B737-400

Flight Crew Operations Manual (FCOM) Volume 1

Revision Number: 8

Revision Date: 15 August 2019

FCOM
Volume 1 Contents

B737-400

Performance Dispatch

Performance Inflight

Chapter 0 - Preface
Section 1 - Model Identification

The aircraft listed in the table below are covered in this Quick Reference Handbook (QRH). The table information is used to distinguish data peculiar to one or more, but not all of the aircraft. Where data applies to all aircraft listed, no reference is made to individual aircraft.

Aircraft number is supplied by FAL. Registry number is supplied by Transport Canada. Serial and tabulation number are supplied by Boeing.

Aircraft Number	Registry Number	Serial Number	Tab Number	Model Miscellaneous Data
404	C-FLDX	24804	PW563	737-408
405	C-FLHJ	25104	PW240	737-4Q8
406	C-FLRS	28888	PJ604	737-490
407	C-FLHE	28889	PJ605	737-490

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Chapter 0 - Preface
Section 2 - Introduction

General

This Flight Crew Operations Manual (FCOM) conforms to information provided in the Boeing Flight Crew Operations Manual, Document Number D6-27372-400E-TBCE, Revision Number 42, dated December 20, 2018.

The purpose of this manual is to:

- provide the necessary operating limitations, procedures, performance, and systems information the flight crew needs to safely and efficiently operate the 737 aircraft during all anticipated airline operations;
- serve as a comprehensive reference for use during transition training for the 737 aircraft;
- 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 aircraft listed in the Model Identification section. It contains operational procedures and information which apply only to these aircraft. The manual covers the Boeing delivered configuration of these aircraft. Changes to the delivered configuration are incorporated by the owner/operator.

This manual is not suitable for use for any aircraft not listed in the Model Identification section. Further, it may not be suitable for aircraft 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 aircraft. 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 aircraft are properly reflected in the operational procedures and information contained in this manual.

This manual is structured in a 2 volume format, along with a Quick Reference Handbook (QRH). Volume 1 includes Operational Limitations, Normal Procedures, Non-Normal Procedures, Supplementary Procedures, Dispatch Performance Data, and Inflight Performance Data. Volume 2 contains systems information. The QRH contains all checklists necessary for Normal and Non-Normal Procedures, as well as Inflight Performance Data.

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

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

Please send all correspondence regarding content or use of this manual, including Bulletin status, to the FAL Chief Pilot, Line Operations.

Organization

The FCOM is organized in the following manner.

Volume 1

- Preface chapter 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 aircraft, and reflect the latest knowledge and experience available.
- Non-Normal Procedures contain Company specific information.
- Supplementary Procedures chapter covers those procedures accomplished as required rather than routinely on each flight.
- Performance Dispatch (PD) chapter contains performance information necessary for self dispatch.
- Performance Inflight (PI) chapter contains information necessary for in-flight use.

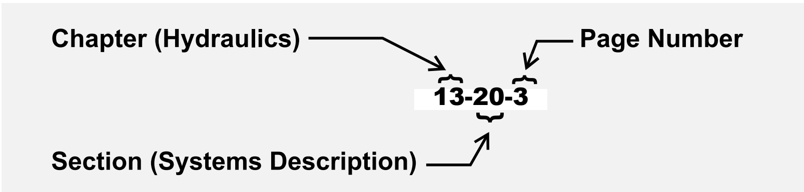
Volume 2 - Chapters 1 through 15 contain general aircraft and systems information. These chapters are generally subdivided into sections covering controls and indicators and systems descriptions.

Quick Reference Handbook (QRH) - The QRH covers normal checklists, non-normal checklists, operational information, performance information necessary for in-flight use (PI) on an expedited basis, and manoeuvres.

Page Numbering

The FCOM uses a decimal page numbering system. The page number is divided into 3 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 revision number and page date. The page date is the date of publication of the manual or the most recent revision date.

Warnings, Cautions, and Notes

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

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

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

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

Flight Crew Operations Manual Configuration

Customer aircraft configuration determines the data provided in this manual. The Boeing Company keeps a list of each aircraft configuration as it is built and modified through the service bulletin process.

Customer Configured Aircraft Effectivity

Differences in aircraft configuration for customer specific documents may be shown by the use of aircraft effectivity throughout Volumes 1, 2 and

QRH. The following rules are used to express aircraft effectivity within customer documents:

- aircraft effectivity can be displayed in one of four formats – by tabulation number, serial number, registry number or aircraft number (customer defined). The default FCOM/QRH document effectivity display is by tabulation number;
- aircraft effectivities are listed in alpha-numeric order; a range of aircraft is defined by a dash (e.g. C-FLHE - C-FLRS). A comma in the effectivity range indicates a break in the range (e.g. C-FLDX, C-FLHE-C-FLHJ);
- aircraft effectivities apply only to the paragraph, illustration, operational note, procedural step, etc. and to subordinate items (if any) just below the specific effectivity range annotation.

Example (with subordinate items):

C-FLDX

Tail skid. . . . . Check

Verify that the tail skid is not damaged.

Horizontal stabilizer and elevator . . . . Check

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

Example (without subordinate items):

C-FLHE - C-FLRS

CABIN TEMPERATURE selector . . . . .As needed

CABIN AIR CONDITIONING. . . . . .As needed

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

When aircraft effectivities are centered immediately below a checklist title, the entire checklist applies to the listed aircraft. In the following example, the PACK checklist is applicable to C-FLDX only:

PACK

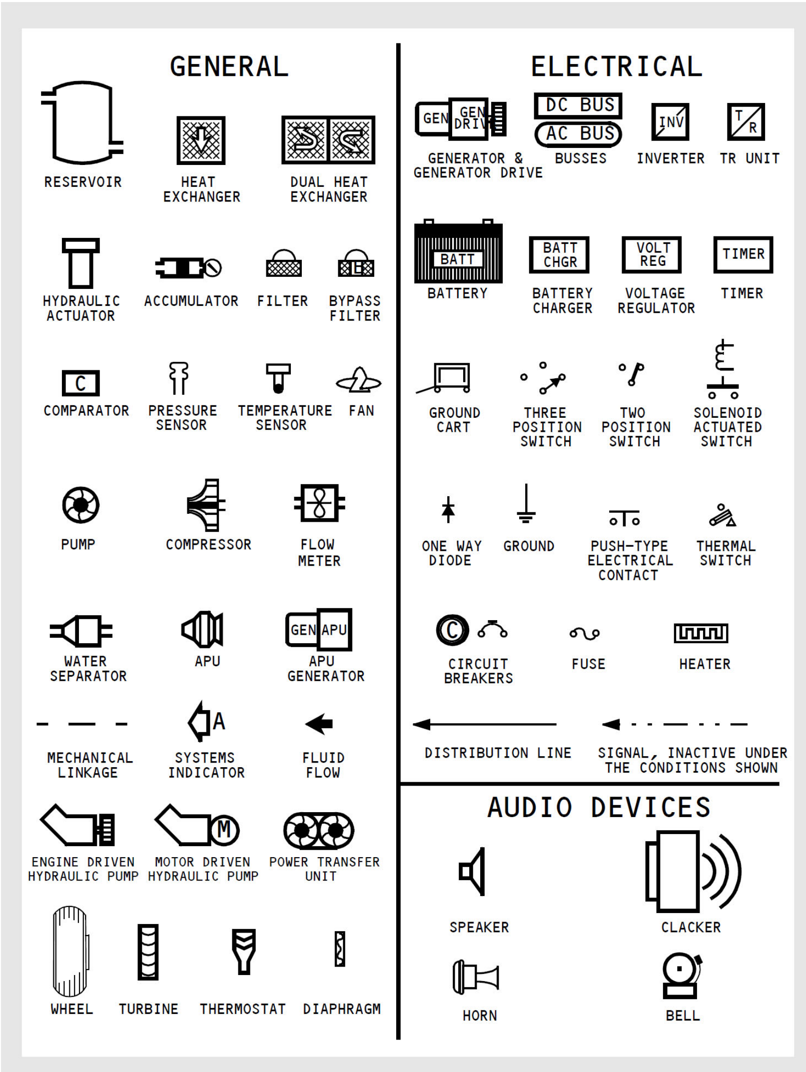
C-FLDX

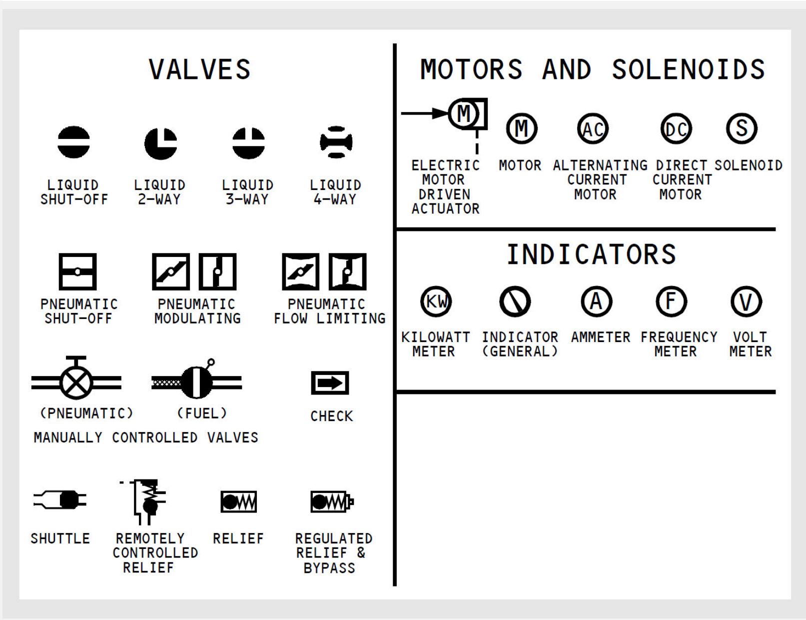
SPECIAL NOTE

This FCOM contains information which has been included by Flair Airlines Ltd (FAL) on aircraft covered by this manual. This information may differ from Boeing recommended information. FAL has included this information in the manual, and such inclusion does not imply that The Boeing Company in any way endorses or approves such information. The technical accuracy and validity of all information originated by FAL, and its effect, if any, on other portions of this manual, is the sole responsibility of FAL.

Schematic Symbols

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




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

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Chapter 0 - Preface
Section 3 - Abbreviations

GENERAL

The following abbreviations may be found throughout the manual. Some abbreviations may also appear in lowercase letters. Abbreviations having very limited use are explained in the chapter where they are used.

A

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

B

BARO	Barometric
BRT	Bright
BTL DISCH	Bottle Discharge (fire extinguishers)
B/C	Back Course

C

C	Captain Celsius Centre
CAA/JAA	Civil Aviation Authority/Joint Aviation Authority
CANC/RCL	Cancel/Recall
CB	Circuit Breaker
CDU	Control Display Unit

CG	Centre of Gravity
CHKL	Checklist
CLB	Climb
COMM	Communication
CON	Continuous
CONFIG	Configuration
CRZ	Cruise
CTL	Control

D

DC	Direct Current
DDG	Dispatch Deviations Guide
DEP ARR	Departure Arrival
DES	Descent
DISC	Disconnect
DME	Distance Measuring Equipment
DSPL	Display

E

E/D	End of Descent
EADI	Electronic Attitude Display Indicator
EEC	Electronic Engine Control
EFIS	Electronic Flight Instrument System
EGPWS	Enhanced Ground Proximity Warning System
EGT	Exhaust Gas Temperature
ELEC	Electrical
ELEV	Elevator
ENG	Engine
EXEC	Execute
EXT	Extend
E/E	Electrical and Electronic

F

F	Fahrenheit
FA	Flight Attendant
FAL	Flair Airlines Ltd.
FCC	Flight Control Computers
FCTL	Flight Control
F/D or FLT DIR	Flight Director
FMC	Flight Management Computer
FMS	Flight Management System
F/O	First Officer
FPA	Flight Path Angle
FPV	Flight Path Vector

G

GA	Go-Around
GEN	Generator
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
G/S	Glideslope

H

HDG	Heading
HDG REF	Heading Reference
HDG SEL	Heading Select
HPA	Hectopascals
HUD	Head-Up Display

I

IAF	Initial Approach Fix
IAS	Indicated Airspeed

ICI	Ice Crystal Icing
IDENT	Identification
IFD	In-Flight Director
IN	Inches
IND LTS	Indicator Lights
ILS	Instrument Landing System
INBD	Inboard
INOP	Inoperative
INTC CRS	Intercept Course
ISLN	Isolation
K	
kts	Knots
KGS	Kilograms
L	
L	Left
LBS	Pounds
LDG ALT	Landing Altitude
LIM	Limit
LNAV	Lateral Navigation
M	
MAG	Magnetic
MAN	Manual
MAP	Missed Approach Point
MB	Millibars
MCP	Mode Control Panel
MDA	Minimum Descent Altitude
MEL	Minimum Equipment List
MIN	Minimum
MMO	Maximum Mach Operating Speed
MOD	Modify
MTRS	Meters
N	
NAV RAD	Navigation Radio
NAVAID	Navigational Aid
ND	Navigation Display
NM	Nautical Miles
NORM	Normal
N1	Low Pressure Rotor Speed
N2	High Pressure Rotor Speed
O	
OAT	Outside Air Temperature
OFP	Operational Flight Plan
OHU	Overhead Unit
OVHD	Overhead
OVRD	Override
P	
PA	Passenger Address
PASS	Passenger
PCU	Power Control Unit
PERF INIT	Performance Initialization
PF	Pilot Flying
PFC	Primary Flight Computers
PFD	Primary Flight Display
PM	Pilot Monitoring
PNL	Panel
POS	Position
POS INIT	Position Initialization
POST	Power On Self Test

PRI	Primary
P/S	Pitot-Static
PSI	Pounds per Square Inch
PSID	Pounds per Square Inch Differential
PSIG	Pounds Per Square Inch Gauge
PTT	Push-To-Talk
PTU	Power Transfer Unit
PWS	Predictive Windshear System

R

R	Right
RA	Radio Altitude Resolution Advisory
RECIRC	Recirculation
REF	Reference
RET	Retract
RF	Refill
RFI	Runway Friction Index
RNP	Required Navigation Performance
RVSM	Reduced Vertical Separation Minimum

S

S/C	Step Climb
SEL	Select
SM	statute miles
SPD	Speed
STA	Station
STAB	Stabilizer
STAT	Status
STD	Standard

T

T or TRU	True
T or TK or TRK	Track
TA	Traffic Advisory
TAI	Thermal Anti-Ice
TAT	Total Air Temperature
TCAS	Traffic Alert and Collision Avoidance System
TDZE	Touch Down Zone Elevation
T/D	Top of Descent
TFC	Traffic
THR HOLD	Throttle Hold
TLR	Takeoff & Landing Report
TO	Takeoff
TO/GA	Takeoff/Go-Around

U

UPR DSPL	Upper Display
UTC	Universal Time Coordinated

V

VA	Design Manoeuvring Speed
VMO	Maximum Operating Speed
VNAV	Vertical Navigation
VOR	VHF Omnidirectional Range
VR	Rotation Speed
VREF	Reference Speed
VTK	Vertical Track
V/S	Vertical Speed

V1	Takeoff Decision Speed
V2	Takeoff Safety Speed

W

WPT	Waypoint
WXR	Weather Radar

X

XTK	Cross Track

Z

ZFW	Zero Fuel Weight

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Chapter 0 - Preface
Section 4 - Revision Record / Distribution List / Revision Highlights

REVISION RECORD

The following is a record of the changes made to this manual.

Revision No.	Revision Date	Revision No.	Revision Date
0 (Original)	10 August 2012		
1	5 October 2012		
2	7 December 2012		
3	28 June 2013		
4	6 December 2013		
5	14 February 2014		
6	13 June 2014		
7	01 Apr 2019		
8	15 Aug 2019		

DISTRIBUTION LIST

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

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

Digital:
Manual holders are responsible for maintaining any and all printed copies to ensure the manual is up to date.

Copy No.	Title of Holder
Master	Document Standards Coordinator
Transport Canada	Principal Operations Inspector
FlairConnect	Document Standards Coordinator
AirWatch	Document Standards Coordinator

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

REVISION 8 HIGHLIGHTS

Chapter, Section	Page No.	Description of Changes
This Chapter		Changed location of Distribution List.
Chp 0, Sec 6a	0-6a-1	Bulletin Status updated - all Company bulletins have been incorporated.
Chp 0, Sec 6b	0-6b-1	Boeing Bulletin record updated: ▪ FLR-1(FR) - status changed to INC and removed bulletin - FCOM and QRH amended as required by the bulletin. ▪ Added new bulletin - TBCE-31. ▪ Removed cancelled bulletins - no longer applicable.
Except as noted, the changes on the pages indicated below have been made to align the B737-400 SOPs with the B737-800 SOPs such as wording, order of sections/items.		
Chp L, Sec 10	all	
Chp NP, Sec 11	NP-11-3	
	NP-11-5	
	NP-11-6	
	NP-11-9	
	NP-11-13	
	NP-11-16	
	NP-11-5 to NP-11-12	Page content changes.
Chp NP, Sec 21	NP-21-1	
	NP-21-2	
	NP-21-3	
	NP-21-4	
	NP-21-5	
	NP-21-7	
	NP-21-9	
	NP-21-10	
	NP-21-13	Lavatory SMOKE light removed - not installed on FAL a/c.
	NP-21-14	
	NP-21-19	
	NP-21-22	Reference to FLAP LOAD RELIEF light - not installed on FAL a/c.

Chapter, Section	Page No.	Description of Changes
	NP-21-23 to NP-21-63	
	NP-21-4 to NP-21-64	Page content changes.
Chp NP, Sec 40	NP-40-3	
	NP-40-4	
	NP-40-5	
	NP-40-6	
	NP-40-4 to NP-40-6	Page content changes.
Chp NNP, Sec 22	NNP-22-4	
	NNP-22-7	
	NNP-22-7 / NNP-22-8	Page content changes.

Chapter 0 - Preface
Section 5 - List of Effective Pages

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V-TOC-2	7 - 01 Apr 2019

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0-1-2	7 - 01 Apr 2019

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Revision Record / Distribution List / Revision Highlights

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Company Bulletin Record

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Boeing Bulletin Record

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Performance Dispatch

Performance Inflight

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Chapter 0 - Preface
Section 6a - Company Bulletin Record

GENERAL

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

BULLETIN STATUS

IN EFFECT. the bulletin contains pertinent information not otherwise covered in the Company Operations Manual. The bulletin remains active and should be retained in the manual (inserted after this page).

INCORPORATED. Information has been incorporated in the Company Operations Manual. The bulletin shall be removed from the manual.

CANCELLED. Time restricted bulletin no longer in effect. The bulletin shall be removed from the Company Operations Manual.

Bulletin Number	Bulletin Date	Title of Bulletin	Bulletin Status

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Chapter 0 - Preface
Section 6b - Boeing Bulletin Record

GENERAL

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

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

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

Bulletin status is defined as follows:

- In Effect (IE) - the bulletin contains pertinent information not otherwise covered in the FCOM. The bulletin remains active and should be retained in the manual.
- Incorporated (INC) - the bulletin operating information has been incorporated into the FCOM. 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 FCOM. 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 FCOM or QRH, the included pages should be filed as instructed in the Flight Crew Operations Manual Information section of the bulletin.

Number	Subject	Date	Status
FLR-1(FR)	Cabin Altitude Warning Indications and Procedures Briefing	August 10, 2012	INC
FLR-2(FR)	BLEED TRIP OFF Light Illuminating During A No Engine Bleed Takeoff	August 10, 2012	IE
FLR-3(FR)	Trailing Edge Flaps - Outboard Flap Carriage Spindle Fractures	August 10, 2012	IE
FLR-4(FR)	Main Landing Gear (MLG) Actuator Beam Fracture and/or MLG Actuator Beam Arm Fracture	August 10, 2012	IE
FLR-5(FR)	Inflight Elevator Tab Vibration	August 10, 2012	IE
FLR-6(FR)	Runaway Stabilizer Procedure	August 10, 2012	IE
FLR-7(FR)	Nonselected MCP Setting Changes	August 10, 2012	IE
FLR-10(FR)	Standby Horizon Indicator Display	August 10, 2012	IE
FLR-11(FR)	Auxiliary Power Unit (APU) Starting	August 10, 2012	IE
FLR-15(FR)	FMC Lockup with Selection of a Standard Instrument Departure (SID) on Missed Approach (FMC Update U10.0 and later)	February 14, 2014	IE
FLR-16(FR)	Instrument Approach Procedures with an FMC Missed Approach Altitude Constraint Above 10,000 ft MSL	February 14, 2014	IE
TBCE-31	Incorrect FMC Speed/Altitude Constraints following a runway change with a Standard Terminal Arrival (STAR) and the previous runway already executed in the FMC	July 1, 2016	IE

Flight Crew Operations Manual Bulletin
for
Flair Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

737

Number: FLR-2(FR)

IssueDate: August 10, 2012

Subject: BLEED TRIP OFF Light Illuminating During A No Engine Bleed Takeoff

Reason: This bulletin provides information contained in Red Bulletin 737- 300/400/500 92-3R1, dated October 30, 1992, which informed flight crews that a BLEED TRIP OFF light may illuminate during a No Engine Bleed Takeoff.

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

Several operators reported that during a No Engine Bleed Takeoff the BLEED TRIP OFF light illuminated. The illumination occurs because a relief valve, specifically built into the pneumatic system to limit duct pressure upstream of the bleed valve during a No Engine Bleed Takeoff, does not have enough flow capacity to limit pressure in the duct below the overpressure switch activation point. Activation of the overpressure switch causes the BLEED TRIP OFF light to illuminate. The bleed system can be reset if duct pressure falls below the overpressure switch point. Duct pressure can be reduced by selecting the engine anti-ice ON.

A minimum altitude of 1500 feet AGL or when obstacle clearance height has been attained is established to maintain consistency with the existing Operations Manual Supplementary Normal No Engine Bleed Takeoff and Landing procedure and to minimize crew work load during the initial takeoff phase of flight.

Flight Crew Operations Manual Bulletin No. FLR-2 , Dated August 10, 2012 (continued)

The maximum TAT restriction set for anti-ice use to facilitate bleed trip reset was increased from 10°C (50°F) to 38°C (100°F). This increase is acceptable for this interim procedure due to the limited actuation time.

Garrett Service Bulletin 3214446-36-1575, released in January 1993, provided instructions for replacement of the current relief valve with a new higher capacity relief valve.

Operating Instructions

Until Garrett Service Bulletin 3214446-36-1575 is incorporated, the following operating instructions are recommended:

<u>If the BLEED TRIP OFF light illuminates during a No Engine Bleed Takeoff and normal reset is not possible:</u>

Accomplish the following at a minimum of 1500 feet (AGL) or when obstacle clearance height has been attained and TAT is 38°C (100°F) or below.

ENGINE ANTI-ICE SWITCH (Affected Side)................................ON

TRIP RESET SWITCH..RESET

CABIN PRESSURIZATION SYSTEM......................RECONFIGURE

Reset the cabin pressurization system to normal configuration.

ENGINE ANTI-ICE SWITCH(ES)..............................AS REQUIRED

<u>If the BLEED TRIP OFF light remains illuminated:</u>

Accomplish the BLEED TRIP OFF Checklist.

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 FLR-2(FR) "In Effect" (IE).

This Operations Manual Bulletin will be cancelled after Boeing is notified that all affected airplanes in the operator’s fleet have been modified by Garrett Service Bulletin 3214446-36-1575. If the operator does not plan to modify all the airplanes and would like to have the contents of this Bulletin incorporated in the Operations Manual, please advise Boeing accordingly.

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

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Flight Crew Operations Manual Bulletin
for
Flair Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

737

Number: FLR-3(FR)

IssueDate: August 10, 2012

Subject: Trailing Edge Flaps - Outboard Flap Carriage Spindle Fractures

Reason: To inform flight crews of outboard trailing edge flap carriage spindle fractures that could cause mid-flap displacement with associated infight roll-off. In addition, to inform flight crews to report any unexpected roll-off condition to maintenance.

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 outboard mid-flap carriage spindle fractures from operators of 737-100 through -500 airplanes. Two carriage assemblies move on independent flap tracks and connect each outboard trailing edge mid-flap to the wing. Fractures have been found in varying locations along the length of the carriage spindle, which connects the carriage assembly to the mid-flap. A fracture can result in the displacement of the associated flap from the carriage assembly.

This displacement can cause a change in the flap angle of attack resulting in airplane roll-off as the flaps extend. An airplane roll-off condition that requires one unit or more of rudder trim and/or 2.5 units or more of aileron trim to maintain wings level flight when the flaps are extended can be an indication of a spindle fracture. The flight deck flap indications are normal.

Flight Crew Operations Manual Bulletin No. FLR-3 , Dated August 10, 2012 (continued)

A fractured spindle will not cause roll changes when the trailing edge flaps are fully retracted. Roll changes should be minimal at flap positions 1, 2, 5, and 10. Depending upon the location of the fracture, roll changes are expected to be more pronounced as the flaps extend to 15 or greater. If one carriage spindle fractures at the critical location, the pilot can compensate for it with aileron and/or rudder inputs. However, if both the inboard and outboard spindles on an outboard flap fracture in the critical location, a large potentially uncontrollable rolling moment could occur.

Operating Instructions

During flap operation at flaps 15 or greater with normal flap indications, if an unexpected roll-off occurs stop flap extension. If the roll-off requires one unit or more of rudder trim and/or 2.5 units or more of aileron trim to maintain wings level flight, retract flaps to flaps 1. Land using flaps 1 and Vref 40 + 30 knots. Report the roll-off condition to maintenance.

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 FLR-3(FR) "In Effect" (IE).

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

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

Flight Crew Operations Manual Bulletin for Flair Airlines Ltd.

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

Number: FLR-4(FR)

IssueDate: August 10, 2012

Subject: Main Landing Gear (MLG) Actuator Beam Fracture and/or MLG Actuator Beam Arm Fracture

Reason: This bulletin informs flight crews of a potential uncommanded control wheel roll input and/or control wheel jam or large increase in control wheel forces during landing gear retraction due to a MLG actuator beam and/or MLG actuator beam arm fracture.

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 five (5) reported cases of MLG actuator beam fractures and nine (9) reported cases of MLG actuator beam arm fractures. After takeoff and during landing gear retraction, a fracture allows the MLG actuator to extend beyond its normal position and contact the spoiler and/or aileron cables. Contact with these cables can cause an uncommanded control wheel roll input with subsequent airplane roll, and/or a control wheel jam or a large increase in control wheel forces.

Flight Crew Operations Manual Bulletin No. FLR-4 , Dated August 10, 2012 (continued)

One operator reported an occurrence in which, after takeoff and during landing gear retraction, the airplane experienced an uncommanded control wheel roll input. An almost full opposite sustained control wheel input, using considerable force by both pilots, was required to correct the airplane roll. The crew was advised that the flight spoilers on one wing were fully raised. They also observed the illumination of a MLG red indicator light. They lowered the landing gear and noted that the roll problem diminished. Only a small amount of aileron was required to maintain straight and level flight. The flight was terminated and a normal landing was performed. Ground inspection of the MLG found fractured MLG actuator beam components along with damaged spoiler and aileron cables. Several hydraulic tubes were also crushed.

Corrective action for the MLG actuator beam fracture and MLG actuator beam arm fracture is being developed and will be provided to operators as soon as it is complete.

Operating Instructions

If, during or immediately after landing gear retraction, an uncommanded roll and/or control wheel jam or large increase in control wheel forces is experienced, extend the landing gear. Plan to land at the nearest suitable airport.

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 FLR-4(FR) "In Effect" (IE).

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

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

Flight Crew Operations Manual Bulletin
for
Flair Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

737

Number: FLR-5(FR)

IssueDate: August 10, 2012

Subject: Inflight Elevator Tab Vibration

Reason: This bulletin informs 737-100/-200/-300/-400/-500 flight crews of the potential for elevator tab vibration that may lead to significant structural damage.

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

THE FOLLOWING PROCEDURE AND/OR INFORMATION IS EFFECTIVE UPON RECEIPT

Background Information

Boeing has received multiple reports of in-service vibration on 737-100/200/300/400/500 airplanes caused by worn or failed elevator tab assemblies. In one event, the flight crew experienced the partial loss of a right hand elevator and tab. The loss was discovered following several flight sectors in which aft cabin vibration was noted by the flight crew.

Flight crews should be aware that there are many causes of airframe vibration, including free-play in movable surfaces, system or engine malfunctions, and environmental factors. These most recent reports of in-flight vibration have been identified as resulting from worn or improperly installed hardware in the elevator tab system. In some cases, airframe vibration was reported on multiple flights over an extended period of time before identification and corrective actions were accomplished.

Flight Crew Operations Manual Bulletin No. FLR-5 , Dated August 10, 2012 (continued)

Elevator tab vibration can occur during any phase of flight and is characterized as a clearly noticeable moderate to severe vertical motion in the flight deck and aft cabin. This vibration is characterized as a low frequency vertical vibration in which motion of items attached to airplane structure, such as sun visors, may be noticeable. In some cases, pilots have reported feeling vibration in the control column and rudder pedals as this vertical motion is transmitted through the structure and cables to the controls. If the cause of the vibration is suspected to be due to empennage control surfaces, the discrepancy should be corrected prior to further revenue flight.

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

Additional maintenance guidance is provided in the latest version of Boeing Service Bulletin 737-55A1070.

Operating Instructions

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

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

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

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

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

Administrative Information

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

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

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

Flight Crew Operations Manual Bulletin for Flair Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

737

Number: FLR-6(FR)

IssueDate: August 10, 2012

Subject: Runaway Stabilizer Procedure

Reason: This bulletin is issued to operators of an intermittent stabilizer trim system anomaly and provide additional guidance when accomplishing the Runaway Stabilizer procedure.

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

Four operators have reported instances of excessive stabilizer trim system coasting (stabilizer trim wheel continues to rotate) after the control wheel stabilizer trim switches have been activated and released. The reports indicate that when the pilot released the trim switches, the stabilizer trim wheel coasted up to 40 turns (four units of trim). In some instances the trim wheel stopped moving in the commanded direction and then rotated up to 40 turns in the opposite direction.

The stabilizer trim main electric motor turns in only one direction. It drives the stabilizer trim actuator through two electro-magnetic clutches. One clutch is engaged for nose-up trim and the other is engaged for nose-down trim. Boeing examination of a suspect clutch showed that the reported coasting and/or reverse coasting of the stabilizer manual trim wheel was due to intermittent jamming of a clutch disc in one of the clutch assemblies. As a result, the electric motor will remain mechanically connected to the stabilizer trim mechanical actuator gear system after the control wheel stabilizer trim switches have been released.

Flight Crew Operations Manual Bulletin No. FLR-6 , Dated August 10, 2012 (continued)

With flaps down, the electric motor can continue to rotate up to 40 additional turns of the manual trim wheel after electrical power has been removed. With flaps up, manual trim wheel coasting is not significant because of the reduced trim motor speed. The autopilot trim system, which uses a motor that turns in either direction and drives the stabilizer trim through a single clutch, does not exhibit this problem.

Boeing Service Bulletin 737-27A1191, dated October 13, 1994, and revision dated November 3, 1994, provide instructions to replace the stabilizer trim electric actuator on the stabilizer trim control system.

Recommended Operating Procedures

The current Runaway Stabilizer procedure will effectively inhibit and limit an out of trim condition. Normal pilot reaction to a runaway stabilizer of opposing the runaway with main electric trim in addition to control column force will initially resolve a runaway. The Runaway Stabilizer Checklist recall action, “STABILIZER TRIM CUTOUT SWITCHES...CUTOUT” will isolate the malfunction if the runaway was caused by the main electric trim or autopilot trim systems. The stabilizer trim cutout switches only remove electrical power to the electric motors.

If the trim wheel continues to rotate after this action has been taken, the recall action “STBILIZER TRIM WHEEL....GRASP AND HOLD” will prevent further runaway or coasting. If the electric motor remains mechanically connected to the stabilizer trim mechanical actuator gear system because of a clutch malfunction, actuating the stabilizer trim cutout switches to cutout will not immediately stop the trim wheel rotation. Grasping the trim wheel will stop the rotation more quickly than allowing the trim wheel to coast to a stop, keeping the airplane more in trim.

In accordance with the procedure, trim the stabilizer manually for the remainder of the flight.

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 FLR-6(FR) "In Effect" (IE).

This Operations Manual Bulletin will be cancelled after Boeing is notified that all affected airplanes in the operator’s fleet have been modified by Boeing Service Bulletin 737-27A1191. If the operator does not plan to modify all the airplanes and would like to have the contents of this Bulletin incorporated in the Operations Manual, please advise Boeing accordingly.

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

Flight Crew Operations Manual Bulletin for Flair Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

Number: FLR-7(FR)
IssueDate: August 10, 2012

Subject: Nonselected MCP Setting Changes

Reason: This bulletin provides information contained in Red Bulletin 737- 300/400/500 90-2R1, dated April 15, 1992, which advised flight crews that nonselected changes in MCP settings can occur on 737 airplanes equipped with SP-300 autopilots.

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 are several reported instances of nonselected changes in the ALT, IAS/MACH and/or V/S display windows on the SP-300 autopilot Mode Control Panel (MCP). Changes in altitude of more than 1000 feet have been reported.

Two causes for these undesired changes in the MCP were identified: inductively coupled transients (EMI) and electrical power interrupts.

The FAA issued an AD, 88-NM-115-AD, requiring, as an interim action, the following information to be incorporated into the Limitations Section of the FAA approved Airplane Flight Manual (AFM).

Boeing issued Service Bulletin 737-22A1098, dated January 17, 1991, to correct the conditions which caused nonselected changes in the MCP display windows.

NPRM 91-NM-215-AD was then issued directing the removal of the AFM limitation upon completion of the service bulletin.

Autopilot Limitations

For airplanes with SP-300 autopilot Mode Control Panel (MCP), flight crews must use the following procedures:

Flight Crew Operations Manual Bulletin No. FLR-7 , Dated August 10, 2012 (continued)

1. Check MCP settings after any electrical power interruptions.
2. Following change in ALT selection in the MCP window, check the ALTdisplay to ensure desired altitude is displayed:
3. Closely monitor altitude during all altitude changes to ensure that the autopilot captures and levels off at the desired altitude.

Note: Standard "callouts," crew coordination, and cross-checking of MCP settings and flight instruments are necessary to detect any nonselected MCP display changes.

Recommended Operating Procedures

Until Service Bulletin 737-22A1098 is incorporated, flight crews should be made aware of the following recommended operating procedures:

UNCOMMANDED MCP SETTING CHANGES

The MCP selected and displayed settings may change without command and with no alert warning.

Anytime electrical power is interrupted:

MCP Settings.......................................CHECK AND RESET AS NECESSARY

Anytime the MCP selected altitude is changed:

MCP Altitude................. ....CHECK AND RESET AS NECESSARY

Closely monitor the altimeter during all altitude changes to ensure the autopilot acquires and levels off at the correct altitude. Use standard callouts and crew coordination, and cross-check MCP settings with flight instruments to detect any uncommanded MCP changes.

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 FLR-7(FR) "In Effect" (IE).

This Operations Manual Bulletin will be cancelled after Boeing is notified that all affected airplanes in the operator's fleet have been modified by Service Bulletin 737-22A1098. If the operator does not plan to modify all the airplanes and would like to have the contents of this Bulletin incorporated in the Operations Manual, please advise Boeing accordingly.

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

Flight Crew Operations Manual Bulletin
for
Flair Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

737

Number: FLR-10(FR)

IssueDate: August 10, 2012

Subject: Standby Horizon Indicator Display

Reason: This bulletin provides information contained in Red Bulletin 737-300/400 88-9R1, dated April 15, 1992, which advised flight crews of a Localizer Pointer display anomaly when a VOR is tuned.

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 Standby Horizon Indicator can display misleading information when the #1 VHF NAV radio is tuned to a VOR frequency and the Standby Horizon Indicator ILS selector is tuned to ILS or BCRS. Under these conditions the localizer pointer will show an inaccurate display and the Localizer Flag will NOT come into view. An inappropriate course correction may result.

Corrective action requires an airplane wiring change and a modification to the Standby Horizon Indicator. Boeing Service Bulletin 737-34-1244 was issued to address these changes.

Until modifications are complete, to prevent incorrect interpretation of the information displayed on the Standby Horizon Indicator, the ILS selector should normally be left in the OFF position. The selector should be moved from the OFF position only when an ILS, Localizer, or Localizer Backcourse approach is made. If an approach is made, the flight crew must verify that the VHF navigation radio is tuned to the correct frequency by aurally identifying the station prior to commencing the approach.

Flight Crew Operations Manual Bulletin No. FLR-10 , Dated August 10, 2012 (continued)

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 FLR-10(FR) "In Effect" (IE).

This Operations Manual Bulletin will be cancelled after Boeing is notified that all affected airplanes in the operator's fleet have been modified by Boeing Service Bulletin 737-34-1244. If the operator does not plan to modify all the airplanes and would like to have the contents of this Bulletin incorporated in the Operations Manual, please advise Boeing accordingly.

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

Flight Crew Operations Manual Bulletin
for
Flair Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

737

Number: FLR-11(FR)

IssueDate: August 10, 2012

Subject: Auxiliary Power Unit (APU) Starting

Reason: This bulletin provides information contained in Red Bulletin 737- 300/ 400/500 90-4R2, dated September 30, 1991, which advised flight crews of the requirement for a qualified ground observer to monitor subsequent starts following unsuccessful Auxiliary Power Unit (APU) ground 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

On January 22, 1990 an operator of a Boeing Model 737 series airplane experienced significant fire damage to the empennage. The damaged area was reported to be the elevator, trim tab and tail cone. This damage was due to Auxiliary Power Unit (APU) torching following an unsuccessful first start attempt. A previous incident occurred on March 17, 1989. Empennage damage similar to that of the most recent incident was reported.

A torching APU start occurs when leftover fuel from a previous unsuccessful start attempt does not drain from the APU properly and ignites during a subsequent start attempt. When a torching start occurs, the accumulated fuel in the APU tailpipe is consumed and the APU operation is otherwise normal. If unburned fuel mist is blown back onto the empennage surfaces during the initial unsuccessful start attempt, it is possible that a fire on the external surfaces of the empennage could occur if torching occurred during the next start attempt.

Flight Crew Operations Manual Bulletin No. FLR-11 , Dated August 10, 2012 (continued)

The only means to detect the torching start and/or flames on the empennage surfaces is by an external observer. By the time the observer communicates to the crew that a torching start has occurred, the excess fuel will most likely be consumed and the torching ceased. Unless the operator sees the evidence that a fire exists on the empennage surface, no other flight crew action is required except for a normal APU shutdown to allow the required inspections of the airplane surfaces.

If the observer sees fire on the airplane surfaces, the flight crew should advise the tower and request fire equipment. In this instance, the APU can be shut down either by normal procedures since the APU fire extinguishing system would not be effective to combat either the APU torching or the external surface fire. Inflight starting of the APU is not impaired because the fuel vapors are carried away from the airplane. Torching of any leftover fuel in the APU exhaust area will not damage the airplane.

The Federal Aviation Administration (FAA) issued an Airworthiness Directive (AD) effective March 12, 1990 requiring that after an unsuccessful ground start the APU be placarded to prohibit ground operation or that any subsequent APU ground start attempts be monitored by a “qualified ground observer.”.

The Boeing Company designed a modified system to improve draining of leftover fuel after an unsuccessful APU start. These modifications are described under Administrative Information below.

Operating Instructions

For airplanes with unmodified APU drain systems, the following procedures apply:

1. Following any unsuccessful APU start attempt, the subsequent APU ground start attempt(s) must be monitored by a qualified ground observer to assure that the airplane is not damaged due to torching.
2. The placard may be removed and APU ground starting resumed without an observer following appropriate maintenance action to determine and resolve the cause of the unsuccessful ground start, or successful ground or inflight starting and operation is accomplished.

Note: Inflight starting and operating of the APU is not impacted by this action.

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 FLR-11(FR) "In Effect" (IE).

Flight Crew Operations Manual Bulletin No. FLR-11 , Dated August 10, 2012 (continued)

This Operations Manual Bulletin will be cancelled after Boeing is notified that all affected airplanes in the operator's fleet have been modified by one of the following methods:

1. Installation of a Garrett GTCP 85-129 APU with PRR 33890-86 incorporated (installs a modified drain system on airplanes at production line number 2061 and on).

2. Incorporation of Service Bulletin 737-49-1073 (installs the modified drain system on airplanes delivered prior to incorporation of PRR 33890-86).

3. Installation of the Sundstrand APS 2000 alternative APU (includes the modified drain system).

4. Installation of the Garrett GTCP 36-280 alternative APU (includes the modified drain system).

The FAA has approved the above four options as acceptable means of compliance to the above Airworthiness Directive. If the operator does not plan to modify all of the airplanes and would like to have the content of this Bulletin incorporated in the Operations Manual, please advise Boeing accordingly.

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

Flight Crew Operations Manual Bulletin No. FLR-11 , Dated August 10, 2012 (continued)

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Flight Crew Operations Manual Bulletin
for
Flair Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

737

Number: FLR-15(FR)

IssueDate: February 14, 2014

Subject: FMC Lockup with Selection of a Standard Instrument Departure (SID) on Missed Approach (FMC Update U10.0 and later)

Reason: This bulletin informs flight crews of the potential for the FMC to lockup following selection of a SID during a missed approach procedure.

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 simulator testing, a Boeing flight crew experienced an FMC lockup and subsequent reset following selection of an engine out (EO) standard instrument departure (SID) procedure while flying an LNAV missed approach. The FMC reset shortly after the lockup and all entered data was retained. The crew was able to select the desired active waypoint and re-capture the LNAV route by using the INTC ARC function.

Further discussions with GE Aerospace have determined the problem can occur when the leg after the active waypoint in the flight plan for the missed approach is an arc leg, and a SID (normal or EO) is selected to create a modified flight plan.

This anomaly exists in FMC Update U10.0 and later. The anomaly will be corrected in FMC Update U10.8.

Boeing recommends operators evaluate this information to determine if it is applicable to their flight operations. A decision can then be made as to whether it is necessary to release this bulletin to Flight Crew.

Flight Crew Operations Manual Bulletin No. FLR-15 , Dated February 14, 2014 (continued)

Operating Instructions

Do not select a SID (normal SID or EO SID) while flying an LNAV missed approach procedure.

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 FLR-15(FR) "In Effect" (IE).

This FCOM bulletin will remain in effect until Boeing is informed that all affected airplanes in your fleet have FMC Update U10.8 installed.

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

Flight Crew Operations Manual Bulletin for Flair Airlines Ltd.

The Boeing Company
Seattle, Washington 98124-2207

737

Number: FLR-16(FR)

IssueDate: February 14, 2014

Subject: Instrument Approach Procedures with an FMC Missed Approach Altitude Constraint Above 10,000 feet MSL

Reason: This bulletin informs flight crews of an anomaly associated with approaches having a missed approach with an altitude constraint above 10,000 feet MSL 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

During simulator testing, an anomaly was identified when attempting to fly an instrument approach using VNAV for an RNAV (RNP) procedure having a missed approach point with an altitude constraint above 10,000 feet MSL.

The FMC builds the descent path upward and back in the direction of the Final Approach Fix (FAF) by starting at the location of the missed approach waypoint (MAP) and its associated altitude constraint. The FMC calculates this path using the coded Glide Path (GP) angle, also called the vertical angle. The MAP is normally shown on the LEGS page as an RWxx or MXxx waypoint. When the MAP is the runway threshold, the altitude constraint is typically the threshold elevation plus threshold crossing height.

For a missed approach point with an altitude constraint above 10,000 feet MSL, the FMC does not consider the altitude constraint to be valid. The FMC uses the airport elevation rather than the MAP altitude as the starting altitude for path construction. The difference between the missed approach point altitude constraint and the airport elevation results in an incorrect VNAV path.

Flight Crew Operations Manual Bulletin No. FLR-16 , Dated February 14, 2014 (continued)

This anomaly exists in FMC Updates U7.1 and later. The anomaly will be corrected in FMC Update U11, currently scheduled for release in the 4th quarter of 2010.

Boeing recommends operators evaluate this information to determine if it is applicable to their flight operations by reviewing their approach procedures to airports with an elevation above 9000 feet. A decision can then be made as to whether it is necessary to release this bulletin to Flight Crew.

Operating Instructions

1. On an approach procedure that has a missed approach point with an altitude constraint above 10,000 feet MSL, do not use VNAV after the Final Approach Fix (FAF). LNAV or other appropriate roll modes may be used through the approach procedure.

2. Do not use the VNAV path deviation indication on the MAP display or the Vertical Deviation (VERT DEV) information on the FMC Descent page for descent rate guidance after passing the FAF.

3. Ensure compliance with each minimum altitude constraint on the final approach segment (step-down fixes).

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 FLR-16(FR) "In Effect" (IE).

This FCOM bulletin will remain in effect until Boeing is informed that all affected airplanes in your fleet have FMC Update U11 installed.

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

BOEING

Flight Crew Operations Manual Bulletin

The Boeing Company
Seattle, Washington 98124-2207

737

Number: TBCE-31

IssueDate: July 1, 2016

Airplane Effectivity: 737-300/400/500 Airplanes with U10.2 through U12 FMC Operational Software.

Subject: Incorrect FMC Speed/Altitude Constraints following a runway change with a Standard Terminal Arrival (STAR) and the previous runway already executed in the FMC

Reason: To inform crews on this subject and to provide guidance.

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 that during an arrival with a valid STAR and runway active in the FMC flight plan, the landing runway was changed by Air Traffic Control (ATC). After the runway change was made in the FMC, the crew noticed that the waypoint constraints associated with the new RWY selection were incorrect. The FMC software did not automatically update the speed and altitude constraints associated with the new RWY selection in the FMC, with a valid STAR/RWY combination active in the FMC flight plan. The speed/altitude constraints associated with the initial STAR and previous runway assignment remained in the active flight plan.

This results with incorrect waypoint constraints in the FMC flight plan for the STAR with the selection of a new RWY.

This condition was introduced in U10.2 and is present in all versions of FMC software from U10.2 through U12.

Flight Crew Operations Manual Bulletin No. TBCE-31, Dated July 1, 2016 (continued)

Operating Instructions

This condition can be resolved by re-selecting and executing the existing STAR, after the new RWY has been selected in the FMC. This method is less of a workload than manually inserting each waypoint speed/altitude constraint into the FMC. In the event it is not possible to re-enter the STAR, because the airplane is already established on a segment of the ATC-issued STAR, manual entry of each waypoint speed/altitude constraint into the FMC may be necessary. Regardless of which method is used to overcome this situation, it is critical that the pilots carefully review all airspeed and altitude constraints associated with a STAR and RWY, when either are entered or changed in the FMC flight plan.

Currently there are no plans to correct this in the B737-300/400/500 airplanes.

Administrative Information

Insert this bulletin behind the Bulletin Record page in Volume 1 of your Flight Crew Operations Manual (FCOM). Amend the FCOM Bulletin Record Page to show bulletin TBCE-31 "In Effect" (IE).

Currently there are no plans to correct this in the B737-300/400/500 airplanes.

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

Chapter L - Limitations
Section TOC - Contents

Operating Limitations

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Chapter L - Limitations
Section 10 - Operating Limitations

General

This chapter contains:

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

Limitations and operational information are included if they are:

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

Limitations and operational information are not included if they are:

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

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

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

Aircraft General

AFM Limitations

Runway slope	+/– 2%
# Maximum Takeoff and Landing Tailwind Component	FLDX: 10 knots FLHJ, FLRS, FLHE: 15 knots
Maximum speeds	Observe Vmo pointer and gear/ flap placards
Maximum flight operational latitude	73° North and 60° South
Maximum Operating Altitude	37000 ft
Maximum Takeoff and Landing Altitude	8400 ft

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

AFM Operational Information

Severe turbulent air penetration speed is 280 KIAS / .73M, whichever is lower. Applicable to Climb and Descent only. During Cruise, refer to Chapter SP, Section 16 Severe Turbulence.

Takeoff and Landing Crosswind Guidelines - Non-TALPA

Runway Condition	TAKEOFF	LANDING
	Crosswind Component (knots)	Crosswind Component (knots)*
Dry	35	35 ***
Wet	25	35 ***
Standing Water/Slush	15	20 ***
Snow - No Melting **	20	35 ***
Ice - No Melting **	7	17

* Reduce landing crosswind guidelines by 5 kts on wet or contaminated runways whenever asymmetric reverse thrust is used.

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

*** Sideslip only (zero crab) landings are not recommended with crosswind components in excess of 17 kts at Flap 15, 20 kts at Flap 30, or 23 kts at Flap 40. This recommendation ensures adequate ground clearance and is based on maintaining adequate control margin.

- Guidelines are based on the most adverse aircraft loading (light weight and AFT centre of gravity), and proper pilot technique (for takeoff the guidelines assume an engine out RTO).
- On slippery runways, guidelines are a function of runway surface condition.

- Guidelines apply for runways 148 ft (45 m) or greater in width.
- Guidelines are based on steady wind (no gust) conditions and include all engines operating and engine inoperative. Gust effects increase pilot workload without significantly affecting the provided guidelines.

Refer to BFCTM, Crosswind Takeoff and/or Crosswind Landing section(s) for TALPA guidelines and crosswind techniques.

Non-AFM Operational Information

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

Do not operate HF radios during refuelling.

Altitude Display Limits for RVSM Operations

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

The maximum allowable in-flight difference between Captain and First Officer (F/O) altitude displays for RVSM operations is 200 ft.

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

Field Elevation	Max Difference Between Captain & F/O	Max Difference Between Captain or F/O & Field Elevation
sea level	40 ft	75 ft
5000 ft	45 ft	75 ft
10000 ft	50 ft	75 ft

Weight Limitations

737-400 Aircraft

	C-FLHJ, C-FLRS, C-FLHE	C-FLDX
Maximum Taxi Weight	65,317 kg	68,265 kgs
Maximum Takeoff Weight	65,090 kg[a]	68,038 kgs[a]
Maximum Landing Weight	54,884 kg[b]	56,245 kgs[b]
Maximum Zero Fuel Weight	51,255 kg	53,070 kgs

a. May be further restricted by takeoff, en route, and landing performance.
b. May be further restricted by field length or climb limit.

All Aircraft

C.G. Limits	Use approved weight and balance system.

Air Systems

AFM Limitations

The maximum cabin differential pressure (relief valves) is 8.65 psi.

Non-AFM Operational Information

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

Note: The SMOKE or FUMES REMOVAL Non-Normal procedure takes precedence over the statement regarding no air conditioning pack in HIGH during takeoff, approach, or landing. The SMOKE or FUMES REMOVAL checklists require the Operating PACK switch(es) HIGH. Switch(es) need to be placed in HIGH in order to increase ventilation for smoke removal.

Autopilot / Flight Director System

AFM Limitations

Do not use aileron trim with autopilot (A/P) engaged.

Do not engage the A/P for takeoff or during climb below 1000 ft AGL.

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

For automatic landing limitations, see FCOM CAT II procedures.

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

Autoland capability may only be used with flaps 30° or 40° and both engines operative.

Non-AFM Operational Information

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

COMMUNICATIONS

AFM Limitations

Note: The following limitation is applicable to aircraft which have not incorporated the effects of Honeywell service bulletin 4051600-22-0023 which installs a Honeywell flight control computer to correct the VHF-2 squelch break anomaly.

Because of unacceptable electromagnetic interference between the flight control computer, the EFIS symbol generator, and the VHF-2 antenna, do not use VHF-2 on 120.000 MHz or 120.005 MHz as a primary means of communication. If frequency 120.000 MHz or 120.005 MHz is required, use VHF-1.

On aircraft equipped with Rockwell/Collins Model HFS-700 and/or HFS-900 communication transceivers, flights predicated on the use of the following HF frequencies are prohibited:

- 11.133 MHz
- 22.434 MHz
- 22.683 MHz
- 22.766 MHz.

ELECTRICAL POWER

Non-AFM Operational Information

Maximum generator drive oil temperature: 157° C.

ENGINES AND APU

AFM Limitations

Engine Limit Display Markings

Maximum and minimum limits are red. Caution limits are amber.

General Engine Limitations

Maximum time limit for takeoff thrust	5 minutes
Maximum N1 RPM	106%
Maximum N2 RPM	105%
Maximum Takeoff EGT	930°C 940°C[a]
Maximum Continuous EGT	895°C
Maximum Start EGT	725°C
Minimum Oil Pressure	13 psi
Maximum Oil Temperature	165°C maximum 160°C – 165°C allowable for 15 minutes 160°C maximum continuous

a. Applicable only after installation of EGT indicators with 20 second transient timing feature.

Engine Ignition

Continuous ignition must be on (ENGINE START switch in the CONT position) during takeoff and landing, and during engine anti-ice operations.

Power Management Control (PMC)

Both PMCs must be either OFF or ON for takeoff.

Reverse Thrust

Intentional selection of reverse thrust in flight is prohibited.

APU

Maximum EGT is 760°C.

Maximum continuous EGT is 710°C.

Do not use APU for both bleed and electrical load above 10000 ft.

Do not use APU bleed above 17000 ft.

Do not use APU for electrical load above 35000 ft.

APU can operate up to 37000 ft.

Non-AFM Operational Information

Engines

Pneumatic pressure (prior to starter engagement): minimum 30 psig at sea level, decreasing 1/2 psig per 1000 ft above sea level.

APU

APU bleed valve must be closed when:

- ground air connected and isolation valve open
- Engine No. 1 bleed valve open
- isolation valve and Engine No. 2 bleed valve open.

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

If there are multiple aborted start attempts, 5 minutes cooling is required between the second and third start attempt. A wait of 1 hour is required after the third start attempt.

Flight Controls

AFM Limitations

The maximum altitude with flaps extended is 20000 ft.

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

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

Non-AFM Operational Information

Do not deploy the speedbrakes in flight at radio altitudes less than 1000 ft.

Alternate flap duty cycle:

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

FLIGHT MANAGEMENT, NAVIGATION

AFM Limitations

Look-Ahead Terrain Alerting (EGPWS)

Do not use the terrain display for navigation.

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

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

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

Non-AFM Operational Information

Avoid weather radar operation in a hangar, or within 50 feet (15.25 meters) of fuelling operations or a fuel spill.

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

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

FUEL

AFM Limitations

Do not reset a tripped fuel pump circuit breaker.

The use of JP-4 and Jet B fuels is prohibited in revenue operations.

Maximum fuel temperature is 49°C.

Inflight tank fuel temperature must be maintained at least 3°C above the freezing point of the fuel being used or -45°C, whichever is higher.

For those aircraft with the centre tank fuel pump auto shutoff system installed, intentional dry running of a centre tank fuel pump (low pressure light illuminated) is prohibited.

Fuel Balance

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

Fuel Loading

Main tanks 1 and 2 must be scheduled to be full if centre tank contains more than 453 kg of fuel.

LANDING GEAR

Non-AFM Operational Information

Do not apply brakes until after touchdown.

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Chapter NP - Normal Procedures
Section TOC - Contents

Introduction

Amplified Procedures

Chapter NP - Normal Procedures
Section 11 - Introduction

GENERAL

This chapter contains:

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

NORMAL PROCEDURES PHILOSOPHY AND ASSUMPTIONS

Normal procedures verify for each phase of flight that:

- the aircraft condition is satisfactory;
- the flight deck configuration is correct.

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

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

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

Normal procedures also assume coordination with the ground crew before:

- hydraulic system pressurization; or
- flight control surface movement; or
- aircraft movement.

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

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

CONFIGURATION CHECK

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

If there is an incorrect configuration or response:

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

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

- check the Minimum Equipment List (MEL) to decide if the condition has a dispatch effect;
- decide if maintenance is needed.

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

- do the respective non-normal checklist (NNC);
- on the ground, check the MEL.

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

- check the MEL;
- the respective non-normal checklist is not needed.

Crew Duties

Pre-flight and post-flight 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 crew member is responsible for moving the controls and switches in their area of responsibility:

- the phase of flight areas of responsibility for both normal and non-normal procedures are shown in the Area of Responsibility illustrations in this section; typical panel locations are shown.
- the pre-flight and post-flight areas of responsibility are defined by the "Preflight Procedure - Captain" and "Preflight Procedure - First Officer".

The Captain may direct actions outside of the crew member's area of responsibility.

The general PF phase of flight responsibilities are:

- taxiing;
- flight path and airspeed control;
- aircraft configuration;
- navigation.

The general PM phase of flight responsibilities are:

- checklist reading
- communications
- tasks asked for by the PF
- monitoring taxiing, flight path, airspeed, aircraft configuration and navigation.

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

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

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

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

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

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

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

CREW DUTIES REFERENCE CHART

Crew Duties	CAPT	F/O	PF	PM
REPORT				
Report and check-in with Dispatch, all crew present	●			
FLIGHT PLANNING				
Review Flight Plan, Weather, Route Information, NOTAMs	●	●		
Paperwork to aircraft	(●)	●		
Joint crew briefing	●	●		
COCKPIT PREPARATION				
Exterior Inspection			(●)	●
Check A/C Documents	●	●		
Cockpit preparation / Interior Inspection	●	●		
Check Journey and Maintenance Logs	●	●		
Set up FMS equipment			●	(●)
Verify FMS equipment			(●)	●
Check final documents (W&B, Gen Dec's, NOTOC, etc.) on board	●	●		
ATC Clearance	●	●		
Takeoff / Taxi briefing	●	●		
TAXI AND BEFORE TAKEOFF				
Taxi Clearance		●		
Takeoff briefing if changed			●	
Ensure required fuel for takeoff	●	●		
CLIMB AND CRUISE				
Send SkyTrac departure message				●
FMS changes and updates			●	●
MCP changes and updates Autopilot engaged			●	●
MCP changes and updates Autopilot not engaged				●
PA Announcements			●	●
Update Weather				●
WAYPOINT PASSAGE				
Confirm name of next waypoint, desired track, distance and time to next waypoint				●
Send SkyTrac position reports, as applicable.				●
Record data on Operational Flight Plan				●

Crew Duties	CAPT	F/O	PF	PM
BEFORE DESCENT				
Arrival ATIS				●
FMS set up for approach			●	●
Landing Briefing			●	
DESCENT, APPROACH AND LANDING				
Call Arriving Station with ETA, Load and Requirements, as applicable.				●
MCP changes and updates Autopilot engaged			●	●
MCP changes and updates Autopilot not engaged				●
After Landing Checks and Ground Communications		●		
POSTFLIGHT				
Shutdown checks	●	●		
Flight and Maintenance Log Book entries	(●)	●		
Report to dispatch	●			
Transmit and return completed operational paperwork per COM		●		
Transmit SkyTrac Arrival message.		●		

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

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

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

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

Cross Checks:

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

must respond with "CORRECTING", and the PM must ensure that the corrections are adequate.

Headsets will normally be worn and used as follows:

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

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

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

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

Pilot Incapacitation and the Two-Challenge Rule

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

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

STERILE COCKPIT

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

This includes:

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

CHECKLISTS

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

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

Checklist use is challenge and response.

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

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

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

CONTROL DISPLAY UNIT (CDU) PROCEDURES

Before taxi, the Captain or F/O may make CDU entries. The other pilot must verify the entries.

When possible, make CDU entries before taxi or when stopped. If CDU entries must be made during taxi, the F/O makes the entries. The PF must verify the entries before they are executed.

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

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

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

AUTOPILOT FLIGHT DIRECTOR SYSTEM (AFDS) PROCEDURES

The crew must always monitor:

- aircraft course
- vertical path
- speed

When selecting a value on the MCP, announce and 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
- auto throttle

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

- course
- vertical path
- thrust
- speed

Announcing changes on the FMA and thrust mode display when they occur is a requirement to verify correct mode of operation.

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

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

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

PERFORMANCE DATA CDU ENTRY AND CROSSCHECK

The entry of correct performance data into the FMS is critical to the safety of the flight. FAL uses Aerodata TLR for the calculation of take off performance. Cross checking the calculated data as well as the entry of that data is fundamental to safe operation. The following procedure will be used so that both crew members are actively involved in the calculation and entry of performance data:

A. The First Officer will complete the weight and balance and read the corresponding calculations when prompted by the Captain during CDU entry. Prior to using the weight and balance data the First Officer will read out loud and confirm the correct aircraft has been selected along with all the entries made. The Captain will confirm the entries match the provided load information.

B. The Captain will use the TLR data pages and confirm the date, aircraft and routing. The Captain will then confirm that the weather conditions are within the TLR limits and confirm the runway to be used. This should be completed verbally with the First Officer so that both crew members have a clear understanding.

Performance Data . . . . Enter

PERF INIT page:

Captain enters ZFW as calculated by the First Officer using the B737 WB APP.

Verify the FUEL on the CDU, Flight Plan and fuel quantity indicators agree. Execute the changes.

Verify that the calculated GW on the CDU agrees with the weight and balance.

N1 LIMIT page:

Verify OAT.

Enter an assumed temperature from the TLR data (based on weight, the runway to be used and conditions).

Select full climb thrust.

TAKEOFF REF page:

Request from First Officer the calculated CG and Enter CG.

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

Using the TLR data enter the takeoff V Speeds.

First Officer will use the TLR data sheet and, using the same process as above select the runway, assumed temp and V Speeds and verbally confirm the selection.

Captain will confirm that V Speeds in the CDU match the First Officer's callout.

This is a critical cross check to ensure that the proper conditions, runway, data and V speeds are in fact being used.

TAXI AND TAKEOFF BRIEFING / EMERGENCY PROCEDURES REVIEW

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

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

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

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

I'll fly, Flap [5] [15] Takeoff; Maximum Thrust / Reduced Thrust; Taxi route and hot spots.

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

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

Captain:

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

The crew member noticing the emergency or abnormality shall clearly state the problem.

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

If the decision is to REJECT, I will:

- close thrust levers / disengage auto throttle;
- observe or apply maximum braking;
- raise speedbrakes;
- apply maximum amount of reverse thrust consistent with conditions;
- bring aircraft to a complete stop on the runway and set the parking brake;
- advise the cabin: "THIS IS THE CAPTAIN SPEAKING. REMAIN SEATED, REMAIN SEATED" as soon as practical;
- perform any necessary memory items or checklists as appropriate;
- if an evacuation is required, initiate Evacuation Checklist.

First Officer:

- Note the reject speed
- Verify thrust levers closed, autothrottle disengaged and maximum brakes applied
- Call "SPEEDBRAKES UP"
- Call "REVERSERS NORMAL"
- Call out any omitted action items
- Call out “60 KNOTS” and advise ATC
- Standby for instructions

Pilot Flying:

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

- continue the takeoff,
- rotate at Vr,
- positive rate, gear up,
- cancel Master Caution.
- There will be no other calls below 400 ft.
- At 400 ft, call for a roll mode, then
- call: "WHAT'S THE PROBLEM?"
- If required, perform any necessary memory items,
- climb at V2 to V2+20 to 1000 ft AFL or TOCA, whichever is higher.
- Set flaps up speed.
- Retract flaps on schedule.
- When flaps have been retracted and at or above Flaps Up manoeuvre, speed - call for Level Change.
- Set max continuous thrust, and
- call for the appropriate emergency checklist.

Scan Flow and Areas of Responsibility

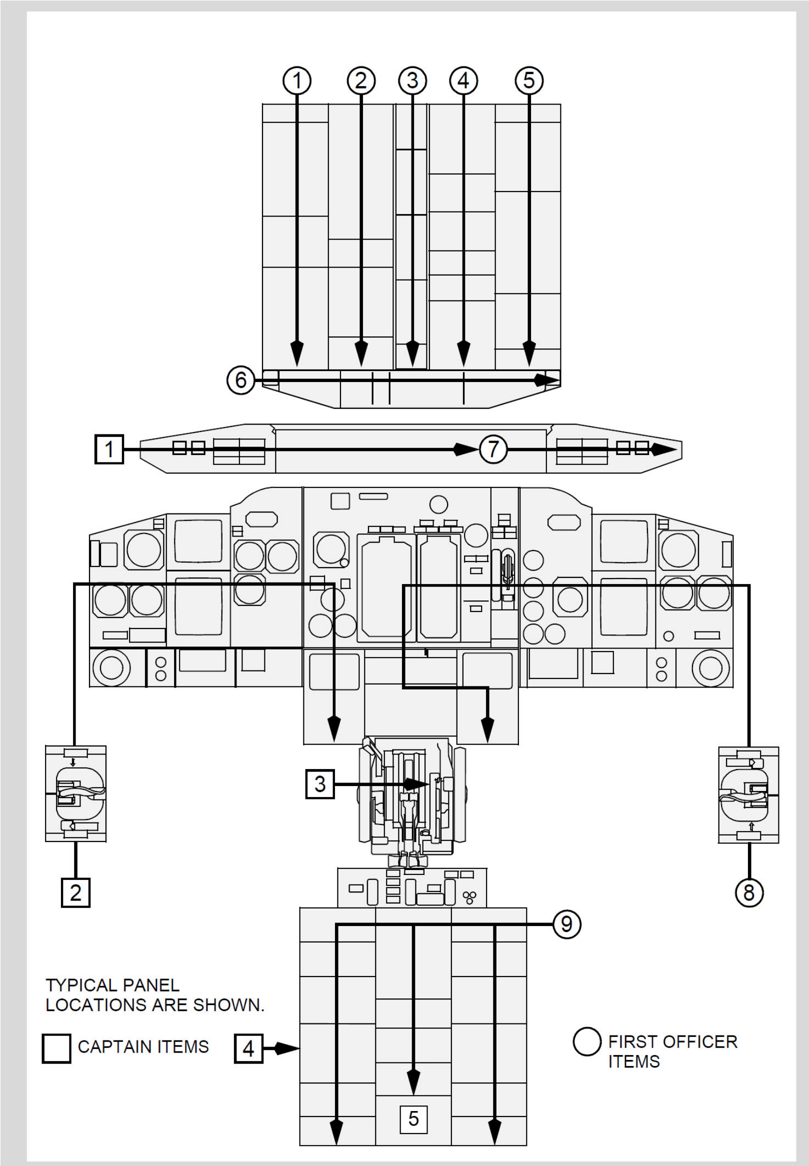
The scan flow diagram provides general guidance on the order of each step the flight crew member should follow when doing the pre-flight procedures.

