

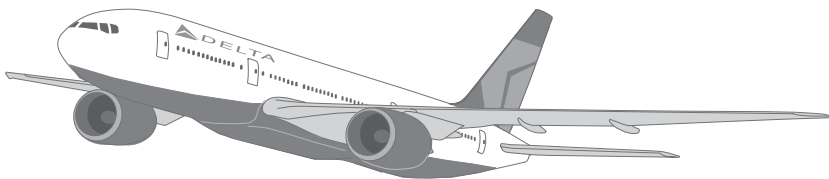
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777-232ER/LR
Operations Manual
Volume 1
Delta Air Lines, Inc.

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June 17, 2016

Preface

Model Identification

Chapter P1

Section 1

General

The aircraft listed in the table below are covered in the operations manual. The numbers are 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 numbers.

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

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

The procedures and information contained in this manual also apply to aircraft acquired by Delta Air Lines subsequent to the current revision; however, this document may not address all pertinent information for these aircraft. In such instances, specific operating procedures and systems information can be found in appropriate Differences Chapter(s) and/or Fleet Bulletin(s) prior to their incorporation in the next scheduled revision.

Ship Number	Registry Number	Serial Number	Tabulation Number
7001	N860DA	29951	WB446
7002	N861DA	29952	WB447
7003	N862DA	29734	WB448
7004	N863DA	29735	WB449
7005	N864DA	29736	WB450
7006	N865DA	29737	WB451
7007	N866DA	29738	WB452
7008	N867DA	29743	WB453
7101	N701DN	29740	WD066
7102	N702DN	29741	WD067
7103	N703DN	32222	WD068
7104	N704DK	29739	WD069
7105	N705DN	29742	WD070
7106	N706DN	30440	WD071
7107	N707DN	39091	WD072
7108	N708DN	39254	WD073
7109	N709DN	40559	WD074
7110	N710DN	40560	WD075
And Subsequent			

Preface

Introduction

Chapter P1

Section 2

General

The manufacturer has developed normal and non-normal procedures for the 777 aircraft. Delta Air Lines, Inc. has modified some of these procedures for simplification and standardization, when appropriate, with other aircraft operated by Delta Air Lines, Inc. Finally, the FAA has approved the procedures presented in this Operations Manual.

These procedures are intended to be followed during normal ground operations and in flight. Deviations from these procedures should be made only with good cause and based on the safest course of action. The captain's best judgment must be applied if an abnormality occurs that is not covered by these procedures.

Manual Rights

The 777 Operations Manual has been prepared for the exclusive use of Delta Air Lines, Inc., Flight Operations personnel under the direction and authority of Delta and shall, at all times, remain the property of Delta. The holder hereof acknowledges and agrees that this manual contains or may contain trade secrets, copyrighted material and commercial and proprietary information, privileged and confidential, to the interest of Delta, and the holder hereof further agrees that this manual may not be reproduced, distributed or copied, in whole or in part, without the express prior written consent of Delta.

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Corrections to the Manual

Log on to the Delta Flight Operations Portal, <http://dlnet.delta.com> and submit a Publications Change Request (PCR) to correct any errors or discrepancies discovered in this manual, or to submit a suggested change to any Aircraft Operating Manual, Volume 1, Volume 2, Quick Reference Handbook (QRH), Flight Crew Training Manual (FCTM), Normal Checklist, Airway Manual (AM), Flight Operations Manual (FOM), Operating Experience (OE/TOE) Guide, Fleet Bulletin (FB), or All Pilot Bulletin (APB).

There are links to the PCR form on each fleet page and also on the Flight Ops Manuals/Library Services page. Once submitted, the PCR is automatically routed to the applicable Fleet Technical Manager and Technical Writer for that manual.

Organization

The operations manual is organized in the following manner.

Volume 1

- Preface - Contains general information regarding the manual's purpose, structure, and content. It also contains lists of abbreviations, a record of revisions and a list of effective pages.
- Limitations - Covers operational limitations.
- Normal Procedures - Covers all amplified normal operating procedures and are based on a thorough analysis of crew activity required to operate the aircraft, and reflect the latest knowledge and experience available.
- Normal Operational Information - Contains reference material used to support normal procedures.
- Supplementary Procedures is organized by system and covers:
 - any procedure that is non-routine in nature,
 - any first-flight-of-the-day test or other systems test,
 - guidance on lengthy operating procedures, and
 - adverse weather procedures and guidance.
- Differences - Notes differences between aircraft models and variants.

Volume 2

- Preface - Contains general information regarding the manual's purpose, structure, and content. It also contains lists of abbreviations, a record of revisions and a list of effective pages.
- Contains general aircraft and systems information. These chapters are generally subdivided into sections covering controls and indicators and systems descriptions.

QRH

- Non-normal checklists - Contains checklists used to manage non-normal situations.
- Non-Normal Operational Information - Contains reference material used to support non-normal procedures.
- Non-Normal Checklist Instructions - Contains non-normal checklist instructions and evacuation flow/philosophy.
- Revision Record - Contains general information regarding the manual's purpose, structure, and content. It also contains lists of abbreviations, a record of revisions and a list of effective pages.

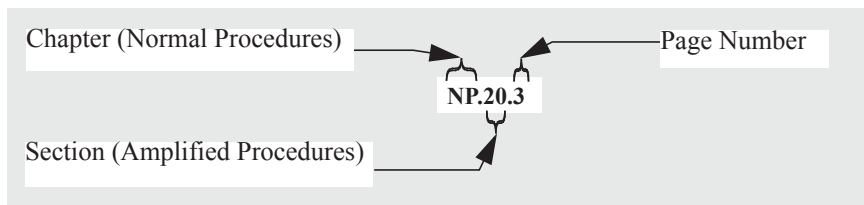
FCTM

- Preface - Contains general information regarding the manual's purpose, structure, and content. It also contains lists of abbreviations, a record of revisions and a list of effective pages.
- Provides information and recommendations on aircraft operations, maneuvers, techniques, and human factors.

Page Numbering

This manual uses a decimal page numbering system. The page number is divided into three fields; chapter, section, and page. An example of a page number for the Normal Procedures chapter follows:

Example Page Number



Warnings, Cautions, and Notes

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

Warning - A warning is an instruction about a hazard that if ignored could result in injury, loss of aircraft control, or loss of life. A warning will appear prior to the applicable step or item.

WARNING: Do not pressurize any hydraulic or pneumatic system until clearance is obtained from Maintenance.

Caution - A caution is an instruction concerning a hazard that if ignored could result in damage to equipment. A caution will appear prior to the applicable step or item.

CAUTION: Do not set takeoff thrust until oil temperature is above 50°C.

Note - A note provides amplified information, instruction, or emphasis. A note will appear after the applicable step or item.

Note: The checklist must not be modified in any way.

Aircraft Effectivities

Differences in aircraft configuration are shown by use of aircraft effectivities throughout Volumes 1 and 2, QRH, and the FCTM. The following rules are used to express aircraft effectivities:

- Aircraft effectivities are listed by model and/or ship number. A range of aircraft is defined by a dash, e.g. 9901 - 9910. A comma in the effectivity range indicates a break in the range, e.g. 9901 - 9910, 9912 - 9925; aircraft 9911 is excluded from the range. Aircraft introduced to the fleet following manual publication are effective as subsequent ships, e.g. 9901 & Subsequent.
- Aircraft effectivities are listed in bold text throughout the manual, except in the Limitations chapter. In the Limitations chapter, aircraft effectivities are listed in bold when the effectivity applies to the entire section or subsection. When the effectivity applies only to a step within a section, it is listed in normal text.
- Aircraft effectivities apply only to the paragraph, illustration, operational note, procedural step, etc. and to subordinate items (if any). Refer to the examples below.

Example (with subordinate items):

9951 – 9961	
CTR TK PUMP (affected).....	OFF
Do not open the WING X FEED valve.	
OUTR TK XFR.....	ON

In this example, the effectivity 9951 - 9961 applies to the first procedural step (CTR TK PUMP.....) and the further indented/subordinate step (Do not...). The effectivity does not apply to the next equivalently indented step (OUTR TK XFR.....).

Example (without subordinate items):

Using ship number:

9951 – 9961	
CTR TK PUMP (affected).....	ON
OUTR TK XFR.....	OFF

In this example, the effectivity 9951 - 9961 applies to the first procedural step (CTR TK PUMP.....) only. The effectivity does not apply to the next procedural step (OUTR TK XFR.....).

Using model number:

767-300	
EQUIPMENT COOLING mode selector.....	AUTO

In this example, the 767-300 will have the selector in the AUTO position.

When aircraft effectivities are centered immediately below a checklist title, the entire checklist applies to the listed aircraft. In the following example, the FUEL L + R CTR PUMPS LO PR checklist is applicable to 9951-9961 only:

FUEL L + R CTR PUMPS LO PR
9951-9961

Preface

Abbreviations

Chapter P1

Section 3

General

The following abbreviations may be found throughout the manual. Some abbreviations may also appear in lowercase letters. Abbreviations having very limited use are explained in the chapter where they are used. Since this list is compiled across several fleets, there may be some abbreviations that do not apply to this specific fleet.

A	
ABV	Above
AC	Alternating Current or Aircraft
ACARS	Aircraft Communications Addressing and Reporting System
ACE	Actuator Control Electronics
ACP	Audio Control Panel
ACT	Active
ADC	Air Data Computer
ADF	Automatic Direction Finder
ADI	Attitude Director Indicator
ADIRS	Air Data Inertial Reference System
ADIRU	Air Data Inertial Reference Unit
ADM	Air Data Module
ADS	Automatic Dependent Surveillance
AED	Automated External Defibrillator

AFDC	Autopilot Flight Director Computer
AFDS	Autopilot Flight Director System
AFE	Above Field Elevation
AFM	Airplane Flight Manual (FAA approved)
AFM - DPI	Airplane Flight Manual - Digital Performance Information
AFS	Automatic Flight System (Autopilot or Autothrottle)
A/G	Air/Ground
AGL	Above Ground Level
AH	Alert Height
AHRS	Attitude Heading Reference System
AI	Anti-Ice
AIL	Aileron
AIMS	Airplane Information Management System
ALFA	Safe Stall Margin Speed
ALT	Altitude
ALT ACQ	Altitude Acquire

ALT HOLD	Altitude Hold
ALTN	Alternate
AM	Amplitude Modulation
AMI	Airline Modifiable Information
ANP	Actual Navigational Performance
ANT	Antenna
ANU	Aircraft Nose Up
AOA	Angle of Attack
AOC	Airline Operational Communication Data Link
A/P	Autopilot
APB	All Pilot Bulletin
APL	Airplane
APP	Approach
APU	Auxiliary Power Unit
ARINC	Aeronautical Radio, Incorporated
ARPT	Airport
ARR	Arrival
ART	Automatic Reserve Thrust
ASA	Autoland Status Annunciator
ASI	Airspeed Indicator
ASR	Airport Surveillance Radar
ASYM	Asymmetry
A/T	Autothrottle
ATA	Actual Time of Arrival
ATC	Air Traffic Control

ATIS	Automated Terminal Information Service
ATM	Assumed Temperature Method
ATT	Attitude
AUTO	Automatic
AUTO-THROT	Autothrottle
AUX	Auxiliary
AVAIL	Available
AWABS	Automated Weight and Balance System

B	
BARO	Barometric
BAT	Battery
B/C or B/CRS or BAC or BCS	Back Course
BFO	Beat Frequency Oscillator
BITE	Built-In Test Equipment
BKR	Breaker
BLD	Bleed
BLW	Below
BRG	Bearing
BRT	Bright
BTL	Bottle
BTL DISCH	Bottle Discharge (fire extinguisher)
BTMS	Brake Temperature Monitoring System

C	

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C	Captain or Celsius or Center or Cool
CAA	Civil Aviation Authority
CADC	Central Air Data Computer
CALSEL	Call Select
CANC/RCL	Cancel/Recall
CANPA	Constant Angle Non-Precision Approach
CAP	Capture
CAPT	Captain
CAWS	Central Aural Warning System
CB	Circuit Breaker
CCD	Cursor Control Device
CDS	Common Display System
CDU	Control Display Unit
CFIT	Controlled Flight Into Terrain
CG	Center of Gravity
CHKL	Checklist
CHR	Chronograph
CKD	Checked
CKT	Circuit
CL	Close
CLB	Climb
CLMP	Computer Lockout Manual Power
CLR	Clear
CMD	Command
CO	Company

COMM	Communication
COMP	Comparator
COMPT	Compartment
CON	Continuous
CONFIG	Configuration
CONT	Control
COOL	Cooling
CRS	Course
CRT	Cathode Ray Tube
CRZ	Cruise
CTL	Control
CTR	Center
CWS	Control Wheel Steering

D	
DA	Decision Altitude
DA(H)	Decision Altitude (Height)
DC	Direct Current
DCU	Display Concentrator Unit
D/D	Direct Descent
DDA	Derived Decision Altitude (MDA +50 feet)
DDG	Dispatch Deviations Guide
DEL	Delete
DEP	Departure
DEP ARR	Departure Arrival
DEPR	Depressurize
DES	Descent
DEU	Display Electronic Unit

DFCS	Digital Flight Control System
DFGC	Digital Flight Guidance Computer
DFGS	Digital Flight Guidance System
DH	Decision Height
DIFF	Differential
DIR	Direct
DISC	Disconnect
DISCH	Discharge
DK	Deck
DME	Distance Measuring Equipment
DN	Down
DPC	Display Processing Computer
DSP	Display Select Panel
DSPL	Display
DTG	Distance to Go
DTW	Distance to Waypoint
DU	Display Unit

