92.7	91.4	91.5	91.3	91.1	92.1	92.8	93.6	93.5	94.1	94.2
-15	85.2	89.2	92.1	91.7	91.6	91.8	90.5	90.6	90.4	90.2	91.2	91.9	92.7	92.6	93.2	93.3
-20	84.3	88.3	91.2	90.8	90.7	90.9	89.6	89.7	89.5	89.4	90.3	91.0	91.8	91.7	92.3	92.4
-25	83.5	87.4	90.3	89.9	89.8	90.0	88.7	88.8	88.6	88.5	89.4	90.1	90.9	90.8	91.4	91.4
-30	82.7	86.6	89.4	89.0	88.9	89.1	87.8	87.9	87.7	87.6	88.5	89.2	89.9	89.9	90.5	90.5
-35	81.8	85.7	88.5	88.1	88.0	88.2	86.9	87.0	86.8	86.7	87.6	88.3	89.0	88.9	89.5	89.6
-40	80.9	84.8	87.5	87.1	87.1	87.2	86.0	86.1	85.9	85.7	86.7	87.4	88.1	88.0	88.6	88.6

ALTERNATE MODE EEC

ENGINE INOP

Max Continuous %N1

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

280 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	91.2	91.9	93.0	91.3	90.5	89.7	89.8									
25	91.3	93.6	94.7	92.9	91.9	90.9	90.6	90.0	89.6	89.3						
20	90.5	95.5	96.8	94.9	93.5	92.4	91.6	90.9	90.3	90.0	89.2	88.4				
15	89.7	95.0	98.2	97.0	95.5	94.2	92.6	92.0	91.4	91.2	90.5	89.7	89.7	90.4	90.0	89.5
10	88.9	94.2	97.3	97.2	97.3	96.1	93.5	93.3	92.7	92.5	92.1	91.6	91.4	91.6	91.2	90.5
5	88.1	93.4	96.5	96.3	96.4	96.7	95.1	94.3	94.7	94.6	93.7	93.2	92.9	92.8	92.3	91.6
0	87.3	92.5	95.6	95.4	95.6	95.8	94.4	94.4	94.6	94.9	96.2	94.9	94.3	93.9	93.3	92.6
-5	86.5	91.7	94.7	94.5	94.7	94.9	93.6	93.6	93.8	94.0	95.8	96.4	95.5	94.9	94.4	93.6
-10	85.7	90.8	93.8	93.7	93.8	94.1	92.7	92.7	92.9	93.2	94.9	95.5	96.0	95.7	95.3	94.5
-15	84.9	90.0	92.9	92.8	92.9	93.2	91.8	91.8	92.0	92.3	94.0	94.6	95.1	95.2	95.4	94.6
-20	84.1	89.1	92.0	91.9	92.0	92.2	90.9	90.9	91.2	91.4	93.1	93.7	94.2	94.3	94.5	93.6
-25	83.3	88.2	91.1	91.0	91.1	91.3	90.0	90.0	90.5	90.5	92.2	92.8	93.2	93.3	93.6	92.7
-30	82.4	87.3	90.2	90.0	90.2	90.4	89.1	89.1	89.3	89.5	91.3	91.8	92.3	92.4	92.6	91.8
-35	81.6	86.4	89.3	89.1	89.2	89.5	88.2	88.2	88.4	88.6	90.3	90.9	91.3	91.4	91.7	90.8
-40	80.7	85.5	88.3	88.2	88.3	88.5	87.2	87.2	87.5	87.7	89.4	89.9	90.4	90.5	90.7	89.9

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.6	-0.5	-0.5	-0.4	-0.4	-0.5	-0.6	-0.7	-0.8	-0.8	-0.7	-0.9	-0.8	-0.7	-0.6	-0.6
ENGINE & WING*	-0.9	-0.9	-0.9	-0.8	-0.8	-0.9	-1.1	-1.2	-1.3	-1.3	-1.2	-1.4	-1.4	-1.2	-1.2	-1.2
ENGINE & WING**	-1.2	-1.2	-1.2	-1.2	-1.2	-1.4	-1.5	-1.7	-1.9	-1.9	-1.7	-1.9	-1.9	-1.8	-1.7	-1.8

*Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

240 KIAS

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	90.5	90.6	91.4	89.3	89.1	89.0	89.1									
25	90.5	91.6	92.8	90.6	90.2	89.8	90.0	89.6	89.3	89.4						
20	89.8	92.4	94.1	92.1	91.5	90.7	90.8	90.5	90.2	90.1	89.2	88.0				
15	89.1	92.9	95.3	94.0	93.3	92.2	91.8	91.4	91.0	90.9	90.2	88.8	87.1	86.0	86.5	88.0
10	88.3	92.1	95.5	95.9	95.2	94.0	92.9	92.5	92.0	91.8	91.0	89.9	88.6	87.5	86.9	88.2
5	87.5	91.3	94.6	95.5	96.5	95.9	94.1	93.7	93.2	93.0	92.0	91.1	90.1	89.2	88.8	89.7
0	86.7	90.4	93.8	94.6	95.6	96.2	94.7	94.4	94.5	94.3	93.1	92.3	91.8	90.9	90.5	91.0
-5	85.9	89.6	92.9	93.7	94.7	95.3	93.9	94.2	94.3	94.4	94.2	93.5	93.4	92.5	91.8	92.1
-10	85.1	88.8	92.1	92.9	93.8	94.4	93.0	93.4	93.5	93.6	94.1	94.5	94.4	93.8	93.2	93.3
-15	84.3	87.9	91.2	92.0	92.9	93.5	92.1	92.5	92.6	92.7	93.2	94.2	95.0	94.7	94.1	94.1
-20	83.5	87.1	90.3	91.1	92.0	92.6	91.2	91.6	91.7	91.8	92.3	93.2	94.4	94.8	94.7	94.7
-25	82.7	86.2	89.4	90.2	91.1	91.7	90.3	90.7	90.8	90.9	91.3	92.3	93.4	93.8	94.0	94.1
-30	81.8	85.3	88.5	89.3	90.2	90.8	89.4	89.7	89.9	89.9	90.4	91.4	92.5	92.9	93.0	93.1
-35	81.0	84.4	87.6	88.3	89.3	89.8	88.5	88.8	89.0	89.0	89.5	90.4	91.5	91.9	92.1	92.2
-40	80.1	83.6	86.6	87.4	88.3	88.9	87.6	87.9	88.0	88.1	88.5	89.5	90.6	91.0	91.1	91.2

ALTERNATE MODE EEC**ENGINE INOP****Max Continuous %N1****Based on engine bleed for packs on or off and anti-ice off****200 KIAS**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
30	89.8	89.6	89.9	88.2	88.3	88.3	89.4									
25	90.1	90.8	91.6	88.9	89.1	89.1	89.2	89.3	89.9	90.2						
20	90.1	91.4	92.6	89.6	89.9	89.9	90.0	89.6	89.2	89.4	89.5	89.5				
15	89.4	91.4	92.8	90.6	91.0	90.9	90.9	90.5	90.1	89.9	89.0	88.7	88.7	89.2	89.7	88.8
10	88.6	91.0	92.8	91.7	92.2	92.2	92.2	91.6	91.0	90.8	89.9	89.0	88.0	88.4	88.9	88.0
5	87.8	90.2	92.1	92.5	93.0	93.7	93.4	92.8	92.2	91.9	90.8	89.9	89.0	88.4	88.1	87.2
0	87.0	89.4	91.3	91.7	92.8	93.8	94.7	94.1	93.5	93.2	91.9	90.9	90.0	89.2	88.7	88.0
-5	86.2	88.6	90.4	90.8	91.9	93.1	94.2	94.5	94.7	94.5	93.1	91.9	90.9	90.0	89.4	89.1
-10	85.4	87.7	89.6	90.0	91.1	92.3	93.3	93.9	94.3	94.6	94.1	92.8	91.8	90.8	90.1	90.0
-15	84.6	86.9	88.7	89.1	90.2	91.4	92.4	93.0	93.5	93.7	93.9	93.4	92.4	91.5	90.7	90.8
-20	83.8	86.0	87.9	88.2	89.3	90.5	91.5	92.1	92.6	92.8	93.0	93.0	92.7	91.7	91.1	91.4
-25	82.9	85.2	87.0	87.4	88.4	89.6	90.6	91.1	91.6	91.9	92.1	92.1	92.2	91.8	91.1	91.6
-30	82.1	84.3	86.1	86.5	87.5	88.7	89.7	90.2	90.7	91.0	91.2	91.2	91.2	90.8	90.7	91.3
-35	81.2	83.5	85.2	85.6	86.6	87.8	88.8	89.3	89.8	90.0	90.2	90.2	90.3	89.9	89.7	90.4
-40	80.4	82.6	84.3	84.7	85.7	86.8	87.8	88.3	88.8	89.1	89.3	89.3	89.0	88.8	89.4	

%N1 Adjustments for Engine Bleed

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)															
	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35	37
ENGINE ONLY	-0.6	-0.5	-0.5	-0.4	-0.4	-0.5	-0.6	-0.7	-0.8	-0.8	-0.7	-0.9	-0.8	-0.7	-0.6	-0.6
ENGINE & WING*	-0.9	-0.9	-0.9	-0.8	-0.8	-0.9	-1.1	-1.2	-1.3	-1.3	-1.2	-1.4	-1.4	-1.2	-1.2	-1.2
ENGINE & WING**	-1.2	-1.2	-1.2	-1.2	-1.2	-1.4	-1.5	-1.7	-1.9	-1.9	-1.7	-1.9	-1.9	-1.8	-1.7	-1.8

*Wing anti-ice on, packs on.

**Wing anti-ice on, packs off.

DRAFT

Intentionally
Blank

Performance Inflight

Gear Down

Chapter PI

Section 56

GEAR DOWN

220 KIAS Max Climb EPR

TAT (°C)	PRESSURE ALTITUDE (1000 FT)															
	0	5	10	12	14	16	18	20	22	24	25	27	29	31	33	35
55	1.204	1.203	1.223	1.231	1.241	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
50	1.221	1.215	1.223	1.231	1.241	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
45	1.239	1.232	1.223	1.231	1.241	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
40	1.258	1.250	1.242	1.239	1.241	1.252	1.262	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
35	1.271	1.270	1.260	1.257	1.257	1.262	1.276	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
30	1.271	1.293	1.284	1.283	1.282	1.278	1.273	1.276	1.279	1.281	1.282	1.274	1.265	1.252	1.238	1.219
25	1.271	1.303	1.311	1.309	1.307	1.304	1.301	1.299	1.284	1.281	1.282	1.274	1.265	1.252	1.238	1.219
20	1.271	1.303	1.339	1.337	1.335	1.334	1.331	1.329	1.316	1.300	1.291	1.274	1.265	1.252	1.238	1.219
15	1.271	1.303	1.343	1.361	1.367	1.368	1.365	1.363	1.348	1.333	1.325	1.299	1.271	1.252	1.238	1.219
10	1.271	1.303	1.343	1.361	1.385	1.404	1.403	1.402	1.386	1.369	1.360	1.334	1.308	1.277	1.243	1.219
5	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.444	1.429	1.410	1.400	1.372	1.345	1.317	1.288	1.253
0	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.471	1.455	1.447	1.413	1.385	1.359	1.332	1.306
-5	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.475	1.486	1.492	1.456	1.426	1.402	1.380	1.359
-10	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.475	1.486	1.492	1.494	1.464	1.441	1.426	1.407
-15	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.475	1.486	1.492	1.494	1.495	1.475	1.463	1.450
-20	1.271	1.303	1.343	1.361	1.385	1.410	1.435	1.464	1.475	1.486	1.492	1.494	1.495	1.499	1.493	1.484

Anti-Ice Adjustment

ANTI-ICE CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
ENGINE ONLY	-.016	-.015	-.015	-.009	-.017	-.023	-.019	-.016
ENGINE AND WING*	-.022	-.023	-.025	-.020	-.030	-.038	-.034	-.032
ENGINE AND WING**	-.029	-.031	-.035	-.030	-.043	-.053	-.048	-.048

*Wing anti-ice on, dual bleed source and packs on or off.

**Wing anti-ice on, single bleed source and both packs off.

Long Range Cruise Altitude Capability

Max Climb Thrust, 300 ft/min residual rate of climb

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
660	14400	14300	12000
640	15800	15700	13600
620	17100	17000	15100
600	18400	18300	16500
580	19700	19600	17900
560	20800	20700	19300
540	21900	21800	20500
520	23000	22900	21700
500	24200	24100	22800
480	25300	25200	24000
460	26300	26100	25100
440	27300	27100	26200
420	28300	28000	27200
400	29400	29100	28300
380	30600	30100	29400
360	31500	31200	30600
340	32200	31900	31500

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GEAR DOWN**Long Range Cruise Control**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		10	13	15	17	19	21	23	25	27	29
660	EPR	1.204	1.253	1.291							
	MACH	.479	.499	.511							
	KIAS	265	261	258							
	FF/ENG	15529	15395	15416							
620	EPR	1.186	1.228	1.261	1.301						
	MACH	.469	.489	.501	.514						
	KIAS	259	256	252	249						
	FF/ENG	14589	14433	14371	14499						
580	EPR	1.167	1.205	1.234	1.266	1.312					
	MACH	.457	.478	.491	.504	.517					
	KIAS	253	250	247	244	241					
	FF/ENG	13649	13497	13400	13407	13541					
540	EPR	1.150	1.183	1.208	1.236	1.272	1.322				
	MACH	.444	.465	.479	.492	.505	.519				
	KIAS	245	243	241	238	235	232				
	FF/ENG	12713	12572	12457	12394	12420	12552				
500	EPR	1.132	1.162	1.184	1.208	1.239	1.277	1.336			
	MACH	.430	.452	.466	.480	.493	.507	.527			
	KIAS	238	236	234	232	229	226	226			
	FF/ENG	11769	11644	11535	11422	11399	11426	11779			
460	EPR	1.115	1.141	1.160	1.182	1.209	1.241	1.285	1.347		
	MACH	.415	.436	.451	.465	.480	.493	.513	.534		
	KIAS	229	228	226	225	223	220	220	220		
	FF/ENG	10894	10707	10614	10495	10443	10413	10634	10992		
420	EPR	1.099	1.121	1.138	1.157	1.178	1.208	1.246	1.291	1.357	
	MACH	.398	.420	.434	.449	.464	.478	.498	.519	.540	
	KIAS	220	219	218	217	215	213	213	213	213	
	FF/ENG	10010	9791	9683	9581	9527	9501	9605	9792	10171	
380	EPR	1.083	1.103	1.117	1.132	1.149	1.177	1.212	1.247	1.294	1.361
	MACH	.381	.402	.416	.431	.446	.463	.482	.502	.523	.546
	KIAS	210	209	209	208	207	206	206	206	206	206
	FF/ENG	9133	8911	8771	8660	8625	8650	8724	8803	8956	9326
340	EPR	1.070	1.086	1.098	1.110	1.121	1.147	1.180	1.209	1.245	1.293
	MACH	.362	.382	.397	.412	.429	.446	.465	.484	.505	.527
	KIAS	199	199	199	199	199	199	199	199	199	.549
	FF/ENG	8341	8164	8039	7946	7798	7838	7883	7931	7997	8134
											8478

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	
315	285	258	236	217	200	190	180	171	162	154	
634	570	515	471	433	400	378	359	340	324	309	
955	858	774	706	650	600	567	537	509	485	463	
1280	1149	1035	943	867	800	756	715	679	646	617	
1609	1441	1297	1180	1084	1000	944	894	848	807	771	
1940	1736	1560	1419	1302	1200	1133	1072	1017	968	924	
2276	2034	1825	1658	1520	1400	1322	1251	1186	1128	1077	
2615	2334	2091	1898	1739	1600	1510	1429	1354	1288	1229	
2959	2636	2359	2139	1958	1800	1699	1606	1523	1448	1382	
3307	2942	2629	2381	2177	2000	1887	1784	1691	1607	1534	
3660	3251	2901	2623	2397	2200	2075	1961	1859	1767	1685	
4017	3563	3174	2867	2617	2400	2263	2139	2026	1925	1837	
4378	3877	3449	3112	2838	2600	2451	2316	2193	2084	1987	
4743	4194	3725	3357	3059	2800	2639	2493	2360	2242	2138	
5112	4514	4003	3603	3280	3000	2827	2669	2527	2400	2288	
5485	4835	4282	3850	3502	3200	3014	2845	2693	2557	2437	
5862	5160	4563	4098	3724	3400	3202	3021	2858	2714	2587	
6245	5488	4845	4346	3946	3600	3389	3197	3024	2870	2735	
6632	5819	5129	4596	4169	3800	3577	3373	3190	3027	2884	
7023	6152	5415	4846	4392	4000	3764	3549	3356	3183	3032	

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)							
	10		14		20		24	
	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	17.0	0:45	15.5	0:44	13.7	0:42	13.4	0:40
400	33.1	1:31	30.5	1:27	27.5	1:23	26.8	1:19
600	49.2	2:18	45.5	2:11	41.2	2:03	40.2	1:57
800	65.3	3:04	60.5	2:55	55.0	2:44	53.6	2:35
1000	81.4	3:50	75.5	3:38	68.7	3:24	67.0	3:13
1200	96.8	4:39	89.7	4:24	81.8	4:06	79.6	3:53
1400	112.2	5:27	104.0	5:09	94.9	4:48	92.2	4:32
1600	127.2	6:16	117.9	5:55	107.7	5:30	104.5	5:12
1800	142.0	7:07	131.6	6:43	120.1	6:13	116.4	5:52
2000	156.7	7:57	145.2	7:30	132.6	6:56	128.4	6:32
2200	170.9	8:50	158.4	8:19	144.5	7:40	139.8	7:13
2400	185.1	9:43	171.6	9:08	156.4	8:24	151.2	7:55
2600	198.9	10:37	184.5	9:58	168.1	9:09	162.3	8:36
2800	212.5	11:32	197.3	10:49	179.6	9:54	173.2	9:19
3000	226.0	12:27	210.0	11:40	191.1	10:40	184.0	10:01
3200	238.9	13:23	222.1	12:32	202.2	11:27	194.4	10:44
3400	251.8	14:20	234.3	13:25	213.3	12:13	204.8	11:28
3600	264.5	15:18	246.2	14:18	224.2	13:01	214.9	12:12
3800	276.8	16:17	257.9	15:12	234.9	13:49	224.8	12:56
4000	289.2	17:16	269.6	16:06	245.5	14:37	234.7	13:41

GEAR DOWN**Long Range Cruise Enroute Fuel and Time****Fuel Required Adjustment (1000 LB)**

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)									
	300	350	400	450	500	550	600	650	700	
20	-3.7	-2.9	-2.0	-1.1	0.0	2.6	5.2	8.0	10.9	
40	-7.8	-5.9	-4.0	-2.0	0.0	5.4	11.1	17.1	23.5	
60	-11.9	-8.9	-5.9	-3.0	0.0	8.0	16.5	25.6	35.2	
80	-16.1	-12.0	-7.9	-4.0	0.0	10.4	21.5	33.4	46.1	
100	-20.2	-15.0	-9.9	-5.0	0.0	12.6	26.2	40.7	56.1	
120	-24.4	-18.1	-12.0	-6.1	0.0	14.6	30.4	47.2	65.2	
140	-28.5	-21.2	-14.0	-7.1	0.0	16.5	34.2	53.2	73.5	
160	-32.7	-24.3	-16.1	-8.1	0.0	18.1	37.6	58.6	81.0	
180	-36.9	-27.4	-18.1	-9.1	0.0	19.5	40.6	63.3	87.6	
200	-41.0	-30.6	-20.2	-10.2	0.0	20.7	43.2	67.4	93.4	
220	-45.2	-33.7	-22.3	-11.2	0.0	21.8	45.4	70.9	98.3	
240	-49.4	-36.9	-24.5	-12.3	0.0	22.6	47.2	73.8	102.3	
260	-53.6	-40.1	-26.6	-13.3	0.0	23.2	48.6	76.0	105.5	
280	-57.9	-43.3	-28.8	-14.4	0.0	23.7	49.5	77.6	107.9	
300	-62.1	-46.5	-31.0	-15.5	0.0	23.9	50.1	78.6	109.4	

Based on Long Range Cruise and VREF30+80 descent.

Descent at VREF30+80

PRESSURE ALT (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	54	58	63	67	71	75	79	84	88	92
TIME (MINUTES)	13	14	15	16	16	17	17	18	19	19

GEAR DOWN**Holding
Flaps Up**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)						
	1500	5000	10000	15000	20000	25000	30000
660	EPR	1.111	1.139	1.194	1.281		
	KIAS	249	249	249	249		
	FF/ENG	15280	15000	15140	15520		
620	EPR	1.100	1.125	1.174	1.250		
	KIAS	242	242	242	242		
	FF/ENG	14400	14090	14160	14360		
580	EPR	1.090	1.113	1.157	1.223	1.339	
	KIAS	237	237	237	237	237	
	FF/ENG	13620	13290	13290	13370	14160	
540	EPR	1.081	1.101	1.140	1.199	1.292	
	KIAS	232	232	232	232	232	
	FF/ENG	12860	12580	12460	12470	12970	
500	EPR	1.072	1.090	1.125	1.175	1.255	
	KIAS	226	226	226	226	226	
	FF/ENG	12060	11860	11680	11600	11850	
460	EPR	1.063	1.079	1.110	1.154	1.222	1.347
	KIAS	220	220	220	220	220	
	FF/ENG	11250	11110	10910	10750	10850	11540
420	EPR	1.054	1.068	1.095	1.134	1.191	1.291
	KIAS	213	213	213	213	213	
	FF/ENG	10450	10300	10150	9880	9920	10280
380	EPR	1.047	1.059	1.081	1.115	1.161	1.247
	KIAS	206	206	206	206	206	206
	FF/ENG	9660	9490	9380	9080	9050	9240
340	EPR	1.040	1.050	1.069	1.098	1.133	1.209
	KIAS	199	199	199	199	199	199
	FF/ENG	9020	8860	8720	8440	8210	8330

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

GEAR DOWN**Holding
Flaps 1**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
660	EPR	1.115	1.143	1.198	1.284
	KIAS	229	229	229	229
	FF/ENG	14670	14390	14570	14830
620	EPR	1.103	1.129	1.177	1.252
	KIAS	222	222	222	222
	FF/ENG	13770	13480	13560	13700
580	EPR	1.093	1.115	1.159	1.223
	KIAS	217	217	217	217
	FF/ENG	12930	12690	12630	12720
540	EPR	1.083	1.103	1.142	1.197
	KIAS	212	212	212	212
	FF/ENG	12130	11960	11820	11820
500	EPR	1.073	1.091	1.125	1.174
	KIAS	206	206	206	206
	FF/ENG	11300	11160	11010	10920
460	EPR	1.064	1.079	1.109	1.152
	KIAS	200	200	200	200
	FF/ENG	10490	10340	10230	10020
420	EPR	1.054	1.068	1.094	1.131
	KIAS	193	193	193	193
	FF/ENG	9680	9520	9440	9150
380	EPR	1.047	1.058	1.080	1.111
	KIAS	186	186	186	186
	FF/ENG	9010	8870	8750	8490
340	EPR	1.039	1.049	1.067	1.093
	KIAS	179	179	179	179
	FF/ENG	8200	8080	7950	7730

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



Performance Inflight

Gear Down, Engine INOP

Chapter PI

Section 57

GEAR DOWN**ENGINE INOP****MAX CONTINUOUS THRUST****Driftdown Speed/Level Off Altitude****100 ft/min residual rate of climb****Includes APU fuel burn**

WEIGHT (1000 LB)	VREF30 + 80 DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
500	476	224	4100	2800
460	438	218	6700	5900
420	401	211	9300	8700
380	364	204	12400	11900
340	326	197	14900	14000
				13200

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
500	2100		
480	4000		
460		2400	
440	5800	4800	3200
420	7500	6700	5800
400	9200	8500	7700
380	11200	10300	9500
360	12700	12200	11500
340	13900	13200	12600

GEAR DOWN**ENGINE INOP****MAX CONTINUOUS THRUST****Long Range Cruise Control**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)					
		5	7	9	11	13	15
480	EPR MACH KIAS FF/ENG						
440	EPR MACH KIAS FF/ENG	1.312 .366 221 20938	1.361 .379 221 21487				
400	EPR MACH KIAS FF/ENG	1.263 .349 211 18577	1.302 .362 211 18792	1.351 .375 211 19254	1.409 .389 210 19826		
360	EPR MACH KIAS FF/ENG	1.227 .335 202 16667	1.257 .347 203 16770	1.294 .360 203 16958	1.342 .374 203 17332	1.403 .389 203 17890	
340	EPR MACH KIAS FF/ENG	1.212 .329 199 15842	1.239 .341 199 15909	1.271 .354 199 16058	1.313 .367 199 16265	1.366 .382 199 16688	1.439 .397 199 17379

**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	
353	309	271	242	220	200	186	174	163	153	145	
533	465	408	364	330	300	279	260	244	229	217	
714	622	545	486	440	400	372	347	324	305	288	
897	781	684	609	550	500	464	433	404	380	360	
1080	940	822	732	661	600	557	518	485	456	431	
1265	1100	961	855	772	700	650	604	565	531	502	
1450	1260	1100	978	882	800	742	690	645	606	573	
1637	1420	1239	1101	993	900	835	777	725	681	643	
1824	1582	1378	1224	1104	1000	927	863	805	756	714	
2013	1744	1518	1348	1214	1100	1020	949	886	831	785	
2202	1907	1659	1472	1325	1200	1113	1035	966	906	856	

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Long Range Cruise Diversion Fuel and Time

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)						
	6		8		10		12
	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)	TIME (HR:MIN)	FUEL (1000 LB)
200	15.9	0:55	15.5	0:54	15.2	0:53	15.0
300	23.9	1:22	23.3	1:20	22.9	1:18	22.7
400	31.8	1:49	31.1	1:46	30.7	1:43	30.4
500	39.4	2:16	38.5	2:12	38.0	2:09	37.8
600	47.1	2:43	46.0	2:39	45.4	2:34	45.1
700	54.7	3:11	53.5	3:05	52.8	3:00	52.5
800	62.4	3:38	61.0	3:32	60.1	3:26	59.8
900	69.7	4:06	68.2	3:59	67.2	3:52	66.8
1000	77.1	4:34	75.5	4:26	74.3	4:18	73.7
1100	84.3	5:02	82.5	4:54	81.2	4:45	80.5
1200	91.5	5:31	89.5	5:21	88.1	5:12	87.3

Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)					
	300	350	400	450	500	550
10	-1.4	-0.7	0.0	1.3	2.3	3.4
20	-2.8	-1.5	0.0	2.9	5.5	7.8
30	-4.3	-2.2	0.0	4.5	8.6	12.2
40	-5.7	-2.9	0.0	5.9	11.6	16.5
50	-7.1	-3.7	0.0	7.3	14.4	20.8
60	-8.5	-4.4	0.0	8.7	17.2	25.0
70	-9.8	-5.1	0.0	9.9	19.9	29.2
80	-11.2	-5.8	0.0	11.0	22.6	33.3
90	-12.5	-6.5	0.0	12.1	25.1	37.4
100	-13.8	-7.2	0.0	13.1	27.5	41.4

GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

**Holding
Flaps Up**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)			
		1500	5000	10000	15000
500	EPR	1.286			
	KIAS	226			
	FF/ENG	23810			
460	EPR	1.255	1.320		
	KIAS	220	220		
	FF/ENG	22000	22290		
420	EPR	1.227	1.278		
	KIAS	213	213		
	FF/ENG	20230	20240		
380	EPR	1.200	1.243	1.345	
	KIAS	206	206	206	
	FF/ENG	18490	18390	19110	
340	EPR	1.175	1.212	1.291	1.439
	KIAS	199	199	199	199
	FF/ENG	16750	16630	16950	18250

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

Performance Inflight**Text****Chapter PI****Section 58****Introduction**

This chapter contains information to supplement performance data from the Flight Management Computer. 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 Flight Manual, the Flight Manual shall always take precedence.