Specific guidance on the items to be checked are detailed in the amplified Normal Procedures:

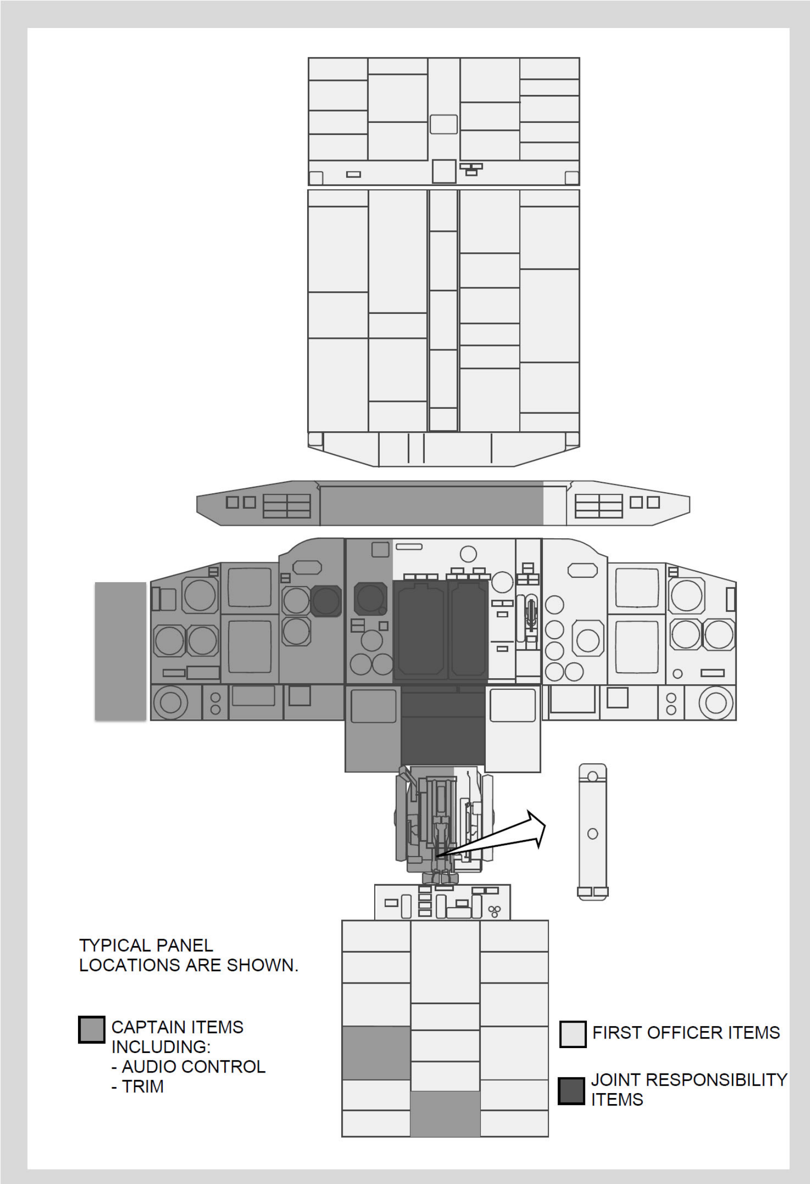
Pre-Flight Procedure - Captain

Pre-Flight Procedure - First Officer.

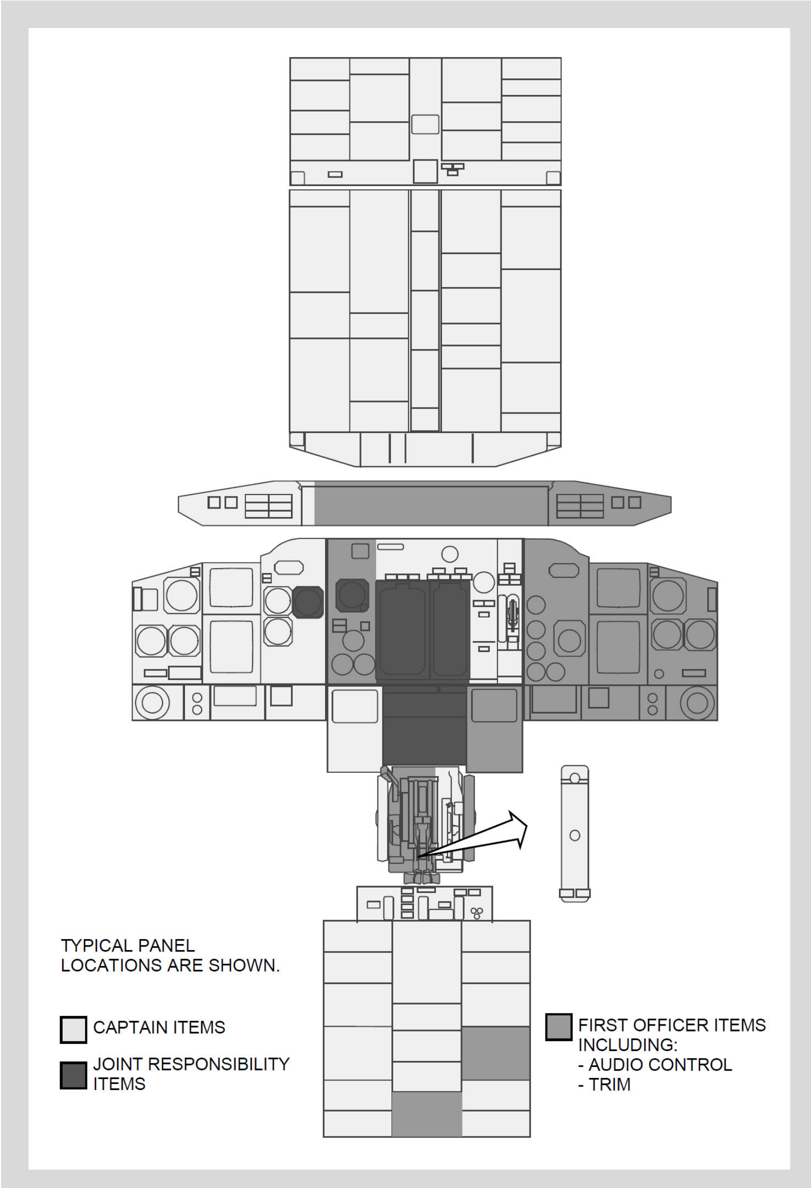
PRE-FLIGHT AND POST-FLIGHT SCAN FLOW



Areas of Responsibility - Captain as Pilot Flying or Taxiing



AREAS OF RESPONSIBILITY - F/O AS PILOT FLYING OR TAXIING



Pre-Flight Procedure Scan Flow:

The Captain and F/O pre-flight procedure scan flow will be performed as per pages NP-11-12 to NP-11-13, and in the following sequence:

- Preliminary Preflight Procedure (PF)
- Exterior Inspection (PM)
- Initial FMC/CDU Setup (PF)
- Preflight Flow (PF)
- Preflight Flow (PM) (after returning from exterior inspection)
- Checks FMC Entries (PM) (crew compares FMC with Flight Plan)
- Set up EFB/charts, Headsets, Seat and Pedals.
- Call for and complete the Preflight Checklist.
- Obtain ATC Clearance, Captain sets MCP Altitude and Transponder Code.
- Enter appropriate SID and Departure Routing per clearance and confirm.
- Conduct Taxi and Takeoff Briefing / Emergency Procedures Review.
- First Officer completes Weight & Balance on EFB (or as appropriate).
- Compare ZFW, Takeoff and Landing Weights with OFP and investigate/reconcile any differences.
- Consult TLR for performance data and V Speeds.
- Enter ZFW, Assumed Temperature, Flap Setting and V Speeds into FMS, set Stabilizer Trim and set V2 Speed on MCP, confirm.
- When ready, and in consultation with the IFD and Ground Crew, close the doors and call for the Before Start Checklist.

Chapter NP - Normal Procedures
Section 21 - Amplified Procedures

PRELIMINARY PREFLIGHT PROCEDURE - CAPTAIN OR FIRST OFFICER

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

Upon entering the flight deck, the F/O must confirm that the QRH, log books, runway analysis data, Operational Flight Plan, MEL and any other required documents are on board.

The PF will begin the interior set-up with the Preliminary Preflight checks while the PM is completing the exterior inspection. Organize the OFP and paperwork on the clipboard. If the PF is doing the walk around, this item would then fall to the PM.

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

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

Verify that the ON DC lights illuminate then extinguish.

Verify that the ALIGN lights are illuminated.

Verify that the following are sufficient for flight:

- oxygen pressure
- hydraulic quantity
- engine oil quantity

Do the remaining actions for the first of the day or after maintenance action.

Maintenance documents . . . . Check

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

Flight deck access system switch . . . . Guard closed

Flight deck door . . . . Open

Flight deck door lock selector . . . . .AUTO

Emergency access code . . . . Enter

ENT key . . . . Push

Verify alert sounds.

Verify AUTO UNLK light illuminates.

Flight deck door lock selector . . . . DENY

Verify AUTO UNLK light extinguishes.

Flight deck door lock selector . . . . UNLKD

Flight deck access system switch . . . . OFF

Emergency equipment . . . . Check

Fire extinguisher - Checked and stowed.

Crash axe - Stowed.

Escape ropes - Stowed.

Other needed equipment - Checked and stowed

SERVICE INTERPHONE switch . . . . .OFF

ENGINE panel . . . . Set

Verify that the REVERSER lights are extinguished.

PMC switches - ON.

Verify that the INOP lights are extinguished.

Verify that the LOW IDLE light is extinguished.

ELT switch . . . . ARM

Oxygen panel . . . . Set

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

PASSENGER OXYGEN switch - Guard closed.

Verify that the PASS OXY ON light is extinguished.

Flight recorder switch . . . . Guard closed

MACH AIRSPEED WARNING

TEST switches . . . . .Push, one at a time

Verify the clacker sounds.

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

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

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

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

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

Crew oxygen valve . . . . .Open

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

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

Parking brake. . . . . As needed

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

Tune and adjust radios as required, record the ATIS on the OFP.

CREW BRIEFING

Prior to the completion of the pre-flight checks (first flight of the day) the Captain will ensure the Crew Member Pre-Flight Safety Briefing has been completed as per COM 3.23.

CDU PRE-FLIGHT PROCEDURE - CAPTAIN AND F/O

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 Pre-Flight Procedure. The Performance Data entries must be complete before the Before Start Checklist.

The Captain or F/O 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 en route 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 database ACTIVE date range is current.

POS INIT page

Verify that the time is correct.

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

Navigation Data . . . . Set

ROUTE page

Enter the ORIGIN.

Enter the route.

Enter the FLIGHT NUMBER.

Activate and execute the route.

DEPARTURES page

Select the runway and departure routing.

Execute the runway and departure routing.

LEGS page

Verify or enter the correct RNP for the departure.

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

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

Performance Data. . . . . Set

PERF INIT page

Enter:

Cost Index

Reserves (from OFP)

CRZ ALT

CRZ wind

Confirm transition altitude.

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

CAUTION: Do not enter the ZFW into the GW boxes. Doing so causes the FMC to calculate performance data with significant errors.

Captain enters ZFW as calculated by the First Officer using the B737 WB APP.

Verify the FUEL on the CDU, Flight Plan and fuel quantity indicators agree. Execute the changes.

Verify that the calculated GW on the CDU agrees with the weight and balance and the Flight Plan.

Thrust mode display

Verify that TO shows.

TAKEOFF REF page:

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

Enter an assumed temperature from the TLR data (based on weight, the runway to be used and conditions).

Select full climb thrust.

Request from First Officer the calculated CG and Enter CG.

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

Using the TLR data, enter the takeoff V Speeds.

First Officer will use the TLR data sheet and, using the same process as above, select the runway, assumed temp and V Speeds and verbally confirm the selection.

Captain will confirm that V Speeds in the CDU match the First Officer's callout.

Verify that the preflight is complete.

EXTERIOR INSPECTION

Before each flight, the Captain, F/O, or Maintenance crew must verify that the aircraft is satisfactory for flight.

The Captain normally completes the exterior inspection.

Items at each location may be checked in any sequence.

Use the detailed inspection route below to check that:

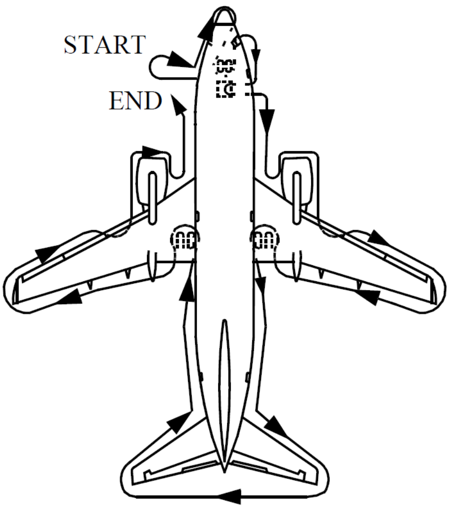
- the surfaces and structures are clear, not damaged, not missing parts and there are no fluid leaks*;
- the tires are not too worn, not damaged, and there is no tread separation;
- the gear struts are not fully compressed;
- the engine inlets and tailpipes are clear, the access panels are secured, the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

- the probes, vents, and static ports are clear and not damaged;
- the skin area adjacent to the pitot probes and static ports is not wrinkled;
- the antennas are not damaged;
- the light lenses are clean and not damaged

For cold weather operations see the Supplementary Procedures.

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

Inspection Route



Left Forward Fuselage

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

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

Nose

Radome . . . . Check

Conductor straps - Secure

Forward E and E door. . . . . Secure

Nose Wheel Well

Tires and wheels. . . . . Check

Exterior light . . . . Check

Gear strut and doors . . . . Check

Nose wheel steering assembly . . . . Check

Nose gear steering lockout pin . . . . As needed

Gear pin . . . . As needed

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

Right Forward Fuselage

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

Oxygen pressure relief green disc . . . . In place

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

Right Wing Root, Pack, and Lower Fuselage

Ram air deflector door . . . . Extended

Pack and pneumatic access doors . . . . Secure

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

Exterior lights . . . . Check

Leading edge flaps. . . . . Check

Number 2 Engine

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

Access panels and fan cowl latches . . . . Latched

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

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

Thrust reverser. . . . . Stowed

Exhaust area and tailcone . . . . Check

Right Wing and Leading Edge

Access panels . . . . Latched

Leading edge flaps and slats . . . . Check

Fuel measuring sticks . . . . Flush and secure

Wing Surfaces . . . . Check

Fuel tank vent . . . . Check

Right Wing Tip and Trailing Edge

Position and strobe lights . . . . Check

Static discharge wicks . . . . Check

Aileron and trailing edge flaps . . . . Check

Right Main Gear

Tires, brakes and wheels . . . . Check

Verify that the wheel chocks are in place as needed.

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

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

Hydraulic lines . . . . Secure

Gear pin . . . . .As needed

Right Main Wheel Well

APU FIRE CONTROL handle. . . . . Up

Wheel well . . . . Check

Right AFT Fuselage

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

Negative pressure relief door . . . . .Closed

Outflow valve . . . . Check

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

APU air inlet . . . . .Open

APU fire bottle. . . . . Check

Verify that the red and yellow discs show.

Tail

Vertical stabilizer and rudder . . . . Check

Elevator feel probes . . . . Check

Tail skid. . . . . Check

Verify that the tail skid is not damaged.

Horizontal stabilizer and elevator . . . . Check

Static discharge wicks . . . . Check

Strobe light . . . . Check

APU cooling air inlet and exhaust outlet. . . . . Check

Left AFT Fuselage

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

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

Left Main Gear

Tires, brakes and wheels . . . . Check

Verify that the wheel chocks are in place as needed.

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

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

Hydraulic lines . . . . .Secure

Gear pin . . . . As needed

Left Main Wheel Well

Wheel well . . . . Check

Engine fire bottle pressure . . . . Check

Left Wing Tip and Trailing Edge

Aileron and trailing edge flaps . . . . Check

Static discharge wicks . . . . Check

Position and strobe lights. . . . . Check

Left Wing and Leading Edge

Fuel tank vent . . . . Check

Wing Surfaces . . . . Check

Fuel measuring sticks . . . . .Flush and secure

Leading edge flaps and slats . . . . Check

Access panels . . . . Latched

Number 1 Engine

Exhaust area and tailcone . . . . Check

Thrust reverser. . . . . Stowed

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

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

Access panels and fan cowl latches . . . . Latched

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

Left Wing Root, Pack, and Lower Fuselage

Leading edge flaps . . . . Check

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

Exterior lights . . . . Check

Pack and pneumatic access doors . . . . Secure

Ram air deflector door . . . . .Extended

Pre-Flight Procedure - First Officer

The First Officer normally does this procedure. The Captain may do this procedure as needed.

Flight control panel . . . . Check

FLIGHT CONTROL switches – Guards closed

Verify that the flight control LOW PRESSURE lights are illuminated.

Flight SPOILER switches – Guards closed

YAW DAMPER switch – ON

Verify that the YAW DAMPER light is extinguished.

Verify that the standby hydraulic LOW QUANTITY light is extinguished.

Verify that the standby hydraulic LOW PRESSURE light is extinguished.

Verify that the STBY RUD ON light is extinguished.

ALTERNATE FLAPS master switch – Guard closed

ALTERNATE FLAPS position switch – OFF

Verify that the FEEL DIFF PRESS light is extinguished.

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

Verify that the SPEED TRIM FAIL light is extinguished.

Verify that the MACH TRIM FAIL light is extinguished.

Verify that the AUTO SLAT FAIL light is extinguished.

Instrument and NAV transfer switches . . . . Set

VHF NAV transfer switch – NORMAL

IRS transfer switch – NORMAL

EFI transfer switch – NORMAL

Fuel panel . . . . Set

Verify that the FUEL VALVE CLOSED lights are illuminated dim.

Verify that the FILTER BYPASS lights are extinguished.

CROSSFEED selector – Closed

Verify that the VALVE OPEN light is extinguished.

FUEL PUMP switches – OFF

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

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

Electrical panel. . . . . Set

BATTERY switch – Guard closed

GALLEY power switch – ON

STANDBY POWER switch – Guard closed

Verify that the STANDBY PWR OFF light is extinguished.

Generator drive DISCONNECT switches – Guards closed

Verify that the LOW OIL PRESSURE lights are illuminated.

Verify that the HIGH OIL TEMP lights are extinguished.

BUS TRANSFER switch – Guard closed

Verify that the TRANSFER BUS OFF lights are extinguished.

Verify that the BUS OFF lights are extinguished.

Verify that the GEN OFF BUS lights are illuminated.

Overheat and fire protection panel. . . . . Check

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

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

Alert ground personnel before the following test is accomplished:

OVERHEAT DETECTOR switches – NORMAL

TEST switch – Hold to FAULT/INOP

Verify that the MASTER CAUTION lights are illuminated.

Verify that the OVHT/DET annunciator is illuminated.

Verify that the FAULT light is illuminated.

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

Verify that the APU DET INOP light is illuminated.

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

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

TEST switch – Hold to OVHT/FIRE

Verify that the fire warning bell sounds.

Verify that the master FIRE WARN lights are illuminated.

Verify that the MASTER CAUTION lights are illuminated.

Verify that the OVHT/DET annunciator is illuminated.

Master FIRE WARN light – Push

Verify that the master FIRE WARN lights are extinguished.

Verify that the fire warning bell cancels.

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

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

Verify that the WHEEL WELL light stays illuminated.

EXTINGUISHER TEST switch – Check

TEST Switch . . . . Position to 1 and hold.

Verify that the three green extinguisher test lights are illuminated.

TEST Switch . . . . .Release

Verify that the three green extinguisher test lights are extinguished.

Repeat for test position 2.

APU switch (as needed) . . . . START

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

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

CAUTION: Centre tank fuel pump switches should be positioned ON only if the fuel quantity in the centre tank exceeds 453 kg.

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

When the APU GEN OFF BUS light is illuminated:

APU GENERATOR bus switches . . . . .ON

Verify that the BUS OFF lights are extinguished.

Verify that the TRANSFER BUS OFF lights are extinguished.

Note: Run the APU for one full minute before using it as a bleed air source.

EQUIPMENT COOLING switches . . . . NORM

Verify that the OFF lights are extinguished.

EMERGENCY EXIT LIGHTS switch . . . . Guard closed

Verify that the NOT ARMED light is extinguished.

Passenger signs . . . . Set

NO SMOKING switch – ON

FASTEN BELTS switch – ON (when fuelling is complete)

Windshield WIPER selector . . . . OFF

Verify that the windshield wipers are stowed.

WINDOW HEAT switches . . . . ON

Position switches ON at least 10 minutes before takeoff.

Verify that the OVERHEAT lights are extinguished.

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

PITOT STATIC HEAT switches . . . . OFF

Verify that all lights are illuminated.

WING ANTI–ICE switch . . . . OFF

Verify that the VALVE OPEN lights are extinguished.

ENGINE ANTI–ICE switches . . . . OFF

Verify that the COWL ANTI–ICE lights are extinguished.

Verify that the COWL VALVE OPEN lights are extinguished.

Hydraulic panel . . . . Set

ENGINE HYDRAULIC PUMPS switches – ON

Verify that the LOW PRESSURE lights are illuminated.

A ELECTRIC HYDRAULIC PUMP switch – OFF

Verify that the LOW PRESSURE light is illuminated.

Verify that the OVERHEAT light is extinguished.

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

B ELECTRIC HYDRAULIC PUMP switch – ON

Verify that the LOW PRESSURE and OVERHEAT lights are extinguished.

Air conditioning panel . . . . Set

AIR TEMPERATURE source selector – As needed

TRIM AIR switch – ON

Verify that the ZONE TEMP lights are extinguished.

Temperature selectors – As needed

Verify that the RAM DOOR FULL OPEN lights are illuminated.

RECIRCULATION FAN switches – AUTO

Air conditioning PACK switches – One switch AUTO or HIGH, other switch OFF

ISOLATION VALVE switch – AUTO

Engine BLEED air switches – ON

APU BLEED air switch – ON

Verify that the DUAL BLEED light is illuminated.

Verify that the PACK lights are extinguished.

Verify that the WING–BODY OVERHEAT lights are extinguished.

Verify that the BLEED TRIP OFF lights are extinguished.

Cabin pressurization panel . . . . Set

Verify that the AUTO FAIL light is extinguished.

Verify that the OFF SCHED DESCENT light is extinguished.

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

LANDING ALTITUDE indicator – Destination field elevation

CABIN Rate selector – Index

CABIN ALTITUDE indicator – 200 ft below destination field elevation

FLT/GRD switch – GRD

Pressurization mode selector – AUTO

Verify that the STANDBY light is extinguished.

Verify that the MANUAL light is extinguished.

Lighting panel. . . . . Set

LANDING light switches – RETRACT and OFF

RUNWAY TURNOFF light switches – OFF

TAXI light switch – OFF

Ignition select switch . . . . IGN L or R

Alternate the ignition select switch position on subsequent starts.

ENGINE START switches . . . . OFF

Lighting panel. . . . . Set

LOGO light switch – As needed

POSITION/STROBE light switch – OFF

ANTI–COLLISION light switch – OFF

WING illumination switch – As needed

WHEEL WELL light switch – As needed

C-FLDX

NAV MODE selector . . . . As needed

Select FMC, ANS-L or ANS-R as needed for navigation system to be used for departure.

Mode control panel . . . . Set

COURSE(S) – Set

FLIGHT DIRECTOR switch – ON

Move the switch for the pilot flying to ON first.

Oxygen. . . . . Test and set

Note the crew oxygen pressure.

Oxygen mask – Stowed and doors closed

RESET/TEST switch – Push and hold

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

EMERGENCY/TEST selector – Push and hold

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

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

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

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

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

Normal/100% selector – 100%

Crew oxygen pressure – Check

Verify that the pressure is sufficient for dispatch.

Marker beacon lights . . . . Test

Clock. . . . . Set

C-FLDX

SBAS SEL Annunciator . . . . OFF (annunciator not illuminated)

Disengage light TEST switch . . . . Hold to 1

Verify that the A/P light is illuminated steady amber.

Verify that the A/T light is illuminated steady amber.

Verify that the FMC light is illuminated steady amber.

Disengage light TEST switch . . . . Hold to 2

Verify that the A/P light is illuminated steady red.

Verify that the A/T light is illuminated steady red.

Verify that the FMC light is illuminated steady amber.

Do the Initial Data and Navigation Data steps from the CDU Pre-Flight Procedure and verify that the IRS alignment is complete before checking the flight instruments.

Flight instruments . . . . Check

Heading . . . . ___,___

Airspeed . . . . _______

Altimeter . . . . ___in(mb)/___(altitude)

Verify that the flight instrument indications are correct.

Verify that only these flags are shown:

- TCAS OFF
- expected RDMI flags

Verify that the flight mode annunciations are correct:

- auto throttle mode is blank
- pitch mode is blank
- roll mode is blank
- AFDS status is FD

GROUND PROXIMITY panel . . . . Check

FLAP INHIBIT switch – Guard closed

GEAR INHIBIT switch – Guard closed

TERRAIN INHIBIT switch – Guard closed

Verify that the GROUND PROXIMITY INOP light is extinguished.

Landing gear panel . . . . Set

LANDING GEAR lever – DN

Verify that the green landing gear indicator lights are illuminated.

Verify that the red landing gear indicator lights are extinguished.

TAKEOFF CONFIG light (as installed). . . . . Verify extinguished

CABIN ALTITUDE light (as installed) . . . . Verify extinguished

ANTISKID switch . . . . Guard closed

Verify that the ANTISKID INOP light is extinguished

AUTO BRAKE select switch . . . . RTO

Verify that the AUTO BRAKE DISARM light is extinguished.

REVERSER UNLOCKED lights. . . . . Verify extinguished

A/T LIM light. . . . . Verify extinguished

START VALVE OPEN lights . . . . Verify extinguished

LOW OIL PRESSURE lights . . . . Verify illuminated

OIL FILTER BYPASS lights . . . . Verify extinguished

Engine instrument primary panel . . . . Set

N1 manual set knob – Push

FUEL USED RESET switch – Push

Engine instruments . . . . Check

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

Hydraulic quantity indications . . . . Above RF

CARGO FIRE panel . . . . Check

C-FLHJ, C-FLRS, C-FLHE

This check is needed once per flight day.

Cargo Fire Panel. . . . . Check

DETECTOR SELECT switches . . . . NORM

TEST switch . . . . .Push

Verify that the fire warning bell sounds.

Verify that the master FIRE WARN lights are illuminated.

Master FIRE WARN light. . . . . .Push

Verify that the master FIRE WARN lights are extinguished.

Verify that the fire warning bell cancels.

Verify that the green EXTINGUISHER test lights stay illuminated.

Verify that the FWD and AFT cargo fire warning lights stay illuminated.

Verify that the DETECTOR FAULT light stays extinguished.

Verify that the DISCH light stays illuminated.

C-FLDX

This check is needed once per flight day.

Preflight:

Verify Both CCU and both SCU circuit breakers on the P18-2 panel are closed.

Verify "SYS OK" is illuminated and all other lamps are not illuminated.

Depress Lamp Test Switch:

Cockpit Fire Bell rings.

"FIRE WARNING" lights on glare shield illuminate.

"MASTER CAUTION" lights on glare shield illuminate.

"OVERHEAD" annunciation on Master Caution annunciator panel illuminates.

All lamps on CDU illuminate.

CDU Alphanumeric display illuminates all pixels.

Depress "FIRE WARNING" light/switch or Bell Cutoff Switch while holding the Lamp Test Switch:

Fire Bell mutes.

"FIRE WARNING" lights on glare shield are extinguished.

Depress "MASTER CAUTION" light/switch while holding Lamp Test Switch:

"MASTER CAUTION" lights on glare shield are extinguished.

"OVERHEAD" annunciation on Master Caution annunciator panel is extinguished.

Release Lamp Test Switch:

"SYS OK" light is illuminated.

All other CDU lamps are not illuminated.

EFIS control panel . . . . Set

Decision height selector – As needed

Mode selector – MAP

Range selector – As needed

TRAFFIC switch (as installed) . . . . As needed

WEATHER RADAR – Off

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

Map switches – As needed

VHF communications radios . . . . Set

VHF NAVIGATION radios . . . . Set for departure

NAV switches. . . . . AUTO / AUTO or as req'd for departure

Audio control panel . . . . Set

ADF radios. . . . . Set

C-FLDX

HF radios . . . . Set

WARNING: Do not key the HF radio while the aircraft is being fueled. Injury to personnel or fire can occur.

WEATHER RADAR panel . . . . Set

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

Transponder panel. . . . . Set / Standby

Note: For FD "A", set the transponder to 1. For FD "B", set the transponder to 2.

STABILIZER TRIM override switch . . . . Guard closed

WARNING: Do not put objects between the seat and the aisle stand. Injury can occur when the seat is adjusted.

Seat . . . . Adjust

Use the handhold above the forward window for assistance when pulling the seat forward. Do not use the glare shield, as damage can occur.

Adjust the seat for optimum eye reference.

Whenever the seat is adjusted, verify a positive horizontal (fore and AFT) seat lock by pushing against the seat.

Rudder pedals . . . . Adjust

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

Seat belt and shoulder harness . . . . Adjust

Do the PREFLIGHT checklist on the Captain's command.

PRE-FLIGHT PROCEDURE - CAPTAIN

The Captain normally does this procedure. The First Officer may do this procedure if needed.

Lights . . . . .Test

Master LIGHTS TEST and DIM switch – TEST

The fire warning lights are not checked during this test. Use individual test switches or push to test features to check lights which do not illuminate during the light test. Use scan flow to verify that all other lights are flashing or illuminated. Verify that all system annunciator panel lights are illuminated.

Master LIGHTS TEST and DIM switch – As needed

C-FLDX

NAV MODE selector . . . . .As needed

Select FMC, ANS-L or ANS-R as needed for navigation system to be used for departure.

Mode control panel . . . . Set

COURSE(S) – Set

FLIGHT DIRECTOR switch – ON

Move the switch for the pilot flying to ON first.

Bank angle selector – As needed

Autopilot DISENGAGE bar – UP

Oxygen . . . . Test and Set

Note the crew oxygen pressure.

Oxygen mask – Stowed and doors closed

RESET/TEST switch – Push and hold

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

EMERGENCY/TEST selector – Push and hold

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

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

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

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

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

Normal/100% selector – 100%

Crew oxygen pressure – Check

Verify that the pressure is sufficient for dispatch.

Marker beacon lights . . . . Test

Marker beacon switch . . . . As needed

Clock . . . . Set

NOSE WHEEL STEERING switch. . . . . Guard closed

C-FLDX

SBAS SEL Annunciator . . . . OFF (annunciator not illuminated)

Disengage light TEST switch . . . . Hold to 1

Verify that the A/P light is illuminated steady amber.

Verify that the A/T light is illuminated steady amber.

Verify that the FMC light is illuminated steady amber.

Disengage light TEST switch . . . . Hold to 2

Verify that the A/P light is illuminated steady red.

Verify that the A/T light is illuminated steady red.

Verify that the FMC light is illuminated steady amber.

Do the Initial Data and Navigation Data steps from the CDU Preflight Procedure and verify that the IRS alignment is complete before checking the flight instruments.

Flight Instruments . . . . Check

Heading . . . . ___, ___, check stby compass___

Airspeed . . . . ______

Altimeter . . . . ___ in (mb) / ___ (altitude)

Verify that the flight mode annunciations are correct:

- autothrottle (A/T) mode is blank
- pitch mode is blank
- roll mode is blank
- AFDS status is FD

Standby instruments. . . . . Check

Standby altimeter – Set

Verify that the flight instrument indications are correct.

Verify that no flags are shown.

Standby horizon – Set

Gyro caging control – Pull, then release

Approach mode selector (as installed) – OFF

Verify that the flight instrument indications are correct.

Verify that no flags are shown.

STAB OUT OF TRIM light. . . . . Verify extinguished

Fuel Gauges . . . . Indicating

SPEEDBRAKE lever. . . . . DOWN detent

Verify that the SPEED BRAKE DO NOT ARM light is extinguished.

Verify that the SPEED BRAKE ARMED light is extinguished.

Verify that the SPEED BRAKE light is extinguished.

Reverse thrust levers . . . . .Down

Forward thrust levers . . . . .Closed

FLAP lever . . . . Set

Set the flap lever to agree with the flap position.

Parking brake . . . . Set

Verify that the parking brake warning light is illuminated

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

Engine start levers . . . . CUTOFF

STABILIZER TRIM cutout switches . . . . NORMAL

EFIS control panel . . . . .Set

Decision height selector – As needed

Mode selector – MAP

TRAFFIC switch (as installed) . . . . .As needed

Range selector – As needed

WEATHER RADAR – Off

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

Map switches – As needed

VHF communications radios . . . . .Set

VHF NAVIGATION radios . . . . Set for departure

Audio control panel . . . . .Set

Trim . . . . .Set

Note: The B ELECTRIC HYDRAULIC PUMP switch must be selected ON prior to completing the trim check.

Check each trim for freedom of movement. This check is required for the first flight of the day.

WARNING: Do not put objects between the seat and the aisle stand. Injury can occur when the seat is adjusted.

Seat . . . . Adjust

Use the handhold above the forward window for assistance when pulling the seat forward. Do not use the glare shield as damage can occur.

Adjust the seat for optimum eye reference.

Whenever the seat is adjusted, verify a positive horizontal (fore and AFT) seat lock by pushing against the seat.

Rudder pedals . . . . Adjust

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

Seat belt and shoulder harness . . . . Adjust

Call "PREFLIGHT CHECKLIST"

BEFORE START PROCEDURE

Start the Before Start Procedure after Load Summary and Load Report are on board.

EFB . . . . .Airplane Mode C, F/O

Papers / Logbooks . . . . Onboard C, F/O

Flight Deck Door . . . . Closed and locked F/O

Verify that the CAB DOOR UNLOCKED/LOCK FAIL light is extinguished.

Passenger Signs. . . . . On F/O

Do the CDU Pre-Flight Procedure – Performance Data steps before completing this procedure.

CDU display . . . . Set C, F/O

Normally the PF selects the TAKEOFF REF page.

Normally the PM selects the LEGS page.

N1 bugs . . . . Check C, F/O

Verify that the N1 reference bugs are correct.

MCP . . . . Set C

AUTOTHROTTLE ARM switch . . . . ARM

IAS/MACH selector . . . . Set V2

Initial heading . . . . Set

Initial altitude . . . . Set

Taxi and Takeoff briefings . . . . Complete C, F/O

The pilot who will do the takeoff does the taxi and takeoff briefing.

As part of the takeoff briefing for the first flight of the day and following a change of either flight crew member, cabin altitude warning indications and memory item procedures must be briefed on aircraft in which the CABIN ALTITUDE and TAKEOFF CONFIG lights are not installed, or are installed but not activated. The briefing must contain the following information:

Whenever the intermittent warning horn sounds in flight at an aircraft flight altitude above 10000 feet MSL:

1. Immediately, don oxygen masks and set regulators to 100%.
2. Establish crew communications.
3. Do the CABIN ALTITUDE WARNING or Rapid Depressurization non-normal checklist.

Both pilots must verify on the overhead Cabin Altitude Panel that the cabin altitude is stabilized at or below 10,000 feet before removing oxygen masks.

Exterior doors . . . . Verify closed F/O

Flight deck windows . . . . Closed and locked C, F/O

Start clearance . . . . Obtain C, F/O

Establish communications with ground personnel through headset or visual signals.

Confirm: brakes set; chocks removed; doors closed; boarding/loading equipment removed; aircraft clear for start.

Note: If a pushback is required, the F/O should commence the Before Start Procedure as soon as the ground crew verifies that the tow bar is connected and the nose gear steering lockout pin is installed.

Obtain a clearance to pressurize the hydraulic systems.

Obtain a clearance to start the engines.

If pushback is needed:

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

Fuel panel . . . . Set F/O

If the centre tank fuel quantity exceeds 460 kilograms:

LEFT and RIGHT CENTER FUEL PUMPS switches . . . . ON

Verify that the LOW PRESSURE lights illuminate momentarily and then extinguish.

If a LOW PRESSURE light stays illuminated turn off the affected CENTER FUEL PUMPS switch.

CAUTION: Centre tank fuel pump switches should be positioned ON only if the fuel quantity in the centre tank exceeds 453 kg.

AFT and FORWARD FUEL PUMPS switches . . . . ON

Verify that the LOW PRESSURE lights are extinguished.

If pushback is not needed:

Hydraulic panel . . . . Set F/O

If pushback is needed and the nose gear steering lockout pin is NOT installed:

WARNING: Do not pressurize hydraulic system A. Unwanted tow bar movement can occur.

System A HYDRAULIC PUMP switches – OFF

Verify that the system A pump LOW PRESSURE lights are illuminated.

System B electric HYDRAULIC PUMP switch – ON

Verify that the system B electric pump LOW PRESSURE light is extinguished.

Verify that the brake pressure is 2,800 psi minimum.

Verify that the system B pressure is 2,800 psi minimum.

If pushback is not needed, or if pushback is needed and the nose gear steering lockout pin is installed:

Electric HYDRAULIC PUMP switches – ON

Verify that the electric pump LOW PRESSURE lights are extinguished.

Verify that the brake pressure is 2,800 psi minimum.

Verify that the system A and B pressures are 2,800 psi minimum.

ANTI COLLISION light switch. . . . . ON F/O

Trim. . . . . Confirm Set C

Stabilizer trim – _____ UNITS

Set the trim for takeoff.

Verify that the trim is in the green band.

Aileron trim – 0 units

Rudder trim – 0 units

Call "BEFORE START CHECKLIST"

Do the BEFORE START checklist.

PUSHBACK OR TOWING PROCEDURE

The Engine Start procedure may be done during pushback or towing.

Establish communications with ground handling personnel. C

CAUTION: Do not hold or turn the nose wheel steering wheel during pushback or towing. This can damage the nose gear or the tow bar.

CAUTION: Do not use aircraft brakes to stop the aircraft during pushback or towing. This can damage the nose gear or the tow bar.

Transponder reply selector . . . . AS NEEDED F/O

Note: At airports where ground tracking is not available, select STBY. At airports equipped to track aircraft on the ground, select AUTO with TCAS selected OFF.

Set or release the parking brake as directed by ground handling personnel C or F/O

When pushback or towing is complete:

Verify that the tow bar is disconnected C

Verify that the nose gear steering lockout pin is removed C

System A HYDRAULIC PUMPS switches . . . . ON

Verify that the System A pump LOW PRESSURE lights are extinguished.

Verify that the System A pressure is 2,800 psi minimum.

ENGINE START PROCEDURE

Starter duty cycle:

- Multiple consecutive start attempts are permitted. Each start attempt is limited to 2 minutes of starter usage.
- A minimum of 20 seconds is needed between the first and second start attempts.
- A minimum of 3 minutes is needed between the second and subsequent start attempts.

Normal engine start considerations:

- Captain will monitor start timing and FO will monitor ignition timing.
- Do not move an engine start lever to idle early or a hot start can occur.
- Keep a hand on the engine start lever while monitoring RPM, EGT and fuel flow until stable.
- If fuel is shut off accidentally (by closing the engine start lever) do not reopen the engine start lever in an attempt to restart the engine.
- Failure of the ENGINE START switch to stay in GRD until the starter cutout RPM can cause a hot start. Do not re-engage the ENGINE START switch until engine RPM is below 20% N2.
- If a fluid leak (other than a continuous stream) from any of the engine drains is discovered during the Exterior Inspection, the engine can be started. If during engine start, the ground crew reports a fluid leak from an engine drain, the engine start may be continued.
- If the fluid leak continues after the engine is stable at idle, do one of the following:
    - shut down the engine for maintenance action, or
    - run the engine at idle thrust for up to 5 minutes. If the fluid leak stops during this time, no maintenance action is needed, or

- shut down and restart the engine. Run the engine at idle thrust for up to 5 minutes. If the fluid leak stops during this time, no maintenance action is needed.

Do the ABORTED ENGINE START checklist for one or more of the following abort start conditions:

- The N1 or N2 does not increase or increases very slowly after the EGT increases.
- There is no oil pressure indication by the time that the engine is stable at idle.
- The EGT does not increase by 10 seconds after the engine start lever is moved to IDLE.
- The EGT quickly nears or exceeds the start limit.

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

Start pressure . . . . ____ psi F/O

The minimum start pressure at sea level is 30 psi. Decrease the minimum start pressure 0.5 psi for each 1000 ft above sea level.

Start sequence . . . . .Announce C

Call "START #__ ENGINE" C

ENGINE START switch . . . . .GRD F/O

Verify that the N2 RPM increases . . . . "N2" C

Verify that the N1 RPM increases . . . . "N1" C

Verify Oil Pressure increase . . . . "OIL PRESSURE" C

When N1 rotation is seen and N2 is at 25%, or (if 25% N2 is not possible), at maximum motoring and a minimum of 20% N2:

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

Engine start lever . . . . IDLE C

Monitor fuel flow and EGT indications.

Verify EGT increase . . . . "EGT" C

At 46% N2, verify that the ENGINE START switch moves to OFF. If not, move the ENGINE START switch to OFF . . . . F/O

Verify that the START VALVE OPEN light extinguishes when the ENGINE START switch moves to OFF. . . . . F/O

Call "STARTER CUTOUT" . . . . F/O

Monitor N1, N2, EGT, fuel flow and oil pressure for normal indications while the engine accelerates to a stable idle . C, F/O

After the engine is stable at idle, start the other engine.

After start, call "STABLE ENGINES"

Before Taxi Procedure

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

Note: The F/O completes the Before Taxi Procedure as soon as the engines are stable at idle. When getting to the point for selecting flaps, they will rest their hand on the flap lever until the Captain calls "FLAP ____" as needed for takeoff.

GENERATOR 1 and 2 switches	ON	F/O
PITOT STATIC HEAT switches	ON	F/O
WING ANTI-ICE switch	As needed	F/O
ENGINE ANTI-ICE switches	As needed	F/O
HYDRAULIC SYSTEM switches	ON	F/O
PACK switches	AUTO	F/O
ISOLATION VALVE switch	AUTO	F/O
APU BLEED air switch	OFF	F/O
FLT/GRD switch	FLT	F/O
ENGINE START switches	CONT	F/O
AUTOBRAKE	RTO	F/O
Engine start levers	IDLE detent	C
Verify that the ground equipment is clear.		C, F/O
Call: "FLAP ____" as needed for takeoff		C
Flap lever	Set takeoff flaps	F/O

Verify requested take off flap setting against the CDU setting and call "FLAP ___CONFIRMED"

Flight controls	Check	C

Verify that the LE FLAPS EXT green light is illuminated.

Make slow and deliberate inputs, one direction at a time. The F/O is to follow through with the Captain to ensure full range of motion and proper seat position.

Move the control wheel and the control column to full travel in both directions and verify:

- freedom of movement
- that the controls return to centre

Hold the nose wheel steering wheel during the rudder check to prevent nose wheel movement.

Move the rudder pedals to full travel in both directions and verify:

- freedom of movement

- that the rudder pedals return to centre

Transponder mode selector . . . . As needed F/O

At airports where ground tracking is not available, select STBY. At airports equipped to track aircraft on the ground, select an active transponder setting, TA mode.

Recall . . . . Check C, F/O

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

APU switch . . . . .OFF F/O

Update changes to the taxi briefing, as needed. . . . . C or PF

Call "BEFORE TAXI CHECKLIST." C

Do the BEFORE TAXI checklist

With the pushback and before taxi checklist complete, the Captain will call for the F/O to call ground and request taxi clearance.

Copy taxi instructions, read back and clarify any misunderstanding of the route, hold points and direction.

During the taxi, **DO NOT** engage in administrative duties or actions that distract from situational awareness.

BEFORE TAKEOFF PROCEDURE

Engine warm up requirement:

- verify an increase in engine oil temperature before takeoff.

Engine warm up recommendations:

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

CAPTAIN	FIRST OFFICER
	IFD will call the flight deck via interphone and say: "CABIN SECURE".
The pilot who will do the takeoff updates changes to the takeoff briefing as needed.	
Set the weather radar display as needed. Set the terrain display as needed.	
Call "BEFORE TAKEOFF CHECKLIST"	Do the BEFORE TAKEOFF checklist.

TAKEOFF PROCEDURE

CAPTAIN	FIRST OFFICER
	When cleared to position for takeoff on the departure runway make PA from the flight deck: "FLIGHT ATTENDANTS BE SEATED FOR TAKEOFF."
Before entering the departure runway, verify that the runway and runway entry point are correct.	
Set weather radar/TERRAIN as required. It is recommended that one pilot display TERRAIN. **Note:** Consider not using RETRACTABLE LANDING lights.	When entering the departure runway, set the STROBE light switch to ON. Set the transponder mode selector to TA/RA. Set weather radar/TERRAIN as required. It is recommended that one pilot display TERRAIN.
Verify that the brakes are released. Align the aircraft with the runway.	
Verify that the aircraft heading agrees with the assigned runway heading.	
When cleared for takeoff, set all FIXED LANDING light switches to ON.	
Note: For F/O takeoffs - the F/O becomes the PF after the aircraft is aligned on the runway, FIXED LANDING light switches are ON, the aircraft is cleared for takeoff and the controls are transferred.	

Pilot Flying	Pilot Monitoring
Immediately prior to advancing the thrust levers, start elapsed time (using Elapsed Time selector) and call: "TAKEOFF".	Call: "RUNWAY XXX VERIFIED". **Note:** Verification requires: 1. Runway number on the ND and runway matches runway cleared for takeoff. 2. Aircraft heading on the runway reconciles with runway number cleared for takeoff (e.g. aircraft heading 332 and cleared for takeoff on Rwy 33L).

Advance the thrust levers to approximately 40% N1. Allow the engines to stabilize.	
Push the TO/GA switch. Call "N1/TOGA". **Note:** Call roll mode if annunciated.	
Note: Selecting the TOGA Button with uneven Engine Thrust by as little as 2% may cause the Auto-Thrust to advance at different rates, causing asymmetric thrust and yaw. If this happens on a contaminated runway, loss of control may be the result.	
Verify the correct takeoff thrust is set.	Verify the correct takeoff thrust is set. Monitor the engine instruments during the takeoff. Call out any abnormal indications. Adjust takeoff thrust before 60 knots as needed. During strong headwinds, if the thrust levers do not advance to the planned takeoff thrust by 60 knots, manually advance the thrust levers. Call “THRUST SET.”
After takeoff thrust is set, the Captain's hand must be on the thrust levers until V1.	
Monitor airspeed and runway centreline. Maintain light forward pressure on the control column.	Monitor airspeed and call out any abnormal indications.
Verify 80 knots and call: "CHECK".	Call "80 KNOTS"
Verify V1 speed.	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 ft radio altitude, call for a roll mode, as needed.	Select or verify the roll mode.

NADP 1 Profile: Takeoff power, Takeoff flap and climb at V2+10 - 20kts to 1500 feet AAE (Above Airport Elevation). At 1500 feet AAE, reduce to climb thrust and maintain V2+10 - 20kts to 3000 feet AAE. At 3000 feet AAE, accelerate to en route climb speed with flap retraction on schedule. NADP 2 Profile: Takeoff power, Takeoff flap and climb at V2+10 - 20kts to 1000 feet AAE. At 1000 feet AAE (or MFRA if higher), reduce to climb thrust and accelerate to minimum manoeuvring speed (Vzf), retracting flaps on schedule. From 1000 feet AAE to 3000 feet AAE, continue to climb at not greater than Vzf+20kts. At 3000 feet AAE, when flaps are UP, accelerate to en route climb speed.	
At thrust reduction height, call: "SET CLIMB THRUST".	
	Push the N1 switch.
Verify that climb thrust is set.	
At acceleration height, call: "SET FLAPS UP SPEED".	
	Set the flaps up manoeuvring speed.
Verify acceleration. Call: "FLAP ____" according to the flap retraction schedule.	
	Verify the speed and set the FLAP lever as directed. Monitor flaps and slats retraction. When flaps are indicating the selected position, call "FLAP ____".
	When flaps and slats have fully retracted, call: "FLAPS UP, NO LIGHTS".
After flaps and slats retraction is complete, call: "LEVEL CHANGE, SPEED ____" (Select speed appropriate to speed limit, noise abatement and/or departure profile.)	Select or verify Level Change and set MCP speed as requested.

Engage the autopilot when above the minimum altitude for autopilot engagement.	
	After flap retraction is complete: ▪ set or verify that the engine bleeds and air conditioning packs are operating; ▪ set the engine start switches, as needed; ▪ set the AUTO BRAKE select switch to OFF; ▪ set the landing gear lever to OFF after landing gear retraction is complete.
At 3000 ft AAE, call or select "VNAV" (if applicable) or "LEVEL CHANGE, SPEED _____".	
	Push the VNAV switch as directed.
After flap retraction and above 3000 ft AAE, call "AFTER TAKEOFF CHECKLIST".	
	Do the AFTER TAKEOFF checklist.

Once above 3000 AGL, engage VNAV.

Takeoff Flap Retraction Speed Schedule

Takeoff Flaps	At & Below 53,070 kg	Above 53,070 kg up to 62,823 kg	Above 62,823 kg	Select Flaps
15	V2 + 15 170 or F 190 or F	V2 + 15 180 or F 200 or F	V2 + 15 190 or F 210 or F	5 1 UP
5	V2 + 15 190 or F	V2 + 15 200 or F	V2 + 15 210 or F	1 UP
Limit bank angle to 15° until reaching V2 + 15.				

"F" = Minimum flap retraction speed for next flap setting on speed tape display.

Before calling for flap settings, the PF will note and consider the speeds above.

The PM will note and confirm speed in range and set the requested Flap position. If speed is out of limits for flap retraction, PM will call: "SPEED".

Climb and Cruise Procedure

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

Pilot Flying	Pilot Monitoring
At or above 10000 ft MSL, Captain selects all LANDING light switches to OFF.	F/O selects Logo light switch OFF, if applicable. After 10000 ft, send SkyTrac Departure message.
	Set the passenger signs as needed. Check pressurization normal.
CAUTION: Do not allow the shoulder harness straps to retract quickly. Buckles can pull or damage circuit breakers.	
Climbing or Descending: Call passing through: "10,000", "20,000" and "30,000". e.g. "10000 CLIMBING FL330".	
Climbing or Descending: Call 1000 ft prior to cleared altitude. e.g. "FL270 CLIMBING FL280".	
At transition level, set and cross check the altimeters to standard. PF calls: "TRANSITION, SET 29.92 INCHES"; PM calls: "29.92 INCHES SET AND CROSS CHECKED". The Captain sets the standby altimeter to 29.92 inches.	
	During climb, set both centre tank fuel pump switches to OFF when both centre tank fuel pump LOW PRESSURE lights illuminate.
	When established in a level flight attitude, if the centre tank contains usable fuel and both centre tank fuel pump switches are OFF, set both centre tank fuel pump switches to ON again. Set both centre tank fuel pump switches to OFF when both centre tank fuel pump LOW PRESSURE lights illuminate.

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td colspan="2">At top of climb, complete panel scan in area of responsibility, including a RECALL check.
Ensure altimeters are within RVSM limits.
Setup VHF as follows:
1) VHF #1 - ATC
2) VHF #2 - 121.5</td></tr>
<tr><td>Ensure the aircraft is in trim.
CAUTION: Do not fly above Maximum Altitude in the FMC. Fly at or below Optimum Altitude as much as possible.</td><td>Before the top of descent, modify the active route as needed for the arrival and approach.</td></tr>
<tr><td colspan="2">In flight, the PM usually makes the CDU modifications as directed by PF. The PM calls: "CONFIRM". The PF calls "CONFIRMED" after verifying the change is correct and then PF calls: "EXECUTE". The PM executes the change only after the PF verifies the entries.</td></tr>
</table>

DESCENT PROCEDURE

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

Complete the Descent Procedure by 10000 feet MSL.

Prior to TOD, the Captain sets the standby altimeter to destination QNH.

Pilot Flying	Pilot Monitoring
	During the descent, verify the RNP as needed.
	Set both centre tank fuel pump switches to OFF when both centre tank fuel pump LOW PRESSURE lights illuminate.
	Verify that pressurization is set to landing altitude.
Review the system annunciator lights.	Recall and review the system annunciator lights.
Call for Autobrake setting as required.	Check landing performance. Set the Autobrake select switch to the needed brake setting.
Set or verify the navigation radios and courses for the approach.	
Verify VREF on the APPROACH REF page.	Enter VREF on the APPROACH REF page.
Set the DH REF / RA minimums as needed for the approach. If planning an RNAV approach using VNAV, set the RNP value (normally 0.3) in the FMC.	
Do the approach briefing and call: "DESCENT CHECKLIST"	Do the DESCENT checklist.

APPROACH BRIEFING

The approach briefing will be given by the PF prior to descent after obtaining the arrival ATIS or advisory.

Both pilots will review the approach procedure. The briefing shall include the following:

- STAR
- Type of approach - State page number and effective date. If applicable, check that the approach plate is current.
- Navigational frequency to be used.
- Final Approach Course.

- Verify or set the applicable RNP value for RNAV approaches using VNAV.
- Glideslope / FAF minimum altitude crossing fix.
- DA / MDA
- Minimum safe altitude sectors.
- Transition altitude.
- Missed Approach Point and Missed Approach Procedure.
- Vertical profile including all minimum altitudes, crossing altitudes and approach minimums.
- Flap setting / Autobrake / Vref / Command speed.
- Weather considerations - crosswind/tailwind, visibility, cloud cover, rain, ice and snow effect on braking, windshear, thunderstorms, etc.
- **Minimum CFRI is .25**.
- Management of the AFDS. Set up of NAV SOURCES.
- Operations, monitoring and standard calls.
- Questions and confirmation of minimum altitudes by PM.

For CAT II operations, review and verify all CAT II requirements have been met as per pages NP-21-39 - NP-21-41.

Brief the CAT II approach using briefing guide on page NP-21-39 plus any additional considerations listed above.

CAT II OPERATIONS

CAT II Approach Briefing

ILS CAT II APPROACH RUNWAY ____, (Airport), (page#), Effective Date ____.

LOCALIZER FREQ ____, APPROACH COURSE ____, CROSS FIX ____ @ (altitude).

FLAPS ____ AUTOBRAKE ____

DECISION HEIGHT IS ____ FEET, SET ON THE RADIO ALTIMETER.

AFTER APPROACH IS ARMED, I WILL ENGAGE THE 2nd AUTOPILOT.

ON THE GLIDESLOPE AND PRIOR TO THE FAF, WE WILL BE FULLY CONFIGURED FOR LANDING.

WE WILL BOTH MONITOR THE INSTRUMENTS WHILE ON APPROACH. YOU WILL REMAIN HEADS DOWN THROUGHOUT THE APPROACH, LANDING, ROLL OUT AND/OR GO-AROUND.

AT 1000 FEET AGL, YOU WILL CALL "1000".

IF APPROPRIATE, I WILL ANSWER "STABILIZED".

AT 500 FEET AGL, YOU WILL CALL: "500, FLARE ARMED".

I WILL GO HEADS UP AND SCAN FOR VISUAL CUES.

AT 100 FEET ABOVE MINIMUMS, YOU WILL CALL: "100 ABOVE".

AT MINIMUMS, YOU WILL CALL: "MINIMUMS".

I WILL CALL EITHER: "LANDING" OR "GO AROUND".

IN THE EVENT OF A GO-AROUND: [BRIEF MISSED APPROACH PROCEDURE].

CALL ANY DEVIATIONS FROM FLIGHT PATH, AFDS ANNUNCIATORS OR AN UNSTABILIZED CONDITION.

ANY QUESTIONS?

Note: Prior to conducting a CAT II Approach: Review the CAT II Limitations and Approach Ban Criteria as displayed on the reverse side of the glareshield NORMAL CHECKLIST.

CAT II Limitations

Wind Direction	Autoland Wind Limits
Headwind	25 knots
Tailwind	C-FLDX - 10 knots C-FLHJ, C-FLRS, C-FLHE - 15 knots
Crosswind	15 knots

- No CAT II landings are authorized at airfields above 8400 ft pressure altitude.
- Automatic landings can be made using Flap 30 or Flap 40, however, Flap 40 should be used for CAT II operations to improve cockpit visibility.
- Maximum glideslope angle is 3.25°.
- Minimum glideslope angle is 2.5°.

  Note: Autoland should not be attempted unless the final approach course path is aligned with the runway centreline. If the localizer beam is offset from the centreline, the AFDS may cause the aircraft to depart the runway.

- FAL's policy is to operate all CAT II Approaches with 2 autopilots engaged and landing with Autoland.
- Use Autobrake 2 for dry runway / 3 or MAX for wet, slippery runways.

CAT II Aircraft Equipment Requirements

Item	Installed
Two independent Flight Directors	Required.
Two ILS Receivers	Required.
Two Air Data Computers	Required.
Two IRSs	Required.
Two Radar Altimeters	Required. To include independent displays.
Two Flight Director Mode Annunciations	Required. To include independent displays.
Duplicate Flight Instruments	Required. To include independent displays.
Avionics Failure Warning System	Required. To include ILS comparator and avionics warning system.
Missed Approach Guidance	Required. To include 2 independent Flight Director Go-around modes.
Communication Equipment	One VHF Communication radio required.
Duplicate equipment to annunciate DH	Required. To include independent displays.
Ice and Rain Protection	Required. To include a protection system for each windshield.
Two Autopilots	Required.

APPROACH PROCEDURE

Stabilized Approach

Maintaining a stable speed, descent rate and vertical/lateral flight path in landing configuration is commonly referred to as the stabilized approach concept.

Any significant deviation from planned flight path, airspeed or descent rate should be announced. The decision to execute a go-around is no indication of poor performance.

All approaches should be stabilized by 1000 ft AAE in instrument meteorological conditions (IMC) and in visual meteorological conditions (VMC), and the speed must be stabilized to within 10 knots of command speed and not less than Vref.

The following recommendations are consistent with criteria developed by the Flight Safety Foundation:

- The aircraft is on the correct flight path.
- Only small changes in heading / pitch are required to maintain the correct flight path.
- The aircraft speed is not more than command speed +10 knots indicated airspeed and not less than Vref.
- The aircraft is in the correct landing configuration.
- Sink rate is no greater than 1,000 fpm; if an approach requires a sink rate greater than 1,000 fpm, a special briefing should be conducted.
- Power setting is appropriate for the aircraft configuration.
- All briefings and checklists have been conducted.
- ILS approaches should be flown within one dot of the glideslope and localizer.
- During a circling approach, wings should be level on final when the aircraft reaches 300 ft above airport elevation

Unique approach procedures or abnormal conditions requiring a deviation from the above elements of a stabilized approach require a special briefing.

> **Note:** An approach that becomes unstabilized below 1000 ft AAE in IMC and in VMC requires an immediate go-around. Do not attempt to land from an unstable approach.

These conditions should be maintained throughout the rest of the approach for it to be considered a stabilized approach.

At 100 ft HAT for all visual approaches, the aircraft should be positioned so the flight deck is within, and tracking to remain within, the lateral confines of the runway edges extended.

As the aircraft crosses the runway threshold it should be:

- Stabilized on target airspeed to within +10 knots until arresting descent rate at flare.
- On a stabilized flight path using normal manoeuvring.
- Positioned to make a normal landing in the touchdown zone.

Initiate a go-around if the above criteria cannot be maintained.

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.

If a Flap 15 landing is needed because of performance:

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

Pilot Flying	Pilot Montoring
When descending below transition level, set and cross check the altimeters. PF calls: "TRANSITION, SET _____ INCHES". PM calls: "_____ INCHES SET AND CROSS CHECKED".	
Update changes to the arrival and approach, as needed. Verify approach aids tuned and identified.	
In descent at 10000 ft MSL, Captain sets the FIXED Landing light switches to ON, First Officer sets LOGO light switch to ON (during night operations).	During arrival and approach, verify the RNP as needed.
Update the arrival and approach as needed.	At 10000 ft MSL (adjust if required for high airport elevation) or 10 minutes prior to landing, select the SEAT BELT sign ON. Call: "FLIGHT ATTENDANTS PREPARE FOR ARRIVAL." If seatbelt sign is already on: select OFF, then ON again.
Call "APPROACH CHECKLIST"	Do the APPROACH checklist.

Flap Extension Schedule

Current Flap Position	At Speed (knots) a* / b* / c*	Select Flaps	Command Speed for Selected Flaps a* / b* / c*
Up	210 - 220 - 230	1	190 - 200 - 210
1	190 - 200 - 210	5	180 - 190 - 200
5	180 - 190 - 200	10	170 - 180 - 190
10	170 - 180 - 190	15	150 - 160 - 170
15	150 - 160 - 170	25	140 - 150 - 160
25	140 - 150 - 160	30 or 40	(VREF30 or VREF40) + wind additives

a* = At and below 53,070 kgs

b* = Above 53,070 kgs and up to 62,823 kgs

c* = Above 62,823 kgs

Before calling for flap settings, the PF will note and consider the speeds above.

The PM will note and confirm speed in range before selecting requested flap setting.

The PF will confirm the flap selection and movement of the flaps before calling for or selecting a lower speed on the MCP.

Pilot Flying	Pilot Monitoring
"FLAP 1, SPEED 190" (as applicable)	Set the flap lever as directed. Monitor flaps and slats extension. When flaps indicate the selected position, Call "FLAP 1"

LANDING PROCEDURE - ILS CAT I

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Initially:
If on radar vectors
▪ HDG SEL
▪ Pitch mode (as needed)
If en route to a fix
▪ LNAV or other roll mode
▪ VNAV or other pitch mode</td><td></td></tr>
<tr><td>Call "FLAP ____, (SPEED)" according to the flap extension schedule. After flap selection, Set MCP speed.</td><td></td></tr>
<tr><td></td><td>Set the flap lever as directed.
Monitor flaps and slats extension.
When flaps indicate the selected position,
Call "FLAP ____"</td></tr>
<tr><td colspan="2">When on localizer intercept heading:
▪ Verify that the ILS is tuned and identified.
▪ Verify that LOC and G/S pointers are shown.
Note: When using LNAV to intercept the final approach course, LNAV might parallel the localizer without capturing it.
LNAV should not be selected until the aircraft is established on the intercept heading.</td></tr>
<tr><td>When cleared for the approach, and on the intercept heading with the LOC pointer properly displayed, arm the APP mode.
If a dual channel approach is desired, engage the second autopilot.</td><td></td></tr>
<tr><td>"LOCALIZER AND GLIDESLOPE ARMED"</td><td></td></tr>
<tr><td>Use LNAV or HDG SEL to intercept the final approach course as needed.</td><td>Call "LOCALIZER ALIVE"</td></tr>
<tr><td colspan="2">Verify that the localizer is captured.
Verify the final approach course heading.</td></tr>
<tr><td>Call "LOCALIZER CAPTURED"</td><td></td></tr>
<tr><td></td><td>"GLIDESLOPE ALIVE"</td></tr>
</table>

Pilot Flying	Pilot Monitoring
At glideslope alive, call: "GEAR DOWN" "FLAP 15" "SET (SPEED) ____" ▪ Set the speedbrake lever to ARM. (Captain arms speedbrake) ▪ Verify that the SPEEDBRAKE ARMED light is illuminated. "SPEEDBRAKE ARMED"	Set the landing gear lever to DOWN. Verify that the green landing gear indicator lights are illuminated. Check speed and set the flap lever as directed. When flaps indicate the selected position, Call "FLAP 15" Set the engine start switches to CONT.
At glideslope capture: "GLIDESLOPE CAPTURED" "FLAP _____, SET (SPEED)" as needed for landing. Set the missed approach altitude on the MCP.	Check speed and set the flap lever as directed. Monitor flap and slat extension.
Call "LANDING CHECKLIST"	Do the LANDING checklist.
	At OM / FAF: "(FIX NAME) ____" (published altitude)
Acknowledge 1000; Call "STABILIZED, MISSED APPROACH ALTITUDE ____ SET"	At 1000 ft AAE, verify MA altitude set on MCP, AFDS status and aircraft in stabilized approach. Call "ONE THOUSAND"
On approaches other than CAT II and prior to 100 ft above DH, the PM will advise the PF of runway environment in sight by stating the following: "APPROACH LIGHTS IN SIGHT" "RUNWAY IN SIGHT"	
"CHECK"	At 100 feet above minimums: Call "100 ABOVE"
If a normal approach and visual reference can be maintained, call "LANDING". If the requirements above are not met, or at any time thereafter, immediately execute a missed approach and call: "GO AROUND, GO AROUND THRUST"	At minimums: Call "MINIMUMS"

Pilot Flying	Pilot Monitoring
If suitable visual reference is established at DA(H), MDA(H) or the missed approach point, disengage the autopilot early enough to allow time to establish aircraft control before beginning the flare. Disengage the auto throttle at the same time. Maintain the glidepath to landing.	While maintaining situational awareness, monitor the RA and call: "50" "30" "20"
For a single channel approach, disengage the autopilot and auto throttle no later than the minimum use height for single autopilot operation. For a dual channel approach, disengage the autopilot after touchdown.	