E	
EADI	Electronic Attitude Director Indicator
ECON	Economy
E/D	End of Descent
E/E	Electrical/Electronic
EEC	Electronic Engine Control
EFB	Electronic Flight Bag

EFI	Electronic Flight Instruments
EFIS	Electronic Flight Instrument System
EGPWS	Enhanced Ground Proximity Warning System
EGT	Exhaust Gas Temperature
EHSI	Electronic Horizontal Situation Indicator
EICAS	Engine Indication and Crew Alerting System
EIS	Electronic Instrument System
ELEC	Electrical
ELEV	Elevator
EMER	Emergency
ENG	Engine
ENG OUT	Engine Out
ENT	Entry
EO or E/O	Engine Out
EOAP	Electronic Overhead Annunciation Panel
EPR	Engine Pressure Ratio
EQPT or EQUIP	Equipment
ER	Extended Range
ETOPS	Extended Range Operation with Twin Engine Airplanes
EVAC	Evacuation
EXEC	Execute
EXT	Extend or External

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F	
F	Fahrenheit
FAC	Final Approach Course
FAA	Federal Aviation Administration
FADEC	Full Authority Digital Engine Control
FAF	Final Approach Fix
FAR	Federal Aviation Regulation
FB	Fleet Bulletin
FCC	Flight Control Computer
FCTL	Flight Control
FCTM	Flight Crew Training Manual
FD, F/D or FLT DIR	Flight Director
FF	Fuel Flow
FFM	Force Fight Monitor
FGCP	Flight Guidance Control Panel
FGS	Flight Guidance System
FILT	Filter
FIR	Flight Information Region
FL CH or FLCH	Flight Level Change
FLT	Flight
FLT CTRL	Flight Control
FLPRN	Flaperon
FMA	Flight Mode Annunciator
FMC	Flight Management Computer

FMS	Flight Management System
F/O or F O	First Officer
FOM	Flight Operations Manual
FPA	Flight Path Angle
FPM	Feet Per Minute
FPS	Flight Planning System
FPV	Flight Path Vector
FREQ	Frequency
F/S	Fast/Slow
FT	Feet
FWD	Forward
FWSOV	Fire Wall Shut Off Valve
FX	Fix

G	
GA	Go-Around
GE	General Electric
GEN	Generator
GLS	GPS Landing System
GMT	Greenwich Mean Time
GND	Ground
GP or G/P	Glidepath
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
GS	Ground Speed
G/S	Glideslope
GW	Gross Weight

H	
HAA	Height Above Airport
HAT	Height Above Touchdown
HDG	Heading or Hydraulic Driven Generator
HDG REF	Heading Reference
HDG SEL	Heading Select
HF	High Frequency
HGS	Head-Up Guidance System (HGS® is a registered trademark of Flight Dynamics)
HI	High
HLD	Hold
HPA	Hectopascals
HPSOV	High Pressure Shut Off Valve
HSI	Horizontal Situation Indicator
HUD	Head-Up Display
HYD	Hydraulic

I	
IAF	Initial Approach Fix
IAN	Instrument Approach Navigation
IAS	Indicated Airspeed
IDENT	Identification
IFE	In-Flight Entertainment System
IFR	Instrument Flight Rules
IGN	Ignition

IGS	Instrument Guidance System
ILS	Instrument Landing System
IM	Inner Marker
IMC	Instrument Meteorological Conditions
IN	Inches
INBD	Inboard
IND	Indicator
IND LTS	Indicator Lights
INOP	Inoperative
INIT	Initialization
INSTR	Instrument
INT or INTPH	Interphone
INTC	Intercept
INTC CRS	Intercept Course
IP	Instructor Pilot
IRS	Inertial Reference System
IRU	Inertial Reference Unit
ISA	International Standard Atmosphere
ISDU	Inertial System Display Unit
ISFD	Integrated Standby Flight Display
ISLN	Isolation

J	
JAA	Joint Aviation Authority

K	

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K or KTS	Knots
KCAS	Knots Calibrated Airspeed
KGS	Kilograms
KIAS	Knots Indicated Airspeed

L	
L	Left
LAT	Latitude
LBS	Pounds
LD	Load
LDA	Localizer-type Directional Aid
LDG	Landing
LDG ALT	Landing Altitude
LE	Leading Edge
LIM	Limit
LIM SPD	Limit Speed
LKD	Locked
L NAV or LNAV	Lateral Navigation
LOC	Localizer
LOC-BC	Localizer Back Course
LOM	Locator Outer Marker
LON	Longitude
LR	Long Range
LPR	Landing Performance Request
LPV	Localizer Performance with Vertical Guidance
LRC	Long Range Cruise
LRU	Line Replaceable Unit

LSK	Line Select Key
LT	Light
LWR CTR	Lower Center
LWR DSPLY or LWR DSPL	Lower Display

M	
M	Mach
MAG	Magnetic
MAHP	Missed Approach Holding Point
MAN	Manual
MAP	Missed Approach Point
MASI	Mach/Airspeed Indicator
MAX	Maximum
MCC	Maintenance Control Center
MCDU	Multi-purpose Control and Display Unit
MCO	Maintenance Carry Over
MCP	Mode Control Panel
MCT	Maximum Continuous Thrust
MDA	Minimum Descent Altitude
MDA(H)	Minimum Descent Altitude (Height)
MDM	Mechanical Dispatch Manual
MEA	Minimum Enroute Altitude
MEL	Minimum Equipment List
MFD	Multifunction Display

MHZ	Megahertz
MIC	Microphone
MIN	Minimum
MKR	Marker
MLS	Microwave Landing System
MM	Middle Marker
MMO	Maximum Mach Operating Speed
MNPS	Minimum Navigation Performance Specification
MOCA	Minimum Obstruction Clearance Altitude
MOD	Modify
MORA	Minimum Off Route Altitude
MSA	Minimum Safe Altitude
MSG	Message
MSGS RCVD	Messages Received
MSL	Mean Sea Level
MTRS	Meters
MUH	Minimum Use Height

N	
N	Normal
NADP	Noise Abatement Departure Procedures
NAR	North American Route
NAV	Navigation
NAV RAD	Navigation Radio
ND	Navigation Display

NGS	Nitrogen Generation System
NLT	No Later Than
NM	Nautical Mile(s)
NNC	Non-Normal Checklists
NNM	Non-Normal Maneuvers
NPS	Navigation Performance Scales
NORM	Normal
NWS	National Weather Service
N1	Low Pressure Rotor Speed
N2	High Pressure Rotor Speed (Pratt & Whitney and GE engines) or Intermediate Pressure Rotor Speed (Rolls Royce Engines)
N3	High Pressure Rotor Speed (Rolls Royce Engines)

O	
OAP	Overhead Annunciator Panel (a.k.a. EOAP)
OAT	Outside Air Temperature
OCC	Operations Control Center
ODM	Operational Data Manual
OFST	Offset
OHU	Overhead Unit
OM	Outer Marker
OP	Open
OUTBD DSPL	Outboard Display

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OVHD	Overhead
OVHT	Overheat
OVRD	Override
OVSPD	Overspeed
OXY or O2	Oxygen

P	
PA	Passenger Address
PAPI	Precision Approach Path Indicator
PAR	Precision Approach Radar
PASS	Passenger
PBE	Protective Breathing Equipment
PCP	Pilot Call Panel
PDC	Pitch Data Computer or Performance Data Computer or Pre-Departure Clearance
PERF	Performance
PERF INIT	Performance Initialization
PES	Pitch Enhancement System
PF	Pilot Flying
PFAF	Precision Final Approach Fix
PFC	Primary Flight Computer
PFD	Primary Flight Display
PI	Performance Inflight

PIP	Product Improvement Package
PM	Pilot Monitoring
PMC	Power Management Control
PNL	Panel
POS	Position
POS INIT	Position Initialization
POS REF	Position Reference
PPI	Planned Position Indicator
PPOS	Present Position
PRES or PRESS	Pressure
PREV	Previous
PRI	Primary
PROG	Progress
PROX	Proximity
P/RST	Push To Reset
PRV	Pressure Regulating Valve
PSI	Pounds Per Square Inch
PTH	Path
PTT	Push To Talk
PTU	Power Transfer Unit
PWR	Power
PWS	Predictive Windshear System

Q	
Q	Quantity
QFE	Local Station Pressure
QNH	Altimeter Setting

QRH	Quick Reference Handbook
QTY	Quantity

R	
R	Right
RA	Radio Altitude or Resolution Advisory
RAD	Radio
RAT	Ram Air Temperature or Ram Air Turbine
RCL	Request for Clearance
RDMI	Radio Distance Magnetic Indicator
REC	Recorder
RECIR or RECIRC	Recirculation
REF	Reference
RET	Retract
REV	Reverse
RF	Radius-to-Fix (RF) Legs or Refill
RMI	Radio Magnetic Indicator
RNAV or RNV	Area Navigation
RNP	Required Navigational Performance
RPL	Rudder Pressure Limiter
RPM	Revolutions Per Minute
RPR	Rudder Pressure Reducer
RR	Rolls Royce

RSEP	Rudder System Enhancement Program
RST	Reset
RSVR	Reservoir
R/T	Radio Transmit
RTE	Route
RTO	Rejected Takeoff
RTP	Radio Tuning Panel
RUD	Rudder
RVR	Runway Visual Range
RVSM	Reduced Vertical Separation Minimum

S	
SAARU	Secondary Attitude Air Data Reference Unit
SAT	Static Air Temperature or Satellite
SB	Service Bulletin
S/B	Speedbrake
S/C	Step Climb
SCL	Secure Content Locker
SDF	Simplified Directional Facility
SEI	Standby Engine Indicator
SEL	Select
SELCAL	Selective Calling
SENS	Sensitivity
SERV	Service
SG	Symbol Generator
SPD	Speed
SPDBRK	Speedbrake

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STA	Station
STAB	Stabilizer
STAT	Status
STBY	Standby
STD	Standard
SYS	System

T	
T or TRU	True
T or TK or TRK	Track (to a Navaid)
TA	Traffic Advisory
TAA	Terminal Arrival Area
TACAN	Tactical Air Navigation
TAC	Thrust Asymmetry Compensation
TAI	Thermal Anti-Ice
TAS	True Airspeed
TAT	Total Air Temperature
T/C	Top of Climb
TCA	Terminal Control Area
TCAS	Traffic Alert and Collision Avoidance System
T/D	Top of Descent
TDU	Takeoff Data Uplink
TDZ	Touch Down Zone
TDZE	Touch Down Zone Elevation
TE	Trailing Edge
TEMP	Temperature
TERR	Terrain

TFC	Traffic
TFR	Transfer
THR	Throttle or Thrust
THR HOLD	Throttle Hold
TMC	Thrust Management Computer
TMI	Track Message Identifier
TMSP	Thrust Mode Select Panel
TO or T/O	Takeoff
TOC	Top of Climb
TOD	Top of Descent
TOPR	Takeoff Performance Request
TO/GA	Takeoff/Go-Around
TP	Turbulence Plot
TR	Traffic Resolution
TRP	Thrust Rating Panel
TRU	Transformer Rectifier Unit
TURB	Turbine or Turbulence

U	
UNLKD	Unlocked
UNSCHD or UNSCHED	Unscheduled
UPR DSPL	Upper Display
U.S.	United States
USB	Upper Side Band
UTC	Universal Time Coordinated

UTIL	Utility

V	
VA	Design maneuvering speed
VAL	Valve
VANP	Vertical Actual Navigational Performance
VASI	Visual Approach Slope Indicator
VDP	Visual Descent Point
VEF	Speed at Engine Failure
VERT	Vertical
VFR	Visual Flight Rules
VG	Vertical Gyro
VHF	Very High Frequency
VIB	Vibration
VLV	Valve
VMC	Visual Meteorological Conditions
VMCA	Minimum Control Airspeed or Single Engine Minimum Control Airspeed
VMCG	Minimum Control Speed Ground
VMO	Maximum Operating Speed
V NAV or VNAV	Vertical Navigation
VOR	VHF Omnidirectional Range
VR	Rotation Speed
VREF	Reference Speed

VRNP	Vertical Required Navigation Performance
V/S	Vertical Speed
VSCF	Variable Speed Constant Frequency
VSD	Vertical Situation Display
VSI	Vertical Speed Indicator
VTK	Vertical Track
V1	Takeoff Decision Speed
V1 (MCG)	Minimum V1 for Control on the Ground
V2	Scheduled Takeoff Target Speed

W	
W	Warm
WATRS	Western Atlantic Route System
WDR	Weight Data Record
WGS-84	World Geodetic System of 1984
WHL	Wheel
WPR	Waypoint Position Reporting
WPT	Waypoint
WT	Weight
WXR	Weather Radar

X	
X-FEED	Crossfeed
XPDR or XPDR	Transponder
XTK	Cross Track

Preface

Revision Record

Chapter P1

Section 4

Revision Transmittal Letter

To: All holders of Delta Air Lines, Inc. Operations Manuals.

Subject: Operations Manual Revision.

This revision reflects the most current information available to Delta Air Lines, Inc. through the subject revision date. The following revision highlights explain changes in this revision. General information below explains the use of revision bars to identify new or revised information.