General**FMC Takeoff Speeds**

FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. 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 may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Clearway and Stopway V1 Adjustments

Takeoff speed corrections are to be applied to V1 when using takeoff weights based on the use of clearway and stopway.

Adjust V1 by the amount shown in the table. The adjusted V1 must not exceed VR. If V1 is greater than VR, VR may be increased to equal V1. The resultant V2 will be increased by the same amount that VR was increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

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

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 13mm (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 is determined as follows:

- (1) Determine the dry field/obstacle limit weight for the takeoff flap setting.
- (2) 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.
- (3) Adjust field length available for temperature by amount shown on chart.

- (4) Enter the V1(MCG) Limit Weight table with the field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

- (1) Determine takeoff speeds V1, VR and V2 for actual brake release weight using Takeoff Speeds from the Performance Dispatch chapter or from the FMC.
- (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

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. Good reported braking action denotes wet runway conditions or runways covered by compact snow. Similarly, poor braking action denotes runways covered with wet ice. Performance is based on reversers operating and a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR 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 Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Go-Around EPR

To find Go-Around EPR based on normal engine bleed for packs on and anti-ice off, enter the Go-Around EPR table with airport pressure altitude and reported OAT or TAT and read EPR. EPR adjustments are shown for engine bleeds for various conditions.

Max Climb EPR

This table shows Max Climb EPR for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read EPR. EPR adjustments are shown for anti-ice operation.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body attitude and average EPR 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 may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

All Engines

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of 1.5g (48° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 ft.

Long Range Cruise Control

These tables provide target EPR, 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, .84 Mach approximates the Long Range Cruise Mach schedule.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .84/310/250 descent. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table 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.

Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

Descent at .84/310/250

Distance and time for descent are shown for a .84/310/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing Flaps 30 at the outer marker.

Holding

Target EPR, 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 for the selected flap setting. Flaps 1 is based on VREF30+60 speed schedule. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read EPR, IAS and fuel flow per engine.

Advisory Information

Normal Configuration Landing Distance

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. 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.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing 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 corrections for off-reference landing weight, altitude, wind, slope, and speed conditions. Each correction is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the 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.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy 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, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

Engine Inoperative

Initial Max Continuous EPR

The Initial Max Continuous EPR setting for use following an engine failure is shown. The table is based on the typical all engine cruise Mach number of .84 to provide a target EPR setting at the start of driftdown. Once driftdown is established, the Max Continuous EPR table should be used to determine EPR for the given conditions.

Max Continuous EPR

Power setting is based on one engine operating with one bleed source for pack(s) operating and all anti-ice bleeds off. Enter the table for appropriate pressure altitude with IAS or Mach and TAT to read Max Continuous EPR. Apply the anti-ice corrections below the table as required.

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/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Long Range Cruise Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target EPR, 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 PENALTY (LB/HR)				
	GROSS WEIGHT (1000 LB)				
	700	600	500	400	300
43				360	310
39			420	360	310
35		470	420	380	300
31	520	500	450	370	310
25	510	490	440	380	340
20	520	520	460	410	360
15	520	520	480	440	400
10	540	520	510	490	440
5	590	590	570	530	480

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 .84/310/250 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 corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Alternate Mode EEC

Limit Weight

A simplified method which conservatively accounts for the effects of EEC in the ALTERNATE mode is to reduce the PRIMARY mode (normal) performance limited weights. The Limit Weight table provides takeoff field, climb, obstacle, net level off and landing climb weights. To determine limit weights for operations with the EEC in the ALTERNATE mode, enter the table with the limit weights for PRIMARY mode EEC operation and read the associated limit weight for each performance condition. The most limiting of the takeoff weights must be used. The ALTERNATE Mode EEC Landing Climb limit must be compared to the Landing Field Length limit and the more limiting of the two must be used as the landing limit weight. 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 Adjustments Table. The adjusted V1 should not exceed the adjusted VR.

NOTE: The FMC does incorporate ALTERNATE Mode EEC performance in its takeoff speeds calculations.

Max Takeoff %N1

Takeoff power settings are presented for normal air condition bleed. Max Takeoff %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule with anti-ice off. Enter the table with pressure altitude and TAT to read Max Climb %N1. Apply bleed adjustments as required.

Max Cruise %N1

Maximum Cruise %N1 is presented for .84M, which approximates Long Range Cruise speed. Enter the table with pressure altitude and TAT to read Max Cruise %N1. Appropriate bleed adjustments are shown.

Go-Around %N1

Go-Around power setting for ALTERNATE MODE EEC operation is presented for normal engine bleed for packs on. Go-Around %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Alternate Mode EEC, Engine Inoperative

Initial Max Continuous %N1

Initial Max Continuous %N1 settings for use following an engine failure are presented. The table is based on the typical all engine cruise Mach number of .84 to provide a target %N1 setting at the start of driftdown. Appropriate bleed adjustments are shown. Once driftdown is established, the Max Continuous %N1 table should be used to determine %N1 for the given conditions.

Max Continuous %N1

Max Continuous %N1 settings are presented as a function of pressure altitude and TAT for engine inoperative speeds of 320, 280, 240, and 200 KIAS. Power settings may be interpolated for intermediate airspeeds. Apply bleed adjustments as required.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. 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 will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain

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accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

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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General

Chapter PI

Section 60

Maximum Allowable Clearway

FIELD LENGTH (FT)	MAX ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	420
6000	560
8000	680
10000	790
12000	870
14000	1000
16000	1160

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)														
	DRY RUNWAY					WET RUNWAY					WET SKID-RESISTANT				
	100	120	140	160	180	100	120	140	160	180	100	120	140	160	180
1000	-3	-3	-3	-3	-3										
800	-3	-3	-3	-3	-3										
600	-3	-3	-3	-2	-2										
400	-2	-2	-1	-1	-1										
200	-1	-1	0	0	0										
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-200	3	3	3	2	1	2	2	1	0	0	2	2	1	0	0
-400	5	5	4	3	2	4	3	2	1	1	4	4	2	1	1
-600	8	7	5	3	3	5	4	2	2	2	4	4	2	2	2
-800	8	8	5	3	3	6	5	3	2	2	4	4	2	2	2
-1000	8	8	5	3	3	7	7	4	3	3	4	4	2	2	2

VREF

WEIGHT (1000 LB)	FLAPS		
	30	25	20
800	185	187	200
750	180	183	196
700	173	177	189
650	162	171	183
600	156	164	176
550	149	157	168
500	142	150	161
450	135	142	152
400	127	134	144
350	118	125	134

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Flap Maneuver Speed

FLAP POSITION	MANEUVER SPEED
FLAPS UP	VREF30 + 80
FLAPS 1	VREF30 + 60
FLAPS 5	VREF30 + 40
FLAPS 15	VREF30 + 20
FLAPS 20	VREF30 + 20
FLAPS 25	VREF25
FLAPS 30	VREF30

ADVISORY INFORMATION**Slush/Standing Water Takeoff****Maximum Reverse Thrust****Weight Adjustment (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)		S.L.	4000	8000	S.L.	4000	8000	
840	-83.3	-94.5	-105.7	-98.7	-109.9	-121.1	-124.4	-135.6	-146.8
800	-80.4	-91.6	-102.8	-94.8	-106.0	-117.2	-118.5	-129.7	-140.9
760	-77.3	-88.5	-99.7	-90.6	-101.8	-113.0	-112.4	-123.6	-134.8
720	-73.5	-84.7	-95.9	-85.8	-97.0	-108.2	-105.5	-116.7	-127.9
680	-69.1	-80.3	-91.5	-80.2	-91.4	-102.6	-97.9	-109.1	-120.3
640	-63.9	-75.1	-86.3	-73.8	-85.0	-96.2	-89.5	-100.7	-111.9
600	-58.1	-69.3	-80.5	-66.8	-78.0	-89.2	-80.3	-91.5	-102.7
560	-51.6	-62.8	-74.0	-59.0	-70.2	-81.4	-70.3	-81.5	-92.7
520	-44.5	-55.7	-66.9	-50.5	-61.7	-72.9	-59.6	-70.8	-82.0
480	-36.6	-47.8	-59.0	-41.3	-52.5	-63.7	-48.1	-59.3	-70.5
440	-28.1	-39.3	-50.5	-31.4	-42.6	-53.8	-35.8	-47.0	-58.2
400	-19.1	-30.3	-41.5	-20.9	-32.1	-43.3	-22.9	-34.1	-45.3
360	-10.1	-21.3	-32.5	-10.4	-21.6	-32.8	-10.1	-21.3	-32.5

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)		S.L.	4000	8000	S.L.	4000	8000	
7000	343.3			371.4			419.6		
7400	396.8			425.4			475.2	370.4	
7800	450.6	348.7		480.7	376.8		532.2	425.1	
8200	506.2	402.1		537.5	430.9		590.6	480.8	375.9
8600	563.6	456.1	354.0	596.2	486.3	382.2	650.7	537.9	430.7
9000	623.2	511.8	407.5	656.9	543.3	436.4	712.6	596.6	486.5
9400	685.1	569.5	461.6	719.8	602.2	491.9	776.3	656.8	543.7
9800	749.7	629.2	517.5	785.2	663.1	549.1		718.9	602.5
10200	817.0	691.4	575.4		726.2	608.2		782.9	662.9
10600		756.3	635.3		791.9	669.3			725.2
11000		823.8	697.8			732.7			789.4
11400			763.0			798.6			

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 -180 ft/+170 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)			S.L.	4000	8000
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)					
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	S.L.
800	-25	-23	-21	-21	-19	-17	-14	-12	-10			
760	-27	-25	-23	-23	-21	-19	-15	-13	-11			
720	-29	-27	-25	-25	-23	-21	-16	-14	-12			
680	-30	-28	-26	-26	-24	-22	-18	-16	-14			
640	-31	-29	-27	-27	-25	-23	-19	-17	-15			
600	-31	-29	-27	-28	-26	-24	-20	-18	-16			
560	-31	-29	-27	-28	-26	-24	-22	-20	-18			
520	-31	-29	-27	-28	-26	-24	-23	-21	-19			
480	-30	-28	-26	-28	-26	-24	-23	-21	-19			
440	-29	-27	-25	-28	-26	-24	-24	-22	-20			
400	-29	-27	-25	-27	-25	-23	-24	-22	-20			
360	-28	-26	-24	-26	-24	-22	-24	-22	-20			

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG). V1 not to exceed VR.

ADVISORY INFORMATION**Slush/Standing Water Takeoff****No Reverse Thrust****Weight Adjustment (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)		S.L.	4000	8000	S.L.	4000	8000	
840	-115.4	-127.8	-140.2	-134.1	-146.5	-158.9	-164.7	-177.1	-189.5
800	-110.3	-122.7	-135.1	-127.5	-139.9	-152.3	-155.2	-167.6	-180.0
760	-105.1	-117.5	-129.9	-120.8	-133.2	-145.6	-145.5	-157.9	-170.3
720	-99.3	-111.7	-124.1	-113.4	-125.8	-138.2	-135.4	-147.8	-160.2
680	-92.9	-105.3	-117.7	-105.5	-117.9	-130.3	-124.7	-137.1	-149.5
640	-85.9	-98.3	-110.7	-97.0	-109.4	-121.8	-113.5	-125.9	-138.3
600	-78.3	-90.7	-103.1	-88.0	-100.4	-112.8	-101.8	-114.2	-126.6
560	-70.1	-82.5	-94.9	-78.3	-90.7	-103.1	-89.6	-102.0	-114.4
520	-61.3	-73.7	-86.1	-68.1	-80.5	-92.9	-76.9	-89.3	-101.7
480	-51.9	-64.3	-76.7	-57.3	-69.7	-82.1	-63.7	-76.1	-88.5
440	-42.0	-54.4	-66.8	-45.9	-58.3	-70.7	-49.9	-62.3	-74.7
400	-31.6	-44.0	-56.4	-34.1	-46.5	-58.9	-35.8	-48.2	-60.6
360	-21.2	-33.6	-46.0	-22.2	-34.6	-47.0	-21.7	-34.1	-46.5

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)		S.L.	4000	8000	S.L.	4000	8000	
10200							429.6		
10600							495.1	384.7	
11000				363.8			562.5	449.1	339.8
11400							632.0	515.1	403.9
11800	363.6			431.9	316.1		703.7	583.1	468.7
12200	434.3	314.3		502.3	384.2		778.0	653.3	535.3
12600	508.2	384.8		652.8	523.9	404.6		725.7	603.9
13000	586.7	456.1	335.4	734.1	598.5	473.8		800.8	674.8
13400	670.7	531.2	405.9	820.0	676.7	545.9			748.0
13800	761.9	611.3	478.2		759.4	621.5			823.6
14200	859.2	697.2	554.7		846.1	701.0			
14600		790.9	636.4			785.2			
15000			724.4						

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 -280 ft/+270 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000			
800	-41	-37	-33	-35	-31	-27	-23	-19	-15			
760	-43	-39	-35	-37	-33	-29	-25	-21	-17			
720	-45	-41	-37	-39	-35	-31	-27	-23	-19			
680	-46	-42	-38	-41	-37	-33	-29	-25	-21			
640	-47	-43	-39	-42	-38	-34	-32	-28	-24			
600	-47	-43	-39	-43	-39	-35	-34	-30	-26			
560	-47	-43	-39	-44	-40	-36	-36	-32	-28			
520	-47	-43	-39	-44	-40	-36	-37	-33	-29			
480	-47	-43	-39	-44	-40	-36	-39	-35	-31			
440	-46	-42	-38	-44	-40	-36	-40	-36	-32			
400	-46	-42	-38	-44	-40	-36	-40	-36	-32			
360	-45	-41	-37	-44	-40	-36	-41	-37	-33			

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		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
840	0.0	-3.2	-6.4	-45.4	-48.6	-51.8	-85.6	-88.8	-92.0
800	0.0	-3.2	-6.4	-46.4	-49.6	-52.8	-83.4	-86.6	-89.8
760	-2.4	-5.6	-8.8	-47.3	-50.5	-53.7	-81.1	-84.3	-87.5
720	-7.6	-10.8	-14.0	-47.7	-50.9	-54.1	-78.5	-81.7	-84.9
680	-11.3	-14.5	-17.7	-47.6	-50.8	-54.0	-75.7	-78.9	-82.1
640	-13.2	-16.4	-19.6	-47.0	-50.2	-53.4	-72.5	-75.7	-78.9
600	-13.9	-17.1	-20.3	-45.2	-48.4	-51.6	-68.3	-71.5	-74.7
560	-13.6	-16.8	-20.0	-42.2	-45.4	-48.6	-62.7	-65.9	-69.1
520	-12.4	-15.6	-18.8	-37.9	-41.1	-44.3	-55.7	-58.9	-62.1
480	-10.3	-13.5	-16.7	-32.1	-35.3	-38.5	-47.3	-50.5	-53.7
440	-7.2	-10.4	-13.6	-25.1	-28.3	-31.5	-37.5	-40.7	-43.9
400	-3.2	-6.4	-9.6	-16.8	-20.0	-23.2	-26.3	-29.5	-32.7
360	0.0	-1.4	-4.6	-7.1	-10.3	-13.5	-13.7	-16.9	-20.1

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
5000	396.3								
5400	513.2	396.3							
5800	629.1	513.2	396.3						
6200	744.1	629.1	513.2	317.2					
6600	858.4	744.1	629.1	391.6					
7000		858.4	744.1	468.4	361.7				
7400			858.4	548.5	437.4	332.1			
7800				632.2	516.0	406.8			
8200				720.2	598.3	484.2	369.2		
8600				812.9	684.4	564.9	414.9		
9000					775.2	649.4	462.2	360.3	
9400						738.3	511.2	405.7	
9800						831.7	562.3	452.6	351.4
10200							615.7	501.3	396.4
10600							671.7	551.9	443.0
11000							730.6	604.8	491.4
11400							793.3	660.2	541.6
11800								718.6	594.0
12200								780.4	648.9
12600									706.6
13000									767.8

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 5°C above/below 4°C.
Adjust "Medium" field length available by -130 ft/+120 ft for every 5°C above/below 4°C.
Adjust "Poor" field length available by -190 ft/+180 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)		S.L.	PRESS ALT (FT)		S.L.	PRESS ALT (FT)		S.L.
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
800	-7	-5	-3	-18	-16	-14	-32	-30	-28
760	-9	-7	-5	-21	-19	-17	-35	-33	-31
720	-10	-8	-6	-23	-21	-19	-37	-35	-33
680	-11	-9	-7	-24	-22	-20	-39	-37	-35
640	-12	-10	-8	-25	-23	-21	-40	-38	-36
600	-13	-11	-9	-26	-24	-22	-41	-39	-37
560	-13	-11	-9	-26	-24	-22	-41	-39	-37
520	-13	-11	-9	-27	-25	-23	-42	-40	-38
480	-14	-12	-10	-27	-25	-23	-42	-40	-38
440	-14	-12	-10	-27	-25	-23	-42	-40	-38
400	-14	-12	-10	-28	-26	-24	-42	-40	-38
360	-15	-13	-11	-29	-27	-25	-41	-39	-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 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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
840	-6.4	-6.4	-6.4	-74.5	-74.5	-74.5	-126.1	-126.1
800	-11.5	-11.5	-11.5	-73.4	-73.4	-73.4	-120.9	-120.9
760	-16.3	-16.3	-16.3	-72.4	-72.4	-72.4	-115.8	-115.8
720	-20.5	-20.5	-20.5	-71.5	-71.5	-71.5	-111.2	-111.2
680	-23.8	-23.8	-23.8	-70.8	-70.8	-70.8	-107.0	-107.0
640	-26.4	-26.4	-26.4	-70.2	-70.2	-70.2	-103.2	-103.2
600	-27.7	-27.7	-27.7	-68.3	-68.3	-68.3	-98.4	-98.4
560	-27.6	-27.6	-27.6	-64.5	-64.5	-64.5	-92.0	-92.0
520	-26.1	-26.1	-26.1	-58.9	-58.9	-58.9	-83.7	-83.7
480	-23.2	-23.2	-23.2	-51.3	-51.3	-51.3	-73.8	-73.8
440	-18.9	-18.9	-18.9	-42.0	-42.0	-42.0	-62.3	-62.3
400	-13.2	-13.2	-13.2	-30.7	-30.7	-30.7	-49.0	-49.0
360	-6.0	-6.0	-6.0	-17.5	-17.5	-17.5	-33.9	-33.9

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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
6200	502.7	311.8						
6600	678.3	541.9	365.2					
7000	820.6	708.7	578.6					
7400		847.7	737.9					
7800			874.7					
9400				405.5				
9800				613.9	380.0			
10200				775.2	595.7	353.1		
10600					760.3	577.1		
11000					905.4	745.3		
11400						890.9		
...								
15400							324.8	
15800							570.0	294.2
16200							738.4	550.3
16600							879.7	529.9
17000							865.7	708.0
17400								851.7

- Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.
- Adjust "Good" field length available by -100 ft/+90 ft for every 5°C above/below 4°C.
Adjust "Medium" field length available by -170 ft/+160 ft for every 5°C above/below 4°C.
Adjust "Poor" field length available by -270 ft/+270 ft for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- 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)		S.L.	PRESS ALT (FT)		S.L.	PRESS ALT (FT)		S.L.
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
800	-10	-6	-2	-27	-23	-19	-52	-48	-44
760	-12	-8	-4	-30	-26	-22	-55	-51	-47
720	-14	-10	-6	-32	-28	-24	-58	-54	-50
680	-15	-11	-7	-35	-31	-27	-61	-57	-53
640	-17	-13	-9	-36	-32	-28	-64	-60	-56
600	-18	-14	-10	-38	-34	-30	-67	-63	-59
560	-18	-14	-10	-40	-36	-32	-69	-65	-61
520	-19	-15	-11	-41	-37	-33	-70	-66	-62
480	-20	-16	-12	-43	-39	-35	-71	-67	-63
440	-21	-17	-13	-44	-40	-36	-71	-67	-63
400	-22	-18	-14	-46	-42	-38	-71	-67	-63
360	-23	-19	-15	-48	-44	-40	-71	-67	-63

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**TO1 Slush/Standing Water Takeoff****10% Thrust Reduction****Maximum Reverse Thrust****Weight Adjustment (1000 LB)**

TO1 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.	4000	8000	S.L.	4000	8000
840	-78.3	-89.5	-100.7	-93.6	-104.8	-116.0	-119.3	-130.5	-141.7
800	-75.4	-86.6	-97.8	-89.7	-100.9	-112.1	-113.6	-124.8	-136.0
760	-72.7	-83.9	-95.1	-86.1	-97.3	-108.5	-108.3	-119.5	-130.7
720	-70.3	-81.5	-92.7	-82.7	-93.9	-105.1	-103.1	-114.3	-125.5
680	-67.3	-78.5	-89.7	-78.7	-89.9	-101.1	-97.2	-108.4	-119.6
640	-63.5	-74.7	-85.9	-73.8	-85.0	-96.2	-90.3	-101.5	-112.7
600	-58.8	-70.0	-81.2	-68.0	-79.2	-90.4	-82.6	-93.8	-105.0
560	-53.4	-64.6	-75.8	-61.4	-72.6	-83.8	-73.8	-85.0	-96.2
520	-47.2	-58.4	-69.6	-53.9	-65.1	-76.3	-64.2	-75.4	-86.6
480	-40.2	-51.4	-62.6	-45.6	-56.8	-68.0	-53.7	-64.9	-76.1
440	-32.4	-43.6	-54.8	-36.5	-47.7	-58.9	-42.2	-53.4	-64.6
400	-23.8	-35.0	-46.2	-26.5	-37.7	-48.9	-29.9	-41.1	-52.3
360	-14.8	-26.0	-37.2	-16.0	-27.2	-38.4	-17.0	-28.2	-39.4

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.	4000	8000	S.L.	4000	8000
5800							313.5		
6200	298.1			325.6			373.3		
6600	356.6			384.7			433.3	319.5	
7000	415.2	303.9		444.3	331.5		494.7	379.3	
7400	475.2	362.4		505.8	390.7		558.0	439.3	325.5
7800	537.5	421.1	309.7	569.5	450.4	337.4	623.5	501.0	385.3
8200	602.5	481.3	368.3	635.8	512.1	396.6	691.1	564.5	445.4
8600	670.4	543.9	427.0	704.9	576.1	456.5	761.3	630.1	507.2
9000	741.8	609.1	487.5	777.2	642.6	518.3	833.8	698.0	570.9
9400	816.8	677.4	550.3	851.9	712.0	582.6	906.6	768.5	636.8
9800	892.7	749.1	615.8		784.7	649.4		841.0	704.9
10200		824.4	684.4		859.4	719.1		913.9	775.7
10600		900.3	756.5			792.2			848.3
11000			832.0			866.9			
11400			907.9						

- Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
- Adjust field length available by -180 ft/+170 ft for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION**TO1 Slush/Standing Water Takeoff****10% Thrust Reduction****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.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
800	-22	-20	-18	-17	-15	-13	-9	-7	-5
760	-24	-22	-20	-20	-18	-16	-11	-9	-7
720	-26	-24	-22	-21	-19	-17	-12	-10	-8
680	-27	-25	-23	-23	-21	-19	-14	-12	-10
640	-28	-26	-24	-24	-22	-20	-15	-13	-11
600	-28	-26	-24	-25	-23	-21	-17	-15	-13
560	-28	-26	-24	-25	-23	-21	-18	-16	-14
520	-28	-26	-24	-25	-23	-21	-19	-17	-15
480	-27	-25	-23	-25	-23	-21	-20	-18	-16
440	-26	-24	-22	-24	-22	-20	-20	-18	-16
400	-26	-24	-22	-24	-22	-20	-20	-18	-16
360	-25	-23	-21	-23	-21	-19	-20	-18	-16

1. Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.
2. If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter 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**TO1 Slush/Standing Water Takeoff****10% Thrust Reduction****No Reverse Thrust****Weight Adjustment (1000 LB)**

TO1 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)		PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
840	-111.3	-123.7	-136.1	-130.5	-142.9	-155.3	-162.7	-175.1	-187.5
800	-106.4	-118.8	-131.2	-124.1	-136.5	-148.9	-153.4	-165.8	-178.2
760	-101.6	-114.0	-126.4	-117.8	-130.2	-142.6	-144.3	-156.7	-169.1
720	-96.9	-109.3	-121.7	-111.7	-124.1	-136.5	-135.3	-147.7	-160.1
680	-91.7	-104.1	-116.5	-105.0	-117.4	-129.8	-125.8	-138.2	-150.6
640	-85.8	-98.2	-110.6	-97.7	-110.1	-122.5	-115.7	-128.1	-140.5
600	-79.3	-91.7	-104.1	-89.7	-102.1	-114.5	-105.0	-117.4	-129.8
560	-72.0	-84.4	-96.8	-80.9	-93.3	-105.7	-93.7	-106.1	-118.5
520	-64.1	-76.5	-88.9	-71.5	-83.9	-96.3	-81.8	-94.2	-106.6
480	-55.4	-67.8	-80.2	-61.5	-73.9	-86.3	-69.2	-81.6	-94.0
440	-46.1	-58.5	-70.9	-50.7	-63.1	-75.5	-56.1	-68.5	-80.9
400	-36.1	-48.5	-60.9	-39.3	-51.7	-64.1	-42.4	-54.8	-67.2
360	-25.7	-38.1	-50.5	-27.5	-39.9	-52.3	-28.3	-40.7	-53.1

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)		PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
8600							302.3		
9000							375.7		
9400							450.3	324.3	
9800				329.4			528.3	397.8	
10200				410.6			610.1	473.2	346.3
10600	356.7			495.2	353.6		696.5	552.3	420.2
11000	443.9	296.6		585.8	435.3	297.2	788.1	635.4	496.6
11400	537.9	382.5		683.6	521.6	377.9	883.3	723.3	576.8
11800	641.5	471.2	322.2	790.5	614.2	460.6		816.4	661.3
12200	757.9	567.8	408.4	903.3	714.6	548.6		912.1	750.7
12600	886.3	674.7	499.2		824.0	643.4			844.9
13000		795.8	598.6			746.4			
13400			709.4			857.8			
13800			834.4						

1. Enter Weight Adjustment table with slush/standing water depth and TO1 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.