Landing Procedure - ILS CAT II

Pilot Flying	Pilot Monitoring
Initially: If on radar vectors ▪ HDG SEL ▪ Pitch mode (as needed) If en route to a fix ▪ LNAV or other roll mode ▪ VNAV or other pitch mode	
Call "FLAP ____, (SPEED)" according to the flap extension schedule. After flap selection, Set MCP speed.	
	Set the flap lever as directed. Monitor flaps and slats extension. When flaps indicate the selected position, Call "FLAP ____"

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td colspan="2">When on localizer intercept heading:
▪ Verify that the ILS is tuned and identified.
▪ Verify that LOC and G/S pointers are shown.
Note: When using LNAV to intercept the final approach course, LNAV might parallel the localizer without capturing it.
LNAV should not be selected until the aircraft is established on the intercept heading.</td></tr>
<tr><td>When cleared for the approach, and on the intercept heading with the LOC pointer properly displayed, arm the APP mode.</td><td></td></tr>
<tr><td>"LOCALIZER AND GLIDESLOPE ARMED"
Engage the second autopilot.
Call "SECOND AUTOPILOT ENGAGED"</td><td>"CHECK"</td></tr>
<tr><td>Use LNAV or HDG SEL to intercept the final approach course as needed.</td><td>Call "LOCALIZER ALIVE"</td></tr>
<tr><td colspan="2">Verify that the localizer is captured.
Verify the final approach course heading.</td></tr>
<tr><td>Call "LOCALIZER CAPTURED"</td><td></td></tr>
<tr><td></td><td>"GLIDESLOPE ALIVE"</td></tr>
<tr><td>At glideslope alive, call:
"GEAR DOWN"
"FLAP 15"
"SET (SPEED) ____"
▪ Set the speedbrake lever to ARM. (Captain arms speedbrake)
▪ Verify that the SPEEDBRAKE ARMED light is illuminated.
"SPEEDBRAKE ARMED"</td><td>Set the landing gear lever to DOWN.
Verify that the green landing gear indicator lights are illuminated.
Check speed and set the flap lever as directed. When flaps indicate the selected position,
Call "FLAP 15"
Set the engine start switches to CONT.</td></tr>
<tr><td>At glideslope capture:
"GLIDESLOPE CAPTURED"
"FLAP _____, SET (SPEED)" as needed for landing.
Set the missed approach altitude on the MCP.</td><td>Check speed, set the flap lever as directed. Monitor flap and slat extension.</td></tr>
<tr><td>Call "LANDING CHECKLIST"</td><td>Do the LANDING checklist.</td></tr>
</table>

Pilot Flying	Pilot Monitoring
	At OM / FAF: "(FIX NAME) ____" (published altitude)
Acknowledge 1000; Call "STABILIZED, MISSED APPROACH ALTITUDE ____ SET"	At 1000 ft AAE, verify MA altitude set on MCP, AFDS status and aircraft in stabilized approach. Call "ONE THOUSAND"
Monitor the approach. Verify the AFDS status at 500 ft radio altitude. Verify aircraft in stabilized approach.	
	At 500 ft radio altitude, Call “500, FLARE ARMED”
Scan for visual cues. "CHECK"	At 100 feet above minimums: Call "100 ABOVE"
If visual reference (approach lights, runway environment) can be established and maintained, call "LANDING". If the requirements above are not met, or at any time thereafter, immediately execute a missed approach and call: "GO AROUND, GO AROUND THRUST"	At minimums, call "MINIMUMS"
During AUTOLAND, keep hands on controls and closely monitor aircraft. If "NO FLARE" is called, immediately press TOGA button and GO AROUND.	Keep heads down and closely monitor. At 50 ft radar altitude, annunciated FLARE, will replace G/S. If not, call "NO FLARE".
Upon disengaging AP during landing roll; "AUTOPILOT DISENGAGED".	

LANDING PROCEDURE - NON-PRECISION INSTRUMENT APPROACHES

Localizer and Backcourse Approaches

On aircraft with localizer input to the FMS, localizer and localizer backcourse approaches can be flown. The FMS uses the localizer to calculate the final approach course. Since the localizer is only one dimensional, to determine the location of the final approach fix and missed approach point, the FMS will retain the GPS. When flying a backcourse approach with the FMS, the course arrow will reflect the landing runway inbound course. In addition, a barometric glideslope is available. This will make the approach similar to an ILS, MDA minima + 50 ft must be observed.

RNAV Approaches

RNAV approach denotes the ability to fly a final approach course that is either not using a ground base NAVAID or is not directly in line with a ground base NAVAID. The 3 types of RNAV approaches are identified by the parentheses following RNAV and are GPS, VOR DME, and RNP. RNAV (GPS) AND GPS APPROACHES Most aircraft that fly RNAV (GPS) approaches do so as GPS approach certified aircraft. LNAV only requires lateral navigation and all GPS approach certified aircraft may use the LNAV MDA + 50 ft. When conducting instrument approaches using VNAV the following minimums must be observed: LNAV MDA (H) + 50 feet or LNAV / VNAV DA(H).

VOR and VOR/DME Approaches

VOR and VOR/DME approaches can be flown as a GNSS or GPS overlay approach. Transport Canada mandates that the GPS will be retained for FMS navigation for all VOR or VOR/DME approaches. Due to limitations of the FMS, the FMS can only present one type of VOR approach to a specific runway. Where a VOR and VOR/DME approach both go to the same runway, only the VOR/DME approach profile will be presented. VOR approaches will have a baro constructed glideslope. MDA minima + 50 ft must be observed.

NDB Approaches

Through the FMS; NDB (Non Directional Beacon) approaches can only be flown with the use of GNSS or GPS. To make a non-overlay NDB approach legal, the NDB must be tuned and identified and the NDB RMI needle must be selected. Most NDB approaches will have a baro constructed glideslope. MDA minima + 50 ft must be observed.

Landing Procedure - Non-Precision Instrument Approaches Using Vertical Speed - Stabilized Constant Descent Angle (SCDA) Approach

NPAs can be flown using a Stabilized Constant Descent Angle (SCDA) resulting in a stabilized final approach with minimal vertical manoeuvring. Using the SCDA NPA procedure, the aircraft is not flown at minimum altitudes for extended periods. The aircraft can be flown at or above the PT altitudes or intermediate approach segment altitude until an approximate 3° vertical descent path is intercepted, and a continuous descent to MDA can be made. SCDA is flown until the runway environment is in sight and descent to landing or until MDA is reached (treated like a DA) and the missed approach is commenced.

Descent to MDA normally commences after the FAF to provide a vertical path that is between 2.9° and 3.5° to a nominal threshold crossing height of 50, however, the vectoring altitudes for approaches, both RNAV and Non-Precision NDB and LOC only, are higher than the FAF crossing altitude. The new design on approaches in Canada are presented up to 10 miles from the FAF. In some cases, additional reference points have been added for crossing checks. All step down altitudes must be respected. It is the crew's responsibility to verify that the vertical path crosses at or above these altitudes. The FMC will calculate a SCDA and VDI based on the entered cruise altitude.

SCDA specifies:

- 800 fpm will be the vertical speed for the vast majority of approaches with a 3° glideslope.
- MDA Minima + 50 ft must be observed.
- The desired vertical speed must be initiated at approximately 0.3 NM prior to the FAF (if distance available). Vertical speed must be set promptly to ensure that desired profile is maintained. Avoid use of LVL CHG inside the FAF as descent initiation is too slow.
- For all non-precision approaches, if weather is less than 1000 ft/3 sm, the approach must be flown using the autopilot when conducting a SCDA.
- Autopilot must be disconnected not less than 50 ft below published MDA.
- Descent rates greater than 1000 fpm are not permitted, unless briefed.
- Descent rate corrections of more than +300 fpm not permitted. It is a mandatory go-around. (Momentary corrections exceeding ±300 fpm are permitted).

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Initially:
If on radar vectors
▪ HDG SEL
▪ Pitch mode (as needed)
If en route to a fix
▪ LNAV or other roll mode
▪ VNAV or other pitch mode</td><td></td></tr>
<tr><td>Call "FLAP ____, (SPEED)." according to the flap extension schedule. After flap selection, Set MCP speed.</td><td></td></tr>
<tr><td></td><td>Set the flap lever as directed.
Monitor flaps and slats extension.
When flaps indicate the selected position,
Call "FLAP ____"</td></tr>
<tr><td colspan="2">The recommended roll modes for the final approach are:
▪ 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 VOR/LOC.</td></tr>
<tr><td colspan="2">When on the final approach course intercept heading for LOC, LOC-BC, SDF or LDA approaches:
▪ verify that the localizer is tuned and identified
▪ verify that the LOC pointer is shown.</td></tr>
<tr><td>Select LNAV or arm the VOR/LOC mode, as required.</td><td></td></tr>
<tr><td colspan="2">WARNING: When using LNAV to intercept the localizer, LNAV might parallel the localizer without capturing it.
Note: LNAV should not be selected until the aircraft is established on the intercept heading.</td></tr>
<tr><td></td><td>Call "INBOUND TRACK ALIVE" and "CAPTURED" (if appropriate).</td></tr>
<tr><td colspan="2">Plan to cross IF at published altitude. Call: "(IF FIX) INBOUND"
Once established on inbound track, in ALT HOLD, set next lower approach waypoint crossing altitude.</td></tr>
</table>

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Prior to SCDA descent point, call
▪ "GEAR DOWN"
▪ "FLAP 15"
▪ "SET (SPEED) ____" (if speed intervention engaged).
▪ Set the speedbrake lever to ARM. (Captain arms speedbrake)
▪ Verify that the SPEEDBRAKE ARMED light is illuminated.
▪ "SPEEDBRAKE ARMED"</td><td>Set the landing gear lever to DOWN.
Verify that the green landing gear indicator lights are illuminated.
Check speed and set the flap lever as directed. Monitor flaps and slats extension. When flaps indicate the selected position,
Call "FLAP 15"
Set the engine start switches to CONT.</td></tr>
<tr><td colspan="2">At SCDA descent point, set VERT SPD to pre-calculated descent rate.</td></tr>
<tr><td>2 NM prior to the FAF, configure aircraft for Final Landing Flap Configuration:
"FLAP (30/40)"
"SET SPEED"
"LANDING CHECKLIST"</td><td>Check speed and set the flap lever as directed. Monitor flaps and slats extension.
Do the LANDING checklist.</td></tr>
<tr><td>Prior to the FAF in ALT HOLD or On Profile Descent (SCDA), set MDA(H) +50 ft on MCP.</td><td>Verify MDA(H) +50 feet set on MCP.</td></tr>
<tr><td>At 0.3 NM prior to the FAF, set the computed Vertical Speed descent rate on the MCP.</td><td></td></tr>
<tr><td></td><td>At FAF:
"(FIX NAME) ______" (published altitude)</td></tr>
<tr><td>Acknowledge 1000;
Call: "STABILIZED, MISSED APPROACH ALTITUDE ____ SET"</td><td>At 1000 ft AAE, verify MA altitude set on MCP, AFDS status and aircraft in stabilized approach.
Call "ONE THOUSAND"</td></tr>
<tr><td colspan="2">On approaches other than CAT II and prior to 100 ft above MDA, the PM will advise the PF of runway environment in sight by stating the following:
"APPROACH LIGHTS IN SIGHT"
"RUNWAY IN SIGHT"</td></tr>
</table>

Pilot Flying	Pilot Monitoring
If visual reference (approach lights, runway environment) can be established and maintained, call "LANDING" If the requirements above are not met, or at any time thereafter, immediately execute a missed approach: Call "GO AROUND, GO AROUND THRUST."	At minimums, call "MINIMUMS".
If suitable visual reference is established at DA(H), MDA(H) or the missed approach point, disengage the autopilot early enough to allow time to establish aircraft control before beginning the flare. Disengage the auto throttle at the same time. Maintain the glidepath to landing.	While maintaining situational awareness, monitor the RA and call: "50" "30" "20"

Landing Procedure - Instrument Approach Using VNAV

Stabilized Approach

VNAV should be used only for approaches that have one of the following features:

- a published GP angle on the LEGS page for the final approach segment;
- an RWxx waypoint at the approach end of the runway; or
- a missed approach waypoint before the approach end of the runway (for example, MXxx).

Use of the autopilot during the approach minimizes crew workload and provides:

- autopilot alerts and mode fail indications; and
- more accurate course and glide path tracking.

Enter the appropriate wind additive on the Approach Reference page or use speed intervention, if available.

This procedure is not authorized using QFE.

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Initially:
If on radar vectors
▪ HDG SEL
▪ Pitch mode (as needed)
If en route to a fix
▪ LNAV or other roll mode
▪ VNAV or other pitch mode</td><td></td></tr>
<tr><td colspan="2">The recommended roll modes for the final approach are:
▪ for a RNAV or RNAV (GNSS) approach, use LNAV;
▪ for a LOC-BC, or NDB approach, use LNAV;
▪ for a LOC, VOR, SDF or LDA approach, use VOR/LOC or LNAV.</td></tr>
<tr><td colspan="2">When on the final approach course intercept heading for LOC, LOC-BC, SDF or LDA approaches:
▪ verify that the localizer is tuned and identified;
▪ verify that the LOC pointer is shown.</td></tr>
<tr><td>Call "FLAP ____, (SPEED)." according to the flap extension schedule. After flap selection, Set MCP speed.</td><td></td></tr>
<tr><td></td><td>Set the flap lever as directed.
Monitor flaps and slats extension.
When flaps indicate the selected position,
Call "FLAP ____"</td></tr>
<tr><td colspan="2">When on the final approach course intercept heading, verify that LOC pointers are shown if selected.</td></tr>
<tr><td>Upon ATC clearance for the approach, use LNAV or arm the VOR/LOC mode.</td><td></td></tr>
<tr><td>"LOCALIZER ARMED" or
"LNAV SELECTED"</td><td></td></tr>
<tr><td colspan="2">WARNING: When using LNAV to intercept the localizer, LNAV might parallel the localizer without capturing it. The aircraft can then descend on the VNAV PATH with the localizer not captured.
Note: LNAV should not be selected until the aircraft is established on the intercept heading.</td></tr>
</table>

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Use HDG SEL or LNAV to intercept the final approach course as needed.</td><td>"LOCALIZER ALIVE" or
"INBOUND TRACK"</td></tr>
<tr><td>"LOCALIZER CAPTURED" or
"LNAV."</td><td></td></tr>
<tr><td>Approximately 2 NM before the final approach fix and after ALT HOLD or VNAV PTH is annunciated:
▪ Set TDZE if available. If TDZE is not available, set airport elevation.
▪ If elevation does not end in zero zero, for example, 1820, set MCP ALTITUDE window to the closest 100 foot increment below the desired altitude.
▪ Select or verify VNAV.
C-FLRS
▪ If desired, engage or verify speed intervention.</td><td></td></tr>
<tr><td>Call:
▪ "GEAR DOWN"
▪ "FLAP 15"
▪ "SET (SPEED) ____" (if speed intervention engaged).
▪ Set the speedbrake lever to ARM. (Captain arms speedbrake)
▪ Verify that the SPEEDBRAKE ARMED light is illuminated.
▪ "SPEEDBRAKE ARMED"</td><td>Set the landing gear lever to DN.
Verify that the green landing gear indicator lights are illuminated.
Check speed and set the flap lever as directed. Monitor flaps and slats extension. When flaps indicate the selected position,
Call "FLAP 15"
Set the engine start switches to CONT.</td></tr>
<tr><td>Beginning the final approach descent, call "FLAP ____, SPEED ____" (as needed for landing).</td><td>Check speed and set the flap lever as directed. Monitor flaps and slats extension.</td></tr>
<tr><td>Call "LANDING CHECKLIST"</td><td>Do the LANDING checklist.</td></tr>
<tr><td colspan="2">At the final approach fix:
▪ verify the crossing altitude;
▪ cross check the altimeters. Verify they agree within 100 feet.</td></tr>
<tr><td></td><td>At OM / FAF:
"(FIX NAME) ____" (published altitude).</td></tr>
</table>

Pilot Flying	Pilot Monitoring
Acknowledge 1000; Call "STABILIZED" (1000 ft. RA call is for awareness only)	At 1000 feet AAE, verify AFDS status and aircraft in stabilized approach. Call "ONE THOUSAND"
On approaches other than CAT II and prior to 100 ft above DA(H) or MDA(H), the PM will advise the PF of runway environment in sight by stating the following: "APPROACH LIGHTS IN SIGHT" "RUNWAY IN SIGHT"	
Monitor the approach. Verify the AFDS status at 500 ft radio altitude. Verify aircraft in stabilized approach.	
"CHECK"	"At 100 feet above minimums: Call "100 ABOVE"
If a normal approach and visual reference can be maintained, call "LANDING". If the requirements above are not met, or at any time thereafter, immediately execute a missed approach and call: "GO AROUND, GO AROUND THRUST"	At minimums: Call "MINIMUMS"
If suitable visual reference is established at DA(H), MDA(H) or the missed approach point, disengage the autopilot early enough to allow time to establish aircraft control before beginning the flare. Disengage the auto throttle at the same time. Maintain the required vertical path to landing.	While maintaining situational awareness, monitor the RA and call: "50" "30" "20"

Go-Around and Missed Approach Procedure

Mandatory Missed Approach

On all instrument approaches, execute an immediate missed approach when:

- a suitable visual reference has not been established by minimums and maintained to landing;
- a navigation radio or flight instrument failure occurs which affects the ability to safely complete the approach;
- the navigation instruments show significant disagreement;
- on ILS final approach and either the localizer or the glideslope indicator shows full deflection;
- on a radar approach and radio communication is lost;
- not stabilized by 1000 ft AAE or becomes unstabilized below 1000 ft AAE in IMC or VMC conditions.

Pilot Flying	Pilot Monitoring
Call "GO AROUND, GO AROUND THRUST" and at the same time: ▪ push the TO/GA switch ▪ call "FLAP 15"	Position the flap lever to 15 and monitor flap retraction.
Verify: ▪ the rotation to go-around attitude ▪ that the thrust increases.	
	Verify that the thrust is sufficient for the go-around or adjust as needed.
Verify a positive rate of climb on the altimeter and call: "GEAR UP, CHECK MISSED APPROACH ALTITUDE"	Verify a positive rate of climb on the altimeter and call: "POSITIVE RATE". Set the landing gear lever to UP.
	Verify that missed approach altitude is set on the MCP.
Above 400 ft radio altitude, verify LNAV or select HDG SEL as appropriate.	Observe mode annunciation.
If needed, call: "TUNE NAV RADIOS FOR MISSED APPROACH".	Tune the navigation radios as directed.
Verify that the missed approach route is tracked.	

Pilot Flying	Pilot Monitoring
At acceleration height: Call "FLAP ____" according to the flap retraction schedule.	Verify the speed and set the flap lever as directed. Monitor flaps and slats retraction. When flaps are indicating the selected position, call "FLAP ___".
After flaps are set to the planned flap setting and at or above the flap manoeuvring speed, select LVL CHG. VNAV may be selected if the flaps are up.	
Verify that climb thrust is set. Verify that the missed approach altitude is captured.	
	Set the landing gear lever to OFF after landing gear retraction is complete. Set the engine start switches as needed.
Call "AFTER TAKEOFF CHECKLIST".	Do the AFTER TAKEOFF checklist.

LANDING ROLL PROCEDURE

Pilot Flying	Pilot Monitoring
If an autoland was accomplished, disengage the autopilot. Control the aircraft manually.	
Verify that the thrust levers are closed. Verify that the SPEEDBRAKE lever is UP. Without delay, fly the nose wheel smoothly onto the runway.	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 moved to the reverse detent, a full stop landing must be made. If an engine stays in reverse, safe flight is not possible.	

Pilot Flying	Pilot Monitoring
Without delay, move the reverse thrust levers to the interlocks and hold light pressure until the interlocks release. Then apply reverse thrust as needed.	Verify the forward thrust levers are closed. When both REVERSER UNLOCKED lights are illuminated, call "REVERSERS NORMAL" If a light(s) is not illuminated, call: "NO REVERSE NUMBER 1", or "NO REVERSE NUMBER 2", or "NO REVERSERS".
By 60 knots, start movement of the reverse thrust levers to be at the reverse idle detent before taxi speed.	"60 KNOTS".
After the engines are at reverse idle, move the reverse thrust levers full down.	
Before taxi speed, disarm the autobrake and advise "MANUAL BRAKING" Use manual braking as needed.	Call “AUTOBRAKES DISARMED” when advisory light illuminates.

WARNING: During landing rollout call:

1) "3000 FEET REMAINING" at 3000 feet remaining markerboard or equivalent (daytime) or at alternating red and white centreline lights or equivalent (night), and
2) "1000 FEET REMAINING" at 1000 feet remaining markerboard or equivalent (daytime) or at all red centreline lights or equivalent (night).

After Landing Procedure

Start the After Landing Procedure when clear of the active runway and the SPEEDBRAKE lever is stowed. The Captain will stow the SPEEDBRAKE lever, which is the cue for the First Officer to begin the After Landing Flow. The flow should only be completed when clear of the active runway and after taxi instructions have been received.

Engine cooldown recommendations:

- Run the engines for at least 3 minutes
- Use a thrust setting normally used for taxi operations
- Routine cooldown times less than 3 minutes are not recommended.

Pilot Flying	Pilot Monitoring
The Captain moves or verifies that the SPEEDBRAKE lever is DOWN.	
	Set the TRANSPONDER MODE SELECTOR as needed. At airports where ground tracking is not available, select STBY. At airports equipped to track aircraft on the ground, select TA only.
	Set the WEATHER RADAR to OFF.
	Set the FLAP LEVER to UP.
	Set the STAB TRIM to 5 units.
	Set the AUTO BRAKE select switch to OFF.
LANDING LIGHTS, Runway Turnoff Lights and Taxi Light, as needed.	Set the exterior lights as needed.
	Set the ENGINE START switches and ENGINE ANTI ICE switches to OFF (or as required).
	Set the PITOT STATIC HEAT switches to OFF.
	Set the Flight/Ground switch to GRD.
	Start the APU as required. (Start APU as close to gate as possible.)
	When available, select the APU GEN bus switches to ON and call: "APU ON BUS".
Note: If the landing was made in slush, the flaps should remain extended until an assessment of the contaminant on the aircraft can be determined and the contaminant removed.	

SHUTDOWN PROCEDURE

Start the Shutdown Procedure after taxi is complete.

Parking brake. . . . . Set C

Verify that the parking brake warning light is illuminated.

Electrical power . . . . Set F/O

If APU power is needed:

Verify that the APU GENERATOR OFF BUS light is illuminated.

APU GENERATOR bus switches - ON

Verify that the BUS OFF lights are extinguished.

If external power is needed:

Verify that the GRD POWER AVAILABLE light is illuminated.

GRD POWER switch - ON

Verify that the BUS OFF lights are extinguished.

Engine start levers . . . . CUTOFF C

Operate the engines at or near idle thrust for a minimum of 3 minutes before shutdown to thermally stabilize the engines and reduce undercowl soak-back temperatures. Taxi thrust can be considered idle thrust for this purpose.

If idle reverse thrust or no reverse thrust is used during the landing rollout, the 3 minute period can begin when thrust is reduced to idle for landing.

Routine cooldown times of less than 3 minutes before engine shutdown can cause engine degradation.

If towing is needed:

Establish communications with ground handling personnel C

WARNING: If the nose gear steering lockout pin is not installed and hydraulic system A is pressurized, any change to electrical or hydraulic power with the tow bar connected may cause unwanted tow bar movement.

Verify that the nose gear steering lockout pin is installed, or, if the nose gear steering lockout pin is not used. C

System A HYDRAULIC PUMP switches - OFF

Verify that the system A pump LOW PRESSURE lights are illuminated.

CAUTION: Do not hold or turn the nose wheel steering wheel during pushback or towing. This can damage the nose gear or the tow bar.

CAUTION: Do not use aircraft brakes to stop the aircraft during pushback or towing. This can damage the nose gear or the tow bar.

Set or release the parking brake as directed by ground handling personnel C

FASTEN BELTS switch. . . . . OFF F/O

ANTI COLLISION light switch. . . . . OFF F/O

FUEL PUMP switches. . . . . OFF F/O

GALLEY power switch . . . . As needed F/O

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

ENGINE ANTI-ICE switches . . . . OFF F/O

Hydraulic panel. . . . . Set F/O

ENGINE HYDRAULIC PUMPS switches - ON

ELECTRIC HYDRAULIC PUMPS switches - As needed

ENGINE START switches. . . . . OFF F/O

RECIRCULATION FAN switches . . . . As needed F/O

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

One air conditioning PACK switch - AUTO or HIGH

Other air conditioning PACK switch - OFF

ISOLATION VALVE switch . . . . AUTO F/O

Engine BLEED air switches . . . . ON F/O

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

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

FLIGHT DIRECTOR switches / MCP Panel:
. . . . .OFF / ALT 9900 / SPD 110 C, F/O

Transponder mode selector . . . . .STBY / 1000 F/O

After the wheel chocks are in place:

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

APU switch . . . . As needed F/O

Run the APU for one full minute with no bleed air load before shutdown.

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

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

CAUTION: Centre tank fuel pump switches should be positioned ON only if the fuel quantity in the centre tank exceeds 453 kg.

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

Call "SHUTDOWN CHECKLIST".		C
Complete the SHUTDOWN checklist.		F/O

SECURE PROCEDURE

Complete this procedure when the aircraft will be left unattended by the flight crew and/or maintenance.

CAUTION: Do not leave the APU running without flight crew or maintenance supervision.

IRS mode selectors	OFF	F/O
Galley Power switch.	OFF	F/O
EMERGENCY EXIT LIGHTS switch	OFF	F/O
WINDOW HEAT switches	OFF	F/O
Air conditioning PACK switches.	OFF	F/O
Interior/Exterior LIGHTS	OFF	C, F/O
APU / Ground Power	(as required)	C
DC Selector	Not on BATT	F/O
BATTERY switch	OFF	F/O
Call: "SECURE CHECKLIST"		C
Do the SECURE checklist..		F/O

If the aircraft is not handed over to a succeeding flight crew or Maintenance personnel, complete Electrical Power Down Supplementary Procedure.

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Chapter NP - Normal Procedures
Section 40 - Standard Callouts

General

Both crew members should be aware of altitude, aircraft position and situation. Avoid casual and non-essential conversation during critical phases of flight, particularly during taxi, takeoff, approach and landing. Sterile cockpit rules apply below 10000 ft.

While in terminal airspace and, in particular, between 10000 ft and 20000 ft, non-essential duties such as paperwork and communication (i.e., with flight attendants, SkyTrac, etc.) should be avoided.

The pilot monitoring should accomplish callouts based on instrument indications or observations for the appropriate condition. The pilot flying should verify the condition/location from their instruments and acknowledge. FMA/MCP and Autopilot Status Annunciation changes should be called out by the PF, and verified and acknowledged ("CHECK") by the PM. Any other calls made by the PF or PM for awareness or as per Standard Calls should be verified and acknowledged with "CHECK". If the pilot flying does not make the required callout, the pilot monitoring should make it.

One of the basic fundamentals of the "Crew Coordination Concept" is that each crew member must be able to supplement or act as a backup for the other crew member. Proper adherence to standard callouts is an essential element of a well-managed cockpit. These callouts provide both crew members required information about aircraft systems and about the participation of the other crew member. The absence of a standard callout at the appropriate time may indicate a malfunction of an aircraft system or indication, or indicate the possibility of incapacitation of the other crew member.

When GPWS height callouts occur during approach (above 100 ft RA), the pilot flying should acknowledge the electronic callout. If the normally expected electronic voice callout is not heard by the flight crew, the pilot monitoring should make the callout.

STANDARD CALLOUTS

Phase of Flight	PF Call	PM Call
Ground (Engine Start)	"N2" (Captain)	
Ground (Engine Start)	"N1" (Captain)	
Ground (Engine Start)	"OIL PRESSURE" (Captain)	
Ground (Engine Start)	"EGT" (Captain)	
		"STARTER CUTOUT or "NO STARTER CUTOUT" (First Officer)
	"STABLE ENGINES" (Captain)	
At 400 feet RA following takeoff or go-around	"LNAV" or "HEADING SELECT", as applicable	
Climbing or Descending: Call passing through "10000", "20000" and "30000" E.G. "10000 CLIMBING FL330"	"10000 CLIMBING FL330"	
		"CHECK"
Transition in climb	"TRANSITION, SET 29.92 INCHES"	
		"29.92 INCHES SET AND CROSS CHECKED"
1000 feet below	"8000 CLIMBING 9000" (as applicable)	
		"CHECK"
Level Off	"ALTITUDE ACQUIRE / HOLD / VNAV PATH" (FMA change)	
		"CHECK"

Phase of Flight	PF Call	PM Call
New Cleared Altitude/FL (A/P ON)	"EIGHT THOUSAND SET" (call out what the PF sees on PFD)	
		"CHECK"
Transition in Descent	"TRANSITION, SET ____ INCHES"	"____ INCHES SET AND CROSS CHECKED" (or mb as applicable)
Descent through 10000 ft or FL100 (adjust if required for high altitude airport elevations)	"10000 DESCENDING ____"	"FLIGHT ATTENDANTS PREPARE FOR ARRIVAL"
	"APPROACH CHECKLIST"	
1000 ft above	"9000 DESCENDING 8000"	
		"CHECK"
Transfer of control	"YOU HAVE CONTROL"	
		"I HAVE CONTROL"
When disengaging autopilot	"AUTOPILOT DISENGAGED"	
When disengaging autothrottle	"AUTOTHROTTLE DISENGAGED"	
After a navigation change has been EXECUTED in the FMS and if not in LNAV		"LNAV AVAILABLE"
During Rejected Takeoff or during landing rollout		"SPEEDBRAKES UP" or "SPEEDBRAKES NOT UP (as appropriate) "REVERSERS NORMAL" or "NO REVERSER NUMBER 1 (or 2)" or "NO REVERSERS".

Phase of Flight	PF Call	PM Call
Windshear Encounter	"WINDSHEAR TOGA"	
TCAS RA	"TCAS, I HAVE CONTROL"	

STANDARD CALLOUTS - APPROACH

Condition / Location	Pilot Flying	Pilot Monitoring
After selecting Approach mode	"LOCALIZER AND GLIDESLOPE ARMED"	
Localizer alive		"LOCALIZER ALIVE"
Localizer Capture	"LOCALIZER CAPTURED"	
Glideslope alive		"GLIDESLOPE ALIVE"
	"GEAR DOWN" (if appropriate) "FLAP 15" "SET SPEED___ " "SPEEDBRAKE ARMED"	"FLAP 15 "
Glideslope capture	"GLIDESLOPE CAPTURED"	
	"FLAP ___, SPEED ___," (as needed for landing) "LANDING CHECKLIST"	
FAF		"___ (FIX NAME)" (actual altitude)
	"CHECK" (check against G/S check altitude)	

Condition / Location	Pilot Flying	Pilot Monitoring
1000 ft AFE	"STABILIZED, MISSED APPROACH ALTITUDE ____ SET"	"ONE THOUSAND"
500 RA (during CAT II approaches only).		"500, FLARE ARMED"
100 feet above DA	"CHECK"	"100 ABOVE"
At DA	"LANDING" or "GO-AROUND"	"MINIMUMS"
Landing (except CAT II)		"50" "30" "20"
AUTOLAND:		
Approx 50 feet RA		"NO FLARE" if FLARE does not annunciate
Approx 27 feet RA		"NO RETARD" if RETARD does not annunciate.

Note: The PF may call "VISUAL" prior to the "100 ABOVE" call when the runway environment is in sight (and will remain so throughout the remainder of the approach). After the "VISUAL" call, the PF can manoeuvre from the instrument approach track if required to line up with the runway (e.g. offset final approach track.)

Note: The following calls are dependent on whether the autopilot is engaged or disengaged:

a) "FLAP ____, SET SPEED ____" (if autopilot is off)

b) "FLAP ____, SPEED ____" (if autopilot is on)

STANDARD CALLOUTS - GO-AROUND / MISSED APPROACH

Phase of Flight	PF Call	PM Call
Decision to Go-Around made	"GO AROUND, GO AROUND THRUST" "FLAP ___" as appropriate.	
		"POSITIVE RATE"
	"GEAR UP, CHECK MISSED APPROACH ATLITUDE"	
Acceleration Height	"FLAP ___" according to retraction schedule.	

Chapter NNP - Non-Normal Procedures
Section TOC - Contents

Introduction and Procedures

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Chapter NNP - Non-Normal Procedures
Section 22 - Introduction and Procedures

INTRODUCTION

Non-Normal Procedures are to be carried out in accordance with the QRH.

For checklists with memory items, the pilot monitoring first verifies that each memory item has been done. The checklist is normally read aloud during this verification. The pilot flying does not need to respond except for items that are not in agreement with the checklist.

NON-NORMAL CHECKLISTS

Non-Normal checklist are used by the flight crew to properly configure the aircraft for safe flight and to ensure a high level of safety while coping with non-normal situations. All actions must be coordinated and accomplished in a deliberate, systematic manner.

Do not reset any tripped fuel pump or fuel control circuit breaker. Any other circuit breaker that has opened should be reset only in accordance with the procedures in the QRH or Airplane Flight Manual. For more information, refer to the Company Operations Manual.

Both pilots must agree before moving critical controls in flight, such as:

- The thrust lever of a failed engine.
- An engine start lever.
- An engine, APU or cargo fire switch.
- A generator drive disconnect switch.
- A flight control or spoiler switch.

There are some situations where the crew must always land at the nearest suitable airport. These situations include, but are not limited to, conditions where:

- the non-normal checklist has the words "Plan to land at the nearest suitable airport";
- cabin smoke or fire persists;
- one main AC power source remains (such as engine or APU generator).
- one hydraulic system remains (the standby system is considered a hydraulic system)
- any other situation determined by the crew to have a significant adverse effect on safety if the flight is continued.

All Non-Normal Checklists, and the guidance information for the use of the checklists, can be found in the Quick Reference Handbook (QRH).

Flight Crew Notification of an Emergency

Refer to COM Section 5.

Ground Emergency Coordination Procedures

While on the ground with the aircraft on the stand, cabin crew should inform of any irregularity observed. During taxiing, takeoff roll, initial climb and final approach, cabin crew must inform the Captain of any anomalous situation or incident that might endanger passengers' lives, and which requires an immediate evacuation.

This information will be reported over the interphone, after having notified with the emergency chime signal (3 chimes).

Rejected Takeoff

Briefing

The Flair Standard Takeoff Briefing will include information on the events that will result in a rejected takeoff and the actions to be taken.

The reasons for rejecting a takeoff between 80 knots and V1 are

- fire or fire warning
- engine failure
- predictive windshear [as installed]
- if the aircraft is unsafe or unable to fly.

Should one of those critical failures occur, the pilot first noticing the problem shall call the problem, and the Captain will call "REJECT", and the reason for reject shall be discussed once the aircraft has been brought to a stop.

In the event of a rejected takeoff, the F/O will call "60 KNOTS" and advise ATC as soon as possible, requesting assistance if required.

Execution

Once the decision to reject the takeoff is made, the Captain becomes PF.

It is strongly advised that the Autobrake be set to "RTO" for takeoff, and that the PM monitors the system. Autobrake is not available if the takeoff is rejected below 90 kts. A rejected takeoff below 80 kts will require that the autothrottle (A/T) be disengaged.

Consideration needs to be given to placing any fire downwind of the aircraft. If this is not practical, initially turn the aircraft into the wind. Generally, the aircraft should be stopped on the runway as this allows better access for emergency vehicles and more space for evacuation.

The Captain will bring the aircraft to a complete stop and make a PA "THIS IS THE CAPTAIN SPEAKING. REMAIN SEATED, REMAIN SEATED".

After analyzing the situation, the Captain will either initiate the Evacuation Non-Normal Checklist or, should an evacuation prove to be not required and normal operations can be resumed, make a PA "THIS IS THE CAPTAIN SPEAKING. FLIGHT ATTENDANTS, RETURN TO NORMAL OPERATIONS".

Evacuation Procedure

The Evacuation Non-Normal Checklist shall be performed as a read and do procedure.

Once the Evacuation Checklist has been completed, the pilots will help cabin crew members to evacuate the passengers.

Flight Deck Crew Responsibilities

After completing the procedures, and when circumstances permit, the F/O will leave the aircraft by the R1 door as soon as possible. They will take control of the evacuation from outside the aircraft until they are relieved by the Captain.

The Captain, if circumstances permit, will inspect the inside of the aircraft to make sure no one is left on board and then they will leave the aircraft using door L1, taking control of the evacuation. If conditions are unfavourable, flight crew members will leave the aircraft by the nearest available exit (e.g. the Flight Deck side windows).

Rapid Deplanement

Rapid deplanement is the quick and orderly disembarking of passengers through the main cabin door. The command from the Flight Deck to deplane the passengers shall be: "THIS IS THE CAPTAIN SPEAKING. DEPLANE QUICKLY" over the PA.

Engine Malfunction After V1

In the event of any engine failure or fire after V1, the takeoff is to be continued.

The PM is to call: "ENGINE FAILURE" or "ENGINE FIRE" but is not to identify the engine. This removes the possibility of the wrong engine being called. Only after passing 400 ft is the problem to be confirmed and the faulty engine identified. The sequence of events is then:

- Memory Items (if any)
- Flap retraction

- Speed selection and Level Change
- Max Continuous Thrust
- Non-Normal Checklist
- After Takeoff Checklist

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>Maintain directional control by smoothly applying rudder proportionate with thrust decay to maintain runway centreline.</td><td>If engine failure or fire occurs after V1, call: "ENGINE FAILURE" or "ENGINE FIRE".</td></tr>
<tr><td>At Vr, rotate towards the target pitch attitude (12° - 13°).
Do not rotate early or rapidly. Adjust pitch attitude to maintain desired airspeed of V2 to V2+20 knots.</td><td>At Vr, call: "ROTATE".</td></tr>
<tr><td colspan="2">Limit the bank angle to 15° until V2+15 knots to maintain an adequate manoeuvring margin. The bank angle limit increases to 30° at V2+15 knots with takeoff flaps.</td></tr>
<tr><td></td><td>"POSITIVE RATE"</td></tr>
<tr><td>"GEAR UP"</td><td></td></tr>
<tr><td>At 400 ft AGL, call for Roll Mode.</td><td>Select HDG or LNAV, as requested.</td></tr>
<tr><td>As soon as possible after 400 ft:
Call "WHAT'S THE PROBLEM?"</td><td>PM will state the emergency, carefully identifying the correct engine (e.g. "ENGINE FIRE #1").</td></tr>
<tr><td colspan="2">In case of an engine failure, there are no memory items. The non-normal checklist for an engine failure is normally accomplished after the flaps have been retracted and if conditions permit.
In case of engine fire, severe damage or separation, memory items must be accomplished as soon as possible after 400 ft AGL.</td></tr>
<tr><td colspan="2">When an engine failure and/or fire after takeoff necessitates the actioning of Memory Items, the PF is to deselect the A/T and close their own thrust lever after receiving confirmation of the correct selection from the PM. Subsequently, all selections are to be made by the PM after confirmation from the PF.</td></tr>
<tr><td>"ENGINE FIRE MEMORY ITEMS"</td><td></td></tr>
<tr><td>"AUTOTHROTTLE DISENGAGE"</td><td></td></tr>
</table>

<table>
<tr><th>Pilot Flying</th><th>Pilot Monitoring</th></tr>
<tr><td>"(# ____) THRUST LEVER, CONFIRM?"
"CLOSE"</td><td>"(# ____), CONFIRMED"</td></tr>
<tr><td>"(# ____) CONFIRMED"</td><td>"(# ____) ENGINE START LEVER, CONFIRM"?
"CUTOFF"</td></tr>
<tr><td>(# ____) CONFIRMED"</td><td>"(# ____) ENGINE FIRE SWITCH, CONFIRM?"
"PULL"
"BOTTLE DISCHARGED"</td></tr>
<tr><td colspan="2">If the Engine Fire Switch or Engine Overheat light stays illuminated:
Engine Fire Switch - Rotate to the stop and hold for 1 second.
If after 30 seconds the engine fire switch or ENG Overheat light stays illuminated:
Engine Fire Switch - Rotate to the other stop and hold for 1 second.</td></tr>
<tr><td></td><td>"ENGINE FIRE MEMORY ITEMS - COMPLETE"</td></tr>
</table>

At engine out acceleration altitude, 1000 feet AGL or as shown in the Special Procedures, accelerate for flap retraction.

After flaps have been retracted:

- select climb speed and LVL CHG;
- confirm CON thrust on the EIS has been selected and set;
- accomplish the reference non-normal checklist items;
- accomplish AFTER TAKEOFF checklist;
- select ENGINE OUT on FMS.

Engine Failure On Final Approach

If an engine failure should occur on final approach with the aircraft in the landing configuration, the decision to continue the approach or execute a go-around should be made immediately. If the approach is continued and sufficient thrust is available, continue the approach with landing flaps. If the approach is continued and sufficient thrust is not available for landing flaps, retract the flaps to 15 and adjust thrust on the operating engine. Speed should be increased to 20 knots over the previously set Flap 30 or 40 Vref. This is equal to at least Vref for Flap 15.

WINDSHEAR

Whenever windshear warnings occur, the procedures specified in the FCTM, FCOM (Volume 1, SP) and QRH Non-Normal Maneuvres will be used.

Windshear is defined as any change of wind speed and/or direction over arelatively short distance on the flight path. Severe windshear produces changes in speed greater than 15 kts or changes in the Vertical Speed Indicator readings of over 500 ft per minute.

The presence of windshear may be indicated by:

- Stormy conditions
- Virga (rain which evaporates before reaching the ground)
- PIREPs
- Low Level Windshear Alerting System (LLWAS)

If there is a chance windshear will be encountered, the following preventive actions are recommended:

On takeoff

- Use the maximum power available.
- Use the longest runway available.
- Use Flaps between 5 and 15.
- Pay attention to oscillations in airspeed during takeoff and initial climb.
- If windshear close to V1 is encountered, speed may quickly diminish without there being enough runway left for the aircraft to stop, so that a normal rotation should be initiated at least 2000 ft before the end of the runway even if speed is low. A rotation superior to normal may be necessary to achieve takeoff on the remaining length of the runway.
- Once in the air, the Windshear Escape Maneuvre will be executed as indicated in QRH Chapter Maneuvers, section Non Normal Maneuvers.

Note: If windshear is reported or suspected, *consider* delaying the takeoff.

Approach and Landing

- Use Flaps 30º.
- If there is a possibility of windshear or it has been reported, the approach must be stabilized before 1000 AGL, to improve the capacity of reaction and recognition.
- Add Vref corrections without exceeding 20 kts.

- Avoid great changes in power and compensation as IAS increases, since IAS is likely to decrease rapidly immediately afterwards.
- Maintain constant coordination between pilots.
- Pay careful attention to the altimeter, vertical speed indicator and ILS glide path.
- The PM will advise of any deviation.
- Using the A/P and the A/T will allow a better instrument cross check to be made.
- Use the longest runway available.
- Use all available aids, PAPI, VASI etc.

Recognition of a Recovery From Windshear

See Windshear Escape Maneuver stated in QRH Chapter Maneuvers.

TCAS Warning

Refer to COM Section 3.45. Traffic Alert and Collision Avoidance System and QRH Chapter: Maneuvers, Traffic Avoidance.

Whenever a TCAS RA occurs, the PF will call "TCAS, I HAVE CONTROL" and comply with the RA. ATC must be informed of all TCAS manoeuvres and the phraseology is: Callsign + TCAS RA (an example would be "FLAIR 123 TCAS RA").

Emergency Descent

Whenever QRH Non-Normal recall items require the donning of oxygen masks and the initiation of an Emergency Descent, the following procedure will be used:

- Both pilots don oxygen masks simultaneously.
- Captain takes over as PF.
- Captain performs the descent in accordance with the Memory Items.
- First Officer alerts ATC and obtains an altimeter setting.

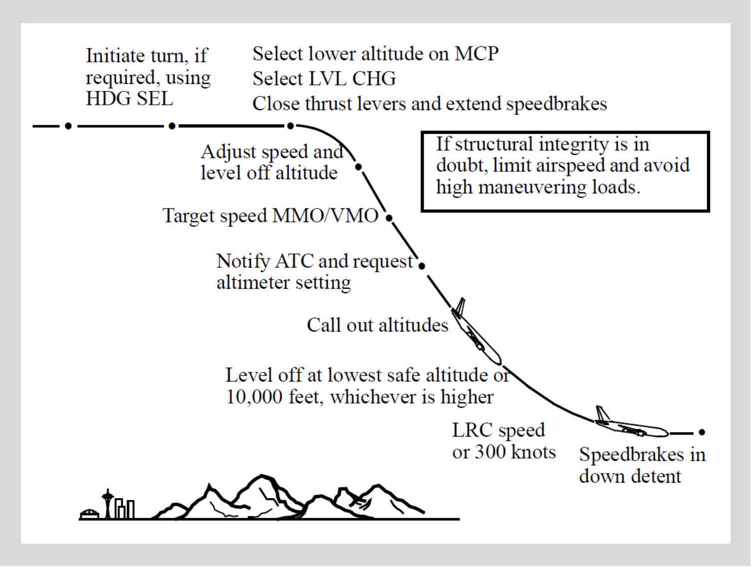
This manoeuvre is designed to bring the aircraft down smoothly to a safe altitude, in the minimum time, with the least possible passenger discomfort. It is intended as a specialized case in the event of an uncontrollable loss of cabin pressurization.

Note: Use of the A/P is recommended.

In the event of a cabin altitude exceedance or the intermittent cabinaltitude/configuration warning horn sounds, complete the QRH **CABIN ALTITUDE WARNING or Rapid Depressurization** checklist.

If the cabin altitude is uncontrollable, go to the **Emergency Descent** checklist.

Captain takes over as PF.



Perform the manoeuvre deliberately and methodically. Do not be distracted from flying the aircraft. If icing conditions are entered, use anti-ice and thrust as required.

> **Note:** Rapid descents are normally made with the landing gear up.

The PM checks the lowest safest altitude, notifies ATC and obtains an area altimeter setting (QNH). Both pilots should verify that all memory items have been accomplished and call out any items not completed. The PM calls out 2000 ft and 1000 ft above the level off altitude.

Level off at the lowest safe altitude or 10000 ft, whichever is higher. Lowest safe altitude is the Minimum Enroute Altitude (MEA), Minimum Off Route Altitude (MORA) or any other altitude based on terrain clearance, navigational aid reception or other appropriate criteria.

If severe turbulent air is encountered or expected, reduce to the turbulent air penetration speed.

Refer to COM Section 5.14 for additional reference.

CABIN ALTITUDE WARNING OR RAPID DEPRESSURIZATION

Pilot Flying	Pilot Monitoring
OXYGEN MASK . . . . ON/100% Crew communications establish. "CAPTAIN ON OXYGEN"	OXYGEN MASK. . . . . ON/100% Crew communications establish. "FIRST OFFICER ON OXYGEN"
"CAN YOU CONTROL THE CABIN?" Seat Belt/No Smoking - ON Engine Start Switches - CONT All Landing and Runway Turnoff Lights - ON	Ensure Packs and Bleeds - ON Press Mode Selector - MAN AC Outflow Valve Sw - Hold in CLOSE until Outflow Valve indicates fully closed. "CONTROLLABLE" "UNABLE TO CONTROL"
If cabin is uncontrollable "EMERGENCY DESCENT" Set 10000 ft or Min Safe Altitude LVL CHG Set Speed Mmo / Vmo Heading, Turn if required Thrust levers - Idle Speedbrake - Flight detent	If Cabin Altitude uncontrollable: Passenger Oxygen Switch - ON Advise ATC. Request area altimeter setting and lower safe altitude. Confirm MEA. Squawk 7700 if required.
When stabilized in descent, PA "THIS IS THE CAPTAIN SPEAKING. EMERGENCY DESCENT, EMERGENCY DESCENT"	
"EMERGENCY DESCENT CHECKLIST"	Accomplish Emergency Descent Checklist.
"TRANSITION, SET ____ INCHES"	
	"____ INCHES SET AND CROSS CHECKED" (or mb as applicable)
When pitch mode changes to ALT on the FMA, adjust speed then retract speedbrakes to down detent. Level off at lowest safe altitude or 10000 ft, whichever is higher. Set LRC or 300 kts IAS.	Call: "2000 to LEVEL" Call: "1000 to LEVEL"

Pilot Flying	Pilot Monitoring
Once aircraft has descended to safe altitude, PA: "THIS IS THE CAPTAIN SPEAKING. FLIGHT ATTENDANTS COMMENCE POST - DEPRESSURIZATION DUTIES"	
When appropriate below 13000 ft, PA: "THIS IS THE CAPTAIN SPEAKING. YOU MAY NOW REMOVE YOUR OXYGEN MASKS"	
Crew Oxygen Regulators - NORMAL Flight crew must use oxygen when cabin altitude is above 10000 ft. To conserve oxygen, move the regulator to Normal.	
	Engine Start Switches - As Needed
When the cabin altitude is at or below 10000 ft, oxygen masks may be removed.	

Approach to Stall Recovery

All recoveries from approach to stall should be done as if an actual stall has occurred.

Immediately do the following at the first indication of stall (buffet or stick shaker).

Note: Do not use flight director commands during the recovery.

Pilot Flying	Pilot Monitoring
Initiate the recovery: ▪ Hold the control column firmly. ▪ Disconnect A/P and A/T. ▪ Smoothly apply nose down elevator to reduce the angle of attack until buffet or stick shaker stops. Nose down stabilizer trim may be needed.*	▪ Monitor altitude and airspeed. ▪ Verify all required actions have been done and call out any omissions. ▪ Call out any trend toward terrain contact.

Pilot Flying	Pilot Monitoring
Continue the recovery: ▪ Roll in the shortest direction to wings level if needed.** ▪ Advance thrust levers as needed. ▪ Retract the speedbrakes. ▪ Do not change gear or flap configuration, except ▪ During liftoff, if flaps are up, call for Flap 1.	▪ Monitor altitude and airspeed. ▪ Verify all required actions have been done and call out any omissions. ▪ Call out any trend toward terrain contact. ▪ Set the FLAP lever as directed.
Complete the recovery: ▪ Check airspeed and adjust thrust as needed. ▪ Establish pitch attitude. ▪ Return to the desired flight path. ▪ Re-engage the A/P and A/T, if desired.	▪ Monitor altitude and airspeed. ▪ Verify all required actions have been done and call out any omissions. ▪ Call out any trend toward terrain contact.

WARNING: *If the control column does not provide the needed response, stabilizer trim may be necessary.

WARNING: **Excessive use of pitch trim or rudder may aggravate the condition, or may result in loss of control or in high structural loads.

Bomb Threat and Hijacking

Unlawful Interference

All information contained in this section is "privileged need to know" and must be treated as such for security reasons.

Action of Pilot in Command

All decisions as to the conduct of the flight when an unlawful interference is underway must be made by the pilot-in-command (PIC) according to his/her judgment and assessment of the situation. Under no circumstances will the PIC allow the hijacker access to the Flight Deck. The PIC will establish and maintain contact with ATC and the Company, and will divert the aircraft to the nearest suitable airport to land as soon as possible.

Should the hijacker gain access to the Flight Deck, the PIC should:

- comply with the demands of the hijacker within the range of operational feasibility;
- ensure that nothing is done to endanger the safety of the crew, passengers or aircraft;
- attempt to communicate with the ground station, indicating intentions, if possible;
- advise the hijacker that in order to meet his/her demands, the following factors must be considered to permit a change in destination:
  - fuel capability;
  - clearance through ATC;
  - filing of revised flight plan to ensure safety of operation;
  - weather conditions; and
  - runway length.

Communications Signals During Hijack

When possible, the pilot of a hijacked aircraft should transmit his predicament to ATC in the clear. However, should the hijacker gain access to the flight deck, they may forcibly prevent such transmissions which will necessitate use of covert signalling. The use of the specific word identified during crew training will convey a message to ATC that communication in the clear is impossible due to hijack activity. ATC will confirm receipt of the signal and message by using the covert word with the flight number in response.

The standard signal for unlawful interference is the hijack transponder code. The spoken code numbers impart the same message as if the respective transponder codes were received on radar.

ATC shall acknowledge receipt of the transponder code by transmitting: "FAL 999, CENTER….. YOU ARE SQUAWKING _ _ _ _. IS THIS INTENTIONAL?". An affirmative reply will initiate ATC response to hijacking and notification of the Company and appropriate authorities.

When a clear radio transmission of a hijacking is received, controllers shall assign the hijack code to the aircraft.

Where an emergency occurs in addition to the unlawful interference, the PIC shall change from the hijack code to code 7700, allowing a period of at least 3 minutes on the hijack code or until a confirmation is received from the controller, whichever is sooner, before changing to code 7700. Controllers shall acknowledge receipt of 7700 by transmitting: "FAL 999, CENTER NOW READING YOU ON TRANSPONDER SEVEN SEVEN ZERO ZERO."

Aircraft squawking code 7700 and not in radio contact with the ground will be considered by ATC to have an emergency in addition to hijacking and the appropriate emergency procedures will be implemented. In these cases, notification to the Company and concerned authorities shall include information that the aircraft displayed the hijack code as well as the emergency code.

INADVERTENT ENCOUNTER WITH MODERATE TO SEVERE INFLIGHT ICING

Moderate Icing: The rate of accumulation is such that even short encounters become potentially hazardous, and use of de-icing or anti-icing equipment or diversion is necessary.

Severe Icing: The rate of accumulation is such that de-icing or anti-icing equipment fails to reduce or control the hazard. Immediate diversion is necessary.

The B737 is certified for in-flight icing conditions, however, if moderate to severe in-flight icing conditions are inadvertently encountered, flight crew should consider the following actions:

- turn on all available de-ice/anti-ice equipment, as appropriate;
- request an expedited clearance from ATC to exit the area of icing conditions.

Any non-standard procedures shall be briefed between the flight crew members.

For more information, refer to COM Section 3.38 - Flight Operations in Icing Conditions.

Minimum Runway Friction Index

The minimum Runway Friction Index (RFI) suitable for landing policy for Flair Airlines will be 0.25. Pilots will use best judgement considerations when landing on any runway with surface contamination/low RFIs.

Pilot Incapacitation

Refer to COM Section 5.18 - Incapacitated Pilot and Section 5.19 - Incapacitated Flight Attendant.

Chapter SP - Supplementary Procedures
Section TOC - Contents

Automatic Flight

Communications

Electrical

Engines, APU

Fire Protection

Flight Instruments

Flight Management, Navigation

Fuel

Warning Systems

Adverse Weather

Chapter SP - Supplementary Procedures
Section 05 - Introduction

General

This section contains procedures (adverse weather operation, engine crossbleed start, and so on) that are accomplished as required rather than routinely performed on each flight.

Supplementary procedures may be required because of adverse weather, unscheduled maintenance or as a result of a procedure referenced in a Non-Normal Checklist. Additionally, some may be performed if the flight crew must accomplish preflight actions normally performed by Maintenance personnel.

At the discretion of the Captain, procedures may be performed by memory, by reviewing the procedure prior to accomplishment, or by reference to the procedure during its accomplishment.

Supplementary procedures are provided by section. Section titles correspond to the respective chapter title for the system being addressed except for the Adverse Weather section.

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Chapter SP - Supplementary Procedures
Section 1 - Airplane General, Emer. Equip., Doors, Windows

INTERIOR INSPECTION

Emergency exit lights . . . . Check

Passenger signs . . . . Check

Service and entry doors . . . . Check

Escape slides . . . . Check pressure

Emergency exits . . . . Check

Wing upper surfaces . . . . Check

Lavatory fire extinguishers . . . . Check

Emergency equipment . . . . Check

Check availability and condition of emergency equipment, as required.

FLIGHT DECK DOOR ACCESS SYSTEM TEST

Flight deck access system switch . . . . NORM

Flight deck door . . . . Open

Flight deck door lock selector . . . . .AUTO

Emergency access code . . . . Enter

ENT key . . . . Push

Verify alert sounds.

Verify AUTO UNLK light illuminates.

Flight deck door lock selector . . . . DENY

Verify AUTO UNLK light extinguishes.

Flight deck door lock selector . . . . UNLKD

Flight deck access system switch . . . . OFF

Verify LOCK FAIL light illuminates.

Flight deck access system switch . . . . NORM

Guard - Down

Verify LOCK FAIL light extinguishes.

WATER SYSTEM DRAINING

In the event the passenger water system becomes contaminated, or the aircraft is to be parked in freezing temperatures for an extended period, it may be necessary to completely drain the system to prevent damage to the water lines or other equipment.

The system may be drained either by pressure or by gravity.

Pressure Draining:

APU . . . . ON

APU bleed switch . . . . ON

This will pressurize the water tank. If the APU is not usable, an external pneumatic cart may be used by positioning the Isolation Valve switch OPEN. The tank may also be pressurized through a valve on the external servicing panel.

Water Heaters. . . . . .OFF

CAUTION: Failure to do this could cause damage to the heaters when the water is drained.

Tank drain valve . . . . OPEN

Shutoff/Drain valves . . . . .DRAIN

When water stops flowing from outlets:

Tank Drain valve . . . . .CLOSE

Shutoff/Drain valves . . . . ON

Allow 2 minutes for the pressure to stabilize. To exhaust residual water, turn each shutoff/drain valve to DRAIN and then ON. Open each water faucet, galley water drain shutoff valve and coffee maker drain for 2 minutes, and then close. Depressurize the water tank by deactivating the air pressure source.

Gravity Draining:

Water Heaters. . . . . .OFF

Fill and Overflow valve . . . . OPEN

Tank Drain valve . . . . OPEN

Shutoff/Drain valves . . . . .DRAIN

When water stops flowing from outlets:

Fill and Overflow valve .... CLOSE

Tank Drain valve .... CLOSE

Shutoff/Drain valves .... ON

Open each lavatory faucet and galley outlet to drain residual water.

OXYGEN MASK MICROPHONE TEST

MASK - BOOM switch . . . . MASK

Flight interphone transmitter selector switch . . . . Push

Speaker switch. . . . . ON

RESET/TEST. . . . . Slide down and hold

EMERGENCY/TEST selector . . . . Push and hold

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

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

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

Push-to-Talk switch . . . . Release

RESET/TEST. . . . . Release

EMERGENCY/TEST selector . . . . Release

Speaker switch. . . . . As needed

MASK-BOOM switch . . . . BOOM

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Chapter SP - Supplementary Procedures
Section 2 - Air Systems

Wing - Body Overheat Test

Wing-body OVHT TEST switch . . . . Push

Hold for a minimum of 5 seconds.

Both WING-BODY OVERHEAT lights - illuminated

MASTER CAUTION - illuminated

AIR COND system annunciator - illuminated

Wing-body OVHT TEST switch . . . . Release

Both WING-BODY OVERHEAT lights - extinguished

MASTER CAUTION lights - extinguished

AIR COND system annunciator - extinguished

External Air Cart Use

CAUTION: The BAT switch should always be on when using the aircraft air conditioning system since the protective circuits are DC. This ensures protection in the event of loss of AC power.

Note: For engine start with a ground air source, see Chapter SP, Section 7.

APU BLEED air switch. . . . . OFF

ISOLATION VALVE switch. . . . . OPEN

RECIRC FAN switches . . . . .AUTO

PACK switch(es) . . . . AUTO or HIGH

The operation of 2 packs from one air source is permitted provided the external air cart can maintain 20 psi minimum with both packs operating.

Trim air switch . . . . ON

Cabin temperature selectors . . . . .AUTO

Set for desired temperature.

Duct pressure. . . . . .20 psi min.

If external air cannot hold 20 psi minimum and the APU is operating:

ISOLATION VALVE switch . . . . AUTO

APU BLEED air switch . . . . .ON

APU supplies left pack and external air source supplies right pack.

Ground Conditioned Air Use

Before connecting ground conditioned air:

PACK switches . . . . OFF

Packs can be damaged if they are operated while ground conditioned air is connected.

After disconnecting ground conditioned air:

PACK switches . . . . .As required

Using the APU for Heating (On the Ground / Engines Shut Down)

Under extremely cold conditions, both packs may be used for more rapid heating.

ISOLATION VALVE switch . . . . OPEN

During right pack operation only, under cold conditions, if the left PACK TRIP OFF light illuminates, position the recirculation fan OFF until the cabin temperature stabilizes.

Isolated Pack Operation During Engine Start

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

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

Engine No. 2. . . . . Start

After engine No. 2 stabilized:

ISOLATION VALVE switch. . . . . .CLOSE

Right PACK switch. . . . . .AUTO

Duct pressure . . . . Stabilized

Engine No. 1. . . . . Start

After engine No. 1 stabilized:

ISOLATION VALVE switch. . . . . .AUTO

Auto Trip and Standby Check

Pack switches. . . . . .OFF

Pressurization mode selector . . . . AUTO

FLT/GND switch . . . . GRD

Cabin Altitude indicator. . . . . .500 feet above field elevation

Captain and First Officer altimeters . . . . Set

Cabin Rate selector . . . . Index

Verify pressurization mode lights extinguish and the Outflow Valve Position indicator is at OPEN.

FLT/GND switch . . . . FLT

Verify Outflow Valve Position indicator moves toward CLOSE.

Pressurization mode selector . . . . Check

Verify the AUTO FAIL and STANDBY lights illuminated and the Outflow Valve Position indicator moves toward OPEN.

Cabin Altitude indicator . . . . 500 ft below field elevation

Verify the Outflow Valve Position indicator moves toward CLOSE.

FLT/GND switch . . . . GRD

Verify the AUTO FAIL and STANDBY lights extinguished and the Outflow Valve Position indicator moves toward OPEN.

FLT/GND switch . . . . FLT

Verify Outflow Valve Position indicator moves toward CLOSE.

Auto Trip and Manual Check

Note: This test must be performed immediately after the Auto Trip and Standby Check to test excessive pressurization rates. If the initial CHECK input has cleared (approximately 30 seconds) the AUTO FAIL and STANDBY lights do not illuminate.

Pack switches . . . . OFF

Pressurization mode selector . . . . AUTO

AUTO FAIL light - illuminated

STANDBY light - illuminated

Pressurization mode selector . . . . MAN AC

AUTO FAIL light - extinguished

STANDBY light - extinguished

MANUAL light - illuminated

Outflow valve switch . . . . Hold OPEN

Verify Valve Position indicator moves toward OPEN.

Outflow valve switch . . . . Hold CLOSE

Verify Valve Position indicator moves toward CLOSE.

Pressurization Mode selector . . . . MAN DC

MANUAL light - illuminated

Outflow valve switch . . . . Hold OPEN

Verify Valve Position indicator moves toward OPEN.

Outflow valve switch . . . . Hold CLOSE

Verify Valve Position indicator moves toward CLOSE.

FLT/GRD switch . . . . GRD

Pressurization mode selector . . . . AUTO

Verify Valve Position indicator moves toward OPEN.

MANUAL light - extinguished

STANDBY MODE OPERATION

Before start:

Pressurization mode selector . . . . STBY

Standby light - illuminated

Cabin Altitude indicator . . . . Set

CAB ALT - takeoff field elevation minus 200 ft

Cabin Rate selector . . . . Index

FLT/GND switch . . . . GRD

Verify the Outflow Valve Position indicator is full OPEN.

After Start:

Air Conditioning Pack switches . . . . AUTO

FLT/GRD switch . . . . FLT

After takeoff:

Cabin Altitude indicator . . . . Set

Check the placard below the pressurization module for the cabin altitude corresponding to the planned flight altitude. Reset CAB ALT to this altitude.

Cabin Rate selector . . . . Adjust

Maintain normal proportional climb rate.

Cruise:

Cabin Altitude indicator . . . . Reset

Reset CAB ALT using the placard for flight altitude changes greater than 1000 feet.

Before descent:

Cabin Altitude indicator . . . . .Set

CAB ALT - landing field elevation minus 200 ft

Descent:

Cabin Rate selector . . . . Adjust

Maintain normal proportional descent rate (300-500 fpm.)

After landing:

FLT/GRD switch . . . . GRD

Manual Mode Operation

This condition is indicated by the cabin altitude, rate of climb, and differential pressure not responding to the standby mode inputs to the pressurization controller. The AUTO FAIL and/or STANDBY lights may be illuminated.