Revision Record

No.	Revision Date	Date Filed	No.	Revision Date	Date Filed
0	October 14, 1998		1	March 19, 1999	
2	March 30, 1999		3	May 31, 1999	
4	December 15, 1999		5	November 17, 2000	
6	November 30, 2001		7	June 14, 2002	
8	November 25, 2002		9	April 15, 2004	
10	December 15, 2003		11	August 15, 2004	
12	January 31, 2005		13	September 6, 2005	
14	March 31, 2006		15	December 18, 2006	
16	December 26, 2006		17	December 20, 2007	
18	February 15, 2008		19	October 27, 2008	
20	April 1, 2009		21	June 1, 2009	
22	August 1, 2009		23	October 1, 2009	
24	November 10, 2009		25	January 1, 2010	
26	April 1, 2009		27	June 23, 2011	
28	February 16, 2012		29	June 7, 2012	
30	November 7, 2012		31	March 14, 2013	
32	July 3, 2013		33	October 24, 2013	
34	February 13, 2014		35	June 5, 2014	

No.	Revision Date	Date Filed	No.	Revision Date	Date Filed
36	September 25, 2014		37	July 30, 2015	
38	June 17, 2016				

General

Delta Air Lines, Inc. issues operations manual revisions to provide new or revised procedures and information. Formal revisions also incorporate appropriate information from previously issued Fleet Bulletins.

The revision date is the approximate date the revision material is distributed and considered current. The revision should be incorporated on the revision date, but may be incorporated as much as 21 days after the revision date.

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

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

Filing Instructions

Consult the List of Effective Pages (P1.5). Pages identified with an asterisk (*) are either replacement pages, new (original) issue pages, or deleted pages. Remove corresponding old pages and replace or add new pages. Remove pages marked DELETED; there are no replacement pages for deleted pages.

Be careful when inserting changes not to throw away pages from the manual that are not replaced. The List of Effective Pages determines the correct content of the manual.

Revision Highlights

This section (P1.4) replaces the existing section P1.4 in your manual.

Pages containing revised technical and non-technical material have revision bars associated with the changed text or illustration.

Repaginated material not containing technical revisions are identified only by a new page date.

All references to the Airway Manual have been updated to reflect the new organization of the Airway Manual. These changes will not be indicated with individual highlights.

Chapter - Preface

Section 1 - Introduction

P1.2.3 - Updated bullet regarding content within the FCTM.

Chapter L - Limitations

Section 10 - Operating Limitations

Airplane General

L.10.1 - Removed reference to Green Pages.

GPWS - Look-Ahead Terrain Alerting

L.10.6 - Removed TCAS section, including sentence: “Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with a TCAS II resolution advisory.” Content has been moved to the FCTM.

Chapter NP - Normal Procedures

Section 11 - Normal Checklist Instructions

Normal Checklist Instructions

NP.11.1 - Added new section for cross fleet standardization.

Section 12 - Operational Procedures

Automation Guidelines

NP.12.1 - Updated fourth bullet for cross fleet standardization and partial incorporation of FB 16-01, Automation Policy Changes.

NP.12.1 - In Autopilot Guidelines, second bullet, changed "verify" to "verbalize".

NP.12.1 - In Autopilot Guidelines, fourth bullet, changed "verify" to "verbalize" and "PF" to "PM".

Standard Callouts

NP.12.3 - Added sentence "Crews should focus on the aircraft state during the level-off period." for cross fleet standardization.

NP.12.3-4 - Added "Approximately" for cross fleet standardization.

NP.12.4 - Removed ALL APPROACHES (ILS and Non-ILS) table partially incorporating FB 16-01, Automation Policy Changes.

NP.12.6 - Added GO AROUND ALL APPROACHES table incorporating FB 15-04, Updated Go-Around Callouts.

Lights Usage

NP.12.10 - Added "logo" to row for In flight (above 18,000 feet) for cross fleet standardization.

NP.12.10 - Removed bullet "LOGO lights - as required".

Section 20 - Amplified Procedures

Interior Inspection - First Officer or Relief Pilot

NP.20.3 - Updated required documents to check by removing the ODM, FRM, Volume 2, and FCTM.

NP.20.3 - Added step for EFB Mounts. . .Check.

Preflight Procedure - Pilot Monitoring

NP.20.25 - Added 7101-7110 steps to CPDLC/ADS step.

NP.20.25 - Added effectivity 7001-7008.

Preflight Procedure - Captain

NP.20.31 - Updated reference to Limitations section.

Preflight Procedure - First Officer

NP.20.35 - Updated reference to Limitations section.

Pushback Procedure

NP.20.41 - Removed information reflecting installation of 10,500 pounds for center fuel tank EICAS messages.

NP.20.41 - Revised use of EICAS message FUEL IN CENTER for turning the CENTER FUEL PUMP switches ON instead of the fuel quantities. The quantities listed were when the FUEL IN CENTER message shows.

After Start Procedure

NP.20.45 - Updated rows incorporating FB 15-07, Adding “Salute Received” to After Start Procedure.

Departure Runway Change Checklist

NP.20.50 - Updated Flaps step incorporating FB 16-01, Automation Policy Changes.

NP.20.50 - Updated Runway position step. Step to now be completed by the captain and first officer. Incorporation of FB 16-01, Automation Policy Changes.

NP.20.50 - Changed Takeoff briefing step to be completed by the captain incorporating FB 16-01, Automation Policy Changes.

Before Takeoff Procedure

NP.20.51 - Updated per FB 16-01, Automation Policy Changes.

NP.20.52 - Moved Runway position step to first step in Before Takeoff checklist. Step to now be completed by the captain and first officer. Incorporation of FB 16-01, Automation Policy Changes.

NP.20.52 - Updated Flaps step incorporating FB 16-01, Automation Policy Changes.

NP.20.52 - Changed Takeoff briefing step to be completed by the captain incorporating FB 16-01.

NP.20.52 - Moved Transponder step above Flight Attendants step per FB 16-01, Automation Policy Changes; no content change.

Cruise Procedure

NP.20.57 - Updated definition of extreme cold weather to “(-10°C or lower, or as specified in the Delta Special Page)”.

Landing Procedure

NP.20.64 - Updated bullet by adding “and Automation Guidelines” and removed rows containing callouts and Note incorporating FB 16-01, Automation Policy Changes.

Go-Around Procedure

NP.20.66-67 - Updated Go Around Procedure table incorporating FB 15-04, Updated Go-Around Callouts.

Shutdown Procedure

NP.20.73 - Updated to include reference to newly added RNAV (RNP) approach recording procedures in SP.5.

Chapter NOI - Normal Operational Information

Section 3 - Approach Guidance

ILS CAT I, LDA with GS - Approach Guide APP Mode

NOI.3.5 - Updated Note for cross fleet standardization.

GPS, RNAV (GPS), or RNAV (GNSS) - Approach Guide

LNAV & VNAV Modes

NOI.3.13 - Added information to FMS approach procedure step for cross fleet standardization.

RNAV (RNP) - Approach Guide LNAV & VNAV Modes

NOI.3.16 - Removed bullet "vectored to a final approach course intercept heading and level at the active waypoint altitude, or"; cannot be vectored to an approach course during an RNP.

ILS (GS Out), LOC, LOC (BACK CRS), LDA, VOR, or NDB - Approach Guide LNAV or LOC & VNAV Modes

NOI.3.19 - Removed reference to Green Pages.

Charted Visual - Approach Guide (Procedure in FMS Database)

LNAV & VNAV Modes

NOI.3.23 - Removed reference to Green Pages.

Chapter SP - Supplementary Procedures

Section 05 - Introduction

General

SP.05.1 - Updated for cross fleet standardization.

Section 2 - Air Systems

Air Conditioning Packs

SP.2.1 - Added "This step. . .". to beginning of sentences.

SP.2.1 - Removed "prior to" to standardize with Boeing.

SP.2.2 - Revised note to: "APU to Pack Takeoff is prohibited at airport altitudes above 6,900 feet field elevation." to standardize with Boeing.

Section 5 - Communications

Digital Flight Information (ARINC 623)

SP.5.3 - Updated Green Page reference to Delta Special Page.

Automatic Waypoint Position Reporting (WPR)

SP.5.24 - Added WPR Reset Procedure incorporating FB 15-05, WPR Reset Procedure.

RNAV (RNP) Approach Recording Via ACARS

SP.5.28 - Added new section.

Section 7 - Engines, APU

Engine Ground Pneumatic Start

SP.7.3 - Added Note "Inform ground personnel two air start carts are required.".

Engine Condition Monitoring (ECM) Report Documentation

SP.7.7 - Added new section.

Section 11 - Flight Management, Navigation

Engine Out SIDs (FMS Programmed)

SP.11.8 - Updated Green Page reference to Delta Special Page.

RNAV Departure/Arrival Procedures

SP.11.16 - Updated Before Takeoff section to match NP.20, Before Takeoff Procedure.

Runway Change Procedures

SP.11.18 - Updated Green Pages reference to Delta Special Pages.

SP.11.19 - Updated Runway position and Flaps steps to match NP.20, Before Takeoff Procedure.

SP.11.19 - Updated Green Pages reference to Delta Special Pages.

Section 16 - Adverse Weather

Cold Weather Operation

SP.16.6 - Updated LR information to standardize with Boeing.

Guidelines for Takeoff on Contaminated Runways or Landing with Braking Action Less than Good

SP.16.11 - Added "on the following page" to provide a location of the referenced Takeoff Crosswind Chart.

SP.16.12 - Added title to chart "Takeoff Crosswind Chart".

SP.16.13,15 - Added A321.

SP.16.14 - Added A321 and updated Dry Snow when determining the contaminant depth to less than or equal to 1.0 inches.

Ground De/Anti-Icing Procedure

SP.16.18 - Updated Captain response per APB 15-04, 2015-16 De/Anti-Icing Guide and Communication Changes.

Remote (Engines Running)

SP.16.29 - Removed reference to Green Pages.

SP.16.29 - Updated Pre-Deicing Communication and Pre-Deicing Communication Using Forced Air, Deicer/Coord and Captain's response to include "engines at idle". Updated per APB 15-04, 2015-16 De/Anti-Icing Guide and Communication Changes.

Operation in a Sandy or Dusty Environment

SP.16.38 - Removed 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." to standardize with Boeing.

SP.16.41 - Added Before Takeoff section to standardize with Boeing.

SP.16.41 - Removed LR only effectivity from bullet "Avoid the use of "bump thrust" to standardize with Boeing; applies to all 777 aircraft.

Preface

Chapter P1

List of Effective Pages - FAA Approved

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Normal Procedures (tab)	
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Limitations

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Limitations

Operating Limitations

Chapter L

Section 10

General

The 777 aircraft must be operated in compliance with Certificate Limitations of the applicable FAA Approved Airplane Flight Manual (AFM). This chapter contains Airplane Flight Manual (AFM) limitations and manufacturer recommended non-AFM operating limitations.

Limitations that are obvious, shown on displays or placards, or incorporated within an operating procedure or flight plan/performance documents are not published in this chapter.

Those AFM limitations that are incorporated into a Normal or Supplementary procedure in the Volume 1, any section of the Volume 2, or any section of the QRH are identified with an [AFM] tag.

Note: The symbol (#) indicates recall limitations. Recall limitations are those operationally significant limitations that must be committed to memory. Memorization is necessary because there are no placards, display indications, or markings indicating a limitation exists.

Note: A logbook entry is required any time an aircraft limitation is exceeded, e.g., overweight landing, engine exceedance, etc.

Airplane General

Operational Limits	
Runway slope	+/- 2%
# Maximum Operating Altitude	43,100 feet pressure altitude
Maximum Takeoff and Landing Altitude	8,400 feet pressure altitude
# Maximum Takeoff and Landing Tailwind Component	10 knots, or as permitted by Delta Special Pages

Non-AFM Operational Information

The turbulent air penetration speed (in severe turbulence) is defined as:

- 270 KIAS below 25,000 feet
- 280 KIAS/.82 Mach (whichever is lower) at and above 25,000 feet.
- Maintain a minimum speed of 15 knots above the minimum maneuvering speed (amber band) at all altitudes when below 0.82 Mach.

The Delta 777 crosswind limit is 40 knots for takeoff and landing, including gusts.

Note: The crosswind component may be further limited by low visibility approaches, autolands, or contamination, or takeoff weights less than 550,000 pounds.

Note: If Takeoff Gross Weight is less than 550,000 pounds or the runway is contaminated (not DRY), refer to SP.16, Guidelines for Contaminated Runways.

Do not operate HF radios during refueling operations.

Do not use FLCH on final approach below 1,000 feet AFE.

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

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

RVSM Operations

Non-AFM Operational Information

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

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

Weight Limitations

7101 - 7110

Weights	Pounds
Maximum Taxi Weight	768,000
Maximum Takeoff Weight	766,000
Maximum Landing Weight	492,000
Maximum Zero Fuel Weight	461,000

7001 – 7008

Weights	Pounds
Maximum Taxi Weight	657,000
Maximum Takeoff Weight	656,000
Maximum Landing Weight	460,000
Maximum Zero Fuel Weight	430,000

Door Mounted Power Assists and Escape Slides

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

Flight Deck Security Door

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

Air Systems

Cabin Pressurization

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

Autoflight

Autopilot/Flight Director System

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

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

Automatic Landing

Maximum allowable wind speeds when landing weather minima are predicated on autoland operations (e.g. CAT II autoland, CAT III):

Headwind	25 knots
Crosswind	25 knots *
Tailwind	10 knots

* The Boeing AFM low visibility autoland crosswind limitation is 25 knots. To both initiate and land, Delta Ops Specs further restricts CAT II and CAT III low visibility operations to a 15 knot crosswind limit. For CAT I or higher visibility, apply the normal crosswind limit.

The maximum glideslope angle is 3.25 degrees.