2. Adjust field length available by -280 ft/+270 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**TO1 Slush/Standing Water Takeoff****10% Thrust Reduction****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)		S.L.	4000	8000	S.L.	4000	8000	S.L.	4000
800	-36	-32	-28	-29	-25	-21	-16	-12	-8	
760	-39	-35	-31	-32	-28	-24	-18	-14	-10	
720	-41	-37	-33	-34	-30	-26	-20	-16	-12	
680	-42	-38	-34	-36	-32	-28	-23	-19	-15	
640	-43	-39	-35	-37	-33	-29	-25	-21	-17	
600	-43	-39	-35	-39	-35	-31	-28	-24	-20	
560	-43	-39	-35	-39	-35	-31	-30	-26	-22	
520	-43	-39	-35	-40	-36	-32	-32	-28	-24	
480	-43	-39	-35	-40	-36	-32	-34	-30	-26	
440	-42	-38	-34	-40	-36	-32	-35	-31	-27	
400	-41	-37	-33	-39	-35	-31	-35	-31	-27	
360	-41	-37	-33	-39	-35	-31	-36	-32	-28	

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**TO1 Slippery Runway Takeoff****10% Thrust Reduction****Maximum Reverse Thrust****Weight Adjustment (1000 LB)**

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
840	0.0	-3.2	-6.4	-39.0	-42.2	-45.4	-79.4	-82.6	-85.8
800	0.0	-3.2	-6.4	-40.0	-43.2	-46.4	-77.2	-80.4	-83.6
760	0.0	-3.2	-6.4	-41.1	-44.3	-47.5	-75.3	-78.5	-81.7
720	-0.9	-4.1	-7.3	-42.4	-45.6	-48.8	-73.8	-77.0	-80.2
680	-6.4	-9.6	-12.8	-43.4	-46.6	-49.8	-72.0	-75.2	-78.4
640	-10.3	-13.5	-16.7	-43.8	-47.0	-50.2	-69.9	-73.1	-76.3
600	-12.3	-15.5	-18.7	-43.6	-46.8	-50.0	-67.4	-70.6	-73.8
560	-13.0	-16.2	-19.4	-42.1	-45.3	-48.5	-63.6	-66.8	-70.0
520	-12.7	-15.9	-19.1	-39.2	-42.4	-45.6	-58.2	-61.4	-64.6
480	-11.4	-14.6	-17.8	-34.8	-38.0	-41.2	-51.3	-54.5	-57.7
440	-9.1	-12.3	-15.5	-29.0	-32.2	-35.4	-42.9	-46.1	-49.3
400	-5.7	-8.9	-12.1	-21.7	-24.9	-28.1	-32.8	-36.0	-39.2
360	-1.3	-4.5	-7.7	-12.9	-16.1	-19.3	-21.1	-24.3	-27.5

ADVISORY INFORMATION

TO1 Slippery Runway Takeoff
10% Thrust Reduction
Maximum Reverse Thrust
V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
4600	364.9								
5000	488.8	364.9							
5400	611.7	488.8	364.9						
5800	733.7	611.7	488.8	310.5					
6200	855.0	733.7	611.7	389.4					
6600		855.0	733.7	470.9	357.7				
7000			855.0	556.1	437.9	326.3	284.0		
7400				645.6	521.6	405.4	331.5		
7800				740.0	609.2	487.6	379.1		
8200				839.5	701.6	573.7	428.1	322.0	
8600					799.4	664.1	479.0	369.5	
9000					899.6	759.6	532.1	418.1	312.5
9400						859.5	587.5	468.6	360.0
9800							645.8	521.3	408.3
10200							707.4	576.2	458.4
10600							772.8	633.9	510.6
11000							841.4	694.8	565.0
11400							910.2	759.4	622.2
11800								827.7	682.3
12200								896.5	746.1
12600									813.9
13000									882.7

1. Enter Weight Adjustment table with reported braking action and TO1 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust "Good" field length available by -90 ft/+90 ft for every 5°C above/below 4°C.
Adjust "Medium" field length available by -130 ft/+120 ft for every 5°C above/below 4°C.
Adjust "Poor" field length available by -190 ft/+180 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**TO1 Slippery Runway Takeoff****10% Thrust Reduction****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.	4000	8000	S.L.	4000	8000
800	-6	-4	-2	-16	-14	-12	-29	-27	-25
760	-8	-6	-4	-19	-17	-15	-32	-30	-28
720	-9	-7	-5	-20	-18	-16	-34	-32	-30
680	-10	-8	-6	-22	-20	-18	-35	-33	-31
640	-11	-9	-7	-23	-21	-19	-37	-35	-33
600	-11	-9	-7	-23	-21	-19	-37	-35	-33
560	-12	-10	-8	-24	-22	-20	-38	-36	-34
520	-12	-10	-8	-24	-22	-20	-38	-36	-34
480	-12	-10	-8	-24	-22	-20	-38	-36	-34
440	-12	-10	-8	-25	-23	-21	-38	-36	-34
400	-13	-11	-9	-25	-23	-21	-38	-36	-34
360	-13	-11	-9	-26	-24	-22	-38	-36	-34

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**TO1 Slippery Runway Takeoff****10% Thrust Reduction****No Reverse Thrust****Weight Adjustment (1000 LB)**

TO1 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	REPORTED BRAKING ACTION									
	GOOD			MEDIUM			POOR			
	PRESS ALT (FT)		S.L.	4000	8000	S.L.	4000	8000	S.L.	4000
840	0.0	0.0	0.0	-68.2	-68.2	-68.2	-120.4	-120.4	-120.4	-120.4
800	-3.6	-3.6	-3.6	-67.1	-67.1	-67.1	-115.5	-115.5	-115.5	-115.5
760	-8.7	-8.7	-8.7	-66.3	-66.3	-66.3	-110.9	-110.9	-110.9	-110.9
720	-13.7	-13.7	-13.7	-65.8	-65.8	-65.8	-106.5	-106.5	-106.5	-106.5
680	-18.2	-18.2	-18.2	-65.5	-65.5	-65.5	-102.6	-102.6	-102.6	-102.6
640	-21.8	-21.8	-21.8	-65.3	-65.3	-65.3	-99.2	-99.2	-99.2	-99.2
600	-24.5	-24.5	-24.5	-65.2	-65.2	-65.2	-96.2	-96.2	-96.2	-96.2
560	-25.9	-25.9	-25.9	-63.7	-63.7	-63.7	-91.9	-91.9	-91.9	-91.9
520	-25.8	-25.8	-25.8	-60.1	-60.1	-60.1	-85.7	-85.7	-85.7	-85.7
480	-24.2	-24.2	-24.2	-54.4	-54.4	-54.4	-77.7	-77.7	-77.7	-77.7
440	-21.1	-21.1	-21.1	-46.7	-46.7	-46.7	-67.7	-67.7	-67.7	-67.7
400	-16.4	-16.4	-16.4	-36.9	-36.9	-36.9	-55.8	-55.8	-55.8	-55.8
360	-10.2	-10.2	-10.2	-24.9	-24.9	-24.9	-41.8	-41.8	-41.8	-41.8

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION									
	GOOD			MEDIUM			POOR			
	PRESS ALT (FT)		S.L.	4000	8000	S.L.	4000	8000	S.L.	4000
5800	519.6	314.6								
6200	705.4	561.1	372.9							
6600	857.4	737.4	600.0							
7000		887.0	768.3							
7400			916.7							
8600				341.7						
9000				588.1	311.8					
9400				769.2	567.4	282.0				
9800					752.8	546.0				
10200					912.9	736.0				
10600						896.9				
...							401.0			
14200							637.8			
14600							808.0			
15000								618.2		
15400								792.4		
15800									597.9	
										776.8

1. Enter Weight Adjustment table with reported braking action and TO1 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
2. Adjust "Good" field length available by -100 ft/+90 ft for every 5°C above/below 4°C.
Adjust "Medium" field length available by -170 ft/+160 ft for every 5°C above/below 4°C.
Adjust "Poor" field length available by -270 ft/+270 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**TO1 Slippery Runway Takeoff****10% Thrust Reduction****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.	4000	8000	S.L.	4000	8000
800	-9	-5	-1	-24	-20	-16	-47	-43	-39
760	-11	-7	-3	-26	-22	-18	-50	-46	-42
720	-12	-8	-4	-29	-25	-21	-53	-49	-45
680	-14	-10	-6	-31	-27	-23	-56	-52	-48
640	-15	-11	-7	-32	-28	-24	-58	-54	-50
600	-16	-12	-8	-34	-30	-26	-61	-57	-53
560	-16	-12	-8	-35	-31	-27	-63	-59	-55
520	-17	-13	-9	-37	-33	-29	-64	-60	-56
480	-18	-14	-10	-38	-34	-30	-65	-61	-57
440	-18	-14	-10	-40	-36	-32	-65	-61	-57
400	-19	-15	-11	-41	-37	-33	-65	-61	-57
360	-20	-16	-12	-43	-39	-35	-65	-61	-57

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**TO2 Slush/Standing Water Takeoff****20% Thrust Reduction****Maximum Reverse Thrust****Weight Adjustment (1000 LB)**

TO2 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)		S.L.	PRESS ALT (FT)		S.L.	PRESS ALT (FT)	
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
840	-74.8	-86.0	-97.2	-90.1	-101.3	-112.5	-116.1	-127.3
800	-71.8	-83.0	-94.2	-86.1	-97.3	-108.5	-110.2	-121.4
760	-68.9	-80.1	-91.3	-82.2	-93.4	-104.6	-104.5	-115.7
720	-66.2	-77.4	-88.6	-78.6	-89.8	-101.0	-99.3	-110.5
680	-64.0	-75.2	-86.4	-75.6	-86.8	-98.0	-94.6	-105.8
640	-61.6	-72.8	-84.0	-72.2	-83.4	-94.6	-89.5	-100.7
600	-58.3	-69.5	-80.7	-67.9	-79.1	-90.3	-83.2	-94.4
560	-54.1	-65.3	-76.5	-62.5	-73.7	-84.9	-76.0	-87.2
520	-48.9	-60.1	-71.3	-56.2	-67.4	-78.6	-67.5	-78.7
480	-42.8	-54.0	-65.2	-48.8	-60.0	-71.2	-58.1	-69.3
440	-35.8	-47.0	-58.2	-40.6	-51.8	-63.0	-47.6	-58.8
400	-27.9	-39.1	-50.3	-31.3	-42.5	-53.7	-36.0	-47.2
360	-19.2	-30.4	-41.6	-21.1	-32.3	-43.5	-23.5	-34.7

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)		S.L.	PRESS ALT (FT)		S.L.	PRESS ALT (FT)	
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
5400						315.6		
5800	306.4			334.0		381.9		
6200	371.3			399.6		448.5	322.3	
6600	436.5	312.9		466.1	340.6	517.2	388.5	
7000	504.0	377.8		535.2	406.2	588.3	455.3	328.9
7400	574.5	443.1	319.4	607.3	472.9	662.0	524.2	395.1
7800	648.6	510.9	384.3	682.7	542.3	738.8	595.5	462.1
8200	726.6	581.7	449.7	761.9	614.7	818.6	669.6	531.2
8600	809.2	656.1	517.8	844.5	690.5	899.3	746.6	602.8
9000	893.4	734.7	589.0		770.0	622.1		826.7
9400		817.6	663.8		852.7	698.2		907.4
9800		901.8	742.8			778.2		754.5
10200			826.0			861.0		834.7
10600			910.2					915.5

1. Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
2. Adjust field length available by -180 ft/+170 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**TO2 Slush/Standing Water Takeoff****20% Thrust Reduction****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.	4000	8000	S.L.	4000	8000
800	-19	-17	-15	-14	-12	-10	-5	-3	-1
760	-21	-19	-17	-16	-14	-12	-6	-4	-2
720	-23	-21	-19	-18	-16	-14	-8	-6	-4
680	-24	-22	-20	-20	-18	-16	-10	-8	-6
640	-25	-23	-21	-21	-19	-17	-11	-9	-7
600	-26	-24	-22	-22	-20	-18	-13	-11	-9
560	-25	-23	-21	-22	-20	-18	-14	-12	-10
520	-25	-23	-21	-22	-20	-18	-15	-13	-11
480	-24	-22	-20	-22	-20	-18	-16	-14	-12
440	-23	-21	-19	-21	-19	-17	-17	-15	-13
400	-23	-21	-19	-21	-19	-17	-17	-15	-13
360	-22	-20	-18	-20	-18	-16	-17	-15	-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**TO2 Slush/Standing Water Takeoff****20% Thrust Reduction****No Reverse Thrust****Weight Adjustment (1000 LB)**

TO2 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)		S.L.	PRESS ALT (FT)		S.L.	PRESS ALT (FT)		
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000	
840	-109.4	-121.8	-134.2	-129.3	-141.7	-154.1	-163.0	-175.4	-187.8
800	-104.3	-116.7	-129.1	-122.7	-135.1	-147.5	-153.5	-165.9	-178.3
760	-99.3	-111.7	-124.1	-116.2	-128.6	-141.0	-144.3	-156.7	-169.1
720	-94.5	-106.9	-119.3	-109.9	-122.3	-134.7	-135.2	-147.6	-160.0
680	-89.9	-102.3	-114.7	-103.8	-116.2	-128.6	-126.2	-138.6	-151.0
640	-85.0	-97.4	-109.8	-97.5	-109.9	-122.3	-117.0	-129.4	-141.8
600	-79.3	-91.7	-104.1	-90.3	-102.7	-115.1	-107.1	-119.5	-131.9
560	-72.8	-85.2	-97.6	-82.4	-94.8	-107.2	-96.5	-108.9	-121.3
520	-65.6	-78.0	-90.4	-73.7	-86.1	-98.5	-85.2	-97.6	-110.0
480	-57.6	-70.0	-82.4	-64.3	-76.7	-89.1	-73.3	-85.7	-98.1
440	-48.9	-61.3	-73.7	-54.1	-66.5	-78.9	-60.7	-73.1	-85.5
400	-39.4	-51.8	-64.2	-43.2	-55.6	-68.0	-47.4	-59.8	-72.2
360	-29.1	-41.5	-53.9	-31.6	-44.0	-56.4	-33.5	-45.9	-58.3

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)		S.L.	PRESS ALT (FT)		S.L.	PRESS ALT (FT)	
S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
7800							295.8	
8200							383.1	
8600							473.0	322.0
9000				370.5			569.3	409.6
9400	333.9			472.2	302.1		673.2	501.3
9800	441.8			583.6	400.5		786.0	599.7
10200	561.3	365.8		707.9	504.5	331.3	905.9	706.0
10600	699.2	476.0	291.8	848.1	619.3	430.6		821.4
11000	862.5	600.4	397.7		748.3	537.4		739.4
11400		745.9	511.6		892.3	656.4		
11800		913.7	641.6			790.6		
12200			794.8					857.4

- Enter Weight Adjustment table with slush/standing water depth and TO2 dry field/obstacle limit weight to obtain slush/standing water weight adjustment.
- Adjust field length available by -280 ft/+270 ft for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- Max allowable slush/standing water limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION**TO2 Slush/Standing Water Takeoff****20% Thrust Reduction****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.	4000	8000	S.L.	4000	8000
800	-31	-27	-23	-23	-19	-15	-7	-3	0
760	-34	-30	-26	-26	-22	-18	-10	-6	-2
720	-36	-32	-28	-29	-25	-21	-12	-8	-4
680	-37	-33	-29	-31	-27	-23	-15	-11	-7
640	-38	-34	-30	-32	-28	-24	-18	-14	-10
600	-39	-35	-31	-34	-30	-26	-21	-17	-13
560	-39	-35	-31	-34	-30	-26	-24	-20	-16
520	-39	-35	-31	-35	-31	-27	-26	-22	-18
480	-38	-34	-30	-35	-31	-27	-28	-24	-20
440	-38	-34	-30	-35	-31	-27	-29	-25	-21
400	-37	-33	-29	-35	-31	-27	-30	-26	-22
360	-36	-32	-28	-34	-30	-26	-31	-27	-23

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**TO2 Slippery Runway Takeoff****20% Thrust Reduction****Maximum Reverse Thrust****Weight Adjustment (1000 LB)**

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
840	0.0	-3.2	-6.4	-34.0	-37.2	-40.4	-75.3	-78.5	-81.7
800	0.0	-3.2	-6.4	-35.0	-38.2	-41.4	-73.1	-76.3	-79.5
760	0.0	-3.2	-6.4	-36.0	-39.2	-42.4	-70.9	-74.1	-77.3
720	0.0	-3.2	-6.4	-37.0	-40.2	-43.4	-69.1	-72.3	-75.5
680	0.0	-3.2	-6.4	-38.6	-41.8	-45.0	-67.9	-71.1	-74.3
640	-5.6	-8.8	-12.0	-39.9	-43.1	-46.3	-66.6	-69.8	-73.0
600	-9.6	-12.8	-16.0	-40.6	-43.8	-47.0	-64.9	-68.1	-71.3
560	-11.5	-14.7	-17.9	-40.6	-43.8	-47.0	-62.8	-66.0	-69.2
520	-12.2	-15.4	-18.6	-39.2	-42.4	-45.6	-59.1	-62.3	-65.5
480	-11.8	-15.0	-18.2	-36.3	-39.5	-42.7	-53.8	-57.0	-60.2
440	-10.3	-13.5	-16.7	-31.7	-34.9	-38.1	-46.7	-49.9	-53.1
400	-7.7	-10.9	-14.1	-25.5	-28.7	-31.9	-37.9	-41.1	-44.3
360	-4.0	-7.2	-10.4	-17.8	-21.0	-24.2	-27.4	-30.6	-33.8

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
4200	324.0								
4600	455.9	324.0							
5000	586.8	455.9	324.0						
5400	716.7	586.8	455.9	299.5					
5800	845.8	716.7	586.8	383.3					
6200		845.8	716.7	470.0	349.7				
6600			845.8	560.9	434.9	316.2	286.7		
7000				656.8	524.0	400.4	337.3		
7400				758.6	617.9	487.8	388.3		
7800				865.4	717.1	579.7	441.1	327.2	
8200					822.5	676.7	496.2	378.0	
8600						779.7	553.9	430.4	317.0
9000						886.8	614.6	485.0	367.7
9400							678.8	542.1	419.7
9800							747.2	602.2	473.8
10200							820.2	665.6	530.5
10600							894.1	733.1	589.9
11000								805.4	652.6
11400								879.3	719.3
11800									790.6
12200									864.5

- Enter Weight Adjustment table with reported braking action and TO2 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
- Adjust "Good" field length available by -90 ft/+90 ft for every 5°C above/below 4°C.
Adjust "Medium" field length available by -130 ft/+120 ft for every 5°C above/below 4°C.
Adjust "Poor" field length available by -190 ft/+180 ft for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

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ADVISORY INFORMATION**TO2 Slippery Runway Takeoff****20% Thrust Reduction****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.	4000	8000	S.L.	4000	8000
800	-6	-4	-2	-15	-13	-11	-27	-25	-23
760	-7	-5	-3	-17	-15	-13	-29	-27	-25
720	-9	-7	-5	-19	-17	-15	-31	-29	-27
680	-9	-7	-5	-20	-18	-16	-32	-30	-28
640	-10	-8	-6	-21	-19	-17	-33	-31	-29
600	-10	-8	-6	-21	-19	-17	-34	-32	-30
560	-11	-9	-7	-22	-20	-18	-35	-33	-31
520	-11	-9	-7	-22	-20	-18	-35	-33	-31
480	-11	-9	-7	-22	-20	-18	-35	-33	-31
440	-11	-9	-7	-23	-21	-19	-35	-33	-31
400	-12	-10	-8	-23	-21	-19	-35	-33	-31
360	-12	-10	-8	-23	-21	-19	-35	-33	-31

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**TO2 Slippery Runway Takeoff****20% Thrust Reduction****No Reverse Thrust****Weight Adjustment (1000 LB)**

TO2 DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 LB)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
840	0.0	0.0	0.0	-64.0	-64.0	-64.0	-117.7	-117.7	-117.7
800	0.0	0.0	0.0	-63.0	-63.0	-63.0	-112.5	-112.5	-112.5
760	-1.6	-1.6	-1.6	-61.9	-61.9	-61.9	-107.6	-107.6	-107.6
720	-6.7	-6.7	-6.7	-61.0	-61.0	-61.0	-103.1	-103.1	-103.1
680	-11.8	-11.8	-11.8	-60.7	-60.7	-60.7	-99.0	-99.0	-99.0
640	-16.4	-16.4	-16.4	-60.6	-60.6	-60.6	-95.4	-95.4	-95.4
600	-20.2	-20.2	-20.2	-60.7	-60.7	-60.7	-92.4	-92.4	-92.4
560	-23.0	-23.0	-23.0	-60.9	-60.9	-60.9	-89.7	-89.7	-89.7
520	-24.4	-24.4	-24.4	-59.4	-59.4	-59.4	-85.6	-85.6	-85.6
480	-24.1	-24.1	-24.1	-55.6	-55.6	-55.6	-79.4	-79.4	-79.4
440	-22.2	-22.2	-22.2	-49.6	-49.6	-49.6	-71.1	-71.1	-71.1
400	-18.6	-18.6	-18.6	-41.4	-41.4	-41.4	-60.7	-60.7	-60.7
360	-13.5	-13.5	-13.5	-30.9	-30.9	-30.9	-48.1	-48.1	-48.1

V1(MCG) Limit Weight (1000 LB)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
5400	522.5	295.8							
5800	723.4	567.7	359.8						
6200	888.7	757.9	610.0						
6600			790.9						
8200				528.9					
8600				740.6	503.8				
9000				918.2	721.8	477.7			
9400					900.6	702.6			
9800						882.9			
...							416.2		
13000							669.3	381.7	
13400									
13800							852.7	648.5	344.2
14200								835.2	627.0
14600									817.8

- Enter Weight Adjustment table with reported braking action and TO2 dry field/obstacle limit weight to obtain slippery runway weight adjustment.
- Adjust "Good" field length available by -100 ft/+90 ft for every 5°C above/below 4°C.
Adjust "Medium" field length available by -170 ft/+160 ft for every 5°C above/below 4°C.
Adjust "Poor" field length available by -270 ft/+270 ft for every 5°C above/below 4°C.
- Find V1(MCG) limit weight for adjusted field length and pressure altitude.
- Max allowable slippery runway limited weight is lesser of weights from 1 and 3.

ADVISORY INFORMATION**TO2 Slippery Runway Takeoff****20% Thrust Reduction****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.	4000	8000	S.L.	4000	8000
800	-8	-4	0	-21	-17	-13	-42	-38	-34
760	-10	-6	-2	-23	-19	-15	-44	-40	-36
720	-11	-7	-3	-26	-22	-18	-47	-43	-39
680	-12	-8	-4	-27	-23	-19	-50	-46	-42
640	-13	-9	-5	-29	-25	-21	-52	-48	-44
600	-14	-10	-6	-30	-26	-22	-55	-51	-47
560	-15	-11	-7	-32	-28	-24	-56	-52	-48
520	-15	-11	-7	-33	-29	-25	-58	-54	-50
480	-16	-12	-8	-34	-30	-26	-58	-54	-50
440	-16	-12	-8	-35	-31	-27	-58	-54	-50
400	-17	-13	-9	-37	-33	-29	-58	-54	-50
360	-18	-14	-10	-38	-34	-30	-58	-54	-50

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.