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

Pressurization mode selector. . . . . MAN

MANUAL light - illuminated

CABIN/FLIGHT ALTITUDE placard . . . . Check

Determine the desired cabin altitude.

If a higher cabin altitude is desired:

Outflow valve switch (momentarily) . . . . OPEN

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

If a lower cabin altitude is desired:

Outflow valve switch (momentarily) . . . . CLOSE

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

During Descent:

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

Outflow valve switch (momentarily) . . . . CLOSE

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

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

Pressurization Control Operation - Landing at Alternate Airport

At top of descent

CAB ALT indicator . . . . SET

Set CAB ALT to new destination airport elevation minus 200 ft.

LAND ALT indicator . . . . Reset

Reset to new destination field elevation.

Automatic Pressurization Control - Landing Airport Elevation Above 6000 Feet

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

Prior to takeoff:

LAND ALT indicator . . . . 6000 ft

CAB ALT indicator . . . . 6000 ft

At initial descent or approximately 20 minutes prior to landing:

LAND ALT indicator . . . . Destination field elevation

CAB ALT indicator . . . . Reset

Reset CAB ALT to destination airport elevation minus 200 ft.

Unpressurized Takeoff and Landing

When making a no engine bleed takeoff or landing with the APU inoperative, or operative but not providing bleed air:

Takeoff

PACK switches . . . . AUTO

ISOLATION VALVE switch . . . . CLOSE

Engine BLEED air switches . . . . .OFF

APU BLEED air switch . . . . .OFF

CAB ALT indicator . . . . 2000 ft above field elevation

Cabin Rate selector . . . . Index

Pressurization mode selector. . . . . .STBY

FLT/GRD switch. . . . . FLT

After Takeoff

Note: If engine failure occurs, do not position engine BLEED air switches ON until reaching 1500 ft or until obstacle clearance height has been attained.

At not less than 400 ft, and prior to 2000 ft above field elevation:

Engine No. 2 BLEED air switch . . . . .ON

When CABIN rate of CLIMB indicator stabilizes

Engine No. 1 BLEED air switch . . . . .ON

ISOLATION VALVE switch . . . . AUTO

Pressurization Mode selector . . . . AUTO

Landing

When below 10000 ft:

CAB ALT indicator. . . . . 1500 ft above field elevation

Cabin Rate Selector . . . . Index

Pressurization Mode selector . . . . .STBY

When starting the turn to final approach:

Engine BLEED air switches . . . . OFF

Avoid high rates of descent for passenger comfort.

No Engine Bleed Takeoff and Landing

When making a no engine bleed takeoff or landing with the APU operating.

Takeoff

Note: If anti-ice is required for taxi, configure for a "No Engine Bleed Takeoff" just prior to takeoff.

Note: If anti-ice is not required for taxi, configure for a "No Engine Bleed Takeoff" just after engine start.

Right PACK switch . . . . .AUTO

ISOLATION VALVE switch. . . . . CLOSE

Left PACK switch . . . . .AUTO

Engine No. 1 BLEED air switch . . . . OFF

APU BLEED air switch . . . . ON

Engine No. 2 BLEED air switch . . . . .OFF

Trim air switch. . . . . ON

WING ANTI-ICE switch. . . . . .OFF

The WING ANTI-ICE switch must remain OFF until the engine BLEED air switches are repositioned to ON and the ISOLATION VALVE switch is repositioned to AUTO.

After Takeoff

Note: If engine failure occurs, do not position engine BLEED air switches ON until reaching 1500 ft or until obstacle clearance height has been attained.

Engine No. 2 BLEED air switch . . . . ON

APU BLEED air switch . . . . .OFF

When CABIN rate of CLIMB indicator stabilizes:

Engine No. 1 BLEED air switch. . . . . ON

ISOLATION VALVE switch. . . . . AUTO

Landing

If additional go-around thrust is desired, configure for a "No Engine Bleed Landing".

When below 10000 ft:

WING ANTI-ICE switch . . . . OFF

Right PACK switch. . . . . AUTO

ISOLATION VALVE switch. . . . . CLOSE

Left PACK switch . . . . AUTO

Engine No. 1 BLEED air switch. . . . . OFF

APU BLEED air switch . . . . ON

Engine No. 2 BLEED air switch. . . . . OFF

Chapter SP - Supplementary Procedures
Section 3 - Anti-Ice, Rain

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 16.

WINDOW HEAT SYSTEM TESTS

Overheat Test

The overheat test simulates an overheat condition to check the overheat warning function of the window heat system.

WINDOW HEAT switches . . . . ON

WINDOW HEAT TEST switch . . . . OVHT

OVERHEAT lights - On

C-FLHE - C-FLRS
ON lights - Extinguish

Lights extinguish after approximately 1 minute.

C-FLDX
OFF lights - Illuminated

Lights illuminate after approximately 1 minute.

MASTER CAUTION - On

ANTI-ICE system annunciator - On

WINDOW HEAT switches . . . . Reset

Position the WINDOW HEAT switches OFF, then ON.

Power Test
C-FLHE - C-FLRS

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

WINDOW HEAT switches . . . . ON

Note: Do not perform the power test when all ON lights are illuminated.

WINDOW HEAT TEST switch . . . . PWR TEST

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

WINDOW HEAT ON lights . . . . Illuminated

If any ON light remains extinguished, the window heat system is inoperative. Observe the maximum airspeed limit of 250 kts below 10000 ft.

Power Test
C-FLDX

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

WINDOW HEAT switches. . . . . ON

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

WINDOW HEAT TEST switch. . . . . PWR TEST

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

WINDOW HEAT OFF lights . . . . Extinguished

If any OFF light remains illuminated, the window heat system is inoperative. Observe the maximum airspeed limit of 250 kts below 10000 ft.

Chapter SP - Supplementary Procedures
Section 4 - Automatic Flight

LEVEL CHANGE CLIMB / DESCENT

ALTITUDE selector . . . . Set desired altitude

Note: If a new MCP altitude is selected while in ALT ACQ, the AFDS engages in V/S and the existing vertical speed is maintained.

LVL CHG switch . . . . Push

Verify FMA display

Thrust mode (climb) - N1

Thrust mode (descent) - RETARD then ARM

Pitch mode - MCP SPD

IAS/MACH selector . . . . Set desired speed

VERTICAL SPEED (V/S) CLIMB / DESCENT

ALTITUDE selector . . . . Set desired altitude

Note: If a new MCP altitude is selected while in ALT ACQ, the AFDS engages in V/S and the existing vertical speed is maintained.

V/S thumbwheel . . . . Set desired vertical speed

Verify FMA display

Thrust mode (climb or descent) - MCP SPD

Pitch mode - V/S

IAS/MACH selector . . . . Set desired speed

To transition to the vertical speed mode from another engaged climb or descent mode:

V/S mode switch . . . . Push

V/S climb mode engages at existing V/S.

V/S thumbwheel . . . . Set desired vertical speed

Verify FMA display

Thrust mode (climb or descent) - MCP SPD

Pitch mode - V/S

IAS/MACH selector . . . . Set desired speed

Note: During V/S climb or descent, ALT ACQ and ALT HOLD occur automatically at the selected altitude.

Note: During V/S mode operation with the A/T engaged, if airspeed becomes more than 5 knots below the MCP selected airspeed and is not increasing, the AFS automatically engages the LVL CHG mode.

Altitude Hold

Altitude HOLD switch . . . . Push

Verify FMA display

Pitch mode - ALT HOLD

Heading Select

Heading selector. . . . . Set desired heading

Heading select switch . . . . Push

Verify FMA display

Roll mode - HDG SEL

VOR Navigation

VHF NAV radio(s) . . . . Tune and identified

COURSE selector. . . . . Set desired course

When on an intercept heading to the VOR course:

VOR LOC mode switch . . . . .Push

Verify VOR LOC armed mode annunciates.

A/P automatically captures the VOR course.

Verify VOR LOC engaged mode annunciates upon course capture.

Note: If change to a localizer frequency is desired when captured in the VOR mode, disengage VOR LOC mode prior to selection of the localizer. VOR LOC mode can then be re-engaged.

Circling Approach

Note: A/P use is recommended until intercepting the landing profile.

If a missed approach is needed at any time while circling make an initial climbing turn toward the landing runway and intercept the missed approach course.

Configuration at MDA(H):

- Gear down
- Flap 15
- Speedbrake armed

MCP altitude selector . . . . Set

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

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

Verify ALT HLD mode annunciates.

MCP altitude selector . . . . Set missed approach altitude

HDG SEL switch . . . . Push

Verify HDG SEL mode annunciates.

Before starting the turn to base:

- Landing flaps (if not previously selected)
- Do the landing checklist

Intercepting the landing profile

Autopilot disengage switch . . . . Push

Auto throttle disengage switch . . . . Push

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Chapter SP - Supplementary Procedures
Section 5 - Communications

COCKPIT VOICE RECORDER TEST

Test switch . . . . Push

After a slight delay, observe that the monitor indicator rises into the green band. A tone may be heard through a headset plugged into the headset jack.

The indicator remains in the green band and the tone continues until the switch is released.

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Chapter SP - Supplementary Procedures
Section 6 - Electrical

ELECTRICAL POWER UP

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

BATTERY switch . . . . Guard closed

STANDBY POWER switch. . . . . Guard closed

ALTERNATE FLAPS master switch. . . . . Guard closed

Windshield WIPER selector . . . . OFF

LANDING GEAR lever. . . . . DN

Verify that the green landing gear indicator lights are illuminated.

Verify that the red landing gear indicator lights are extinguished.

WEATHER RADAR . . . . Off

If external power is needed:

Verify that the GRD POWER AVAILABLE light is illuminated.

GRD POWER switch - ON

Verify that the BUS OFF lights are extinguished.

Verify that the TRANSFER BUS OFF lights are extinguished.

Verify that the STANDBY PWR OFF light is extinguished.

If APU power is needed:

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

Alert ground personnel before the following test is accomplished.

OVHT DET switches - NORMAL

TEST switch - Hold to FAULT/INOP

Verify that the MASTER CAUTION lights are illuminated.

Verify that the OVHT/DET annunciator is illuminated.

Verify that the FAULT light is illuminated.

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

Verify that the APU DET INOP light is illuminated.

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

TEST switch - Hold to OVHT/FIRE

Verify that the fire warning bell sounds.

Verify that the master FIRE WARN lights are illuminated.

Verify that the MASTER CAUTION lights are illuminated.

Verify that the OVHT/DET annunciator is illuminated.

Master FIRE WARN light - Push

Verify that the master FIRE WARN lights are extinguished.

Verify that the fire warning bell cancels.

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

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

Extinguisher test switch - Check

TEST switch - Position to 1 and hold

Verify that the three green extinguisher test lights are illuminated.

TEST switch - Release

Verify that the three green extinguisher test lights are extinguished.

Repeat for test position 2.

APU - Start

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

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

CAUTION: Centre tank fuel pump switches should be positioned ON only if the fuel quantity in the centre tank exceeds 453 kg.

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

When the APU GEN OFF BUS light is illuminated

APU GENERATOR bus switches - ON

Verify that the BUS OFF lights are extinguished.

Verify that the TRANSFER BUS OFF lights are extinguished.

Verify that the STANDBY PWR OFF light is extinguished.

C-FLDX

Verify that the APU LOW OIL QUANTITY light is extinguished.

C-FLHE - C-FLRS

Verify that the APU MAINT light is extinguished.

Verify that the APU LOW OIL PRESSURE light is extinguished.

C-FLDX

Verify that the APU HIGH OIL TEMP light is extinguished.

C-FLHE - C-FLRS

Verify that the APU FAULT light is extinguished.

Verify that the APU OVER SPEED light is extinguished.

Wheel well fire warning system . . . . Test

Test switch - Hold to OVHT/FIRE

Verify that the fire warning bell sounds.

Verify that the master FIRE WARN lights are illuminated.

Verify that the MASTER CAUTION lights are illuminated.

Verify that the OVHT/DET annunciator is illuminated.

Fire warning BELL CUTOUT switch - Push

Verify that the master FIRE WARN lights are extinguished.

Verify that the fire warning bell cancels.

Verify that the WHEEL WELL light stays illuminated.

Electrical Power Down

This procedure assumes the Secure procedure is complete.

If APU was operating:

It is recommended that the APU be operated for one full minute with no pneumatic load prior to shutdown.

APU switch and/or GRD POWER switch. . . . . OFF

If APU was operating:

Delay approximately 20 seconds after APU shutdown for the APU door to close to assure the APU will start on the next flight.

BATTERY switch. . . . . .OFF

STANDBY POWER TEST

Battery switch . . . . ON

AC-DC meter selectors. . . . . .STBY PWR

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

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

STANDBY POWER switch . . . . .OFF

Check STANDBY PWR OFF light illuminated.

AC-DC voltmeters. . . . . Zero

STANDBY POWER switch . . . . .BAT

Check STANDBY PWR OFF Light extinguished.

AC-DC voltmeters. . . . . Check

AC voltmeter 115 +/- 5 volts

DC voltmeter 26 +/- 4 volts

Frequency meter. . . . . Check

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

STANDBY POWER switch . . . . AUTO

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

Chapter SP - Supplementary Procedures
Section 7 - Engines, APU

Battery Start

(With APU bleed or ground air available)

Maintenance documents . . . . Check

FLIGHT DECK ACCESS SYSTEM switch . . . . Guard closed

BATTERY switch . . . . Guard closed

ELECTRIC HYDRAULIC PUMPS switches . . . . OFF

LANDING GEAR lever . . . . DN

Verify that the green landing gear indicator lights are illuminated.

Verify that the red landing gear indicator lights are extinguished.

Weather radar . . . . Off

Emergency equipment . . . . Check

Fire extinguisher - Checked and stowed

Crash axe - Stowed

Escape ropes - Stowed

Other needed equipment - Checked and stowed.

Flight recorder switch . . . . Guard closed

Circuit breakers (P6 panel) . . . . Check

Crew oxygen valve . . . . Open

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

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

Verify that the oxygen pressure is sufficient for flight.

Accomplish the following Preflight Procedure - First Officer items

Overheat and fire protection panel . . . . Check

OVERHEAT DETECTOR switches - NORMAL

TEST switch - Hold to FAULT/INOP

TEST switch - Hold to OVHT/FIRE

EXTINGUISHER TEST switch - Check

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

On the Captain's command, the F/O reads and the Captain does the following items:

Oxygen . . . . Test and set

Standby power . . . . .BAT

GALLEY power switch . . . . ON

EMERGENCY EXIT LIGHTS switch. . . . . Guard closed

Passenger signs . . . . Set

HYDRAULIC PUMP switches. . . . . ON

Air conditioning panel . . . . Set

PACK switches - One switch AUTO or HIGH, one switch OFF

Engine BLEED air switches - ON

APU BLEED air switch - ON

SPEED BRAKE lever . . . . DOWN detent

Reverse thrust levers . . . . .Down

Forward thrust levers . . . . .Closed

Parking brake . . . . Set

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

Engine start levers . . . . .CUTOFF

Papers . . . . Aboard

When cleared for Engine Start, do the following:

Air conditioning PACK switches . . . . .OFF

ANTICOLLISION light switch . . . . ON

Ignition select switch. . . . . IGN-R

Engine Start

Engine No. 1 start . . . . .Accomplish

Only N1, N2, EGT and fuel flow indications are displayed.

Generator 1 switch . . . . ON

IRS mode selectors . . . . OFF, then NAV

Verify that the ON DC lights illuminate, then extinguish.

Verify that the ALIGN lights are illuminated.

FMC/CDU . . . . Set IRS position

Verify that the following are sufficient for flight:

- hydraulic quantity
- engine oil quantity

WARNING: If engine No. 1 was started using a ground air source, to minimize the hazard to ground personnel, the external air should be disconnected and engine No. 2 started using the Engine Crossbleed Start procedure.

Engine No. 2 start . . . . Accomplish

Generator 2 switch . . . . .ON

Cabin pressurization panel . . . . .Set

FLIGHT ALTITUDE indicator - Cruise altitude

LANDING ALTITUDE indicator - Destination field elevation

CABIN Rate selector - Index

CABIN ALTITUDE indicator - 200 feet below destination field elevation

FLT/GRD switch - GRD

Pressurization mode selector - AUTO

Verify that the STANDBY light is extinguished.

Verify that the MANUAL light is extinguished.

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

SERVICE INTERPHONE switch . . . . OFF

ENGINE panel . . . . .Set

Verify that the REVERSER lights are extinguished.

PMC switches - ON

Verify that the INOP lights are extinguished.

Verify that the LOW IDLE light is extinguished.

Oxygen panel . . . . .Set

CREW OXYGEN pressure indicator - Check

Verify that the pressure meets dispatch requirements.

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

PASSENGER OXYGEN switch - Guard closed

Verify that the PASS OXY ON light is extinguished.

Manual gear extension access door . . . . Closed

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

BEFORE TAXI checklist . . . . Accomplish

IRS alignment . . . . Complete

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

ENGINE CROSSBLEED START

Do not accomplish a crossbleed start during pushback.

Prior to using this procedure, ensure that the area to the rear is clear.

Engine BLEED air switches . . . . ON

APU BLEED air switch . . . . .OFF

PACK switches . . . . .OFF

ISOLATION VALVE switch . . . . AUTO

Ensures bleed air supply for engine start.

Engine thrust lever
(operating engine). . . . . Advance thrust lever until bleed duct pressure indicates 30 PSI

Non-operating engine . . . . Start

Use normal start procedures with crossbleed air.

After starter cutout, adjust thrust on both engines, as required.

HIGH ALTITUDE AIRPORT ENGINE START (ABOVE 8400 FEET)

For aircraft certified for operation at high altitude airports, accomplish the following:

Ignition select switch. . . . . Both

Engine start. . . . . Accomplish

The minimum start pressure is 30 psi minus .5 psi for each 1000 ft above sea level. An indication of N1 rotation plus a minimum of 20% N2 are required prior to introducing fuel to the engine. Engine acceleration will be much slower than during starts at lower altitudes. The engine start switch must be held to the GRD position until N2 RPM reaches 50%.

CAUTION: Do not attempt to re-engage the starter above 20% N2 if it is inadvertently allowed to cut out at 46% N2.

Note: Fuel fogging from the engine exhaust may occur during a normal high altitude airport start.

PMC OFF TAKEOFF AND CLIMB

This procedure must be accomplished only if PMC OFF performance data is available for the type of engines installed.

PMC switches . . . . OFF

FMC/CDU TAKEOFF REF page . . . . Select

OAT . . . . Enter

Enter the actual airport ambient temperature.

Note: N1 RPM will increase as speed increases during takeoff. The RPM increase could be as much as 7% depending on temperature and pressure altitude. The takeoff performance figures for PMC OFF account for the RPM change. DO NOT reduce thrust during takeoff unless engine parameters exceed other limits.

Do not enter SEL TEMP. In this case, takeoff may be accomplished using OAT for temperature reference.

If FMC is inoperative or not used:

N1 cursors . . . . .Set

Set full rated thrust value for PMC OFF.

Takeoff thrust . . . . .Set

Set thrust manually or with auto throttle by 60 kts.

After takeoff

Thrust levers (if required) . . . . Adjust

The N1 setting should be monitored throughout the climb, and the thrust levers reset as necessary. The pilot not flying will compute the thrust setting for cruise speed schedule prior to reaching cruise altitude.

Starting with Ground Air Source (AC Electrical Power Available)

Engine No. 1 must be started first.

When cleared to start:

APU BLEED air switch . . . . OFF

Engine No. 1 start . . . . .Accomplish

Use normal start procedures.

WARNING: To minimize the hazard to ground personnel, the external air should be disconnected, and engine No. 2 started using the Engine Crossbleed Start procedure.

Chapter SP - Supplementary Procedures
Section 8 - Fire Protection

Fire and Overheat System Test With an Inoperative Loop

To determine the specific inoperative loop

OVHT DET switches . . . . A

Test switch . . . . OVHT/FIRE

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

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

OVHT DET switches . . . . B

Test switch . . . . OVHT/FIRE

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

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

OVHT DET switches . . . . As required

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

Test switch . . . . OVHT/FIRE

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

Intentionally Blank

Chapter SP - Supplementary Procedures
Section 10 - Flight Instruments

Altimeter Difference

Note: If flight in RVSM airspace is planned, use the RVSM table in the Limitations section.

This procedure is accomplished when there is a noticeable difference between the altimeters. Accomplish this procedure in stabilized level flight or on the ground.

Altimeters . . . . Set

The reference barometric setting for this check is field barometric pressure or standard barometric pressure (29.92 in Hg or 1013 mb) as appropriate. Perform the following for all altimeters:

- First rotate the Baro Set knob clockwise to a higher barometric setting than the reference.
- Then rotate the Baro Set knob counterclockwise back to the reference barometric setting.

Altimeters . . . . Crosscheck

Maximum differences between the altimeter readings:

ALTITUDE	ELEC / ELEC	ELEC / STBY
Sea level	50 feet	60 feet
5000 feet	50 feet	80 feet
10000 feet	60 feet	200 feet
15000 feet	70 feet	see note
20000 feet	80 feet	see note
25000 feet	100 feet	see note
30000 feet	120 feet	see note
35000 feet	140 feet	see note
40000 feet	160 feet	see note

Note: Above 10000 ft and .4 Mach, position error causes the tolerance to diverge rapidly and direct crosscheck becomes inconclusive. Between 10000 ft and 29000 ft, differences greater than 400 ft should be suspect and verified by ground maintenance checks. Between 29000 ft and the maximum operating altitude, differences greater then 500 ft should be suspect and verified by ground maintenance checks.

If it is not possible to identify which altimeter is indicating the correct altitude:

ATC . . . . Notify

QFE Operation

Use this procedure when ATC altitude assignments are referenced to QFE altimeter settings.

Note: Do not use LNAV or VNAV.

Altimeters . . . . Set

Set altimeters to QFE when below transition altitude/level.

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

Landing Altitude Indicator . . . . Set at zero

Cabin Altitude Indicator. . . . . Set at -200

Chapter SP - Supplementary Procedures
Section 11 - Flight Management, Navigation

TESTS

Transponder Test

Transponder switch . . . . TEST

C-FLHE - C-FLRS

Check that the ATC FAIL light illuminates.

C-FLDX

Check that the XPNDR FAIL light illuminates.

Check that all code segments illuminate. Verify that no error codes exist.

Verify "TCAS SYSTEM TEST - OK" aural sounds.

AURAL ALERTS	DEFINITION
"TCAS SYSTEM TEST FAIL"	Test failed. Maintenance required.
"TCAS SYSTEM TEST OK"	Test complete. System operable.

Weather Radar Test

EHSI mode selector . . . . Expanded scale mode except PLAN

STAB switch . . . . ON

TEST . . . . ON

WXR. . . . . ON

Verify test pattern consists of the following colours:

- Green
- Yellow
- Red
- Magenta.

Verify no fault messages are present.

IRS

Align Light(s) Flashing

Do not move IRS Mode selector to OFF except where called for in procedure.

POS INIT page. . . . . Select

Set IRS position . . . . Enter present position

Enter present position using the most accurate latitude and longitude available. If the present position is being entered via the CDU and a position is already displayed on the SET IRS POS line, enter new position over displayed position.

If ALIGN light continues to flash:

Set IRS position. Enter present position

Re-enter same present position.

If ALIGN light continues to flash after re-entry:

IRS. . . . . OFF

Rotate IRS Mode Selector to OFF and verify ALIGN light extinguished.

Note: Light must be extinguished before continuing with procedure (approximately 30 seconds.)

IRS. . . . . NAV

Rotate IRS Mode Selector to NAV and verify ALIGN light illuminated.

Set IRS position. Enter present position

Enter present position. If ALIGN light flashes, re-enter same present position over displayed position.

Note: Approximately 10 minutes are required for alignment.

If ALIGN light continues to flash, maintenance action is required.

Fast Realignment

Prior to commencing this procedure, the aircraft must be parked and not moved until the procedure is completed and the ALIGN lights extinguished.

FMC/CDU POS INIT page . . . . Select

Enter the correct present position (PPOS) into the scratch pad. Use the most accurate PPOS available.

IRS mode selectors . . . . .ALIGN

Observe ALIGN light illuminates steadily.

FMC/CDU POS INIT page . . . . Select

Press line select key (LSK) 4R when box prompts appear. Confirm that the box prompts are replaced by the entered present position. If ALIGN light flashes then re-enter the same position into the scratch pad even if it is already displayed under the SET IRS POS line. Press LSK 4R. (Box prompts are not required for present position re-entry.)

IRS mode selectors . . . . NAV

Observe ALIGN light extinguished within 30 seconds.

If ALIGN light continues to flash, then refer to the section on IRS Align Light(s) Flashing.

Note: If time permits, it is preferable to perform a full alignment of the IRS. A more precise alignment will result.

If the mode selector is accidentally switched to OFF or ATT, position mode selector to OFF, wait for ALIGN light(s) to extinguish, then perform full alignment procedure.

High Latitude Alignment

This procedure should be followed when aligning the IRS systems at latitudes greater than 70° 12.0 and less than 78° 15.0.

IRS mode selectors . . . . ALIGN

Position Initialization page . . . . .Set

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

The IRS mode selectors must be in ALIGN for a minimum of 17 minutes.

IRS mode selectors . . . . NAV

IRS Entries

Present Position Entry

IRS mode selectors . . . . NAV

ALIGN lights must be illuminated (steady or flashing).

IRS display selector . . . . PPOS

Latitude . . . . Enter

Key-in latitude in the data display, beginning with N or S, then press the ENT Key (the Cue Lights extinguish).

Longitude . . . . Enter

Key in longitude in the data display, beginning with E or W, then press the ENT key (the cue lights extinguish). Observe that proper latitude and longitude are displayed and that the ALIGN light is not flashing.

Heading - Enter Through CDU

FMC/CDU POS INIT page . . . . Select

Enter the correct heading into the CDU scratch pad then press line select key 5R. Verify entered heading appears on line 5R. Select HDG on the IRS display selector and verify that the entered heading is displayed on the navigation displays.

Heading - Enter through ISDU

IRS display selector . . . . HDG

Press the H key to initiate a heading entry.

Key-in present magnetic heading. Press the ENT key (the cue lights extinguish). Observe proper heading displayed on the navigation displays.

Inadvertent Selection of Attitude Mode (While On The Ground)

Inadvertent selection of the attitude mode may be due to physically overpowering the switch during turn-on, or the result of a faulty switch where the flight crew cannot accurately determine which mode is selected. If the ATT position is selected inadvertently when switching to NAV, the IRS must be turned off, and after the ALIGN lights extinguish, a full alignment must be initiated.

FLIGHT MANAGEMENT

Lateral Navigation Using the FMC / CDU

Direct To or Intercept Course (Overwrite)

RTE LEGS page . . . . Select

On page 1/XX, line 1L, enter the desired waypoint over the presently active waypoint.

Observe INTC CRS prompt in line 6R.

If intercepting a leg to the waypoint, enter the desired intercept course in the INTC CRS line. Observe the desired course is displayed on line 6R. The displayed course on line 1L may vary by several degrees due to magnetic variation.

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

EXEC key . . . . Push

Observe the MOD RTE LEGS page changes to ACT.

LNAV may disengage after execution of an intercept leg to a waypoint. If LNAV disengages, turn to a heading to satisfy LNAV capture criteria, as described in Chapter 11, Flight Management, Navigation, and then engage LNAV.

Direct To (DIR/INTC Key)

DIR INTC key. . . . . Push

Observe DIRECT TO box prompts displayed in line 6L.

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

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

EXEC key. . . . . Push

Observe the MOD RTE LEGS page changes to ACT.

Intercept Leg To (DIR/INTC Key)

DIR INTC key. . . . . Push

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

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

Observe INTC CRS prompt displayed in line 6R. Enter the desired intercept course in the INTC CRS line. Observe the desired course is displayed on line 6R. The displayed course on line 1L may vary by several degrees due to magnetic variation.

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

EXEC key. . . . . Push

Observe the MOD RTE LEGS page changes to ACT.

LNAV may disengage after execution of an intercept leg to a waypoint. If LNAV disengages, turn to a heading to satisfy LNAV capture criteria, as described in Chapter 11, Flight Management, Navigation, and then engage LNAV.

Route Modification

RTE LEGS or RTE page . . . . Select

Line select existing waypoints in the desired sequence.

Key in any new waypoints in the scratch Pad and line select into the flight plan. Correct any ROUTE DISCONTINUITIES.

EXEC key. . . . . Push

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

Linking a Route Discontinuity

Correct the ROUTE DISCONTINUITY by entering or deleting waypoints in a sequence that provides a continuous flight-plan path.

EXEC key . . . . Push

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

Determining ETA and Distance to Cross Radial (Bearing) or Distance From a Fix

FIX INFO page . . . . Select

Enter the identifier of the reference waypoint (normally an off route waypoint) onto the FIX line. Enter the desired radial or distance from the FIX on a RAD/DIS line, or line select the ABM prompt if the desired radial from the FIX is perpendicular to the present route/course.

Time and distance to go . . . . Check

Check ETA and DTG, as desired.

Note: If ETA and DTG are not displayed, the fix entered is not on the current planned route or it has already been passed.

Changing Destination

RTE page . . . . Select

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

EXEC key . . . . Push

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

Note: If destination is changed during climb, performance predictions may be blanked if the new flight plan is incompatible with the entered cruise altitude. Correct by entering a lower CRZ ALT on the CLB page.

Entering Holding Fix Into Route

HOLD key . . . . Push

If the RTE HOLD page is displayed, observe the NEXT HOLD prompt. Line select 6L until the (RTE LEGS) HOLD AT page is displayed.

Observe that HOLD AT box prompts and the PPOS prompt (if in flight) are displayed. Enter the holding fix in line 6L, or line select PPOS.

If the holding fix is a waypoint in the active route, or PPOS was selected, observe the MOD RTE HOLD page displayed. If the holding fix is a waypoint not in the active route, observe the message HOLD AT XXXXX displayed in the scratch pad. Enter the holding fix into the route by line selecting in the desired waypoint sequence. Observe the MOD RTE HOLD page displayed. If displayed holding details are incorrect or inadequate, enter correct information on the appropriate line(s).

EXEC key. . . . . Push

Observe the MOD RTE HOLD page changes to RTE HOLD (ACT RTE HOLD if holding at PPOS).

Exiting Holding Pattern

HOLD key . . . . Push

Observe EXIT HOLD prompt displayed.

EXIT HOLD line select key . . . . Push

Observe EXIT HOLD prompt changes to EXIT ARMED.

EXEC key. . . . . Push

Observe that EXIT ARMED is highlighted in reverse video and LNAV flight returns to the holding fix and resumes the active route.

Note: The holding pattern may be exited by performing a DIRECT TO modification if desired. In this case, the flight path may not return to the holding fix before proceeding to the selected waypoint.

Along Track Displacement

RTE LEGS page . . . . Select

Line select the reference waypoint to the scratch pad. Add a "/" and the + or - distance desired. (EX SEA/15 for a point 15 miles down track from SEA.)

Line select the reference waypoint. (The FMC will automatically position the created waypoint to the appropriate position.)

EXEC key. . . . . Push

Observe the MOD RTE LEGS page change to ACT.

Entering Created Waypoints on the Route or Route Legs Pages

Note: Created waypoints are stored in the temporary navigation data base for one flight only.

RTE or RTE LEGS page. . . . . Select

Using any of the following methods, key into the scratch pad the parameters which define the new created waypoint (the place identifiers must already be stored in one of the FMC data bases):

- place bearing/distance (for example, SEA250/40);
- place bearing/place bearing (for example, SEA180/ELN270);
- along-track displacement (for example, SEA/-10);
- latitude and longitude (for example, N4731.8W12218.3).

Enter into the route by line selecting to the appropriate waypoint sequence.

Repeat the above steps to define additional created waypoints as desired. Correct any ROUTE DISCONTINUITY.

EXEC key . . . . Push

Observe the MOD RTE or MOD RTE LEGS page changes to ACT (for an inactive route, ACTIVATE and EXECute on the RTE or RTE LEGS page).

Entering Created Waypoints on the NAV DATA Pages

Note: Created waypoints entered on the SUPP NAV DATA pages (permitted on the ground only) are stored in the supplemental navigation data base for an indefinite time period; those entered on the REF NAV DATA pages are stored in the temporary navigation data base for one flight only.

INIT/REF key . . . . Push

Observe the INDEX prompt displayed.

INIT/REF INDEX page . . . . Select

Observe the NAV DATA prompt displayed. To access the SUPP NAV DATA page, key SUPP into the scratch pad.

NAV DATA page . . . . Select

If the SUPP NAV DATA page is selected, observe the EFF FRM date line displayed. Enter the current or appropriate date on line 3R and EXECute.

Enter a crew-assigned identifier on either the WPT IDENT, NAVAID IDENT, or AIRPORT IDENT line, as appropriate. Use the navaid category only for stations with DME.

DATA . . . . Enter

For a WPT IDENT entry, define the waypoint with entries for either latitude and longitude, or with entries for REF IDENT and RADIAL/DIST (the REF IDENT identifier must already be stored in one of the FMC data bases).

For a NAVAID IDENT or AIRPORT IDENT entry, enter appropriate data.

The EXEC key illuminates when data has been entered into all box prompts.

EXEC key. . . . . Push

Repeat the above steps to define additional created waypoints as desired. To enter a new identifier in the same category, simply overwrite the previous identifier.

Note: To enter a created waypoint into the flight plan, key the identifier into the scratch pad and follow the route modification procedure.

Deleting Created Waypoints on the NAV DATA Pages

INIT/REF key . . . . Push

Observe the INDEX prompt displayed.

INIT/REF INDEX page . . . . Select

Observe the NAV DATA prompt displayed. To access the SUPP NAV DATA page, key SUPP into the scratch pad.

NAV DATA page . . . . Select

Enter the identifier on either the WPT IDENT, NAVAID IDENT, or AIRPORT IDENT line, as appropriate.

DATA . . . . Delete

Press the DEL Key and then line select the identifier. Observe the EXEC Key illuminate.

EXEC Key . . . . Push

Data previously entered is deleted. Observe NAV DATA page displayed with prompts.

Entering a Crossing Radial (Bearing) or Distance From a Fix as a Route Waypoint

FIX INFO page . . . . Select

Enter the identifier of the reference waypoint (normally an off route waypoint) onto the FIX line. Enter the desired radial or distance from the FIX on a RAD/DIS line, or line select the ABM prompt if the desired radial or distance from the FIX is perpendicular to the present route/course.

Line select the desired intersection (lines 2L-5L) into the scratch pad and observe the new created waypoint displayed as FIX/Radial/Distance.

RTE LEGS page . . . . Select

Line select the new created waypoint, displayed in the scratch pad, to the desired waypoint sequence.

Repeat the above steps to define additional created waypoints as desired. Correct any ROUTE DISCONTINUITIES.

EXEC key . . . . Push

Observe the MOD RTE LEGS page changes to ACT.

Note: These created waypoints are stored in the temporary navigation database for 1 flight only.

Inhibiting VOR / DME Stations

Note: This procedure provides the capability to inhibit the use of specific navaid stations. It also provides the capability of selecting the use of VOR or DME for position updating.

PROG page . . . . Select

Observe the NAV STATUS prompt displayed.

NAV STATUS page . . . . Select

NAV OPTIONS page . . . . Select (NEXT/PREV page of NAV STATUS page)

Enter desired identifier in 1L-1R for DME INHIBIT and 2L-2R for VOR INHIBIT. To select the ON or OFF UPDATE function, line select 3L for DME UPDATE and 4L for VOR UPDATE.

Entering a Lateral Offset

RTE page . . . . Select

Observe the OFFSET prompt displayed.

LATERAL OFFSET page . . . . Select

Observe dash prompts for OFFSET DIST.

OFFSET DIST . . . . Enter

Enter desired offset distance using format Lxx or Rxx for left or right offset up to 99 NM. Observe the dash prompts for START WAYPOINT and END WAYPOINT.

START/END WAYPOINT . . . . Enter

If no start/end waypoint is entered, offset will begin/end at first/last valid offset leg.

FMC Navigation Check

If the IRS NAV ONLY, VERIFY POSITION or UNABLE REQUIRED NAV PERFORMANCE - RNP message is shown in the CDU scratch pad, or course deviation is suspected, do the following as necessary to ensure navigation accuracy

Ensure that one VOR is operating in the AUTO tuning mode so that the FMC can update its position if NAVAIDS are available. Check the NAV STATUS page to ensure that radio updating is occurring. In some cases, it may be necessary to switch both VORs to the AUTO mode to achieve radio updating.

Determine the actual aircraft position using raw data from the VHF navigation or ADF radios and compare that position with the FMC position. (Use the FIX page.)

If radio NAVAIDS are unavailable, compare the FMC position with the IRS positions using the POS REF page of the FMC CDU. If the 2 IRS positions are in agreement and the FMC position is significantly different, the FMC position is probably unreliable. The POS SHIFT page may be used to shift the FMC position to one of the IRS positions. This is accomplished by line selecting the IRS or radio position and then pressing the EXEC Key.

Confirm actual position with ATC radar or visual reference points, if available.

Navigate using the most accurate information available. The possibilities are LNAV (continue to monitor FMC position using VOR/ADF raw data displays on the non-flying pilot's EHSI).

CAUTION: Navigating in the LNAV mode with an unreliable FMC position may result in significant navigation errors.

Conventional VOR/ADF procedures. Radar vectors from ATC. Dead reckoning from last known position. Use of visual references.

Lateral Navigation Using the AN/CDU

C-FLDX

Entering Active FMC Flight Plan into AN/CDU

INIT/REF key . . . . Push

Observe the INDEX prompt is displayed.

INIT REF INDEX page . . . . Select

Press the INDEX prompt. Observe the INIT REF INDEX page displayed and the IRS NAV prompt in line (5R).

IRS LEGS page . . . . Select

Press the IRS NAV prompt. Observe the IRS LEGS page displayed and the prompt in line 5L CROSSLOAD prompt if an active FMC flight plan exists; LAST FMC PLAN prompt if the FMC has failed and an active FMC flight plan existed prior to the failure.

FMC flight plan . . . . Enter

Line select 5L to display the active (or most recent) flight plan. A maximum of 20 waypoints can be displayed. Undefined procedural legs contained in the FMC flight plan are bypassed in the AN/CDU flight plan. Modify the flight plan if desired.

EXEC key . . . . Push

Observe the IRS LEGS page changes to ACT.

Note: If the present FMC flight plan exceeds 20 waypoints Repeat the above procedure during flight to update the AN/CDU flight plan with additional waypoints.

Manual Entry of AN/CDU Flight Plan

INIT/REF key . . . . Push

Observe the INDEX prompt is displayed.

INIT REF INDEX page . . . . Select

Press the INDEX prompt. Observe the INIT REF INDEX page displayed and the IRS NAV prompt in line (5R).

IRS LEGS page . . . . Select

Key any of the following into the scratch pad

- For a crew assigned identifier, key in the identifier (6 characters maximum) followed by latitude and longitude (for example, SIMONE/N4802.2W12241.3).

- For an AN/CDU assigned identifier, key in only latitude and longitude (for example, S3618.5E14136.9). The AN/CDU assigns a sequential identifier WPT01, etc.
- If repeating an identifier which is already in the flight plan, key in only the identifier (for example, SEA).

Enter each waypoint into the route by line selecting to the desired sequence. A maximum of 20 waypoints can be in the flight plan at any one time. If required, additional waypoints can be entered as the flight progresses.

EXEC key. . . . . Push

Observe the IRS LEGS page changes to ACT.

Proceeding Direct to a Waypoint

IRS LEGS page . . . . Select

Key any of the following into the scratch pad

- For a crew assigned identifier, key in the identifier (6 characters maximum) followed by latitude and longitude (for example, SIMONE/N4802.2W12241.3).
- For an AN/CDU assigned identifier, key in only latitude and longitude (for example, S3618.5E14136.9). The AN/CDU assigns a sequential identifier WPT01, etc.
- If repeating an identifier which is already in the flight plan, key in only the identifier (for example, SEA).

On page 1/XX, line 1L, enter the desired waypoint over the presently active waypoint.

EXEC key. . . . . Push

Observe the MOD IRS LEGS page changes to ACT.

Route Modification

IRS LEGS page . . . . Select

Line select existing waypoints in the desired sequence.

Key in any new waypoints in the scratch pad and line select into the flight plan.

EXEC key. . . . . Push

Observe the MOD IRS LEGS page changes to ACT.

Vertical Navigation Using the FMC / CDU

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

MCP altitude selector . . . . .Set desired altitude

Verify ALT HOLD is annunciated on the flight mode indicator when levelling at the selected MCP altitude.

MCP N1 light extinguishes if levelling from a climb.

N1 limit changes to CRZ if levelling from a climb.

To continue climb or descent

MCP altitude selector . . . . Set desired altitude

VNAV switch . . . . .Push

Climb or descent is initiated. Mode annunciations appear as initial climb or descent.

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

RTE LEGS page. . . . . Select

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

Minimum speed values permitted are 210 kts for climb waypoints and 150 kts for descent waypoints.

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

Line select to the desired waypoint line.

EXEC key . . . . Push

Observe the MOD RTE LEGS page changes to ACT.

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

Deleting Waypoint Speed and Altitude Restriction

RTE LEGS page. . . . . Select

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

EXEC key . . . . Push

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

Changing Speed and/or Altitude Restriction During Climb or Descent

CLB/DES page. . . . . Select

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

EXEC key. . . . . Push

Observe the MOD CLB or MOD DES page changes to ACT (or pre-planned) and the restriction is changed or deleted.

Changing Climb / Cruise / Descent Speed Schedule

CLB/CRZ/DES page . . . . Select

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

EXEC key. . . . . Push

Observe the MOD CLB, MOD CRZ, or MOD DES page changes to ACT (or pre-planned) and the new speed schedule is specified.

Early Descent

MCP altitude selector. . . . . .Set

Set next level-off altitude.

DES page. . . . . Select

Line select the DES NOW prompt.

EXEC key. . . . . Push

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

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

Step Climb or Descent From Cruise

MCP altitude selector. . . . . .Set

Set new level-off altitude.

FLT ALT indicator . . . . .Set

Set new level-off altitude.

CRZ page. . . . . Select

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

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

EXEC key . . . . Push

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

Performance and Progress Functions of the FMC/CDU

Determining ETA And Fuel Remaining For New Destination

RTE page . . . . Select

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

PROGRESS page . . . . Select

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

RTE page . . . . Select

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

Estimated Wind Entries For Cruise Waypoints

RTE LEGS page. . . . . Select

Observe the DATA prompt displayed.

RTE DATA page . . . . Select

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

Step Climb Evaluation

CRZ page . . . . Select

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

Step climb savings . . . . .Determine

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

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

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

Entering Descent Forecasts

DES page. . . . . Select

Observe the FORECAST prompt displayed.

DES FORECASTS page . . . . Select

Verify the TRANS LVL and revise if required. Enter anticipated TAI ON/OFF altitudes if appropriate. Enter average ISA DEV forecast for descent and destination QNH.

Enter forecast descent WINDs (for up to 3 different altitudes).

EXEC key. . . . . Push

Observe the MOD DES FORECASTS page changes to ACT.

RTA Navigation Using the FMC/CDU

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

Entering an RTA Waypoint and Time

RTA PROGRESS page . . . . Select

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

RTA . . . . Enter

Enter into line 1R, the required time of arrival in hours, minutes and seconds using a 6 digit number (examples: 174530, 1745, 1745.5). Observe MOD RTA PROGRESS page displayed with pertinent data for complying with entered RTA. Observe EXEC key illuminated.

EXEC key. . . . . Push

Observe the ACT RTA PROGRESS page displayed.

Entering Speed Restrictions For RTA Navigation

PERF LIMITS page. . . . . Select

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

EXEC key . . . . Push

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

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

Entering New Time Error Tolerances For RTA Navigation

PERF LIMITS page. . . . . Select

Enter desired time error tolerance (6 to 30 seconds) for the RTA waypoint on line 1L (example: 25). Observe MOD PERF LIMITS page displayed and EXEC key illuminated.

EXEC Key. . . . . Push

Observe the ACT PERF LIMITS page displayed.

Chapter SP - Supplementary Procedures
Section 12 - Fuel

FUEL BALANCING

If an engine fuel leak is suspected:

Accomplish the ENGINE FUEL LEAK Checklist.

Maintain main tank No. 1 and No. 2 fuel balance within limitations.

Note: Fuel pump pressure should be supplied to the engines at all times. At high altitude, without fuel pump pressure, thrust deterioration or engine flameout may occur.

If the centre tank contains fuel:

Centre tank fuel pump switches . . . . OFF

Crossfeed selector . . . . Open

Fuel pump switches (low tank) . . . . OFF

When quantities are balanced

Fuel pump switches (main tank) . . . . ON

Centre tank fuel pump switches . . . . ON

Crossfeed selector . . . . Close

If the centre tank contains no fuel:

Crossfeed selector . . . . Open

Fuel pump switches (low tank) . . . . OFF

When quantities are balanced:

Fuel pump switches . . . . ON

Crossfeed selector . . . . Close

REFUELLING

Fuel Load Distribution

Main tanks No. 1 and No. 2 should normally be serviced equally until full. Additional fuel is loaded into the centre tank until the desired fuel load is reached.

Note: Main tanks No. 1 and No. 2 must be scheduled to be full if the centre tank contains more than 453 kg of fuel. With less than 453 kg of centre tank fuel, partial main tank fuel may be loaded provided the effects of balance have been considered.

Fuel Pressure

Apply from a truck or fuel pit. A nozzle pressure of 50 psi provides approximately 1136 litres per minute.

Normal Refuelling

When a full fuel load is required, the fuel shutoff system closes the fuelling valves automatically when the tanks are full. When a partial fuel load is required, the fuel quantity indicators are monitored and the fuelling valves are closed by manually positioning the fuelling valve switches to CLOSED when the desired fuel quantity is aboard the aircraft.

Refuelling with Battery Only

When the APU is inoperative and no external power source is available, refuelling can be accomplished as follows:

Battery switch . . . . ON

Standby power switch. . . . . .BAT

The battery operates the entire fuelling system normally, including the gages and fuel shutoff system. The only limitation during this type of operation is the battery life.

Refuelling With No AC or DC Power Source Available

When it becomes necessary to refuel with the APU inoperative, the aircraft battery depleted, and no external power source available, refuelling can still be accomplished

Fuelling hose nozzle. . . . . Attached to the refuelling receptacle

Fuelling valves . . . . .Open for the tanks to be refueled

Note: Main tanks No. 1 and No. 2, and the centre tank refuelling valves each have a red override button that must be pressed and held while fuel is being pumped into the tank. Releasing the override button allows the spring in the valve to close the valve.

Caution must be observed not to overfill a tank, since there is no automatic fuel shutoff during manual operation. When the desired amount of fuel has been pumped into the tanks, the refuelling valves for the respective tanks can be released. Main tanks No. 1 and No. 2 may also be refueled through filler ports over the wing. It is not possible to refuel the centre tank externally.

GROUND TRANSFER OF FUEL

Fuel can be transferred from one tank to another tank using the fuel pumps, fuelling valve, defuelling valve, and crossfeed valve. AC power must be available.

Note: Before transferring fuel, ensure that the associated FUEL PUMP LOW PRESSURE lights are operating.

CAUTION: On aircraft with the centre tank fuel pump automatic shutoff system installed, transferring fuel with passengers on board is prohibited, unless the fuel quantity in the tank from which fuel is being taken is maintained at or above 900 kg.

To transfer fuel from the main tanks to the centre tank:

Main tank fuel pump switches . . . . ON

Crossfeed selector . . . . Open

Manual defuelling valve . . . . Open

Centre tank fuelling valve switch . . . . OPEN

Fuel transfer . . . . Monitor

The centre tank fuel quantity indicator shows an increase in fuel. The main tank indicators show a decrease in fuel.

When a FUEL PUMP LOW PRESSURE light illuminates, turn OFF the associated fuel pump.

When the required amount of fuel has been transferred:

Centre tank fuelling valve switch . . . . CLOSED

Manual defuelling valve . . . . Close

Crossfeed selector . . . . Close

Main tank fuel pump switches . . . . OFF

Main Tanks . . . . Refill

Refuelling panel and defuel panel access doors . . . . Close

FUEL CROSSFEED VALVE CHECK

Crossfeed selector . . . . Open

Verify Crossfeed VALVE OPEN light illuminates bright and then dim.

Crossfeed selector . . . . Close

Verify Crossfeed VALVE OPEN light illuminates bright and then extinguishes.

Fuel Quantity Indicators Test

Note: With a fuel quantity indicator inoperative, a zero fuel quantity input will be sent to the fuel summation unit causing a possible FMC gross weight error.

Fuel quantity test switch . . . . .Push and hold

Hold until the fuel quantity indicators:

(1, 2, and CTR) - drive to zero and "ERR 0" is displayed.

Note: Do not push the QTY TEST switch when the aircraft is being fuelled. This will cause inaccurate indications at the external fuelling panel.

Fuel quantity test switch . . . . .Release

Releasing the test switch initiates a self-test. The fuel quantity indicators display:

- All segments for two seconds
- Blank for two seconds
- Stored error codes (if any) for two seconds each
- Indicator full scale value for two seconds
- Actual fuel quantity.

Chapter SP - Supplementary Procedures
Section 15 - Warning Systems

GROUND PROXIMITY WARNING SYSTEM (GPWS) TEST

Verify IRS alignment is complete.

Verify that the guards are closed for all GROUND PROXIMITY INHIBIT switches.

Ground proximity SYS TEST switch . . . . Push momentarily

Verify the following:

- BELOW G/S, PULL UP and GPWS INOP lights illuminate.
- WINDSHEAR light (as installed) illuminates.
- EADI WINDSHEAR message (as installed) shows.
- "GLIDESLOPE", "WHOOP, WHOOP, PULL UP" and "WINDSHEAR" (as installed) aurals sound.

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

Intentionally Blank

Chapter SP - Supplementary Procedures
Section 16 - Adverse Weather

INTRODUCTION

Aircraft operation in adverse weather conditions may require additional considerations due to the effects of extreme temperatures, precipitation, turbulence, and windshear. Procedures in this section supplement normal procedures and should be observed when applicable.

TAKEOFF - WET OR CONTAMINATED RUNWAY CONDITIONS

The following information applies to takeoffs on wet or contaminated runways

- For wet runways, reduced thrust (fixed derate, assumed temperature method, or both) is allowed provided suitable takeoff performance accountability is made for the increased stopping distance on a wet surface.
- For runways contaminated by slush, snow, standing water, or ice, reduced thrust (fixed derate) is allowed provided takeoff performance accounts for the runway surface condition. Reduced thrust using assumed temperature method, whether alone or in combination with a fixed derate, is not allowed.
- V1 may be reduced to minimum V1 to provide increased stopping margin provided the field length required for a continued takeoff from the minimum V1 and obstacle clearance meet the regulatory requirements. The determination of such minimum V1 may require a real time performance calculation tool or other performance information supplied by dispatch.
- Takeoffs are not recommended when slush, wet snow, or standing water depth is more than 1/2 inch (13 mm) or dry snow depth is more than 4 inches (102 mm).

COLD WEATHER OPERATIONS

Considerations associated with cold weather operation are primarily concerned with low temperatures and with ice, snow, slush, and standing water on the aircraft, ramps, taxiways, and runways.

Icing conditions exist when OAT (on the ground) or TAT (in-flight) is 10°C or below and any of the following exist:

- visible moisture (clouds, fog with visibility of 1 sm (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 or wing anti-ice when OAT (on the ground) or TAT (in-flight) is above 10°C.

Exterior Inspection

Although removal of surface snow, ice and frost is normally a Maintenance function, during preflight procedures, the Captain or F/O 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, tab surfaces, upper wing surfaces and control surface balance panel cavities must be free of snow, ice and frost.

Thin hoarfrost is acceptable on the upper surface of the fuselage provided all vents and ports are clear. Thin hoarfrost is a uniform white deposit of fine crystalline texture, which usually occurs on exposed surfaces on a cold and cloudless night, and which is thin enough to distinguish surface features underneath, such as paint lines, markings or lettering.

Control surface balance panel cavities. . . . . Check

Check drainage after snow removal. Puddled water may freeze in flight.

Pitot probes and static ports . . . . Check

Verify that all pitot probes and static ports free of snow and ice. Water rundown after snow removal may freeze immediately forward of static ports and cause an ice buildup which disturbs airflow over the static ports resulting in erroneous static readings even when static ports are clear.

Air conditioning inlets and exits . . . . Check

Verify that the air inlets and exits, including the outflow valve, are free of snow and ice.

If the APU is operating, verify that the outflow valve is fully open.

Engine inlets . . . . Check

Verify that the inlet cowling is free of snow and ice.

Verify that the fan is free to rotate.

Snow or ice that accumulates on the fan spinner or fan blades during extended shutdown periods must be removed by maintenance or other means before engine start.

Snow or ice that accumulates on the fan spinner or fan blades as a result of operation in icing conditions, such as during approach or taxi in, is allowed if the fan is free to rotate and the snow or ice is removed using the ice shedding procedure during taxi out and before setting takeoff thrust.

Fuel tank vents. . . . . Check

Verify all traces of ice and frost are removed.

Landing gear doors . . . . Check

Landing gear doors should be free of snow and ice.

APU air inlets . . . . Check

The APU inlet door and cooling air inlet must be free of snow and ice before APU start.

Preflight Procedure - F/O

Do the normal Preflight Procedure - First Officer with the following modifications:

Under extremely cold conditions, both packs may be used for more rapid heating

APU switch . . . . START F/O

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

ISOLATION VALVE switch . . . . OPEN F/O

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

Note: Keep all doors to the aircraft closed as much as possible.

Do the following step after completing the normal Preflight Procedure - First Officer:

PITOT STATIC HEAT switches. . . . . .ON

Verify that all pitot static heat lights are extinguished.

Engine Start Procedure

Do the normal Engine Start Procedure with the following modifications:

- If ambient temperature is below -35°C, idle the engine for 2 minutes before changing thrust lever position.
- Several minutes may be needed for oil pressure to reach the normal operating pressure. During this period, oil pressure may go above the normal range and the OIL FILTER BYPASS light may illuminate. Operate the engine at idle thrust until oil pressure returns to the normal range.
- If the oil pressure remains above the normal range after the oil temperature has stabilized within limits, shut down the engine.

Engine Anti-Ice Operation - On the Ground

Engine anti-ice must be selected ON immediately after both engines are started and remain on during all ground operations when icing conditions exist or are anticipated.

WARNING: Do not rely on airframe visual icing cues before activating engine anti-ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.

CAUTION: Do not use engine anti-ice when OAT is above 10°C.

When engine anti-ice is needed:

ENGINE START switches. . . . . .CONT F/O

ENGINE ANTI-ICE switches . . . . ON F/O

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

Verify that the COWL ANTI-ICE lights are extinguished.

Note: If the COWL VALVE OPEN lights remain illuminated bright with engines at IDLE, position APU BLEED air switch to OFF and increase thrust slightly (up to a maximum of 30% N1).

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE switches . . . . OFF F/O

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

ENGINE START switches. . . . . .OFF

Wing Anti-Ice Operation - On the Ground

Use wing anti-ice during all ground operations between engine start and takeoff when icing conditions exist or are anticipated, unless the aircraft is, or will be protected by the application of Type II or Type IV fluid in compliance with an approved ground de-icing program.

WARNING: Do not use wing anti-ice as an alternative for ground de-icing/anti-icing. Close inspection is still needed to ensure that no frost, snow or ice is adhering to the wing, leading edge devices, stabilizer, control surfaces or other critical aircraft components at takeoff.

CAUTION: Do not use wing anti-ice when OAT is above 10°C.

When wing anti-ice is needed:

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

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

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

When wing anti-ice is no longer needed:

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

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

Before Taxi Procedure

Do the normal Before Taxi Procedure with the following modifications:

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

Normally, the generator drives will stabilize within 1 minute, although due to cold oil, up to 5 minutes can be needed to produce steady power.

If there is snow and ice accumulation on the wing, consider delaying the flight control check until after de-icing/anti-icing is accomplished.

Flight controls. . . . . Check C

An increase in control forces can be expected at low temperatures.

CAUTION: The flap position indicator and the leading edge devices annunciator panel should be closely observed for positive movement. If the flaps should stop, the flap lever should be placed immediately in the same position as indicated.

Flaps . . . . Check F/O

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

If taxi route is through ice, snow, slush, or standing water in low temperatures or if precipitation is falling with temperatures below freezing, taxi out with the flaps up. Taxiing with the flaps extended subjects the flaps and flap drives to contamination. Leading edge devices are also susceptible to slush accumulations.

Call "FLAP ____" as needed C

Flap lever . . . . Set flaps, as needed F/O

Taxi Out

CAUTION: Taxi at a reduced speed. Use smaller nose wheel steering wheel and rudder inputs and apply minimum thrust smoothly. Differential thrust may be used to help maintain aircraft momentum during turns. At all other times, apply thrust evenly. Taxiing on slippery taxiways or runways at excessive speed or with high crosswinds may start a skid.

CAUTION: When operating the engines over significant amounts of standing de-icing or anti-icing fluid, limit thrust to the minimum required. Excessive ingestion of de-icing or anti-icing fluid can cause the fluid to build up on the engine compressor blades resulting in compressor stalls and engine surges.

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

Check that the area behind the aircraft is clear C

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

Note: Fan blade ice build up is cumulative. If the fan spinner and fan blades were not de-iced prior to taxi out, the time the engines were operating during the taxi in should be included in the 30 minute interval.

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

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

De-Icing / Anti-Icing

Testing of undiluted de-icing/anti-icing fluids has shown that some of the fluid remains on the wing during takeoff rotation and initial climb. The residual fluid causes a 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

odours to enter the aircraft. 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 "FLAP UP" C

Flaps . . . . UP F/O

Prevents ice and slush from accumulating in flap cavities during de-icing.

Thrust levers . . . . Idle C

Reduces the possibility of injury to personnel at inlet or exhaust areas.

WARNING: Ensure that the stabilizer trim wheel handles are stowed before using electric trim to avoid personal injury.

Stabilizer trim . . . . ____ UNITS C

Set the trim for takeoff.

Verify that the trim is in the green band.

If the engines are running:

FLT/GRD switch . . . . GRD F/O

Reduces possible pressure changes when the Engine BLEED air switches are turned OFF.

Engine BLEED air switches . . . . .OFF F/O

Reduces the possibility of fumes entering the air conditioning system.

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

Reduces the possibility of fumes entering the air conditioning system.

After de-icing/anti-icing is completed:

APU . . . . .As needed F/O

CAUTION: After de-icing, the use of APU bleed air during takeoff can cause smoke in the aircraft.

APU BLEED air switch .As needed F/O

Wait approximately 1 minute after de-icing is completed to turn engine BLEED air switches on to ensure all de-icing fluid has been cleared from the engines:

Engine BLEED air switches . . . . ON F/O

If the engines are running:

FLT/GRD switch. . . . . FLT F/O

Flight controls . . . . Check, as needed C

An increase in control forces can be expected at low temperatures.

Before Takeoff Procedure

Do the normal Before Takeoff Procedure with the following modifications:

Call "FLAP ____" . . . . as needed for takeoff PF

Flap lever . . . . Set takeoff flaps, as needed PM

Extend the flaps to the takeoff setting at this time if they have been held because of slush, or standing water, or icing conditions, or because of exterior de-icing/anti-icing.

Verify that the LE FLAPS EXT green light is illuminated.

Takeoff Procedure

Do the normal Takeoff Procedure with the following modification:

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

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

Engine Anti-Ice Operation - In Flight

Engine anti-ice must be ON during all flight operations when icing conditions exist or are anticipated, except during climb and cruise when the temperature is below -40°C SAT. Engine anti-ice must be ON before, and during descent in all icing conditions, including temperatures below -40°C SAT.

When operating in areas of possible icing, activate engine anti-ice before entering icing conditions.

WARNING: Do not rely on airframe visual icing cues before activating engine anti-ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow

excessive ingestion of ice and result in engine damage or failure.

CAUTION: Do not use engine anti-ice when TAT is above 10°C.

When engine anti-ice is needed:

ENGINE START switches . . . . CONT PM

ENGINE ANTI-ICE switches . . . . ON PM

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

Verify that the COWL ANTI-ICE lights are extinguished.

Note: If the COWL VALVE OPEN lights remain illuminated bright with engines at IDLE, increase thrust slightly (up to a minimum of 30% N1).

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE switches . . . . OFF PM

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

ENGINE START switches . . . . OFF PM

Fan Ice Removal

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

Prolonged operation in moderate to severe icing conditions can lead to fan blade/spinner icing and engine vibration. Severe icing can usually be avoided by a change in altitude and/or airspeed. If flight in moderate to severe icing conditions cannot be avoided, do the following on both engines, one engine at a time:

Note: Engine vibration can reduce to a low level before 80% N1 is reached, however, thrust increase must continue to a minimum of 80% N1 to remove ice from the fan blades.

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

ENGINE START switches (both). . . . . FLT PM

Autothrottle (if engaged) . . . . Disengage PF

Thrust . . . . Increase PF

Increase thrust to a minimum of 80% N1 for approximately 1 second to ensure the fan blades and spinner are clear of ice.

Thrust . . . . Reduce as needed for flight conditions PF

Wait 15 seconds. This allows engine vibration level to stabilize.

If engine vibration is less than 4.0 units after thrust is reduced, repeat the above steps at approximately 15 minute intervals or sooner as needed.

Autothrottle (if needed) . . . . Engage PF

If engine vibration is 4.0 units or greater after thrust is reduced, do the Engine High Vibration non-normal checklist.

Wing Anti-Ice Operation - In Flight

Ice accumulation on the flight deck window frames, windshield centre post, or on the windshield wiper arm may be used as an indication of structural icing conditions and the need to turn on wing anti-ice.

In flight, the wing anti-ice system may be used as a de-icer or as an anti-icer. The primary method is to use it as a de-icer by allowing ice to accumulate before turning wing anti-ice on. This procedure provides the cleanest airfoil surface, the least possible runback ice formation, and the least thrust and fuel penalty. Normally, it is not necessary to shed ice periodically unless extended flight through icing conditions is necessary (holding).

The secondary method is to use wing anti-ice before ice accumulation. Operate the wing anti-ice system as an anti-icer only during extended operations in moderate or severe icing conditions, such as holding.

CAUTION: Do not use wing anti-ice when TAT is above 10°C.

CAUTION: Use of wing anti-ice above approximately FL350 may cause bleed trip off and possible loss of cabin pressure.

Note: Prolonged operation in icing conditions with the leading edge and trailing edge flaps extended is not recommended. Holding in icing conditions with flaps extended is not recommended.

When wing anti-ice is needed

WING ANTI-ICE switch. . . . . ON PM

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

When wing anti-ice is no longer needed:

WING ANTI-ICE switch. . . . . OFF PM

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

Cold Temperature Altitude Corrections

Extremely low temperatures create significant altimeter errors and greater potential for reduced terrain clearance. When the temperature is colder than ISA, true altitude will be lower than indicated altitude. Altimeter errors become significantly larger when the surface temperature approaches -30°C or colder, and also become larger with increasing height above the altimeter reference source.

Apply the altitude correction table when needed:

- Apply corrections to all published minimum departure, en route and approach altitudes, including missed approach altitudes, according to the table below. Advise ATC of the corrections.
- MDA/DA settings should be set at the corrected minimum altitudes for the approach.
- Corrections apply to QNH and QFE operations.

To determine the correction from the Altitude Correction Table:

- subtract the elevation of the altimeter barometric reference setting source (normally the departure or destination airport elevation) from the published minimum altitude to be flown to determine "height above altimeter reference source";
- 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;
- 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 ft or 1800 m, use twice the correction for 3000 ft or 900 m, respectively). The corrected altitude must always be greater than the published minimum altitude.
- do not correct altimeter barometric reference settings.

An altitude correction due to cold temperature is not needed for the following conditions:

- while under ATC radar vectors;
- when maintaining an ATC assigned flight level (FL);
- when the reported airport temperature is above 0°C or if the airport temperature is at or above the minimum published temperature for the procedure being flown.

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

Altitude Correction Table (Heights and Altitudes in Feet)

Airport Temp °C	Height Above Altimeter Reference Source											
	200 feet	300 feet	400 feet	500 feet	600 feet	700 feet	800 feet	900 feet	1000 feet	1500 feet	2000 feet	3000 feet
0°	20	20	30	30	40	40	50	50	60	90	120	170
-10°	20	30	40	50	60	70	80	90	100	150	200	290
-20°	30	50	60	70	90	100	120	130	140	210	280	420
-30°	40	60	80	100	120	140	150	170	190	280	380	570
-40°	50	80	100	120	150	170	190	220	240	360	480	720
-50°	60	90	120	150	180	210	240	270	300	450	590	890

Approach and Landing

If ice formations are observed on the aircraft surfaces, (wings, windshield wipers, window frames, etc.)

VREF . . . . Add 10 knots PF

This ensures manoeuvring capability.

Note: The combined airspeed corrections for ice formations, steady wind and gust should not exceed a maximum of 20 kts.