The minimum glideslope angle is 2.5 degrees.

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

Communications

Flight Deck Communications Systems (Datalink)

The datalink from the COMPANY format is limited to the transmission and receipt of messages, which will not create an unsafe condition if the message is improperly received, such as the following conditions:

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

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

HF Communication System

If one HF radio is selected for transmission, deselect the other HF radio on all audio control panels to prevent audio interference.

Engines

Engine Fuel System

The maximum tank fuel temperature is 49 degrees C.

Tank fuel temperature prior to takeoff must not be less than (GE90) -40 degrees C, (RR 895) -37 degrees C, or 3 degrees above the fuel freezing point, whichever is higher. In-flight tank fuel temperature must be maintained at least 3 degrees C above the freezing point of the fuel being used. The use of Fuel System Icing Inhibitor additives does not change the minimum fuel tank temperature limit.

Engine Limit Display Markings

Maximum and minimum limits are red.

Caution limits are amber.

Engine Oil System

7001 - 7008

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

Non-AFM Operational Information

7101 - 7110

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

Reverse Thrust

Reverse thrust is for ground use only.

Backing the airplane with use of reverse thrust is prohibited.

Thrust Reverser Deployment

7001 - 7008

After a rejected takeoff (RTO) is performed, where the thrust reversers were deployed, takeoff is prohibited. Any subsequent dispatch will require approval from maintenance.

Airplane Structure

Flight Controls

Do not extend flaps above 20,000 feet.

Full application of pitch, roll, or yaw controls should be confined to speeds below the maneuvering speed. Rapid and large alternating control inputs, especially in combination with large changes in pitch, roll, or yaw, and full control inputs in more than one axis at the same time, should be avoided as they may result in structural failures at any speed, including below the maneuvering speed.

Non-AFM Operational Information

Ground wind limits for all doors:

- 40 knots while opening or closing
- 65 knots while open.

Flight Management, Navigation

ADIRU

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

Fuel System

The use of Jet B and JP4 fuel is prohibited.

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

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

Warning Systems

GPWS - Look-Ahead Terrain Alerting

Do not use the terrain display for navigation.

The use of look-ahead terrain alerting and terrain display functions is prohibited within 15 NM of takeoff, approach or landing at an airport or runway not contained in the GPWS terrain database. Crews will normally be notified of new runways not included in the database via Electronic Fleet Bulletin (EFB) or flight plan remarks.

I

Normal Procedures

Chapter NP

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Normal Procedures

Philosophy and Assumptions

Chapter NP

Section 10

General

A procedure, as used in this manual, is a series of tasks that are required during a particular phase of flight. Normal procedures are routinely performed on most flights and are outlined in Section 20 of this chapter. The procedures are arranged in chronological order.

Normal procedures assume:

- All aircraft systems are operating normally.
- The flight deck configuration is correct before the procedure commences.
- The pilot is employing the use of autoflight systems.
- The pilot has knowledge and understanding of aircraft systems and limitations.

The above assumptions allow normal procedures to be written to the appropriate level of detail. For additional details including recommendations and techniques, refer to the Flight Crew Training Manual (FCTM).

Philosophy and Compliance with Normal Procedures

Normal procedures provide Delta pilots with the fundamental guidance to operate a flight safely and efficiently. As such, pilots are expected to:

- have a sound knowledge and understanding of normal procedures, and
- routinely use and comply with the procedures on every flight.

Procedures are written considering a normal operating environment. The captain may authorize a deviation from normal procedures when considered in the best interest of safety and/or in the event of a non-normal operating environment.

Normal Procedures and CRM/TEM

Normal procedures are designed to embrace the principles of Delta Air Lines' Crew Resource Management (CRM) and Threat and Error Management (TEM) strategies. For example, embedded in normal procedures are the requirements to provide briefings at key times during the flight. It is not practical, however, to include all aspects of CRM/TEM into normal procedures. Pilots must have a comprehensive understanding of Delta's CRM/TEM philosophy and use it in conjunction with normal procedures.

Terminology

May - The word "may" is used in a permissive sense to state authority or permission. Compliance is not mandatory.

Should - The word "should" is used to indicate that compliance is expected. Deviations are permitted only where an operational requirement exists.

Will, Shall, and Must - The words "will", "shall", and "must" are used in an imperative sense to state the requirement to accomplish the act prescribed. Compliance is mandatory unless an emergency situation exists where compliance would not be in the interest of safety.

Guide - A "guide" is a document that assists the pilot in conducting a normal procedure. The use of a guide is not mandatory.

Crew Duties and Responsibilities

The captain retains final authority for all actions directed and performed.

Crew duties are divided between the pilot flying (PF), pilot monitoring (PM), captain (C), and first officer (F).

The captain's general responsibilities during ground operations include:

- calling for checklists, and
- taxiing.

The first officer's general responsibilities during ground operations include:

- monitoring taxi,
- checklist reading,
- communications, and
- tasks requested by the captain.

The captain is responsible for assigning the PF role. Normally the PF/PM roles remain unchanged throughout the flight but the captain may change the assignments at any time due to operational needs.

The PF's general responsibilities during flight are:

- flight path management and airspeed control,
- aircraft configuration,
- navigation, and
- calling for checklists.

The PM's general responsibilities during flight are:

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

Tasks Excluded from Normal Procedures

The following procedures are not addressed in NP.20:

- flight deck lighting,
- crew comfort tasks,
- exterior lighting (Refer to NP.12, Exterior Lights Usage.), and
- communication procedures.

Aircraft Configuration Changes During Normal Procedures

Prior to taxi, the flaps will be selected to the takeoff or default position.

During flight, the PF will call for any gear or flap change; the PM will verify that the airspeed is appropriate before accomplishing the change. If operational necessity requires an immediate configuration change and the PM is occupied with other duties, the PF may announce the change and move the appropriate control. This should be understood as the exception and not the rule.

After landing, no configuration changes shall be made until clear of the active runway, or until the aircraft has reached taxi speed when a 180° turn is required.

Sequence, Flow and Responsibility for Tasks

The specific tasks within a procedure are arranged in a logical order. The sequence of the tasks within a procedure may be changed as necessary.

Tasks are accomplished from memory (with the exception of the Secure procedure). This sequence is referred to as a flow pattern. Flow pattern guides assist in learning the sequence and are located in the Flight Crew Training Manual (FCTM).

Tasks are assigned to and normally performed by a specific pilot. The other pilot may perform the task.

Use of Triggers

A “trigger,” is an event that initiates a procedure or task. Procedures start with a trigger statement. For example, the trigger used to commence the Pushback procedure is:

When all exterior doors are closed and the cabin is ready for pushback:

Triggers are also used within a procedure to define when a task or a series of tasks are normally accomplished.

Operational flexibility may dictate adjusting a particular trigger.

Aircraft Limitations in Normal Procedures

Aircraft limitations are generally found in the Limitations chapter of this manual and are not normally repeated in normal procedures. There are procedures, however, that are defined ideally when in context with a limitation. In these cases, the limitation will be referred to or embedded in the normal procedure. Pilots need to be aware that normal procedures do not always refer to limitations when they are applicable. Pilots must have a fundamental knowledge and understanding of aircraft limitations.

AFM limitations incorporated into a normal or supplementary procedure in the Volume 1, any section of the Volume 2, or any section of the QRH are identified with an [AFM] tag.

Relationship Between Procedures and Checklists

A normal checklist usually follows the completion of a normal procedure. The name of the checklist is either identical to the procedure that precedes it or is preceded with “After.” For example:

- After completing the Taxi procedure, the captain calls for the Taxi checklist
- After completing the Takeoff procedure, the PF calls for the After Takeoff checklist

Not all tasks within a procedure appear on the checklist that follows. Delta uses criteria that include input from human factor experts, FAA requirements, and fleet standardization to determine what tasks rise to the level that requires inclusion on a normal checklist.

Normal Procedures Construction

Table Header

Except for inspections and preflight procedures that are assigned to one crewmember, normal procedures are shown in a two-column table format. The column header indicates the crewmember responsible for each task. The pilot normally assigned the task is identified in the table header as follows:

- Pilot Flying,
- Pilot Monitoring,
- Captain,
- First Officer, or
- Any Crewmember (Secure procedure only).

Table Cells

Each cell represents either:

- a single task,
- multiple related tasks,
- a warning, caution, or note,
- clarifying information, or
- a trigger.

When the cell only appears in one column, the task is assigned to that pilot. When the table cell spans both columns, the task is applicable to both pilots. Due to space limitations and/or complexity, a task can span both columns but will be assigned to one pilot.

The following conventions are used to assign a task within a cell:

- (C) - captain,
- (F) - first officer,
- (PF) - pilot flying, or
- (PM) - pilot monitoring.

Cell Content

Triggers appear across both columns in bold text and do not have a bullet. A task is identified with a bullet (●). When the task requires a control to be positioned, the name of the control device appears followed by the position in which it is to be placed. When either the control or position is labeled on the flight deck, the terms are capitalized. For example:

- EMERGENCY LIGHTS switch - OFF

Warnings and cautions appear before the task they affect. Notes will appear after the task they affect.

References

When it is deemed to be beneficial to refer the reader to another informational source, the notation “Refer to ____” is used.

Separate Tables within a Procedure

On some procedures a separate shaded table is used. The separate table contains tasks that are not part of the associated procedure and have one of the following characteristics:

- The tasks do not fit within the time-ordered flow of the procedure (e.g., transition altitude).
- The tasks are not required on every flight (e.g., runway change procedure).

System Discrepancies during Ground Operations

It is the crewmember's responsibility to verify correct system response.

Before engine start, if there is a discrepancy noted:

- Verify that the system controls are set correctly.
- Check the respective circuit breaker as required.
- Test the respective system light as required.
- Check the Mechanical Dispatch Manual (MDM) to decide if the condition has a dispatch effect.
- Decide if maintenance is needed.

During or after engine start, if there is a discrepancy noted:

- Complete the respective non-normal checklist (NNC).
- On the ground, check the MDM.

After engine start, the MASTER CAUTION system, annunciator lights and EICAS messages are the primary means of alerting the flight crew to non-normal conditions or incorrect configurations.

After engine start, there is no requirement to check status messages. Any message that has an adverse affect on safe continuation of the flight appears as an EICAS alert message.

Normal Procedures

Chapter NP

Normal Checklist Instructions

Section 11

General

The primary purpose of the normal checklists is to ensure that the crew has properly configured the aircraft and to verify essential and critical items have been accomplished.

The explanation of each checklist is found in NP.20, Amplified Procedures section of this chapter.

Checklist Content

The checklist has the minimum items needed to operate the airplane safely.

Normal checklist items meet one or more of the following criteria:

- items essential to safety of flight that are not monitored by an alerting system;
- items essential to safety of flight that are monitored by an alerting system but if not accomplished, would likely result in a catastrophic event;
- items needed to meet regulatory requirements;
- items needed to maintain fleet commonality;
- items that enhance safety of flight and are not monitored by an alerting system;
- items that could result in injury to personnel or damage to equipment if not accomplished.

Normal Checklist Use Policy

The crew will use the checklist on every flight and for every phase of flight for which a checklist has been established.

Normal Checklist Instructions

In the event such as taxi delays where all engines are shut down while off the gate, all procedures and checklists will be performed again starting with the Pushback checklist.

Procedure versus Checklist

Before accomplishing the checklist, each crewmember will configure all controls and systems in accordance with the associated normal procedure. The checklist is then used to verify essential procedural tasks.

Additionally, when a checklist includes a challenge and response for a briefing, the associated briefing should be completed prior to calling for the checklist that contains the briefing. The checklist functions as a “check” list, not a “do” list.

The Secure checklist is the only exception to this verification philosophy. Since these items are not performed on every flight, the Secure Checklist may be accomplished as a “read and do” checklist.

Electronic Checklist Operation

Operation with the electronic normal checklist is the same as the printed normal checklist except there is no need to read aloud or visually confirm items that are green (complete). For the Before Takeoff and Shutdown checklists, the first officer announces “___ CHECKLIST COMPLETE,” the captain visually confirms that the CHECKLIST COMPLETE indication is shown, and announces “___CHECKLIST COMPLETE.” For the Landing checklist, the PM announces “LANDING CHECKLIST COMPLETE,” the PF visually confirms that the CHECKLIST COMPLETE indication is shown, and announces “LANDING CHECKLIST COMPLETE.”

Closed loop (sensed) checklist items change from white to green when the action is taken. The PM is responsible to check off any open loop (not sensed) item and to verify that all closed loop items are green.

If a complete indicator does not appear for an ECL closed loop line item, verify the associated control is positioned correctly. If the related system is functioning normally, or is otherwise operating as expected, override the line item and continue with the checklist. A failure of a line item to automatically complete is not indicative of an ECL fault, therefore, the ECL should continue to be used for all checklists. A logbook entry is required for any faulty switch.

Normal checklists are contained in the QRH for use in the event the ECL is inoperative.

Procedural Errors or Omissions

If during the execution of a checklist the airplane configuration does not agree with the needed configuration:

- Stop the checklist.
- Complete the respective procedural steps.
- Continue the checklist.

If it becomes apparent that an entire procedure was not accomplished:

- Stop the checklist.
- Complete the entire procedure.
- Accomplish the entire checklist from the start.

Checklist Initiation and Completion

On the ground, the captain calls for the checklists and the first officer reads the checklists. In flight, the PF calls for the checklists and the PM reads the checklists. If a checklist is required but has not been called for, the other pilot should query the pilot responsible for calling for the checklist.

Whenever possible, accomplish checklists before or after high workload times.