Minimum Control Speeds**V1(MCG), Minimum VR****Max Takeoff Thrust**

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	116	118	113	115	111	113	109	111	106	109	103	106
50	122	119	121	116	118	111	113	109	111	108	111	103	106
40	104	126	127	123	124	118	120	113	115	112	115	110	106
30	86	128	130	128	130	123	125	118	120	112	115	106	109
20	68	129	130	129	130	125	126	120	122	116	118	110	113
-60	-76	130	130	130	130	126	126	121	122	117	118	112	114

TO1 V1(MCG), Minimum VR**10% Thrust Reduction**

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	111	112	107	110	105	107	103	106	101	104	98	101
50	122	113	115	110	112	105	108	103	106	101	104	98	101
40	104	119	121	117	119	112	114	107	110	103	105	98	101
30	86	122	123	121	123	116	118	112	114	107	109	101	104
20	68	122	124	121	123	118	119	114	116	110	112	104	107
-60	-76	124	124	123	123	119	120	115	116	111	112	106	108

TO2 V1(MCG), Minimum VR**20% Thrust Reduction**

TEMP		PRESSURE ALTITUDE (FT)											
		-2000		0		2000		4000		6000		8000	
°C	°F	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR	V1 (MCG)	Min VR
60	140	105	107	102	104	100	102	98	101	96	99	93	96
50	122	107	109	104	107	100	103	98	101	97	100	93	96
40	104	113	115	110	112	106	108	102	104	104	107	101	103
30	86	115	117	114	116	110	112	106	108	101	104	96	99
20	68	116	117	115	116	111	113	108	110	104	106	99	102
-60	-76	117	118	116	117	113	114	109	111	105	107	101	103

Go-Around %N1

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

REPORTED OAT		TAT (°C)	AIRPORT PRESSURE ALTITUDE (1000 FT)												
°C	°F		-2	-1	0	1	2	3	4	5	6	7	8	9	10
66	150	70	93.7	93.8	94.1	93.9	93.8	93.7	93.6	93.4	93.3	92.6	91.5	90.5	89.6
56	133	60	96.5	96.6	96.9	96.7	96.6	96.5	96.4	96.2	96.1	95.4	94.3	93.4	92.5
51	124	55	97.8	98.0	98.3	98.1	97.9	97.9	97.7	97.6	97.4	96.7	95.7	94.7	93.9
46	115	50	99.1	99.3	99.6	99.4	99.3	99.2	99.1	98.9	98.7	98.0	97.0	96.1	95.2
41	106	45	100.2	100.7	101.1	101.0	100.9	100.7	100.5	100.4	100.0	99.3	98.3	97.3	96.5
36	97	40	101.5	102.4	103.2	103.2	102.8	102.6	102.3	102.0	101.4	100.5	99.5	98.6	97.8
31	88	35	101.2	103.9	105.8	105.4	105.1	104.7	104.3	103.8	102.7	101.7	100.6	99.7	98.9
26	79	30	100.4	103.1	105.9	106.8	107.3	106.8	106.6	106.4	105.0	103.4	101.9	100.8	100.0
21	70	25	99.5	102.2	105.0	105.9	106.5	107.0	107.4	107.4	106.8	105.7	104.0	102.3	101.3
16	61	20	98.7	101.4	104.1	105.0	105.6	106.1	106.5	107.0	106.8	106.3	105.2	104.2	103.3
11	53	15	97.9	100.5	103.2	104.1	104.7	105.2	105.6	106.1	105.9	105.5	104.9	104.4	104.0
7	44	10	97.0	99.6	102.3	103.2	103.8	104.3	104.7	105.1	105.0	104.6	104.0	103.5	103.4
2	35	5	96.1	98.7	101.4	102.3	102.9	103.4	103.8	104.2	104.1	103.7	103.1	102.6	102.5
-3	26	0	95.3	97.8	100.5	101.4	102.0	102.4	102.8	103.3	103.1	102.7	102.2	101.7	101.6
-13	8	-10	93.5	96.0	98.6	99.5	100.1	100.5	100.9	101.4	101.2	100.8	100.3	99.8	99.7
-23	-10	-20	91.7	94.2	96.7	97.6	98.2	98.6	99.0	99.4	99.3	98.9	98.3	97.9	97.8
-33	-27	-30	89.9	92.3	94.8	95.6	96.2	96.6	97.0	97.4	97.3	96.9	96.4	95.9	95.8
-43	-45	-40	88.0	90.4	92.8	93.6	94.2	94.6	95.0	95.4	95.3	94.9	94.4	93.9	93.9
-53	-63	-50	86.1	88.4	90.8	91.6	92.2	92.6	93.0	93.3	93.2	92.9	92.3	91.9	91.8

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)												
	-2	-1	0	1	2	3	4	5	6	7	8	9	10
PACKS OFF	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
1 PACK ON	-0.2	-0.2	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3
WING ANTI-ICE ON	-0.2	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

Max Climb %N1**Based on engine bleed for packs on or off and anti-ice off**

TAT (°C)	PRESSURE ALTITUDE (1000 FT) / SPEED (KIAS OR MACH)									
	0	5	10	15	20	25	30	35	40	43
	310	310	310	310	310	310	310	0.84	0.84	0.84
60	88.3	88.1	90.3	91.0	93.1	96.7	99.6	101.7	101.8	101.3
50	90.6	90.4	90.2	89.6	91.7	95.3	98.0	100.1	100.2	99.7
40	92.5	92.4	92.4	92.2	90.5	93.8	96.5	98.6	98.7	98.2
30	91.6	94.1	94.2	94.0	93.1	94.2	95.2	97.0	97.1	96.6
20	90.1	92.5	95.1	95.8	95.9	95.9	96.9	95.9	95.5	95.0
15	89.3	91.7	94.3	96.9	96.9	96.9	97.8	96.6	95.8	95.4
10	88.6	90.9	93.5	96.1	98.4	98.1	98.8	97.2	96.5	96.0
5	87.8	90.1	92.7	95.2	98.1	99.6	100.1	98.1	97.2	96.8
0	87.0	89.3	91.8	94.4	97.3	99.9	101.5	99.3	98.1	97.6
-5	86.2	88.5	91.0	93.5	96.4	99.0	101.9	100.5	99.5	98.8
-10	85.4	87.7	90.1	92.6	95.5	98.1	100.9	101.3	100.5	100.0
-15	84.6	86.8	89.3	91.7	94.5	97.1	100.0	101.0	100.9	100.5
-20	83.7	86.0	88.4	90.8	93.6	96.2	99.0	100.1	99.9	99.5
-25	82.9	85.1	87.5	89.9	92.7	95.2	98.0	99.1	98.9	98.5
-30	82.1	84.3	86.7	89.0	91.8	94.3	97.0	98.1	97.9	97.5
-35	81.2	83.4	85.8	88.1	90.8	93.3	96.0	97.0	96.9	96.5
-40	80.4	82.5	84.9	87.2	89.8	92.3	95.0	96.0	95.9	95.5

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)									
	0	5	10	15	20	25	30	35	40	43
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
ENGINE & WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4	-0.4	-0.4
ENGINE & WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5	-0.6	-0.6

*Packs on or off with 2 bleed sources.

**Packs off with 1 bleed source.

Flight With Unreliable Airspeed / Turbulent Air Penetration**Altitude and/or vertical speed indications may also be unreliable.****Climb****Flaps Up, Set Max Climb Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 LB)				
		400	500	600	700	800
40000 (.82M)	PITCH ATT V/S (FT/MIN)	4.5 1100	4.0 700			
30000 (280 KIAS)	PITCH ATT V/S (FT/MIN)	5.5 2800	5.0 2100	5.0 1500	4.5 1100	4.0 800
20000 (270 KIAS)	PITCH ATT V/S (FT/MIN)	8.5 4100	7.5 3100	7.5 2400	7.5 1700	7.0 1300
10000 (270 KIAS)	PITCH ATT V/S (FT/MIN)	11.5 5400	10.5 4100	9.5 3300	9.5 2600	9.0 2100
SEA LEVEL (270 KIAS)	PITCH ATT V/S (FT/MIN)	15.0 6300	13.0 4900	12.0 3900	11.5 3200	11.0 2600

Cruise**Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 LB)				
		400	500	600	700	800
40000 (.82M)	PITCH ATT %N1	2.5 82.1	3.0 87.2			
35000 (280 KIAS)	PITCH ATT %N1	1.5 78.9	2.5 81.6	3.0 85.3	3.5 92.0	
30000 (280 KIAS)	PITCH ATT %N1	2.0 74.5	2.5 77.2	3.0 80.7	3.0 84.8	3.0 88.8
25000 (280 KIAS)	PITCH ATT %N1	2.0 70.6	2.5 73.0	3.5 76.1	3.5 80.0	3.5 83.7
20000 (270 KIAS)	PITCH ATT %N1	2.0 65.8	3.0 68.3	4.0 71.4	4.0 75.2	4.0 78.9
15000 (270 KIAS)	PITCH ATT %N1	2.0 61.8	3.0 64.4	4.0 67.2	4.5 70.4	4.5 74.3

Descent**Flaps Up, Set Idle Thrust**

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 LB)				
		400	500	600	700	800
40000 (.82M)	PITCH ATT V/S (FT/MIN)	-1.0 -2700	0.0 -2700			
30000 (280 KIAS)	PITCH ATT V/S (FT/MIN)	-1.0 -2200	0.0 -2000	1.0 -1900	0.5 -2100	0.5 -2500
20000 (270 KIAS)	PITCH ATT V/S (FT/MIN)	-0.5 -1800	0.5 -1600	1.5 -1500	2.0 -1500	1.5 -1600
10000 (270 KIAS)	PITCH ATT V/S (FT/MIN)	-1.0 -1600	0.0 -1400	1.5 -1400	2.5 -1400	2.5 -1400
SEA LEVEL (270 KIAS)	PITCH ATT V/S (FT/MIN)	-1.0 -1400	0.0 -1300	1.0 -1200	2.0 -1200	2.5 -1300

In shaded areas, data reflects the minimum speed limitation of 15 knots above minimum maneuvering speed.

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

Holding**Flaps Up, Set Thrust for Level Flight**

PRESSURE ALTITUDE (FT)		WEIGHT (1000 LB)				
		400	500	600	700	800
10000	PITCH ATT	4.5	5.0	5.5	5.5	5.5
	%N1	52.8	57.5	62.0	66.1	69.7
	KIAS	207	222	238	258	276
5000	PITCH ATT	4.5	5.0	5.5	5.5	5.5
	%N1	49.3	53.8	58.0	61.9	65.6
	KIAS	207	222	237	256	274

Terminal Area (5000 FT)**Set Thrust for Level Flight**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)				
		400	500	600	700	800
FLAPS UP	PITCH ATT	5.0	5.5	6.0	6.0	6.5
	%N1	50.3	55.2	59.5	63.8	67.6
	KIAS	208	223	237	253	266
FLAPS 1 GEAR UP VREF30+80	PITCH ATT	6.5	7.0	7.5	7.5	8.0
	%N1	51.2	56.4	61.1	65.5	69.3
	KIAS	188	203	217	233	246
FLAPS 5 GEAR UP VREF30+40	PITCH ATT	5.5	6.0	6.5	6.5	6.5
	%N1	51.9	57.0	62.2	66.3	70.3
	KIAS	168	183	197	213	226
FLAPS 15 GEAR UP VREF30+20	PITCH ATT	6.5	7.0	7.0	7.0	7.0
	%N1	52.9	58.7	63.7	68.1	72.4
	KIAS	148	163	177	193	206
FLAPS 20 GEAR DOWN VREF30+20	PITCH ATT	5.0	5.0	5.5	5.0	5.5
	%N1	58.8	64.9	70.4	75.3	79.5
	KIAS	148	163	177	193	206

Final Approach (1500 FT)**Gear Down, Set Thrust for 3° Glideslope**

FLAP POSITION (VREF + INCREMENT)		WEIGHT (1000 LB)				
		400	500	600	700	800
FLAPS 20 VREF20+10	PITCH ATT	1.0	1.0	1.5	1.5	2.0
	%N1	39.2	43.4	47.2	50.5	53.3
	KIAS	154	171	186	200	210
FLAPS 25 VREF25+10	PITCH ATT	1.5	2.0	2.0	2.0	2.0
	%N1	49.2	53.8	57.7	61.3	64.0
	KIAS	145	160	174	187	197
FLAPS 30 VREF30+10	PITCH ATT	1.0	1.5	1.5		
	%N1	53.4	58.6	62.8		
	KIAS	138	153	166		

DRAFT

Intentionally
Blank

Performance Inflight**All Engine****Chapter PI****Section 61****Long Range Cruise Maximum Operating Altitude****Max Climb Thrust****ISA + 10°C and Below**

WEIGHT (1000 LB)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
780	28300	3	30800	29100	27600
760	28800	2	31300	29700	28200
740	29400	0	31800	30200	28700
720	30000	-1	32300	30700	29100
700	30700	-2	32800	31100	29600
680	31300	-4	33200	31600	30100
660	31900	-5	33700	32100	30600
640	32600	-7	34300	32700	31200
620	33300	-8	34800	33200	31700
600	34000	-10	35300	33800	32300
580	34700	-11	35900	34300	32900
560	35400	-13	36500	34900	33500
540	36200	-15	37100	35600	34100
520	37000	-15	37800	36200	34800
500	37800	-15	38400	36900	35500
480	38600	-15	39100	37600	36200
460	39500	-15	39900	38300	37000
440	40400	-15	40600	39100	37700
420	41400	-15	41400	39900	38600
400	42400	-15	42300	40800	39500
380	43100	-15	43100	41800	40500

ISA + 15°C

WEIGHT (1000 LB)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
780	28300	9	30800	29100	27600
760	28800	8	31300	29700	28200
740	29400	6	31800	30200	28700
720	30000	5	32300	30700	29100
700	30700	3	32800	31100	29600
680	31300	2	33200	31600	30100
660	31900	1	33700	32100	30600
640	32600	-1	34300	32700	31200
620	33300	-2	34800	33200	31700
600	34000	-4	35300	33800	32300
580	34700	-6	35900	34300	32900
560	35400	-7	36500	34900	33500
540	36200	-9	37100	35600	34100
520	37000	-9	37800	36200	34800
500	37800	-9	38400	36900	35500
480	38600	-9	39100	37600	36200
460	39500	-9	39900	38300	37000
440	40400	-9	40600	39100	37700
420	41400	-9	41400	39900	38600
400	42400	-9	42300	40800	39500
380	43100	-9	43100	41800	40500

Long Range Cruise Maximum Operating Altitude**Max Climb Thrust****ISA + 20°C**

WEIGHT (1000 LB)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)		
			1.30 (39°)	1.40 (44°)	1.50 (48°)
780	28300	15	30800	29100	27600
760	28800	13	31300	29700	28200
740	29400	12	31800	30200	28700
720	30000	11	32300	30700	29100
700	30700	9	32800	31100	29600
680	31300	8	33200	31600	30100
660	31900	6	33700	32100	30600
640	32600	5	34300	32700	31200
620	33300	3	34800	33200	31700
600	34000	2	35300	33800	32300
580	34700	0	35900	34300	32900
560	35400	-2	36500	34900	33500
540	36200	-3	37100	35600	34100
520	37000	-3	37800	36200	34800
500	37800	-3	38400	36900	35500
480	38600	-3	39100	37600	36200
460	39500	-3	39900	38300	37000
440	40400	-3	40600	39100	37700
420	41400	-3	41400	39900	38600
400	42400	-3	42300	40800	39500
380	43100	-3	43100	41800	40500

Long Range Cruise Control

WEIGHT (1000 LB)		PRESSURE ALTITUDE (1000 FT)									
		25	27	29	31	33	35	37	39	41	43
780	%N1	84.2	85.9	87.1	89.6						
	MACH	.819	.840	.839	.838						
	KIAS	346	342	327	313						
	FF/ENG	11439	11411	11201	11537						
740	%N1	83.4	84.8	85.9	87.7	90.7					
	MACH	.819	.837	.840	.839	.837					
	KIAS	346	341	328	313	299					
	FF/ENG	11096	10974	10668	10708	11189					
700	%N1	82.5	83.7	84.9	86.1	88.3					
	MACH	.812	.831	.839	.840	.838					
	KIAS	343	338	327	314	300					
	FF/ENG	10640	10513	10229	10021	10265					
660	%N1	81.0	82.5	83.7	84.9	86.4	89.1				
	MACH	.795	.819	.835	.840	.839	.837				
	KIAS	335	332	325	314	300	286				
	FF/ENG	10011	9983	9794	9536	9480	9831				
620	%N1	79.4	81.1	82.5	83.8	84.9	86.7				
	MACH	.775	.803	.825	.838	.840	.839				
	KIAS	326	325	321	313	300	287				
	FF/ENG	9341	9384	9307	9103	8893	8984				
580	%N1	77.6	79.4	81.1	82.4	83.6	84.8	87.5			
	MACH	.751	.782	.809	.830	.839	.840	.838			
	KIAS	315	316	314	310	300	287	274			
	FF/ENG	8646	8743	8740	8651	8448	8289	8522			
540	%N1	75.9	77.5	79.3	81.0	82.3	83.4	85.2	88.6		
	MACH	.728	.757	.788	.814	.833	.840	.839	.837		
	KIAS	305	305	305	303	298	287	274	261		
	FF/ENG	8016	8060	8128	8113	8011	7814	7757	8113		
500	%N1	74.4	75.7	77.3	79.1	80.7	82.1	83.5	85.9		
	MACH	.709	.731	.761	.792	.818	.835	.840	.839		
	KIAS	296	294	294	294	292	285	274	262		
	FF/ENG	7478	7417	7468	7518	7504	7376	7226	7293		
460	%N1	72.8	74.0	75.3	77.0	78.9	80.4	82.1	84.0	86.5	
	MACH	.691	.710	.733	.764	.795	.821	.836	.840	.839	
	KIAS	288	285	282	283	283	280	273	262	250	
	FF/ENG	6982	6872	6822	6874	6918	6892	6790	6706	6803	
420	%N1	70.8	72.3	73.5	74.8	76.5	78.4	80.3	82.4	84.2	86.8
	MACH	.669	.690	.710	.733	.764	.796	.822	.837	.840	.839
	KIAS	278	276	273	270	271	271	268	261	250	238
	FF/ENG	6457	6375	6276	6235	6280	6311	6314	6265	6188	6260
380	%N1	68.5	70.1	71.6	72.8	74.2	75.9	78.2	80.4	82.5	84.3
	MACH	.639	.665	.688	.708	.731	.762	.795	.821	.836	.840
	KIAS	266	266	264	260	258	258	258	255	249	239
	FF/ENG	5889	5850	5779	5697	5655	5676	5727	5783	5742	5644
340	%N1	65.9	67.6	69.2	70.7	72.0	73.3	75.3	78.0	80.3	82.5
	MACH	.604	.632	.659	.683	.704	.726	.757	.790	.817	.835
	KIAS	250	251	252	251	247	244	244	245	242	237
	FF/ENG	5299	5296	5253	5205	5135	5071	5094	5184	5243	5194

Shaded area approximates optimum altitude.

Long Range Cruise Enroute Fuel and Time - Low Altitudes**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
282	261	242	226	213	200	191	182	174	167	160
561	520	484	452	425	400	382	366	351	337	325
840	779	725	678	637	600	574	550	528	508	489
1120	1039	966	904	849	800	766	734	705	678	653
1401	1299	1208	1130	1062	1000	957	918	881	848	817
1683	1560	1451	1357	1274	1200	1149	1101	1057	1017	980
1966	1822	1694	1583	1487	1400	1340	1285	1234	1187	1144
2250	2085	1937	1811	1700	1600	1532	1469	1410	1356	1307
2535	2348	2181	2038	1913	1800	1723	1652	1586	1525	1470
2820	2611	2425	2265	2126	2000	1915	1835	1762	1695	1633

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	9.1	0:37	7.9	0:36	6.5	0:35	5.8	0:34	5.1	0:33
400	18.7	1:09	17.1	1:06	14.8	1:03	13.6	1:01	12.6	0:58
600	28.4	1:42	26.3	1:36	23.1	1:31	21.4	1:28	20.1	1:24
800	37.9	2:15	35.3	2:07	31.3	1:59	29.1	1:55	27.5	1:49
1000	47.3	2:48	44.3	2:38	39.4	2:27	36.8	2:22	34.8	2:15
1200	56.7	3:22	53.2	3:09	47.5	2:56	44.4	2:49	42.1	2:40
1400	66.1	3:55	62.1	3:41	55.5	3:24	51.9	3:17	49.3	3:06
1600	75.3	4:29	70.8	4:12	63.5	3:53	59.4	3:44	56.4	3:32
1800	84.5	5:04	79.5	4:44	71.4	4:22	66.8	4:12	63.5	3:58
2000	93.6	5:38	88.2	5:17	79.2	4:51	74.2	4:40	70.6	4:24

Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)								
	400	450	500	550	600	650	700	750	800
10	-1.4	-1.0	-0.7	-0.3	0.0	0.4	0.8	1.2	1.7
20	-2.9	-2.2	-1.5	-0.7	0.0	0.9	1.8	2.8	3.8
30	-4.5	-3.4	-2.3	-1.1	0.0	1.4	2.9	4.4	5.9
40	-6.1	-4.6	-3.1	-1.5	0.0	1.9	3.9	6.0	8.1
50	-7.6	-5.8	-3.9	-1.9	0.0	2.5	5.0	7.6	10.2
60	-9.2	-7.0	-4.7	-2.3	0.0	3.0	6.1	9.2	12.3
70	-10.7	-8.1	-5.5	-2.7	0.0	3.6	7.2	10.8	14.4
80	-12.3	-9.3	-6.3	-3.1	0.0	4.2	8.3	12.4	16.5
90	-13.8	-10.5	-7.1	-3.5	0.0	4.8	9.4	14.0	18.5
100	-15.3	-11.6	-7.8	-3.9	0.0	5.4	10.6	15.7	20.6
110	-16.9	-12.8	-8.6	-4.3	0.0	6.0	11.7	17.3	22.7
120	-18.4	-13.9	-9.4	-4.7	0.0	6.6	12.9	19.0	24.8

Long Range Cruise Enroute Fuel and Time - High Altitudes

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	
1032	976	925	879	838	800	767	736	708	682	657	
1543	1460	1385	1317	1256	1200	1151	1106	1063	1024	989	
2056	1946	1846	1756	1675	1600	1535	1475	1419	1367	1320	
2571	2433	2308	2195	2094	2000	1920	1845	1775	1710	1651	
3088	2922	2771	2635	2513	2400	2304	2214	2131	2053	1982	
3606	3412	3235	3076	2932	2800	2688	2583	2486	2396	2313	
4126	3904	3699	3517	3352	3200	3072	2953	2842	2739	2645	
4649	4396	4165	3959	3772	3600	3456	3322	3197	3082	2976	
5172	4890	4631	4400	4192	4000	3840	3691	3552	3424	3307	
5697	5384	5098	4843	4612	4400	4224	4060	3908	3767	3637	
6223	5880	5565	5285	5033	4800	4608	4429	4263	4109	3967	
6751	6376	6034	5729	5453	5200	4992	4798	4617	4450	4297	
7281	6874	6503	6172	5874	5600	5375	5166	4971	4791	4626	
7812	7373	6973	6616	6295	6000	5759	5534	5324	5131	4954	
8345	7874	7444	7061	6716	6400	6142	5901	5678	5471	5282	
8880	8376	7915	7506	7138	6800	6525	6269	6030	5811	5610	
9418	8880	8388	7952	7560	7200	6908	6636	6383	6150	5936	
9959	9385	8863	8399	7982	7600	7291	7002	6735	6488	6262	
10502	9893	9338	8846	8405	8000	7674	7369	7086	6826	6587	

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)
800	27.2	1:48	26.3	1:47	25.5	1:47	25.3	1:48	26.2	1:48
1200	41.3	2:39	40.1	2:36	39.0	2:36	38.4	2:37	39.5	2:38
1600	55.4	3:30	53.9	3:26	52.4	3:25	51.6	3:27	52.7	3:28
2000	69.6	4:21	67.7	4:16	65.8	4:15	64.8	4:16	66.0	4:18
2400	83.1	5:13	80.9	5:07	78.8	5:05	77.4	5:06	78.5	5:07
2800	96.7	6:06	94.1	5:58	91.7	5:55	90.1	5:55	90.9	5:57
3200	109.9	6:59	107.1	6:50	104.4	6:45	102.4	6:45	103.0	6:47
3600	122.9	7:54	119.8	7:42	116.9	7:36	114.6	7:35	114.9	7:37
4000	135.9	8:48	132.6	8:34	129.3	8:27	126.7	8:25	126.7	8:27
4400	148.4	9:43	144.8	9:28	141.3	9:19	138.4	9:16	138.1	9:17
4800	160.8	10:39	157.0	10:22	153.2	10:10	150.1	10:07	149.5	10:07
5200	173.0	11:36	168.9	11:17	165.0	11:03	161.5	10:58	160.6	10:57
5600	185.0	12:33	180.6	12:12	176.4	11:57	172.8	11:50	171.6	11:47
6000	197.0	13:30	192.3	13:08	187.9	12:50	184.0	12:41	182.5	12:38
6400	208.5	14:28	203.5	14:05	198.9	13:45	194.8	13:34	193.0	13:29
6800	220.0	15:27	214.8	15:02	209.9	14:41	205.5	14:27	203.5	14:21
7200	231.4	16:26	225.8	16:00	220.7	15:37	216.1	15:21	213.8	15:13
7600	242.5	17:26	236.6	16:58	231.2	16:33	226.4	16:16	223.9	16:05
8000	253.6	18:26	247.4	17:56	241.8	17:30	236.7	17:11	234.0	16:58

Long Range Cruise Enroute Fuel and Time - High Altitudes**Fuel Required Adjustment (1000 LB)**

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)								
	400	450	500	550	600	650	700	750	800
20	-3.7	-2.7	-1.7	-0.8	0.0	2.7	8.7	17.9	30.3
40	-8.1	-6.1	-4.1	-2.0	0.0	4.9	13.5	26.0	42.2
60	-12.3	-9.4	-6.4	-3.2	0.0	6.8	17.9	33.3	53.0
80	-16.5	-12.7	-8.7	-4.3	0.0	8.6	22.0	40.0	62.6
100	-20.6	-15.9	-10.9	-5.4	0.0	10.3	25.6	45.9	71.2
120	-24.5	-19.0	-13.1	-6.5	0.0	11.8	28.9	51.1	78.6
140	-28.4	-22.0	-15.1	-7.5	0.0	13.2	31.8	55.7	84.9
160	-32.2	-24.9	-17.1	-8.6	0.0	14.5	34.3	59.5	90.0
180	-35.9	-27.8	-19.1	-9.6	0.0	15.5	36.4	62.6	94.1
200	-39.5	-30.5	-21.0	-10.6	0.0	16.5	38.1	65.0	97.0
220	-43.0	-33.2	-22.8	-11.5	0.0	17.3	39.5	66.7	98.9
240	-46.4	-35.8	-24.6	-12.4	0.0	17.9	40.4	67.7	99.6
260	-49.7	-38.3	-26.3	-13.3	0.0	18.4	41.0	68.0	99.2
280	-52.9	-40.8	-27.9	-14.2	0.0	18.7	41.2	67.5	97.6
300	-56.0	-43.1	-29.5	-15.1	0.0	18.9	41.1	66.4	95.0
320	-59.0	-45.4	-31.0	-15.9	0.0	19.0	40.5	64.6	91.2
340	-61.9	-47.5	-32.4	-16.7	0.0	18.9	39.5	62.0	86.4

Long Range Cruise Wind-Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 LB)										
	780	740	700	660	620	580	540	500	460	420	380
43						188	94	35	6	0	0
41					153	77	29	6	0	8	
39				117	58	22	4	0	8	23	
37		147	84	40	14	2	1	9	22	38	
35	101	56	25	7	0	2	10	23	37	52	
33	66	34	14	3	0	4	13	24	38	52	64
31	18	6	0	1	7	16	27	39	52	63	72
29	1	0	4	10	19	30	42	53	63	71	76
27	2	7	15	24	34	44	55	64	71	76	77
25	12	20	29	38	48	57	65	71	75	77	76

The above wind factor table is for calculation of wind required to maintain present range capability at new pressure altitude, i.e., break-even wind.

Method:

1. Read wind factors for present and new altitudes from table.
2. Determine difference (new altitude wind factor minus present altitude wind factor);
This difference may be negative or positive.
3. Break-even wind at new altitude is present altitude wind plus difference from step 2.