Note: To prevent increased landing distance due to high airspeed, bleed off airspeed in excess of VREF+5 kts+gust correction when below 200 ft AGL. Maintain the gust correction to touchdown.

After Landing Procedure

CAUTION: Taxi at a reduced speed. Use smaller nose wheel steering wheel and rudder inputs and apply minimum thrust smoothly. Differential thrust may be used to help maintain aircraft momentum during turns. At all other times, apply thrust evenly. Taxiing on slippery taxiways or runways at excessive speed or with high crosswinds may start a skid.

CAUTION: When operating the engines over significant amounts of standing de-icing or anti-icing fluid, limit thrust to the minimum required. Excessive ingestion of de-icing or anti-icing fluid can cause the fluid to build up on the engine

compressor blades resulting in compressor stalls and engine surges.

Do the normal After Landing Procedure with the following modifications:

After prolonged operation in icing conditions with the flaps extended, or when an accumulation of airframe ice is observed, or when operating on a runway or taxiway contaminated with ice, snow, slush, or standing water:

Do not retract the flaps to less than Flap 15 until the flap areas have been checked to be free of contaminants.

Engine anti-ice must be selected ON and remain on during all ground operations when icing conditions exist or are anticipated.

WARNING: Do not rely on airframe visual icing cues before activating engine anti-ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.

CAUTION: Do not use engine anti-ice when OAT is above 10°C.

When engine anti-ice is needed:

ENGINE START switches . . . . CONT F/O

ENGINE ANTI-ICE switches . . . . ON F/O

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

Verify that the COWL ANTI-ICE lights are extinguished.

Note: If the COWL VALVE OPEN lights remain illuminated bright with engines at IDLE, increase thrust slightly (up to a maximum of 30% N1).

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE switches . . . . OFF F/O

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

ENGINE START switches . . . . OFF F/O

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

Check that the area behind the aircraft is clear. C

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

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

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

Shutdown Procedure

Do the following step before starting the normal Shutdown Procedure:

After landing in icing conditions:

WARNING: Ensure that the stabilizer trim wheel handles are stowed before using electric trim to avoid personal injury.

Stabilizer trim . . . . Set 5 units C

Prevents melting snow and ice from running into the tailcone. Excessive water in the tailcone can freeze and lock controls.

Secure Procedure

Do the normal Secure Procedure with the following modifications:

If the aircraft will be attended and warm air circulation throughout the cargo E/E compartments is desired

CAUTION: Do not leave the interior unattended with a pack operating and all doors closed. With the aircraft in this configuration, accidental closure of the main outflow valve can cause unscheduled pressurization of the aircraft.

APU . . . . Start F/O

APU GENERATOR bus switches . . . . ON F/O

One PACK switch . . . . AUTO F/O

ISOLATION VALVE switch . . . . AUTO F/O

Pressurization mode selector . . . . MAN AC F/O

FLT/GRD. . . . . GRD F/O

Outflow valve switch . . . . OPEN F/O

Prevents aircraft pressurization.

Note: The aircraft must be parked into the wind when the outflow valve is full open.

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

If the aircraft will not be attended, or if staying overnight at offline stations or at airports where normal support is not available, the flight crew must arrange for or verify that the following steps are done:

Pressurization mode selector	MAN AC	F/O
Outflow valve	CLOSE	F/O

Position the outflow valve fully closed to inhibit the intake of snow or ice.

Wheel chocks	Verify in place	C or F/O
Parking brake	Released	C

Reduces the possibility of frozen brakes.

Cold weather maintenance procedures for securing the aircraft may be required. These procedures are normally done by Maintenance personnel, and include, but are not limited to:

- protective covers and plugs installed;
- water storage containers drained;
- toilets drained;
- doors and sliding windows closed;
- battery removed. If the battery will be exposed to temperatures below -18°C, the battery should be removed and stored in an area warmer than -18°C, but below 40°C. Subsequent installation of the warm battery ensures the starting capability of the APU.

HOT WEATHER OPERATIONS

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

- If cooling air is available from an outside source, the supply should be plugged in immediately after engine shutdown and should not be removed until just prior to engine start.
- Keep all doors and windows, including cargo doors, closed as much as possible.
- Electronic components which contribute to a high temperature level in the flight deck should be turned off while not needed.
- Open all passenger cabin gasper outlets and close all window shades on the sun-exposed side of the passenger cabin.

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

Brake temperature levels may be reached which can cause the wheel fuse plugs to melt and deflate the tires. Consider the following actions:

- Be aware of brake temperature buildup when operating a series of short flight sectors. The energy absorbed by the brakes from each landing is accumulative.
- Extending the landing gear early during the approach provides additional cooling for tires and brakes.
- In-flight cooling time can be determined from the "Brake Cooling Schedule" in the Performance Inflight section of the QRH.

During flight planning, consider the following:

- High temperatures inflict performance penalties which must be taken into account on the ground before takeoff.
- Alternate takeoff procedures (No Engine Bleed Takeoff, Improved Climb Performance, etc.).

Operation in a Sandy or Dusty Environment

The main hazards of a sandy or dusty environment are erosion (especially of engine fan blades), accumulation of sand or dust on critical surfaces, and blockage. The effects of sand ingestion occur predominantly during takeoff, landing and taxi operations. The adverse effects, however, can occur if the aircraft's flight path was through a cloud of visible sand or dust or the aircraft was parked during a sand or dust storm. Premature engine deterioration can result from sand or dust ingestion, causing increased fuel burn and reduced EGT margins.

CAUTION: After a sandstorm, if all taxiways and runways are not carefully inspected and swept for debris before flight ops are conducted, the risk of engine damage and wear is increased.

Exterior Inspection

Although removal of sand and dust contaminants is primarily a maintenance function, during the exterior inspection, the Captain or F/O should carefully inspect areas where accumulation of sand or dust could change or affect normal system operations.

Do the normal Exterior Inspection with the following additional steps:

Windshield . . . . Check

Verify that the windshield has been cleaned.

Note: Do not use windshield wipers for sand or dust removal. Wash deposits off with water and wipe residue off with a soft cloth.

Surfaces. . . . . Check

Verify that the upper surfaces of the wings and other control surfaces are free of sand.

CAUTION: Particular care should be taken to ensure that the fuselage and all surfaces are clean after a sand storm that occurs with a rain storm.

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

Verify that the left and right ram air inlets are free of sand and dust.

Verify that the cabin pressure outflow valve and both positive pressure relief valves are free of sand and dust.

Leading edge flaps. . . . . Check

Verify that all leading edges are undamaged.

Engine inlets . . . . Check

Verify that the inlet cowling is free of sand and dust.

Verify that the fan is free to rotate and fan blades are undamaged.

Fuel tank vents. . . . . Check

Verify that all vents are free of sand and dust.

Landing gear . . . . Check

Verify that gear struts and doors are free of sand and dust build-up.

Vertical and horizontal stabilizers. . . . . Check

Verify that all leading edges are undamaged.

APU air inlet. . . . . Check

Ensure that the APU inlet door and cooling air inlet are free of sand and dust before APU start.

Preflight Procedure - F/O

Do the normal Preflight Procedure - First Officer with the following modifications:

Note: Minimize the use of air conditioning, other than from a ground air conditioner, as much as possible. If the APU must be used for air conditioning, maintain a temperature as high as possible while still providing a tolerable flight deck and cabin environment.

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

If APU bleed air will be used and the APU is not operating:

APU . . . . .START F/O

Note: Run the APU for one full minute before using it as a bleed air source.

Engine BLEED air switches . . . . OFF F/O

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

Engine Start Procedure

Do the normal Engine Start Procedure with the following modifications:

Note: Use a filtered ground cart for pneumatic air for engine start, if available.

ENGINE START switch. . . . . GRD F/O

Verify that the N2 RPM increases. C, F/O

Motor the engine for the remainder of the starter duty cycle to help remove contaminants. Do not exceed 2 minutes for the entire start cycle.

ENGINE START switch. . . . . OFF F/O

Wait 20 seconds before the second start attempt.

When N2 is below 20%:

ENGINE START switch . . . . GRD F/O

Verify that the N2 RPM increases. C, F/O

Engine start lever. . . . . IDLE C

Before Taxi Procedure

Do the normal Before Taxi Procedure with special emphasis on the following steps:

If bleed air is needed to maintain tolerable flight deck and cabin temperatures, use APU bleed air rather than engine bleed air during the taxi out. Limit APU bleed air use as much as possible to reduce sand and dust ingestion.

If APU bleed air will be used and the APU is not operating:

APU . . . . .START F/O

Note: Run the APU for one full minute before using it as a bleed air source.

Engine BLEED air switches . . . . OFF F/O

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

Flight controls . . . . Check C

Verify that there is no increase in control forces due to sand or dust contaminants.

Taxi Out

Do the following, conditions permitting, to minimize sand and dust ingestion by the engines and to improve visibility during taxi:

- Use all engines during taxi and taxi at low speed. Limit ground speed to 10 kts and maintain thrust below 40% N1 whenever possible to avoid creating engine vortices during ground operations.
- Maintain a greater than normal separation from other aircraft while taxiing and avoid the ingestion of another engine's wake.
- Avoid engine overhang of unprepared surfaces.
- In the event of a crosswind during 180° turns, turn away from the wind, if possible, to minimize sand and dust ingestion.
- Whenever possible, avoid situations that would require the aircraft to be brought to a complete stop.
- Avoid excessive braking. The presence of sand or dust will increase brake wear.

Takeoff

Do the following to minimize sand and dust ingestion by the engines during takeoff:

- Use the maximum fixed derate and/or assumed temperature thrust reduction that meets performance requirements.
- Make an No Engine Bleed Takeoff if operations permit. If cabin and flight deck temperatures can be maintained at a tolerable temperature, consider an Unpressurized Takeoff.
- Before takeoff, allow sand and dust to settle, if conditions allow.
- Do not take off into a sand or dust cloud.
- Use a rolling takeoff. Whenever possible, avoid setting high thrust at low speed.
- When visible sand and dust exist, consider delaying flap retraction until above the dust cloud, if operations permit.

Approach

Do the following, conditions permitting, to minimize sand and dust ingestion:

- Make an No Engine Bleed Landing if operations permit. If cabin and flight deck temperatures can be maintained at a tolerable temperature, consider an Unpressurized Landing.

Landing

Do the following to minimize sand and dust ingestion by the engines during landing:

- Use auto brakes on landing to help minimize the need for reverse thrust.
- Performance permitting, minimize the use of reverse thrust to prevent ingestion of dust and sand and to prevent reduction of visibility. Reverse thrust is most effective at high speed.

After Landing Procedure

Do the normal After Landing Procedure with the following modifications:

If bleed air is needed to maintain tolerable flight deck and cabin temperatures, use APU bleed air rather than engine bleed air during the taxi in. Limit APU bleed air use as much as possible to reduce sand and dust ingestion.

If APU bleed air will be used and the APU is not operating:

APU . . . . .START F/O

Note: Run the APU for one full minute before using it as a bleed air source.

Engine BLEED air switches . . . . OFF F/O

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

Taxi In

Do the following, conditions permitting, to minimize sand and dust ingestion by the engines and to improve visibility during the taxi-in:

- Use all engines and taxi at low speed. Limit ground speed to 10 kts and maintain thrust below 40% N1 whenever possible.
- Maintain a greater than normal separation from other aircraft while taxiing and avoid the ingestion of another engine's wake.
- Avoid engine overhang of unprepared surfaces.
- In the event of a crosswind during 180° turns, turn away from the wind if possible to minimize sand and dust ingestion.
- Whenever possible, avoid situations that would require the aircraft to be brought to a complete stop.
- Avoid excessive braking. The presence of sand or dust will increase brake wear.

Secure Procedure

Do the normal Secure Procedure with the following modifications:

CAUTION: Do not leave the interior unattended with a pack operating and all doors closed. With the main outflow valve closed, an unscheduled pressurization of the aircraft may occur.

PACK switches. . . . . .Verify OFF F/O

Pressurization mode selector. . . . . MAN AC F/O

Outflow VALVE switch ....CLOSE F/O

Position the outflow valve fully closed to inhibit the intake of sand or dust.

Additional procedures for securing the aircraft during sandy or dusty conditions may be needed. These procedures are normally done by Maintenance personnel, and include, but are not limited to:

- engine covers installed, if applicable;
- protective covers and plugs installed (streamers should be used to remind personnel to remove before flight);
- doors and sliding windows closed;
- all compartments closed.

Moderate to Heavy Rain, Hail or Sleet

Flight should be conducted to avoid thunderstorm or hail activity or visible moisture over storm cells. To the maximum extent possible, moderate to heavy rain, hail or sleet should also be avoided.

IF moderate to heavy rain, hail or sleet is encountered or anticipated:

ENGINE START switches . . . . CONT

Autothrottle. . . . . Disengage

Thrust Levers. . . . . .Adjust Slowly

If thrust changes are necessary, move the thrust levers slowly. Avoid changing thrust lever direction until engines have stabilized at a selected setting. Maintain an increased minimum thrust setting.

IAS/MACH . . . . .Use a slower speed

Using a slower speed improves engine tolerance to heavy precipitation intake.

Consider starting the APU (if available).

TURBULENCE

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

Passenger signs . . . . ON

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

Severe Turbulence

Yaw Damper . . . . ON

Auto throttle . . . . .Disengage

AUTOPILOT . . . . CWS

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

Note: If sustained trimming occurs, disengage the autopilot.

ENGINE START switches. . . . . FLT

Thrust . . . . Set

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

Phase of Flight	Airspeed
CLIMB	280 KIAS or .73 Mach
CRUISE	Use FMC recommended thrust settings. If the FMC is inoperative, refer to the Unreliable Airspeed page in the Performance Inflight section of the QRH for approximate N1 settings that maintain near optimum penetration airspeed.
DESCENT	.73 Mach/280/250 KIAS. If severe turbulence is encountered at altitudes below 15000 ft and the aircraft gross weight is less than the maximum landing weight, the aircraft may be slowed to 250 kts in the clean configuration.

Note: If an approach must be made into an area of severe turbulence, delay flap extension as long as possible. The aircraft can withstand higher gust loads in the clean configuration.

WINDSHEAR

Windshear is a change of wind speed and/or direction over a short distance along the flight path. Indications of windshear are listed in the Windshear non-normal manoeuvre in this manual.

Avoidance

The flight crew should search for any clues to the presence of windshear along the intended flight path. Presence of windshear may be indicated by:

- Thunderstorm activity
- Virga (rain that evaporates before reaching the ground)
- Pilot reports
- Low level windshear alerting system (LLWAS) warnings.

Stay clear of thunderstorm cells and heavy precipitation and areas of known windshear. If the presence of windshear is confirmed, delay takeoff or do not continue an approach.

Precautions

If windshear is suspected, be especially alert to any of the danger signals and be prepared for the possibility of an inadvertent encounter. The following precautionary actions are recommended if windshear is suspected:

Takeoff

- Takeoff with full rated takeoff thrust is recommended, unless the use of a fixed derate is required to meet a dispatch performance requirement.
- For optimum takeoff performance, use Flap 5 or 15 unless limited by obstacle clearance and/or climb gradient.
- Use the longest suitable runway provided it is clear of areas of known windshear.
- Consider increasing Vr speed to the performance limited gross weight rotation speed, not to exceed actual gross weight Vr + 20 kts. Set V speeds for the actual gross weight. Rotate at the adjusted (higher) rotation speed. This increased rotation speed results in an increased stall margin and meets takeoff performance requirements. If windshear is encountered at or beyond the actual gross weight Vr, do not attempt to accelerate to the increased Vr but rotate without hesitation.
- Be alert for any airspeed fluctuations during takeoff and initial climb. Such fluctuations may be the first indication of windshear.
- Know the all-engine initial climb pitch attitude. Rotate at the normal rate to this attitude for all non-engine failure takeoffs. Minimize

reductions from the initial climb pitch attitude until terrain and obstruction clearance is assured, unless stick shaker activates.

- Crew coordination and awareness are very important. Develop an awareness of normal values of airspeed, attitude, vertical speed, and airspeed build-up. Closely monitor vertical flight path instruments such as vertical speed and altimeters. The pilot monitoring should be especially aware of vertical flight path instruments and call out any deviations from normal.
- Should airspeed fall below the trim airspeed, unusual control column forces may be required to maintain the desired pitch attitude. If stick shaker is encountered, reduce pitch attitude. Do not exceed the Pitch Limit Indication.

Approach and Landing

- Use Flap 30 for landing.
- Establish a stabilized approach no lower than 1000 ft above the airport to improve windshear recognition capability.
- Use the most suitable runway that avoids the areas of suspected windshear and is compatible with crosswind or tailwind limitations. Use ILS G/S, VNAV path or VASI/PAPI indications to detect flight path deviations and help with timely detection of windshear.
- If the auto throttle 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 kts.
- Avoid large thrust reductions or trim changes in response to sudden airspeed increases as these may be followed by airspeed decreases.
- Cross check flight director commands using vertical flight path instruments.
- Crew coordination and awareness are very important, particularly at night or in marginal weather conditions. Closely monitor the vertical flight path instruments such as vertical speed, altimeters, and glideslope displacement. The pilot monitoring should call out any deviations from normal. Use of the A/P and auto throttle for the approach may provide more monitoring and recognition time.

Recovery

Accomplish the Windshear Escape Manoeuvre found in Non-Normal Manoeuvres section of this manual.

Ice Crystal Icing

At temperatures below freezing near convective weather, the aircraft can encounter visible moisture made up of high concentrations of small ice crystals. Ice crystals can accumulate AFT of the engine fan, in the engine core. Ice shedding can cause engine vibration, engine power loss, and engine damage.

Ice crystal icing (ICI) is difficult to detect because ice crystals do not cause significant weather radar returns. They are often found in high concentrations above and near regions of heavy precipitation. Ice crystals do not stick to cold aircraft surfaces.

Avoid ICI conditions. Flight in clouds containing high concentrations of ice crystals has been associated with engine vibration, engine power loss, and engine damage.

Because these conditions can be difficult to recognize, careful preflight planning is a key component of in-flight situational awareness. When ICI is encountered or suspected, do the QRH Ice Crystal Icing NNC to mitigate the effect on the flight.

Recognize Ice Crystal Icing Weather

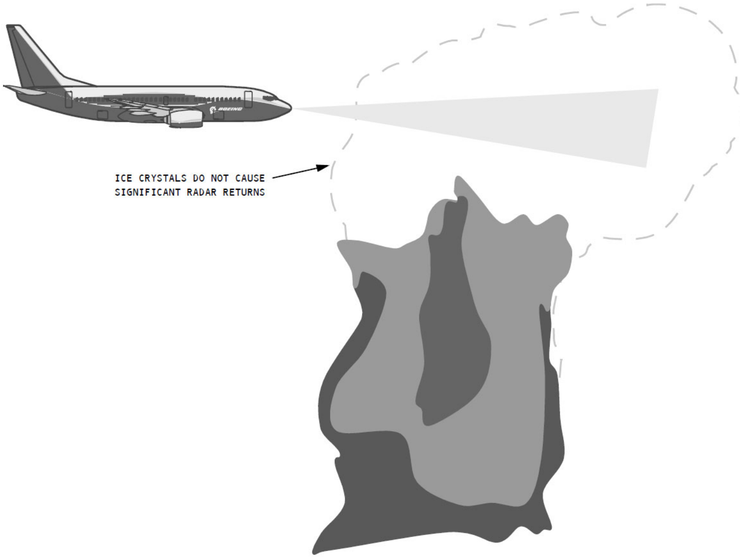
Ice crystals are most frequently found in areas of visible moisture and above altitudes normally associated with icing conditions. Their presence can be indicated by one or more of the following:

- 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).
- Areas of light to moderate turbulence.
- In IMC with:
  - no significant airframe icing and
  - no significant radar returns at aircraft altitude; and
  - heavy precipitation below the aircraft, identified by amber and red radar returns on weather radar.
- Cloud tops above typical cruise levels (above the tropopause).
- Smell of ozone or sulfur.
- Humidity increase.
- Static discharge around the windshield (St. Elmo's fire).

Avoiding Ice Crystal Icing

During flight in IMC, avoid flying directly over significant amber or red radar returns, even if there are no returns at aircraft altitude.

Use the weather radar controls to assess weather radar reflectivity below the aircraft flight path. Refer to weather radar operating instructions for additional information.



Areas with a higher risk of High Ice Water Content (HIWC) are identified by some aviation weather vendors. In these areas, ICI should be suspected while operating in IMC. Use of this of HIWC information is recommended for strategic preflight planning and in-flight adjustments in order to avoid potential ICI conditions.

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.

Chapter PD - Performance Dispatch
Section TOC - Contents: Engine Type

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Chapter PD - Performance Dispatch

737-400 CFM56-3_22.K KG FT FAA

Takeoff

Enroute

Landing

Text

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Chapter PD - Performance Dispatch
Section 10 - Takeoff

Takeoff Field Corrections - Dry Runway

Slope Corrections

FIELD LENGTH AVAILABLE (FT)	SLOPE CORRECTED FIELD LENGTH (FT)								
	RUNWAY SLOPE (%)								
	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
4200	4280	4260	4240	4220	4200	4080	3960	3840	3720
4600	4710	4680	4650	4630	4600	4450	4290	4140	3990
5000	5130	5100	5060	5030	5000	4810	4630	4440	4250
5400	5550	5510	5470	5440	5400	5180	4960	4740	4520
5800	5970	5930	5890	5840	5800	5550	5290	5040	4790
6200	6390	6340	6300	6250	6200	5910	5630	5340	5050
6600	6810	6760	6710	6650	6600	6280	5960	5640	5320
7000	7240	7180	7120	7060	7000	6650	6290	5940	5580
7400	7660	7590	7530	7460	7400	7010	6630	6240	5850
7800	8080	8010	7940	7870	7800	7380	6960	6540	6120
8200	8500	8430	8350	8280	8200	7750	7290	6840	6380
8600	8920	8840	8760	8680	8600	8110	7630	7140	6650
9000	9340	9260	9170	9090	9000	8480	7960	7440	6920
9400	9770	9670	9580	9490	9400	8850	8290	7740	7180
9800	10190	10090	9990	9900	9800	9210	8630	8040	7450
10200	10610	10510	10410	10300	10200	9580	8960	8340	7720
10600	11030	10920	10820	10710	10600	9950	9290	8640	7980
11000	11450	11340	11230	11110	11000	10310	9630	8940	8250
11400	11880	11760	11640	11520	11400	10680	9960	9240	8520
11800	12300	12170	12050	11920	11800	11050	10290	9540	8780

Wind Corrections

SLOPE CORRECTED FIELD LENGTH (FT)	SLOPE & WIND CORRECTED FIELD LENGTH (FT)							
	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
4200	2460	3040	3620	4200	4400	4610	4840	5080
4600	2810	3410	4000	4600	4810	5040	5270	5520
5000	3170	3780	4390	5000	5230	5460	5710	5950
5400	3520	4150	4770	5400	5640	5890	6140	6390
5800	3880	4520	5160	5800	6060	6320	6570	6830
6200	4230	4890	5540	6200	6470	6740	7010	7260
6600	4590	5260	5930	6600	6890	7170	7440	7700
7000	4940	5630	6310	7000	7310	7600	7870	8140
7400	5300	6000	6700	7400	7720	8020	8310	8580
7800	5650	6370	7080	7800	8140	8450	8740	9010
8200	6010	6740	7470	8200	8550	8880	9180	9450
8600	6360	7110	7850	8600	8970	9300	9610	9890
9000	6710	7480	8240	9000	9380	9730	10040	10320
9400	7070	7850	8620	9400	9800	10160	10480	10760
9800	7420	8220	9010	9800	10210	10580	10910	11200
10200	7780	8590	9390	10200	10630	11010	11340	11630
10600	8130	8960	9780	10600	11040	11430	11780	12070
11000	8490	9320	10160	11000	11460	11860	12210	12510
11400	8840	9690	10550	11400	11870	12290	12640	12950
11800	9200	10060	10930	11800	12290	12710	13080	13380

Takeoff Field & Climb Limit Weights - Dry Runway

Flap 5 - Sea Level Pressure Altitude

CORRECTED FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	14	18	22	26	30	32	36	40	50
4600	53.8	50.1	49.0	48.6	48.3	48.0	47.6	47.1	46.1	45.1	42.8
5000	56.2	52.4	51.2	50.8	50.5	50.2	49.8	49.3	48.2	47.2	44.8
5400	58.4	54.5	53.3	52.9	52.6	52.2	51.8	51.3	50.2	49.2	46.7
5800	60.5	56.5	55.2	54.9	54.5	54.2	53.8	53.2	52.1	51.1	48.6
6200	62.6	58.4	57.1	56.8	56.4	56.0	55.6	55.1	53.9	52.9	50.3
6600	64.4	60.2	58.9	58.5	58.2	57.8	57.4	56.8	55.6	54.6	51.9
7000	66.2	61.9	60.6	60.2	59.8	59.4	59.0	58.4	57.2	56.1	53.4
7400	67.8	63.4	62.0	61.6	61.2	60.9	60.4	59.8	58.6	57.5	54.8
7800	69.3	64.9	63.5	63.1	62.7	62.3	61.8	61.2	60.0	58.8	56.0
8200	70.8	66.3	64.8	64.4	64.0	63.6	63.2	62.6	61.3	60.1	57.3
8600	72.3	67.6	66.2	65.8	65.3	64.9	64.5	63.9	62.6	61.4	58.5
9000	73.6	68.9	67.4	67.0	66.6	66.2	65.7	65.1	63.8	62.6	59.6
9400	74.8	70.2	68.7	68.3	67.8	67.4	67.0	66.3	65.0	63.7	60.8
9800	74.8	71.4	69.9	69.5	69.0	68.6	68.1	67.5	66.1	64.9	61.8
10200	74.8	72.6	71.0	70.6	70.1	69.7	69.2	68.6	67.2	65.9	62.9
10600	74.8	73.7	72.1	71.7	71.2	70.8	70.3	69.6	68.2	67.0	63.8
CLIMB LIMIT WT (1000 KG)	64.7	64.3	64.1	64.0	63.9	63.8	63.7	62.6	60.6	58.8	54.5

With engine bleed for packs off, increase field limit weight by 550 kg and climb limit weight by 900 kg.

With engine anti-ice on, decrease field limit weight by 500 kg and climb limit weight by 190 kg.

With engine and wing anti-ice on[a], decrease field limit weight by 500 kg and climb limit weight by 780 kg.

For 42 inch tires, or 40 inch tires with a 42 inch tire wheel well, decrease climb limit weight by 50 kg.

a. Wing anti-ice decrement is only applicable to aeroplanes without the auto wing anti-ice shutoff system.

Takeoff Field & Climb Weights - Dry Runway
Flap 5 - 2000 ft Pressure Altitude

CORRECTED FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	14	18	22	26	30	32	36	40	50
4600	50.9	47.4	46.3	45.9	45.6	45.3	44.4	43.9	43.0	42.0	39.7
5000	53.2	49.5	48.4	48.0	47.7	47.4	46.5	46.0	45.0	44.0	41.6
5400	55.3	51.6	50.4	50.0	49.7	49.4	48.4	47.9	46.9	45.9	43.4
5800	57.4	53.5	52.3	51.9	51.6	51.3	50.3	49.8	48.7	47.7	45.1
6200	59.3	55.4	54.1	53.8	53.4	53.1	52.1	51.5	50.5	49.4	46.8
6600	61.1	57.1	55.8	55.5	55.1	54.8	53.7	53.2	52.1	51.0	48.4
7000	62.8	58.7	57.4	57.0	56.7	56.3	55.3	54.7	53.6	52.5	49.8
7400	64.3	60.1	58.8	58.4	58.1	57.7	56.6	56.1	54.9	53.8	51.0
7800	65.8	61.5	60.2	59.8	59.4	59.0	57.9	57.4	56.2	55.1	52.3
8200	67.3	62.9	61.5	61.1	60.7	60.3	59.2	58.7	57.5	56.3	53.4
8600	68.6	64.2	62.8	62.4	62.0	61.6	60.5	59.9	58.7	57.5	54.6
9000	69.9	65.4	64.0	63.6	63.2	62.8	61.6	61.1	59.8	58.6	55.7
9400	71.2	66.6	65.2	64.8	64.4	64.0	62.8	62.2	61.0	59.7	56.7
9800	72.5	67.8	66.3	65.9	65.5	65.1	63.9	63.3	62.0	60.8	57.7
10200	73.6	68.9	67.4	67.0	66.6	66.1	65.0	64.3	63.1	61.8	58.7
10600	74.7	70.0	68.5	68.0	67.6	67.2	66.0	65.4	64.1	62.8	59.6
CLIMB LIMIT WT (1000 KG)	61.7	61.3	61.1	61.0	60.9	60.8	59.0	58.1	56.3	54.5	50.4

With engine bleed for packs off, increase field limit weight by 550 kg and climb limit weight by 900 kg.

With engine anti-ice on, decrease field limit weight by 500 kg and climb limit weight by 190 kg.

With engine and wing anti-ice on[a], decrease field limit weight by 500 kg and climb limit weight by 780 kg.

For 42 inch tires, or 40 inch tires with a 42 inch tire wheel well, decrease climb limit weight by 50 kg.

a. Wing anti-ice decrement is only applicable to aeroplanes without the auto wing anti-ice shutoff system.

Takeoff Field & Climb Limit Weights - Dry Runway
Flap 5 - 4000 ft Pressure Altitude

CORRECTED FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	14	18	22	26	30	32	36	40	50
4600	48.3	44.9	43.9	43.6	43.3	42.4	41.4	41.0	40.0	39.0	36.4
5000	50.5	47.0	45.9	45.6	45.3	44.4	43.4	42.9	41.9	40.9	38.2
5400	52.5	49.0	47.9	47.6	47.2	46.3	45.3	44.8	43.7	42.7	39.9
5800	54.5	50.9	49.7	49.4	49.0	48.1	47.0	46.5	45.5	44.4	41.5
6200	56.4	52.7	51.5	51.1	50.8	49.8	48.8	48.2	47.1	46.0	43.1
6600	58.1	54.3	53.2	52.8	52.4	51.4	50.4	49.8	48.7	47.6	44.6
7000	59.8	55.9	54.7	54.3	54.0	52.9	51.8	51.3	50.1	49.0	45.9
7400	61.2	57.3	56.0	55.7	55.3	54.2	53.1	52.5	51.4	50.2	47.1
7800	62.6	58.6	57.3	57.0	56.6	55.5	54.4	53.8	52.6	51.4	48.2
8200	64.0	59.9	58.6	58.2	57.8	56.7	55.6	55.0	53.8	52.6	49.3
8600	65.3	61.1	59.8	59.4	59.0	57.9	56.7	56.2	54.9	53.7	50.4
9000	66.6	62.3	61.0	60.6	60.2	59.1	57.9	57.3	56.0	54.8	51.4
9400	67.8	63.5	62.1	61.7	61.3	60.2	59.0	58.3	57.1	55.8	52.4
9800	69.0	64.6	63.2	62.8	62.4	61.2	60.0	59.4	58.1	56.8	53.3
10200	70.1	65.7	64.3	63.9	63.4	62.3	61.0	60.4	59.1	57.8	54.3
10600	71.2	66.7	65.3	64.9	64.4	63.3	62.0	61.3	60.0	58.7	55.2
CLIMB LIMIT WT (1000 KG)	59.2	58.8	58.6	58.5	58.4	56.8	55.1	54.2	52.3	50.6	46.0

With engine bleed for packs off, increase field limit weight by 550 kg and climb limit weight by 900 kg.

With engine anti-ice on, decrease field limit weight by 500 kg and climb limit weight by 190 kg.

With engine and wing anti-ice on[a], decrease field limit weight by 500 kg and climb limit weight by 780 kg.

For 42 inch tires, or 40 inch tires with a 42 inch tire wheel well, decrease climb limit weight by 50 kg.

a. Wing anti-ice decrement is only applicable to aeroplanes without the auto wing anti-ice shutoff system.

Takeoff Field & Climb Limit Weights - Dry Runway
Flap 5 - 6000 ft Pressure Altitude

CORRECTED FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	14	18	22	26	30	32	36	40	50
4600	45.5	42.3	41.2	40.9	40.1	39.2	38.4	37.9	37.0	36.1	33.3
5000	47.6	44.3	43.2	42.9	42.0	41.1	40.2	39.8	38.8	37.9	35.0
5400	49.5	46.2	45.0	44.7	43.8	42.9	42.0	41.5	40.5	39.6	36.7
5800	51.4	48.0	46.8	46.5	45.6	44.6	43.7	43.2	42.2	41.2	38.2
6200	53.2	49.7	48.5	48.2	47.2	46.3	45.3	44.8	43.8	42.8	39.7
6600	54.9	51.3	50.1	49.8	48.8	47.8	46.9	46.4	45.3	44.2	41.1
7000	56.5	52.8	51.6	51.2	50.3	49.3	48.3	47.8	46.7	45.6	42.4
7400	57.9	54.1	52.9	52.5	51.5	50.5	49.5	48.9	47.8	46.7	43.5
7800	59.2	55.4	54.1	53.7	52.7	51.7	50.6	50.1	49.0	47.9	44.5
8200	60.5	56.6	55.3	54.9	53.9	52.9	51.8	51.3	50.1	48.9	45.6
8600	61.8	57.8	56.5	56.1	55.1	54.0	52.9	52.3	51.2	50.0	46.6
9000	63.0	59.0	57.6	57.2	56.2	55.1	54.0	53.4	52.2	51.0	47.5
9400	64.2	60.1	58.7	58.3	57.2	56.1	55.0	54.4	53.2	52.0	48.4
9800	65.3	61.1	59.7	59.3	58.2	57.1	56.0	55.4	54.1	52.9	49.3
10200	66.4	62.1	60.7	60.3	59.2	58.1	56.9	56.3	55.1	53.8	50.2
10600	67.4	63.1	61.7	61.3	60.2	59.0	57.8	57.3	56.0	54.7	51.0
CLIMB LIMIT WT (1000 KG)	56.1	55.8	55.6	55.6	54.0	52.4	50.9	50.1	48.5	46.9	42.2

With engine bleed for packs off, increase field limit weight by 550 kg and climb limit weight by 900 kg.

With engine anti-ice on, decrease field limit weight by 500 kg and climb limit weight by 190 kg.

With engine and wing anti-ice on[a], decrease field limit weight by 500 kg and climb limit weight by 780 kg.

For 42 inch tires, or 40 inch tires with a 42 inch tire wheel well, decrease climb limit weight by 50 kg.

a. Wing anti-ice decrement is only applicable to aeroplanes without the auto wing anti-ice shutoff system.

Takeoff Field & Climb Limit Weights - Dry Runway
Flap 5 - 8000 ft Pressure Altitude

CORRECTED FIELD LENGTH (FT)	FIELD LIMIT WEIGHT (1000 KG)										
	OAT (°C)										
	-40	0	14	18	22	26	30	32	36	40	50
4600	42.6	39.6	38.6	37.8	37.0	36.2	35.3	34.9	34.0	33.0	30.5
5000	44.6	41.5	40.5	39.7	38.8	38.0	37.1	36.6	35.7	34.7	32.1
5400	46.5	43.3	42.2	41.4	40.6	39.7	38.7	38.3	37.3	36.3	33.7
5800	48.3	45.0	43.9	43.1	42.2	41.3	40.3	39.9	38.9	37.9	35.1
6200	50.1	46.7	45.6	44.7	43.8	42.9	41.9	41.4	40.4	39.4	36.6
6600	51.7	48.3	47.1	46.2	45.3	44.4	43.4	42.9	41.8	40.8	37.9
7000	53.2	49.7	48.5	47.6	46.7	45.7	44.7	44.2	43.1	42.1	39.1
7400	54.5	50.9	49.7	48.8	47.8	46.9	45.8	45.3	44.2	43.1	40.1
7800	55.8	52.1	50.9	50.0	49.0	48.0	46.9	46.4	45.3	44.2	41.1
8200	57.0	53.3	52.1	51.1	50.1	49.1	48.0	47.5	46.4	45.2	42.1
8600	58.2	54.4	53.2	52.2	51.2	50.1	49.0	48.5	47.4	46.2	43.0
9000	59.4	55.5	54.2	53.2	52.2	51.2	50.0	49.5	48.3	47.1	43.9
9400	60.5	56.6	55.2	54.2	53.2	52.1	51.0	50.4	49.3	48.0	44.8
9800	61.6	57.6	56.2	55.2	54.2	53.1	51.9	51.4	50.2	48.9	45.6
10200	62.6	58.5	57.2	56.2	55.1	54.0	52.8	52.3	51.0	49.8	46.4
10600	63.6	59.5	58.1	57.1	56.0	54.9	53.7	53.1	51.9	50.6	47.2
CLIMB LIMIT WT (1000 KG)	53.0	52.7	52.5	51.2	49.8	48.3	46.9	46.2	44.6	43.0	38.8

With engine bleed for packs off, increase field limit weight by 550 kg and climb limit weight by 900 kg.

With engine anti-ice on, decrease field limit weight by 500 kg and climb limit weight by 190 kg.

With engine and wing anti-ice on[a], decrease field limit weight by 500 kg and climb limit weight by 780 kg.

For 42 inch tires, or 40 inch tires with a 42 inch tire wheel well, decrease climb limit weight by 50 kg.

a. Wing anti-ice decrement is only applicable to aeroplanes without the auto wing anti-ice shutoff system.

TAKEOFF OBSTACLE LIMIT WEIGHT

Flap 5 - Sea Level 30°C & Below, Zero Wind
Based On Engine Bleed For Packs On and Anti-Ice Off

OBSTACLE HEIGHT (FT)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)											
	DISTANCE FROM BRAKE RELEASE (1000 FT)											
	8	10	12	14	16	18	20	22	24	26	28	30
10	60.3											
50	55.0	60.0	63.5									
100	51.3	56.1	59.6	62.3	64.0							
150	48.5	53.2	56.7	59.5	61.3	63.0	64.3					
200	46.2	50.9	54.4	56.9	59.1	60.9	62.4	63.5	64.5	65.2		
250	44.2	48.9	52.4	55.0	57.2	59.1	60.6	61.9	62.9	63.8	64.6	65.2
300		47.1	50.7	53.2	55.5	57.4	59.0	60.4	61.5	62.5	63.3	64.0
350		45.5	48.9	51.7	54.0	56.0	57.6	59.0	60.2	61.2	62.1	62.9
400		43.6	47.3	50.2	52.6	54.6	56.3	57.7	58.9	60.0	61.0	61.8
450			46.0	48.9	51.3	53.4	55.1	56.5	57.8	58.9	59.9	60.7
500			44.7	47.7	50.1	52.2	53.9	55.4	56.7	57.9	58.8	59.8
550				46.6	49.0	51.1	52.9	54.4	55.7	56.8	57.9	58.8
600				45.5	47.9	50.0	51.9	53.4	54.8	55.9	57.0	57.9
650				44.5	47.0	49.1	50.9	52.5	53.9	55.1	56.1	57.1
700					46.0	48.1	50.0	51.6	53.0	54.2	55.3	56.3
750					45.1	47.3	49.1	50.7	52.1	53.4	54.5	55.5
800					44.3	46.4	48.3	49.9	51.4	52.6	53.8	54.8
850						45.6	47.5	49.1	50.6	51.9	53.0	54.1
900						44.8	46.7	48.4	49.8	51.2	52.3	53.4
950							46.0	47.6	49.1	50.5	51.6	52.7
1000							45.3	47.0	48.5	49.8	51.0	52.1

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

OAT Adjustments

OAT (°C)	REFERENCE OBSTACLE LIMIT WEIGHT (1000 KG)						
	44	48	52	56	60	64	68
30 & Below	0	0	0	0	0	0	0
32	-0.6	-0.7	-0.8	-0.8	-0.9	-1.0	-1.0
34	-1.3	-1.4	-1.5	-1.6	-1.8	-1.9	-2.0
36	-1.9	-2.1	-2.3	-2.5	-2.7	-2.9	-3.1
38	-2.5	-2.8	-3.0	-3.3	-3.6	-3.8	-4.1
40	-3.1	-3.5	-3.8	-4.1	-4.5	-4.8	-5.1
42	-3.7	-4.1	-4.5	-4.9	-5.3	-5.6	-6.0
44	-4.3	-4.7	-5.2	-5.6	-6.1	-6.5	-6.9
46	-4.9	-5.4	-5.9	-6.4	-6.9	-7.4	-7.9
48	-5.4	-6.0	-6.6	-7.1	-7.7	-8.2	-8.8
50	-6.0	-6.6	-7.3	-7.9	-8.5	-9.1	-9.7

Pressure Altitude Adjustments

ALT (FT)	OAT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	44	48	52	56	60	64	68
S.L. & Below	0	0	0	0	0	0	0
1000	-1.6	-1.8	-1.9	-2.1	-2.2	-2.4	-2.5
2000	-3.2	-3.5	-3.8	-4.1	-4.4	-4.7	-5.0
3000	-4.7	-5.1	-5.5	-5.9	-6.3	-6.7	-7.2
4000	-6.1	-6.6	-7.1	-7.7	-8.2	-8.7	-9.3

Takeoff Obstacle Limit Weight
Flap 5 - Wind Adjustments

WIND (KTS)	OAT & ALT ADJUSTED OBSTACLE LIMIT WEIGHT (1000 KG)						
	44	48	52	56	60	64	68
15 TW	-9.4	-8.6	-7.9	-7.1	-6.4	-5.6	-4.8
10 TW	-6.2	-5.7	-5.2	-4.7	-4.2	-3.7	-3.2
5 TW	-3.1	-2.9	-2.6	-2.4	-2.1	-1.9	-1.6
0	0	0	0	0	0	0	0
10 HW	0.7	0.7	0.6	0.5	0.5	0.4	0.3
20 HW	1.5	1.3	1.2	1.0	0.9	0.8	0.6
30 HW	2.2	2.0	1.8	1.6	1.4	1.2	0.9
40 HW	3.0	2.7	2.4	2.1	1.8	1.5	1.3

With engine bleed for packs off, increase weight by 450 kg.

With engine anti-ice on, decrease weight by 1200 kg.

Chapter PD - Performance Dispatch
Section 11 - Enroute

LONG RANGE CRUISE MAXIMUM OPERATING ALTITUDE

Max Cruise Thrust - ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20(33°)	1.25(36°)	1.30(39°)	1.40(44°)	1.50(45°)
68	29500	-7	32800	31900	31000	29400	27900
66	30100	-8	33400	32500	31700	30000	28500
64	30800	-10	34100	33200	32300	30700	29200
62	31500	-11	34700	33800	33000	31400	29900
60	32200	-13	35400	34500	33700	32100	30600
58	32900	-14	36100	35300	34400	32800	31400
56	33700	-16	36900	36000	35200	33600	32100
54	34400	-18	37000	36700	35900	34400	32900
52	35200	-19	37000	37000	36700	35200	33700
50	36100	-21	37000	37000	37000	36000	34500
48	36900	-21	37000	37000	37000	36800	35400
46	37000	-21	37000	37000	37000	37000	36300
44	37000	-21	37000	37000	37000	37000	37000

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)
68	29500	-1	32400*	31900	31000	29400	27900
66	30100	-3	33200*	32500	31700	30000	28500
64	30800	-4	34000*	33200	32300	30700	29200
62	31500	-6	34700	33800	33000	31400	29900
60	32200	-7	35400	34500	33700	32100	30600
58	32900	-9	36100	35300	34400	32800	31400
56	33700	-10	36900	36000	35200	33600	32100
54	34400	-12	37000	36700	35900	34400	32900
52	35200	-14	37000	37000	36700	35200	33700
50	36100	-16	37000	37000	37000	36000	34500
48	36900	-16	37000	37000	37000	36800	35400
46	37000	-16	37000	37000	37000	37000	36300
44	37000	-16	37000	37000	37000	37000	37000

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)
68	29500	4	31500*	31500*	31000	29400	27900
66	30100	3	32400*	32400*	31700	30000	28500
64	30800	1	33300*	33200	32300	30700	29200
62	31500	0	34100*	33800	33000	31400	29900
60	32200	-2	35000*	34500	33700	32100	30600
58	32900	-3	35900*	35300	34400	32800	31400
56	33700	-5	36600*	36000	35200	33600	32100
54	34400	-7	37000	36700	35900	34400	32900
52	35200	-8	37000	37000	36700	35200	33700
50	36100	-10	37000	37000	37000	36000	34500
48	36900	-10	37000	37000	37000	36800	35400
46	37000	-10	37000	37000	37000	37000	36300
44	37000	-10	37000	37000	37000	37000	37000

*** Denotes altitude thrust limited in level flight, 100 fpm residual rate of climb.**

LONG RANGE CRUISE TRIP FUEL AND TIME

Ground to Air Miles Conversion

AIR DISTANCE (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
273	254	238	223	211	200	190	181	173	166	160
535	501	471	445	421	400	381	364	348	334	322
797	748	704	666	631	600	573	548	525	503	484
1058	995	938	887	841	800	764	731	700	672	646
1319	1241	1170	1107	1051	1000	955	914	875	840	808
1579	1486	1402	1328	1261	1200	1146	1097	1051	1009	971
1839	1732	1634	1548	1471	1400	1338	1280	1226	1177	1133
2099	1977	1866	1768	1681	1600	1529	1462	1401	1346	1295
2359	2223	2099	1989	1890	1800	1720	1645	1577	1514	1457
2619	2469	2332	2210	2100	2000	1911	1829	1753	1683	1620
2880	2715	2564	2431	2310	2200	2103	2012	1929	1852	1783
3141	2961	2797	2651	2520	2400	2294	2196	2105	2021	1946
3402	3207	3029	2872	2730	2600	2485	2379	2281	2191	2109
3663	3453	3262	3092	2940	2800	2677	2562	2457	2360	2272
3924	3700	3495	3313	3150	3000	2868	2746	2633	2529	2435
4185	3946	3728	3534	3360	3200	3059	2929	2809	2698	2598
4446	4192	3960	3755	3570	3400	3251	3112	2984	2867	2760

Reference Fuel and Time Required

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	29		31		33		35		37	
	FUEL (1000	TIME (HR:MI	FUEL (1000	TIME (HR:MI	FUEL (1000	TIME (HR:MI	FUEL (1000	TIME (HR:MI	FUEL (1000	TIME (HR:MI
200	1.5	0:38	1.5	0:38	1.5	0:38	1.5	0:38	1.5	0:38
400	2.6	1:06	2.6	1:06	2.5	1:05	2.5	1:06	2.5	1:06
600	3.7	1:35	3.6	1:34	3.5	1:33	3.5	1:34	3.4	1:34
800	4.8	2:03	4.7	2:01	4.6	2:01	4.5	2:02	4.4	2:02
1000	5.9	2:31	5.8	2:29	5.6	2:29	5.5	2:30	5.5	2:30
1200	7.1	2:59	6.9	2:57	6.7	2:57	6.6	2:58	6.5	2:58
1400	8.2	3:26	8.0	3:24	7.8	3:24	7.6	3:26	7.5	3:26
1600	9.4	3:54	9.1	3:52	8.9	3:52	8.7	3:54	8.6	3:55
1800	10.6	4:21	10.2	4:20	10.0	4:20	9.8	4:22	9.7	4:23
2000	11.7	4:49	11.4	4:47	11.1	4:48	10.9	4:50	10.8	4:51
2200	13.0	5:16	12.6	5:15	12.3	5:15	12.0	5:18	12.0	5:19
2400	14.2	5:44	13.8	5:42	13.4	5:43	13.2	5:46	13.2	5:47
2600	15.4	6:11	15.0	6:10	14.6	6:11	14.4	6:14		
2800	16.7	6:38	16.2	6:37	15.8	6:39	15.6	6:42		
3000	17.9	7:06	17.4	7:05	17.0	7:06	16.8	7:10		
3200	19.2	7:33	18.7	7:32	18.3	7:34	18.1	7:38		
3400	20.5	8:00	20.0	8:00	19.5	8:02	19.4	8:06		

Long Range Cruise Trip Fuel and Time
Fuel Required Adjustments (1000 kg)

REFERENCE FUEL REQUIRED (1000 KG)	LANDING WEIGHT (1000 KG)						
	30	35	40	45	50	55	60
2	0.0	0.1	0.1	0.0	0.1	0.2	0.4
4	-0.5	-0.3	-0.1	0.0	0.2	0.5	0.7
6	-1.0	-0.6	-0.3	0.0	0.3	0.7	1.1
8	-1.3	-0.9	-0.4	0.0	0.6	1.3	2.3
10	-1.7	-1.1	-0.6	0.0	0.9	2.0	3.5
12	-2.0	-1.3	-0.7	0.0	1.1	2.6	4.7
14	-2.3	-1.6	-0.8	0.0	1.4	3.2	5.9
16	-2.7	-1.8	-0.9	0.0	1.7	3.8	7.1
18	-3.0	-2.1	-1.0	0.0	1.9	4.4	8.3
20	-3.4	-2.3	-1.2	0.0	2.2	5.1	9.5
22	-3.7	-2.5	-1.3	0.0	2.5	5.7	10.7

Based on 280/.74 climb, Long Range Cruise and 74/250 descent.

Long Range Cruise Step Climb

Ground to Air Miles Conversion

Air Distance (NM)					GROUND DISTANCE (NM)	AIR DISTANCE (NM)				
HEADWIND COMPONENT (KTS)						TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
813	759	712	670	633	600	570	543	519	496	476
1074	1005	944	891	843	800	761	726	694	664	637
1335	1251	1177	1111	1053	1000	952	909	869	833	800
1596	1497	1410	1332	1263	1200	1143	1092	1045	1001	962
1856	1743	1642	1553	1472	1400	1334	1275	1220	1170	1124
2117	1989	1875	1773	1682	1600	1525	1458	1395	1338	1286
2378	2234	2107	1994	1892	1800	1717	1641	1571	1507	1448
2638	2480	2340	2214	2102	2000	1908	1824	1746	1676	1610
2899	2726	2572	2435	2311	2200	2099	2007	1922	1844	1773
3159	2971	2804	2655	2521	2400	2290	2190	2098	2013	1935
3419	3217	3037	2876	2731	2600	2481	2373	2273	2182	2097
3679	3462	3269	3096	2941	2800	2672	2556	2449	2351	2260
3939	3707	3501	3316	3150	3000	2863	2739	2624	2519	2422
4199	3952	3733	3537	3360	3200	3055	2922	2800	2688	2585
4459	4198	3965	3757	3570	3400	3246	3105	2976	2857	2747

Trip Fuel and Time Required

AIR DIST (NM)	TRIP FUEL (1000 KG)							TIME (HRS:MIN)
	LANDING WEIGHT (1000 KG)							
	30	35	40	45	50	55	60	
600	2.8	3.0	3.2	3.4	3.7	4.0	4.3	1:34
800	3.6	3.8	4.1	4.4	4.8	5.2	5.6	2:02
1000	4.4	4.7	5.0	5.5	6.0	6.4	6.9	2:30
1200	5.2	5.6	6.0	6.5	7.1	7.7	8.3	2:59
1400	6.0	6.4	6.9	7.5	8.3	8.9	9.7	3:27
1600	6.8	7.3	7.9	8.6	9.4	10.2	11.1	3:55
1800	7.6	8.2	8.9	9.7	10.6	11.5	12.5	4:22
2000	8.5	9.1	9.9	10.8	11.9	12.9	13.9	4:50
2200	9.3	10.1	10.9	12.0	13.1	14.2	15.4	5:18
2400	10.2	11.0	12.0	13.1	14.4	15.6	16.9	5:46
2600	11.1	12.0	13.0	14.3	15.7	17.1	18.5	6:14
2800	12.0	12.9	14.1	15.5	17.0	18.5	20.0	6:42
3000	12.9	13.9	15.2	16.7	18.3	20.0	21.6	7:09
3200	13.8	14.9	16.3	18.0	19.7	21.5	23.2	7:37
3400	14.7	16.0	17.5	19.2	21.1	23.0	24.9	8:05

Based on 280/.74 climb, Long Range Cruise and 74/250 descent.

Valid for all pressure altitudes with 4000 ft step climb to 2000 ft above optimum altitude.

SHORT TRIP FUEL AND TIME

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
90	78	68	61	55	50	46	42	39	37	35
158	141	128	117	108	100	93	87	82	77	73
224	204	187	173	161	150	141	132	125	119	113
290	266	246	228	213	200	188	178	169	160	153
356	328	304	284	266	250	236	223	212	202	193
420	389	362	339	318	300	284	269	256	244	233
485	450	420	394	371	350	332	315	300	286	274
549	511	478	449	423	400	379	361	344	329	315
615	573	536	504	475	450	427	406	388	371	355
681	635	595	559	528	500	475	452	431	412	395

Trip Fuel and Time Required

AIR DIST (NM)		LANDING WEIGHT (1000 KG)						TIME (HRS:MIN)
		35	40	45	50	55	60	
50	FUEL (1000 KG) ALT (FT)	0.6 13000	0.6 11000	0.6 11000	0.7 11000	0.7 11000	0.7 9000	0:13
100	FUEL (1000 KG) ALT (FT)	0.9 23000	0.9 23000	1.0 21000	1.0 21000	1.1 19000	1.1 19000	0:22
150	FUEL (1000 KG) ALT (FT)	1.1 35000	1.2 31000	1.2 29000	1.3 27000	1.4 25000	1.5 25000	0:30
200	FUEL (1000 KG) ALT (FT)	1.3 37000	1.4 37000	1.5 35000	1.6 35000	1.7 33000	1.8 31000	0:37
250	FUEL (1000 KG) ALT (FT)	1.5 37000	1.6 37000	1.7 37000	1.8 35000	2.0 35000	2.1 33000	0:45
300	FUEL (1000 KG) ALT (FT)	1.7 37000	1.8 37000	2.0 37000	2.1 35000	2.2 35000	2.4 33000	0:51
350	FUEL (1000 KG) ALT (FT)	1.9 37000	2.1 37000	2.2 37000	2.4 35000	2.5 35000	2.7 33000	0:58
400	FUEL (1000 KG) ALT (FT)	2.1 37000	2.3 37000	2.4 37000	2.6 35000	2.8 35000	3.0 33000	1:05
450	FUEL (1000 KG) ALT (FT)	2.3 37000	2.5 37000	2.7 37000	2.9 35000	3.1 35000	3.3 33000	1:12
500	FUEL (1000 KG) ALT (FT)	2.5 37000	2.7 37000	2.9 37000	3.2 35000	3.4 35000	3.7 33000	1:20

Based on 280/.74 climb, Long Range Cruise and .74/250 descent.

HOLDING PLANNING

Flaps Up

WEIGHT (1000 KG)	TOTAL FUEL FLOW (KG/HR)								
	PRESSURE ALTITUDE (FT)								
	1500	5000	10000	15000	20000	25000	30000	35000	37000
68	3070	3040	3000	2960	2930	2920	2940		
66	2990	2950	2910	2880	2840	2840	2840		
64	2910	2870	2830	2790	2760	2750	2750		
62	2830	2780	2750	2710	2670	2670	2660		
60	2750	2700	2660	2620	2590	2580	2570		
58	2670	2620	2580	2540	2500	2500	2480		
56	2590	2540	2500	2460	2420	2410	2390	2420	
54	2510	2460	2420	2370	2340	2330	2310	2320	
52	2430	2380	2340	2290	2260	2240	2220	2230	
50	2360	2300	2260	2210	2180	2160	2130	2140	2160
48	2290	2220	2180	2130	2100	2080	2050	2050	2070
46	2210	2150	2100	2050	2010	2000	1970	1960	1980
44	2140	2080	2030	1970	1930	1920	1890	1880	1890
42	2080	2020	1970	1920	1870	1840	1800	1800	1810
40	2030	1970	1920	1860	1810	1780	1740	1730	1730

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

Crew Oxygen Requirements

Required Pressure (PSI) for 39 Cubic Foot Cylinder

BOTTLE TEMPERATURE		NUMBER OF CREW USING OXYGEN	
°C	°F	2	3
50	122	1335	1950
45	113	1315	1915
40	104	1290	1885
35	95	1270	1855
30	86	1250	1825
25	77	1230	1795
20	68	1210	1765
15	59	1190	1735
10	50	1170	1705
5	41	1150	1675
0	32	1130	1645
-5	23	1110	1615
-10	14	1090	1585

Required Pressure (PSI) for 76 Cubic Foot Cylinder

BOTTLE TEMPERATURE		NUMBER OF CREW USING OXYGEN		
°C	°F	2	3	4
50	122	735	1050	1370
45	113	725	1035	1345
40	104	715	1020	1325
35	95	700	1005	1300
30	86	690	990	1280
25	77	680	970	1260
20	68	670	955	1240
15	59	655	940	1220
10	50	645	920	1200
5	41	635	905	1175
0	32	620	890	1155
-5	23	610	875	1130
-10	14	600	860	1110

Required Pressure (PSI) for 114 Cubic Foot Cylinder

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

ENGINE INOP
MAX CONTINUOUS THRUST

Net Level Off Weight

PRESSURE ALTITUDE (1000 FT)	LEVEL OFF WEIGHT (1000 KG)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
30	34.4	33.7	32.7
28	37.0	36.1	35.0
26	39.7	38.6	37.5
24	42.5	41.3	40.1
22	45.3	43.9	42.7
20	48.2	46.7	45.4
18	51.1	49.6	48.1
16	54.0	52.2	50.5
14	57.1	55.2	53.3
12	60.2	58.1	56.0
10	63.4	61.1	58.8
8	66.7	64.2	61.5

Bleed Adjustments

BLEED CONFIGURATION	WEIGHT ADJUSTMENT (KG)
ENGINE A/I ON	-2050
ENGINE AND WING A/I ON	-7250
ENGINE BLEED TO PACKS OFF (BELOW 17000 FT)	+2500

Chapter PD - Performance Dispatch
Section 12 - Landing

Landing Field Limit Weight - Dry Runway

Flap 40
Anti-skid Operative and Automatic Speedbrakes Category "A" Brakes
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
3000			2780	3000	3230	3440	3640	3820
3400	2700	2910	3140	3400	3630	3860	4070	4270
3800	3000	3230	3500	3800	4040	4270	4490	4710
4200	3300	3560	3860	4200	4440	4680	4920	5150
4600	3600	3880	4220	4600	4850	5100	5350	5590
5000	3910	4210	4570	5000	5250	5510	5770	6030
5400	4210	4540	4930	5400	5660	5930	6200	6480
5800	4510	4860	5290	5800	6070	6340	6620	6920
6200	4810	5190	5650	6200	6470	6750	7050	7360
6600	5120	5510	6010	6600	6880	7170	7480	7800
7000	5420	5840	6370	7000	7280	7580	7900	8240
7400	5720	6170	6730	7400	7690	8000	8330	8680
7800	6030	6490	7080	7800	8090	8410	8750	9130
8200	6330	6820	7440	8200	8500	8820	9180	9570
8600	6630	7140	7800	8600	8900	9240	9610	10010
9000	6930	7470	8160	9000	9310	9650	10030	10450
9400	7240	7800	8520	9400	9710	10060	10460	10890
9800	7540	8120	8880	9800	10120	10480	10880	11330
10200	7840	8450	9230	10200	10520	10890	11310	
10600	8140	8770	9590	10600	10930	11310		

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
3400	35.6	33.6			
3800	41.2	38.9	36.8	34.6	32.4
4200	46.8	44.2	41.8	39.4	36.9
4600	52.4	49.5	46.9	44.3	41.5
5000	55.9	54.0	51.9	49.1	46.1
5400	59.1	57.1	55.3	53.4	50.7
5800	62.2	60.1	58.2	56.2	54.2
6200	65.1	63.0	61.0	58.9	56.8
6600	67.9	65.5	63.4	61.3	59.2
7000		67.9	65.6	63.4	61.3
7400			67.7	65.4	63.4
7800			69.8	67.4	65.1
8200				69.3	66.8
8600					68.6

Decrease field limit weight by 8050 kg when using manual speedbrakes.

Landing Field Limit Weight - Dry Runway
Flap 40
Anti-Skid Operative and Automatic Speedbrakes
Category "B" Brakes
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
3000			2760	3000	3140	3350	3530	3730
3400		2840	3120	3400	3560	3780	3980	4200
3800	2880	3180	3490	3800	3980	4220	4430	4660
4200	3190	3510	3850	4200	4390	4650	4880	5130
4600	3500	3850	4220	4600	4810	5080	5330	5590
5000	3810	4180	4580	5000	5230	5510	5780	6060
5400	4130	4520	4950	5400	5650	5940	6220	6520
5800	4440	4860	5310	5800	6070	6380	6670	6990
6200	4750	5190	5680	6200	6490	6810	7120	7450
6600	5060	5530	6040	6600	6910	7240	7570	7920
7000	5380	5870	6410	7000	7330	7670	8020	8380
7400	5690	6200	6770	7400	7750	8100	8470	8850
7800	6000	6540	7130	7800	8170	8540	8920	9310
8200	6310	6880	7500	8200	8590	8970	9360	9780
8600	6630	7210	7860	8600	9010	9400	9810	10240
9000	6940	7550	8230	9000	9430	9830	10260	10710
9400	7250	7880	8590	9400	9850	10260	10710	11170
9800	7570	8220	8960	9800	10260	10700	11160	11640
10200	7880	8560	9320	10200	10680	11130	11610	12100
10600	8190	8890	9690	10600	11100	11560	12060	

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
3000	31.0				
3400	36.6	34.6	32.7	30.8	
3800	42.2	40.0	37.8	35.6	33.6
4200	47.8	45.3	42.8	40.4	38.2
4600	53.2	50.6	47.9	45.3	42.7
5000	57.5	55.6	52.9	50.1	47.3
5400	60.7	58.8	56.9	54.5	51.7
5800	63.6	61.5	59.5	57.6	55.6
6200	66.3	64.1	62.0	59.9	57.9
6600	68.8	66.5	64.3	62.1	60.1
7000	71.1	68.8	66.5	64.3	62.1
7400	73.5	71.1	68.6	66.4	64.0
7800		73.4	70.7	68.3	66.0
8200			72.7	70.1	67.7
8600				72.0	69.4
9000				73.8	71.1
9400					72.8

Decrease field limit weight by 8200 kg when using manual speedbrakes.

Landing Field Limit Weight - Dry Runway
Flap 40
Anti-Skid Inoperative and Manual Speedbrakes Category "A" OR "B" Brakes
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
5000				5000	5380	5750	6130	6600
5400			4620	5400	5790	6170	6560	7040
5800			5020	5800	6200	6590	6980	7480
6200		4810	5410	6200	6600	7010	7420	7920
6600	4610	5180	5810	6600	7010	7430	7850	8360
7000	4980	5560	6200	7000	7420	7850	8280	8800
7400	5350	5940	6590	7400	7830	8270	8710	9240
7800	5720	6310	6990	7800	8240	8690	9140	9680
8200	6080	6690	7380	8200	8640	9110	9570	10120
8600	6450	7070	7780	8600	9050	9530	10000	10560
9000	6820	7440	8170	9000	9460	9950	10430	11000
9400	7190	7820	8570	9400	9870	10370	10860	11440
9800	7550	8200	8960	9800	10280	10790	11290	11880
10200	7920	8570	9350	10200	10680	11210	11710	12320
10600	8290	8950	9750	10600	11090	11630	12150	12760
11000	8660	9330	10140	11000	11500	12050	12580	13200
11400	9030	9700	10540	11400	11910	12470	13010	13640
11800	9390	10080	10930	11800	12320	12890	13440	14080
12200	9760	10460	11330	12200	12720	13310	13860	14520
12600	10130	10830	11720	12600	13130	13730	14300	14960

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
5800	34.0	32.2			
6200	37.3	35.3	33.3		
6600	40.6	38.5	36.3	34.2	32.6
7000	43.9	41.6	39.2	37.0	35.2
7400	47.2	44.7	42.2	39.8	37.8
7800	50.5	47.8	45.2	42.6	40.4
8200	53.9	50.9	48.1	45.4	42.9
8600	57.2	54.1	51.1	48.2	45.5
9000	60.6	57.3	54.1	51.0	48.1
9400	64.0	60.5	57.1	53.9	50.7
9800	67.6	63.8	60.2	56.7	53.4
10200		67.1	63.2	59.6	56.1
10600			66.3	62.5	58.8
11000			69.4	65.5	61.5
11400				68.5	64.3
11800					67.2

Landing Field Limit Weight - Wet Runway

Flap 40
Anti-skid Operative and Automatic Speedbrakes
Category "A" Brakes
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
3000				3000	3260	3490	3710	3900
3400			3160	3400	3660	3910	4130	4340
3800	3020	3250	3510	3800	4070	4320	4560	4780
4200	3320	3580	3870	4200	4470	4730	4990	5230
4600	3620	3900	4230	4600	4880	5150	5410	5670
5000	3930	4230	4590	5000	5280	5560	5840	6110
5400	4230	4560	4950	5400	5690	5980	6260	6550
5800	4530	4880	5310	5800	6090	6390	6690	6990
6200	4830	5210	5660	6200	6500	6800	7120	7440
6600	5140	5530	6020	6600	6900	7220	7540	7880
7000	5440	5860	6380	7000	7310	7630	7970	8320
7400	5740	6190	6740	7400	7710	8050	8390	8760
7800	6040	6510	7100	7800	8120	8460	8820	9200
8200	6350	6840	7460	8200	8520	8870	9250	9640
8600	6650	7160	7810	8600	8930	9290	9670	10090
9000	6950	7490	8170	9000	9340	9700	10100	10530
9400	7250	7820	8530	9400	9740	10120	10520	10970
9800	7560	8140	8890	9800	10150	10530	10950	11410
10200	7860	8470	9250	10200	10550	10940	11380	11850
10600	8160	8790	9610	10600	10960	11360	11800	12290

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
3800	34.3	32.3			
4200	39.2	36.9	34.9	32.9	
4600	44.0	41.5	39.3	37.0	34.7
5000	48.9	46.1	43.7	41.2	38.6
5400	53.3	50.7	48.1	45.4	42.6
5800	56.3	54.3	52.3	49.6	46.6
6200	59.0	57.1	55.2	53.3	50.6
6600	61.7	59.7	57.7	55.8	53.8
7000	64.3	62.2	60.2	58.2	56.1
7400	66.8	64.5	62.4	60.4	58.2
7800	69.1	66.6	64.4	62.3	60.2
8200		68.7	66.3	64.0	62.0
8600			68.1	65.8	63.7
9000			69.9	67.5	65.2
9400				69.2	66.7
9800					68.3
10200					69.8

Decrease field limit weight by 8050 kg when using manual speedbrakes.