Normally checklists are not called for until all associated procedural items are complete and there is an expectation that the checklist can be completed without interruption. The Preflight checklist, however, may be initiated before the completion of the logbook and/or fuel required tasks. If either or both of these tasks are not complete, the checklist will be read up to the last completed task. When the remaining task(s) has been completed, the checklist will be continued. Additionally, when the transition level is below 10,000 feet, the Approach checklist should be started, but will not be considered complete until the local altimeter is read.

Crewmembers may need to suspend a checklist for a short time to accomplish other tasks. The checklist should not be stowed prior to completion. If the interruption is short, continue the checklist with the next step. If a crewmember is not sure where the checklist was interrupted or the interruption is for an extended period of time, re-accomplish the checklist from the beginning.

After resuming the checklist, all checklist challenges and responses must be made by the designated pilot(s) before calling the checklist complete and stowing the checklist.

When all items of the checklist have been completed satisfactorily, the pilot reading the checklist shall announce “___ CHECKLIST COMPLETE” and may stow the checklist.

If all pilots vacate the flight deck after accomplishing the Preflight checklist, the checklist must be re-accomplished.

After Shutdown Reminders

The Normal Checklist includes after shutdown reminders. They can be accessed on the ECL at the completion of the Shutdown checklist as a convenient means to recall tasks that may have to be preformed.

Checklist Response Designators

Located on the right side of specific checklist response items are designators indicating which crewmembers must verbalize a response. Items that do not have designators are to be accomplished silently.

The following designators are used:

- C - captain,
- F - first officer,
- C&F - captain and first officer,
- PM - pilot monitoring, and
- All - All flight deck crewmembers,

If a checklist item is identified with a C&F, a dual response is required. The first response will be made by the pilot being challenged, the challenger will then respond.

Checklist Challenges

Checklist challenges identify the control or task to be checked. The pilot reading the checklist shall read the specific challenge as written.

When a checklist challenge does not end with “switch” or “lever”, the challenge refers to system status. For example, “Landing Gear...”, refers to the status of the landing gear, not just the position of the lever.

When a checklist challenge ends with “switch” or “lever”, the challenge refers to the position of the switch or lever. For example, “Engine start levers...” refers to the position of the levers.

Checklist Responses

Checklist responses are spoken as written although some items may use abbreviations due to ECL space limitations.

When a checklist response is shown in all capital letters it refers to switch or lever position. For example, “Engine start levers...CUTOFF.”

When a checklist response is written in lower case it refers to the status of the associated system. For example, “Landing gear...down.”

Tailored responses are included where appropriate.

When a checklist response does not allow the use of a specific switch position, the following terms are used as a response:

- A blank line “____” requires a unique response and is used when the response is a variable value; such as takeoff thrust, altimeters, bugs, flaps, slats, or stabilizer trim settings.
- **as reqd** means alternatives are available. Respond with the actual position of the control. For example, “Autobrakes.....3”.
- **ckd** means that controls or other systems have been evaluated/tested for proper system operation.
- **complete** indicates the associated procedure and/or procedural task in its entirety has been completed.
- **entered** indicates information, values or selections associated with the procedure have been correctly loaded in the appropriate location.
- **set** indicates panel switches, knobs, or bugs are verified to be in the correct position or the correct value has been entered.
- **verified** indicates the challenged items are correctly entered, annunciated, or have otherwise been confirmed to be correctly displayed.
- **xckd** indicates the associated value or setting has been confirmed to have been entered correctly at all locations, as specified.

An explanation of the checklist response appears in the Amplified Procedures section of this chapter when the response:

- is not obvious on how the procedure is verified and/or what needs to be verbalized,
- is not addressed at all in the procedure, or
- has a blank line “____.”

Verification of Checklist Items

When performing a checklist requiring verbalization, the crew will progress to the next item only after the response is confirmed by the crewmember being challenged.

The crewmember responding to a checklist challenge must confirm the task or procedure was completed by:

- visually verifying the checklist item, or
- observing the item was completed, or
- confirming completion with the crewmember who accomplished the procedure.

When responding to a checklist item, a visual verification must be accomplished, when possible.

Runway, Intersection, Departure, Performance Data, or Approach Changes, or Go-Around

Takeoff

In the event a runway, intersection, departure, or performance data change occurs after completing a checklist the captain should call for the Departure Runway Change checklist. After the necessary procedural steps are accomplished, the first officer will verbalize each change item by stating the challenge to the item. The designated crewmember(s) will respond with either:

- “NO CHANGE” for an item, or
- the appropriate checklist response for the item that changed.

Landing

In the event a runway or approach change occurs after completing a checklist the pilot flying (PF) should call for the Approach Runway Change checklist. After the necessary procedural steps are accomplished, the pilot monitoring (PM) will verbalize each change item (if not previously briefed) by stating the challenge to the item. The designated crewmember(s) will respond with either:

- “NO CHANGE” for an item, or
- the appropriate checklist response for the item that changed.

Note: If the landing runway assignment is changed and the captain determines the runway change can be accomplished visually, the captain may choose to waive the runway change items.

Intentionally
Blank

Normal Procedures

Operational Procedures

Chapter NP

Section 12

Multi-purpose Control Display Unit (MCDU)

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

Make MCDU entries before taxi or when stopped, when possible. If MCDU entries must be made during taxi, the first officer makes the entries. The captain must verify the entries.

In flight, MCDU entries will normally be made by the PF. When the autopilot is off, or when operating in a high workload environment, the PF should direct the PM to make MCDU entries. Both pilots should verify MCDU entries affecting lateral or vertical flight path.

Automation Guidelines

The automation policy is described in the FOM. The following guidelines are used to achieve these policies:

- Briefing should include any uncommon levels of automation and related monitoring expectations.
- VNAV should be used when available and appropriate during climb, cruise, and initial descent.
- Both pilots are responsible for comparing the performance of the autoflight system with the desired flight path of the aircraft.
- All pilot-induced lateral, vertical, and speed mode changes should be verbalized by the PF and, after referencing the FMA, the PM should verbally confirm the appropriate FMA status.
- Both pilots are responsible for monitoring the FMA and/or MCP whenever any component of the autoflight system is engaged and a flight mode change occurs.

Autopilot Guidelines

The PF will verbalize when the autopilot is engaged or disengaged.

When an autopilot is engaged:

- the PF should operate the MCP and
- the PM should verbalize that the proper selections have been set.

When an autopilot is not engaged:

- the PM should operate the MCP as directed by the PF and
- the PM should verbalize that the proper selections have been set.

Normal VHF Radio Management

VHF radios should normally be operated as follows:

- VHF L should be used for communications with ATC.
- VHF R should be used for communications with ramp control, station operations, and other company communications. When VHF R is not used for ramp or company communications, a listening watch on 121.5 should be maintained as conditions permit.
- VHF C should be used for ACARS datalink.

The first officer should clearly communicate to the captain the radio being used to receive taxi instructions.

Stabilized Approach

Delta defines a stabilized approach as maintaining a stable speed, descent rate, and lateral flight path while in the landing configuration.

WARNING: At any altitude, if the following stabilized approach criteria cannot be established and maintained, initiate a go-around. Do not attempt to land from an unstable approach.

No lower than 1000 feet AFE:

- Be fully configured for landing (gear and landing flaps extended).
- Maintain a stabilized descent rate not to exceed 1,000 fpm.
- Be aligned with the intended landing runway.

No lower than 500 feet AFE:

- Be on target airspeed.
- The engines are stabilized at the thrust setting required to maintain the desired airspeed and rate of descent.

Crossing the Runway Threshold:

- Positioned to make a normal landing in the touchdown zone.

Planned Deviations

- A circling maneuver and some published approaches (such as the River Visual at DCA) may require a planned deviation to the lateral stabilized approach criteria. Some published approaches require higher than standard descent rates. Verbalize all planned deviations during the approach briefing.

Unplanned Descent Rate Exceedance

- In the event of a momentary descent rate exceedance, crews may proceed as long as the descent rate exceedance is verbally acknowledged and corrective action is immediately initiated.

Standard Callouts

The following callouts will be verbalized by the appropriate crewmember.

Crews should focus on the aircraft state during the level-off period.

Some callouts are made automatically by aircraft aural systems. When a required callout is made automatically, it may be omitted by the appropriate crewmember.

On any approach, when the pilot flying (PF) can maintain visual contact with the runway, the “APPROACHING MINIMUMS” and “MINIMUMS” callouts are not required.

Note: If the Radio Altimeter is inoperative, reference the barometric altimeter for the “1,000” and “500” callouts.

TAKEOFF		
Condition	Crew Member	Callout
At 80 KIAS when HOLD annunciated		“80 KNOTS, HOLD, THRUSTNORMAL”
At V1	PM	“V1”
At VR	PM	“ROTATE”
At positive rate of climb	PM	“POSITIVE RATE”

CLIMB		
Condition	Crew Member	Callout
Approximately 1,000 feet below each assigned altitude	PM	“OUT OF __ FOR __”
Approaching transition altitude (if other than 18,000 feet)	PM	“TRANSITION ALTITUDE”

DESCENT		
Condition	Crew Member	Callout
Approximately 1,000 feet above each assigned altitude	PM	“OUT OF __ FOR __”
Approaching transition level (if other than FL 180)	PM	“TRANSITION LEVEL”

ALL APPROACHES		
Condition	Crew Member	Callout
Any significant deviation from planned flight path, airspeed or descent rate	PM	“SPEED +/- __” or “SINK __”, etc.
At approximately 1,000 AGL	PM	“1,000, CLEARED TO LAND” or “1,000, NO LANDING CLEARANCE”
Below 1,000 AGL: Any descent exceeding 1,000 feet per minute	PM	“SINK __”
At approximately 500 AGL	PM	“500”
Prior to descending below 100 feet above TDZE/Rwy Threshold Elevation: • With runway in sight (if not already called) • With runway not in sight	C	“RUNWAY IN SIGHT” (F must acknowledge) Note: This call not required on CAT III and visual approaches. “GO AROUND” (F must acknowledge)

CAT I & II APPROACHES		
Condition	Crew Member	Callout
Approximately 80 feet above minimums	PM	“APPROACHING MINIMUMS”
At or before minimums	C	“APPROACH LIGHTS IN SIGHT”, or “RUNWAY IN SIGHT” or “GO AROUND” (F must acknowledge)
At minimums	PM	“MINIMUMS”

CAT III APPROACHES		
Condition	Crew Member	Callout
Approximately 80 feet above alert height (AH)	PM	“APPROACHING MINIMUMS”
At alert height (AH)	PM	“MINIMUMS”
	C	“LAND 3” or “GO AROUND”

Non-ILS, CAT I, & CAT II APPROACHES		
Condition	Crew Member	Callout
Approximately 80 feet above minimums	PM	“APPROACHING MINIMUMS”
At or before minimums	C	“APPROACH LIGHTS IN SIGHT”, or “RUNWAY IN SIGHT” or “GO AROUND” (F must acknowledge)
At minimums	PM	“MINIMUMS”

GO AROUND ALL APPROACHES		
Condition	Crew Member	Callout
When a go around is warranted	PF	“GO AROUND”
After proper FMA mode annunciation, verbalize pitch mode	PM	“TOGA VERIFIED”
	PF	“FLAPS ____”
At positive rate of climb	PM	“POSITIVE RATE”
	PF	“GEAR UP”

AFTER ALL LANDINGS		
Condition	Crew Member	Callout
Verify speedbrakes are up	PM	“SPEEDBRAKES UP”
If speedbrakes are not up	PM	“NO SPEEDBRAKES”
At 80 knots	PM	“80 KNOTS”

Clearance Verification Procedures

The pilot flying (PF) and pilot monitoring (PM) should monitor and confirm all issued ATC clearances, unless operational constraints (e.g., PAs, PM leaves flight deck) prohibit. If any pilot is unsure of the stated clearance, contact ATC to verify.

Note: If a clearance, departure procedure, or route is changed, reaccomplish the clearance verification procedure.

Clearance Type	Action	
	PF	PM
Pre-Departure Clearance (PDC)/Departure Clearance (DCL) via ACARS, CPDLC, or voice. On voice clearances, both pilots should monitor and at least one pilot must write down the ATC clearance.		Referencing the departure clearance, verbalize the departure, route of flight, altitude, and any speed restriction to the PF.
	Referencing the FMS and MCP, verbalize the departure, route of flight, altitude, and any speed restriction to the PM.	
Taxi	The captain should repeat the taxi clearance after the first officer has read the clearance back to ATC. When issued complex and/or extensive taxi instructions, at least one pilot should write down, or enter into the FMS scratchpad, the taxi clearance.	
Takeoff	Acknowledge clearance items different than previously briefed.	
Altitude	Both pilots should verify the altitude specified by either an ATC clearance or a procedure has been set correctly by stating the altitude and pointing at the altitude display window. Ensure the proper altimeter reference - QNH, QNE, or QFE - is set.	

Clearance Type	Action	
	PF	PM
CPDLC	If any clearance change is received via CPDLC, clearance must be reviewed by both PF and PM. Ensure the entire uplink is reviewed, referring to page numbers in order to assure the entire content is understood.	
Crossing Restrictions, Headings, and Airspeeds	Acknowledge the clearance received by repeating the new clearance.	
Class I or II Airspace	Refer to Airway Manual, Airspace & Enroute Navigation, CDRC.	