Descent at .84M/310/250

PRESSURE ALTITUDE (1000 FT)	25	27	29	31	33	35	37	39	41	43
DISTANCE (NM)	96	104	111	118	124	129	135	140	145	150
TIME (MINUTES)	20	21	22	23	24	24	25	26	26	27

**Holding
Flaps Up**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)									
		1500	5000	10000	15000	20000	25000	30000	35000	40000	43000
800	%N1	62.7	65.6	69.7	74.5	79.1	83.7	88.8			
	KIAS	273	275	276	301	314	318	312			
	FF/ENG	10540	10420	10330	10690	11040	11440	12000			
760	%N1	61.3	64.2	68.3	72.8	77.7	82.4	87.0			
	KIAS	266	268	269	285	306	309	312			
	FF/ENG	10010	9920	9800	9990	10430	10760	11180			
720	%N1	59.9	62.7	66.8	71.0	76.2	80.9	85.5			
	KIAS	259	260	261	271	297	300	305			
	FF/ENG	9490	9400	9280	9340	9830	10070	10400			
680	%N1	58.5	61.2	65.4	69.3	74.6	79.3	84.0			
	KIAS	252	253	254	256	286	291	296			
	FF/ENG	8980	8890	8760	8740	9200	9410	9720			
640	%N1	57.0	59.6	63.8	67.7	72.8	77.6	82.2			
	KIAS	245	245	246	248	267	282	286			
	FF/ENG	8470	8370	8250	8210	8480	8780	9070			
600	%N1	55.5	58.0	62.0	66.1	70.7	75.8	80.6	85.3		
	KIAS	236	237	238	239	251	273	276	279		
	FF/ENG	7980	7860	7740	7680	7800	8190	8420	8790		
560	%N1	53.9	56.4	60.2	64.4	68.7	74.0	78.7	83.5		
	KIAS	231	231	231	231	234	263	266	270		
	FF/ENG	7500	7370	7230	7170	7180	7600	7780	8020		
520	%N1	52.3	54.7	58.4	62.5	66.7	71.8	76.6	81.5		
	KIAS	225	225	225	225	225	243	256	259		
	FF/ENG	7060	6910	6740	6660	6650	6880	7150	7370		
480	%N1	50.7	53.0	56.6	60.5	64.7	69.3	74.5	79.3		
	KIAS	220	220	220	220	220	224	245	248		
	FF/ENG	6640	6470	6270	6190	6160	6210	6540	6720		
440	%N1	48.8	51.2	54.7	58.4	62.6	66.9	72.2	77.1	83.5	
	KIAS	213	213	213	213	213	213	232	237	240	
	FF/ENG	6240	6050	5840	5750	5680	5670	5920	6090	6440	
400	%N1	46.8	49.3	52.8	56.3	60.4	64.7	69.4	74.5	81.0	
	KIAS	207	207	207	207	207	207	209	225	228	
	FF/ENG	5850	5660	5430	5340	5250	5200	5230	5480	5760	
360	%N1	44.7	47.1	50.7	54.2	57.9	62.4	66.6	71.8	78.3	82.3
	KIAS	200	200	200	200	200	200	200	212	215	217
	FF/ENG	5590	5400	5170	5050	4940	4870	4840	4900	5110	5270

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

**Holding
Flaps 1**

WEIGHT (1000 LB)		PRESSURE ALTITUDE (FT)				
		1500	5000	10000	15000	20000
800	%N1	65.2	68.1	72.7	77.2	82.2
	KIAS	242	242	242	242	242
	FF/ENG	11530	11500	11450	11560	11820
760	%N1	63.7	66.5	70.9	75.4	80.5
	KIAS	242	242	242	242	242
	FF/ENG	10890	10840	10770	10840	11080
720	%N1	62.2	65.0	69.2	73.8	78.8
	KIAS	236	236	236	236	236
	FF/ENG	10290	10230	10160	10190	10400
680	%N1	60.6	63.5	67.6	72.2	77.1
	KIAS	228	228	228	228	228
	FF/ENG	9700	9640	9560	9570	9740
640	%N1	59.0	61.8	65.9	70.5	75.3
	KIAS	221	221	221	221	221
	FF/ENG	9130	9050	8960	8960	9090
600	%N1	57.3	60.0	64.1	68.4	73.2
	KIAS	216	216	216	216	216
	FF/ENG	8560	8480	8360	8360	8430
560	%N1	55.6	58.1	62.2	66.4	71.2
	KIAS	211	211	211	211	211
	FF/ENG	8010	7910	7790	7760	7810
520	%N1	53.9	56.3	60.2	64.3	68.9
	KIAS	205	205	205	205	205
	FF/ENG	7480	7350	7220	7180	7200
480	%N1	52.1	54.4	58.1	62.2	66.5
	KIAS	200	200	200	200	200
	FF/ENG	6990	6830	6670	6610	6600
440	%N1	50.1	52.4	56.0	59.9	64.1
	KIAS	193	193	193	193	193
	FF/ENG	6510	6330	6140	6050	6030
400	%N1	48.0	50.3	53.8	57.4	61.7
	KIAS	187	187	187	187	187
	FF/ENG	6050	5850	5650	5540	5490
360	%N1	45.5	48.1	51.5	54.9	59.0
	KIAS	180	180	180	180	180
	FF/ENG	5730	5530	5300	5180	5100

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

Performance Inflight

Advisory Information

Chapter PI

Section 62

ADVISORY INFORMATION

Normal Configuration Landing Distance

Flaps 30

	REF DIST	LANDING DISTANCE AND ADJUSTMENTS (FT)							
		WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	550000 LB LANDING WT	PER 10000 LB ABOVE/ BELOW 550000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF30	ONE REV	NO REV

Dry Runway

MAX MANUAL	3220	+80/-40	70	-130/+430	+40/-40	+70/-70	120	70	160
AUTOBRAKE MAX	4360	+70/-60	110	-180/+620	+0/0	+110/-110	220	0	0
AUTOBRAKE 4	5690	+100/-80	150	-260/+880	+0/0	+160/-160	310	0	0
AUTOBRAKE 3	6750	+120/-100	190	-320/+1100	+0/-40	+190/-190	350	0	0
AUTOBRAKE 2	7490	+140/-120	230	-370/+1260	+90/-170	+210/-210	280	210	210
AUTOBRAKE 1	8140	+160/-140	270	-430/+1470	+250/-260	+230/-230	280	840	1050

Good Reported Braking Action

MAX MANUAL	4550	+70/-60	120	-210/+750	+110/-100	+110/-110	170	300	700
AUTOBRAKE MAX	4730	+80/-60	130	-220/+770	+100/-80	+120/-120	200	320	740
AUTOBRAKE 4	5720	+100/-80	150	-260/+900	+30/-10	+160/-160	310	20	120
AUTOBRAKE 3	6750	+120/-100	190	-320/+1100	+10/-40	+190/-190	350	0	0
AUTOBRAKE 2	7490	+140/-120	230	-370/+1260	+90/-170	+210/-210	280	210	210
AUTOBRAKE 1	8140	+160/-140	270	-430/+1470	+250/-260	+230/-230	280	840	1050

Medium Reported Braking Action

MAX MANUAL	6110	+110/-90	190	-330/+1210	+270/-210	+160/-160	220	800	2050
AUTOBRAKE MAX	6110	+110/-90	190	-330/+1210	+270/-210	+160/-160	230	790	2040
AUTOBRAKE 4	6320	+120/-90	190	-340/+1230	+210/-130	+170/-170	310	740	2020
AUTOBRAKE 3	7050	+130/-110	200	-370/+1320	+130/-120	+200/-200	350	340	1380
AUTOBRAKE 2	7640	+140/-120	230	-400/+1410	+190/-220	+210/-210	280	390	1070
AUTOBRAKE 1	8160	+160/-140	280	-430/+1510	+310/-280	+230/-240	280	910	1400

Poor Reported Braking Action

MAX MANUAL	7750	+150/-130	270	-480/+1840	+580/-400	+210/-210	250	1660	4870
AUTOBRAKE MAX	7760	+150/-130	270	-480/+1840	+590/-410	+210/-210	250	1660	4870
AUTOBRAKE 4	7760	+160/-130	270	-480/+1840	+590/-380	+210/-210	280	1660	4870
AUTOBRAKE 3	8020	+160/-130	260	-490/+1870	+490/-320	+220/-230	340	1490	4730
AUTOBRAKE 2	8370	+160/-140	280	-500/+1910	+510/-390	+230/-230	280	1330	4430
AUTOBRAKE 1	8680	+170/-150	300	-520/+1960	+580/-420	+240/-240	280	1570	4250

Reference distance is for sea level, standard day, no wind or slope, VREF30 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 210 ft.

For autobrake 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).

ADVISORY INFORMATION**Normal Configuration Landing Distance****Flaps 25**

LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	550000 LB LANDING WT	PER 10000 LB ABOVE / BELOW 550000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD/ TAIL WIND	DOWN/ UP HILL	ABOVE/ BELOW ISA	PER 5 KTS ABOVE VREF25	ONE REV NO REV

Dry Runway

MAX MANUAL	3380	+70/-40	80	-130/+440	+40/-40	+70/-70	120	80	180
AUTOBRAKE MAX	4690	+60/-60	120	-190/+640	+0/0	+120/-120	230	0	0
AUTOBRAKE 4	6160	+80/-90	170	-270/+920	+0/0	+170/-170	320	0	0
AUTOBRAKE 3	7320	+100/-110	210	-340/+1150	+0/-70	+210/-210	350	10	10
AUTOBRAKE 2	8050	+120/-130	250	-390/+1310	+120/-190	+230/-230	290	320	320
AUTOBRAKE 1	8720	+150/-150	300	-450/+1520	+280/-290	+250/-250	290	990	1300

Good Reported Braking Action

MAX MANUAL	4820	+60/-70	130	-220/+770	+120/-100	+120/-120	170	330	780
AUTOBRAKE MAX	5020	+70/-70	140	-230/+790	+110/-60	+130/-130	220	350	830
AUTOBRAKE 4	6190	+80/-90	170	-280/+940	+30/-10	+170/-170	330	20	120
AUTOBRAKE 3	7320	+100/-110	210	-340/+1150	+10/-70	+210/-210	350	10	10
AUTOBRAKE 2	8050	+120/-130	250	-390/+1310	+120/-190	+230/-230	290	320	320
AUTOBRAKE 1	8720	+150/-150	300	-450/+1520	+280/-290	+250/-250	290	990	1300

Medium Reported Braking Action

MAX MANUAL	6490	+100/-100	210	-340/+1240	+290/-210	+170/-170	240	880	2280
AUTOBRAKE MAX	6490	+100/-100	210	-340/+1240	+200/-130	+190/-190	330	750	2190
AUTOBRAKE 4	6800	+100/-100	210	-350/+1270	+140/-150	+210/-220	340	370	1460
AUTOBRAKE 3	7620	+110/-120	220	-380/+1370	+220/-240	+230/-230	290	510	1230
AUTOBRAKE 2	8210	+120/-130	260	-410/+1450	+220/-240	+250/-250	290	1060	1670
AUTOBRAKE 1	8750	+150/-150	300	-450/+1570	+340/-300	+250/-250	290	1750	4770

Poor Reported Braking Action

MAX MANUAL	8230	+140/-140	290	-490/+1880	+610/-420	+230/-230	250	1830	5420
AUTOBRAKE MAX	8250	+140/-140	290	-490/+1880	+620/-430	+230/-230	260	1830	5430
AUTOBRAKE 4	8260	+140/-140	290	-490/+1880	+610/-390	+230/-230	280	1830	5440
AUTOBRAKE 3	8610	+140/-140	290	-510/+1920	+500/-350	+240/-240	340	1570	5210
AUTOBRAKE 2	8950	+150/-150	310	-520/+1960	+550/-410	+250/-250	290	1500	4920
AUTOBRAKE 1	9280	+160/-160	320	-540/+2020	+600/-450	+260/-260	290	1750	4770

Reference distance is for sea level, standard day, no wind or slope, VREF25 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 220 ft.

For autobrake 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 Distance Flaps 20

	REF DIST	LANDING DISTANCE AND ADJUSTMENTS (FT)						
		WEIGHT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
BRAKING CONFIGURATION	550000 LB LANDING WT	PER 10000 LB ABOVE/BELOW 550000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD/TAIL WIND	DOWN/UP HILL	ABOVE/BELOW ISA	PER 5 KTS ABOVE VREF20	ONE REV NO REV

Dry Runway

MAX MANUAL	3670	+90/-40	90	-140/+460	+50/-40	+80/-80	130	100	210
AUTOBRAKE MAX	5190	+70/-70	130	-200/+680	+0/0	+140/-140	240	0	0
AUTOBRAKE 4	6880	+90/-100	190	-290/+980	+0/0	+200/-200	350	0	0
AUTOBRAKE 3	8180	+120/-130	240	-360/+1220	+10/-80	+240/-240	370	30	30
AUTOBRAKE 2	9000	+140/-150	290	-410/+1390	+140/-220	+260/-260	310	430	430
AUTOBRAKE 1	9740	+170/-170	350	-470/+1610	+310/-330	+290/-290	310	1220	1590

Good Reported Braking Action

MAX MANUAL	5290	+70/-80	150	-230/+810	+130/-120	+140/-140	180	400	940
AUTOBRAKE MAX	5520	+80/-80	160	-240/+830	+110/-60	+140/-140	240	400	970
AUTOBRAKE 4	6890	+90/-100	190	-300/+1000	+30/-10	+200/-200	350	20	140
AUTOBRAKE 3	8180	+120/-130	240	-360/+1220	+10/-80	+240/-240	370	30	30
AUTOBRAKE 2	9000	+140/-150	290	-410/+1390	+140/-220	+260/-260	310	430	430
AUTOBRAKE 1	9740	+170/-170	350	-470/+1610	+310/-330	+290/-290	310	1220	1590

Medium Reported Braking Action

MAX MANUAL	7160	+110/-110	230	-360/+1300	+310/-250	+190/-200	230	1050	2730
AUTOBRAKE MAX	7160	+110/-110	240	-360/+1300	+320/-230	+200/-200	250	1040	2720
AUTOBRAKE 4	7540	+110/-120	240	-370/+1330	+220/-140	+210/-210	350	840	2570
AUTOBRAKE 3	8490	+120/-130	260	-410/+1440	+160/-160	+240/-240	370	430	1740
AUTOBRAKE 2	9150	+140/-150	300	-440/+1530	+240/-270	+260/-260	310	630	1490
AUTOBRAKE 1	9770	+170/-170	350	-480/+1660	+380/-340	+290/-290	310	1290	2020

Poor Reported Braking Action

MAX MANUAL	9110	+160/-160	330	-520/+1960	+660/-460	+250/-250	270	2150	6480
AUTOBRAKE MAX	9120	+160/-160	330	-520/+1970	+670/-470	+260/-260	270	2150	6490
AUTOBRAKE 4	9120	+160/-160	330	-520/+1970	+670/-430	+260/-260	310	2150	6490
AUTOBRAKE 3	9540	+160/-160	330	-540/+2010	+550/-390	+270/-270	360	1820	6190
AUTOBRAKE 2	9930	+170/-170	350	-550/+2050	+600/-450	+280/-280	300	1780	5880
AUTOBRAKE 1	10300	+180/-180	370	-570/+2110	+660/-490	+300/-300	310	2070	5690

Reference distance is for sea level, standard day, no wind or slope, VREF20 approach speed, 2 engine reverse thrust, and auto speedbrakes.

For Max Manual braking and manual speedbrakes, increase reference landing distance by 240 ft.

For autobrake and manual speedbrakes, increase reference landing distance by 200 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 DISTANCES AND ADJUSTMENTS (FT)										
EICAS MESSAGE	VREF	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% 10°C	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ	
ANTISKID (FLAPS 25)	VREF25	5980	100/-100	190	-320/1210	260/-200	90/-90	410	840	2200
ANTISKID (FLAPS 30)	VREF30	5640	110/-80	180	-310/1180	250/-190	80/-80	410	760	1980
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	3500	100/-50	90	-130/490	50/-40	40/-40	260	-	160
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	3060	80/-30	70	-120/430	40/-40	40/-40	240	-	130
FLAPS DRIVE (FLAPS \leq 5)	VREF30+40	3850	150/-40	110	-150/570	60/-50	70/-70	280	160	370
FLAPS DRIVE (5 < FLAPS < 20)	VREF30+20	3500	110/-30	90	-130/500	40/-40	40/-40	260	100	220
FLAPS DRIVE (FLAPS \geq 20)	VREF20	3460	90/-50	80	-130/470	40/-40	40/-40	240	90	200
FLAPS PRIMARY FAIL	VREF20	3950	80/-50	90	-150/500	50/-50	50/-50	320	120	260
FLAP/SLAT CONTROL	VREF20	3460	90/-50	80	-130/470	40/-40	40/-40	240	90	200
FLIGHT CONTROL MODE	VREF20	4000	80/-50	100	-150/510	50/-50	50/-50	330	130	280
HYD PRESS SYS C	VREF20	3950	80/-50	90	-150/500	50/-50	50/-50	320	120	260
HYD PRESS SYS L+C	VREF30+20	4380	100/-40	110	-160/560	70/-60	60/-60	410	-	190
HYD PRESS SYS L+R	VREF30+20	4740	90/-40	120	-190/660	110/-100	70/-70	460	-	-
HYD PRESS SYS R+C	VREF30+20	5380	80/-50	150	-220/760	140/-120	80/-80	520	-	440
HYD PRESS SYS L (FLAPS 25)	VREF25	3440	70/-40	80	-140/470	50/-50	40/-40	290	-	110
HYD PRESS SYS L (FLAPS 30)	VREF30	3270	70/-30	70	-130/460	50/-40	40/-40	290	-	100
HYD PRESS SYS R (FLAPS 25)	VREF25	3790	50/-50	90	-160/550	70/-60	50/-50	330	-	170
HYD PRESS SYS R (FLAPS 30)	VREF30	3580	60/-40	90	-150/530	60/-60	50/-50	320	-	150
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	3970	130/-40	110	-150/560	60/-50	60/-60	280	150	340
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	3530	100/-30	80	-130/460	40/-40	40/-40	250	100	210
PRI FLIGHT COMPUTERS	VREF20	4000	80/-50	100	-150/510	50/-50	50/-50	330	130	280
SLATS DRIVE	VREF30+30	3800	110/-40	100	-140/520	50/-40	40/-40	260	110	250
STABILIZER	VREF30+20	3530	100/-30	80	-130/460	40/-40	40/-40	250	100	210

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance
Good Reported Braking Action**

		LANDING DISTANCES AND ADJUSTMENTS (FT)							
EICAS MESSAGE	VREF	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1% PER 10°C	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
ANTISKID (FLAPS 25)	VREF25	5980	100/-100	190	-320/1210	260/-200	90/-90	410	840 2200
ANTISKID (FLAPS 30)	VREF30	5640	110/-80	180	-310/1180	250/-190	80/-80	410	760 1980
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	5170	80/-80	150	-240/840	150/-120	80/-80	380	- 640
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	4430	80/-60	120	-210/780	130/-100	60/-60	360	- 500
FLAPS DRIVE (FLAPS \leq 5)	VREF30+40	5580	90/-70	160	-230/830	130/-110	90/-90	340	510 1240
FLAPS DRIVE ($5 < \text{FLAPS} < 20$)	VREF30+20	5020	80/-60	140	-220/800	120/-110	70/-70	350	420 1000
FLAPS DRIVE (FLAPS \geq 20)	VREF20	4920	70/-80	140	-220/790	120/-100	70/-70	350	380 890
FLAPS PRIMARY FAIL	VREF20	5500	80/-90	160	-240/850	140/-120	80/-80	430	470 1130
FLAP/SLAT CONTROL	VREF20	4920	70/-80	140	-220/790	120/-100	70/-70	350	380 890
FLIGHT CONTROL MODE	VREF20	5590	80/-90	160	-240/860	150/-130	80/-80	450	490 1200
HYD PRESS SYS C	VREF20	5500	80/-90	160	-240/850	140/-120	80/-80	430	470 1130
HYD PRESS SYS L+C	VREF30+20	6460	110/-70	190	-290/1000	230/-190	100/-100	580	- 840
HYD PRESS SYS L+R	VREF30+20	6910	110/-70	200	-320/1110	320/-250	110/-110	650	- -
HYD PRESS SYS R+C	VREF30+20	6550	110/-70	190	-290/1010	240/-190	100/-100	600	- 880
HYD PRESS SYS L (FLAPS 25)	VREF25	5110	70/-80	140	-240/870	160/-140	70/-70	430	- 530
HYD PRESS SYS L (FLAPS 30)	VREF30	4840	90/-60	130	-230/850	160/-130	70/-70	430	- 480
HYD PRESS SYS R (FLAPS 25)	VREF25	5110	70/-80	140	-240/870	160/-140	70/-70	430	- 530
HYD PRESS SYS R (FLAPS 30)	VREF30	4790	80/-60	130	-230/840	150/-130	70/-70	420	- 460
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	5690	90/-70	170	-240/840	140/-120	80/-80	350	500 1200
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	5020	80/-60	140	-220/800	120/-110	60/-60	350	390 930
PRI FLIGHT COMPUTERS	VREF20	5590	80/-90	160	-240/860	150/-130	80/-80	450	490 1200
SLATS DRIVE	VREF30+30	5400	90/-70	160	-230/830	130/-110	70/-70	360	440 1050
STABILIZER	VREF30+20	5020	80/-60	140	-220/800	120/-110	60/-60	350	390 930

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance****Medium Reported Braking Action**

		LANDING DISTANCES AND ADJUSTMENTS (FT)							
EICAS MESSAGE	VREF	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
		500000 LB LDG WT	PER 10000 LB ABV/BLW 500000 LB	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV
ANTISKID (FLAPS 25)	VREF25	7490	140/-140	270	-450/1820	550/-360	110/-110	470	1730 5310
ANTISKID (FLAPS 30)	VREF30	7050	150/-110	240	-440/1780	530/-340	100/-100	460	1570 4780
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	7310	130/-130	230	-380/1410	400/-300	110/-110	510	- 1910
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	6160	120/-90	190	-340/1300	340/-250	90/-90	470	- 1460
FLAPS DRIVE (FLAPS \leq 5)	VREF30+40	7580	140/-110	260	-360/1320	300/-240	130/-130	440	1350 3810
FLAPS DRIVE (5 < FLAPS $<$ 20)	VREF30+20	6750	130/-100	220	-340/1270	290/-230	100/-100	450	1110 3040
FLAPS DRIVE (FLAPS \geq 20)	VREF20	6580	120/-110	220	-340/1260	290/-220	100/-100	430	990 2630
FLAPS PRIMARY FAIL	VREF20	7230	130/-130	240	-360/1330	330/-250	110/-110	520	1180 3230
FLAP/SLAT CONTROL	VREF20	6580	120/-110	220	-340/1260	290/-220	100/-100	430	990 2630
FLIGHT CONTROL MODE	VREF20	7380	130/-130	250	-370/1350	340/-260	110/-110	540	1250 3480
HYD PRESS SYS C	VREF20	7230	130/-130	240	-360/1330	330/-250	110/-110	520	1180 3230
HYD PRESS SYS L+C	VREF30+20	9090	170/-120	300	-460/1670	600/-430	140/-140	720	- 2530
HYD PRESS SYS L+R	VREF30+20	11120	180/-120	350	-590/2100	1160/-730	190/-190	910	- -
HYD PRESS SYS R+C	VREF30+20	9200	170/-120	310	-460/1680	620/-440	140/-140	740	- 2630
HYD PRESS SYS L (FLAPS 25)	VREF25	7290	120/-120	240	-400/1490	460/-330	110/-110	560	- 1660
HYD PRESS SYS L (FLAPS 30)	VREF30	6880	130/-90	220	-390/1460	440/-310	110/-110	560	- 1510
HYD PRESS SYS R (FLAPS 25)	VREF25	7240	120/-120	230	-400/1490	450/-320	110/-110	550	- 1630
HYD PRESS SYS R (FLAPS 30)	VREF30	6720	130/-90	210	-380/1440	420/-300	100/-100	530	- 1410
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	7590	140/-110	260	-360/1330	310/-240	110/-120	440	1260 3430
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	6690	130/-100	220	-340/1270	290/-220	80/-80	430	1010 2680
PRI FLIGHT COMPUTERS	VREF20	7380	130/-130	250	-370/1350	340/-260	110/-110	540	1250 3480
SLATS DRIVE	VREF30+30	7190	130/-100	240	-350/1310	310/-240	90/-90	440	1110 2970
STABILIZER	VREF30+20	6690	130/-100	220	-340/1270	290/-220	80/-80	430	1010 2680

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION**Non-Normal Configuration Landing Distance
Poor Reported Braking Action**

		LANDING DISTANCES AND ADJUSTMENTS (FT)							
EICAS MESSAGE	VREF	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS	SLOPE ADJ PER 1%	TEMP ADJ PER 10°C	APP SPD ADJ	REVERSE THRUST ADJ
		500000 PER LB LDG WT	PER 10000 LB ABV/BLW 500000 LB	PER 1000 FT ABV S.L.	HEAD/ TAIL WIND	DOWN/ UP HILL	ABV/ BLW ISA	PER 10 KTS ABV VREF	ONE REV NO REV
ANTISKID (FLAPS 25)	VREF25	9650	210/-190	380	-690/3260	2660/-720	150/-150	530	4340 15000
ANTISKID (FLAPS 30)	VREF30	9090	220/-160	350	-670/3200	2580/-690	140/-140	510	4010 15000
ENG SHUTDOWN L, R (FLAPS 20)	VREF20	9740	190/-180	350	-570/2230	990/-590	160/-160	610	- 4850
ENG SHUTDOWN L, R (FLAPS 30)	VREF30	8140	170/-130	280	-520/2070	840/-490	130/-130	550	- 3690
FLAPS DRIVE (FLAPS \leq 5)	VREF30+40	9580	200/-150	370	-500/1990	640/-430	170/-170	530	2770 9540
FLAPS DRIVE (5 < FLAPS \leq 20)	VREF30+20	8510	180/-140	320	-480/1920	620/-410	130/-130	520	2280 7500
FLAPS DRIVE (FLAPS \geq 20)	VREF20	8270	160/-150	300	-470/1900	610/-400	130/-130	500	2020 6320
FLAPS PRIMARY FAIL	VREF20	8950	180/-170	330	-500/1980	670/-440	140/-140	580	2330 7610
FLAP/SLAT CONTROL	VREF20	8270	160/-150	300	-470/1900	610/-400	130/-130	500	2020 6320
FLIGHT CONTROL MODE	VREF20	9150	180/-170	340	-510/2000	700/-460	140/-140	610	2480 8260
HYD PRESS SYS C	VREF20	8950	180/-170	330	-500/1980	670/-440	140/-140	580	2330 7610
HYD PRESS SYS L+C	VREF30+20	12140	240/-180	450	-700/2730	1560/-850	200/-200	820	- 6360
HYD PRESS SYS L+R	VREF30+20	17790	270/-160	590	-1100/4220	5750/-1980	320/-320	1140	- -
HYD PRESS SYS R+C	VREF30+20	12260	250/-190	460	-710/2750	1590/-870	200/-200	840	- 6540
HYD PRESS SYS L (FLAPS 25)	VREF25	9910	180/-170	360	-630/2520	1310/-690	160/-160	660	- 4300
HYD PRESS SYS L (FLAPS 30)	VREF30	9370	190/-140	330	-610/2470	1270/-660	150/-150	660	- 3950
HYD PRESS SYS R (FLAPS 25)	VREF25	9790	170/-170	350	-620/2500	1280/-670	160/-160	640	- 4150
HYD PRESS SYS R (FLAPS 30)	VREF30	9040	180/-130	320	-600/2420	1190/-620	140/-140	610	- 3570
PITCH UP AUTHORITY (FLAPS 5)	VREF30+40	9450	190/-150	360	-500/1980	640/-430	150/-150	500	2480 8010
PITCH UP AUTHORITY (FLAPS 20)	VREF30+20	8360	180/-130	300	-480/1900	610/-400	110/-110	500	2030 6340
PRI FLIGHT COMPUTERS	VREF20	9150	180/-170	340	-510/2000	700/-460	140/-140	610	2480 8260
SLATS DRIVE	VREF30+30	8960	190/-140	330	-490/1950	630/-420	120/-120	500	2210 6900
STABILIZER	VREF30+20	8360	180/-130	300	-480/1900	610/-400	110/-110	500	2030 6340

Actual (unfactored) distances are shown.

Includes distances from 50 ft above threshold (1000 ft air distance).