Landing Field Limit Weight - Wet Runway
Flap 40
Anti-skid Operative and Automatic Speedbrakes
Category "B" Brakes
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
3000				3000	3140	3370	3560	3770
3400			3130	3400	3560	3800	4010	4230
3800		3170	3490	3800	3970	4230	4460	4700
4200	3180	3510	3860	4200	4390	4660	4910	5160
4600	3490	3850	4220	4600	4810	5100	5350	5630
5000	3800	4180	4590	5000	5230	5530	5800	6090
5400	4110	4520	4950	5400	5650	5960	6250	6560
5800	4430	4850	5320	5800	6070	6390	6700	7020
6200	4740	5190	5680	6200	6490	6820	7150	7490
6600	5050	5530	6040	6600	6910	7260	7600	7950
7000	5360	5860	6410	7000	7330	7690	8040	8420
7400	5680	6200	6770	7400	7750	8120	8490	8890
7800	5990	6540	7140	7800	8170	8550	8940	9350
8200	6300	6870	7500	8200	8590	8980	9390	9820
8600	6610	7210	7870	8600	9010	9420	9840	10280
9000	6930	7550	8230	9000	9420	9850	10290	10750
9400	7240	7880	8600	9400	9840	10280	10740	11210
9800	7550	8220	8960	9800	10260	10710	11180	11680
10200	7860	8550	9330	10200	10680	11140	11630	12140
10600	8180	8890	9690	10600	11100	11580	12080	12610

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
3400	30.4				
3800	35.3	33.3	31.5		
4200	40.2	38.0	35.9	33.9	31.9
4600	45.0	42.6	40.3	38.0	35.9
5000	49.9	47.3	44.7	42.2	39.9
5400	54.5	51.8	49.1	46.4	43.8
5800	57.9	56.0	53.4	50.6	47.8
6200	60.7	58.7	56.8	54.5	51.6
6600	63.2	61.1	59.1	57.2	55.1
7000	65.6	63.4	61.3	59.2	57.2
7400	67.8	65.5	63.3	61.2	59.1
7800	69.8	67.6	65.3	63.1	61.0
8200	71.9	69.6	67.2	65.0	62.8
8600	73.9	71.5	69.0	66.7	64.4
9000		73.5	70.8	68.4	66.1
9400			72.6	70.0	67.6
9800				71.6	69.1
10200				73.2	70.6
10600					72.1
11000					73.5

Field Limit Weight (1000 KG)

Decrease field limit weight by 8200 kg when using manual speedbrakes.

Landing Field Limit Weight - Wet Runway
Flap 40
Anti-skid Inoperative and Manual Speedbrakes
Category "A" OR "B" Brakes
Wind Corrected Field Length (FT)

FIELD LENGTH AVAILABLE (FT)	WIND COMPONENT (KTS)							
	-15	-10	-5	0	10	20	30	40
5000					5420	5820	6240	6770
5400				5400	5830	6240	6670	7200
5800				5800	6240	6660	7100	7650
6200			5310	6200	6650	7090	7530	8080
6600			5700	6600	7050	7500	7960	8520
7000		5400	6090	7000	7460	7920	8390	8970
7400		5780	6490	7400	7870	8340	8820	9400
7800	5500	6160	6880	7800	8280	8770	9250	9840
8200	5860	6530	7280	8200	8690	9180	9680	10290
8600	6230	6910	7670	8600	9090	9600	10110	10720
9000	6600	7290	8070	9000	9500	10020	10540	11160
9400	6970	7660	8460	9400	9910	10440	10970	11610
9800	7340	8040	8860	9800	10320	10870	11400	12050
10200	7700	8420	9250	10200	10730	11290	11830	12490
10600	8070	8790	9640	10600	11130	11700	12260	12930
11000	8440	9170	10040	11000	11540	12130	12690	13370
11400	8810	9550	10430	11400	11950	12550	13120	13810
11800	9170	9920	10830	11800	12360	12960	13550	14240
12200	9540	10300	11220	12200	12770	13390	13980	14690
12600	9910	10680	11620	12600	13170	13800	14410	15130

Field Limit Weight (1000 KG)

WIND CORRECTED FIELD LENGTH (FT)	AIRPORT PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
6600	33.5				
7000	36.3	34.5	32.5		
7400	39.2	37.2	35.0	33.1	
7800	42.1	39.9	37.6	35.5	33.8
8200	45.0	42.6	40.2	38.0	36.0
8600	47.9	45.3	42.8	40.4	38.3
9000	50.8	48.0	45.3	42.8	40.5
9400	53.7	50.7	47.9	45.3	42.8
9800	56.6	53.5	50.5	47.7	45.0
10200	59.5	56.3	53.1	50.1	47.3
10600	62.4	59.1	55.7	52.6	49.5
11000	65.5	61.8	58.4	55.1	51.8
11400	68.6	64.7	61.0	57.6	54.1
11800		67.6	63.7	60.1	56.5
12200			66.4	62.6	58.8
12600			69.1	65.2	61.2
13000				67.8	63.6
13400					66.1

Field Limit Weight (1000 KG)

13800					68.6

LANDING CLIMB LIMIT WEIGHT

Valid For Approach With Flap 15 and Landing With Flap 40
Based On Engine Bleed For Packs On and Anti-Ice Off

AIRPORT OAT (°C)	LANDING CLIMB LIMIT WEIGHT (1000 KG)					
	AIRPORT PRESSURE ALTITUDE (FT)					
	-1000	0	2000	4000	6000	8000
54	54.9	53.7				
52	55.8	54.6				
50	56.7	55.4	51.3			
48	57.5	56.3	52.2			
46	58.4	57.2	53.0	48.8		
44	59.3	58.0	53.8	49.7		
42	60.1	58.9	54.6	50.6	47.2	
40	60.9	59.7	55.5	51.5	47.9	
38	61.9	60.5	56.3	52.4	48.7	44.8
36	62.9	61.5	57.2	53.3	49.5	45.6
34	64.0	62.5	58.1	54.2	50.3	46.4
32	65.1	63.6	58.9	55.1	51.1	47.2
30	65.2	64.6	59.9	56.0	51.9	47.9
28	65.2	64.7	60.8	56.9	52.7	48.6
26	65.3	64.7	61.7	57.7	53.4	49.4
24	65.3	64.8	61.7	58.6	54.2	50.1
22	65.4	64.9	61.8	59.3	55.0	50.8
20	65.5	64.9	61.9	59.4	55.8	51.5
18	65.5	65.0	61.9	59.4	56.6	52.2
16	65.6	65.0	62.0	59.5	56.6	53.0
14	65.6	65.1	62.0	59.5	56.7	53.6
12	65.7	65.1	62.1	59.6	56.7	53.7
10	65.7	65.2	62.1	59.6	56.8	53.7
-40	66.3	65.8	62.7	60.2	57.3	54.2

With engine bleed for packs off, increase weight by 1250 kg. With engine anti-ice on, decrease weight by 550 kg.

With engine and wing anti-ice on, decrease weight by 5250 kg.

When operating in icing conditions during any part of the flight with forecast landing temperature below 8°C, decrease weight by 4830 kg.

ENGINE INOP
ADVISORY INFORMATION
GO-AROUND THRUST

GO-AROUND CLIMB GRADIENT

Flap 15
Based on engine bleed for packs on and anti-ice off Reference Go-Around Gradient (%)

OAT (°C)	PRESSURE ALTITUDE (FT)				
	0	2000	4000	6000	8000
50	2.69	1.68	0.54		
46	3.13	2.05	1.10	0.10	
42	3.56	2.47	1.44	0.59	
38	3.97	2.90	1.90	0.97	0.00
34	4.47	3.34	2.36	1.37	0.40
30	4.98	3.80	2.82	1.77	0.77
26	5.01	4.25	3.25	2.15	1.13
22	5.04	4.27	3.65	2.54	1.48
18	5.07	4.30	3.68	2.92	1.83
14	5.10	4.32	3.70	2.94	2.17
10	5.11	4.34	3.72	2.96	2.19

Gradient Adjustment for Weight (%)

WEIGHT (1000 KG)	REFERENCE GO-AROUND GRADIENT (%)					
	0	1	2	3	4	5
65	-2.46	-2.73	-2.98	-3.22	-3.46	-3.73
60	-1.84	-2.03	-2.21	-2.38	-2.55	-2.74
55	-1.01	-1.12	-1.22	-1.32	-1.40	-1.51
50	0	0	0	0	0	0
45	1.20	1.32	1.45	1.58	1.73	1.85
40	2.74	3.01	3.30	3.61	3.92	4.20
35	4.81	5.28	5.77	6.28	6.81	7.34

Gradient Adjustment for Speed (%)

SPEED (KIAS)	WEIGHT ADJUSTED GO-AROUND GRADIENT (%)					
	0	1	2	3	4	5
VREF	-0.46	-0.48	-0.50	-0.51	-0.53	-0.54
VREF+5	0.00	0.00	0.00	0.00	0.00	0.00
VREF+10	0.26	0.27	0.27	0.28	0.29	0.30
VREF+20	0.60	0.59	0.60	0.60	0.61	0.62
VREF+30	0.76	0.73	0.70	0.67	0.64	0.61

With engine bleed for packs off, increase gradient by 0.3%. With engine anti-ice on, decrease gradient by 0.1%.

With engine and wing anti-ice on, decrease gradient by 1.2%.

Decrease gradient by 0.8% for ice accumulation when operating in icing conditions during any part of the flight with forecast landing temperatures below 8°C.

Quick Turnaround Limit Weight

Flap 40
Category "A" Brakes

AIRPORT OAT (°C)	LIMIT WEIGHT (1000 KG)					
	AIRPORT PRESSURE ALTITUDE (FT)					
	-1000	0	2000	4000	6000	8000
54	55.2	54.4				
50	55.6	54.7	52.9			
45	56.1	55.2	53.3	51.4		
40	56.6	55.7	53.7	51.8	49.9	
35	57.2	56.1	54.2	52.2	50.3	48.5
30	57.7	56.6	54.6	52.6	50.7	48.9
25	58.2	57.1	55.0	53.1	51.1	49.3
20	58.7	57.6	55.5	53.5	51.6	49.7
15	59.3	58.1	56.1	54.0	52.1	50.1
10	59.8	58.7	56.6	54.5	52.5	50.6
5	60.4	59.3	57.2	55.1	53.0	51.0
0	61.0	59.9	57.8	55.6	53.5	51.5
-5	61.7	60.5	58.3	56.2	54.0	52.0
-10	62.3	61.1	58.9	56.8	54.6	52.5
-15	63.0	61.8	59.5	57.3	55.2	53.0
-20	63.7	62.4	60.1	57.8	55.8	53.6
-30	65.1	63.8	61.4	59.1	56.9	54.7
-40	66.6	65.3	62.8	60.3	58.2	56.0
-50	68.4	67.0	64.5	62.0	59.6	57.4
-54	69.0	67.7	65.2	62.7	60.2	57.9

Increase weight by 550 kg per 1% uphill slope. Decrease weight by 1200 kg per 1% downhill slope.

Increase weight by 1400 kg per 10 kts headwind. Decrease weight by 7700 kg per 10 kts tailwind.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 53 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

Quick Turnaround Limit Weight
Flap 40
Category "B" Brakes

AIRPORT OAT (°C)	LIMIT WEIGHT (1000 KG)					
	AIRPORT PRESSURE ALTITUDE (FT)					
	-1000	0	2000	4000	6000	8000
54	61.1	59.9				
50	61.4	60.3	58.1			
45	62.0	60.8	58.6	56.5		
40	62.5	61.4	59.1	56.9	54.8	
35	63.1	61.9	59.6	57.4	55.3	53.2
30	63.6	62.5	60.1	57.9	55.8	53.7
25	64.2	63.0	60.7	58.4	56.3	54.1
20	64.8	63.6	61.2	58.9	56.8	54.6
15	65.4	64.2	61.8	59.5	57.3	55.1
10	66.1	64.8	62.4	60.1	57.8	55.6
5	66.7	65.5	63.0	60.6	58.4	56.1
0	67.4	66.1	63.6	61.2	58.9	56.7
-5	68.1	66.8	64.3	61.9	59.5	57.2
-10	68.8	67.5	65.0	62.5	60.1	57.8
-15	69.5	68.2	65.7	63.2	60.7	58.4
-20	70.3	69.0	66.4	63.9	61.4	59.0
-30	71.5	70.3	67.8	65.3	62.7	60.3
-40	70.7	70.3	69.4	66.8	64.2	61.6
-50	70.3	70.3	70.3	68.3	65.7	63.1
-54	70.3	70.3	70.3	69.0	66.3	63.7

Increase weight by 600 kg per 1% uphill slope. Decrease weight by 1100 kg per 1% downhill slope.

Increase weight by 1500 kg per 10 kts headwind. Decrease weight by 6850 kg per 10 kts tailwind.

After landing at weights exceeding those shown above, adjusted for slope and wind, wait at least 53 minutes and check that wheel thermal plugs have not melted before executing a takeoff.

Chapter PD - Performance Dispatch
Section 13 - Text

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 maximum takeoff thrust. The range of conditions covered is limited to those normally encountered in airline operation. In the event of conflict between the data presented in this chapter and that contained in the approved AFM, the AFM shall always take precedence.

TAKEOFF

The maximum allowable takeoff weight will be the least of the Field, Climb and Obstacle Limit Weights as determined from the tables shown. Tire and Brake Energy Limits are not shown as they are not limiting for the range of conditions shown in this chapter.

Field Limit Weight - Slope and Wind Corrections

These tables 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 conditions, and show both Field and Climb Limit Weights. Enter the appropriate table for pressure altitude and runway condition with "Slope and Wind Corrected Field Length" determined above and airport OAT to obtain Field Limit Weight. Also read Climb Limit Weight for the same OAT. Intermediate altitudes may be interpolated or use next higher altitude.

Obstacle Limit Weight

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

En Route

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 manoeuvre capability. Note that this table considers both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 100 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 15° may cause the aircraft to lose speed and/or altitude.

The altitudes shown in the table are limited to the maximum certified altitude of 37000 ft.

Long Range Cruise Trip Fuel and Time

Long Range Cruise Trip Fuel and Time tables are provided to determine trip time and fuel required to destination. 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 en route wind to an equivalent still air distance for use with the Reference Fuel and Time tables. Next, enter the Reference Fuel and Time table with air distance from the Ground to Air Miles Conversion table and the desired altitude and read Reference Fuel and Time Required. Lastly, enter the Fuel Required Adjustment table with the Reference Fuel and the planned landing weight to obtain the adjustment to the fuel required at the planned landing weight.

Long Range Cruise Step Climb Trip Fuel and Time

The Long Range Cruise Step Climb Trip Fuel and Time tables are provided to determine trip time and fuel required to destination when flying a step climb profile. Step climb profiles are based on 4000 ft step climbs to keep the flight within 2000 ft of the optimum altitude for the current cruise weight. To determine trip fuel and time, enter the Ground to Air Miles Conversion table and determine air distance as discussed above. Then enter the Trip Fuel and Time Required table with air distance and planned landing weight to read trip fuel. Continue across the table to read trip time.

Short Trip Fuel and Time

These tables are provided to determine trip fuel and time for short distances or alternates. Obtain air distance from the upper table using the ground distance and wind component to the alternate. Enter the 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

This table provides total fuel flow information necessary for planning flaps up holding and reserve fuel requirements. Data is based on the FMC holding speed schedule which is the higher of the maximum endurance and flaps up manoeuvre speeds. As noted, the fuel flow is based on flight in a racetrack holding pattern. For holding in straight and level flight, reduce table values by 5%.

Flight Crew Oxygen Requirements

Regulations require that sufficient oxygen be provided to the flight crew to account for the greater of supplemental breathing oxygen in the event of a cabin depressurization or protective breathing in the event of smoke or harmful fumes in the flight deck. The oxygen quantity associated with the above requirements is achieved with the minimum dispatch oxygen cylinder pressure.

To determine the minimum dispatch oxygen cylinder pressure, enter the appropriate flight crew oxygen table with the number of crew plus observers using oxygen and read the minimum cylinder pressure required for the appropriate cylinder temperature.

Net Level Off Weight

The Net Level Off Weight table is provided to determine terrain clearance capability in straight and level flight following an engine failure. Regulations require terrain clearance planning based on net performance which is the gross (or actual) gradient performance degraded by 1.1%. In addition, the net level off pressure altitude must clear the terrain by 1000 ft.

To determine the maximum weight for terrain clearance, enter the table with required net level off pressure altitude and expected ISA deviation to obtain weight. Adjust weight for anti-ice operation as noted below the table.

LANDING

Tables are provided for determining the maximum landing weight as limited by field length or climb requirements for a single landing flap.

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

Landing Field Limit Weight

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

Landing Climb Limit Weight

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

Go-Around Climb Gradient

Enter the Reference Go-Around Gradient table with airport OAT and pressure altitude to determine the reference go-around gradient. Then adjust the reference gradient for aircraft weight and speed using the tables provided to determine the weight and speed adjusted go-around gradient. Apply the necessary corrections for engine bleed configuration and icing conditions as noted.

Quick Turnaround Limit Weight

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

If the landing weight exceeds the maximum quick turnaround weight, wait the specified time and then check that the wheel thermal plugs have not melted before executing a subsequent takeoff.

Chapter PI - Performance Inflight
Section TOC - Contents: Engine Type

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Chapter PI - Performance Inflight

737-400 CFM56-3_22.K KG FT FAA EI

General

All Engines

Advisory Information

Engine Inoperative

PMC Off

Gear Down

Text

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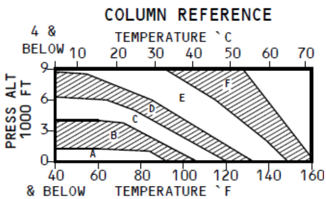
Chapter PI - Performance Inflight
Section 10 - General

Takeoff Speeds

Flap 5



SLOPE/WIND V1 ADJUSTMENT[a]						
WEIGHT 1000 KG	SLOPE %			WIND KTS		
	DN		UP	TAIL		HEAD
	-2	0	2	-15	0	40
70	-3	0	4	-3	0	1
60	-2	0	2	-3	0	1
50	-2	0	1	-4	0	1
40	-2	0	1	-4	0	1

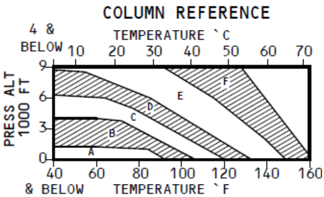
WT 1000 KG	A			B			C		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
70	158	163	168	158	164	169			
65	151	155	161	152	156	162	153	157	162
60	144	148	155	145	148	155	146	149	155
55	137	139	149	138	140	149	138	141	148
50	129	131	142	130	132	142	131	133	142
45	121	123	136	122	124	135	122	125	135
40	113	114	130	113	116	129	113	116	128

WT 1000 KG	D			E			F		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
70									
65									
60									
55	140	143	148						
50	132	134	141	133	135	141			
45	124	126	135	125	127	134	128	128	134
40	115	117	128	116	118	127	119	120	126

IN BOXED AREA, CHECK MINIMUM V1 (MCG) FOR ACTUAL TEMP.

Takeoff Speeds

Flap 15



SLOPE/WIND V_1 ADJUSTMENT[a]						
WEIGHT 1000 KG	SLOPE %			WIND KTS		
	DN		UP	TAIL		HEAD
	-2	0	2	-15	0	40
70	-3	0	4	-3	0	1
60	-2	0	2	-3	0	1
50	-2	0	1	-4	0	1

WT 1000 KG	A			B			C		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
70	150	152	158						
65	143	145	152	145	146	151			
60	137	139	146	138	140	146	139	140	146
55	130	131	141	131	132	140	131	133	140
50	122	124	135	123	125	134	124	125	134
45	114	116	128	116	117	128	116	118	128
40	106	107	122	108	109	122	108	110	122

WT 1000 KG	D			E			F		
	V1	VR	V2	V1	VR	V2	V1	VR	V2
70									
65									
60									
55	134	134	140						
50	126	126	134	127	128	133			
45	118	119	127	120	120	126	120	121	127
40	109	111	121	111	112	120	112	113	120

IN BOXED AREA, CHECK MINIMUM V1 (MCG) FOR ACTUAL TEMP.

V1(MCG)

ACTUAL OAT		PRESS ALT FT					
`C	`F	-1000	0	2000	4000	6000	8000
55	131	106	104				
50	122	109	107	103			
40	104	113	111	107	103	99	94
30	86	117	116	111	107	104	98
20	68	117	116	113	111	107	102
10	50	118	116	113	111	108	104
-50	-58	119	118	115	112	109	105

FOR A/C OFF INCREASE V1 (MCG) BY 2 KTS.

Maximum Allowable Clearway

FIELD LENGTH (FT)	MAX. ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	400
6000	500
8000	550
10000	600
12000	700
14000	750

Clearway and Stopway V1 Adjustments

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)			
	100	120	140	160
800			-3	-2
600		-3	-2	-1
400	-4	-3	-2	-1
200	-2	-1	-1	0
0	0	0	0	0
-400	1	1	1	1
-800	1	1	1	1

Stab Trim Setting

Max Takeoff Thrust
Flap 5

C.G. % MAC	6	10	14	18	22	26	30
STAB TRIM	5 1/2	5	4 1/2	3 3/4	3 1/4	2 3/4	2 1/4

For weights at or below 45360 kg, subtract 1/2 unit from above value.
For weights at or above 61235 kg add 1/2 unit from above value.

Flap 15

C.G. % MAC	6	10	14	18	22	26	30
STAB TRIM	5	4 1/4	3 3/4	3	2 1/2	1 3/4	1

For weights at or below 45360 kg subtract 1/2 unit from above value.
For weights at or above 61235 kg add 1/2 unit from above value.

VREF

WEIGHT (1000 KG)	FLAPS		
	40	30	15
70	155	159	177
65	149	154	171
60	143	147	164
55	137	141	156
50	130	134	149
45	124	127	141
40	116	119	132
35	109	111	123

RECOMMENDED MANOEUVRING SPEEDS

FLAP POSITION	MANEUVER SPEED (KIAS)		
	WEIGHT		
	AT OR BELOW 53070 KG	ABOVE 53070 KG AND AT OR BELOW 62823 KG	ABOVE 62823 KG
UP	210	220	230
1	190	200	210
5	170/*180	180/ *190	190/ *200
10	160/ *170	170/ *180	180/ *190
15	150	160	170
25	140	150	160
30	VREF 30		
40	VREF 40		

*** Manoeuvring speeds for aircraft without the Rudder System Enhancement Program (RSEP) installed.**

ADVISORY INFORMATION

Slush / Standing Water Takeoff

Maximum Reverse Thrust
Weight Adjustment (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3mm (0.12 INCHES)			6mm (0.25 INCHES)			13mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
68	-7.6	-8.1	-8.6	-9.5	-9.9	-9.7	-13.8	-13.7	-12.3
64	-7.2	-7.8	-8.1	-8.7	-9.5	-9.7	-12.3	-13.2	-13.1
60	-6.6	-7.4	-7.9	-7.9	-8.8	-9.5	-10.9	-12.5	-13.1
56	-6.0	-6.8	-7.5	-7.1	-8.1	-9.0	-9.5	-11.4	-12.7
52	-5.3	-6.2	-7.0	-6.2	-7.3	-8.5	-8.1	-10.1	-11.8
48	-4.6	-5.4	-6.3	-5.3	-6.4	-7.5	-6.8	-8.6	-10.4
44	-3.8	-4.5	-5.2	-4.3	-5.2	-6.3	-5.4	-6.8	-8.6
40	-3.0	-3.6	-4.2	-3.4	-4.1	-4.8	-4.2	-5.0	-6.8
36	-2.0	-2.4	-2.7	-2.2	-2.6	-3.1	-3.0	-3.2	-5.0

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	3mm (0.12 INCHES)			6mm (0.25 INCHES)			13mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
4600							32.1		
5000	30.2			33.0			38.3	32.1	
5400	37.0	29.2		40.0	32.4		44.7	37.2	31.5
5800	43.6	34.8	28.7	46.7	37.9	31.5	50.9	42.3	35.8
6200	49.9	40.4	33.2	52.9	43.3	36.2	56.4	47.4	40.0
6600	56.7	45.8	37.7	59.3	48.7	40.8	62.0	52.3	44.4
7000	63.2	51.4	42.1	66.3	54.3	45.2	67.6	57.3	48.9
7400	70.2	56.9	46.8	73.3	59.9	49.9	73.1	62.1	53.3
7800		62.5	51.8		65.3	54.7		66.9	57.9
8200		68.7	56.6		71.4	59.5		71.8	62.5
8600		75.0	61.6			64.6			67.0
9000			66.7			69.4			71.6
9400			71.7			74.1			

1. **Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -130 ft/+120 ft for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for temperature adjusted field length and pressure altitude.**
4. **Maximum 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								
	3mm (0.12 INCHES)			6mm (0.25 INCHES)			13mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
68	-11	-10	-8	-6	-5	-5	0	0	-2
64	-13	-11	-9	-7	-6	-6	0	0	-1
60	-15	-13	-11	-9	-7	-6	0	0	-1
56	-17	-15	-12	-11	-9	-7	0	0	0
52	-18	-16	-14	-14	-11	-8	-1	0	0
48	-20	-18	-15	-16	-13	-9	-5	0	0
44	-21	-20	-17	-18	-15	-11	-10	-3	0
40	-22	-20	-18	-19	-17	-13	-14	-7	0
36	-22	-21	-19	-20	-18	-15	-15	-11	-3

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).**

No Reverse Thrust
Weight Adjustment (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3mm (0.12 INCHES)			6mm (0.25 INCHES)			13mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
72	-9.7	-10.7	-11.5	-11.8	-13.1	-13.4	-16.8	-17.7	-16.3
68	-9.0	-10.0	-11.0	-10.6	-12.2	-13.1	-15.0	-16.9	-16.6
64	-8.3	-9.3	-10.3	-9.6	-11.2	-12.5	-13.3	-15.7	-16.5
60	-7.6	-8.6	-9.6	-8.6	-10.1	-11.7	-11.5	-14.2	-16.2
56	-6.8	-7.8	-8.8	-7.6	-8.9	-10.6	-9.8	-12.4	-15.4
52	-6.1	-6.9	-7.9	-6.7	-7.8	-9.4	-8.2	-10.6	-14.4
48	-5.2	-6.0	-6.9	-5.7	-6.6	-8.0	-6.7	-8.6	-12.9
44	-4.4	-5.0	-5.8	-4.8	-5.4	-6.5	-5.4	-6.6	-11.0
40	-3.5	-4.0	-4.6	-3.7	-4.3	-5.0	-4.2	-4.8	-8.7

ADVISORY INFORMATION

Slush/Standing Water Takeoff
No Reverse Thrust
V1 (MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	3mm (0.12 INCHES)			6mm (0.25 INCHES)			13mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
6000							34.8		
6500				33.2			42.1	35.1	
7000	33.9			40.4	32.6		49.4	41.4	35.1
7500	41.3	32.0		48.2	38.9	32.1	56.9	47.3	39.8
8000	49.4	38.6	30.6	56.4	45.5	37.6	64.5	53.2	44.9
8500	58.0	45.3	36.3	65.1	52.4	43.3	72.5	59.4	50.4
9000	67.0	52.5	42.1	74.1	59.7	49.2		66.6	56.1
9500	76.1	60.0	48.2		67.2	55.3		75.1	62.0
10000		67.8	54.5		74.9	61.7			67.8
10500		75.8	61.2			68.1			73.5
11000			67.9						
11500			74.7						

1. **Enter Weight Adjustment table with slush/standing water depth and dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -160 ft/+150 ft for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for temperature adjusted field length and pressure altitude.**
4. **Maximum allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	3mm (0.12 INCHES)			6mm (0.25 INCHES)			13mm (0.50 INCHES)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
68	-20	-14	-12	-10	-3	-3	0	0	0
64	-22	-18	-14	-14	-7	-5	0	0	0
60	-25	-21	-17	-17	-11	-7	0	0	0
56	-27	-24	-20	-21	-15	-10	-2	0	0
52	-29	-27	-22	-24	-19	-12	-7	0	0
48	-31	-28	-24	-27	-22	-15	-14	-3	0
44	-32	-30	-27	-29	-25	-19	-21	-10	0
40	-32	-31	-28	-30	-27	-23	-25	-17	-3
36	-32	-30	-28	-30	-28	-25	-26	-22	-7

1. **Obtain V1, VR and V2 for the actual weight using the Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment Table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

ADVISORY INFORMATION

SLIPPERY RUNWAY TAKEOFF

Maximum Reverse Thrust
Weight Adjustment (1000 KG)

DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
68	-0.5	-0.5	-0.5	-4.4	-4.4	-4.4	-7.1	-7.1	-7.1
64	-0.7	-0.7	-0.7	-4.2	-4.2	-4.2	-7.0	-7.0	-7.0
60	-1.0	-1.0	-1.0	-4.1	-4.1	-4.1	-6.7	-6.7	-6.7
56	-1.1	-1.1	-1.1	-4.1	-4.1	-4.1	-6.4	-6.4	-6.4
52	-1.3	-1.3	-1.3	-4.1	-4.1	-4.1	-6.0	-6.0	-6.0
48	-1.3	-1.3	-1.3	-3.9	-3.9	-3.9	-5.4	-5.4	-5.4
44	-1.1	-1.1	-1.1	-3.5	-3.5	-3.5	-4.7	-4.7	-4.7
40	-0.8	-0.8	-0.8	-2.9	-2.9	-2.9	-3.9	-3.9	-3.9
36	-0.5	-0.5	-0.5	-1.9	-1.9	-1.9	-2.8	-2.8	-2.8

V1 (MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
3800	31.6								
4200	42.1								
4600	52.6	36.8							
5000	62.9	47.3	31.6	33.2					
5400	73.2	57.8	42.1	40.9	29.4				
5800		68.0	52.6	48.5	37.1				
6200			62.9	56.3	44.7	33.2	31.4		
6600			73.2	64.4	52.3	40.9	36.1		
7000				72.5	60.3	48.5	40.9	29.1	
7400					68.4	56.3	45.9	33.8	
7800						64.4	51.1	38.5	
8200						72.5	56.6	43.3	31.4
8600							62.3	48.5	36.1
9000							68.2	53.8	40.9
9400							74.3	59.4	45.9
9800								65.3	51.1
10200								71.3	56.6
10600									62.3
11000									68.2
11400									74.3

1. **Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Adjust "Good" field length available by -100 ft/+90 ft for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -100 ft/+90 ft for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -140 ft/+130 ft for every 5°C above/below 4°C.
3. **Find V1(MCG) limit weight for temperature adjusted field length and pressure altitude.**
4. **Maximum allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff Maximum Reverse Thrust V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
68	-4	-2	0	-12	-10	-8	-29	-25	-21
64	-5	-3	-1	-15	-13	-11	-32	-28	-24
60	-7	-5	-3	-17	-15	-13	-34	-30	-26
56	-8	-6	-4	-19	-17	-15	-37	-33	-29
52	-10	-8	-6	-21	-19	-17	-38	-34	-30
48	-11	-9	-7	-23	-21	-19	-40	-36	-32
44	-12	-10	-8	-24	-22	-20	-41	-37	-33
40	-13	-11	-9	-25	-23	-21	-42	-38	-34
36	-14	-12	-10	-27	-25	-23	-42	-38	-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).**

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
72	-0.9	-0.9	-0.9	-5.8	-5.8	-5.8	-9.4	-9.4	-9.4
68	-1.3	-1.3	-1.3	-5.8	-5.8	-5.8	-9.0	-9.0	-9.0
64	-1.6	-1.6	-1.6	-5.7	-5.7	-5.7	-8.6	-8.6	-8.6
60	-1.8	-1.8	-1.8	-5.6	-5.6	-5.6	-8.1	-8.1	-8.1
56	-1.8	-1.8	-1.8	-5.3	-5.3	-5.3	-7.5	-7.5	-7.5
52	-1.8	-1.8	-1.8	-4.9	-4.9	-4.9	-6.8	-6.8	-6.8
48	-1.7	-1.7	-1.7	-4.4	-4.4	-4.4	-6.0	-6.0	-6.0
44	-1.5	-1.5	-1.5	-3.9	-3.9	-3.9	-5.2	-5.2	-5.2
40	-1.1	-1.1	-1.1	-3.1	-3.1	-3.1	-4.1	-4.1	-4.1
36	-0.7	-0.7	-0.7	-2.3	-2.3	-2.3	-3.0	-3.0	-3.0

V1 (MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
4400	32.2								
4800	44.2	27.3							
5200	56.1	39.4							
5600	67.7	51.4	34.6						
6000	79.1	63.1	46.6						
6400		74.5	58.5	33.2					
6800			70.0	42.1	29.6				
7200				51.5	38.4				
7600				61.3	47.6	35.0			
8000				71.2	57.2	43.9			
8400					67.1	53.4			
8800					77.1	63.2			
9200						73.2	31.6		
9600							37.0		
10000							42.5		
10400							48.5	35.9	
10800							54.9	41.4	
11200							61.7	47.3	34.8
11600							68.9	53.6	40.3
12000								60.3	46.1
12400								67.4	52.3
12800								74.8	58.9
13200									66.0
13600									73.3

1. **Enter Weight Adjustment table with reported braking action and dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
1. **Adjust "Good" field length available by -100 ft/+100 ft for every 5°C above/below 4°C.**
   Adjust "Medium" field length available by -100 ft/+100 ft for every 5°C above/below 4°C.
   Adjust "Poor" field length available by -180 ft/+130 ft for every 5°C above/below 4°C
2. **Find V1(MCG) limit weight for temperature adjusted field length and pressure altitude.**
3. **Maximum allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff
No Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
68	-6	-3	0	-19	-16	-13	-38	-31	-24
64	-8	-5	-2	-21	-18	-15	-42	-35	-28
60	-10	-7	-4	-24	-21	-18	-45	-38	-31
56	-12	-9	-6	-27	-24	-21	-49	-42	-35
52	-14	-11	-8	-30	-27	-24	-52	-45	-38
48	-15	-12	-9	-32	-29	-26	-54	-47	-40
44	-17	-14	-11	-34	-31	-28	-56	-49	-42
40	-18	-15	-12	-36	-33	-30	-57	-50	-43
36	-19	-16	-13	-37	-34	-31	-58	-51	-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).**

TAKEOFF %N1

Based On Engine Bleed To Packs On (Auto) and Anti-Ice On or Off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)									
°C	°F	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000
55	131	93.2	93.8	93.8	93.8						
50	122	93.8	94.3	94.3	94.3	93.9	93.6				
45	113	94.2	94.7	94.7	94.6	94.6	94.6	94.7	94.4	94.2	
40	104	94.6	95.2	95.2	95.1	95.0	95.1	95.1	95.2	95.1	94.9
35	95	95.2	95.6	95.6	95.6	95.5	95.7	95.7	95.7	95.6	95.5
30	86	95.2	96.1	96.1	96.0	96.0	96.3	96.2	96.1	96.0	96.0
25	77	94.4	95.3	95.8	96.2	96.5	96.7	96.6	96.6	96.5	96.4
20	68	93.6	94.5	95.0	95.4	95.9	96.6	97.1	97.1	97.0	96.9
15	59	92.8	93.7	94.2	94.6	95.1	95.8	96.3	96.8	97.2	97.5
10	50	92.0	92.9	93.4	93.8	94.2	95.0	95.4	95.9	96.4	96.8
5	41	91.2	92.1	92.5	92.9	93.4	94.1	94.6	95.1	95.5	96.0
0	32	90.3	91.2	91.7	92.1	92.6	93.3	93.7	94.2	94.7	95.1
-10	14	88.7	89.6	90.0	90.4	90.8	91.5	92.0	92.5	92.9	93.4
-20	-4	87.0	87.8	88.3	88.7	89.1	89.8	90.2	90.7	91.1	91.6
-30	-22	85.2	86.0	86.5	86.9	87.3	88.0	88.4	88.9	89.3	89.7
-40	-40	83.5	84.3	84.7	85.1	85.5	86.2	86.6	87.1	87.4	87.9
-50	-58	81.7	82.5	82.9	83.2	83.7	84.3	84.7	85.2	85.6	86.0

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)	
	-2000	9000
ENGINE BLEED TO PACKS OFF	1.0	1.0

ASSUMED TEMPERATURE REDUCED THRUST

Maximum Assumed Temperature (Table 1)
Based On 25% Takeoff Thrust Reduction

OAT (°C)	PRESS ALT (1000 FT)										OAT (°F)	PRESS ALT (1000 FT)									
	-1	0	1	2	3	4	5	6	7	8		-1	0	1	2	3	4	5	6	7	8
55	74	71	71								130	165	159	159							
50	71	69	68	68	69	70					120	160	155	154	154	155	157				
45	69	67	66	66	67	67	67	68	70		110	155	151	149	149	150	151	151	152	155	
40	67	65	64	64	64	64	64	64	66	68	100	151	148	145	145	145	145	147	145	149	151
35	65	63	62	62	62	61	61	62	63	64	90	146	143	141	141	140	140	140	140	143	144
30	63	61	60	60	59	59	59	59	60	61	80	146	142	139	138	136	135	135	135	137	138
25	63	61	59	58	57	56	56	56	57	58	70	146	142	138	136	135	131	129	129	130	132
20	63	61	59	58	57	55	53	54	54	55	60	146	142	138	136	135	131	127	127	126	126
15 & BELOW	63	61	59	58	57	55	53	53	52	52	50 & BELOW	146	142	138	136	135	131	127	127	126	126

Assumed Temperature Reduced Thrust
Maximum Takeoff %N1 (Table 2)
Based On Engine Bleed To Packs On (Auto) and Engine Anti-Ice on Or Off

ASSUMED TEMP		AIRPORT PRESSURE ALTITUDE (FT)									
°C	°F	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000
75	167	86.0	85.4	85.4							
70	158	87.8	87.6	87.4	87.4	87.6					
65	149	89.7	89.7	89.4	89.2	89.2	89.2	89.3	89.5	89.9	90.4
60	140	91.6	91.8	91.3	91.0	90.8	90.7	90.7	90.8	91.1	91.4
55	131	93.1	93.8	93.2	92.7	92.4	92.1	92.1	92.0	92.1	92.3
50	122	93.7	94.3	94.3	94.3	93.9	93.6	93.4	93.2	93.2	93.2
45	113	94.0	94.7	94.7	94.6	94.6	94.6	94.7	94.4	94.2	94.0
40	104	94.4	95.2	95.2	95.1	95.0	95.1	95.1	95.2	95.1	94.9
35	95	95.0	95.6	95.6	95.6	95.5	95.7	95.7	95.7	95.6	95.5
30	86	95.2	96.1	96.1	96.0	96.0	96.3	96.2	96.1	96.0	96.0
25	77	94.4		96.6	96.5	96.5	96.7	96.6	96.6	96.5	96.4
20	68	93.6					97.1	97.1	97.1	97.0	96.9
15	59	92.8							97.6	97.5	97.5
MINIMUM ASSUMED TEMP °C (°F)		32(90)	30(86)	28(82)	26(79)	24(75)	22(72)	20(68)	18(64)	16(61)	15(59)

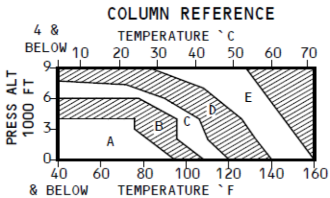
With engine bleed to packs off, increase %N1 by 1.0.

%N1 Adjustment For Temperature Difference (Table 3)

ASSUMED TEMP MINUS OAT		OUTSIDE AIR TEMPERATURE														
°C	°F	°C	-40	-20	0	5	10	15	20	25	30	35	40	45	50	55
		°F	-40	-4	32	41	50	59	68	77	86	95	104	113	122	131
10	18						1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.4	1.4	1.3
20	36				3.3	3.2	3.2	3.1	3.0	3.0	2.9	2.8	2.8	2.7	2.5	2.3
30	54				4.8	4.8	4.6	4.5	4.4	4.3	4.0	3.8	3.6	3.6	3.6	3.6
40	72			6.0	6.2	6.1	6.0	5.8	5.7	5.2	5.0	5.0				
50	90			8.2	7.5	7.3	7.2	6.6	6.5							
60	108		10.4	9.5	8.7	8.1	7.9									
70	126		11.8	10.7	9.3											
80	144		13.0	11.8	10.1											
90	162		14.0	12.4												
100	180		15.0	12.8												
110	198		15.4													

1. **Determine Maximum Assumed Temperature allowed from Table 1.**
2. **Find Maximum %N1 from Table 2 using the desired assumed temperature (no greater than temperature from Table 1).**
3. **Use the difference between assumed temperature and OAT to determine the %N1 adjustment from Table 3.**
4. **Subtract %N1 adjustment from Maximum %N1 in Table 2.**

TAKEOFF SPEEDS (20K DERATE)



SLOPE/WIND V1 ADJUSTMENT[a]						
WEIGHT 1000 KG	SLOPE %			WIND KTS		
	DN		UP	TAIL		HEAD
	-2	0	2	-15	0	40
70	-2	0	3	-3	0	2
60	-2	0	1	-3	0	1
50	-2	0	1	-4	0	1
40	-2	0	1	-4	0	1

FLAPS	WT 1000 KG	A			B			C			D			E		
		V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2	V1	VR	V2
5	70	161	165	168	161	165	168									
	65	154	157	162	154	158	161	155	159	162						
	60	147	149	155	147	150	155	148	151	155	150	152	155			
	55	139	141	149	140	142	148	140	143	148	142	144	148			
	50	132	133	142	132	134	141	132	135	141	134	136	141	137	137	141
	45	123	125	135	124	125	135	124	126	134	126	127	134	128	128	134
	40	115	116	128	115	117	128	116	117	128	117	119	127	120	120	127
15	70	152	154	159												
	65	146	147	152	148	149	153									
	60	139	140	146	141	141	146	142	143	146						
	55	132	133	140	134	134	140	135	135	140	136	136	140			
	50	124	125	134	126	126	134	127	127	133	128	128	133			
	45	116	118	128	118	118	128	119	119	127	120	120	127	120	121	126
	40	107	110	122	109	110	121	110	111	121	111	112	120	112	113	120

IN BOXED AREA CHECK MINIMUM V1 (MCG) FOR ACTUAL TEMP.

V1(MCG) (20K DERATE)

ACTUAL OAT		PRESS ALT FT					
`C	`F	-1000	0	2000	4000	6000	8000
54	130	101	99				
50	122	103	101	99	97		
40	104	107	106	103	103	98	93
30	86	110	110	107	107	103	96
20	68	111	110	108	108	105	101
10	50	111	110	109	108	105	101
-50	-58	112	111	110	109	106	102

FOR A/C OFF, INCREASE V1 (MCG) BY 3 KTS.

Maximum Allowable Clearway (20K Derate)

FIELD LENGTH (FT)	MAX. ALLOWABLE CLEARWAY FOR V1 REDUCTION (FT)
4000	400
6000	500
8000	550
10000	600
12000	700
14000	750

Clearway and Stopway V1 Adjustments (20K Derate)

CLEARWAY MINUS STOPWAY (FT)	NORMAL V1 (KIAS)			
	100	120	140	160
800			-3	-2
600		-3	-2	-1
400	-4	-3	-2	-1
200	-2	-1	-1	0
0	0	0	0	0
-400	1	1	1	1
-800	1	1	1	1

Stab Trim Setting (20K Derate)

Flap 5

C.G. % MAC	6	10	14	18	22	26	30
STAB TRIM	5 1/2	5	4 1/2	3 3/4	3 1/4	2 3/4	2 1/4

For weights at or below 45360 kg, subtract 1/2 unit from above value.
For weights at or above 61235 kg, add 1/2 unit from above value.

Flap 15

C.G. % MAC	6	10	14	18	22	26	30
STAB TRIM	5	4 1/4	3 3/4	3	2 1/2	1 3/4	1

For weights at or below 45360 kg, subtract 1/2 unit from above value.
For weights at or above 61235 kg, add 1/2 unit from above value.

ADVISORY INFORMATION

SLUSH / STANDING WATER TAKEOFF (20K DERATE)

Maximum Reverse Thrust Weight Adjustment (1000 KG)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
68	-7.4	-7.8	-8.2	-9.3	-9.7	-10.0	-13.8	-15.5	-17.1
64	-7.0	-7.4	-7.7	-8.6	-9.0	-9.4	-12.5	-14.1	-15.8
60	-6.5	-6.9	-7.2	-7.9	-8.3	-8.6	-11.1	-12.8	-14.4
56	-5.9	-6.3	-6.6	-7.1	-7.5	-7.8	-9.8	-11.4	-13.1
52	-5.2	-5.6	-6.0	-6.2	-6.6	-6.9	-8.4	-10.1	-11.7
48	-4.5	-4.8	-5.2	-5.3	-5.6	-6.0	-7.0	-8.7	-10.3
44	-3.6	-4.0	-4.4	-4.2	-4.6	-5.0	-5.6	-7.3	-9.0
40	-2.7	-3.1	-3.5	-3.1	-3.5	-3.9	-4.2	-5.9	-7.5
36	-1.7	-2.1	-2.5	-2.0	-2.4	-2.7	-2.8	-4.5	-6.1

V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
4200							28.5		
4600	28.5			30.4			34.0		
5000	34.5			36.3			39.7		
5400	40.7			42.4	29.9		46.1	33.5	
5800	47.2	33.9		49.1	35.7		53.0	39.1	
6200	54.0	40.0		56.0	41.8	29.3	60.1	45.4	32.9
6600	60.8	46.5	33.3	62.8	48.4	35.1	66.8	52.3	38.5
7000	67.3	53.3	39.4	69.3	55.3	41.2	73.1	59.4	44.7
7400	73.7	60.1	45.9	75.6	62.1	47.7		66.2	51.6
7800		66.7	52.6		68.6	54.6		72.4	58.7
8200		73.0	59.4		74.9	61.5			65.5
8600			66.0			68.0			71.8
9000			72.4			74.3			

1. **Enter Weight Adjustment table with slush/standing water depth and 20K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -110 ft/+100 ft for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for temperature adjusted field length and pressure altitude.**
4. **Maximum allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slush/Standing Water Takeoff (20K Derate)
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	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
64	-10	-6	-2	-4	0	0	0	0	0
60	-13	-9	-5	-7	-3	0	0	0	0
56	-15	-11	-7	-9	-5	-1	0	0	0
52	-16	-12	-8	-11	-7	-3	0	0	0
48	-18	-14	-10	-13	-9	-5	-3	0	0
44	-19	-15	-11	-14	-10	-6	-6	-2	0
40	-20	-16	-12	-16	-12	-8	-9	-5	-1
36	-20	-16	-12	-18	-14	-10	-12	-8	-4

1. **Obtain V1, VR and V2 for the actual weight using the 20K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

No Reverse Thrust
Weight Adjustment (1000 KG)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
68	-10.7	-11.4	-12.0	-13.0	-13.6	-14.3	-18.3	-19.8	-21.3
64	-10.0	-10.7	-11.3	-11.9	-12.6	-13.2	-16.3	-17.8	-19.2
60	-9.3	-9.9	-10.6	-10.8	-11.5	-12.2	-14.4	-15.9	-17.3
56	-8.5	-9.1	-9.8	-9.7	-10.4	-11.0	-12.6	-14.0	-15.5
52	-7.6	-8.3	-8.9	-8.6	-9.3	-9.9	-10.8	-12.3	-13.8
48	-6.7	-7.3	-8.0	-7.4	-8.1	-8.8	-9.2	-10.7	-12.2
44	-5.7	-6.3	-7.0	-6.3	-6.9	-7.6	-7.7	-9.2	-10.7
40	-4.6	-5.3	-5.9	-5.1	-5.7	-6.4	-6.3	-7.8	-9.2
36	-3.5	-4.1	-4.8	-3.8	-4.5	-5.1	-4.9	-6.4	-7.9

ADVISORY INFORMATION

Slush/Standing Water Takeoff (20K Derate)
No Reverse Thrust
V1(MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
5800							30.5		
6200							35.6		
6600				29.6			41.5		
7000	28.9			35.5			50.0	30.5	
7400	35.5			42.2			59.2	35.6	
7800	42.7			50.7	29.6		65.9	41.5	
8200	50.9	28.9		58.9	35.5		70.9	50.0	30.5
8600	58.5	35.5		65.1	42.2		75.7	59.2	35.6
9000	64.5	42.7		69.8	50.7	29.6		65.9	41.5
9400	69.4	50.9	28.9	74.4	58.9	35.5		70.9	50.0
9800	73.9	58.5	35.5		65.1	42.2		75.7	59.2
10200		64.5	42.7		69.8	50.7			65.9
10600		69.4	50.9		74.4	58.9			70.9
11000		73.9	58.5			65.1			75.7
11400			64.5			69.8			
11800			69.4			74.4			
12200			73.9						

1. **Enter Weight Adjustment table with slush/standing water depth and 20K Derate dry field/obstacle limit weight to obtain slush/standing water weight adjustment.**
2. **Adjust field length available by -170 ft/+140 ft for every 5°C above/below 4°C.**
3. **Find V1(MCG) limit weight for available field length and pressure altitude.**
4. **Maximum allowable slush/standing water limited weight is lesser of weights from 1 and 3.**

V1 Adjustment (KIAS)

WEIGHT (1000 KG)	SLUSH/STANDING WATER DEPTH								
	0.12 INCHES (3 mm)			0.25 INCHES (6 mm)			0.50 INCHES (13 mm)		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
60	-22	-18	-14	-12	-8	-4	0	0	0
56	-25	-21	-17	-15	-11	-7	0	0	0
52	-27	-23	-19	-19	-15	-11	-1	0	0
48	-30	-26	-22	-22	-18	-14	-6	-2	0
44	-32	-28	-24	-25	-21	-17	-12	-8	-4
40	-34	-30	-26	-29	-25	-21	-18	-14	-10
36	-36	-32	-28	-32	-28	-24	-25	-21	-17

1. **Obtain V1, VR and V2 for the actual weight using the 20K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

ADVISORY INFORMATION

Slippery Runway Takeoff (20K Derate)

Maximum Reverse Thrust Weight Adjustment (1000 KG)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
68	0.0	0.0	0.0	-3.7	-3.7	-3.7	-6.8	-6.8	-6.8
64	-0.3	-0.3	-0.3	-4.0	-4.0	-4.0	-7.0	-7.0	-7.0
60	-0.7	-0.7	-0.7	-4.2	-4.2	-4.2	-6.9	-6.9	-6.9
56	-0.9	-0.9	-0.9	-4.1	-4.1	-4.1	-6.6	-6.6	-6.6
52	-0.9	-0.9	-0.9	-3.9	-3.9	-3.9	-6.1	-6.1	-6.1
48	-0.8	-0.8	-0.8	-3.5	-3.5	-3.5	-5.5	-5.5	-5.5
44	-0.6	-0.6	-0.6	-3.0	-3.0	-3.0	-4.8	-4.8	-4.8
40	-0.3	-0.3	-0.3	-2.5	-2.5	-2.5	-4.0	-4.0	-4.0
36	0.0	0.0	0.0	-1.8	-1.8	-1.8	-3.1	-3.1	-3.1

V1 (MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
3800	34.7								
4200	45.2	31.6							
4600	55.7	42.1	28.4	28.5					
5000	66.3	52.6	38.9	36.5					
5400		63.1	49.4	44.4	30.9				
5800		73.6	59.9	52.3	38.9		29.4		
6200			70.5	60.3	46.8	33.3	34.9		
6600				68.2	54.7	41.2	40.4		
7000					62.6	49.2	45.9	32.2	
7400					70.6	57.1	51.3	37.6	
7800						65.0	56.8	43.1	29.4
8200						72.9	62.3	48.6	34.9
8600							67.7	54.1	40.4
9000							73.2	59.5	45.9
9400								65.0	51.3
9800								70.5	56.8
10200								75.9	62.3
10600									67.7
11000									73.2

1. **Enter Weight Adjustment table with reported braking action and 20K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Find V1(MCG) limit weight for available field length and pressure altitude.**
3. **Adjust "Good" field length available by -90 ft/+90 ft for every 5°C above/below 4°C. Adjust "Medium" field length available by -90 ft/+90 ft for every 5°C above/below 4°C. Adjust "Poor" field length available by -120 ft/+110 ft for every 5°C above/below 4°C.**
4. **Find V1(MCG) limit weight for available field length and pressure altitude.**
5. **Maximum allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff (20K Derate)
Maximum Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
68	-2	-1	0	-10	-9	-8	-19	-17	-16
64	-4	-3	-2	-12	-11	-10	-21	-20	-18
60	-6	-4	-3	-14	-13	-12	-23	-22	-21
56	-7	-6	-5	-16	-15	-14	-26	-25	-24
52	-9	-7	-6	-18	-17	-16	-29	-28	-26
48	-10	-8	-7	-20	-19	-18	-31	-30	-29
44	-11	-9	-8	-22	-20	-19	-33	-32	-31
40	-11	-10	-9	-23	-21	-20	-35	-33	-32
36	-11	-10	-9	-23	-22	-21	-35	-34	-33

1. **Obtain V1, VR and V2 for the actual weight using the 20K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

No Reverse Thrust
Weight Adjustment (1000 KG)

20K DERATE DRY FIELD/OBSTACLE LIMIT WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
68	-1.2	-1.2	-1.2	-6.3	-6.3	-6.3	-10.4	-10.4	-10.4
64	-1.7	-1.7	-1.7	-6.6	-6.6	-6.6	-10.4	-10.4	-10.4
60	-2.1	-2.1	-2.1	-6.7	-6.7	-6.7	-10.1	-10.1	-10.1
56	-2.3	-2.3	-2.3	-6.5	-6.5	-6.5	-9.5	-9.5	-9.5
52	-2.4	-2.4	-2.4	-6.2	-6.2	-6.2	-8.8	-8.8	-8.8
48	-2.3	-2.3	-2.3	-5.7	-5.7	-5.7	-7.9	-7.9	-7.9
44	-2.1	-2.1	-2.1	-5.1	-5.1	-5.1	-7.0	-7.0	-7.0
40	-1.8	-1.8	-1.8	-4.4	-4.4	-4.4	-6.2	-6.2	-6.2
36	-1.3	-1.3	-1.3	-3.6	-3.6	-3.6	-5.5	-5.5	-5.5

ADVISORY INFORMATION

Slippery Runway Takeoff (20K Derate)
No Reverse Thrust
V1 (MCG) Limit Weight (1000 KG)

ADJUSTED FIELD LENGTH (FT)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
4600	36.7								
5000	50.7	33.8							
5400	64.7	47.9	31.0						
5800		61.9	45.1						
6200		76.0	59.1						
6600			73.2	29.7					
7000				41.7					
7400				53.7	30.9				
7800				65.7	42.9				
8200					54.9	32.1			
8600					66.9	44.1			
9000						56.1			
9400						68.1			
10200							31.2		
10600							39.3		
11000							47.5		
11400							55.7	29.5	
11800							63.8	37.7	
12200							72.0	45.9	
12600								54.0	
13000								62.2	36.1
13400								70.4	44.2
13800									52.4
14200									60.6
14600									68.7

1. **Enter Weight Adjustment table with reported braking action and 20K Derate dry field/obstacle limit weight to obtain slippery runway weight adjustment.**
2. **Find V1(MCG) limit weight for available field length and pressure altitude.**
3. **Adjust "Good" field length available by -110 ft/+100 ft for every 5°C above/below 4°C. Adjust "Medium" field length available by -110 ft/+100 ft for every 5°C above/below 4°C. Adjust "Poor" field length available by -180 ft/+180 ft for every 5°C above/below 4°C.**
4. **Find V1(MCG) limit weight for temperature adjusted field length and pressure altitude.**
5. **Maximum allowable slippery runway limited weight is lesser of weights from 1 and 3.**

ADVISORY INFORMATION

Slippery Runway Takeoff (20K Derate)
No Reverse Thrust
V1 Adjustment (KIAS)

WEIGHT (1000 KG)	REPORTED BRAKING ACTION								
	GOOD			MEDIUM			POOR		
	PRESS ALT (FT)			PRESS ALT (FT)			PRESS ALT (FT)		
	S.L.	4000	8000	S.L.	4000	8000	S.L.	4000	8000
68	-4	-1	0	-15	-12	-9	-34	-31	-28
64	-6	-3	-1	-18	-15	-12	-38	-35	-32
60	-8	-6	-3	-22	-19	-16	-42	-40	-37
56	-10	-8	-5	-25	-22	-19	-47	-44	-41
52	-12	-10	-7	-28	-25	-23	-51	-49	-46
48	-14	-12	-9	-31	-28	-26	-56	-53	-50
44	-16	-13	-10	-34	-31	-29	-61	-58	-55
40	-18	-15	-12	-37	-34	-32	-65	-62	-60
36	-19	-16	-14	-40	-37	-34	-70	-67	-64

1. **Obtain V1, VR and V2 for the actual weight using the 20K Derate Dry Runway Takeoff Speeds table.**
2. **If V1(MCG) limited, set V1 = V1(MCG). If not V1(MCG) limited, enter V1 Adjustment table with the actual weight to obtain V1 speed adjustment. If adjusted V1 is less than V1(MCG), set V1 = V1(MCG).**

TAKEOFF %N1 (20K DERATE)

Based On Engine Bleed To Packs On (Auto) and Anti-Ice On or Off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)									
°C	°F	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000
55	131	89.9	90.5								
50	122	90.6	91.1	91.6	92.3	93.1					
45	113	91.2	91.6	92.1	92.6	93.9	94.9	94.7	94.2		
40	104	91.7	92.1	92.6	93.0	94.3	95.3	95.3	95.3	95.0	94.3
35	95	92.0	92.5	93.0	93.4	94.7	95.9	95.8	95.8	95.1	94.5
30	86	91.8	92.8	93.2	93.6	95.0	96.5	96.4	96.4	95.7	95.0
25	77	91.0	92.1	92.9	93.6	94.5	95.9	96.3	96.7	96.2	95.6
20	68	90.3	91.3	92.1	92.8	93.8	95.1	95.5	95.9	95.9	95.9
15	59	89.5	90.5	91.3	92.0	93.0	94.3	94.7	95.1	95.3	95.3
10	50	88.7	89.7	90.5	91.2	92.1	93.4	93.9	94.3	94.4	94.6
5	41	87.9	88.9	89.7	90.4	91.3	92.6	93.0	93.4	93.6	93.7
0	32	87.1	88.1	88.9	89.6	90.5	91.8	92.2	92.6	92.7	92.9
-10	14	85.5	86.5	87.2	87.9	88.8	90.1	90.5	90.9	91.0	91.2
-20	-4	83.9	84.8	85.6	86.2	87.1	88.3	88.7	89.1	89.2	89.4
-30	-22	82.2	83.1	83.9	84.5	85.4	86.6	87.0	87.4	87.5	87.6
-40	-40	80.5	81.4	82.1	82.7	83.6	84.8	85.1	85.5	85.7	85.8
-50	-58	78.8	79.6	80.3	81.0	81.8	82.9	83.3	83.7	83.8	84.0

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	AIRPORT PRESSURE ALTITUDE (FT)	
	-1000	8000
ENGINE BLEED TO PACKS OFF	1.0	1.0

ASSUMED TEMPERATURE REDUCED THRUST (20K DERATE)

Maximum Assumed Temperature (Table 1)
Based On 25% Takeoff Thrust Reduction

OAT (°C)	PRESS ALT (1000 FT)										OAT (°F)	PRESS ALT (1000 FT)									
	-1	0	1	2	3	4	5	6	7	8		-1	0	1	2	3	4	5	6	7	8
55	74	73	73								130	164	162	162							
50	71	71	69	68	66	65					120	159	158	155	153	149	147				
45	69	68	67	66	63	62	62	63	65		110	154	153	151	149	144	142	142	143	145	
40	66	66	65	64	61	60	60	60	60	62	100	150	148	146	145	140	138	138	137	139	141
35	64	63	62	62	59	58	58	57	59	60	90	146	143	142	141	137	134	133	132	136	137
30	63	61	61	60	58	56	55	55	56	58	80	146	141	140	137	135	131	129	128	131	132
25	63	61	60	58	57	55	54	53	54	55	70	146	141	140	136	134	131	129	127	127	126
20 & BELOW	63	61	60	58	57	55	54	53	53	52	60 & BELOW	146	141	140	136	134	131	129	127	127	126

Assumed Temperature Reduced Thrust (20K Derate) Maximum Takeoff %N1 (Table 2) Based On Engine Bleed To Packs On (Auto) and Engine Anti-Ice On or Off

ASSUMED TEMP		AIRPORT PRESSURE ALTITUDE (FT)									
°C	°F	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000
75	167	83.0	83.9	83.8	83.5						
70	158	84.7	85.6	85.6	85.4	84.9	84.7				
65	149	86.6	87.3	87.3	87.2	87.0	87.0	87.1	87.2	87.6	87.9
60	140	88.3	88.9	89.0	89.0	89.1	89.1	89.1	89.0	89.1	89.3
55	131	89.7	90.5	90.6	90.7	91.1	91.3	91.0	90.8	90.7	90.6
50	122	90.4	91.1	91.6	92.3	93.1	93.4	92.9	92.5	92.2	91.9
45	113	91.0	91.6	92.1	92.7	93.9	94.9	94.8	94.2	93.7	93.1
40	104	91.6	92.1	92.6	93.0	94.3	95.3	95.3	95.3	95.0	94.3
35	95	92.0	92.5	93.0	93.4	94.8	95.9	95.9	95.8	95.1	94.5
30	86	91.7	92.8	93.2	93.6	95.0	96.5	96.4	96.4	95.7	95.0
25	77	90.9		92.9	93.7	94.5	95.9	96.5	96.7	96.2	95.6
20	68	90.2				93.8				95.9	95.9
15	59	89.4									95.4
MINIMUM ASSUMED TEMP °C (°F)		32(90)	30(86)	28(82)	26(79)	24(75)	29(85)	27(81)	25(77)	20(68)	15(59)

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

%N1 Adjustment For Temperature Difference (Table 3)

ASSUMED TEMP MINUS OAT		OUTSIDE AIR TEMPERATURE													
°C	°F	°C	-40	-20	0	5	10	15	20	25	30	35	40	45	50	55
		°F	-40	-4	32	41	50	59	68	77	86	95	104	113	122	131
10	18						1.6	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.4	1.3
20	36				3.3	3.3	3.1	3.1	3.0	3.0	2.9	2.8	2.7	2.6	2.5	2.3
30	54				4.8	4.7	4.6	4.5	4.4	4.3	4.1	3.9	3.7	3.5	3.4	3.3
40	72			6.8	6.1	6.0	5.9	5.7	5.5	5.3	5.1	4.9				
50	90			8.1	7.4	7.2	6.9	6.7	6.3							
60	108		10.4	9.3	8.4	8.1	7.7									
70	126		11.5	10.5	9.0											
80	144		12.7	11.4	9.8											
90	162		13.8	11.9												
100	180		14.5	12.6												
110	198		14.9													

1. **Determine Maximum Assumed Temperature allowed from Table 1.**
2. **Find Maximum %N1 from Table 2 using the desired assumed temperature (no greater than temperature from Table 1).**
3. **Use the difference between assumed temperature and OAT to determine the %N1 adjustment from Table 3.**
4. **Subtract %N1 adjustment from Maximum %N1 in Table 2.**

Max Climb %N1

Based On Engine Bleed To Packs On (Auto) and Anti-Ice Off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)/SPEED (KIAS OR MACH)								
	0	5	10	15	20	25	30	35	37
	250	250	250	280	280	280	.74	.74	.74
50	90.9	91.1	92.5						
40	92.0	92.2	93.6	93.3	93.6				
30	92.2	93.2	93.5	94.2	94.6	94.7			
20	90.6	92.8	94.3	95.0	95.4	95.6	95.7		
10	89.1	91.2	93.1	95.1	96.1	96.4	96.6	96.6	96.6
0	87.5	89.6	91.5	93.4	95.5	97.2	97.5	97.5	97.5
-10	85.9	87.9	89.8	91.7	93.7	95.9	97.9	98.4	98.4
-20	84.2	86.3	88.1	90.0	91.9	94.0	96.0	99.0	99.3
-30	82.5	84.5	86.3	88.2	90.1	92.1	94.1	97.0	97.6
-40	80.8	82.8	84.5	86.3	88.2	90.2	92.2	95.0	95.6
-50	79.1	81.0	82.7	84.5	86.3	88.3	90.2	92.9	93.5