Lights Usage

Exterior Lights Usage

Exterior lights should be used in accordance with the following:

Phase of Flight	Lights Usage
Aircraft is powered	Navigation/Position lights illuminated continuously. • NAV lights - ON • LOGO lights - ON
Engines running/aircraft moving	Anti-collision lights (beacons) illuminated immediately prior to aircraft movement or engine start, whichever occurs first. • BEACON - ON
Taxiing	Taxi light illuminated when moving or intending to move. • TAXI light - ON
Crossing a runway	All exterior lights illuminated. Note: Avoid using LANDING and STROBE lights if they will adversely affect the vision of other pilots. • TAXI light - ON • RUNWAY TURNOFF lights - ON • LANDING lights - ON • WING lights - ON • STROBE lights - ON
Line up and wait	All exterior lights illuminated, except the landing lights. Note: Avoid using STROBE lights if they will adversely affect the vision of other pilots. • TAXI light- ON • RUNWAY TURNOFF lights - ON • WING lights - ON • STROBE lights - ON

Phase of Flight	Lights Usage
Takeoff	All exterior lights illuminated. • LANDING lights - ON
In flight (above 18,000 feet)	Exterior lights extinguished, except the anti-collision (beacon), logo, navigation/position, and strobe lights. • TAXI light- OFF • RUNWAY TURNOFF lights - OFF • LANDING lights - OFF • WING lights - OFF
In flight (below 18,000 feet)	All exterior lights illuminated. Note: The TAXI and NOSE LANDING lights may remain OFF until landing clearance has been received. • TAXI light - ON • RUNWAY TURNOFF lights - ON • LANDING lights - ON • WING lights - ON

Emergency Lights Usage

Emergency lights must be armed for taxi, takeoff, and landing. They are not required to be armed during either the boarding or deplaning process.

Normal Procedures
Amplified Procedures

Chapter NP
Section 20

Interior Inspection - First Officer or Relief Pilot

Normally the first officer or relief pilot accomplishes this procedure. However, it does not preclude the captain from completing all or part of the procedure if time and conditions dictate.

It is the responsibility of the flight leader/purser to verify the cabin emergency equipment inspection is completed. For flights without flight attendants on board, refer to SP.1, Cabin Inspection-Flights without Flight Attendants.

The Interior Inspection procedure assumes that the Electrical Power Up procedure is complete. Refer to SP.6, Electrical Power Up, if required.

WARNING: If a red A/C OUT-OF-SERVICE tag is installed, personnel are not to activate any system, control, switch, or circuit breaker without obtaining verbal approval of maintenance personnel (preferably the mechanic performing the repairs).

First flight of the day items (if required) Check

These checks or tests need only be accomplished prior to the first departure of the calendar day as noted in the aircraft logbook. These system tests are covered in the Supplementary Procedures chapter of this manual.

Procedure	Location
Observer Oxygen Mask(s) Test	SP.1
Flight Deck Access System Test [AFM]	SP.1
Fire Warning System Test (only on non-ETOPS flights)	SP.8

Flight deck security search Complete
Refer to FOM, chapter 4, Sensitive Security Information, for
information and timing requirements.

Logbook Check
All crewmembers must review the logbook to become familiar with
the history and maintenance status of the aircraft.

If there is doubt concerning the status of the logbook, contact MCC
via the Dispatcher.

- Ensure the logbook matches the aircraft ship number.
- Ensure the Airworthiness Release has been signed by
Maintenance.

Note: Airworthiness Release sign-off is not required at a Delta
non-maintenance station when aircraft airworthiness
discrepancies do not exist.

- Review any EP-19s for special equipment and/or operating
instructions.
- Consult the MDM for any operating limitations or crew
operating procedures as a result of existing MELs/CDLs.
- For ETOPS departures, check for a Pre-Departure Check
(PDC).

Potable water and waste tanks Check
• Confirm the potable water supply is sufficient.
• Verify the waste quantity is at an acceptable level.

STATUS Check
Verify that only acceptable messages are shown.

7101 - 7110
FLIGHT DECK ACCESS SYSTEM OFF
Guard up, switch up.

7001 - 7008
Mechanical Latch Pin As required

Quantities Check

Check the following are sufficient for flight:

- minimum oxygen pressure 1,000 psi

Note: If crew oxygen pressure is below 1,000 psi, contact maintenance to determine if enough oxygen is available for flight.

- hydraulic quantities: No RF, OF, or LO displayed
- engine oil quantities: No LO displayed

Required documents Check

- Aircraft Logbook
- Jeppesen Airside Flight Kits
- Quick Reference Handbook (QRH) (2)
- Mechanical Dispatch Manual (MDM)
- Engine Performance Logbook
- Quick Reference Card

EFB Mounts Check

Verify 3 EFB mounts on board.

Circuit breakers Check

Verify circuit breakers are in or collared in compliance with dispatch requirements.

Flight deck emergency equipment Check

- Fire Extinguisher - Check and stowed
 - Trigger safety pin in place
 - Seal intact
 - Pressure in green band
 - Properly stowed
- Crash Ax - stowed
- PBE - check
 - Verify the PBE is in its stowage bracket and both plastic seals are intact.
- Escape ropes - stowed
- Life vests - stowed
- 7001-7008**
- ELT - ARMED
 - Verify properly stowed and the mode switch is in the ARMED position.

7101 - 7110

- ELT switch - guard closed;
 - Verify the switch guard closed and the EICAS message ELT ON is not shown.

Jumpseat(s) Secure
Ensure jumpseat(s) that will be unoccupied for the flight are secured and shoulder harnesses are retracted or secured. Lap belts should be fastened in non-folding jumpseats.

Crew luggage Secure

Printer paper Check
Verify PAPER light - extinguished
Verify printer paper quantity, including spare rolls, is sufficient for the duration of the flight.

Overhead maintenance panel Guards closed
Verify that all lights are extinguished.

CARGO TEMPERATURE selectors - As required
Normally, AFT set to LOW and BULK set to HIGH.

COCKPIT VOICE RECORDER Check
Refer to SP.5, Cockpit Voice Recorder Test.

Door 1 Upper Crew Rest. Check
Verify the security, integrity, and provisioning of the pilot crew rest area (s). Ensure bedding provisions for the pilot crew rest area(s) is sufficient for all flight deck crewmembers. The cabin crew is responsible for the preflight of the flight attendant rest area. [AFM]
Verify the following emergency equipment:

- Portable oxygen bottle - Check
- Fire extinguishers (2 halon, 1 H2O) - Checked and stowed
- Flash light - Check
- PBE (4) - Check
- First Aid Kit - Check

Exterior Inspection - Captain or First Officer or Relief Pilot

Before each flight the captain must verify the airplane is in satisfactory condition for flight. Make a complete exterior inspection, and report any discrepancies to the captain and to maintenance as soon as possible. Emphasis should be placed on tire wear, airframe or control damage, and leaking fluids.

Be aware of security issues. Refer to FOM, chapter 4, Sensitive Security Information.

Following the route below, complete the preflight at the point where the inspection began, ensuring a complete circuit around the aircraft.

Items at each location may be checked in any sequence.

Ensure that:

- surfaces and structures are clear, undamaged, not missing parts, and there are no fluid leaks.

Note: Assessing the condition of the upper wing surfaces may require viewing from inside the aircraft.

- hydraulic lines and electrical wires are secure and undamaged.
- installed placards are readable.
- gear struts are not fully compressed.
- gear pins have been removed.
- engine inlets and tailpipes are clear, cowlings are secured and undamaged, and the reversers are stowed.
- doors and access panels that are not in use are latched.
- probes, sensors, ports, vents, and drains are unobstructed, clear, and undamaged.
- skin area adjacent to the pitot probes and static ports is not wrinkled.
- antennas are not damaged.
- light lenses are clean and not damaged.
- exterior lights are illuminated in accordance with NP.12, Lights Usage.

Notify maintenance if any:

- tread groove is worn completely around the tire.
- tires are worn beyond limits, damaged, or tread is separating.
- layer of cord is showing.
- questionable cut exists.
- tire shows appearance of improper inflation.
- wheel through-bolt or nut is missing or damaged.

For Cold Weather Operation, refer to SP.16.

Check the following specific items during the exterior inspection:



Left Forward Fuselage

- Probes, sensors, ports, vents and drains (as applicable).....Check
- Doors and access panels (not in use)..... Latched
- Oxygen pressure relief green disc In place
- Forward outflow valve Check

Nose

- Radome Check
- Diverter strips - Secure
- Doors and access panels (not in use)..... Latched
- Probes, sensors, ports, vents and drains (as applicable).....Check
- Wipers and windshield Check

Nose Landing Gear and Wheel Well

Tires and wheels	Check
Gear doors	Check
Gear strut and nose wheel steering assembly	Check
Hydraulic lines and electrical wires	Check
Exterior lights	Check
Gear pin	Removed
APU ground control fire panel	Check
Nose gear steering lockout pin	As required
If towbar is attached, towing lever set to bypass, pin installed.	
Wheel well light switches	As needed

Right Forward Fuselage

Probes, sensors, ports, vents, and drains (as applicable)	Check
Doors and access panels (not in use)	Latched
Exterior lights	Check
Pack inlet	Check
Negative pressure relief doors	Check

Right Inboard Wing and Lower Fuselage

Probes, sensors, ports, vents, and drains (as applicable)	Check
Doors and access panels (not in use)	Latched
Exterior lights	Check
Pack inlet	Check
Leading edge slat	Check
Fuel sticks	Check

Right Engine

Doors and access panels (not in use)	Latched
Probes, sensors, ports, vents, and drains (as applicable)	Check
Fan blades and spinner	Check
Thrust reverser	Stowed
Exhaust area and tailcone	Check
Pylon	Check

Right Wing and Leading Edge

Doors and access panels (not in use)	Latched
Probes, sensors, ports, vents, and drains (as applicable)	Check
Leading edge slats	Check
Fuel sticks	Check

Right Wing Tip and Trailing Edge

Exterior lights	Check
Static discharge wicks	Check
Control surfaces	Check
Flaps and fairings	Check
Fuel jettison nozzle	Check

Right Landing Gear and Wheel Well

Tires, brakes and wheels	Check
Gear strut, actuators, and doors	Check
Hydraulic lines and electrical wires	Check
Gear pins	Removed
Main gear steering bypass	NORMAL

Right Aft Fuselage and Upper Wing Surface

Doors and access panels (not in use) Latched
Probes, sensors, ports, vents, and drains (as applicable) Check
Upper wing surface condition Check

Tail

Doors and access panels (not in use) Latched
Probes, sensors, ports, vents, and drains (as applicable) Check
Vertical stabilizer and rudder Check
Horizontal stabilizer and elevator Check
Static discharge wicks Check
Exterior lights Check
Lower aft fuselage surface Check

Check for evidence of tail strike damage.

Left Aft Fuselage and Upper Wing Surface

Doors and access panels (not in use) Latched
Probes, sensors, ports, vents, and drains (as applicable) Check
Aft outflow valve Check
Upper wing surface condition Check

Left Landing Gear and Wheel Well

Gear strut, actuators, and doors Check
Hydraulic lines and electrical wires Check
Tires, brakes and wheels Check
Gear pins Removed
Main gear steering bypass NORMAL

Left Wing Tip and Trailing Edge

Exterior lights	Check
Static discharge wicks	Check
Flaps and fairings	Check
Control surfaces	Check
Fuel jettison nozzle	Check

Left Wing and Leading Edge

Probes, sensors, ports, vents, and drains (as applicable)	Check
Doors and access panels (not in use)	Latched
Fuel sticks	Check
Leading edge slats	Check

Left Engine

Doors and access panels (not in use)	Latched
Probes, sensors, ports, vents, and drains (as applicable)	Check
Fan blades and spinner	Check
Exhaust area and tailcone	Check
Thrust reverser	Stowed
Pylon	Check

Left Inboard Wing and Lower Fuselage

Doors and access panels (not in use)	Latched
Probes, sensors, ports, vents, and drains (as applicable)	Check
Exterior lights	Check
Fuel sticks	Check
Pack inlet	Check
Leading edge slat	Check

Left Forward Fuselage

Doors and access panels (not in use)	Latched
Probes, sensors, ports, vents, and drains (as applicable)	Check
Negative pressure relief doors	Check
Positive pressure relief valves	Check

Preflight Procedure - Pilot Flying

Normally the pilot flying (PF) accomplishes this procedure. However, it does not preclude another crewmember from completing all or part of the procedure if time and conditions dictate. In all cases both the pilot flying (PF) and pilot monitoring (PM) must confirm the FMS preflight entries.

After completing this procedure, the pilot flying (PF) should accomplish a visual scan to ensure the pilot monitoring (PM) has accomplished the flight deck set-up.

The following procedure assumes the flight plan is uplinked. If uplink is unavailable, refer to SP.11, Flight Management, Navigation section for manual flight plan entry procedures.

WARNING: If a red A/C OUT-OF-SERVICE tag is installed, personnel are not to activate any system, control, switch, or circuit breaker without obtaining verbal approval of maintenance personnel (preferably the mechanic performing the repairs).

ADIRU ON

If alignment is required, refer to SP. 11, ADIRU Alignment/Position Update.

FMS **Set**

Prior to FMS preflight loading, DATALINK READY must be displayed on the FMC COMM page. A VHF or SATCOM ACARS connection is required for FMS Data Link to function.

IDENT page:

Verify that the MODEL is correct.

Verify that the ENG RATING is correct.

Verify that the current database is active based upon the local date of departure.

Compare the FF Factor on the flight plan to the FF at 5R. If the values are not the same, update using the following steps:

- Type ARM in the scratchpad and line select to 5R.
- Type a forward slash / followed by the FF Factor value on the FP in the scratchpad and line select to 5R. Include negative sign if necessary.