Assumes maximum manual braking and maximum available reverse thrust.

ADVISORY INFORMATION**Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 30**

AIRPORT OAT	°C °F	LANDING CLIMB LIMIT WEIGHT (1000 LB)					
		AIRPORT PRESSURE ALTITUDE (FT)					
-2000	0	2000	4000	6000	8000		
54	129	672.3	628.0				
52	126	690.0	643.1				
50	122	707.8	659.3	605.6			
48	118	725.5	677.8	619.9			
46	115	743.7	696.5	635.4	585.0		
44	111	761.0	714.1	652.5	600.2		
42	108	777.3	732.3	671.6	614.6	563.6	
40	104	793.0	750.7	689.9	629.6	576.5	
38	100	809.0	769.5	707.1	644.2	589.2	523.7
36	97	823.4	785.6	722.9	658.1	600.0	534.2
34	93	834.9	801.0	739.6	671.9	609.6	544.6
32	90	835.0	816.7	753.4	684.7	618.5	554.2
30	86	835.0	830.3	765.2	699.0	627.8	562.5
28	82	835.0	830.6	775.5	709.9	638.0	570.7
26	79	835.0	830.8	787.4	718.4	648.3	578.8
24	75	835.0	831.0	787.5	725.5	659.0	587.6
22	72	835.0	831.2	787.7	732.4	666.4	596.9
20	68	835.0	831.5	787.8	732.6	671.0	604.8
18	64	835.0	831.6	788.0	732.8	675.5	610.3
16	61	835.0	831.8	788.2	732.9	675.6	614.2
14	57	835.0	831.9	788.4	733.1	675.8	617.6
12	54	835.0	832.1	788.5	733.3	675.9	617.8
10	50	835.0	832.1	788.7	733.4	675.9	617.9
8	46	835.0	832.2	788.9	733.6	676.0	617.9
6	43	835.0	832.3	788.9	733.7	676.0	617.8
4	40	835.0	832.4	781.7	706.6	645.9	570.9
2	36	835.0	832.4	781.9	706.7	646.0	570.9
0	32	835.0	832.5	781.9	706.8	646.1	571.0
-40	-40	835.0	832.7	781.9	706.8	646.1	571.1

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

With engine bleed for packs off, increase weight by 2900 lb.

With engine and wing anti-ice on, decrease weight by 4800 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 48400 lb.

ADVISORY INFORMATION**Landing Climb Limit Weight****Valid for approach with flaps 20 and landing with flaps 25**

AIRPORT OAT		LANDING CLIMB LIMIT WEIGHT (1000 LB)					
		AIRPORT PRESSURE ALTITUDE (FT)					
°C	°F	-2000	0	2000	4000	6000	8000
54	129	680.0	637.9				
52	126	695.9	653.6				
50	122	712.4	668.9	615.7			
48	118	729.4	684.9	630.1			
46	115	746.7	701.5	645.6	594.1		
44	111	763.5	718.1	662.4	609.4		
42	108	779.7	735.6	679.3	624.3	572.7	
40	104	795.5	753.2	695.5	639.7	586.1	
38	100	811.6	771.9	711.8	655.4	599.2	533.2
36	97	826.3	788.0	727.2	668.7	611.1	543.8
34	93	835.0	803.5	743.1	681.2	620.9	554.2
32	90	835.0	819.5	756.3	692.2	630.5	564.5
30	86	835.0	833.3	767.7	705.0	639.8	573.1
28	82	835.0	833.5	778.2	715.2	650.4	581.7
26	79	835.0	833.7	790.3	723.4	660.6	589.8
24	75	835.0	834.0	790.5	730.1	670.3	598.7
22	72	835.0	834.2	790.6	736.7	676.8	608.2
20	68	835.0	834.4	790.8	736.9	680.7	616.4
18	64	835.0	834.6	791.0	737.0	684.6	622.2
16	61	835.0	834.7	791.2	737.2	684.7	626.3
14	57	835.0	834.9	791.3	737.4	684.8	629.8
12	54	835.0	835.0	791.5	737.5	684.9	630.0
10	50	835.0	835.0	791.7	737.7	685.0	630.1
8	46	835.0	835.0	791.8	737.9	685.1	630.1
6	43	835.0	835.0	791.9	738.0	685.2	630.0
4	40	835.0	835.0	792.0	738.1	685.2	618.9
2	36	835.0	835.0	792.1	738.2	685.3	619.0
0	32	835.0	835.0	792.1	738.2	685.4	619.0
-40	-40	835.0	835.0	792.4	738.4	685.8	619.3

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

With engine bleed for packs off, increase weight by 3200 lb.

With engine and wing anti-ice on, decrease weight by 4000 lb.

When operating in icing conditions during any part of the flight with forecast landing temperature below 10°C, decrease weight by 49000 lb.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule**
Reference Brake Energy (Millions of Foot Pounds)

WEIGHT (1000 LB)	OAT (°C)	BRAKES ON SPEED (KIAS)																	
		80			100			120			140			160					
		PRESSURE ALTITUDE (1000 FT)																	
780	0	21.8	23.8	26.1	32.5	35.8	39.7	45.4	50.5	56.5	59.5	66.5	74.6	83.6	94.0	90.2	101.1	113.5	
	10	22.4	24.5	26.9	33.4	36.9	40.9	46.8	52.1	58.2	61.4	68.6	77.0	77.0	86.3	96.9	93.1	104.2	116.8
	15	22.8	24.9	27.4	34.0	37.6	41.7	47.7	53.1	59.3	62.5	69.9	78.4	78.3	87.8	98.6	94.7	106.0	118.7
	20	23.2	25.4	27.8	34.7	38.2	42.4	48.5	54.0	60.3	63.5	71.1	79.7	79.7	89.3	100.2	96.2	107.7	120.6
	30	23.8	26.0	28.5	35.5	39.2	43.5	49.8	55.4	62.0	65.3	73.0	81.9	81.9	91.7	102.9	98.9	110.6	123.7
	40	23.9	26.1	28.7	35.9	39.7	44.1	50.6	56.3	63.0	66.4	74.4	83.5	83.4	93.5	105.0	100.8	112.8	126.0
740	0	21.0	22.8	25.0	31.1	34.3	38.0	43.5	48.3	53.9	56.8	63.5	71.2	71.3	79.9	89.8	86.3	96.8	108.7
	10	21.5	23.5	25.7	32.0	35.3	39.1	44.8	49.8	55.6	58.6	65.5	73.5	73.6	82.5	92.6	89.1	99.8	111.9
	15	21.9	23.9	26.2	32.6	36.0	39.8	45.6	50.7	56.6	59.7	66.7	74.8	74.9	83.9	94.2	90.6	101.5	113.8
	20	22.3	24.3	26.7	33.2	36.6	40.5	46.4	51.6	57.6	60.7	67.9	76.1	76.2	85.3	95.8	92.1	103.1	115.6
	30	22.8	24.9	27.3	34.0	37.5	41.6	47.6	53.0	59.2	62.4	69.7	78.2	78.3	87.7	98.4	94.7	105.9	118.6
	40	23.0	25.1	27.5	34.4	37.9	42.1	48.3	53.8	60.1	63.4	71.0	79.7	79.7	89.4	100.4	96.5	108.1	120.9
700	0	20.1	21.9	23.9	29.8	32.8	36.2	41.5	46.1	51.4	54.2	60.5	67.8	68.0	76.2	85.6	82.4	92.4	103.8
	10	20.6	22.5	24.6	30.6	33.7	37.3	42.8	47.5	53.0	55.9	62.4	70.0	70.1	78.6	88.3	85.0	95.2	106.9
	15	21.0	22.9	25.1	31.2	34.3	38.0	43.6	48.4	53.9	56.9	63.5	71.2	71.4	80.0	89.8	86.4	96.9	108.7
	20	21.4	23.3	25.5	31.8	35.0	38.7	44.3	49.2	54.9	57.9	64.6	72.4	72.6	81.3	91.3	87.9	98.5	110.4
	30	21.9	23.8	26.1	32.5	35.8	39.7	45.5	50.5	56.4	59.5	66.4	74.4	74.6	83.6	93.8	90.3	101.2	113.4
	40	22.0	24.0	26.3	32.9	36.2	40.2	46.1	51.3	57.3	60.5	67.6	75.8	76.0	85.2	95.7	92.1	103.2	115.6
620	0	18.4	20.0	21.8	27.1	29.7	32.8	37.6	41.6	46.3	48.8	54.4	60.9	61.2	68.4	76.8	74.1	83.1	93.4
	10	18.9	20.5	22.4	27.9	30.6	33.8	38.7	42.9	47.7	50.4	56.1	62.8	63.1	70.6	79.3	76.5	85.7	96.3
	15	19.3	20.9	22.8	28.4	31.2	34.4	39.4	43.6	48.6	51.3	57.1	63.9	64.2	71.9	80.7	77.8	87.2	97.9
	20	19.6	21.3	23.2	28.9	31.7	35.0	40.1	44.4	49.4	52.2	58.1	65.0	65.4	73.1	82.0	79.2	88.7	99.6
	30	20.0	21.7	23.8	29.6	32.5	35.9	41.1	45.6	50.7	53.6	59.7	66.8	67.1	75.1	84.3	81.4	91.2	102.3
	40	20.1	21.9	23.9	29.9	32.8	36.3	41.7	46.2	51.5	54.4	60.7	68.0	68.3	76.5	85.9	82.9	93.0	104.3
540	0	16.8	18.1	19.8	24.4	26.7	29.4	33.6	37.1	41.2	43.4	48.3	53.9	54.2	60.5	67.8	65.5	73.4	82.5
	10	17.2	18.6	20.3	25.1	27.5	30.3	34.6	38.2	42.4	44.8	49.8	55.5	55.9	62.4	69.9	67.6	75.7	85.1
	15	17.5	19.0	20.7	25.6	28.0	30.8	35.2	38.9	43.2	45.6	50.7	56.5	56.9	63.5	71.2	68.8	77.1	86.5
	20	17.8	19.3	21.0	26.0	28.5	31.4	35.9	39.6	44.0	46.4	51.5	57.5	57.9	64.6	72.4	70.0	78.4	88.0
	30	18.2	19.7	21.5	26.6	29.2	32.1	36.8	40.6	45.1	47.6	52.9	59.1	59.4	66.4	74.4	71.9	80.6	90.4
	40	18.3	19.8	21.6	26.9	29.4	32.5	37.2	41.1	45.7	48.3	53.7	60.1	60.4	67.6	75.8	73.3	82.1	92.2
460	0	15.2	16.4	17.7	21.8	23.8	26.1	29.6	32.6	36.0	37.9	42.0	46.7	47.0	52.3	58.5	56.6	63.3	70.9
	10	15.6	16.8	18.2	22.4	24.4	26.8	30.5	33.5	37.1	39.1	43.3	48.2	48.4	53.9	60.3	58.4	65.3	73.2
	15	15.9	17.1	18.6	22.8	24.9	27.3	31.0	34.2	37.8	39.8	44.1	49.1	49.3	54.9	61.4	59.4	66.4	74.5
	20	16.1	17.4	18.9	23.2	25.3	27.8	31.6	34.8	38.5	40.5	44.9	49.9	50.2	55.9	62.5	60.5	67.6	75.8
	30	16.5	17.8	19.3	23.7	25.9	28.4	32.4	35.6	39.4	41.5	46.0	51.3	51.5	57.4	64.2	62.1	69.4	77.8
	40	16.5	17.8	19.4	23.9	26.1	28.7	32.7	36.0	39.9	42.1	46.7	52.0	52.3	58.3	65.3	63.2	70.7	79.3
380	0	13.6	14.6	15.8	19.2	20.8	22.7	25.6	28.1	30.9	32.4	35.7	39.6	39.6	43.9	48.9	47.3	52.7	58.9
	10	14.0	15.0	16.2	19.7	21.4	23.4	26.3	28.9	31.8	33.3	36.8	40.8	40.8	45.3	50.4	48.8	54.3	60.7
	15	14.2	15.3	16.5	20.0	21.8	23.8	26.8	29.4	32.4	33.9	37.4	41.5	41.6	46.1	51.4	49.7	55.3	61.8
	20	14.5	15.5	16.8	20.4	22.2	24.2	27.3	29.9	33.0	34.5	38.1	42.3	42.3	46.9	52.3	50.5	56.3	62.9
	30	14.8	15.9	17.2	20.8	22.7	24.8	28.0	30.6	33.8	35.4	39.1	43.3	43.4	48.1	53.6	51.9	57.8	64.6
	40	14.8	15.9	17.2	20.9	22.8	25.0	28.2	30.9	34.2	35.8	39.6	43.9	44.0	48.8	54.5	52.7	58.7	65.8

To correct for wind, enter table with the brakes on speed minus one half the headwind or plus 1.5 times the tailwind.

If ground speed is used for brakes on speed, ignore wind and enter table with sea level, 15°C.

ADVISORY INFORMATION**Recommended Brake Cooling Schedule****Event Adjusted Brake Energy (Millions of Foot Pounds)****No Reverse Thrust**

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	4.4	14.1	23.7	33.2	42.6	51.9	61.2	70.5	79.9	89.3	98.9	108.7
	MAX AUTO	4.4	13.1	21.7	30.2	38.7	47.3	56.0	65.0	74.3	83.9	94.0	104.6
	AUTOBRAKE 4	4.3	12.5	20.4	28.1	35.7	43.4	51.2	59.3	67.7	76.6	86.1	96.4
	AUTOBRAKE 3	4.2	11.9	19.2	26.3	33.3	40.3	47.4	54.8	62.6	70.8	79.7	89.3
	AUTOBRAKE 2	4.1	11.2	17.9	24.4	30.8	37.2	43.7	50.5	57.6	65.1	73.2	81.9
	AUTOBRAKE 1	4.0	10.3	16.3	22.1	27.8	33.4	39.1	45.1	51.3	58.0	65.1	72.9

2 Engine Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)											
EVENT		10	20	30	40	50	60	70	80	90	100	110	120
LANDING	RTO MAX MAN	10	20	30	40	50	60	70	80	90	100	110	120
	MAX MAN	3.3	12.0	21.0	30.0	38.9	47.5	56.1	64.5	72.8	81.0	89.2	97.5
	MAX AUTO	2.0	8.7	15.5	22.3	29.3	36.4	43.8	51.5	59.6	68.3	77.5	87.4
	AUTOBRAKE 4	1.4	5.6	10.4	15.6	20.9	26.4	32.2	38.3	44.8	51.9	59.6	68.0
	AUTOBRAKE 3	0.9	3.2	6.4	10.3	14.3	18.5	23.0	27.9	33.2	39.0	45.4	52.4
	AUTOBRAKE 2	0.3	1.8	4.0	6.5	9.3	12.3	15.6	19.2	23.3	27.9	33.0	38.7
	AUTOBRAKE 1	0.2	1.2	2.6	4.3	6.1	8.1	10.3	12.8	15.6	18.8	22.3	26.4

Cooling Time (Minutes)

		EVENT ADJUSTED BRAKE ENERGY (MILLIONS OF FOOT POUNDS)								
16 & BELOW		17	18	20	24	28	32	35	36 TO 44	45 & ABOVE
GEAR DOWN INFLIGHT	NO SPECIAL PROCEDURE	1	2	3	4	6	7	7	CAUTION	FUSE PLUG MELT ZONE
GROUND	REQUIRED	11	18	26	42	55	66	73		
BTMS	UP TO 2.4	2.4	2.6	2.9	3.4	4.0	4.5	4.9	5.0 TO 6.3	6.3 & ABOVE

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

For one brake deactivated, increase brake energy by 10 percent.

For two brakes deactivated, increase brake energy by 20 percent.

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 8 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not 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 EICAS 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. (When inflight with gear extended, the BTMS indications may vary between individual brakes, due to air-stream effects.)

DRAFT

Intentionally
Blank

Performance Inflight

Engine Inoperative

Chapter PI

Section 63

ENGINE INOP

Initial Max Continuous %N1

Based on .84M, engine bleed for one pack on and anti-ice off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)								
	27	29	31	33	35	37	39	41	43
20	97.4	97.0	96.7	96.3	95.9	95.9	95.6	95.3	95.0
15	98.2	97.8	97.3	97.0	96.6	96.3	96.0	95.7	95.4
10	99.2	98.9	98.3	97.7	97.2	97.0	96.6	96.3	96.0
5	100.2	100.1	99.7	98.8	98.1	97.8	97.4	97.1	96.8
0	99.3	100.9	101.0	99.9	99.3	98.8	98.3	97.9	97.6
-5	98.4	99.9	101.2	101.3	100.5	100.2	99.7	99.3	98.8
-10	97.4	99.0	100.3	101.6	101.3	101.3	100.7	100.3	100.0
-15	96.5	98.1	99.3	100.6	101.0	102.0	101.1	100.8	100.5
-20	95.6	97.1	98.3	99.6	100.1	101.0	100.1	99.8	99.5
-25	94.6	96.1	97.4	98.6	99.1	100.0	99.1	98.8	98.5
-30	93.7	95.2	96.4	97.6	98.1	99.0	98.1	97.8	97.5
-35	92.7	94.2	95.4	96.6	97.0	97.9	97.1	96.8	96.5
-40	91.7	93.2	94.4	95.6	96.0	96.9	96.1	95.8	95.5

ENGINE INOP**Max Continuous %N1**

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

37000 FT to 27000 FT Pressure Altitudes

37000 FT PRESS ALT			TAT (°C)										
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.86	94.3	95.4	96.4	97.4	98.4	99.5	100.5	101.4	101.2	100.2	98.9	97.7
240	0.74	96.1	97.2	98.3	99.3	100.4	101.4	102.1	101.9	100.9	99.5	98.1	97.1
200	0.63	95.7	96.7	97.8	98.8	99.9	100.8	101.4	100.9	100.0	98.5	97.0	96.3
35000 FT PRESS ALT			TAT (°C)										
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
280	0.82	94.6	95.6	96.6	97.7	98.7	99.7	100.7	101.7	101.4	100.4	99.2	98.1
240	0.71	95.1	96.2	97.2	98.3	99.3	100.3	101.3	101.8	100.9	99.8	98.3	97.2
200	0.60	94.8	95.8	96.9	97.9	98.9	99.9	100.9	101.0	100.2	98.8	97.1	96.1
33000 FT PRESS ALT			TAT (°C)										
KIAS	M	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5
320	0.89	91.4	92.4	93.4	94.4	95.4	96.4	97.4	98.3	99.3	100.2	99.8	98.8
280	0.79	95.0	96.0	97.1	98.1	99.2	100.2	101.2	102.2	102.4	101.0	100.0	98.7
240	0.68	95.6	96.7	97.8	98.8	99.8	100.9	101.9	102.4	101.8	100.2	98.9	97.5
200	0.58	95.9	97.0	98.0	99.1	100.1	101.1	101.6	101.6	101.0	99.3	97.9	96.4
31000 FT PRESS ALT			TAT (°C)										
KIAS	M	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10
320	0.85	92.7	93.8	94.8	95.7	96.7	97.7	98.7	99.6	100.5	100.8	99.7	98.4
280	0.76	96.3	97.4	98.4	99.5	100.5	101.5	102.5	103.5	102.0	100.6	99.1	98.0
240	0.66	97.4	98.4	99.5	100.5	101.5	102.6	103.3	103.0	101.0	99.5	98.1	96.9
200	0.55	97.6	98.7	99.7	100.8	101.8	102.6	102.8	102.0	100.7	98.7	97.2	96.1
29000 FT PRESS ALT			TAT (°C)										
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
320	0.82	93.8	94.8	95.8	96.8	97.8	98.7	99.7	100.6	101.6	100.1	98.9	97.8
280	0.73	96.6	97.6	98.6	99.6	100.6	101.6	102.6	102.5	101.0	99.5	98.1	97.1
240	0.63	98.1	99.2	100.2	101.3	102.3	103.3	103.1	101.6	99.8	98.4	97.1	96.0
200	0.53	98.6	99.7	100.7	101.7	102.7	103.2	102.7	101.2	99.4	97.7	96.3	96.2
27000 FT PRESS ALT			TAT (°C)										
KIAS	M	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15
360	0.88	90.2	91.2	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.2	98.1
320	0.79	93.4	94.4	95.3	96.3	97.3	98.2	99.2	100.1	101.1	100.6	99.2	98.1
280	0.70	95.4	96.4	97.4	98.4	99.4	100.4	101.3	102.3	101.3	99.7	98.2	97.1
240	0.60	97.2	98.2	99.2	100.3	101.3	102.3	103.0	102.0	99.9	98.5	97.2	96.2
200	0.51	98.4	99.4	100.4	101.5	102.5	103.2	102.7	101.8	99.9	98.1	96.5	95.6

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION		PRESSURE ALTITUDE (1000 FT)					
		37	35	33	31	29	27
ENGINE A/I ON		-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON		-0.4	-0.4	-0.4	-0.3	-0.3	-0.3
WING A/I ON - PACKS OFF		-0.6	-0.5	-0.5	-0.5	-0.5	-0.4

ENGINE INOP**Max Continuous %N1****Based on engine bleed for packs on or off and anti-ice off****25000 FT to 18000 FT Pressure Altitudes**

25000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.85	91.2	92.2	93.1	94.1	95.0	95.9	96.8	97.7	98.6	99.5	98.9	98.1
320	0.76	93.9	94.8	95.8	96.8	97.7	98.7	99.6	100.5	101.1	99.6	98.5	97.6
280	0.67	95.5	96.5	97.5	98.5	99.4	100.4	101.3	101.5	100.4	98.8	97.5	96.7
240	0.58	97.4	98.5	99.5	100.5	101.5	102.4	102.3	100.9	99.3	97.8	96.7	95.9
200	0.49	99.3	100.3	101.4	102.4	103.4	103.1	102.0	100.6	98.5	97.1	96.1	95.9
24000 FT PRESS ALT		TAT (°C)											
KIAS	M	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20
360	0.83	91.3	92.3	93.2	94.2	95.1	96.0	96.9	97.8	98.7	99.6	99.4	98.4
320	0.75	93.6	94.6	95.6	96.5	97.5	98.4	99.4	100.3	101.2	100.0	98.8	97.8
280	0.66	95.4	96.4	97.4	98.3	99.3	100.3	101.2	101.8	100.7	99.1	97.8	96.9
240	0.57	97.3	98.3	99.3	100.3	101.3	102.2	102.6	101.4	99.8	98.3	97.1	96.2
200	0.48	98.8	99.9	100.9	101.9	102.9	103.4	102.3	101.0	98.9	97.4	96.3	95.6
22000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.80	92.1	93.0	94.0	94.9	95.8	96.7	97.6	98.5	99.4	100.0	99.0	98.3
320	0.72	94.3	95.3	96.3	97.2	98.1	99.1	100.0	100.9	100.7	99.3	98.2	97.5
280	0.63	96.1	97.1	98.1	99.0	100.0	100.9	101.9	101.3	99.8	98.4	97.3	96.6
240	0.55	97.7	98.7	99.7	100.7	101.7	102.7	102.3	100.9	99.3	97.7	96.8	96.1
200	0.46	99.5	100.5	101.5	102.5	103.5	103.0	101.5	99.9	97.9	96.8	95.9	95.8
20000 FT PRESS ALT		TAT (°C)											
KIAS	M	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25
360	0.77	93.7	94.6	95.6	96.5	97.4	98.4	99.3	100.2	101.1	102.0	101.3	100.1
320	0.69	95.9	96.9	97.8	98.8	99.7	100.7	101.6	102.6	103.5	101.8	100.4	99.1
280	0.61	97.7	98.7	99.6	100.6	101.6	102.6	103.5	104.3	102.8	100.9	99.4	98.3
240	0.53	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.1	102.4	100.7	98.7	97.2
200	0.44	98.0	99.0	99.9	100.9	101.9	102.9	103.8	102.6	100.5	98.0	96.2	95.3
18000 FT PRESS ALT		TAT (°C)											
KIAS	M	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.75	94.4	95.4	96.3	97.2	98.2	99.1	100.0	100.9	101.8	102.0	100.6	99.4
320	0.67	96.7	97.7	98.6	99.6	100.5	101.4	102.4	103.3	102.9	101.2	99.7	98.6
280	0.59	98.5	99.5	100.5	101.5	102.4	103.4	104.3	104.0	102.3	100.4	98.9	97.8
240	0.51	99.6	100.6	101.6	102.6	103.6	104.5	104.9	103.9	101.9	100.0	98.4	97.2
200	0.42	97.2	98.2	99.2	100.1	101.1	101.9	102.0	100.8	98.8	97.3	95.8	94.4

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)				
	25	24	22	20	18
ENGINE A/I ON	-0.2	-0.2	-0.2	-0.2	-0.2
WING A/I ON - PACKS ON	-0.3	-0.3	-0.3	-0.2	-0.3
WING A/I ON - PACKS OFF	-0.4	-0.4	-0.4	-0.3	-0.5

ENGINE INOP**Max Continuous %N1**

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

16000 FT to 5000 FT Pressure Altitudes

16000 FT PRESS ALT			TAT (°C)											
KIAS	M		-25	-20	-15	-10	-5	0	5	10	15	20	25	30
360	0.72	94.8	95.8	96.7	97.6	98.6	99.5	100.4	101.3	102.2	103.1	101.7	100.2	
320	0.64	96.9	97.9	98.8	99.8	100.7	101.7	102.6	103.5	104.4	102.7	100.9	99.4	
280	0.57	98.7	99.7	100.7	101.6	102.6	103.5	104.5	105.4	104.1	102.2	100.3	98.8	
240	0.49	99.1	100.1	101.1	102.0	103.0	104.0	104.9	104.5	103.0	100.9	99.2	97.9	
200	0.41	96.2	97.2	98.1	99.1	100.0	100.9	101.5	101.3	99.8	98.3	97.0	95.4	
14000 FT PRESS ALT			TAT (°C)											
KIAS	M		-20	-15	-10	-5	0	5	10	15	20	25	30	35
360	0.69	94.9	95.9	96.8	97.7	98.6	99.5	100.4	101.3	102.2	102.2	100.8	99.5	
320	0.62	97.1	98.1	99.0	99.9	100.9	101.8	102.7	103.6	103.4	101.5	100.0	98.9	
280	0.54	99.2	100.1	101.1	102.1	103.0	103.9	104.9	104.9	103.0	101.0	99.5	98.4	
240	0.47	97.3	98.2	99.2	100.1	101.1	102.0	102.8	102.5	100.6	99.0	97.8	96.7	
200	0.39	96.1	97.0	98.0	98.9	99.8	100.7	101.4	100.7	99.0	97.6	96.5	95.6	
12000 FT PRESS ALT			TAT (°C)											
KIAS	M		-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.67	95.4	96.3	97.2	98.1	99.0	99.9	100.8	101.6	102.5	101.3	100.0	99.0	
320	0.60	97.3	98.2	99.2	100.1	101.0	101.9	102.8	103.7	102.3	100.6	99.4	98.4	
280	0.52	99.7	100.6	101.6	102.5	103.5	104.4	105.3	104.0	102.0	100.2	99.1	98.1	
240	0.45	96.5	97.4	98.3	99.3	100.2	101.1	101.4	100.6	99.2	98.0	96.9	96.0	
200	0.38	96.7	97.7	98.6	99.5	100.4	101.2	101.3	100.2	98.7	97.4	96.4	95.8	
10000 FT PRESS ALT			TAT (°C)											
KIAS	M		-15	-10	-5	0	5	10	15	20	25	30	35	40
360	0.65	94.2	95.2	96.1	96.9	97.8	98.7	99.6	100.4	101.3	101.5	100.2	99.1	
320	0.58	96.1	97.1	98.0	98.9	99.8	100.7	101.6	102.4	102.6	101.0	99.7	98.6	
280	0.51	98.5	99.4	100.4	101.3	102.2	103.1	104.0	104.6	102.3	100.5	99.4	98.4	
240	0.43	95.6	96.6	97.5	98.4	99.3	100.2	101.0	101.1	100.3	99.1	97.8	96.9	
200	0.36	96.6	97.5	98.4	99.3	100.2	101.1	101.6	101.2	100.1	98.5	97.5	96.6	
5000 FT PRESS ALT			TAT (°C)											
KIAS	M		-10	-5	0	5	10	15	20	25	30	35	40	45
360	0.59	92.6	93.5	94.3	95.2	96.0	96.9	97.7	98.5	99.4	100.2	99.3	98.5	
320	0.53	94.0	94.9	95.8	96.7	97.5	98.4	99.2	100.1	100.9	100.1	99.1	98.2	
280	0.46	95.0	95.9	96.8	97.6	98.5	99.4	100.2	101.1	100.9	99.8	98.8	97.8	
240	0.40	95.7	96.6	97.5	98.4	99.3	100.2	101.0	101.6	100.5	99.4	98.3	97.4	
200	0.33	97.0	97.9	98.8	99.7	100.6	101.5	102.4	101.7	100.3	99.1	98.1	97.3	