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)								
	0	5	10	15	20	25	30	35	37
ENGINE BLEED TO PACKS OFF	0.5	0.5	0.6	0.7	0.8	0.8	0.9	0.9	0.9
PACKS HIGH	-0.3	-0.3	-0.4	-0.4	-0.4	-0.4	-0.5	-0.6	-0.6
ENGINE ANTI-ICE ON	-0.7	-0.8	-0.9	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
ENGINE & WING ANTI-ICE ON	-1.9	-2.0	-2.2	-2.4	-2.6	-2.7	-2.8	-3.0	-3.0

GO-AROUND %N1

Based On Engine Bleed To Packs On (Auto), Engine Anti-Ice On or Off, and Wing Anti-Ice Off

REPORTED OAT		TAT	PRESSURE ALTITUDE (FT)									
°C	°F	°C	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000
55	131	58	93.1	93.9	93.9	93.9						
50	122	53	93.7	94.2	94.2	94.2	94.2	94.2				
45	113	48	94.1	94.7	94.6	94.6	94.6	94.6	94.7	94.8	94.6	
40	104	43	94.5	95.1	95.1	95.1	95.0	95.1	95.1	95.2	95.1	95.0
35	95	38	95.1	95.5	95.6	95.5	95.5	95.7	95.7	95.7	95.6	95.6
30	86	33	95.1	96.1	96.1	96.0	96.0	96.3	96.2	96.2	96.1	96.0
25	77	28	94.3	95.3	95.8	96.2	96.5	96.7	96.7	96.6	96.5	96.5
20	68	23	93.5	94.5	95.0	95.4	95.9	96.6	97.1	97.2	97.0	96.9
15	59	18	92.7	93.7	94.1	94.6	95.1	95.8	96.3	96.8	97.3	97.5
10	50	13	91.9	92.8	93.3	93.7	94.2	95.0	95.4	96.0	96.4	96.9
5	41	8	91.1	92.0	92.5	92.9	93.4	94.1	94.6	95.1	95.6	96.1
0	32	3	90.3	91.2	91.7	92.1	92.6	93.3	93.7	94.3	94.7	95.2
-10	14	-8	88.5	89.5	90.0	90.4	90.8	91.5	92.0	92.5	93.0	93.4
-20	-4	-18	86.8	87.8	88.2	88.6	89.1	89.8	90.3	90.8	91.2	91.6
-30	-22	-28	85.1	86.0	86.5	86.9	87.3	88.0	88.5	89.0	89.4	89.8
-40	-40	-38	83.3	84.2	84.7	85.1	85.5	86.2	86.6	87.1	87.5	87.9
-50	-58	-48	81.5	82.4	82.8	83.2	83.7	84.3	84.7	85.2	85.6	86.0

%N1 Adjustments for Engine Bleeds

BLEED CONFIGURATION	TAT (°C)	
	- 60	60
ENGINE BLEED TO PACKS OFF	0.8	1.0
PACKS HIGH	- 0.3	- 0.3
WING A/I ALL ENGINES	- 1.3	- 1.6
WING A/I 1 ENGINE INOP	- 2.2	- 2.7

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)				
		36	44	52	60	68
35000 (.73M)	**PITCH ATT**	**6.0**	**5.5**	**5.5**	**5.5**	
	V/S (FT/MIN)	2500	1700	1100	500	
30000 (.73M)	**PITCH ATT**	**6.5**	**5.5**	**5.5**	**5.5**	**5.0**
	V/S (FT/MIN)	3300	2500	1800	1300	800
25000 (280 KIAS)	**PITCH ATT**	**6.5**	**6.0**	**6.0**	**5.5**	**5.5**
	V/S (FT/MIN)	3200	2400	1900	1500	1100
20000 (280 KIAS)	**PITCH ATT**	**8.0**	**7.5**	**7.0**	**7.0**	**7.0**
	V/S (FT/MIN)	3900	3100	2400	1900	1500
15000 (280 KIAS)	**PITCH ATT**	**10.0**	**9.0**	**8.0**	**8.0**	**8.0**
	V/S (FT/MIN)	4700	3700	3000	2500	2000
10000 (280 KIAS)	**PITCH ATT**	**11.5**	**10.5**	**9.5**	**9.0**	**9.0**
	V/S (FT/MIN)	5500	4400	3600	2900	2400
5000 (280 KIAS)	**PITCH ATT**	**14.0**	**12.0**	**11.0**	**10.5**	**10.0**
	V/S (FT/MIN)	6200	5000	4100	3400	2900
SEA LEVEL (280 KIAS)	**PITCH ATT**	**16.0**	**14.0**	**12.5**	**11.5**	**11.0**
	V/S (FT/MIN)	6900	5500	4600	3800	3200

Cruise
Flaps Up, Adjust %N1 for Level Flight

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		36	44	52	60	68
30000 (.73M)	**PITCH ATT**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**
	%N1	79	81	83	85	87
10000 (280 KIAS)	**PITCH ATT**	**2.0**	**2.5**	**3.5**	**4.0**	**4.5**
	%N1	66	67	69	70	72

Descent
Flaps Up, Set Idle Thrust

PRESSURE ALTITUDE (FT) (SPEED)		WEIGHT (1000 KG)				
		36	44	52	60	68
30000 (.73M)	**PITCH ATT**	**-3.5**	**-2.0**	**-1.5**	**-0.5**	**0.0**
	V/S (FT/MIN)	-4100	-3600	-3300	-3100	-3100
20000 (280 KIAS)	**PITCH ATT**	**-2.0**	**-1.0**	**0.0**	**0.5**	**1.5**
	V/S (FT/MIN)	-2800	-2400	-2200	-2100	-2000
10000 (280 KIAS)	**PITCH ATT**	**-2.5**	**-1.0**	**0.0**	**0.5**	**1.5**
	V/S (FT/MIN)	-2500	-2100	-2000	-1800	-1800

Holding
Flaps Up, Adjust %N1 for Level Flight

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		36	44	52	60	68
10000	**PITCH ATT**	**4.5**	**5.5**	**5.5**	**5.5**	**5.5**
	%N1	57	60	64	68	72
	KIAS	210	210	230	245	265

Flight With Unreliable Airspeed / Turbulent Air Penetration
Altitude and/or vertical speed indications may also be unreliable.
Terminal Area
Adjust %N1 for Level Flight

FLAP POSITION (SPEED)		WEIGHT (1000 KG)				
		36	44	52	60	68
FLAPS UP (GEAR UP)	**PITCH ATT**	**4.5**	**5.5**	**6.5**	**7.0**	**7.5**
	%N	54.7	57.4	60.5	64.0	67.5
	KIAS	210	210	210	220	230
FLAP 1 (GEAR UP)	**PITCH ATT**	**4.5**	**6.0**	**7.5**	**7.5**	**8.0**
	%N1	56.1	58.8	62.1	65.9	69.4
	KIAS	190	190	190	200	210
FLAP 5 (GEAR UP)	**PITCH ATT**	**4.0**	**5.5**	**7.0**	**7.0**	**7.5**
	%N1	56.3	59.4	63.1	67.0	70.5
	KIAS	180	180	180	190	200
FLAP 15 (GEAR DOWN)	**PITCH ATT**	**5.0**	**6.5**	**8.5**	**8.5**	**8.5**
	%N1	62.0	66.3	70.5	74.6	78.2
	KIAS	150	150	150	160	170

Final Approach
Gear Down, Adjust %N1 for 3° Glideslope

FLAP POSITION		WEIGHT (1000 KG)				
		36	44	52	60	68
FLAP 15 (VREF15+10)	**PITCH ATT**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**
	%N1	45	50	54	58	61
	KIAS	135	149	162	174	185
FLAP 30 (VREF30+10)	**PITCH ATT**	**2.0**	**2.0**	**2.0**	**2.0**	**2.5**
	%N1	50	55	60	64	67
	KIAS	123	135	147	158	167
FLAP 40 (VREF40+10)	**PITCH ATT**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
	%N1	57	62	67	71	74
	KIAS	120	132	143	154	163

Go-Around (1500 FT)
Gear Up, Set Go-Around Thrust

PRESSURE ALTITUDE (FT)		WEIGHT (1000 KG)				
		36	44	52	60	68
10000	**PITCH ATT**	**18.0**	**16.5**	**16.0**	**14.0**	**13.0**
	V/S (FT/MIN)	4100	3100	2300	1900	1500
	KIAS	150	150	150	160	170
5000	**PITCH ATT**	**21.0**	**19.0**	**18.0**	**16.0**	**14.5**
	V/S (FT/MIN)	4700	3600	2800	2300	1900
	KIAS	150	150	150	160	170
SEA LEVEL	**PITCH ATT**	**24.0**	**21.5**	**20.0**	**17.5**	**16.0**
	V/S (FT/MIN)	5100	3900	3100	2600	2200
	KIAS	150	150	150	160	170

Intentionally Blank

Chapter PI - Performance Inflight
Section 11 - All Engines

Long Range Cruise Maximum Operating Altitude

Max Cruise Thrust
ISA + 10°C and Below

WEIGHT (1000 KG)	OPTIMUM ALT (FT)	TAT (°C)	MARGIN TO INITIAL BUFFET 'G' (BANK ANGLE)				
			1.20 (33°)	1.25 (36°)	1.30 (39°)	1.40 (44°)	1.50 (48°)
68	29500	-7	32800	31900	31000	29400	27900
66	30100	-8	33400	32500	31700	30000	28500
64	30800	-10	34100	33200	32300	30700	29200
62	31500	-11	34700	33800	33000	31400	29900
60	32200	-13	35400	34500	33700	32100	30600
58	32900	-14	36100	35300	34400	32800	31400
56	33700	-16	36900	36000	35200	33600	32100
54	34400	-18	37000	36700	35900	34400	32900
52	35200	-19	37000	37000	36700	35200	33700
50	36100	-21	37000	37000	37000	36000	34500
48	36900	-21	37000	37000	37000	36800	35400
46	37000	-21	37000	37000	37000	37000	36300
44	37000	-21	37000	37000	37000	37000	37000

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°)
68	29500	-1	32400*	31900	31000	29400	27900
66	30100	-3	33200*	32500	31700	30000	28500
64	30800	-4	34000*	33200	32300	30700	29200
62	31500	-6	34700	33800	33000	31400	29900
60	32200	-7	35400	34500	33700	32100	30600
58	32900	-9	36100	35300	34400	32800	31400
56	33700	-10	36900	36000	35200	33600	32100
54	34400	-12	37000	36700	35900	34400	32900
52	35200	-14	37000	37000	36700	35200	33700
50	36100	-16	37000	37000	37000	36000	34500
48	36900	-16	37000	37000	37000	36800	35400
46	37000	-16	37000	37000	37000	37000	36300
44	37000	-16	37000	37000	37000	37000	37000

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°)
68	29500	4	31500*	31500*	31000	29400	27900
66	30100	3	32400*	32400*	31700	30000	28500
64	30800	1	33300*	33200	32300	30700	29200
62	31500	0	34100*	33800	33000	31400	29900
60	32200	-2	35000*	34500	33700	32100	30600
58	32900	-3	35900*	35300	34400	32800	31400
56	33700	-5	36600*	36000	35200	33600	32100
54	34400	-7	37000	36700	35900	34400	32900
52	35200	-8	37000	37000	36700	35200	33700
50	36100	-10	37000	37000	37000	36000	34500
48	36900	-10	37000	37000	37000	36800	35400
46	37000	-10	37000	37000	37000	37000	36300
44	37000	-10	37000	37000	37000	37000	37000

*** Denotes altitude thrust limited in level flight, 100 fpm residual rate of climb.**

LONG RANGE CRUISE CONTROL

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)								
		21	23	25	27	29	31	33	35	37
66	%N1	82.7	83.8	84.7	85.6	86.6	88.0	90.2		
	MACH	.713	.730	.742	.745	.745	.745	.745		
	KIAS	324	319	311	300	287	275	263		
	FF/ENG	1610	1581	1547	1498	1457	1433	1437		
62	%N1	81.5	82.6	83.6	84.6	85.4	86.5	88.2	90.9	
	MACH	.698	.718	.734	.744	.745	.745	.745	.744	
	KIAS	317	313	308	299	287	275	263	251	
	FF/ENG	1525	1502	1473	1439	1391	1357	1341	1363	
58	%N1	80.2	81.3	82.4	83.4	84.3	85.2	86.4	88.3	92.2
	MACH	.682	.703	.722	.737	.744	.745	.745	.745	.742
	KIAS	309	306	302	296	287	275	263	251	239
	FF/ENG	1440	1420	1397	1369	1331	1289	1261	1253	1301
54	%N1	78.8	79.9	81.1	82.1	83.2	84.0	85.0	86.3	88.8
	MACH	.665	.685	.707	.725	.740	.745	.745	.745	.745
	KIAS	301	298	295	291	285	275	263	251	240
	FF/ENG	1356	1336	1317	1294	1267	1228	1191	1168	1175
50	%N1	77.2	78.4	79.6	80.7	81.8	82.8	83.6	84.6	86.5
	MACH	.646	.667	.688	.709	.728	.741	.745	.745	.745
	KIAS	292	289	287	284	280	274	263	251	240
	FF/ENG	1270	1253	1233	1216	1194	1167	1130	1098	1085
46	%N1	75.5	76.7	77.9	79.1	80.3	81.3	82.3	83.2	84.6
	MACH	.625	.647	.668	.689	.710	.729	.742	.745	.745
	KIAS	282	280	278	276	273	269	262	251	240
	FF/ENG	1184	1168	1151	1132	1117	1096	1071	1035	1012
42	%N1	73.6	74.9	76.1	77.4	78.5	79.7	80.8	81.8	83.0
	MACH	.603	.624	.646	.667	.688	.710	.729	.743	.745
	KIAS	271	270	268	266	264	261	257	250	240
	FF/ENG	1098	1084	1068	1050	1034	1020	1000	978	949
38	%N1	71.6	72.8	74.1	75.4	76.6	77.8	79.0	80.1	81.5
	MACH	.579	.599	.621	.643	.664	.686	.709	.728	.742
	KIAS	260	259	257	256	254	252	249	245	239
	FF/ENG	1012	1000	984	967	953	939	925	908	892

Shaded area approximates optimum altitude.

Long Range Cruise En Route Fuel and Time - Low Altitudes

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS) 20	40	60	80	100
284	262	243	226	213	200	191	182	174	167	160
428	395	366	341	319	300	286	273	261	250	241
573	528	489	455	426	400	381	364	348	334	321
719	662	612	570	533	500	477	455	435	418	402
865	796	735	684	640	600	572	546	522	501	482
1011	931	859	799	747	700	667	637	610	584	562
1158	1065	983	914	854	800	763	728	697	668	642
1305	1200	1107	1028	961	900	858	819	784	751	722
1453	1335	1231	1143	1068	1000	953	910	871	835	802
1602	1471	1355	1258	1175	1100	1048	1001	957	917	881
1751	1607	1480	1374	1282	1200	1144	1091	1044	1000	961
1900	1744	1605	1489	1389	1300	1239	1183	1131	1084	1041
2050	1880	1730	1605	1497	1400	1334	1274	1218	1167	1121
2201	2018	1856	1721	1604	1500	1429	1364	1304	1250	1201
2352	2156	1982	1836	1712	1600	1524	1455	1391	1332	1280
2504	2294	2108	1952	1819	1700	1620	1545	1477	1415	1359
2657	2432	2234	2068	1926	1800	1715	1636	1564	1498	1438
2810	2571	2361	2185	2034	1900	1810	1726	1650	1580	1517
2964	2711	2488	2302	2142	2000	1904	1816	1736	1663	1597

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT) 10		14		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	1.5	0:39	1.3	0:38	1.1	0:37	1.0	0:36	0.9	0:35
300	2.2	0:58	2.0	0:56	1.7	0:53	1.6	0:51	1.4	0:50
400	3.0	1:17	2.7	1:14	2.3	1:09	2.1	1:07	1.9	1:04
500	3.7	1:35	3.4	1:31	2.9	1:26	2.7	1:22	2.5	1:19
600	4.5	1:54	4.1	1:49	3.6	1:42	3.3	1:38	3.0	1:34
700	5.2	2:13	4.8	2:07	4.2	1:59	3.8	1:53	3.5	1:49
800	5.9	2:32	5.4	2:25	4.8	2:15	4.4	2:09	4.0	2:04
900	6.7	2:52	6.1	2:44	5.3	2:32	4.9	2:25	4.5	2:19
1000	7.4	3:11	6.8	3:02	5.9	2:49	5.5	2:41	5.0	2:34
1100	8.1	3:31	7.4	3:21	6.5	3:06	6.0	2:57	5.6	2:49
1200	8.8	3:50	8.1	3:39	7.1	3:23	6.6	3:13	6.1	3:04
1300	9.5	4:10	8.8	3:58	7.7	3:40	7.1	3:29	6.6	3:20
1400	10.2	4:30	9.4	4:17	8.3	3:57	7.7	3:45	7.1	3:35
1500	10.9	4:51	10.1	4:36	8.9	4:15	8.2	4:02	7.6	3:50
1600	11.6	5:11	10.7	4:55	9.4	4:32	8.7	4:18	8.0	4:06
1700	12.3	5:32	11.4	5:15	10.0	4:50	9.3	4:35	8.5	4:22
1800	13.0	5:52	12.0	5:34	10.6	5:08	9.8	4:52	9.0	4:37
1900	13.7	6:13	12.6	5:54	11.1	5:26	10.3	5:08	9.5	4:53
2000	14.4	6:34	13.3	6:14	11.7	5:44	10.8	5:25	10.0	5:09

Long Range Cruise En Route Fuel and Time - Low Altitudes
Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)					
	30	40	45	50	60	70
2	-0.2	-0.1	0.0	0.1	0.3	0.5
4	-0.5	-0.2	0.0	0.2	0.6	1.1
6	-0.7	-0.2	0.0	0.3	0.9	1.6
8	-0.9	-0.3	0.0	0.4	1.3	2.2
10	-1.2	-0.4	0.0	0.5	1.6	2.7
12	-1.4	-0.5	0.0	0.6	1.9	3.3
14	-1.6	-0.6	0.0	0.7	2.2	3.8
16	-1.9	-0.6	0.0	0.8	2.5	4.3

Long Range Cruise En Route Fuel and Time - High Altitudes

Ground to Air Miles Conversion

AIR DISTANCE (NM) HEADWIND COMPONENT (KTS)					GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAILWIND COMPONENT (KTS)				
100	80	60	40	20		20	40	60	80	100
534	503	475	448	423	400	381	363	346	331	317
797	751	708	669	633	600	572	545	521	499	479
1062	999	942	890	843	800	763	728	696	667	642
1328	1248	1176	1111	1053	1000	954	911	872	837	806
1595	1498	1410	1333	1263	1200	1146	1095	1049	1007	970
1862	1748	1646	1555	1474	1400	1337	1279	1226	1177	1133
2130	2000	1881	1777	1685	1600	1529	1463	1402	1346	1296
2399	2251	2118	2000	1896	1800	1720	1646	1578	1515	1458
2668	2504	2355	2224	2107	2000	1911	1828	1752	1683	1620
2939	2757	2592	2447	2318	2200	2102	2011	1927	1850	1781
3211	3011	2830	2671	2529	2400	2293	2194	2102	2019	1943
3484	3266	3068	2895	2741	2600	2484	2377	2277	2187	2104
3757	3521	3307	3119	2952	2800	2675	2559	2452	2355	2266
4032	3777	3546	3344	3164	3000	2866	2742	2627	2522	2427
4309	4034	3786	3569	3376	3200	3057	2924	2801	2689	2588
4586	4292	4026	3794	3588	3400	3247	3106	2975	2856	2748
4864	4551	4268	4020	3800	3600	3438	3288	3149	3023	2909
5144	4811	4509	4246	4012	3800	3629	3470	3323	3190	3069
5425	5071	4751	4472	4225	4000	3819	3652	3498	3357	3229

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	2.1	0:59	2.0	0:59	1.9	0:59	1.8	1:01	1.8	1:03
600	3.0	1:30	2.9	1:29	2.8	1:28	2.7	1:29	2.6	1:31
800	4.0	2:01	3.8	1:59	3.7	1:57	3.6	1:58	3.5	1:59
1000	4.9	2:31	4.7	2:28	4.6	2:26	4.4	2:26	4.3	2:27
1200	5.9	3:02	5.6	2:58	5.4	2:56	5.3	2:55	5.1	2:55
1400	6.8	3:32	6.6	3:28	6.3	3:25	6.1	3:23	6.0	3:23
1600	7.7	4:03	7.5	3:58	7.2	3:54	7.0	3:52	6.8	3:51
1800	8.7	4:34	8.4	4:28	8.1	4:23	7.8	4:20	7.6	4:19
2000	9.6	5:05	9.3	4:58	9.0	4:52	8.7	4:49	8.4	4:48
2200	10.5	5:36	10.2	5:28	9.8	5:22	9.5	5:18	9.3	5:16
2400	11.5	6:08	11.1	5:59	10.7	5:52	10.3	5:47	10.1	5:44
2600	12.4	6:40	11.9	6:30	11.5	6:22	11.2	6:16	10.8	6:13
2800	13.2	7:12	12.8	7:02	12.4	6:52	12.0	6:46	11.6	6:42
3000	14.1	7:45	13.6	7:33	13.2	7:23	12.8	7:16	12.4	7:11
3200	15.0	8:18	14.5	8:05	14.0	7:54	13.5	7:46	13.2	7:40
3400	15.9	8:52	15.3	8:38	14.8	8:25	14.3	8:16	13.9	8:09
3600	16.7	9:26	16.1	9:10	15.6	8:57	15.1	8:47	14.7	8:39
3800	17.5	10:00	16.9	9:43	16.4	9:29	15.9	9:18	15.4	9:09
4000	18.4	10:35	17.7	10:17	17.1	10:01	16.6	9:49	16.1	9:39

Long Range Cruise En Route Fuel and Time - High Altitudes
Fuel Required Adjustment (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)					
	30	40	45	50	60	70
4	-0.5	-0.2	0.0	0.3	1.3	3.6
6	-0.9	-0.3	0.0	0.4	1.8	4.6
8	-1.2	-0.4	0.0	0.6	2.3	5.5
10	-1.5	-0.5	0.0	0.7	2.7	6.3
12	-1.8	-0.6	0.0	0.8	3.1	7.0
14	-2.1	-0.7	0.0	1.0	3.5	7.7
16	-2.4	-0.9	0.0	1.1	3.9	8.2
18	-2.6	-1.0	0.0	1.2	4.2	8.7
20	-2.8	-1.1	0.0	1.3	4.5	9.1

Long Range Cruise Wind - Altitude Trade

PRESSURE ALTITUDE (1000 FT)	CRUISE WEIGHT (1000 KG)																
	68	66	64	62	60	58	56	54	52	50	48	46	44	42	40	38	36
37								14	8	1	0	0	0	0	0	0	0
35					9	5	2	0	0	2	6	8	10	12	13	14	14
33		9	5	2	1	0	1	3	7	12	17	20	23	26	27	29	30
31	2	1	0	1	3	4	9	14	19	25	31	35	38	41	43	44	45
29	1	2	5	8	12	17	22	28	33	39	45	50	54	57	59	60	61
27	8	12	15	17	25	30	35	41	48	55	61	66	69	71	74	75	77
25	19	24	28	34	39	44	51	57	63	70	78	82	86	89	92	94	96
23	32	37	42	48	53	59	65	72	79	86	94	99	103	106	109	112	113

The above wind factor tables are for calculation of wind required to maintain present range capability at new pressure altitude (i.e., break even wind).

Method:

1. **Read wind factors for present and new altitudes from table.**
2. **Determine difference (new altitude wind factor minus present altitude wind factor); this difference may be negative or positive.**
3. **Break even wind at new altitude is present altitude wind plus difference from Step 2.**

Descent

Based on .74/250 descent speed

PRESSURE ALT (1000 FT)	21	23	25	27	29	31	33	35	37
DISTANCE (NM)	66	72	78	85	91	97	103	109	114
TIME (MINUTES)	15	16	18	18	19	20	21	22	23

HOLDING

Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)								
		1500	5000	10000	15000	20000	25000	30000	35000	37000
66	%N1	63.7	66.7	70.8	74.7	78.5	82.3	86.1		
	KIAS	255	256	259	261	263	265	263		
	FF/ENG	1500	1480	1460	1440	1420	1420	1420		
64	%N1	62.9	65.8	70.0	74.0	77.7	81.5	85.3	92.8	
	KIAS	251	252	254	257	259	261	259	251	
	FF/ENG	1450	1430	1410	1400	1380	1380	1370	1510	
62	%N1	62.1	64.9	69.2	73.2	77.0	80.8	84.6	90.6	
	KIAS	247	248	250	253	255	257	256	249	
	FF/ENG	1410	1390	1370	1350	1340	1330	1330	1410	
60	%N1	61.3	64.0	68.3	72.3	76.2	80.0	83.8	88.9	
	KIAS	243	244	246	248	251	253	252	246	
	FF/ENG	1370	1350	1330	1310	1290	1290	1280	1330	
58	%N1	60.5	63.1	67.4	71.4	75.4	79.2	83.0	87.5	92.3
	KIAS	239	240	241	244	246	248	248	243	239
	FF/ENG	1330	1310	1290	1270	1250	1250	1240	1260	1370
56	%N1	59.7	62.2	66.4	70.5	74.5	78.3	82.1	86.3	89.9
	KIAS	235	235	237	239	242	244	245	241	237
	FF/ENG	1290	1270	1250	1230	1210	1210	1200	1210	1270
54	%N1	58.9	61.3	65.4	69.6	73.6	77.5	81.3	85.3	88.2
	KIAS	231	231	232	235	237	239	241	238	234
	FF/ENG	1260	1230	1210	1190	1170	1160	1150	1160	1200
52	%N1	58.1	60.4	64.4	68.6	72.7	76.5	80.4	84.3	86.7
	KIAS	228	227	228	230	232	235	236	234	231
	FF/ENG	1220	1190	1170	1150	1130	1120	1110	1110	1130
50	%N1	57.2	59.5	63.3	67.6	71.7	75.6	79.5	83.3	85.5
	KIAS	224	223	223	225	227	230	232	230	228
	FF/ENG	1180	1150	1130	1110	1090	1080	1070	1070	1080
48	%N1	56.4	58.6	62.2	66.6	70.7	74.6	78.5	82.4	84.4
	KIAS	220	219	219	220	223	225	227	226	225
	FF/ENG	1140	1110	1090	1070	1050	1040	1030	1030	1040
46	%N1	55.5	57.7	61.1	65.4	69.6	73.6	77.5	81.4	83.3
	KIAS	216	214	214	215	218	220	222	222	221
	FF/ENG	1110	1070	1050	1030	1010	1000	980	980	990
44	%N1	54.5	56.7	60.1	64.2	68.5	72.6	76.5	80.4	82.3
	KIAS	211	210	210	210	212	215	217	218	217
	FF/ENG	1070	1040	1010	990	970	960	940	940	950
42	%N1	53.7	56.0	59.3	63.3	67.5	71.5	75.4	79.3	81.2
	KIAS	210	210	210	210	210	210	212	213	212
	FF/ENG	1040	1010	990	960	930	920	900	900	900
40	%N1	53.1	55.3	58.5	62.4	66.6	70.6	74.4	78.3	80.2
	KIAS	210	210	210	210	210	210	210	210	210
	FF/ENG	1010	980	960	930	900	890	870	860	870
38	%N1	52.4	54.7	57.9	61.5	65.7	69.7	73.5	77.4	79.3
	KIAS	210	210	210	210	210	210	210	210	210
	FF/ENG	990	960	940	900	880	860	840	830	840

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

Chapter PI - Performance Inflight
Section 12 - Advisory Information

NORMAL CONFIGURATION LANDING DISTANCE

Flap 15

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	52000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 52000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV

Dry Runway

MAX MANUAL	3110	470/-220	70	-110/390	40/-40	70/-70	230	70	210
AUTOBRAKE MAX	4030	350/-290	90	-140/480	0/0	100/-100	380	0	50
AUTOBRAKE 3	5800	460/-480	160	-240/800	20/-40	160/-160	540	50	80
AUTOBRAKE 2	6870	620/-630	210	-310/1040	140/-160	190/-190	500	420	440
AUTOBRAKE 1	7410	720/-710	240	-360/1210	230/-250	210/-210	490	900	1490

Good Reported Braking Action

MAX MANUAL	4160	320/-310	110	-180/620	100/-80	100/-100	290	230	750
AUTOBRAKE MAX	4480	340/-340	110	-190/640	80/-70	110/-110	340	260	840
AUTOBRAKE 3	5810	470/-480	160	-240/810	40/-50	160/-160	540	60	210
AUTOBRAKE 2	6870	620/-630	210	-310/1040	140/-160	190/-190	500	420	440
AUTOBRAKE 1	7410	720/-710	240	-360/1210	230/-250	210/-210	490	900	1490

Medium Reported Braking Action

MAX MANUAL	5600	490/-470	160	-280/1000	230/-180	150/-150	370	610	2370
AUTOBRAKE MAX	5690	500/-490	170	-280/1010	200/-160	150/-150	430	620	2390
AUTOBRAKE 3	6230	530/-520	180	-300/1060	160/-130	170/-170	540	410	2150
AUTOBRAKE 2	7020	640/-640	210	-330/1170	220/-210	200/-200	500	510	1570
AUTOBRAKE 1	7440	730/-710	250	-360/1250	290/-260	210/-210	490	930	2080

Poor Reported Braking Action

MAX MANUAL	7120	680/-640	230	-400/1530	510/-350	190/-190	440	1230	6390
AUTOBRAKE MAX	7120	680/-640	230	-400/1530	500/-330	190/-190	470	1210	6400
AUTOBRAKE 3	7240	690/-650	230	-410/1540	470/-310	200/-200	530	1220	6440
AUTOBRAKE 2	7650	730/-700	240	-420/1590	480/-340	210/-210	500	1090	5940
AUTOBRAKE 1	7910	770/-760	260	-440/1630	510/-390	220/-220	490	1260	5990

Reference Distance is based on sea level, standard day, no wind or slope, VREF15 approach speed, two-engine detent No. 2 reverse thrust, and auto speedbrakes.

For maximum manual braking and manual speedbrakes, increase reference landing distance by 330 ft.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Normal Configuration Landing Distance
Flap 30

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	52000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 52000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 10 KTS ABOVE VREF30	ONE REV	NO REV

Dry Runway

MAX MANUAL	2740	330/-160	60	-100/340	30/-30	60/-60	210	40	140
AUTOBRAKE MAX	3510	260/-230	80	-130/430	0/0	80/-80	340	0	20
AUTOBRAKE 3	4950	380/-380	130	-220/730	20/-30	130/-130	510	40	50
AUTOBRAKE 2	5950	510/-520	170	-280/960	90/-130	160/-160	480	200	200
AUTOBRAKE 1	6450	600/-580	200	-330/1130	190/-210	180/-180	470	660	990

Good Reported Braking Action

MAX MANUAL	3750	270/-270	90	-170/590	90/-80	90/-90	290	180	630
AUTOBRAKE MAX	4000	290/-290	100	-170/610	70/-60	90/-90	340	210	690
AUTOBRAKE 3	4960	380/-380	130	-220/740	30/-40	130/-130	510	50	190
AUTOBRAKE 2	5950	510/-520	170	-280/960	90/-130	160/-160	480	200	200
AUTOBRAKE 1	6450	600/-580	200	-330/1130	190/-210	180/-180	470	660	990

Medium Reported Braking Action

MAX MANUAL	5000	420/-400	140	-260/950	210/-170	130/-130	370	490	1980
AUTOBRAKE MAX	5030	430/-410	140	-260/950	180/-140	130/-130	420	490	1970
AUTOBRAKE 3	5380	440/-430	150	-270/990	150/-120	140/-140	510	380	1910
AUTOBRAKE 2	6100	520/-530	180	-310/1090	170/-180	170/-170	480	290	1250
AUTOBRAKE 1	6480	600/-590	210	-330/1170	250/-220	180/-180	470	680	1540

Poor Reported Braking Action

MAX MANUAL	6330	580/-550	200	-380/1460	470/-320	160/-160	420	990	5350
AUTOBRAKE MAX	6330	580/-550	200	-380/1460	470/-310	160/-160	450	990	5380
AUTOBRAKE 3	6370	590/-560	200	-380/1470	450/-300	170/-170	480	1020	5400
AUTOBRAKE 2	6710	610/-590	210	-400/1510	430/-310	180/-180	470	790	5030
AUTOBRAKE 1	6940	650/-640	220	-410/1550	470/-350	190/-190	470	980	4960

Reference Distance is based on sea level, standard day, no wind or slope, VREF30 approach speed, two-engine detent No. 2 reverse thrust, and auto speedbrakes.

For maximum manual braking and manual speedbrakes, increase reference landing distance by 300 ft.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Normal Configuration Landing Distance
Flap 40

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
	52000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 52000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 10 KTS ABOVE VREF40	ONE REV	NO REV

Dry Runway

MAX MANUAL	2650	290/-150	50	-100/330	30/-30	50/-50	200	40	130
AUTOBRAKE MAX	3390	230/-220	70	-130/420	0/0	70/-70	330	0	10
AUTOBRAKE 3	4730	350/-360	120	-210/710	20/-40	120/-120	510	40	60
AUTOBRAKE 2	5640	470/-480	160	-270/930	100/-120	150/-150	500	210	210
AUTOBRAKE 1	6110	550/-540	190	-320/1100	180/-190	170/-170	490	570	940

Good Reported Braking Action

MAX MANUAL	3650	260/-250	90	-160/580	90/-80	80/-80	290	170	590
AUTOBRAKE MAX	3880	280/-270	100	-170/600	70/-60	90/-90	340	190	640
AUTOBRAKE 3	4740	350/-360	120	-210/720	40/-40	120/-120	510	40	200
AUTOBRAKE 2	5640	470/-480	160	-270/930	100/-120	150/-150	500	210	210
AUTOBRAKE 1	6110	550/-540	190	-320/1100	180/-190	170/-170	490	570	940

Medium Reported Braking Action

MAX MANUAL	4820	390/-380	130	-260/930	200/-160	120/-120	380	450	1800
AUTOBRAKE MAX	4860	400/-390	140	-260/940	180/-140	120/-120	440	440	1800
AUTOBRAKE 3	5160	410/-400	140	-270/970	150/-120	130/-130	510	350	1770
AUTOBRAKE 2	5790	480/-490	170	-300/1060	170/-170	160/-160	500	290	1180
AUTOBRAKE 1	6140	560/-540	190	-320/1140	230/-210	170/-170	490	600	1460

Poor Reported Braking Action

MAX MANUAL	6050	540/-510	180	-370/1430	450/-310	150/-160	440	880	4780
AUTOBRAKE MAX	6050	540/-510	180	-370/1430	450/-290	160/-160	460	880	4800
AUTOBRAKE 3	6100	550/-520	190	-370/1440	440/-300	160/-160	480	910	4850
AUTOBRAKE 2	6390	570/-550	190	-390/1470	420/-290	170/-170	500	740	4500
AUTOBRAKE 1	6600	600/-590	210	-400/1510	450/-330	180/-180	490	870	4480

Reference Distance is based on sea level, standard day, no wind or slope, VREF40 approach speed, two-engine detent No. 2 reverse thrust, and auto speedbrakes.

For maximum manual braking and manual speedbrakes, increase reference landing distance by 260 ft. Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

NON-NORMAL CONFIGURATION LANDING DISTANCE
ALL FLAPS UP LANDING
VREF40 + 55

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	4820	840/-410	170	-200/730	80/-70	160/-150	220	300	700
AUTOBRAKE MAX	5950	630/-330	170	-200/710	20/-20	170/-160	260	130	420
AUTOBRAKE 2	9980	760/-810	340	-380/1250	240/-250	300/-290	290	1300	1520

Good Reported Braking Action

MAX MANUAL	5620	580/-360	160	-210/710	120/-110	150/-150	160	530	1290
AUTOBRAKE MAX	6270	530/-370	170	-220/750	80/-70	170/-170	230	430	1260
AUTOBRAKE 2	9980	760/-810	340	-380/1250	240/-250	300/-290	290	1300	1520

Medium Reported Braking Action

MAX MANUAL	7660	560/-560	250	-320/1130	280/-230	220/-210	210	1400	3940
AUTOBRAKE MAX	7910	570/-570	250	-330/1150	260/-220	220/-220	230	1420	4010
AUTOBRAKE 3	9200	600/-660	280	-360/1260	220/-210	260/-260	300	880	3080

Poor Reported Braking Action

MAX MANUAL	9740	800/-780	350	-460/1710	610/-430	280/-270	240	2900	10200
AUTOBRAKE MAX	9790	800/-780	350	-470/1710	600/-410	280/-270	270	2870	10150
AUTOBRAKE 3	10320	790/-800	350	-480/1750	550/-410	300/-290	300	2570	9960

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
ANTI-SKID INOPERATIVE (Flap 15)

VREF15

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	5030	350/-350	130	-200/710	100/-90	120/-120	170	370	900
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	6330	500/-480	180	-290/1050	230/-180	160/-160	210	890	2460
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	7850	680/-650	250	-420/1580	500/-340	200/-200	240	1920	6520
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	10060	950/-890	350	-670/2760	2470/-740	260/-250	260	5740	8040
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
ANTI-SKID INOPERATIVE (Flap 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	4490	300/-300	110	-190/670	100/-80	100/-100	170	300	740
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	5610	420/-410	150	-280/1000	210/-170	140/-130	200	740	2020
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	6940	570/-550	210	-400/1510	470/-310	170/-170	230	1620	5400
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	8930	810/-760	300	-630/2660	2340/-680	220/-220	250	5050	9160
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
ANTI-SKID INOPERATIVE (Flap 40)

VREF40

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	4320	280/-280	100	-190/660	90/-80	100/-100	170	280	670
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	5370	390/-380	140	-270/980	200/-160	130/-130	200	670	1810
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	6600	530/-510	200	-390/1480	450/-300	160/-160	220	1470	4780
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	8480	750/-710	280	-610/2610	2250/-650	210/-210	240	4630	9610
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
JAMMED OR RESTRICTED FLIGHT CONTROLS (Flap 15)

VREF15

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	3310	500/-230	80	-120/440	40/-40	70/-70	120	110	250
AUTOBRAKE MAX	4210	380/-290	100	-150/500	10/0	100/-100	190	20	80
AUTOBRAKE 2	7190	620/-630	220	-310/1060	140/-160	200/-200	260	520	530

Good Reported Braking Action

MAX MANUAL	4310	310/-310	110	-180/620	100/-90	100/-100	150	340	810
AUTOBRAKE MAX	4670	340/-340	120	-190/650	90/-70	110/-110	170	370	890
AUTOBRAKE 2	7190	620/-630	220	-310/1060	140/-160	200/-200	260	520	530

Medium Reported Braking Action

MAX MANUAL	5790	480/-460	170	-280/1010	230/-180	150/-150	190	920	2520
AUTOBRAKE MAX	5940	490/-480	180	-280/1020	210/-170	160/-150	220	920	2540
AUTOBRAKE 3	6550	520/-520	190	-300/1080	150/-130	180/-180	280	620	2210

Poor Reported Braking Action

MAX MANUAL	7320	660/-620	240	-410/1540	500/-350	200/-190	220	1960	6620
AUTOBRAKE MAX	7360	670/-630	240	-410/1540	500/-340	200/-190	230	1940	6610
AUTOBRAKE 3	7560	670/-640	240	-410/1560	460/-310	210/-200	270	1910	6620

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
LEADING EDGE FLAPS TRANSIT (Flap 15)

VREF15 + 5

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	3490	570/-230	100	-120/490	50/-40	90/-80	150	130	290
AUTOBRAKE MAX	4410	420/-300	100	-150/520	10/-10	110/-110	210	10	70
AUTOBRAKE 2	7800	660/-690	250	-330/1110	110/-170	220/-220	300	420	420

Good Reported Braking Action

MAX MANUAL	4690	340/-340	130	-190/660	110/-100	120/-120	160	410	1020
AUTOBRAKE MAX	5010	360/-370	130	-200/680	100/-90	120/-120	190	440	1090
AUTOBRAKE 2	7810	660/-690	250	-330/1110	120/-180	220/-220	300	420	420

Medium Reported Braking Action

MAX MANUAL	6330	530/-510	200	-300/1060	260/-210	170/-170	210	1110	3150
AUTOBRAKE MAX	6410	540/-520	200	-300/1060	240/-190	170/-170	240	1100	3120
AUTOBRAKE 3	6980	550/-550	200	-320/1120	170/-120	190/-190	320	790	2860

Poor Reported Braking Action

MAX MANUAL	8020	740/-690	280	-430/1610	560/-390	220/-210	250	2350	8280
AUTOBRAKE MAX	8030	740/-690	280	-430/1610	570/-380	220/-220	250	2350	8290
AUTOBRAKE 3	8160	740/-690	280	-430/1620	530/-330	230/-220	310	2310	8220

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
LOSS OF SYSTEM A (Flap 15)

VREF15

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	3810	460/-250	90	-130/430	60/-60	90/-90	190	80	310
AUTOBRAKE MAX	4250	390/-290	100	-150/490	20/-10	100/-100	200	10	230
AUTOBRAKE 2	7740	640/-680	230	-330/1110	20/-80	230/-220	390	40	40

Good Reported Braking Action

MAX MANUAL	5420	420/-410	150	-220/740	160/-140	140/-140	250	470	1490
AUTOBRAKE MAX	5400	420/-410	150	-220/740	170/-120	140/-140	250	490	1480
AUTOBRAKE 2	7740	640/-680	230	-330/1110	20/-80	230/-220	390	40	40

Medium Reported Braking Action

MAX MANUAL	7160	630/-600	230	-330/1150	340/-270	190/-190	290	1310	4580
AUTOBRAKE MAX	7160	630/-600	230	-330/1150	350/-280	190/-190	290	1320	4580
AUTOBRAKE 3	7170	630/-570	230	-330/1150	340/-240	190/-190	310	1310	4570

Poor Reported Braking Action

MAX MANUAL	8880	850/-780	310	-470/1710	680/-470	240/-240	320	2750	11830
AUTOBRAKE MAX	8900	850/-790	310	-470/1720	690/-480	240/-240	320	2760	11860
AUTOBRAKE 3	8900	850/-780	310	-470/1720	690/-480	240/-240	320	2760	11860

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
LOSS OF SYSTEM A (Flap 30)

VREF30

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	3610	250/-230	80	-130/430	70/-60	80/-80	230	80	310
AUTOBRAKE MAX	3800	250/-250	90	-140/460	30/-20	90/-90	210	50	280
AUTOBRAKE 2	6520	510/-530	180	-300/1010	0/-30	190/-190	380	0	0

Good Reported Braking Action

MAX MANUAL	4990	370/-360	140	-210/720	160/-140	120/-120	280	420	1380
AUTOBRAKE MAX	4990	370/-370	140	-210/720	170/-140	120/-120	280	420	1380
AUTOBRAKE 2	6570	500/-530	180	-300/1020	50/-60	190/-190	390	-30	60

Medium Reported Braking Action

MAX MANUAL	6440	540/-510	200	-310/1110	330/-260	170/-160	300	1130	3980
AUTOBRAKE MAX	6450	550/-520	200	-310/1110	330/-270	170/-170	300	1140	3990
AUTOBRAKE 3	6450	550/-510	200	-310/1110	330/-260	170/-170	300	1140	3990

Poor Reported Braking Action

MAX MANUAL	7880	720/-670	270	-440/1640	640/-440	210/-200	310	2320	9810
AUTOBRAKE MAX	7900	720/-670	270	-440/1640	650/-440	210/-200	310	2330	9840
AUTOBRAKE 3	7900	720/-670	270	-440/1640	650/-440	210/-200	310	2330	9840

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
LOSS OF SYSTEM A (Flap 40)

VREF40

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	3500	220/-220	80	-130/420	70/-60	80/-80	230	70	280
AUTOBRAKE MAX	3680	230/-240	80	-130/450	30/-20	80/-80	210	50	260
AUTOBRAKE 2	6220	470/-500	170	-290/990	0/-40	180/-180	360	0	0

Good Reported Braking Action

MAX MANUAL	4760	340/-340	130	-200/700	150/-130	120/-120	260	370	1190
AUTOBRAKE MAX	4760	350/-340	130	-200/700	160/-140	120/-120	270	370	1190
AUTOBRAKE 2	6240	470/-490	170	-290/990	40/-50	180/-180	370	-10	10

Medium Reported Braking Action

MAX MANUAL	6070	490/-470	180	-300/1080	300/-240	160/-150	280	970	3290
AUTOBRAKE MAX	6080	500/-470	190	-300/1080	310/-250	160/-150	280	980	3300
AUTOBRAKE 3	6080	500/-470	190	-300/1080	310/-250	160/-150	280	980	3300

Poor Reported Braking Action

MAX MANUAL	7380	650/-610	240	-430/1590	600/-400	190/-190	280	1990	7880
AUTOBRAKE MAX	7400	660/-610	250	-430/1600	600/-410	190/-190	280	2000	7900
AUTOBRAKE 3	7400	660/-610	250	-430/1600	600/-410	190/-190	280	2000	7900

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
LOSS OF SYSTEM B (Flap 15)

VREF15

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	3750	590/-270	100	-140/530	60/-60	90/-90	140	100	330
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	4500	360/-320	120	-190/640	100/-90	110/-110	160	250	760
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	6110	500/-480	180	-290/1040	250/-200	160/-160	200	820	2600
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	7790	700/-660	260	-420/1590	540/-380	210/-200	240	1940	7250
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
MANUAL REVERSION or LOSS OF SYSTEM A and SYSTEM B (Flap 15)

VREF15

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	5740	630/-440	160	-230/760	180/-160	150/-140	290	490	1530
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Good Reported Braking Action

MAX MANUAL	5820	600/-440	160	-230/780	190/-160	150/-150	290	520	1620
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 2	Autobrake Inoperative								

Medium Reported Braking Action

MAX MANUAL	7650	670/-630	240	-340/1200	380/-310	200/-200	330	1450	5130
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Poor Reported Braking Action

MAX MANUAL	9420	900/-830	330	-480/1770	740/-510	260/-250	350	3000	13410
AUTOBRAKE MAX	Autobrake Inoperative								
AUTOBRAKE 3	Autobrake Inoperative								

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
ONE ENGINE INOPERATIVE LANDING (Flap 15)

VREF15

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	3380	550/-240	90	-120/460	50/-40	80/-80	130	0	130
AUTOBRAKE MAX	4220	460/-290	100	-150/510	10/-10	100/-100	200	0	50
AUTOBRAKE 2	7680	620/-640	220	-330/1110	40/-110	220/-220	340	0	20

Good Reported Braking Action

MAX MANUAL	4550	330/-330	120	-190/670	120/-100	120/-120	160	0	440
AUTOBRAKE MAX	4950	360/-360	130	-200/700	110/-90	120/-120	190	0	490
AUTOBRAKE 2	7680	620/-640	220	-330/1110	40/-110	220/-220	340	0	20

Medium Reported Braking Action

MAX MANUAL	6440	530/-520	190	-310/1120	310/-250	180/-180	220	0	1410
AUTOBRAKE MAX	6610	550/-540	200	-320/1140	290/-230	180/-180	250	0	1420
AUTOBRAKE 3	6940	560/-560	200	-330/1160	260/-210	190/-190	280	0	1360

Poor Reported Braking Action

MAX MANUAL	8620	780/-750	280	-480/1790	770/-510	250/-240	270	0	3580
AUTOBRAKE MAX	8640	780/-750	280	-480/1790	780/-490	250/-240	290	0	3580
AUTOBRAKE 3	8820	790/-770	290	-490/1810	760/-520	250/-250	270	0	3640

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
STABILIZER TRIM INOPERATIVE (Flap 15)

VREF15

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	3310	500/-230	80	-120/440	40/-40	70/-70	120	110	250
AUTOBRAKE MAX	4210	380/-290	100	-150/500	10/0	100/-100	190	20	80
AUTOBRAKE 2	7190	620/-630	220	-310/1060	140/-160	200/-200	260	520	530

Good Reported Braking Action

MAX MANUAL	4310	310/-310	110	-180/620	100/-90	100/-100	150	340	810
AUTOBRAKE MAX	4670	340/-340	120	-190/650	90/-70	110/-110	170	370	890
AUTOBRAKE 2	7190	620/-630	220	-310/1060	140/-160	200/-200	260	520	530

Medium Reported Braking Action

MAX MANUAL	5790	480/-460	170	-280/1010	230/-180	150/-150	190	920	2520
AUTOBRAKE MAX	5940	490/-480	180	-280/1020	210/-170	160/-150	220	920	2540
AUTOBRAKE 3	6550	520/-520	190	-300/1080	150/-130	180/-180	280	620	2210

Poor Reported Braking Action

MAX MANUAL	7320	660/-620	240	-410/1540	500/-350	200/-190	220	1960	6620
AUTOBRAKE MAX	7360	670/-630	240	-410/1540	500/-340	200/-190	230	1940	6610
AUTOBRAKE 3	7560	670/-640	240	-410/1560	460/-310	210/-200	270	1910	6620

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
TRAILING EDGE FLAP ASYMMETRY (1 ≤ Flap Lever < 15)

VREF40 + 30

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	3780	590/-280	110	-140/570	50/-50	110/-100	170	170	380
AUTOBRAKE MAX	4790	420/-280	120	-170/580	10/-10	120/-120	220	50	180
AUTOBRAKE 2	8110	640/-660	260	-340/1120	180/-190	240/-230	270	800	850

Good Reported Braking Action

MAX MANUAL	4650	320/-300	120	-190/640	100/-90	120/-120	140	380	920
AUTOBRAKE MAX	5110	330/-310	130	-200/680	70/-50	130/-130	210	370	970
AUTOBRAKE 2	8110	640/-660	260	-340/1120	180/-190	240/-230	270	800	850

Medium Reported Braking Action

MAX MANUAL	6310	470/-460	190	-290/1040	240/-190	170/-170	190	1040	2900
AUTOBRAKE MAX	6510	480/-470	200	-290/1050	220/-180	170/-170	220	1060	2930
AUTOBRAKE 3	7410	500/-530	210	-320/1140	150/-150	210/-200	290	640	2320

Poor Reported Braking Action

MAX MANUAL	8050	670/-640	270	-420/1590	530/-370	220/-220	230	2240	7720
AUTOBRAKE MAX	8080	670/-640	270	-420/1590	520/-350	220/-220	250	2210	7680
AUTOBRAKE 3	8420	660/-650	270	-430/1620	470/-330	240/-230	280	2070	7620

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
TRAILING EDGE FLAP ASYMMETRY (Flap Lever = 15 or 25)

VREF15

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/ BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	3310	500/-230	80	-120/440	40/-40	70/-70	120	110	250
AUTOBRAKE MAX	4210	380/-290	100	-150/500	10/0	100/-100	190	20	80
AUTOBRAKE 2	7190	620/-630	220	-310/1060	140/-160	200/-200	260	520	530

Good Reported Braking Action

MAX MANUAL	4310	310/-310	110	-180/620	100/-90	100/-100	150	340	810
AUTOBRAKE MAX	4670	340/-340	120	-190/650	90/-70	110/-110	170	370	890
AUTOBRAKE 2	7190	620/-630	220	-310/1060	140/-160	200/-200	260	520	530

Medium Reported Braking Action

MAX MANUAL	5790	480/-460	170	-280/1010	230/-180	150/-150	190	920	2520
AUTOBRAKE MAX	5940	490/-480	180	-280/1020	210/-170	160/-150	220	920	2540
AUTOBRAKE 3	6550	520/-520	190	-300/1080	150/-130	180/-180	280	620	2210

Poor Reported Braking Action

MAX MANUAL	7320	660/-620	240	-410/1540	500/-350	200/-190	220	1960	6620
AUTOBRAKE MAX	7360	670/-630	240	-410/1540	500/-340	200/-190	230	1940	6610
AUTOBRAKE 3	7560	670/-640	240	-410/1560	460/-310	210/-200	270	1910	6620

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
TRAILING EDGE FLAP ASYMMETRY (Flap Lever = 30)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	2900	360/-170	60	-110/360	40/-30	60/-60	110	80	170
AUTOBRAKE MAX	3650	280/-230	80	-130/450	10/0	80/-80	180	10	40
AUTOBRAKE 2	6230	500/-520	180	-290/980	90/-130	170/-170	250	250	250

Good Reported Braking Action

MAX MANUAL	3880	270/-260	100	-170/590	90/-80	90/-90	150	280	680
AUTOBRAKE MAX	4180	290/-290	100	-180/620	80/-70	100/-100	170	310	730
AUTOBRAKE 2	6230	500/-520	180	-290/980	100/-130	170/-170	250	250	250

Medium Reported Braking Action

MAX MANUAL	5160	410/-390	150	-260/960	210/-170	130/-130	180	770	2100
AUTOBRAKE MAX	5270	420/-410	150	-270/970	190/-150	130/-130	210	770	2090
AUTOBRAKE 3	5650	430/-420	160	-280/1010	150/-110	150/-150	270	600	1970

Poor Reported Braking Action

MAX MANUAL	6510	570/-530	210	-380/1470	470/-320	170/-170	210	1660	5520
AUTOBRAKE MAX	6540	570/-530	210	-380/1470	470/-320	170/-170	220	1660	5530
AUTOBRAKE 3	6640	580/-540	210	-390/1480	450/-300	170/-170	250	1680	5550

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
TRAILING EDGE FLAP DISAGREE (1 ≤ Indicated Flaps < 15)

VREF40 + 30

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	3780	590/-280	110	-140/570	50/-50	110/-100	170	170	380
AUTOBRAKE MAX	4790	420/-280	120	-170/580	10/-10	120/-120	220	50	180
AUTOBRAKE 2	8110	640/-660	260	-340/1120	180/-190	240/-230	270	800	850

Good Reported Braking Action

MAX MANUAL	4650	320/-300	120	-190/640	100/-90	120/-120	140	380	920
AUTOBRAKE MAX	5110	330/-310	130	-200/680	70/-50	130/-130	210	370	970
AUTOBRAKE 2	8110	640/-660	260	-340/1120	180/-190	240/-230	270	800	850

Medium Reported Braking Action

MAX MANUAL	6310	470/-460	190	-290/1040	240/-190	170/-170	190	1040	2900
AUTOBRAKE MAX	6510	480/-470	200	-290/1050	220/-180	170/-170	220	1060	2930
AUTOBRAKE 3	7410	500/-530	210	-320/1140	150/-150	210/-200	290	640	2320

Poor Reported Braking Action

MAX MANUAL	8050	670/-640	270	-420/1590	530/-370	220/-220	230	2240	7720
AUTOBRAKE MAX	8080	670/-640	270	-420/1590	520/-350	220/-220	250	2210	7680
AUTOBRAKE 3	8420	660/-650	270	-430/1620	470/-330	240/-230	280	2070	7620

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
TRAILING EDGE FLAP DISAGREE (15 ≤ Indicated Flaps < 30)

VREF15

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (FT)							
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	3310	500/-230	80	-120/440	40/-40	70/-70	120	110	250
AUTOBRAKE MAX	4210	380/-290	100	-150/500	10/0	100/-100	190	20	80
AUTOBRAKE 2	7190	620/-630	220	-310/1060	140/-160	200/-200	260	520	530

Good Reported Braking Action

MAX MANUAL	4310	310/-310	110	-180/620	100/-90	100/-100	150	340	810
AUTOBRAKE MAX	4670	340/-340	120	-190/650	90/-70	110/-110	170	370	890
AUTOBRAKE 2	7190	620/-630	220	-310/1060	140/-160	200/-200	260	520	530

Medium Reported Braking Action

MAX MANUAL	5790	480/-460	170	-280/1010	230/-180	150/-150	190	920	2520
AUTOBRAKE MAX	5940	490/-480	180	-280/1020	210/-170	160/-150	220	920	2540
AUTOBRAKE 3	6550	520/-520	190	-300/1080	150/-130	180/-180	280	620	2210

Poor Reported Braking Action

MAX MANUAL	7320	660/-620	240	-410/1540	500/-350	200/-190	220	1960	6620
AUTOBRAKE MAX	7360	670/-630	240	-410/1540	500/-340	200/-190	230	1940	6610
AUTOBRAKE 3	7560	670/-640	240	-410/1560	460/-310	210/-200	270	1910	6620

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
TRAILING EDGE FLAP DISAGREE (30 ≤ Indicated Flaps < 40)

VREF30

	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	2900	360/-170	60	-110/360	40/-30	60/-60	110	80	170
AUTOBRAKE MAX	3650	280/-230	80	-130/450	10/0	80/-80	180	10	40
AUTOBRAKE 2	6230	500/-520	180	-290/980	90/-130	170/-170	250	250	250

Good Reported Braking Action

MAX MANUAL	3880	270/-260	100	-170/590	90/-80	90/-90	150	280	680
AUTOBRAKE MAX	4180	290/-290	100	-180/620	80/-70	100/-100	170	310	730
AUTOBRAKE 2	6230	500/-520	180	-290/980	100/-130	170/-170	250	250	250

Medium Reported Braking Action

MAX MANUAL	5160	410/-390	150	-260/960	210/-170	130/-130	180	770	2100
AUTOBRAKE MAX	5270	420/-410	150	-270/970	190/-150	130/-130	210	770	2090
AUTOBRAKE 3	5650	430/-420	160	-280/1010	150/-110	150/-150	270	600	1970

Poor Reported Braking Action

MAX MANUAL	6510	570/-530	210	-380/1470	470/-320	170/-170	210	1660	5520
AUTOBRAKE MAX	6540	570/-530	210	-380/1470	470/-320	170/-170	220	1660	5530
AUTOBRAKE 3	6640	580/-540	210	-390/1480	450/-300	170/-170	250	1680	5550

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Non-Normal Configuration Landing Distance
TRAILING EDGE FLAPS UP LANDING

VREF40 + 40

BRAKING CONFIGURATION	LANDING DISTANCE AND ADJUSTMENTS (FT)								
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ	SLOPE ADJ	TEMP ADJ	APP SPD ADJ	REVERSE THRUST ADJ	
	55000 KG LANDING WEIGHT	PER 5000 KG ABV/BLW 55000 KG	PER 1000 FT ABOVE SEA LEVEL	PER 10 KTS HEAD/ TAIL WIND	PER 1% DOWN/ UP HILL	PER 10°C ABV/BLW ISA	PER 5 KTS ABOVE VREF	ONE REV	NO REV

Dry Runway

MAX MANUAL	4150	670/-330	130	-170/630	60/-60	130/-120	190	210	490
AUTOBRAKE MAX	5230	490/-300	140	-180/630	20/-20	140/-140	230	70	260
AUTOBRAKE 2	8770	680/-710	290	-350/1170	210/-210	260/-250	270	1010	1150

Good Reported Braking Action

MAX MANUAL	4990	400/-320	140	-190/670	110/-90	130/-130	150	430	1040
AUTOBRAKE MAX	5540	390/-330	150	-210/710	60/-60	140/-140	220	380	1050
AUTOBRAKE 2	8770	680/-710	290	-350/1170	210/-210	260/-250	270	1010	1150

Medium Reported Braking Action

MAX MANUAL	6780	500/-500	210	-300/1070	250/-210	190/-180	190	1150	3210
AUTOBRAKE MAX	7010	510/-510	220	-310/1090	230/-200	190/-190	220	1170	3260
AUTOBRAKE 3	8060	540/-580	240	-340/1180	190/-180	230/-230	280	710	2530

Poor Reported Braking Action

MAX MANUAL	8630	720/-690	300	-440/1630	550/-390	240/-240	230	2440	8420
AUTOBRAKE MAX	8680	710/-690	300	-440/1630	540/-370	240/-240	250	2410	8370
AUTOBRAKE 3	9100	710/-710	300	-450/1670	500/-360	260/-250	280	2190	8250

Reference Distance is based on sea level, standard day, no wind or slope, and maximum available reverse thrust.

MAX MANUAL assumes maximum achievable manual braking.

Reference Distance includes an air distance allowance of 1000 ft from threshold to touchdown. Actual (unfactored) distances are shown.

Recommended Brake Cooling Schedule

Reference Brake Energy Per Brake (Millions of Foot Pounds)

		WIND CORRECTED BRAKES ON SPEED (KIAS)*														
		60			80			100			120			140		
WEIGHT (1000 KG)	OAT (°C)	PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT			PRESS ALT		
		0	4	8	0	4	8	0	4	8	0	4	8	0	4	8
70	-20	6.6	7.4	8.3	11.1	12.5	14.1	16.5	18.7	21.4	22.9	26.0	29.7	30.0	34.1	38.9
	0	7.1	7.9	8.8	11.9	13.4	15.1	17.7	20.1	22.9	24.5	27.9	31.9	32.2	36.6	41.7
	15	7.4	8.3	9.3	12.5	14.1	15.9	18.7	21.2	24.2	25.9	29.4	33.6	33.9	38.5	43.9
	20	7.5	8.4	9.4	12.7	14.3	16.2	19.0	21.5	24.6	26.3	29.9	34.1	34.5	39.2	44.6
	40	7.9	8.8	9.8	13.3	15.0	17.0	20.0	22.7	25.9	27.8	31.6	36.1	36.4	41.4	47.1
65	-20	6.2	6.9	7.8	10.4	11.7	13.2	15.5	17.5	20.0	21.4	24.3	27.8	28.0	31.8	36.3
	0	6.7	7.4	8.3	11.1	12.5	14.1	16.6	18.8	21.4	22.9	26.0	29.7	30.0	34.1	39.0
	15	7.0	7.8	8.7	11.7	13.2	14.9	17.5	19.8	22.6	24.2	27.4	31.4	31.7	36.0	41.0
	20	7.1	7.9	8.8	11.9	13.4	15.2	17.8	20.1	23.0	24.6	27.9	31.9	32.2	36.6	41.7
	40	7.4	8.2	9.2	12.5	14.0	15.9	18.7	21.2	24.2	25.9	29.5	33.7	34.0	38.6	44.1
60	-20	5.8	6.5	7.2	9.7	10.9	12.3	14.4	16.3	18.6	19.9	22.6	25.8	26.0	29.6	33.8
	0	6.3	7.0	7.8	10.4	11.7	13.2	15.4	17.5	19.9	21.3	24.2	27.6	27.9	31.7	36.2
	15	6.6	7.3	8.1	10.9	12.3	13.9	16.3	18.4	21.0	22.5	25.5	29.1	29.4	33.4	38.1
	20	6.7	7.4	8.3	11.1	12.5	14.1	16.5	18.7	21.3	22.8	25.9	29.6	29.9	34.0	38.8
	40	6.9	7.7	8.6	11.6	13.1	14.8	17.4	19.7	22.5	24.1	27.4	31.3	31.6	35.9	41.0
55	-20	5.5	6.1	6.8	9.0	10.1	11.4	13.4	15.1	17.2	18.4	20.8	23.8	24.0	27.2	31.1
	0	5.9	6.5	7.2	9.7	10.8	12.2	14.3	16.2	18.4	19.7	22.3	25.5	25.7	29.2	33.4
	15	6.1	6.8	7.6	10.2	11.4	12.8	15.1	17.0	19.4	20.7	23.5	26.9	27.1	30.8	35.2
	20	6.2	6.9	7.7	10.3	11.6	13.0	15.3	17.3	19.7	21.1	23.9	27.3	27.6	31.3	35.8
	40	6.5	7.2	8.0	10.8	12.1	13.7	16.1	18.2	20.8	22.2	25.2	28.8	29.1	33.1	37.8
50	-20	5.1	5.6	6.3	8.3	9.3	10.5	12.3	13.9	15.7	16.8	19.1	21.8	21.9	24.9	28.5
	0	5.4	6.0	6.7	8.9	10.0	11.2	13.2	14.8	16.9	18.0	20.4	23.3	23.5	26.7	30.5
	15	5.7	6.3	7.0	9.4	10.5	11.8	13.8	15.6	17.8	19.0	21.5	24.6	24.8	28.1	32.2
	20	5.8	6.4	7.1	9.5	10.7	12.0	14.1	15.9	18.1	19.3	21.9	25.0	25.2	28.6	32.7
	40	6.0	6.7	7.4	10.0	11.2	12.6	14.8	16.7	19.0	20.3	23.1	26.4	26.6	30.2	34.5
45	-20	4.7	5.2	5.8	7.7	8.6	9.6	11.2	12.6	14.3	15.3	17.3	19.7	19.9	22.5	25.7
	0	5.0	5.6	6.2	8.2	9.2	10.3	12.0	13.5	15.3	16.4	18.5	21.1	21.3	24.1	27.6
	15	5.3	5.8	6.5	8.6	9.6	10.8	12.6	14.2	16.1	17.3	19.5	22.3	22.4	25.4	29.1
	20	5.3	5.9	6.6	8.7	9.8	11.0	12.8	14.5	16.4	17.5	19.9	22.7	22.8	25.9	29.6
	40	5.5	6.2	6.8	9.1	10.2	11.5	13.5	15.2	17.3	18.5	20.9	23.9	24.0	27.3	31.2
40	-20	4.3	4.8	5.3	7.0	7.8	8.7	10.1	11.4	12.9	13.7	15.5	17.7	17.7	20.1	23.0
	0	4.6	5.1	5.7	7.5	8.3	9.3	10.9	12.2	13.8	14.7	16.6	18.9	19.0	21.5	24.6
	15	4.9	5.4	5.9	7.8	8.8	9.8	11.4	12.8	14.5	15.5	17.5	20.0	20.0	22.7	26.0
	20	4.9	5.4	6.0	8.0	8.9	10.0	11.6	13.0	14.8	15.8	17.8	20.3	20.4	23.1	26.4
	40	5.1	5.6	6.3	8.3	9.3	10.4	12.1	13.7	15.5	16.6	18.8	21.4	21.5	24.4	27.9

* **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**.