Ex: Enter PLUS 2.7 as /2.7 and MINUS 3.5 as /-3.5

To request FMS Data Link preflight uplinks

ACARS INIT DATA REQUEST box **Confirm** checked

Confirm box is checked on the ACARS initialization page.

SEND **Select**

Note: Do not send the INIT DATA REQUEST until the PF is ready to begin loading FMS.

To Load FMS Data Link

The FMC COMM page displays “UPLINK” above the items for which data exists. Selecting the FMC COMM page prompts provides quick access to the appropriate pages. Uplinked data is loaded/accepted by selecting data link action prompts in lieu of making manual entries.

Performance Initialization:

When PERF INIT UPLINK READY message is displayed in the scratchpad:

ACCEPT (on PERF INIT page) Select
The planned ZFW is uplinked instead of RAMP WT.

Note: After receiving the final WDR, actual ZFW uplink or manual entry is still required.

Note: The PERF INIT uplink associated with a TDU will contain the ZFW from the latest WDR. Accept the new ZFW or manually enter prior to loading the TDU to avoid deleting takeoff speeds.

STEP SIZE Enter desired value

Do not enter enroute step climbs or descents on the LEGS pages.

Flight Planned Route (Route 1):

When ROUTE 1 UPLINK READY message is displayed in the scratchpad:

LOAD (on RTE 1 page)..... Select

After RTE 1 loading is complete:

ACTIVATE Select

EXEC Select

Load, activate, and execute RTE 1 promptly.

Note: Departure runway, SID, STAR, transitions and arrival runway are not uplinked and must be manually loaded. Doing so prior to loading the WIND uplink will keep data for wind fixes on those segments from being rejected.

Note: The PF and PM must verify route data.

Wind Data:

Note: The WIND DATA uplink should only be loaded after the flight planned ROUTE is loaded, activated, and executed.

When WIND DATA UPLINK READY is displayed in the scratchpad:

LOAD (on ACT RTE 1 DATA page) Select

After wind loading is complete:

EXEC Select

Split Wind Uplink

If WIND DATA UPLINK is too large the following ACARS message will accompany split uplinks:

****DATA LINK ADVISORY**PARTIAL WIND UPLINK SENT
DUE TO MESSAGE SIZE LIMITS. CHECK FMC COMM PAGE -
CONFIRM ALL UPLINKS ARE LOADED THEN SEND A WIND
REQUEST FROM THE FMC RTE-DATA PAGE-6R.**

Note: Follow this process until all wind data is received.

Descent Forecast:

When DES FORECST UPLINK READY message is displayed in the scratchpad:

LOAD (on DESCENT FORECAST page) Select

Flight Number Uplink:

When FLT NUMBER UPLINK message is displayed in scratchpad:

FLT NO Confirm

On RTE 1 page, confirm the correct flight number is displayed then clear message.

ETP Data (Route 2):

Note: After a delay of approximately 5 minutes, and if ETP information exists, ETP airport and waypoint data will be sent.

When ROUTE 2 UPLINK READY message is displayed in scratchpad:

LOAD (on RTE 2 page) Select
Do not activate RTE 2 data. The DEST airport field is left blank for FMS Critical Terrain Diversion Airport entry.

Note: After all loading is complete, verify “UPLINK” is not displayed above any prompts on the FMC COMM page.

Departure briefing Complete
Refer to FOM, chapter 3, Briefings.

Preflight Procedure - Pilot Monitoring

Normally the pilot monitoring (PM) accomplishes this procedure. However, this does not preclude another crewmember from completing all or part of the procedure if time and conditions dictate. In all cases the pilot monitoring (PM) must confirm that the Preflight Procedure – Pilot Monitoring, has been completed.

WARNING: If a red A/C OUT-OF-SERVICE tag is installed, personnel are not to activate any system, control, switch, or circuit breaker without obtaining verbal approval of maintenance personnel (preferably the mechanic performing the repairs).

THRUST ASYMMETRY COMPENSATION

switch AUTO

Verify that the OFF light is extinguished.

PRIMARY FLIGHT COMPUTERS

DISCONNECT switch Guard closed

Verify that the DISC light is extinguished.

ELECTRICAL panel	Set
BATTERY switch – ON	
Verify that the OFF light is extinguished.	
IFE/PASS SEATS power switch – ON	
Verify that the OFF light is extinguished.	
CABIN/UTILITY power switch – ON	
Verify that the OFF light is extinguished.	
APU GENERATOR switch – ON	
Verify that the OFF light is extinguished.	
BUS TIE switches – AUTO	
Verify that the ISLN lights are extinguished.	
GENERATOR CONTROL switches – ON	
Verify that the OFF lights are illuminated.	
Verify that the DRIVE lights are illuminated.	
BACKUP GENERATOR switches – ON	
The OFF lights stay illuminated until the respective engine is started.	
L WIPER selector	OFF
7001 – 7008	
DOOR LOCK CONTROLLER selector	AUTO
EMERGENCY LIGHTS switch	Guard closed
SERVICE INTERPHONE switch	OFF
PASSENGER OXYGEN ON light	Verify extinguished
Note: Do not push the PASSENGER OXYGEN switch. The switch causes deployment of the passenger oxygen masks.	
WINDOW HEAT switches	ON
Verify that the INOP lights are extinguished.	

WARNING: Do not push the RAM AIR TURBINE switch. The switch causes deployment of the ram air turbine.

RAM AIR TURBINE UNLOCKED light Verify extinguished

HYDRAULIC panel Set

LEFT and RIGHT ENGINE PRIMARY pump switches – ON

Verify that the FAULT lights are illuminated.

Center 1 and Center 2 ELECTRIC PRIMARY pump switches – OFF

Verify that the FAULT lights are illuminated.

DEMAND pump selectors – OFF

Verify that the FAULT lights are illuminated.

PASSENGER SIGNS panel Set

7001 – 7008

NO SMOKING selector – ON

All

SEAT BELTS selector – ON

Lighting panel Set

OVERHEAD/CIRCUIT BREAKER panel light control – Mid position

DOME light control – As required

STORM light switch – As required

MASTER BRIGHTNESS switch – ON

MASTER BRIGHTNESS control – As required

GLARESHIELD PANEL/FLOOD light control – Mid position

LANDING light switches – OFF

APU fire panel	Set
Verify that the APU BTL DISCH light is extinguished.	
APU fire switch – In	
Verify that the APU fire warning light is extinguished.	
CARGO FIRE panel	Set
CARGO FIRE ARM switches – Off	
Verify that the FWD and AFT fire warning lights are extinguished.	
Verify that the cargo fire DISCH light is extinguished.	
ENGINE panel	Set
EEC MODE switches – NORM	
START selectors – NORM	
AUTOSTART switch – ON	
Verify that the OFF light is extinguished.	
FUEL JETTISON panel	Set
FUEL JETTISON NOZZLE switches – Off	
Verify that the VALVE lights are extinguished.	
FUEL TO REMAIN selector – IN	
FUEL JETTISON ARM switch – Off	
Verify that the FAULT light is extinguished.	

-
- FUEL panel..... Set
 Ensure fueling is in progress or complete.
- CROSSFEED switches – OFF [AFM]
 Verify that the VALVE lights are extinguished.
- FUEL PUMP switches – OFF
 Verify that the left forward pump PRESS light is extinguished if the APU is on or is illuminated if the APU is off.
 Verify that the other left and right pump PRESS lights are illuminated.
 Verify that the center pump PRESS lights are extinguished.
- ANTI-ICE panel..... Set
 WING anti-ice selector – AUTO
 ENGINE anti-ice selectors – AUTO
- Lighting panel..... Set
 BEACON light switch – OFF
 NAVIGATION light switch – ON
 LOGO light switch – As required
 WING light switch – As required
 INDICATOR LIGHTS switch – As required
 RUNWAY TURNOFF light switches – OFF
 TAXI light switch – OFF
 STROBE light switch – OFF

AIR CONDITIONING panel	Set
EQUIPMENT COOLING switch – AUTO	
Verify that the OVRD light is extinguished.	
GASPER switch – ON	
RECIRCULATION FANS switches – ON	
FLIGHT DECK TEMPERATURE control – mid AUTO position	
CABIN TEMPERATURE control – Mid position	
PACK switches – AUTO	
Verify that the OFF lights are extinguished.	
TRIM AIR switches – ON	
Verify that the FAULT lights are extinguished.	
BLEED AIR panel	Set
LEFT, CENTER and RIGHT ISOLATION switches – AUTO	
Verify that the CLOSED lights are extinguished.	
ENGINE bleed switches – ON	
The OFF lights stay illuminated until the respective engine is started.	
APU bleed switch – AUTO	
Verify that the OFF light is extinguished.	
PRESSURIZATION panel	Set
OUTFLOW VALVE switches – AUTO	
Verify that the MAN lights are extinguished.	
LANDING ALTITUDE selector – IN	
R WIPER selector	OFF

Mode control panel	Set
FLIGHT DIRECTOR switches – ON	
AUTOTHROTTLE ARM switches – ARM	
Arm VNAV	
Autopilot DISENGAGE bar – Up	
HEADING/TRACK reference switch – HDG	
Initial heading – Set	
BANK LIMIT selector – AUTO	
VERTICAL SPEED/FLIGHT PATH ANGLE reference switch – As required	
ALTITUDE increment selector – As required	
Initial altitude – Set	
Display select panel	Set
LOWER CENTER display switch – Push	
HEADING REFERENCE switch	NORM
FMC selector	AUTO
Integrated standby flight display	Set
Verify that the approach mode display is blank.	
Set local altimeter setting.	
Verify that the flight instrument indications are correct.	
Verify that no flags or messages are shown.	

Landing gear panel Set

Verify that the GND PROX light is extinguished.

FLAP OVERRIDE switch – Off

GEAR OVERRIDE switch – Off

TERRAIN OVERRIDE switch – Off

Landing gear lever – DN

ALTERNATE GEAR switch – Guard closed

AUTOBRAKE selector – RTO

EICAS display Check

Verify that the primary engine indications show existing conditions.

Verify that no exceedance is shown.

Secondary ENGINE indications – Check

Verify that the secondary engine indications show existing conditions.

Verify that no exceedance is shown.

STATUS display switch – Push.

Check status messages.

Note: The following steps apply when the electronic checklist is operational.

CHECKLIST display switch – Push

LOWER CENTER cursor location switch – Push

Verify that the lower center cursor location light is illuminated.

RESETS – Select

RESET ALL – Select

CPDLC/ADS	Select
Refer to SP.5, CPDLC Procedures.	
7101-7110	
COMMUNICATION display switch - Push	
MANAGER - Select	
SYSTEM INFORMATION - Select	
Verify TAIL NUMBER is correct.	
7001-7008	
Communications Main Menu - Select	
MANAGER Page - Select	
ADS Page - Select	
ADS ARM - Select	
ADS EMERGENCY OFF - Select	
Center DISPLAY CONTROL source switch	Off
CENTER PANEL BRIGHTNESS controls	Mid position
ALTERNATE PITCH TRIM levers	Neutral
SPEEDBRAKE lever	DOWN
Reverse thrust levers	Down
Forward thrust levers	Closed
Flaps	Up
Verify proper indication.	
STABILIZER cutout switches	Guards closed
FUEL CONTROL switches	CUTOFF
FUEL CONTROL switch fire warning lights	Verify extinguished

- ALTERNATE FLAPS panel Set
- ALTERNATE FLAPS ARM switch – OFF
- ALTERNATE FLAPS selector – OFF
- Engine fire panel Set
- Verify that the ENG BTL 1 DISCH and ENG BTL 2 DISCH lights are extinguished.
- Engine fire switches – In
- Verify that the LEFT and RIGHT fire warning lights are extinguished.
- Radios & transponder Check and set
- Left radio tuning panel – Set
- Verify that the OFF light is extinguished.
- Set frequencies as required.
- Right radio tuning panel – Set
- Verify that the OFF light is extinguished.
- Set frequencies as required.
- Center radio tuning panel – Set
- Verify that the OFF light is extinguished.
- Verify DATA in active window for ACARS operations.
- Observer's audio control panel – As required
- OBSERVER AUDIO selector – NORM
- Transponder panel – Set

Radar	Set
WEATHER RADAR panel – Set	
WX switches - select	
AUTO switch - AUTO	
GAIN control - calibrated	
The calibrated position is achieved by aligning the word “GAIN” horizontally with the arrow at the 12 o’clock position pointing down.	
Center CDU	Set
Flight deck printer	Set
Verify PAPER light - extinguished	
Verify printer paper quantity, including spare rolls, is sufficient for the duration of the flight.	
7101 - 7110	
FLIGHT DECK DOOR selector	AUTO
7001 - 7008	
Evacuation COMMAND switch	Guard closed
FLOOR LIGHTS switch	As required
AISLE STAND PANEL light control	Mid position
AISLE STAND FLOOD light control	Mid position
FMS entries	Verify

Preflight Procedure - Captain

Logbook Check

All crewmembers must review the logbook to become familiar with the history and maintenance status of the aircraft.

If there is doubt concerning the status of the logbook, contact MCC via the dispatcher.

- Ensure the logbook matches the aircraft ship number.
- Ensure the Airworthiness Release has been signed by Maintenance.

Note: Airworthiness Release sign-off is not required at a Delta non-maintenance station when airworthiness discrepancies do not exist.

- Review any EP-19s for special equipment and/or operating instructions.
- Consult the MDM for any operating limitations or crew operating procedures as a result of existing MELs/CDLs.
- For ETOPS departures, check for a Pre-Departure Check (PDC).