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION		PRESSURE ALTITUDE (1000 FT)					
		16	14	12	10	5	
ENGINE A/I ON		-0.3	-0.2	-0.4	-0.5	-0.5	
WING A/I ON - PACKS ON		-0.4	-0.5	-0.6	-0.7	-0.8	
WING A/I ON - PACKS OFF		-0.6	-0.7	-0.8	-0.9	-1.1	

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 LB)	LEVEL OFF	OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF PRESSURE ALTITUDE (FT)		
			ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
780	758	298	18000	16800	15600
740	720	290	19300	18200	17000
700	682	283	20500	19600	18500
660	642	275	21700	20900	20000
620	601	267	23200	22200	21200
580	562	258	25000	24000	22800
540	524	249	27000	26100	24700
500	485	241	29100	28400	27000
460	448	231	30900	30500	29400
420	409	221	32600	32300	31700
380	369	211	34400	34300	34000

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	
134	126	118	111	105	100	95	90	86	82	79	
269	251	236	222	210	200	190	181	173	165	159	
403	377	354	334	316	300	285	272	260	248	238	
536	502	472	445	421	400	380	362	346	332	318	
670	627	589	556	526	500	475	453	433	415	398	
803	752	707	667	632	600	571	544	520	498	478	
936	877	824	778	737	700	666	635	607	582	558	
1068	1001	942	889	842	800	761	726	695	665	639	
1201	1126	1059	1000	947	900	856	817	782	749	719	
1333	1250	1176	1111	1052	1000	952	908	869	833	799	
1466	1374	1293	1222	1157	1100	1047	1000	956	916	880	
1598	1499	1411	1332	1262	1200	1142	1091	1043	1000	960	
1731	1623	1528	1443	1368	1300	1238	1182	1131	1084	1040	
1863	1747	1645	1554	1473	1400	1333	1273	1218	1167	1121	
1996	1872	1762	1665	1578	1500	1428	1364	1305	1251	1201	
2129	1997	1880	1776	1683	1600	1524	1455	1392	1334	1281	
2262	2121	1997	1887	1788	1700	1619	1546	1479	1418	1361	
2395	2246	2115	1998	1894	1800	1714	1637	1566	1501	1441	

Driftdown/Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 LB)										TIME (HR:MIN)
	WEIGHT AT START OF DRIFTDOWN (1000 LB)										
	380	420	460	500	540	580	620	660	700	740	780
100	2.4	2.6	2.9	3.1	3.3	3.5	3.7	3.9	4.0	4.2	4.2
200	5.4	6.0	6.5	7.1	7.4	7.8	8.3	8.7	9.0	9.5	9.8
300	8.7	9.5	10.4	11.2	11.8	12.5	13.2	13.9	14.5	15.4	15.9
400	11.9	13.1	14.2	15.4	16.3	17.2	18.2	19.2	20.1	21.2	22.1
500	14.9	16.4	17.8	19.3	20.5	21.7	23.0	24.2	25.3	26.8	28.0
600	17.9	19.6	21.3	23.1	24.6	26.1	27.5	29.0	30.4	32.2	33.7
700	20.8	22.8	24.8	26.9	28.6	30.4	32.1	33.8	35.4	37.5	39.3
800	23.7	26.0	28.3	30.6	32.5	34.6	36.5	38.5	40.4	42.7	44.9
900	26.6	29.2	31.7	34.3	36.5	38.8	41.0	43.2	45.4	48.0	50.5
1000	29.5	32.3	35.1	37.9	40.4	42.9	45.4	47.9	50.3	53.2	56.0
1100	32.3	35.4	38.4	41.5	44.3	47.1	49.8	52.5	55.2	58.3	61.4
1200	35.1	38.5	41.8	45.1	48.1	51.2	54.1	57.1	60.1	63.5	66.8
1300	37.9	41.5	45.1	48.7	51.9	55.2	58.5	61.7	64.9	68.6	72.2
1400	40.7	44.6	48.4	52.2	55.7	59.3	62.8	66.2	69.7	73.6	77.5
1500	43.4	47.6	51.6	55.7	59.5	63.3	67.0	70.7	74.5	78.6	82.8
1600	46.1	50.5	54.9	59.2	63.2	67.3	71.3	75.2	79.2	83.6	88.1
1700	48.8	53.5	58.1	62.7	66.9	71.2	75.5	79.7	83.9	88.6	93.3
1800	51.5	56.4	61.2	66.1	70.6	75.2	79.6	84.1	88.6	93.5	98.5

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
780	15300	14000	12400
760	16000	14400	12900
740	16700	15200	13300
720	17500	16000	14200
700	18300	16800	15100
680	19100	17600	16000
660	20000	18500	16800
640	20500	19300	17700
620	21100	20100	18700
600	21700	20800	19700
580	22500	21400	20400
560	23400	22100	21100
540	24300	23100	21700
520	25400	24200	22600
500	26600	25300	23700
480	27900	26600	24900
460	29300	27900	26200
440	30400	29200	27600
420	31300	30400	29000
400	32200	31600	30400
380	33200	32700	31700
360	34200	33900	33000

With engine anti-ice on, no altitude capability adjustment is required.
With engine and wing anti-ice on, decrease altitude capability by 300 ft.

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
780	%N1 MACH KIAS FF/ENG	91.3 .602 334 22536	96.8 .664 337 24156								
740	%N1 MACH KIAS FF/ENG	90.4 .602 334 21826	95.1 .660 335 22989	97.9 .678 332 23330							
700	%N1 MACH KIAS FF/ENG	89.4 .599 333 21042	93.5 .649 329 21608	95.6 .665 325 21727	98.8 .684 322 22025						
660	%N1 MACH KIAS FF/ENG	87.7 .583 324 19683	91.9 .637 323 20284	93.6 .653 319 20323	96.1 .670 315 20423						
620	%N1 MACH KIAS FF/ENG	85.9 .567 315 18411	90.2 .621 315 18905	91.9 .641 313 19032	93.6 .657 309 19011	96.5 .675 305 19194					
580	%N1 MACH KIAS FF/ENG	84.1 .551 306 17177	88.4 .602 305 17504	90.1 .625 305 17683	91.8 .644 302 17733	93.7 .661 298 17760	96.8 .680 295 18050				
540	%N1 MACH KIAS FF/ENG	82.1 .534 296 15983	86.3 .582 294 16124	88.2 .605 295 16312	89.9 .627 294 16429	91.6 .646 292 16476	93.7 .663 288 16562	97.0 .683 285 16922			
500	%N1 MACH KIAS FF/ENG	80.1 .516 286 14812	84.1 .563 284 14796	86.0 .583 284 14951	87.8 .606 284 15098	89.5 .629 284 15202	91.2 .648 281 15263	93.5 .665 277 15363	97.0 .686 274 15748		
460	%N1 MACH KIAS FF/ENG	77.9 .498 276 13638	81.8 .543 274 13500	83.6 .563 273 13643	85.5 .583 273 13767	87.2 .607 273 13886	88.9 .630 272 13996	90.7 .649 272 14052	93.1 .666 266 14137	96.7 .688 264 14531	
420	%N1 MACH KIAS FF/ENG	75.5 .480 266 12483	79.3 .521 263 12254	81.2 .540 262 12367	82.9 .560 262 12495	84.8 .581 261 12575	86.5 .605 261 12676	88.2 .628 261 12787	90.0 .648 258 12829	92.4 .666 255 12899	96.1 .688 252 13288
380	%N1 MACH KIAS FF/ENG	73.1 .462 255 11350	76.7 .500 252 11040	78.5 .517 251 11139	80.3 .536 250 11257	82.0 .556 249 11323	83.8 .578 249 11376	85.6 .601 249 11460	87.3 .625 249 11565	89.1 .646 247 11610	91.5 .664 243 11661
340	%N1 MACH KIAS FF/ENG	70.3 .443 245 10261	73.9 .478 240 9890	75.7 .494 239 9952	77.4 .511 238 10062	79.1 .530 237 10110	80.8 .550 236 10131	82.5 .571 236 10176	84.3 .594 236 10235	86.1 .620 236 10339	88.0 .642 234 10404

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	
286	264	244	227	213	200	190	181	173	166	159	
569	525	487	454	425	400	381	364	348	333	320	
853	788	730	681	638	600	572	546	522	501	482	
1138	1051	974	908	851	800	763	729	698	669	643	
1424	1316	1219	1136	1064	1000	954	911	872	836	803	
1711	1580	1464	1364	1278	1200	1144	1093	1046	1003	964	
1999	1846	1709	1592	1491	1400	1335	1275	1220	1170	1124	
2288	2111	1954	1820	1704	1600	1526	1457	1394	1337	1285	
2578	2378	2201	2049	1918	1800	1717	1639	1568	1504	1445	
2869	2646	2447	2278	2132	2000	1907	1821	1742	1670	1605	

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	9.2	0:38	8.1	0:37	7.3	0:36	6.5	0:35	6.1	0:34
400	19.3	1:12	17.7	1:09	16.5	1:06	15.6	1:04	15.3	1:02
600	29.2	1:46	27.2	1:41	25.7	1:37	24.5	1:34	24.4	1:30
800	39.0	2:21	36.6	2:14	34.7	2:07	33.2	2:03	33.3	1:58
1000	48.7	2:56	45.9	2:47	43.7	2:38	41.9	2:33	42.1	2:26
1200	58.4	3:31	55.1	3:20	52.6	3:09	50.5	3:03	50.7	2:55
1400	67.9	4:06	64.2	3:53	61.4	3:41	59.0	3:33	59.2	3:24
1600	77.4	4:41	73.2	4:27	70.1	4:12	67.4	4:03	67.6	3:53
1800	86.8	5:17	82.1	5:01	78.6	4:44	75.6	4:33	75.8	4:22
2000	96.1	5:53	90.9	5:35	87.2	5:16	83.8	5:03	84.0	4:51

Fuel Required Adjustment (1000 LB)

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)								
	400	450	500	550	600	650	700	750	800
10	-1.7	-1.3	-0.8	-0.4	0.0	0.8	1.8	2.9	4.2
20	-3.7	-2.7	-1.8	-0.9	0.0	1.8	3.9	6.3	9.0
30	-5.7	-4.2	-2.7	-1.4	0.0	2.8	6.0	9.6	13.7
40	-7.7	-5.7	-3.7	-1.9	0.0	3.8	8.0	12.8	18.1
50	-9.8	-7.2	-4.7	-2.4	0.0	4.7	10.0	15.9	22.4
60	-11.8	-8.7	-5.7	-2.8	0.0	5.6	11.9	18.9	26.6
70	-13.9	-10.2	-6.7	-3.3	0.0	6.5	13.7	21.8	30.6
80	-15.9	-11.7	-7.7	-3.8	0.0	7.3	15.5	24.5	34.5
90	-18.0	-13.2	-8.7	-4.3	0.0	8.1	17.2	27.2	38.1
100	-20.1	-14.8	-9.7	-4.8	0.0	8.9	18.8	29.7	41.7

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
800 FF/ENG	%N1 KIAS 20620	81.3 273 20800	84.8 275 21460	89.5 276 23060	94.9		
	%N1 KIAS 19500	79.7 266 19610	83.0 268 20160	87.8 269 21200	92.7		
	%N1 KIAS 18410	78.2 259 18460	81.2 260 18870	86.1 261 19520	90.8 271 22300	99.6	
760 FF/ENG	%N1 KIAS 17340	76.5 252 17340	79.4 253 17340	84.3 254 17630	88.9 256 18000	96.1 286 20240	
	%N1 KIAS 16280	74.7 245 16250	77.7 245 16430	82.3 246 16710	87.1 248 18210	92.7 267	
	%N1 KIAS 15240	72.9 236 15180	75.8 237 15250	80.2 238 15440	85.1 239 15440	90.3 251 16560	
640 FF/ENG	%N1 KIAS 14210	70.9 231 14140	73.8 231 14130	78.1 231 14260	83.0 231 15010	88.0 234 16930	96.0
	%N1 KIAS 13210	68.8 225 13140	71.9 225 13070	76.0 225 13140	80.8 225 13740	85.8 225 14810	91.6
	%N1 KIAS 12240	66.7 220 12170	69.6 220 12060	73.8 220 12090	78.3 220 12540	83.5 220 13170	88.4 224 15210
440 FF/ENG	%N1 KIAS 11280	64.6 213 11200	67.3 213 11070	71.6 213 11080	75.9 213 11390	80.8 213 11800	85.7 213 13060
	%N1 KIAS 10360	62.4 207 10250	65.0 207 10130	69.1 207 10120	73.4 207 10320	78.1 207 10640	83.2 207 11140
	%N1 KIAS 9480	60.0 200 9350	62.6 200 9220	66.4 200 9210	70.7 200 9310	75.3 200 9520	80.3 200 9830

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

ENGINE INOP

ADVISORY INFORMATION

Gear Down Landing Rate of Climb Available

Flaps 20

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	430	320				
50	480	370	210			
48	530	420	270			
46	570	470	320	160		
44	620	530	370	210		
42	670	570	410	250	90	
40	710	620	460	290	120	
38	740	670	510	330	150	
36	740	710	540	370	180	-20
34	740	760	580	400	210	0
32	750	760	610	440	240	30
30	750	770	640	460	280	60
20	770	780	650	510	350	170
10	790	800	600	420	260	130
0	810	810	590	360	130	-110
-20	840	850	610	370	130	-110
-40	880	880	640	390	140	-120

Rate of climb capability shown is valid for 500000 lb, gear down at VREF20 + 5.

Decrease rate of climb 30 ft/min per 10000 lb greater than 500000 lb.

Increase rate of climb 40 ft/min per 10000 lb less than 500000 lb.

Flaps 30

TAT (°C)	RATE OF CLIMB (FT/MIN)					
	PRESSURE ALTITUDE (FT)					
	-2000	0	2000	4000	6000	8000
52	-140	-250				
50	-100	-210	-360			
48	-60	-160	-320			
46	-10	-120	-270	-420		
44	30	-70	-220	-380		
42	70	-30	-180	-340	-500	
40	100	20	-150	-310	-470	
38	140	60	-110	-280	-450	
36	140	100	-70	-250	-420	-620
34	140	130	-40	-210	-400	-600
32	140	150	-10	-180	-370	-580
30	140	150	10	-160	-340	-550
20	150	150	20	-120	-270	-460
10	160	160	0	-150	-300	-660
0	160	160	-50	-270	-500	-730
-20	170	170	-60	-280	-510	-750
-40	180	170	-60	-300	-530	-780

Rate of climb capability shown is valid for 500000 lb, gear down at VREF30 + 5.

Decrease rate of climb 30 ft/min per 10000 lb greater than 500000 lb.

Increase rate of climb 40 ft/min per 10000 lb less than 500000 lb.

DRAFT

Intentionally
Blank

Performance Inflight**Alternate Mode EEC****Chapter PI****Section 64****ALTERNATE MODE EEC****Alternate Mode EEC Max Takeoff %N1**

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

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (1000 FT)											
°C	°F	-2	-1	0	1	2	3	4	5	6	7	8	8.4
55	131	94.3	96.7	97.0	96.7	96.5	96.6	96.4	96.3	96.1	95.5	94.6	94.2
50	122	95.7	98.1	98.6	98.2	97.9	97.9	97.8	97.6	97.4	96.8	95.9	95.6
45	113	97.2	99.6	100.1	99.8	99.4	99.3	99.1	98.9	98.8	98.2	97.3	96.9
40	104	98.9	101.2	101.9	101.4	101.0	100.8	100.6	100.4	100.0	99.4	98.6	98.2
35	95	100.9	102.7	104.7	104.2	103.1	102.6	102.1	101.7	101.1	100.4	99.6	99.3
30	86	100.5	103.7	106.9	106.4	105.6	105.0	104.3	103.7	102.6	101.5	100.7	100.3
25	77	99.7	102.8	106.0	106.7	107.3	107.2	106.7	106.5	105.3	103.8	102.4	101.8
20	68	98.8	101.9	105.1	105.8	106.4	106.8	107.1	107.5	106.8	105.9	104.8	104.3
15	59	98.0	101.1	104.2	104.9	105.5	105.8	106.2	106.5	106.4	106.1	105.6	105.3
10	50	97.1	100.2	103.3	104.0	104.6	104.9	105.3	105.6	105.5	105.2	104.9	104.8
5	41	96.3	99.3	102.4	103.0	103.7	104.0	104.3	104.7	104.5	104.2	104.0	103.8
0	32	95.4	98.4	101.4	102.1	102.7	103.1	103.4	103.7	103.6	103.3	103.0	102.9
-10	14	93.6	96.6	99.6	100.2	100.8	101.2	101.5	101.8	101.7	101.4	101.1	101.0
-20	-4	91.8	94.7	97.7	98.3	98.9	99.2	99.5	99.9	99.7	99.5	99.2	99.0
-30	-22	90.0	92.8	95.7	96.3	96.9	97.2	97.5	97.9	97.7	97.5	97.2	97.1
-40	-40	88.1	90.9	93.7	94.3	94.9	95.2	95.5	95.8	95.7	95.4	95.2	95.0
-50	-58	86.2	88.9	91.7	92.3	92.9	93.1	93.4	93.8	93.6	93.4	93.1	93.0

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (1000 FT)											
	-2	-1	0	1	2	3	4	5	6	7	8	8.4
PACKS OFF	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3
WING ANTI-ICE ON	-0.2	-0.3	-0.4	-0.5	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

DRAFT

Intentionally
Blank

Performance Inflight**Gear Down****Chapter PI****Section 65****GEAR DOWN****220 KIAS Max Climb %N1**

TAT (°C)	PRESSURE ALTITUDE (1000 FT)														
	0	5	10	12	14	16	18	20	22	24	26	28	30	32	34
55	88.2	88.3	91.4	91.1	92.1	91.3	94.0	95.2	95.4	98.1	99.9	101.1	102.4	102.9	103.4
50	89.5	88.8	90.7	90.4	91.4	92.1	93.3	94.5	94.7	97.3	99.2	100.3	101.6	102.1	102.6
45	90.5	90.1	90.0	89.7	90.7	91.4	92.6	93.8	93.9	96.6	98.4	99.6	100.8	101.3	101.8
40	91.6	91.2	91.2	89.7	89.9	90.7	91.9	93.0	93.2	95.8	97.6	98.8	100.0	100.5	101.0
35	92.6	92.3	92.2	92.1	90.6	89.9	91.1	92.3	92.5	95.0	96.8	98.0	99.2	99.7	100.2
30	93.0	93.2	93.2	93.0	92.2	91.2	90.9	91.5	91.7	94.3	96.0	97.2	98.4	98.9	99.4
25	92.2	94.2	94.1	94.0	93.7	92.8	92.1	92.0	91.1	93.5	95.2	96.4	97.6	98.0	98.5
20	91.4	94.2	95.1	95.0	94.9	94.4	93.4	93.0	92.8	93.6	94.4	95.6	96.8	97.2	97.7
15	90.7	93.4	96.7	96.4	96.3	96.1	94.8	94.1	94.5	94.8	95.2	95.3	96.0	96.4	96.9
10	89.9	92.6	96.3	97.9	98.1	98.1	96.8	95.5	96.5	96.2	96.4	96.6	96.1	96.0	
5	89.1	91.7	95.4	97.1	98.9	100.3	99.0	97.9	98.2	97.8	97.8	97.9	97.9	97.3	96.8
0	88.3	90.9	94.6	96.2	98.0	100.1	100.8	100.3	100.1	99.7	99.4	99.4	99.5	98.6	98.1
-5	87.4	90.1	93.7	95.3	97.1	99.1	99.9	100.8	101.9	101.5	101.1	101.1	101.1	100.2	99.6
-10	86.6	89.2	92.8	94.4	96.1	98.2	98.9	99.8	101.4	102.8	102.6	102.6	103.0	101.6	100.8
-15	85.8	88.4	91.9	93.5	95.2	97.3	98.0	98.9	100.4	101.8	102.5	103.2	103.8	102.5	101.4
-20	85.0	87.5	91.1	92.6	94.3	96.3	97.0	97.9	99.4	100.8	101.5	102.2	103.3	102.4	101.3

%N1 Adjustments for Engine Bleed

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)							
	0	5	10	15	20	25	30	35
2 PACKS ON - 1 BLEED SOURCE	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
1 PACK ON - 1 OR 2 BLEED SOURCES	-0.4	-0.5	-0.4	-0.3	-0.2	-0.3	-0.3	-0.4
ENGINE ANTI-ICE ON	-0.3	-0.5	-0.4	-0.3	-0.1	-0.2	-0.2	-0.2
ENGINE & WING ANTI-ICE ON*	-0.6	-0.8	-0.7	-0.5	-0.2	-0.3	-0.3	-0.4
ENGINE & WING ANTI-ICE ON**	-1.1	-0.9	-0.9	-0.6	-0.3	-0.4	-0.5	-0.5

*Packs on or off with 2 bleed sources.

**Packs off with 1 bleed source.

GEAR DOWN**Long Range Cruise Altitude Capability****Max Climb Thrust, 300 ft/min residual rate of climb**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
780	18600	16600	14200
760	19100	17200	14800
740	19700	17900	15500
720	20200	18500	16100
700	21000	19400	17100
680	21900	20400	18200
660	22900	21500	19400
640	23900	22500	20600
620	25000	23500	21900
600	25900	24600	23000
580	27000	25700	24200
560	28000	27000	25400
540	29100	28200	26700
520	30100	29500	28000
500	30900	30500	29300
480	31600	31300	30500
460	32400	32200	31500
440	33300	33100	32600
420	34100	33900	33600
400	34900	34800	34600
380	35800	35700	35600
360	36700	36600	36400

GEAR DOWN**Long Range Cruise Control**

WEIGHT (1000 LB)	%NI	PRESSURE ALTITUDE (1000 FT)								
		10	15	17	19	21	23	25	27	29
800	MACH	.84.9	.89.2	.91.3	.93.9					
	KIAS	.488	.535	.556	.578					
	FF/ENG	.270	.270	.270	.270					
	16879	17230	17550	18041						
760	MACH	.84.0	.88.3	.90.3	.92.5					
	KIAS	.488	.535	.556	.578					
	FF/ENG	.270	.270	.270	.270					
	16350	16643	16893	17295						
720	MACH	.83.2	.87.5	.89.4	.91.4	.94.2				
	KIAS	.488	.535	.556	.578	.600				
	FF/ENG	.270	.270	.270	.270	.270				
	15899	16146	16324	16639	17073					
680	MACH	.81.4	.85.8	.87.8	.89.6	.91.8				
	KIAS	.475	.521	.542	.564	.587				
	FF/ENG	.263	.263	.263	.263	.264				
	14938	15104	15281	15498	15865					
640	MACH	.79.5	.83.9	.86.0	.87.8	.89.7	.92.1			
	KIAS	.461	.506	.526	.548	.570	.594			
	FF/ENG	.255	.255	.255	.255	.256	.256			
	13989	14087	14216	14393	14638	14997				
600	MACH	.77.6	.82.1	.84.1	.86.0	.87.7	.89.7	.92.5		
	KIAS	.447	.491	.511	.531	.553	.576	.600		
	FF/ENG	.247	.247	.247	.247	.248	.248	.248		
	13042	13113	13185	13337	13490	13756	14123			
560	MACH	.75.5	.80.0	.82.0	.84.0	.85.8	.87.6	.89.6	.92.7	
	KIAS	.433	.475	.494	.514	.535	.557	.581	.606	
	FF/ENG	.239	.239	.239	.239	.239	.240	.240	.240	
	12107	12162	12207	12291	12445	12584	12856	13237		
520	MACH	.73.3	.77.8	.79.8	.81.8	.83.7	.85.4	.87.3	.89.4	.92.8
	KIAS	.418	.459	.477	.496	.516	.538	.560	.584	.610
	FF/ENG	.231	.231	.231	.231	.231	.231	.231	.232	.232
	11193	11213	11263	11306	11394	11539	11679	11939	12332	
480	MACH	.71.1	.75.5	.77.4	.79.4	.81.3	.83.2	.85.0	.86.8	.89.1
	KIAS	.402	.442	.459	.478	.497	.517	.539	.562	.587
	FF/ENG	.222	.222	.222	.222	.222	.222	.222	.223	.223
	10294	10279	10324	10368	10407	10495	10627	10769	11006	11406
440	MACH	.68.6	.73.1	.75.0	.76.8	.78.9	.80.7	.82.7	.84.4	.86.2
	KIAS	.387	.425	.442	.460	.478	.498	.519	.540	.563
	FF/ENG	.213	.213	.213	.213	.213	.213	.213	.213	.214
	9429	9422	9440	9486	9514	9547	9627	9739	9856	10065
400	MACH	.66.5	.71.0	.72.8	.74.7	.76.7	.78.7	.80.4	.82.3	.84.0
	KIAS	.375	.413	.429	.446	.465	.484	.504	.525	.548
	FF/ENG	.207	.207	.207	.207	.207	.207	.207	.207	.207
	8736	8731	8729	8756	8786	8810	8845	8930	9028	9136
360	MACH	.64.3	.68.7	.70.5	.72.3	.74.4	.76.4	.78.2	.79.9	.81.8
	KIAS	.363	.399	.415	.432	.450	.468	.488	.508	.530
	FF/ENG	.200	.200	.200	.200	.200	.200	.200	.200	.200
	8041	8029	8026	8031	8049	8072	8095	8137	8220	8303