Recommended Brake Cooling Schedule
Adjusted Brake Energy Per Brake (Millions of Foot Pounds)
No Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)						
EVENT		10	15	20	25	30	35	40
RTO MAX MAN		10	15	20	25	30	35	40
LANDING	MAX MAN	8.6	13.3	18.1	22.8	27.5	32.3	37.0
	MAX AUTO	8.1	12.3	16.6	21.0	25.4	29.9	34.4
	AUTOBRAKE 3	8.0	11.6	15.3	19.2	23.1	27.1	31.2
	AUTOBRAKE 2	7.8	11.0	14.3	17.6	21.1	24.6	28.3
	AUTOBRAKE 1	7.5	10.4	13.4	16.3	19.4	22.5	25.6

Two Engine Detent Reverse Thrust

		REFERENCE BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)						
EVENT		10	15	20	25	30	35	40
RTO MAX MAN		10	15	20	25	30	35	40
LANDING	MAX MAN	8.2	12.5	16.7	20.9	25.0	29.0	33.0
	MAX AUTO	6.0	9.4	12.8	16.4	20.1	23.8	27.7
	AUTOBRAKE 3	3.2	5.2	7.4	9.7	12.2	14.8	17.5
	AUTOBRAKE 2	1.4	2.5	3.8	5.2	6.8	8.5	10.3
	AUTOBRAKE 1	0.6	1.3	2.1	3.0	3.9	5.0	6.2

Cooling Time (Minutes) - Category A Brakes

	ADJUSTED BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)							
	8 & BELOW	10	12	14	16	18	18.5 TO 23.7	23.8 & ABOVE
	BRAKE TEMPERATURE INDICATOR READING							
	UP TO 2.1	2.8	3.2	3.6	4.2	4.8	4.9 to 6.3	6.3 & ABOVE
IN-FLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	2	3	4	5	6	CAUTION	FUSE PLUG MELT ZONE
GROUND		19	32	43	53	61		

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after 1 hour. If overheat occurs after takeoff, extend gear soon for at least 7 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not approach gear or attempt to taxi for 1 hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake Temperature Indicator (if installed) on F/O's Instrument Panel may be used 10 to 15 minutes after brake application to determine recommended cooling time.

Recommended Brake Cooling Schedule
Cooling Time (Minutes) - Category B Brakes

	ADJUSTED BRAKE ENERGY PER BRAKE (MILLIONS OF FOOT POUNDS)								
	8 & BELOW	10	12	14	16	18	20	21.0 TO 28.7	28.8 & ABOVE
	BRAKE TEMPERATURE INDICATOR READING								
	UP TO 2.1	2.8	3.2	3.6	4.2	4.8	5.4	5.6 TO 7.6	7.6 & ABOVE
IN-FLIGHT GEAR DOWN	NO SPECIAL PROCEDURE REQUIRED	2	3	4	5	6	7	CAUTION	FUSE PLUG MELT ZONE
GROUND		19	32	43	53	61	67		

Observe maximum quick turnaround limit.

Table shows energy per brake added by a single stop with all brakes operating. Energy is assumed to be equally distributed among the operating brakes. Total energy is the sum of residual energy plus energy added.

Add 1.0 million foot pounds for each taxi mile.

When in caution zone, wheel fuse plugs may melt. Delay takeoff and inspect after 1 hour. If overheat occurs after takeoff, extend gear soon for at least 7 minutes.

When in fuse plug melt zone, clear runway immediately. Unless required, do not set parking brake. Do not approach gear or attempt to taxi for 1 hour. Tire, wheel and brake replacement may be required. If overheat occurs after takeoff, extend gear soon for at least 12 minutes.

Brake Temperature Indicator (if installed) on F/O's Instrument Panel may be used 10 to 15 minutes after brake application to determine recommended cooling time.

Chapter PI - Performance Inflight
Section 13 - Engine Inoperative

ENGINE INOP

Initial Max Continuous %N1

Based On .74M, Engine Bleed To Packs Auto and Anti-Ice Off

TAT (°C)	PRESSURE ALTITUDE (1000 FT)					
	27	29	31	33	35	37
20	95.2	95.2	95.2	95.2	95.1	95.1
15	95.8	95.8	95.8	958	95.7	95.7
10	96.1	96.1	96.1	96.1	96.0	96.0
5	96.6	96.6	96.6	96.6	96.5	96.5
0	97.1	97.1	97.1	97.1	97.0	97.0
-5	96.6	97.7	97.7	97.7	97.6	97.6
-10	95.7	96.9	98.1	98.7	98.0	98.0
-15	94.8	96.0	97.1	98.4	98.3	98.3
-20	93.9	95.1	96.2	97.4	98.4	98.7
-25	92.9	94.1	95.3	96.5	97.5	98.0
-30	92.0	93.2	94.3	95.5	96.5	97.0
-40	90.1	91.3	92.3	93.5	94.5	95.0
-50	88.1	89.3	90.3	91.5	92.4	93.0

%N1 Adjustment for Engine Bleeds

BLEED CONFIGURATION	PRESSURE ALTITUDE (1000 FT)						
	25	27	29	31	33	35	37
ENGINE ANTI-ICE ON	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9	-1.0
ENGINE AND WING ANTI-ICE ON	-2.9	-2.9	-2.9	-2.8	-2.8	-2.8	-2.9

ENGINE INOP

Max Continuous %N1

33000 FT to 23000 FT Pressure Altitudes
Based On Engine Bleed To Packs Auto and Anti-Ice Off

33000 FT PRESS ALT.		TAT (×C)										
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25
200	.58	92.3	94.4	96.4	97.1	96.5	96.0	95.7				
220	.63	92.2	94.3	96.3	97.8	97.1	96.4	96.1	95.7	95.3		
240	.68	92.1	94.2	96.2	98.1	97.8	96.9	96.4	96.0			
260	.74	91.4	93.5	95.5	97.4	98.0	97.0	96.6	96.1	95.6		
31000 FT PRESS ALT.		TAT (×C)										
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25
200	.55	91.5	93.5	95.5	97.0	96.4	95.8	95.5				
220	.61	91.3	93.3	95.3	97.2	96.8	96.2	95.9	95.6	95.3		
240	.66	91.1	93.1	95.1	97.1	97.4	96.7	96.3	95.9	95.5		
260	.71	90.9	92.9	94.9	96.8	98.0	97.0	96.5	96.1	95.6		
29000 FT PRESS ALT.		TAT (×C)										
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25
200	.53	90.6	92.6	94.6	96.5	96.2	95.6	95.4	95.1			
220	.58	90.4	92.4	94.4	96.3	96.6	96.1	95.8	95.5	95.1		
240	.63	90.2	92.2	94.1	96.1	97.1	96.5	96.1	95.8	95.4		
260	.68	90.0	92.0	93.9	95.9	97.7	96.9	96.4	96.0	95.6	95.1	
27000 FT PRESS ALT.		TAT (×C)										
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25
200	.51	89.8	91.8	93.8	95.7	96.0	95.5	95.2	94.9			
220	.56	89.6	91.6	93.5	95.4	96.4	95.9	95.6	95.3	95.0	94.6	
240	.60	89.3	91.3	93.2	95.1	96.9	96.3	96.0	97.7	95.3	95.0	
260	.65	89.1	91.0	93.0	94.9	96.7	96.7	96.3	95.9	95.5	95.1	
25000 FT PRESS ALT.		TAT (×C)										
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25
200	.49	89.0	91.0	92.9	94.8	95.9	95.4	95.1	94.8	94.5		
220	.53	88.8	90.7	92.7	94.6	96.3	95.7	95.4	95.1	94.8	94.5	
240	.58	88.5	90.5	92.4	94.3	96.1	96.1	95.8	95.5	95.2	94.8	
260	.63	88.2	90.2	92.1	94.0	95.8	96.5	96.1	95.8	95.4	95.0	94.6
23000 FT PRESS ALT.		TAT (×C)										
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25
200	.47	88.2	90.1	92.0	93.9	95.7	95.3	95.0	94.4	94.0		
220	.51	88.0	89.9	91.8	93.7	95.5	95.6	95.3	95.0	94.7	94.4	
240	.56	87.7	89.7	91.6	93.4	95.3	95.9	95.7	95.4	95.0	94.7	94.3
260	.60	87.5	89.4	91.3	93.2	95.0	96.3	96.0	95.7	95.4	95.0	94.6

Anti-Ice Adjustments

BLEED CONFIGURATION	PRESS ALT (1000 FT)					
	23	25	27	29	31	33
ENGINE ANTI-ICE ON	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9
ENGINE AND WING ANTI-ICE ON	-2.9	-2.9	-2.9	-2.9	-2.8	-2.8

ENGINE INOP

Max Continuous %N1
21000 FT to 14000 FT Pressure Altitudes
Based On Engine Bleed To Packs Auto and Anti-Ice Off

21000 FT PRESS ALT.		TAT (×C)											
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25	30
200	.45	87.3	89.3	91.2	93.0	94.8	95.1	94.9	94.6	94.3	93.9		
220	.49	87.2	89.1	91.0	92.9	94.7	95.4	95.1	94.9	94.6	94.2	93.9	93.5
240	.54	86.9	88.9	90.8	92.6	94.4	95.8	95.5	95.2	94.9	94.5	94.2	
260	.60	86.7	88.6	90.5	92.3	94.1	95.9	95.8	95.5	95.2	94.8	94.5	94.0
20000 FT PRESS ALT.		TAT (×C)											
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25	30
200	.44	86.9	88.9	90.7	92.6	94.4	95.1	94.8	94.5	94.2	93.9	93.5	
220	.48	86.8	88.7	90.6	92.4	94.2	95.4	95.1	94.8	94.5	94.2	93.8	93.4
240	.53	86.6	88.5	90.4	92.2	94.0	95.7	95.4	95.1	94.8	94.5	94.1	93.7
260	.57	86.3	88.2	90.1	91.9	93.7	95.5	95.8	95.5	95.1	94.8	94.4	94.0
18000 FT PRESS ALT.		TAT (×C)											
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25	30
200	.42	86.1	88.0	89.9	91.7	93.5	95.0	94.7	94.4	94.1	93.8	93.4	
220	.46	86.0	87.9	89.7	91.6	93.4	95.1	95.0	94.7	94.4	94.1	93.7	93.3
240	.51	85.8	87.7	89.6	91.4	93.2	94.9	95.3	95.0	94.7	94.3	94.0	93.6
260	.55	85.6	87.4	89.3	91.1	92.9	94.7	95.5	95.3	95.0	94.6	94.3	93.8
17000 FT PRESS ALT.		TAT (×C)											
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25	30
200	.42	85.7	87.6	89.5	91.3	93.1	94.9	94.7	94.4	94.1	93.7	93.3	92.9
220	.46	85.6	87.5	89.3	91.1	92.9	94.7	94.9	94.6	94.3	94.0	93.6	93.2
240	.50	85.4	87.3	89.2	91.0	92.8	94.5	95.2	94.9	94.6	94.3	93.9	93.5
260	.54	85.2	87.1	88.9	90.7	92.5	94.2	95.1	95.2	94.9	94.6	94.2	93.8
16000 FT PRESS ALT.		TAT (×C)											
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25	30
200	.41	85.4	87.2	89.1	90.9	92.7	94.4	94.6	94.3	94.0	93.6	93.3	92.8
220	.45	85.2	87.1	88.9	90.7	92.5	94.3	94.9	94.6	94.3	93.9	93.6	93.1
240	.49	85.0	86.9	88.8	90.6	92.3	94.1	94.9	94.8	94.5	94.2	93.8	93.5
260	.53	84.8	86.7	88.5	90.3	92.1	93.8	94.7	95.1	94.8	94.5	94.1	93.7
14000 FT PRESS ALT.		TAT (×C)											
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25	30
200	.39	84.6	86.5	88.3	90.1	91.9	93.6	94.4	94.3	93.9	93.6	93.2	92.7
220	.43	84.4	86.3	88.1	89.9	91.7	93.4	94.2	94.5	94.2	93.8	93.4	93.0
240	.47	84.3	86.1	87.9	89.7	91.5	93.2	94.1	94.7	94.4	94.1	93.7	93.3
260	.51	84.1	85.9	87.8	89.6	91.3	93.0	93.9	94.7	94.7	94.4	94.0	93.6

Anti-Ice Adjustments

BLEED CONFIGURATION	PRESS ALT (1000 FT)					
	14	16	17	18	20	21
ENGINE ANTI-ICE ON	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9
ENGINE AND WING ANTI-ICE ON	-3.1	-3.1	-3.1	-3.0	-3.0	-3.0

ENGINE INOP

Max Continuous %N1
12000 FT to 1000 FT Pressure Altitudes
Based On Engine Bleed To Packs Auto and Anti-Ice Off

12000 FT PRESS ALT.		TAT (×C)											
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25	30
200	.38	83.8	85.7	87.5	89.3	91.0	92.7	93.6	94.2	93.9	93.5	93.1	92.7
220	.41	83.6	85.5	87.3	89.1	90.8	92.5	93.4	94.2	94.1	93.7	93.3	92.9
240	.45	83.5	85.3	87.1	88.9	90.7	92.4	93.2	94.0	94.3	94.0	93.6	93.2
260	.49	83.3	85.2	87.0	88.8	90.5	92.2	93.0	93.9	94.6	94.2	93.9	93.5
10000 FT PRESS ALT.		TAT (×C)											
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25	30
200	.36	83.1	84.9	86.7	88.5	90.2	91.9	92.7	93.6	93.8	93.5	93.1	92.6
220	.40	82.9	84.7	86.5	88.3	90.0	91.7	92.5	93.3	94.0	93.6	93.2	92.8
240	.43	82.7	84.6	86.4	88.1	89.8	91.5	92.4	93.2	94.0	93.9	93.5	93.1
260	.47	82.6	84.4	86.2	88.0	89.7	91.4	92.2	93.0	93.8	94.1	93.8	93.4
7000 FT PRESS ALT.		TAT (×C)											
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25	30
200	.34	81.9	83.7	85.5	87.2	88.9	90.6	91.4	92.3	93.1	93.4	93.0	92.6
220	.38	81.7	83.5	85.3	87.1	88.8	90.4	91.3	92.1	92.9	93.5	93.2	92.7
240	.41	81.6	83.4	85.2	86.9	88.6	90.3	91.1	91.9	92.7	93.5	93.3	92.9
260	.45	81.4	83.3	85.0	86.7	88.4	90.1	90.9	91.7	92.6	93.4	93.6	93.2
5000 FT PRESS ALT.		TAT (×C)											
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25	30
200	.33	81.1	82.9	84.7	86.4	88.1	89.8	90.6	91.4	92.2	93.0	93.0	92.5
220	.36	81.0	82.8	84.5	86.2	87.9	89.6	90.4	91.2	92.0	92.8	93.1	92.7
240	.40	80.8	82.6	84.4	86.1	87.8	89.4	90.2	91.0	91.8	92.6	93.3	92.8
260	.43	80.7	82.5	84.2	85.9	87.6	89.3	90.1	90.9	91.7	92.5	93.3	93.1
3000 FT PRESS ALT.		TAT (×C)											
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25	30
200	.32	80.4	82.2	83.9	85.6	87.3	88.9	89.7	90.5	91.3	92.1	92.9	92.5
220	.35	80.2	82.0	83.7	85.4	87.1	88.8	89.6	90.4	91.2	91.9	92.7	92.6
240	.40	80.1	81.8	83.6	85.3	86.9	88.6	89.4	90.2	91.0	91.8	92.5	92.8
260	.43	79.9	81.7	83.4	85.1	86.8	88.4	89.2	90.0	90.8	91.6	92.4	93.0
1000 FT PRESS ALT.		TAT (×C)											
KIAS	M	-50	-40	-30	-20	-10	0	5	10	15	20	25	30
200	.31	79.6	81.4	83.1	84.8	86.4	88.1	88.9	89.7	90.5	91.2	92.0	92.5
220	.34	79.5	81.2	82.9	84.6	86.3	87.9	88.7	89.5	90.3	91.1	91.8	92.6
240	.37	79.3	81.1	82.8	84.5	86.1	87.7	88.5	89.3	90.1	90.9	91.7	92.4
260	.40	79.2	80.9	82.6	84.3	86.0	87.6	88.4	89.2	90.0	90.7	91.5	92.3

Anti-Ice Adjustments

BLEED CONFIGURATION	PRESS ALT (1000 FT)					
	1	3	5	7	10	12
ENGINE ANTI-ICE ON	-0.6	-0.7	-0.8	-0.8	-0.8	-0.8
ENGINE AND WING ANTI-ICE ON	-2.4	-2.6	-2.8	-2.8	-2.9	-2.9

ENGINE INOP

MAX CONTINUOUS THRUST

Driftdown Speed / Level Off Altitude
100 ft/min Residual Rate of Climb

WEIGHT (1000 KG)		OPTIMUM DRIFTDOWN SPEED (KIAS)	LEVEL OFF ALTITUDE (FT)		
START DRIFTDOWN	LEVEL OFF		ISA + 10 °C & BELOW	ISA + 15°C	ISA + 20°C
68	64	241	13500	12200	10600
64	61	234	15600	14400	13000
60	57	227	17700	16600	15300
56	53	220	19800	18800	17600
52	49	212	22100	21100	20000
48	46	204	24500	23600	22500
44	42	196	26900	26100	25100
40	38	187	29400	28700	27900

Includes APU fuel burn.

ENGINE INOP

Max Continuous Thrust
Driftdown / LRC Cruise Range Capability
Ground to Air Miles Conversion

AIR DISTANCE (NM) HEAD WIND COMPONENT (KTS) 100	80	60	40	20	GROUND DISTANCE (NM)	AIR DISTANCE (NM) TAIL WIND COMPONENT (KTS) 20	40	60	80	100
141	130	121	113	106	100	95	90	85	81	77
288	265	245	228	213	200	188	178	169	161	153
434	398	368	342	320	300	283	267	253	241	229
577	530	490	456	426	400	377	356	338	321	306
718	661	612	569	532	500	471	446	423	402	383
858	790	732	682	638	600	566	536	508	484	461
997	919	853	795	744	700	661	625	594	565	539
1136	1048	972	907	850	800	755	715	680	647	618
1273	1176	1092	1020	956	900	850	806	765	729	696
1410	1303	1211	1132	1062	1000	945	896	851	811	775
1547	1431	1331	1244	1167	1100	1040	986	937	893	853
1684	1558	1450	1356	1273	1200	1135	1076	1023	976	932
1821	1686	1570	1468	1379	1300	1230	1166	1109	1058	1011
1959	1814	1689	1580	1485	1400	1324	1257	1195	1140	1089
2098	1943	1809	1693	1591	1500	1419	1346	1281	1221	1167
2238	2072	1930	1806	1697	1600	1514	1436	1366	1303	1245

Driftdown / Cruise Fuel and Time

AIR DIST (NM)	FUEL REQUIRED (1000 KG) WEIGHT AT START OF DRIFTDOWN (1000 KG) 35	40	45	50	55	60	65	TIME (HR:MIN)
100	0.4	0.4	0.4	0.5	0.5	0.5	0.6	0:17
200	0.8	0.9	1.0	1.1	1.2	1.2	1.3	0:37
300	1.3	1.4	1.6	1.7	1.9	2.1	2.2	0:55
400	1.7	1.9	2.1	2.4	2.6	2.9	3.1	1:14
500	2.1	2.4	2.7	3.0	3.3	3.6	3.9	1:31
600	2.6	2.9	3.2	3.6	3.9	4.3	4.7	1:48
700	3.0	3.3	3.7	4.2	4.6	5.0	5.5	2:05
800	3.4	3.8	4.2	4.8	5.2	5.7	6.2	2:22
900	3.8	4.3	4.8	5.3	5.9	6.4	7.0	2:38
1000	4.2	4.7	5.3	5.9	6.5	7.1	7.8	2:55
1100	4.6	5.2	5.8	6.5	7.1	7.8	8.5	3:11
1200	5.0	5.6	6.3	7.0	7.8	8.5	9.3	3:27
1300	5.4	6.1	6.8	7.6	8.4	9.2	10.0	3:43
1400	5.8	6.5	7.3	8.2	9.0	9.8	10.8	3:60
1500	6.2	6.9	7.8	8.7	9.6	10.5	11.5	4:17
1600	6.6	7.4	8.3	9.3	10.2	11.2	12.2	4:34

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
68	6000	3600	1100
66	7400	5000	2600
64	8700	6500	4100
62	10100	7900	5600
60	11500	9400	7100
58	12900	10900	8700
56	14400	12400	10200
54	15800	13900	11800
52	17200	15400	13400
50	18600	17000	15000
48	20100	18500	16600
46	21600	19900	18200
44	23200	21500	19800
42	24800	23200	21500
40	26300	24800	23200
38	27700	26500	24900

With engine anti-ice on, decrease altitude capability by 1400 ft.

With engine and wing anti-ice on, decrease altitude capability by 5200 ft.

ENGINE INOP

Max Continuous Thrust
Long Range Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)									
		10	12	14	16	18	20	22	24	26	28
65	%N1	91.5									
	MACH	.564									
	KIAS	313									
	FF/ENG	3070									
60	%N1	89.6	90.9								
	MACH	.547	.564								
	KIAS	303	302								
	FF/ENG	2841	2827								
55	%N1	87.4	88.8	90.2	91.5						
	MACH	.527	.545	.562	.579						
	KIAS	292	291	290	287						
	FF/ENG	2607	2599	2583	2554						
50	%N1	85.1	86.5	87.9	89.3	90.6	92.1				
	MACH	.504	.523	.541	.559	.576	.592				
	KIAS	279	279	278	277	275	271				
	FF/ENG	2372	2363	2355	2335	2306	2276				
45	%N1	82.5	83.9	85.3	86.8	88.2	89.5	91.0	92.8		
	MACH	.480	.498	.516	.535	.554	.572	.588	.605		
	KIAS	266	266	265	265	264	262	259	256		
	FF/ENG	2136	2126	2119	2108	2090	2068	2048	2038		
40	%N1	79.5	81.0	82.5	83.9	85.3	86.8	88.2	89.6	91.3	93.6
	MACH	.454	.471	.489	.508	.527	.546	.565	.582	.599	.616
	KIAS	251	251	251	251	250	250	248	246	243	239
	FF/ENG	1904	1893	1884	1876	1865	1852	1842	1821	1801	1798
35	%N1	76.3	77.7	79.2	80.7	82.1	83.6	85.1	86.5	87.9	89.5
	MACH	.429	.443	.459	.477	.496	.515	.535	.554	.573	.590
	KIAS	237	236	235	235	235	235	235	234	232	229
	FF/ENG	1688	1669	1655	1647	1639	1629	1624	1613	1592	1569

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
299	272	249	230	214	200	190	181	173	166	159
608	552	504	464	430	400	380	362	345	330	316
920	834	759	697	646	600	570	542	517	494	473
1235	1118	1015	932	862	800	760	722	688	658	630
1552	1403	1273	1167	1078	1000	949	903	860	821	787
1873	1691	1532	1403	1295	1200	1139	1082	1031	984	943
2197	1981	1793	1640	1512	1400	1328	1262	1202	1147	1099
2525	2273	2055	1878	1730	1600	1517	1441	1372	1310	1255
2856	2567	2317	2115	1948	1800	1707	1621	1543	1473	1410

Reference Fuel and Time Required At Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	10		14		18		22		26	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	1.4	0:42	1.3	0:40	1.1	0:39	1.0	0:38	0.9	0:37
400	2.8	1:22	2.6	1:18	2.4	1:14	2.2	1:11	2.0	1:09
600	4.3	2:03	3.9	1:56	3.6	1:50	3.3	1:46	3.1	1:42
800	5.7	2:44	5.2	2:35	4.8	2:26	4.5	2:20	4.2	2:15
1000	7.0	3:26	6.5	3:14	6.0	3:04	5.6	2:55	5.2	2:48
1200	8.4	4:08	7.8	3:54	7.2	3:41	6.7	3:30	6.2	3:22
1400	9.8	4:52	9.0	4:34	8.3	4:18	7.8	4:06	7.3	3:56
1600	11.1	5:36	10.2	5:16	9.5	4:57	8.8	4:42	8.3	4:30
1800	12.4	6:20	11.5	5:58	10.6	5:36	9.9	5:18	9.2	5:04

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)						
	35	40	45	50	55	60	65
2	-0.2	-0.1	0.0	0.2	0.3	0.5	0.7
4	-0.4	-0.2	0.0	0.3	0.7	1.0	1.4
6	-0.6	-0.3	0.0	0.5	1.0	1.6	2.1
8	-0.7	-0.4	0.0	0.6	1.3	2.1	2.8
10	-0.9	-0.5	0.0	0.8	1.6	2.5	3.5
12	-1.1	-0.6	0.0	0.9	1.9	3.0	4.1
14	-1.3	-0.7	0.0	1.0	2.2	3.4	4.7

ENGINE INOP

Max Continuous Thrust
Holding
Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT)						
		1500	5000	10000	15000	20000	25000	30000
66	%N1	81.1	83.8	87.7				
	KIAS	251	251	251				
	FF/ENG	2720	2710	2710				
64	%N1	80.2	83.0	86.8	91.3			
	KIAS	247	247	247	249			
	FF/ENG	2630	2630	2620	2660			
62	%N1	79.3	82.1	85.9	90.3			
	KIAS	242	243	243	245			
	FF/ENG	2550	2540	2530	2560			
60	%N1	78.3	81.2	85.1	89.3			
	KIAS	238	239	239	241			
	FF/ENG	2460	2450	2450	2470			
58	%N1	77.4	80.3	84.1	88.3			
	KIAS	234	235	236	236			
	FF/ENG	2380	2370	2360	2380			
56	%N1	76.4	79.3	83.2	87.2	92.2		
	KIAS	230	231	232	232	234		
	FF/ENG	2290	2290	2280	2280	2320		
54	%N1	75.3	78.2	82.2	86.2	91.0		
	KIAS	225	227	228	228	230		
	FF/ENG	2210	2200	2190	2190	2220		
52	%N1	74.3	77.1	81.2	85.1	89.8		
	KIAS	221	222	224	223	225		
	FF/ENG	2130	2120	2110	2110	2120		
50	%N1	73.2	76.0	80.2	84.1	88.5		
	KIAS	216	218	219	219	221		
	FF/ENG	2050	2030	2030	2020	2030		
48	%N1	72.1	74.9	79.1	83.0	87.3	92.8	
	KIAS	211	213	215	215	216	217	
	FF/ENG	1970	1950	1940	1930	1940	1990	
46	%N1	71.1	73.8	77.9	81.9	86.0	91.2	
	KIAS	210	210	210	211	211	213	
	FF/ENG	1900	1880	1860	1850	1850	1880	
44	%N1	70.1	72.9	76.9	80.9	84.9	89.8	
	KIAS	210	210	210	210	210	210	
	FF/ENG	1840	1820	1800	1780	1780	1790	
42	%N1	69.1	72.0	75.9	80.0	83.9	88.5	
	KIAS	210	210	210	210	210	210	
	FF/ENG	1780	1760	1740	1720	1710	1720	
40	%N1	68.2	71.1	75.0	79.1	83.0	87.3	93.4
	KIAS	210	210	210	210	210	210	210
	FF/ENG	1730	1700	1680	1660	1650	1650	1710
38	%N1	67.3	70.2	74.1	78.2	82.1	86.2	91.7
	KIAS	210	210	210	210	210	210	210
	FF/ENG	1670	1650	1630	1610	1600	1590	1620

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

Chapter PI - Performance Inflight
Section 14 - PMC Off

PMC OFF

Takeoff Weight Adjustments

AIRPORT PRESSURE ALTITUDE (FT)	TEMPERATURE °C (°F)	PMC OFF TAKEOFF LIMIT WEIGHT ADJUSTMENT (1000 KG)				
		FIELD LIMIT	CLIMB LIMIT	TIRE SPEED LIMIT	BRAKE ENERGY LIMIT (NORMAL TAKEOFF)	BRAKE ENERGY LIMIT (IMPROVED CLIMB TAKEOFF)
BELOW 5000	ABOVE 21°C (70°F)	0	0	-0.25	-0.40	-0.16
	21°C (70°F) & BELOW	0	0	-0.21	-0.40	-0.16
5000 & ABOVE	ABOVE 21°C (70°F)	0	0	-0.20	-0.40	-0.16
	21°C (70°F) & BELOW	-1.66	-1.86	-0.27	-0.40	-0.16

Valid for Flap 5 or Flap 15 takeoff.

Obstacle Limit Weight Adjustments

NORMALOBSTACLE LIMIT WEIGHT (1000 KG)	PMC OFF OBSTACLE LIMIT WEIGHT ADJUSTMENT (1000 KG)	
	AIRPORT PRESSURE ALTITUDE (FT)	
	5000 & BELOW	ABOVE 5000
30	0	-2.40
40	0	-2.50
50	0	-2.70
60	0	-2.90
70	0	-3.00

Valid for Flap 5 or Flap 15 takeoff.

Takeoff Speeds Adjustments

SPEED (KIAS)	PRESSURE ALTITUDE (FT)			
	BELOW 5000		5000 & ABOVE	
	ABOVE 21°C	21°C & BELOW	ABOVE 21°C	21°C & BELOW
V1(MCG)	6	4	6	4
V1	0	0	0	0
VR	0	0	0	1

PMC OFF

Takeoff %N1

Based On Engine Bleed To Packs On (Auto) and Anti-Ice On or Off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)									
°C	°F	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000
55	131	94.7	94.9	94.9	94.9						
50	122	95.1	95.4	95.4	95.4	95.4	95.4				
45	113	95.6	95.9	95.9	95.9	95.9	95.9	95.9	95.9	95.9	
40	104	96.0	96.3	96.3	96.3	96.3	96.3	96.3	96.4	96.4	96.4
35	95	96.3	96.8	96.8	96.8	96.8	96.8	96.8	96.8	96.8	96.8
30	86	95.5	96.6	96.8	97.2	97.2	97.2	97.2	97.2	97.1	97.1
25	77	94.8	95.8	96.0	96.5	97.0	97.4	97.6	97.5	97.5	97.4
20	68	94.0	95.0	95.2	95.7	96.2	96.5	96.9	97.1	97.1	97.1
15	59	93.2	94.1	94.4	94.8	95.4	95.7	96.3	96.3	96.3	96.3
10	50	92.4	93.3	93.5	94.0	94.6	94.9	95.2	95.5	95.6	95.7
5	41	91.5	92.5	92.7	93.2	93.7	94.0	94.4	94.7	94.8	94.9
0	32	90.7	91.7	91.9	92.3	92.9	93.2	93.5	93.8	93.9	94.0
-10	14	89.0	90.0	90.2	90.6	91.2	91.5	91.8	92.1	92.2	92.3
-20	-4	87.3	88.2	88.4	88.9	89.4	89.7	90.0	90.3	90.4	90.5
-30	-22	85.6	86.5	86.7	87.1	87.6	87.9	88.2	88.5	88.6	88.7
-40	-40	83.8	84.7	84.9	85.3	85.8	86.1	86.4	86.7	86.8	86.9
-50	-58	82.0	82.8	83.0	83.5	83.9	84.2	84.5	84.8	84.9	85.0

Based On Engine Bleed To Packs Off and Anti-Ice On or Off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)									
°C	°F	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000
55	131	95.7	95.9	95.9	95.9						
50	122	96.1	96.4	96.4	96.4	96.4	96.4				
45	113	96.6	96.8	96.8	96.8	96.8	96.8	96.8	96.8	96.9	
40	104	97.0	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3	97.3
35	95	97.3	97.7	97.7	97.7	97.7	97.7	97.7	97.7	97.7	97.7
30	86	96.5	97.5	97.7	98.1	98.1	98.1	98.1	98.1	98.1	98.0
25	77	95.7	96.7	96.9	97.4	97.9	97.9	97.9	97.9	97.9	97.9
20	68	94.9	95.9	96.1	96.6	97.1	97.1	97.1	97.1	97.1	97.1
15	59	94.1	95.0	95.3	95.7	96.3	96.3	96.3	96.3	96.3	96.3
10	50	93.3	94.2	94.4	94.9	95.6	95.8	96.1	96.3	96.3	96.3
5	41	92.4	93.4	93.6	94.1	94.6	94.9	95.2	95.4	95.4	95.4
0	32	91.6	92.5	92.7	93.2	93.8	94.1	94.4	94.5	94.5	94.5
-10	14	89.8	90.8	91.0	91.5	92.0	92.3	92.6	92.8	92.8	92.8
-20	-4	88.1	89.1	89.3	89.7	90.3	90.6	90.9	91.0	91.0	91.0
-30	-22	86.4	87.3	87.5	88.0	88.5	88.8	89.1	89.2	89.2	89.2
-40	-40	84.6	85.5	85.7	86.1	86.6	86.9	87.2	87.3	87.4	87.4
-50	-58	82.8	83.6	83.8	84.3	84.7	85.0	85.3	95.5	85.5	85.5

PMC OFF

Takeoff Weight Adjustments (20K Derate)

AIRPORT PRESSURE ALTITUDE (FT)	TEMPERATURE °C (°F)	PMC OFF TAKEOFF LIMIT WEIGHT ADJUSTMENT (1000 KG)				
		FIELD LIMIT	CLIMB LIMIT	TIRE SPEED LIMIT	BRAKE ENERGY LIMIT (NORMAL TAKEOFF)	BRAKE ENERGY LIMIT (IMPROVED CLIMB TAKEOFF)
BELOW 5000	ABOVE 21°C (70°F)	-1.43	-1.43	-0.15	-0.80	-0.32
	21°C (70°F) & BELOW	-0.46	-0.24	-0.09	-0.80	-0.32
5000 & ABOVE	ABOVE 21°C (70°F)	-1.54	-1.79	-0.15	-0.40	-0.16
	21°C (70°F) & BELOW	-1.18	-1.26	-0.09	-0.40	-0.16

Valid for Flap 5 or Flap 15 takeoff.

PMC OFF

Obstacle Limit Weight Adjustments (20K Derate)

NORMAL OBSTACLE LIMIT WEIGHT (1000 KG)	PMC OFF OBSTACLE LIMIT WEIGHT ADJUSTMENT (1000 KG)	
	AIRPORT PRESSURE ALTITUDE (FT)	
	3000 & BELOW	ABOVE 3000
30	0	-2.35
40	0	-2.85
50	0	-3.35
60	0	-3.85
70	0	-4.35

Valid for Flap 5 or Flap 15 takeoff.

PMC OFF

TAKEOFF SPEEDS ADJUSTMENTS (20K DERATE)

SPEED (KIAS)	PRESSURE ALTITUDE (FT)	
	BELOW 5000	5000 & ABOVE
V1(MCG)	6	4
V1	0	0
VR	1	1

PMC OFF

TAKEOFF %N1 (20K DERATE)

Based On Engine Bleed To Packs On (Auto) and Anti-Ice On or Off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)									
°C	°F	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000
55	131	91.5	92.3	92.2	91.7						
50	122	92.0	92.8	93.4	93.7	93.0	93.0				
45	113	92.6	93.1	93.6	93.9	93.9	94.5	94.3	93.7		
40	104	93.1	93.6	94.0	94.2	94.3	95.1	95.0	94.9	94.8	94.5
35	95	93.2	94.1	94.6	94.8	94.8	95.5	95.7	95.6	95.8	95.7
30	86	93.0	94.5	94.3	94.5	95.0	95.4	95.6	95.8	95.8	95.8
25	77	92.2	93.7	93.7	93.7	94.4	95.5	95.3	95.1	95.4	95.8
20	68	91.5	92.9	92.9	92.9	93.6	95.5	95.7	95.8	95.8	95.7
15	59	90.7	92.1	92.1	92.1	92.8	94.9	95.1	95.1	95.1	95.1
10	50	89.9	91.3	91.3	91.3	92.0	94.1	94.3	94.3	94.3	94.3
5	41	89.1	90.5	90.5	90.5	91.2	93.2	93.4	93.4	93.4	93.4
0	32	88.3	89.7	89.7	89.7	90.4	92.4	92.6	92.6	92.6	92.6
-10	14	86.6	88.0	88.0	88.0	88.7	90.7	90.9	90.9	90.9	90.9
-20	-4	85.0	86.3	86.3	86.4	87.0	89.0	89.1	89.1	89.1	89.1
-30	-22	83.3	84.6	84.6	84.6	85.3	87.2	87.4	87.4	87.4	87.4
-40	-40	81.6	82.9	82.9	82.9	83.5	85.4	85.5	85.5	85.6	85.6
-50	-58	79.8	81.1	81.1	81.1	81.7	83.5	83.7	83.7	83.7	83.7

Based On Engine Bleed To Packs Off and Anti-Ice On or Off

AIRPORT OAT		AIRPORT PRESSURE ALTITUDE (FT)									
°C	°F	-1000	0	1000	2000	3000	4000	5000	6000	7000	8000
55	131	92.4	93.3	93.2	92.7						
50	122	93.0	93.8	94.4	94.6	94.0	94.0				
45	113	93.5	94.0	94.6	94.9	94.8	95.5	95.3	94.7		
40	104	94.0	94.5	94.9	95.1	95.2	96.1	95.9	95.8	95.8	95.4
35	95	94.2	95.0	95.6	95.7	95.7	96.5	96.6	96.6	96.7	96.6
30	86	93.9	95.4	95.2	95.4	96.0	96.3	96.5	96.7	96.7	96.8
25	77	93.1	94.6	94.6	94.6	95.3	96.4	96.2	96.0	96.3	96.7
20	68	92.4	93.8	93.8	93.8	94.6	95.9	95.9	95.9	95.9	95.9
15	59	91.6	93.0	93.0	93.0	93.7	95.1	95.1	95.1	95.1	95.1
10	50	90.8	92.2	92.2	92.2	92.9	94.3	94.3	94.3	94.3	94.3
5	41	90.0	91.4	91.4	91.4	92.1	93.4	93.4	93.4	93.4	93.4
0	32	89.2	90.6	90.6	90.6	91.3	92.6	92.6	92.6	92.6	92.6
-10	14	87.5	88.9	88.9	88.9	89.6	90.9	90.9	90.9	90.9	90.9
-20	-4	85.8	87.2	87.2	87.2	87.9	89.1	89.1	89.1	89.1	89.1
-30	-22	84.1	85.5	85.5	85.5	86.1	87.4	87.4	87.4	87.4	87.4
-40	-40	82.4	83.7	83.7	83.7	84.3	85.5	85.5	85.5	85.6	85.6
-50	-58	80.6	81.9	81.9	81.9	82.5	83.7	83.7	83.7	83.7	83.7

Chapter PI - Performance Inflight
Section 15 - Gear Down

GEAR DOWN

220 KIAS Cruise Altitude Capability

Max Cruise Thrust, 100 FPM Residual Rate of Climb

WEIGHT (1000 KG)	PRESSURE ALTITUDE (FT)		
	ISA + 10°C & BELOW	ISA + 15°C	ISA + 20°C
66	21500	20200	18900
64	22200	21000	19700
62	23700	22600	21400
60	24500	23400	22200
58	25300	24200	23000
56	26000	25000	23800
54	26700	25700	24500
52	27400	26400	25200
50	28000	27000	25900
48	28600	27600	26600
46	29200	28200	27200
44	29700	28800	27800
42	30200	29300	28300
40	30700	29800	28800
38	31100	30300	29300

Based on 230 KIAS for weights above 62823 kg.

GEAR DOWN

220 KIAS Cruise Control

WEIGHT (1000 KG)		PRESSURE ALTITUDE (1000 FT)										
		11	13	15	17	19	21	23	25	27	29	31
64	%N1	80.8	82.4	84.0	85.7	87.5	89.5	91.8				
	MACH	.424	.441	.458	.476	.495	.515	.536				
	KIAS	230	230	230	230	230	230	230				
	FF/ENG	1911	1911	1912	1916	1923	1936	1964				
60	%N1	78.7	80.4	82.0	83.6	85.3	87.2	89.3	91.7			
	MACH	.406	.422	.438	.456	.474	.493	.513	.534			
	KIAS	220	220	220	220	220	220	220	220			
	FF/ENG	1763	1761	1762	1763	1767	1773	1787	1818			
56	%N1	77.6	79.3	80.9	82.5	84.1	85.9	87.8	90.0	92.6		
	MACH	.406	.422	.438	.456	.474	.493	.513	.534	.557		
	KIAS	220	220	220	220	220	220	220	220	220		
	FF/ENG	1696	1692	1690	1690	1690	1692	1703	1721	1755		
52	%N1	76.6	78.3	79.9	81.5	83.1	84.7	86.5	88.5	90.8		
	MACH	.406	.422	.438	.456	.474	.493	.513	.534	.557		
	KIAS	220	220	220	220	220	220	220	220	220		
	FF/ENG	1636	1630	1626	1624	1623	1623	1629	1642	1661		
48	%N1	75.6	77.3	79.0	80.5	82.1	83.7	85.5	87.3	89.4	92.1	
	MACH	.406	.422	.438	.456	.474	.493	.513	.534	.557	.580	
	KIAS	220	220	220	220	220	220	220	220	220	220	
	FF/ENG	1582	1575	1571	1568	1566	1564	1568	1577	1586	1616	
44	%N1	74.7	76.4	78.1	79.7	81.2	82.8	84.5	86.3	88.3	90.6	
	MACH	.406	.422	.438	.456	.474	.493	.513	.534	.557	.580	
	KIAS	220	220	220	220	220	220	220	220	220	220	
	FF/ENG	1535	1527	1521	1518	1515	1512	1515	1521	1526	1546	
40	%N1	73.9	75.6	77.3	78.9	80.5	82.1	83.7	85.5	87.3	89.4	92.3
	MACH	.406	.422	.438	.456	.474	.493	.513	.534	.557	.580	.605
	KIAS	220	220	220	220	220	220	220	220	220	220	220
	FF/ENG	1493	1485	1479	1474	1471	1467	1469	1474	1477	1489	1526
36	%N1	73.3	74.9	76.6	78.2	79.8	81.4	83.0	84.7	86.5	88.5	91.1
	MACH	.406	.422	.438	.456	.474	.493	.513	.534	.557	.580	.605
	KIAS	220	220	220	220	220	220	220	220	220	220	220
	FF/ENG	1458	1449	1443	1437	1433	1430	1430	1434	1435	1442	1471

Based on 230 KIAS for weights above 62823 kg.

GEAR DOWN

220 KIAS En Route 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
327	291	260	236	217	200	189	180	171	163	156
663	589	526	476	435	400	378	358	340	324	310
999	887	791	715	654	600	567	537	510	486	465
1335	1184	1055	954	872	800	756	717	680	648	619
1671	1482	1321	1193	1090	1000	945	895	850	809	773
2007	1780	1586	1433	1308	1200	1134	1074	1020	971	928
2343	2078	1851	1672	1527	1400	1323	1253	1189	1132	1082
2679	2376	2116	1912	1745	1600	1512	1432	1360	1294	1236
3015	2673	2381	2150	1963	1800	1701	1611	1529	1456	1391

Reference Fuel and Time Required at Check Point

AIR DIST (NM)	PRESSURE ALTITUDE (1000 FT)									
	12		16		20		24		28	
	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)	FUEL (1000 KG)	TIME (HR:MIN)
200	2.3	0:48	2.1	0:45	1.9	0:43	1.7	0:41	1.6	0:40
400	4.6	1:33	4.3	1:28	4.0	1:24	3.7	1:19	3.5	1:15
600	7.0	2:19	6.5	2:11	6.0	2:04	5.7	1:57	5.4	1:51
800	9.3	3:05	8.7	2:54	8.1	2:44	7.6	2:35	7.2	2:26
1000	11.6	3:51	10.8	3:37	10.1	3:25	9.5	3:13	9.0	3:02
1200	13.8	4:36	12.9	4:20	12.1	4:05	11.3	3:51	10.7	3:37
1400	16.0	5:22	15.0	5:03	14.0	4:46	13.2	4:29	12.5	4:12
1600	18.2	6:08	17.0	5:47	15.9	5:26	15.0	5:07	14.2	4:48
1800	20.4	6:54	19.0	6:30	17.8	6:06	16.8	5:44	15.9	5:23

Fuel Required Adjustments (1000 KG)

REFERENCE FUEL REQUIRED (1000 KG)	WEIGHT AT CHECK POINT (1000 KG)						
	35	40	45	50	55	60	65
2	-0.2	-0.1	-0.1	0.0	0.1	0.3	0.4
4	-0.3	-0.2	-0.1	0.0	0.2	0.5	0.9
6	-0.5	-0.4	-0.2	0.0	0.3	0.8	1.3
8	-0.6	-0.5	-0.3	0.0	0.4	1.0	1.7
10	-0.8	-0.6	-0.3	0.0	0.5	1.2	2.1
12	-0.9	-0.7	-0.4	0.0	0.6	1.4	2.3
14	-1.0	-0.8	-0.4	0.0	0.6	1.5	2.6
16	-1.1	-0.8	-0.5	0.0	0.7	1.6	2.8

Based on 220 KIAS cruise and descent.

Descent at 220 KIAS

PRESSURE ALT (1000 FT)	5	10	15	17	19	21	23	25	27	29	31	33
DISTANCE (NM)	17	26	35	38	42	46	49	53	56	60	64	67
TIME (MINUTES)	6	8	10	11	11	12	13	14	14	15	15	16

GEAR DOWN

HOLDING

Flaps Up

WEIGHT (1000 KG)		PRESSURE ALTITUDE (FT) 1500	5000	10000	15000	20000	25000	30000
66	%N1	73.7	76.4	80.5	84.6	89.1		
	KIAS	230	230	230	230	230		
	FF/ENG	2070	2060	2050	2050	2070		
64	%N1	73.2	75.9	80.0	84.0	88.5		
	KIAS	230	230	230	230	230		
	FF/ENG	2040	2020	2010	2010	2020		
62	%N1	71.7	74.3	78.4	82.6	86.9		
	KIAS	220	220	220	220	220		
	FF/ENG	1930	1910	1890	1890	1900		
60	%N1	71.1	73.8	77.9	82.0	86.2	91.7	
	KIAS	220	220	220	220	220	220	
	FF/ENG	1890	1870	1850	1850	1860	1910	
58	%N1	70.6	73.3	77.3	81.4	85.6	90.8	
	KIAS	220	220	220	220	220	220	
	FF/ENG	1860	1840	1820	1810	1820	1860	
56	%N1	70.1	72.8	76.8	80.9	85.0	90.0	
	KIAS	220	220	220	220	220	220	
	FF/ENG	1830	1800	1780	1770	1780	1810	
54	%N1	69.6	72.3	76.2	80.4	84.4	89.2	
	KIAS	220	220	220	220	220	220	
	FF/ENG	1800	1770	1750	1740	1740	1760	
52	%N1	67.7	70.5	74.4	78.6	82.7	87.3	
	KIAS	210	210	210	210	210	210	
	FF/ENG	1690	1660	1640	1620	1620	1640	
50	%N1	67.1	70.0	73.9	78.0	82.1	86.5	92.8
	KIAS	210	210	210	210	210	210	210
	FF/ENG	1660	1630	1610	1590	1590	1590	1660
48	%N1	66.6	69.4	73.3	77.5	81.5	85.9	91.7
	KIAS	210	210	210	210	210	210	210
	FF/ENG	1630	1600	1580	1560	1550	1560	1610
46	%N1	66.1	68.9	72.8	77.0	81.0	85.2	90.7
	KIAS	210	210	210	210	210	210	210
	FF/ENG	1600	1570	1550	1530	1520	1520	1560
44	%N1	65.6	68.4	72.4	76.4	80.5	84.7	89.9
	KIAS	210	210	210	210	210	210	210
	FF/ENG	1570	1550	1530	1500	1490	1490	1520
42	%N1	65.1	67.9	71.9	75.9	80.0	84.1	89.2
	KIAS	210	210	210	210	210	210	210
	FF/ENG	1550	1520	1500	1480	1470	1460	1490
40	%N1	64.6	67.5	71.5	75.5	79.6	83.6	88.5
	KIAS	210	210	210	210	210	210	210
	FF/ENG	1530	1500	1480	1450	1440	1440	1450
38	%N1	64.2	67.0	71.1	75.0	79.1	83.2	87.9
	KIAS	210	210	210	210	210	210	210
	FF/ENG	1510	1480	1460	1430	1420	1410	1430

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

Chapter PI - Performance Inflight
Section 16 - Text

Introduction

This chapter contains information to supplement performance data from the Flight Management Computer (FMC). In addition, sufficient in-flight 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 AFM, the AFM shall always take precedence.

General

Takeoff Speeds

The speeds presented in the Takeoff Speeds table, as well as FMC computed takeoff speeds, can be used for all performance conditions provided adjustments are made to V1 for clearway, stopway, brake deactivation, improved climb, contaminated runway situations, brake energy limits or obstacle clearance with unbalanced V1. These speeds may be used for weights less than or equal to the performance limited weight.

Normal takeoff speeds, V1, VR, and V2, with anti-skid on, are read from the table by entering with takeoff flap setting, brake release weight, and appropriate column. The appropriate column is obtained by entering the Column Reference chart with the airport pressure altitude and the actual temperature. If an Altitude Adjustment chart is provided, adjust the takeoff speeds appropriately. Slope and wind adjustments to V1 are obtained by entering the Slope and Wind V1 Adjustment table.

V1(MCG)

Regulations prohibit scheduling takeoff with a V1 less than minimum V1 for control on the ground, V1(MCG). Therefore compare the adjusted V1 to the V1(MCG). To find V1(MCG) enter the V1(MCG) table with the airport pressure altitude and actual OAT. If applicable, add the adjustments shown below the table. If the adjusted V1 is less than V1(MCG), set V1 equal to V1(MCG). If 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.

If it is necessary to increase V1 to V1(MCG), then provided the actual field length exceeds the minimum field length of 4500 ft no takeoff weight adjustment is necessary.

Clearway and Stopway V1 Adjustments

Takeoff speed corrections are to be applied to V1 speed when using takeoff weights based on the use of clearway and stopway.

Adjust V1 speed by the amount shown in the appropriate column. The adjusted V1 speed must not exceed VR. If the adjusted V1 speed is greater than VR, reduce V1 to equal VR.

Maximum allowable clearway limits are provided for guidance when more precise data is not available.

Assumed Temperature Takeoff

For reduced thrust takeoffs based on assumed temperature, determine V1, VR, V2 from the appropriate column for airport pressure altitude and assumed temperature. Adjust V1 for slope, wind, clearway and stopway, as required. Compare adjusted V1 with V1(MCG) from table using airport altitude and actual temperature. This is a regulatory requirement to cover the case where the pilot elects to advance thrust levers to maximum takeoff thrust following the engine failure. If adjusted V1 is less than V1(MCG) set V1 equal to V1(MCG).

Stab Trim

To find takeoff stabilizer trim setting, enter the appropriate Stab Trim Setting table with centre of gravity (C.G. % MAC) and read required stabilizer trim units. For weights that meet the conditions listed, apply the adjustments shown below the table.

VREF

The Reference Speed table contains Flaps 40, 30 and 15 landing speeds for a given weight. Apply wind correction shown as required.

Recommended Manoeuvring Speeds

This table provides the flap speed schedule for recommended manoeuvring speed. The speed schedule is a function of weight and will provide adequate manoeuvre margin above stall at all weights.

During flap retraction/extension, movement of the flap to the next position should be initiated when reaching the manoeuvre speed for the existing flap.

Slush / Standing Water Takeoff

Experience has shown that aircraft performance may deteriorate significantly on runways covered with snow, slush, standing water, or ice. Therefore, a reduction in field length/obstacle limited takeoff weight and revised takeoff speeds is necessary. The information provided is intended for guidance in accordance with advisory material. The performance is based on an engine failure at the critical point during takeoff and a 15 foot screen height at the end of the runway. Tables are provided for dispatch with all thrust reversers operative and dispatch with 1 or 2 thrust reversers inoperative.

The entire runway is assumed to be completely covered by a contaminant of uniform thickness and density. Therefore, this information is conservative when operating under typical colder weather conditions where patches of slush exist and some degree of sanding is common.

Takeoffs in slush depths greater than 0.5 inches (13 mm) are not recommended because of possible aircraft damage as a result of slush impingement on the aircraft structure. The use of assumed temperature method for reduced thrust is not allowed on contaminated runways.

Interpolation for slush/standing water depths between the values shown is permitted.

Instructions for Using Tables:

Takeoff weight is determined as follows:

1. Determine the dry field length and obstacle limit weight for the takeoff flap setting.
2. Enter the Weight Adjustment table with the more limiting of the dry field length or obstacle limit weights to obtain the weight reduction for the slush/standing water depth and airport pressure altitude.
3. When indicated, adjust field length available for temperature by the amount provided in the notes below the V1(MCG) limit weight table.
4. Enter V1(MCG) Limit Weight table with the adjusted field length and pressure altitude to obtain the slush/standing water limit weight with respect to minimum field length required for V1(MCG) speed.

The maximum allowable takeoff weight in slush/standing water is the lesser of the limit weights found in Steps 2 and 4.

Takeoff speeds determination:

1. Determine takeoff speeds V1, VR and V2 for actual brake release weight using the Takeoff Speeds table in this section.
2. If V1(MCG) limited, set V1 = V1(MCG). If not limited by V1(MCG) considerations, enter 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

Aircraft 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 aircraft should not experience braking or directional control difficulties when stopping. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate the "poor" data reflects a runway covered with wet ice. Performance is based on an engine failure at the critical point during takeoff and a 15 ft. screen height at the end of the runway. Tables are provided for dispatch with all thrust reversers operative and dispatch with one or two thrust reversers inoperative, and are used in the same manner as the Slush/Standing Water Takeoff tables.

Anti-Skid Inoperative

When operating with anti-skid inoperative, the field limit weight and V1 must be reduced to account for the effect on accelerate-stop performance.

A simplified method which conservatively accounts for the effects of anti-skid inoperative on a dry runway is to reduce the normal field length/obstacle limited weight by 7700 kg and the V1 associated with the reduced weight by the amount shown in the table below.

ANTI-SKID INOPERATIVE V1 ADJUSTMENT	
FIELD LENGTH (FT)	V1 ADJUSTMENT (KIAS)
6000	-28
8000	-21
10000	-17
12000	-14
14000	-11

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 adjusted for wind and slope exceeds approximately 7900 ft.

Detailed analysis for the specific case from the AFM may yield a less restrictive penalty.

Takeoff %N1

To find Max Takeoff %N1 based on normal engine bleed for air conditioning packs on (Auto), enter Takeoff %N1 Table with airport pressure altitude and airport OAT, and read %N1. For packs off operation, apply the %N1 adjustment shown below the table. No takeoff %N1 adjustment is required for engine and wing anti-ice.

Assumed Temperature Reduced Thrust

Regulations permit the use of up to 25% takeoff thrust reduction for operation with assumed temperature reduced thrust. To find the maximum allowable assumed temperature, enter the top chart with airport pressure altitude and OAT. Compare this temperature to that at which the aircraft is performance limited as determined from available takeoff performance data. Next, enter the centre table with airport pressure altitude and the lower of the 2 temperatures previously determined to obtain a maximum takeoff %N1. Do not use an assumed temperature less than the minimum assumed temperature shown. Enter the %N1 Adjustment table with OAT and the difference between the assumed and actual OAT to obtain a %N1 adjustment. Subtract the %N1 adjustment from the maximum takeoff %N1 found previously to determine the assumed temperature reduced thrust %N1.

Takeoff with assumed temperature reduced thrust is not permitted when runway is contaminated with ice, slush, snow, or standing water; anti-skid is inoperative; or PMC is off. Use of this procedure is not recommended if potential windshear conditions exist.

Max Climb %N1

This table shows Max Climb %N1 for a 250 KIAS/280 KIAS/.74M climb speed schedule, normal engine bleed for packs on (Auto) and anti-ice off. Enter the table with airport pressure altitude and TAT, and read %N1. Apply the appropriate bleed setting %N1 adjustment shown below the table. %N1 adjustments are shown for engine bleed to packs off operation, packs high operation, and wing anti-ice on.

Go-Around %N1

To find Max Go-Around %N1 based on normal engine bleed for packs on (Auto) and anti-ice off, enter the Go-Around %N1 table with airport pressure altitude and reported OAT or TAT, and read %N1. Apply the appropriate bleed setting %N1 adjustment shown below the table. %N1 adjustments are shown for engine bleed to packs off operation, packs high operation, and wing anti-ice on.

Flight With Unreliable Airspeed / Turbulent Air Penetration

Pitch attitude and average %N1 information is provided for use in all phases of flight in the event of unreliable airspeed/Mach indications resulting from blocking or freezing of the pitot system. Loss of radome or turbulent air may also cause unreliable airspeed/Mach indications. The cruise table in this section may also be used for turbulent air penetration.

Pitch attitude is shown in bold type for emphasis since altitude and/or vertical speed indications may also be unreliable.

ALL ENGINES

Long Range Cruise Maximum Operating Altitude

These tables provide the maximum operating altitude in the same manner as the FMC. Maximum altitudes are shown for a given cruise weight and manoeuvre capability. This table considers both thrust and buffet limits, providing the more limiting of the two. Any data that is thrust limited is denoted by an asterisk and represents only a thrust limited condition in level flight with 100 ft/min residual rate of climb. Flying above these altitudes with sustained banks in excess of approximately 15° may cause the aircraft to lose speed and/or altitude.

Note that the altitudes shown in the table are limited to the maximum certified altitude of 37000 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 aircraft weight and pressure altitude. As indicated by the shaded area, at optimum altitude .74M 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 En Route Fuel and Time

Long Range Cruise En Route Fuel and Time tables are provided to determine remaining time and fuel required to destination. The data is based on Long Range Cruise and .74M/250 KIAS descent. Tables are presented for low altitudes and high altitudes.

To determine remaining fuel and time required, first enter the Ground to Air Miles Conversion table to convert ground distance and en route 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 favourable 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

Distance and time for descent are shown for a .74M/250 KIAS descent speed schedule. Enter the table with top of descent pressure altitude, and read distance in nautical miles and time in minutes. Data is based on flight idle thrust descent in zero wind. Allowances are included for a straight-in approach with gear down and landing flaps at the outer marker.

Holding

Target %N1, indicated airspeed and fuel flow per engine information is tabulated for holding with flaps up based on the FMC optimum holding speed schedule. This is the higher of the maximum endurance speed and the manoeuvring speed. Small variations in airspeed will not appreciably affect the overall endurance time. Enter the table with weight and pressure altitude to read %N1, IAS and fuel flow per engine.

ADVISORY INFORMATION

Normal Configuration Landing Distance

The normal configuration distance tables are provided as advisory information to help determine the actual landing distance performance of the aircraft for different runway surface conditions and brake configurations.

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 aircraft should not experience braking or directional control difficulties when landing. The performance level used to calculate the "good" data is consistent with wet runway testing done on early Boeing jets. The performance level used to calculate "poor" data reflects runways covered with wet ice.

Dry runway landing performance is shown for maximum manual braking configuration and autobrake settings MAX, 3, 2 and 1. The autobrake performance may be used to assist in the selection of the most desirable autobrake setting for a given field length. Selection of an autobrake setting results in a constant rate of deceleration. Maximum effort manual braking should achieve shorter landing distance than the max autobrake setting. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and normal approach speed for the selected landing flap at sea level, zero wind, zero slope, and two engine detent reverse thrust. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, temperature, speed, and reverse thrust. Each adjustment is independently added to the reference landing distance.

Non-Normal Configuration Landing Distance

Advisory information is provided to support non-normal configurations that affect the landing performance of the aircraft. Landing distances and adjustments are provided for dry runways and runways with good, medium, and poor reported braking action.

Enter the table with the applicable non-normal configuration and read the normal approach speed. The reference landing distance is a reference distance from 50 ft above the threshold to stop based on a reference landing weight and speed at sea level, zero wind, and zero slope. Subsequent columns provide adjustments for off-reference landing weight, altitude, wind, slope, and speed conditions. Each adjustment is independently added to the reference landing distance. Landing distance includes the effect of maximum manual braking and reverse thrust.

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 quick turnaround limit weight. Application of the recommended cooling procedures shown will avoid brake overheat and fuse plug problems that could result from repeated landings at short time intervals or a rejected takeoff.

Engine Inoperative

Initial Max Continuous %N1

The Initial Max Continuous %N1 setting for use following an engine failure is shown. The table is based on the typical all engine cruise speed of .74M 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 1 engine operating with 1 A/C pack operating 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 within the limits of the Max Cruise thrust rating. However, where thrust 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 aircraft will level off considering 100 ft/min residual rate of climb.

The level off altitude is dependent on air temperature (ISA deviation).

Driftdown / LRC Cruise Range Capability

This table shows the range capability from the start of driftdown.

Driftdown is continued to level off altitude. As weight decreases due to fuel burn, the aircraft 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 En Route Fuel and Time Table.

Long Range Cruise Altitude Capability

The table shows the maximum altitude that can be maintained at a given weight and air temperature (ISA deviation), based on Long Range Cruise speed, Max Continuous thrust, and 100 ft/min residual rate of climb.

Long Range Cruise Control

The table provides target %N1, engine inoperative Long Range Cruise Mach number, IAS and fuel flow for the aircraft weight and pressure altitude. The fuel flow values in this table reflect single engine fuel burn.

To conservatively account for APU fuel burn, add 90 kg/hr to fuel flow values.

APU Operation During Flight

For APU operation during flight, increase fuel flow according to the following table. These increments include the APU fuel flow and the effect of increased drag from the APU door.

PRESSURE ALTITUDE (1000 FT)	APU FUEL FLOW (KG/HR)
37	35
35	35
31	45
25	60
20	75
15	90
10	115
5	140

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 .74M/250 KIAS 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 required and time for the actual weight.

Holding

Single engine holding data is provided in the same format as the all engine holding data and is based on the same assumptions.

PMC Off

Introduction

This section contains performance data for aircraft operation with the Power Management Control (PMC) OFF (PMC switch – amber INOP light illuminated) for applicable thrust ratings. Do not use assumed temperature reduced thrust with PMC Off.

Takeoff Weight Adjustment

When operating with PMC off, the normal takeoff performance limit weights should be adjusted by the amount shown in the Takeoff Weights Adjustment and Obstacle Limit Weight Adjustment tables. To determine the limit weights for PMC Off operations, enter the Takeoff Weight Adjustments table with the airport pressure altitude and OAT, then apply the adjustments to the normal PMC On limit weights for field length, climb, tire speed, and brake energy. For adjustments to takeoff obstacle limit, enter the Obstacle Limit Weight Adjustments table with the airport pressure altitude and the normal PMC On obstacle limit weight, then read the associated adjustment.

Takeoff Speed Adjustment

When operating with PMC Off, the normal takeoff speeds should be adjusted by the amount shown in the Takeoff Speeds Adjustment table. To determine the PMC Off takeoff speeds, determine the normal PMC On takeoff speeds associated with the actual takeoff weight after any adjustment necessitated by PMC Off operations, then apply the appropriate adjustments to the takeoff speeds, determined by entering the table with the airport pressure altitude and OAT. The adjusted V1 should not exceed the adjusted VR.

Note: The FMC does not incorporate PMC OFF performance in its takeoff speeds calculations.

Power Settings

Tables are provided to account for engine bleed effects of normal air conditioning packs operation and for engine bleed to packs off operation.

To find Max Takeoff %N1 with both PMCs Off, enter Max Takeoff %N1 table (PMC Off) for the appropriate bleed configuration with airport pressure altitude and airport OAT and read %N1. No takeoff %N1 correction is required for engine anti-ice operation up to 10°C (50°F) which is the highest temperature recommended for engine anti-ice operation.

For Maximum Climb and Go-Around thrust setting with both PMC's Off, use PMC On %N1.

Gear Down

This section contains performance for aircraft 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 inappropriate en route speed schedules, display non-conservative predictions of fuel burn, estimated time of arrival (ETA), maximum altitude, and compute overly shallow descent path. An accurate estimated time of arrival (ETA) is available if current speed or Mach is entered into the VNAV cruise page.

Tables for gear down performance in this section are identical in format and used in the same manner as tables for the gear up configuration previously described.

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