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	
316	284	257	235	216	200	189	180	171	162	155	
634	570	515	470	433	400	379	359	341	326	312	
956	859	774	706	650	600	568	539	512	489	468	
1282	1149	1035	943	867	800	757	718	683	651	623	
1610	1442	1297	1180	1084	1000	947	898	853	813	778	
1942	1737	1560	1419	1302	1200	1136	1077	1024	976	933	
2276	2034	1825	1658	1520	1400	1325	1256	1193	1137	1087	
2614	2333	2091	1898	1739	1600	1514	1434	1362	1298	1241	
2954	2634	2358	2138	1958	1800	1702	1613	1531	1459	1394	
3297	2936	2626	2379	2176	2000	1891	1791	1701	1619	1547	
3642	3240	2894	2620	2396	2200	2080	1969	1869	1780	1700	
3991	3546	3164	2862	2615	2400	2268	2147	2037	1939	1852	
4342	3853	3435	3104	2835	2600	2456	2324	2205	2098	2004	
4697	4164	3707	3347	3055	2800	2644	2502	2373	2258	2156	
5054	4476	3981	3591	3275	3000	2832	2679	2541	2416	2307	
5414	4789	4255	3836	3495	3200	3020	2856	2708	2575	2458	
5778	5105	4531	4081	3716	3400	3208	3033	2875	2734	2609	
6146	5424	4808	4326	3937	3600	3396	3210	3041	2891	2759	
6516	5744	5086	4572	4159	3800	3584	3386	3208	3049	2909	
6889	6066	5365	4819	4380	4000	3772	3564	3375	3207	3059	

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	15.5	0:49	14.1	0:47	12.4	0:44	11.4	0:42	10.6	0:40
400	31.3	1:36	29.1	1:31	26.2	1:24	24.6	1:20	23.3	1:15
600	47.2	2:24	44.0	2:16	40.0	2:04	37.8	1:57	36.1	1:51
800	62.4	3:12	58.4	3:02	53.3	2:46	50.5	2:36	48.3	2:27
1000	77.7	4:01	72.9	3:47	66.7	3:27	63.2	3:15	60.5	3:03
1200	92.4	4:51	86.8	4:34	79.6	4:10	75.4	3:55	72.2	3:40
1400	107.2	5:41	100.8	5:21	92.5	4:52	87.7	4:34	84.0	4:17
1600	121.4	6:32	114.3	6:08	105.0	5:35	99.5	5:14	95.4	4:55
1800	135.6	7:23	127.8	6:56	117.5	6:18	111.4	5:55	106.8	5:32
2000	149.4	8:15	140.8	7:45	129.6	7:02	122.9	6:36	117.8	6:10
2200	163.1	9:07	153.9	8:34	141.7	7:46	134.4	7:17	128.8	6:49
2400	176.4	10:01	166.5	9:23	153.4	8:31	145.6	7:58	139.5	7:28
2600	189.6	10:54	179.1	10:13	165.0	9:16	156.7	8:40	150.1	8:07
2800	202.5	11:49	191.2	11:04	176.4	10:02	167.5	9:23	160.4	8:46
3000	215.3	12:44	203.4	11:55	187.7	10:47	178.3	10:05	170.7	9:26
3200	227.7	13:40	215.1	12:47	198.7	11:34	188.7	10:49	180.7	10:06
3400	240.1	14:36	226.9	13:39	209.6	12:21	199.2	11:32	190.7	10:46
3600	252.1	15:33	238.3	14:32	220.3	13:08	209.3	12:16	200.3	11:27
3800	264.1	16:30	249.6	15:26	230.9	13:56	219.4	13:00	210.0	12:08
4000	275.9	17:28	260.7	16:20	241.3	14:44	229.3	13:45	219.4	12:50

GEAR DOWN**Long Range Cruise Enroute Fuel and Time
Fuel Required Adjustment (1000 LB)**

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)							
	350	400	450	500	550	600	650	700
20	-2.9	-2.0	-1.1	0.0	1.7	4.0	6.6	9.5
40	-6.3	-4.3	-2.2	0.0	3.2	7.4	12.3	18.0
60	-9.7	-6.5	-3.3	0.0	4.7	10.7	17.8	25.9
80	-12.9	-8.7	-4.4	0.0	6.2	13.9	22.9	33.3
100	-16.1	-10.8	-5.5	0.0	7.6	16.8	27.7	40.2
120	-19.2	-12.9	-6.5	0.0	8.9	19.7	32.2	46.5
140	-22.2	-15.0	-7.6	0.0	10.2	22.3	36.3	52.3
160	-25.2	-17.0	-8.6	0.0	11.5	24.8	40.2	57.6
180	-28.0	-19.0	-9.6	0.0	12.7	27.2	43.7	62.3
200	-30.8	-20.9	-10.6	0.0	13.8	29.4	46.9	66.5
220	-33.5	-22.8	-11.6	0.0	14.9	31.5	49.8	70.1
240	-36.2	-24.7	-12.6	0.0	16.0	33.4	52.3	73.3
260	-38.7	-26.5	-13.6	0.0	17.0	35.1	54.5	75.8
280	-41.2	-28.2	-14.5	0.0	17.9	36.7	56.4	77.9

Based on Long Range Cruise and VREF30+80 descent.

Descent at VREF30+80

PRESSURE ALTITUDE (1000 FT)	17	19	21	23	25	27	29	31	33	35
DISTANCE (NM)	35	39	43	48	52	56	60	64	69	73
TIME (MINUTES)	11	12	12	13	14	15	15	16	17	17

GEAR DOWN**Holding
Flaps Up**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)						
	1500	5000	10000	15000	20000	25000	30000
800	%N1	76.4					
	KIAS	262					
	FF/ENG	17280					
760	%N1	75.4	78.5				
	KIAS	262	262				
	FF/ENG	16690	16710				
720	%N1	73.9	76.9				
	KIAS	256	256				
	FF/ENG	15790	15760				
680	%N1	72.1	75.1	79.6			
	KIAS	248	248	248			
	FF/ENG	14820	14790	14740			
640	%N1	70.2	73.3	77.7			
	KIAS	241	241	241			
	FF/ENG	13860	13840	13780			
600	%N1	68.5	71.7	76.1			
	KIAS	236	236	236			
	FF/ENG	13050	13040	12960			
560	%N1	66.9	69.9	74.3	78.9		
	KIAS	231	231	231	231		
	FF/ENG	12270	12260	12180	12240		
520	%N1	65.3	68.1	72.5	77.1	81.9	
	KIAS	225	225	225	225	225	
	FF/ENG	11520	11490	11400	11430	11550	
480	%N1	63.6	66.3	70.7	75.2	80.0	
	KIAS	220	220	220	220	220	
	FF/ENG	10800	10750	10660	10660	10770	
440	%N1	61.7	64.5	68.6	73.1	77.8	82.7
	KIAS	213	213	213	213	213	213
	FF/ENG	10080	10000	9900	9890	9980	10110
400	%N1	59.8	62.5	66.5	71.0	75.6	80.4
	KIAS	207	207	207	207	207	207
	FF/ENG	9380	9290	9170	9170	9210	9290
360	%N1	57.7	60.4	64.3	68.7	73.3	78.2
	KIAS	200	200	200	200	200	200
	FF/ENG	8670	8580	8440	8430	8440	8500

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

GEAR DOWN**Holding
Flaps 1**

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)				
	1500	5000	10000	15000	20000
800	%N1	76.0	79.1	84.0	88.5
	KIAS	242	242	242	242
	FF/ENG	16960	17050	17030	17300
760	%N1	74.9	78.0	82.7	87.3
	KIAS	242	242	242	242
	FF/ENG	16320	16370	16340	16570
720	%N1	73.3	76.4	80.9	85.7
	KIAS	236	236	236	236
	FF/ENG	15370	15390	15380	15540
680	%N1	71.5	74.5	78.9	83.9
	KIAS	228	228	228	228
	FF/ENG	14380	14390	14380	14500
640	%N1	69.4	72.6	77.0	81.9
	KIAS	221	221	221	221
	FF/ENG	13410	13410	13390	13510
600	%N1	67.6	70.8	75.2	79.9
	KIAS	216	216	216	216
	FF/ENG	12590	12580	12530	12660
560	%N1	65.9	68.9	73.3	77.9
	KIAS	211	211	211	211
	FF/ENG	11790	11760	11700	11810
520	%N1	64.1	66.9	71.3	75.8
	KIAS	205	205	205	205
	FF/ENG	11000	10950	10880	10950
480	%N1	62.2	64.9	69.3	73.8
	KIAS	200	200	200	200
	FF/ENG	10250	10170	10090	10130
440	%N1	60.1	62.8	66.9	71.4
	KIAS	193	193	193	193
	FF/ENG	9480	9380	9290	9300
400	%N1	57.9	60.7	64.6	69.1
	KIAS	187	187	187	187
	FF/ENG	8740	8640	8520	8500
360	%N1	55.6	58.2	62.2	66.4
	KIAS	180	180	180	180
	FF/ENG	8010	7900	7760	7710

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

DRAFT

Intentionally
Blank

Performance Inflight

Gear Down, Engine INOP

Chapter PI

Section 66

GEAR DOWN

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

Includes APU fuel burn

WEIGHT (1000 LB)	VREF30 + 80 DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
		ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
700	674	253	5200	4000
660	635	246	7100	6200
620	596	239	9100	8400
580	557	232	10900	10200
540	519	227	12700	12100
500	480	222	14500	14000
460	442	216	16500	15900
420	404	210	18600	18200
380	366	203	20800	20500
				19700

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
740	800		
720	2200		
700	3600	1100	
680	4600	2700	
660	5600	4200	1400
640	6600	5400	3200
620	7600	6700	4800
600	8700	7900	6300
580	9700	9000	7900
560	10700	10100	9000
540	11700	11000	9900
520	12700	12000	10900
500	13600	13000	11800
480	14500	14000	12900
460	15500	15100	14000
440	16600	16000	15100
420	17700	17000	16100
400	18800	18400	17200
380	20000	19800	18700
360	21200	20800	20100

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
680	%N1	97.1						
	MACH	.418						
	KIAS	253						
	FF/ENG	29597						
640	%N1	94.7	97.1					
	MACH	.407	.421					
	KIAS	246	246					
	FF/ENG	27548	27915					
600	%N1	92.6	94.4	97.1				
	MACH	.395	.409	.423				
	KIAS	239	239	238				
	FF/ENG	25711	25775	26281				
560	%N1	90.5	92.1	94.1	97.1			
	MACH	.383	.396	.410	.425			
	KIAS	232	231	231	231			
	FF/ENG	23975	23881	24040	24623			
520	%N1	88.5	90.1	91.9	94.1	97.5		
	MACH	.372	.386	.400	.415	.431		
	KIAS	225	225	225	225	225		
	FF/ENG	22233	22269	22345	22621	23249		
480	%N1	86.4	88.2	89.8	91.7	94.1	97.9	
	MACH	.363	.376	.391	.405	.421	.437	
	KIAS	220	220	220	220	220	220	
	FF/ENG	20677	20727	20792	20944	21208	21887	
440	%N1	84.0	85.9	87.7	89.4	91.3	93.8	97.9
	MACH	.353	.366	.380	.394	.409	.425	.442
	KIAS	213	213	213	213	213	213	
	FF/ENG	19092	19110	19166	19293	19457	19720	20473
400	%N1	81.5	83.5	85.3	87.2	89.0	90.9	93.5
	MACH	.342	.355	.368	.382	.397	.413	.429
	KIAS	207	207	207	207	207	207	207
	FF/ENG	17577	17577	17585	17695	17852	18003	18297
360	%N1	78.9	80.7	82.7	84.6	86.5	88.3	90.2
	MACH	.331	.343	.356	.370	.384	.399	.415
	KIAS	200	200	200	200	200	200	200
	FF/ENG	16044	16055	16035	16082	16230	16375	16525
								16831

GEAR DOWN
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	
165	145	129	117	108	100	93	87	81	77	73	
332	295	263	238	218	200	187	175	165	156	148	
500	444	396	358	327	300	281	263	247	234	222	
669	593	528	477	436	400	374	350	329	311	295	
839	743	662	597	545	500	467	438	411	388	368	
1009	894	795	718	655	600	561	525	494	466	442	
1180	1044	928	838	764	700	654	612	575	543	515	
1351	1196	1063	958	874	800	747	700	657	620	588	
1523	1347	1197	1079	983	900	840	787	739	697	661	
1696	1499	1331	1199	1093	1000	933	874	820	773	733	

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	6		8		10		12		14	
	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)
100	8.6	0:27	8.1	0:27	7.6	0:26	7.2	0:26	6.9	0:25
200	17.4	0:52	16.7	0:51	16.0	0:50	15.4	0:49	15.0	0:47
300	26.2	1:18	25.2	1:15	24.3	1:13	23.6	1:11	23.1	1:10
400	34.9	1:43	33.7	1:40	32.6	1:37	31.7	1:35	31.1	1:32
500	43.4	2:08	42.0	2:05	40.8	2:01	39.7	1:58	39.0	1:54
600	52.0	2:34	50.3	2:29	48.8	2:25	47.6	2:21	46.8	2:17
700	60.4	3:00	58.5	2:54	56.9	2:49	55.4	2:45	54.5	2:40
800	68.7	3:25	66.6	3:20	64.8	3:14	63.2	3:08	62.1	3:03
900	76.9	3:51	74.7	3:45	72.6	3:38	70.9	3:32	69.6	3:26
1000	85.1	4:18	82.6	4:10	80.4	4:03	78.5	3:56	77.0	3:49

GEAR DOWN**ENGINE INOP****MAX CONTINUOUS THRUST****Long Range Cruise Diversion Fuel and Time****Fuel Required Adjustment (1000 LB)**

REFERENCE FUEL REQUIRED (1000 LB)	WEIGHT AT CHECK POINT (1000 LB)							
	350	400	450	500	550	600	650	700
15	-2.5	-1.7	-0.8	0.0	1.6	3.3	5.2	7.3
20	-3.4	-2.3	-1.1	0.0	2.1	4.4	7.0	9.9
25	-4.3	-2.8	-1.4	0.0	2.6	5.5	8.8	12.5
30	-5.2	-3.4	-1.7	0.0	3.0	6.5	10.5	14.9
35	-6.0	-4.0	-2.0	0.0	3.5	7.6	12.2	17.4
40	-6.9	-4.6	-2.3	0.0	3.9	8.5	13.8	19.7
45	-7.8	-5.2	-2.6	0.0	4.4	9.5	15.4	22.0
50	-8.7	-5.8	-2.9	0.0	4.8	10.4	16.9	24.3
55	-9.6	-6.4	-3.2	0.0	5.2	11.3	18.4	26.5
60	-10.5	-7.0	-3.5	0.0	5.6	12.2	19.9	28.6
65	-11.4	-7.6	-3.8	0.0	6.0	13.1	21.3	30.7
70	-12.3	-8.2	-4.0	0.0	6.3	13.9	22.7	32.7
75	-13.1	-8.7	-4.3	0.0	6.7	14.7	24.0	34.6
80	-14.0	-9.3	-4.6	0.0	7.0	15.4	25.3	36.5
85	-14.9	-9.9	-4.9	0.0	7.3	16.1	26.5	38.4
90	-15.8	-10.5	-5.2	0.0	7.6	16.8	27.7	40.1

Based on Long Range Cruise and VREF30+80 descent. Includes APU fuel burn.

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GEAR DOWN
ENGINE INOP
MAX CONTINUOUS THRUST

Holding
Flaps Up

WEIGHT (1000 LB)	PRESSURE ALTITUDE (FT)			
	1500	5000	10000	15000
760 %N1	96.6			
760 KIAS	262			
760 FF/ENG	34160			
720 %N1	94.7			
720 KIAS	256			
720 FF/ENG	32150			
680 %N1	92.8	96.4		
680 KIAS	248	248		
680 FF/ENG	30210	30360		
640 %N1	90.8	94.0		
640 KIAS	241	241		
640 FF/ENG	28280	28220		
600 %N1	89.1	92.1	98.5	
600 KIAS	236	236	236	
600 FF/ENG	26550	26560	27770	
560 %N1	87.2	90.3	95.3	
560 KIAS	231	231	231	
560 FF/ENG	24850	25010	25470	
520 %N1	85.2	88.5	92.8	
520 KIAS	225	225	225	
520 FF/ENG	23170	23340	23590	
480 %N1	83.0	86.4	90.7	97.9
480 KIAS	220	220	220	220
480 FF/ENG	21570	21710	21890	22980
440 %N1	80.7	84.0	88.5	93.8
440 KIAS	213	213	213	213
440 FF/ENG	19930	20050	20190	20710
400 %N1	78.4	81.5	86.3	90.9
400 KIAS	207	207	207	207
400 FF/ENG	18360	18460	18510	18900
360 %N1	76.0	78.9	83.6	88.3
360 KIAS	200	200	200	200
360 FF/ENG	16800	16850	16850	17190

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

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Performance Inflight**Text****Chapter PI****Section 67****Introduction**

This chapter contains information to supplement performance data from the Flight Management Computer. 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 Flight Manual, the Flight Manual shall always take precedence.

General**FMC Takeoff Speeds**

FMC computed takeoff speeds can be used for all performance conditions except where adjustments must be made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, unbalanced for brake energy or obstacle clearance with unbalanced V1. 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 may not help this condition as the minimum control speeds are determined at the actual temperature and therefore are not reduced.

Clearway and Stopway V1 Adjustments

Takeoff speed corrections are to be applied to V1 when using takeoff weights based on the use of clearway and stopway.

Adjust V1 by the amount shown in the table. The adjusted V1 must not exceed VR. If V1 is greater than VR, VR may be increased to equal V1. The resultant V2 will be increased by the same amount that VR was increased.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

VREF Speeds

This table contains flaps 30, 25 and 20 reference speeds for a given weight.

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

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water or ice. Therefore, reductions in runway/obstacle limited takeoff weight and revised takeoff speeds are necessary. The tables are intended for guidance in accordance with advisory material and assume an engine failure at the critical point during the takeoff.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common. Takeoffs in slush depths greater than 13mm (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 is determined as follows:

- (1) Determine the dry field/obstacle limit weight for the takeoff flap setting.
- (2) 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.
- (3) Adjust field length available for temperature by amount shown on chart.

- (4) Enter the V1(MCG) Limit Weight table with the field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in steps 2 and 4.

Takeoff speed determination:

- (1) Determine takeoff speeds V1, VR and V2 for actual brake release weight using Takeoff Speeds from the Performance Dispatch chapter or from the FMC.
- (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

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. Good reported braking action denotes wet runway conditions or runways covered by compact snow. Similarly, poor braking action denotes runways covered with wet ice. Performance is based on reversers operating and a 15 ft screen height at the end of the runway. The tables provided are used in the same manner as the Slush/Standing Water tables.

Minimum Control Speeds

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG), and VR less than minimum VR, (1.05) VMCA. It is therefore necessary to compare the adjusted V1 and VR to V1(MCG) and Minimum VR respectively. To find V1(MCG) and Minimum VR, enter the V1(MCG), Minimum VR 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 Min VR, set VR equal to Min VR and determine a new V2 by adding the difference between the normal VR and Min VR to the normal V2. No takeoff weight adjustment is necessary provided that the field length available exceeds the minimum field length shown in the Field and Climb Limit Weight table.

Go-Around %N1

To find Go-Around %N1 based on normal engine bleed for packs on and anti-ice off, enter the Go-Around %N1 table with airport pressure altitude and reported OAT or TAT and read %N1. %N1 adjustments are shown for engine bleeds for various conditions.

Max Climb %N1

This table shows Max Climb %N1 for a 310/.84 climb speed schedule, normal engine bleed for packs on and anti-ice off. Enter the table with airport pressure altitude and TAT and read %N1. %N1 adjustments are shown for anti-ice operation.

Flight with Unreliable Airspeed / Turbulent Air Penetration

Body 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 may also cause unreliable airspeed/Mach indications. Climb, cruise and descent information is based on the recommended turbulent air penetration speed schedule: 270 knots below 25,000 feet, 280 knots or 0.82 Mach whichever is lower at 25,000 feet and above; maintain a minimum speed of 15 knots above the minimum maneuvering speed when below 0.82 Mach. This schedule provides ample protection from stall and high speed buffet, while also providing protection from exceeding structural limits.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed may also be unreliable.

All Engines

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and maneuver capability. Note that these tables consider both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 300 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 21° may cause the airplane to lose speed and/or altitude.

Note that optimum altitudes shown in the tables result in buffet related maneuver margins of approximately 1.3g (39° bank) or more. The altitudes shown in the table are limited to the maximum certified altitude of 43100 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, .84 Mach approximates the Long Range Cruise Mach schedule.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the table in the Engine Inoperative text section.

Long Range Cruise Enroute Fuel and Time

Long Range Cruise Enroute Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .84/310/250 descent. Tables are presented for low altitudes for shorter trip distances and high altitudes for longer trip distances.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table 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.

Long Range Cruise Wind-Altitude Trade

Wind is a factor which may justify operations considerably below optimum altitude. For example, a favorable wind component may have an effect on ground speed which more than compensates for the loss in air range.

Using this table, it is possible to determine the break-even wind (advantage necessary or disadvantage that can be tolerated) to maintain the same range at another altitude and long range cruise speed. The tables make no allowance for climb or descent time, fuel or distance, and are based on comparing ground fuel mileage.

Descent at .84/310/250

Distance and time for descent are shown for a .84/310/250 descent speed schedule. Enter the table with top of descent pressure altitude and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing Flaps 30 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 for the selected flap setting. Flaps 1 is based on VREF30 + 60 speed schedule. 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

Tables are provided as advisory information for normal configuration landing distances on dry runways and slippery runways with good, medium, and poor reported braking action. These values are actual landing distances and do not include the 1.67 regulatory factor. Therefore, they cannot be used to determine the dispatch required landing field length.

To use these tables, determine the reference landing distance for the selected braking configuration. Then adjust the reference distance for landing weight, altitude, wind, slope, temperature, approach speed, and the number of operative thrust reversers to obtain the actual landing distance.

When landing on slippery runways or runways contaminated with ice, snow, slush, or standing water, the reported braking action must be considered. 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.

Use of the autobrake system commands the airplane to a constant deceleration rate. In some conditions, such as a runway with "poor" braking action, the airplane may not be able to achieve these deceleration rates. In these cases, runway slope and inoperative reversers influence the stopping distance. Since it cannot be determined quickly when this becomes a factor, it is appropriate to add the effects of slope and inoperative reversers when using the autobrake system.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect landing 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 corrections for off-reference landing weight, altitude, wind, slope, and speed conditions. Each correction is independently added to the reference landing distance. Landing distance includes the effects of max manual braking and reverse thrust.

For an engine inoperative autoland, check the rate of climb capability shown in Gear Down Landing Rate of Climb Available tables to ensure adequate climb performance.

Landing Climb Limit Weight

In the event an overweight landing is necessary and the fuel dump system is unavailable, landing climb limits should be checked if a Flaps 25 or 30 landing is planned. Enter the table with airport OAT and pressure altitude to read landing climb limit weight. Apply the noted adjustments as required. At weights exceeding those shown, plan a Flaps 20 landing.

Recommended Brake Cooling Schedule

Advisory information is provided to assist in avoiding problems associated with hot brakes. For normal operation, most landings are at weights below the AFM quick turnaround limit weight.

Use of the recommended cooling schedule will help avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Enter the 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.

To determine the energy per brake absorbed during landing, enter the appropriate Event Adjusted Brake Energy 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, the hottest brake indication 10 to 15 minutes after the airplane has come to a complete stop, or inflight with gear retracted, may be used to determine recommended cooling schedule by entering at the bottom of the chart. An EICAS advisory message, BRAKE TEMP, will appear when any brake registers 5.0 or higher on the EICAS indication and disappear as the hottest brake cools with an EICAS indication of 3.5. Note that even without an EICAS advisory message, brake cooling is recommended.

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 Mach number of .84 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 engine bleed for packs on or off and all anti-ice bleeds off. Enter the table with pressure altitude 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/Cruise Range Capability

This table shows the range capability from the start of driftdown. Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the airplane is accelerated to long range cruise speed. Cruise is continued at level off altitude and long range cruise speed.

To determine fuel required, enter the Ground to Air Miles Conversion table with the desired ground distance and correct for anticipated winds to obtain air distance to destination. Then enter the Driftdown/Cruise Fuel and Time table with air distance and weight at start of driftdown to determine fuel and time required. If altitudes other than the level off altitude is used, fuel and time required may be obtained by using the Engine Inoperative Long Range Cruise Diversion Fuel and Time table.

Long Range Cruise Altitude Capability

Table show the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on LRC speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the airplane weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the following table. These increments include the APU fuel flow and the effect of increased drag from the APU door.

PRESSURE ALTITUDE (1000 FT)	APU FUEL FLOW PENALTY (LB/HR)				
	GROSS WEIGHT (1000 LB)				
	700	600	500	400	300
43				360	310
39			420	360	310
35		470	420	380	300
31	520	500	450	370	310
25	510	490	440	380	340
20	520	520	460	410	360
15	520	520	480	440	400
10	540	520	510	490	440
5	590	590	570	530	480

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 .84/310/250 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 corrections table with the fuel required for the reference weight and the actual weight at checkpoint. Read fuel and time required for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

Gear Down Landing Rate of Climb Available

Rate of climb data is provided as guidance information in the event an engine inoperative autoland is planned. The tables show gear down rate of climb available for Flaps 20 and Flaps 30. Enter the table with TAT and pressure altitude to read rate of climb available. Apply adjustments shown to correct for weight.

Alternate Mode EEC

No takeoff speed adjustments or other performance adjustments are required for operation of EEC in the ALTERNATE mode. Power setting adjustments are only required for the takeoff thrust rating.

Max Takeoff %N1

Takeoff power settings are presented for normal air condition bleed. Max Takeoff %N1 may be read directly from the tables for the desired pressure altitude and airport OAT.

The EEC ALTERNATE mode schedule provides equal or greater thrust than the normal mode for the same lever position. Thrust protection is not provided in the ALTERNATE mode and maximum rated thrust is reached at a thrust lever position less than full forward. As a result, thrust overboost can occur at full forward thrust lever positions.

Gear Down

This section contains performance for airplane operation with the landing gear extended for all phases of flight. 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 will generate inaccurate enroute speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. To obtain accurate ETA predictions, gear down cruise speed and altitude should be entered on the CLB and CRZ pages. Gear down cruise speed should also be entered on the DES page and a STEP SIZE of zero should be entered on the PERF INIT or CRZ page. Use of VNAV during descent under these circumstances is not recommended.

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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