Electronic Flight Bag Set

Prior to the Pushback checklist, turn Airplane mode ON to ensure WiFi and Bluetooth® are turned off. The EFB must be operated in Airplane mode with WiFi disabled from the start of the Preflight checklist through the completion of the Shutdown checklist. Enabling Airplane mode with Bluetooth® off will also conserve battery life.

To turn Airplane mode ON, accomplish the following steps:

- Select SETTINGS
- Select Network icon
- Slide the Airplane mode ON/OFF switch to ON.

JEPPESEN application - Configure

The following steps are mandatory:

- Select the Jepp FliteDeck PRO tile
- Select the route icon.
- Select the down arrow to expand the route drawer
- Select New Flight, if necessary
 - In pop-up window, select OK
- Enter ORIGIN and DESTINATION airports

The following steps are optional:

- Enter ALTERNATE airport as desired
- Enter Nav aids, Airways, and/or Waypoints, as desired
- Select SID
 - Select applicable departure procedure
- Select STAR
 - Select applicable arrival procedure
- Select Terminal Charts View (airplane) icon
- Select REF
 - Select applicable reference documents, e.g., local ramp procedures
- Select CO
 - Select applicable Delta Special Pages, e.g., Engine Out Departure Procedure
- Select TAXI
 - Select applicable taxi charts
- Select enroute icon
 - Select appropriate HIGH/LOW portion of enroute charts and set an appropriate chart scale

Airwatch Secure Content Locker (SCL) - Configure

- Select the DELTA CONTENT LOCKER (Airwatch SCL) tile
- Open the appropriate documents/operating manuals as desired

EFIS control panel.....	Set
MINIMUMS reference selector – RADIO or BARO	
MINIMUMS selector – As desired	
FLIGHT PATH VECTOR switch – As required	
METERS switch – As required	
BAROMETRIC reference selector – IN or HPA	
BAROMETRIC selector – Set local altimeter setting on PFD	
VOR/ADF switches – As required	
ND mode selector – MAP	
ND CENTER switch – As required	
ND range selector – As required	
ND TRAFFIC switch – ON	
TCAS OFF will display on NDs until TCAS is set to TA or TA/RA.	
WEATHER RADAR – Off	
Verify that the weather radar indications are not shown on the ND.	
Map switches – As required	
Oxygen mask.....	Check
Refer to SP.1, Oxygen Mask Test.	
Window	Close and lock
Verify the lock lever is in the locked (forward) position and the orange indicator is not in view.	
MAP light control	As required
Heaters.....	Set
SHOULDER control and FOOT selector - As required	

FORWARD PANEL BRIGHTNESS controls Mid position

Instrument source select panel Set

NAVIGATION source switch – Off

DISPLAY CONTROL source switch – Off

AIR DATA/ATTITUDE source switch – Off

Clock Set

Time/date selector - UTC

Altimeters Set

Set the local altimeter setting.

Verify RVSM and altimeter crosscheck are within limits. Refer to L.10, Airplane General, RVSM Operations.

Verify no flag displayed.

INBOARD DISPLAY selector MFD

Flight and nav instruments Check

Verify that the flight instrument indications are correct.

Verify that only these flags are shown:

- TCAS OFF
- NO VSPD until takeoff V–speeds are selected

Verify that the flight mode annunciations are correct:

- autothrottle mode is blank
- roll mode is TO/GA
- pitch mode is TO/GA
- AFDS status is FLT DIR
- VNAV and/or LNAV armed (as required).

Verify route is displayed and correct.

Select the map mode.

Audio control panel Set

Seat Adjust

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.

WARNING: If the rudder pedal adjust crank is not stowed after use, the rudder pedals may move out of the desired position.

Rudder pedals Adjust

Adjust the rudder pedals to allow for full rudder pedal and brake pedal movement. Stow the rudder pedal adjust crank.

Parking brake Set

Flight attendant briefing Complete

Accomplish a flight attendant briefing. Refer to FOM, chapter 3, Communications.

Fuel required Verify

Compare flight plan block fuel and actual fuel on board.

If actual fuel onboard is less than flight plan block fuel, ensure MIN FUEL FOR T/O plus flight plan TAXI FUEL is on board. Refer to FOM, chapter 5.

ATC clearance Verify

Refer to NP.12, Clearance Verification Procedures.

Call for the Preflight checklist.

Preflight Procedure - First Officer

Logbook Check
Refer to Interior Inspection - First Officer or Relief Pilot.

Electronic Flight Bag Set

Prior to the Pushback checklist, turn Airplane mode ON to ensure WiFi and Bluetooth® are turned off. The EFB must be operated in Airplane mode with WiFi disabled from the start of the Preflight checklist through the completion of the Shutdown checklist. Enabling Airplane mode with Bluetooth® off will also conserve battery life.

To turn Airplane mode ON, accomplish the following steps:

- Select SETTINGS
- Select Network icon
- Slide the Airplane mode ON/OFF switch to ON.

JEPPESEN application - Configure

The following steps are mandatory:

- Select the Jepp FliteDeck PRO tile
- Select the route icon.
- Select the down arrow to expand the route drawer
- Select New Flight, if necessary
 - In pop-up window, select OK
- Enter ORIGIN and DESTINATION airports

The following steps are optional:

- Enter ALTERNATE airport as desired
- Enter Nav aids, Airways, and/or Waypoints, as desired
- Select SID
 - Select applicable departure procedure
- Select STAR
 - Select applicable arrival procedure
- Select Terminal Charts View (airplane) icon
- Select REF
 - Select applicable reference documents, e.g., local ramp procedures
- Select CO
 - Select applicable Delta Special Pages, e.g., Engine Out Departure Procedure

- Select TAXI
 - Select applicable taxi charts
- Select enroute icon
 - Select appropriate HIGH/LOW portion of enroute charts and set an appropriate chart scale

Airwatch Secure Content Locker (SCL) - Configure

- Select the DELTA CONTENT LOCKER (Airwatch SCL) tile
- Open the appropriate documents/operating manuals as desired

EFIS control panel..... Set

MINIMUMS reference selector – RADIO or BARO

MINIMUMS selector – As desired

FLIGHT PATH VECTOR switch – As required

METERS switch – As required

BAROMETRIC reference selector – IN or HPA

BAROMETRIC selector – Set local altimeter setting on PFD

VOR/ADF switches – As required

ND mode selector – MAP

ND CENTER switch – As required

ND range selector – As required

ND TRAFFIC switch – ON

TCAS OFF will display on NDs until TCAS is set to TA or TA/RA.

WEATHER RADAR – Off

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

Map switches – As required

Oxygen mask Check

Refer to SP.1, Oxygen Mask Test.

Window	Close and lock
Verify the lock lever is in the locked (forward) position and the orange indicator is not in view.	
MAP light control	As required
Heaters	Set
SHOULDER control and FOOT selector - As required	
FORWARD PANEL BRIGHTNESS controls	Mid position
Instrument source select panel	Set
NAVIGATION source switch – Off	
DISPLAY CONTROL source switch – Off	
AIR DATA/ATTITUDE source switch – Off	
Clock	Set
Time/date selector - UTC	
Altimeter	Set
Set the local altimeter setting.	
Verify RVSM and altimeter crosscheck are within limits. Refer to L.10, Airplane General, RVSM Operations.	
Verify no flag displayed.	
INBOARD DISPLAY selector	MFD

Flight & nav instruments Check

Verify that the flight instrument indications are correct.

Verify that only these flags are shown:

- TCAS OFF
- NO VSPD until takeoff V-speeds are selected

Verify that the flight mode annunciations are correct:

- autothrottle mode is blank
- roll mode is TO/GA
- pitch mode is TO/GA
- AFDS status is FLT DIR
- VNAV and/or LNAV armed (as required).

Verify route is displayed and correct.

Select the map mode.

Audio control panel Set

Seat Adjust

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.

WARNING: If the rudder pedal adjust crank is not stowed after use, the rudder pedals may move out of the desired position.

Rudder pedals Adjust

Adjust the rudder pedals to allow for full rudder pedal and brake pedal movement. Stow the rudder pedal adjust crank.

Fuel required Verify

Compare flight plan block fuel and actual fuel on board.

If actual fuel onboard is less than flight plan block fuel, ensure MIN FUEL FOR T/O plus flight plan TAXI FUEL is on board. Refer to FOM, chapter 5.

ATIS Obtain

ATC clearance.....Obtain

After receiving the clearance:

- Set the MCP, as required.
- Set the transponder code.
- Verify ATC clearance. Refer to NP.12, Clearance Verification Procedures.

Read the Preflight checklist when requested.

Preflight Checklist

Interior & exterior inspection	complete	C
Captain ensures the interior and exterior inspections are complete.		
Circuit breakers	ckd	C
Passenger signs	ON	C
Mode control panel	set	C
Windows	closed & locked	C&F
Oxygen mask	ckd	ALL
Refer to SP.1, Oxygen Mask Test.		
Altimeters	___, xckd	C&F
Confirm the captain, first officer, and standby altimeter barometric settings and barometric reference (IN or HPA) are correctly set.		
Verbalize the altimeter setting.		
Flight & nav instruments	ckd	C&F
EICAS	ckd	C
Ensure only expected EICAS messages are shown.		
Parking brake	set	C
Fuel control switches	CUTOFF	C
Radios & transponder	set	C
Ensure the communication radios are set as appropriate.		
Ensure the transponder code is set as appropriate and the Transponder mode select switch is set to STBY.		
Radar	off	C
Flight attendant briefing	complete	C
Departure briefing	complete	C
Logbook & QRHs	onboard	C
Ensure the logbook is onboard and logbook review is complete.		
Ensure that each QRH is on board.		

Fuel required ____ onboard ____ C&F

Compare and verbalize flight plan block fuel and actual fuel on board.

If actual fuel onboard is less than flight plan block fuel, ensure MIN FUEL FOR T/O plus flight plan TAXI FUEL is on board. Refer to FOM, chapter 5.

Pushback Procedure

Captain	First Officer
Operate the APU in accordance with FOM chapter 3, Aircraft Operational Policy. APU selector - START, then ON Rotate the selector to the START position, then slowly release back to ON. Do not allow the APU selector to spring back to the ON position.	
When all exterior doors are closed and the cabin is ready for pushback:	
• Verify exterior doors - Closed • Verify “CABIN IS READY FOR PUSHBACK” advisory has been received.	• Flight deck door - Closed and locked
	• Hydraulic panel - Set Note: Pressurize the right system first to prevent fluid transfer between systems. Right ELECTRIC DEMAND pump selector – AUTO • Verify that FAULT light is extinguished. Center 1 and Center 2 ELECTRIC PRIMARY pump switches – ON • Verify that the Center 1 FAULT light is extinguished. • The Center 2 FAULT light may stay illuminated until after engine start because of load shedding. Note: With only a single ground power source available, including the APU, the C2 PRIMARY pump will not run if the C1 pump is selected ON. The C2 PRIMARY pump FAULT light remains illuminated until an engine generator is operating. The HYD PRESS PRI C2 message is inhibited.

Captain	First Officer
	Left ELECTRIC DEMAND pump selector – AUTO - Verify that the FAULT light is extinguished. Center 1 and Center 2 AIR DEMAND pump selectors – AUTO - Verify that the FAULT lights are extinguished.
	Fuel panel - Set
(F) LEFT and RIGHT FUEL PUMP switches – ON [AFM] - Verify that the PRESS lights are extinguished. If the FUEL IN CENTER message shows: [AFM] - CENTER FUEL PUMP switches – ON [AFM] - One or both PRESS lights may stay illuminated until after the engine start because of load shedding.	
	Transponder - XPNDR, or as required by local airport operating procedures
Call “PUSHBACK CHECKLIST.”	Accomplish the Pushback checklist.
Note: The Pushback checklist must be completed prior to aircraft movement.	
When advised the ground crew is ready for pushback:	
Direct the first officer to call for pushback or engine start clearance as appropriate.	When requested by the captain, call for pushback or engine start clearance.
When pushback clearance has been received:	
- BEACON - ON - Parking Brake - OFF Note: Do not turn the beacon on or release brakes until cleared for pushback or engine start.	
Call “BEACON ON, BRAKES RELEASED, CLEARED TO PUSH.”	

Captain	First Officer
CAUTION: Do not hold or turn the nose wheel tiller during pushback or towing. This can damage the nose gear or the tow bar.	
CAUTION: Do not use the brakes to stop the airplane during pushback or towing. This can damage the nose gear or the tow bar.	
With initial aircraft movement:	
If not immediately cleared for engine start, ask: “ARE WE CLEAR TO START ENGINE(S)?”	Plan engine start to be prepared to taxi upon ground crew salute.

Pushback Checklist

Doors	closed	F
Ensure all door EICAS alert messages are extinguished on the Upper EICAS.		
Hydraulic panel	set	F
Fuel panel	set	F
Flight deck door	closed & locked	F
Ensure the LOCK FAIL light is extinguished.		
Ensure the flight deck door UNLKD light is extinguished.		
Transponder	XPNDR	F

Engine Start Procedure

Captain	First Officer
Taxi out with both engines operating.	
7101 - 7110	
Engines must be started one at a time.	
7001 – 7008	
Both engines may be started at the same time.	
The tug driver will advise the captain when it is clear to start engine(s).	
Note: One pilot will accomplish the engine start procedure while the other will monitor the pushback. Normally the first officer accomplishes the engine start procedure.	
When cleared and ready to start:	
Announce the engine(s) to be started.	
	• Select the secondary engine display • Engine START selector(s) - START • FUEL CONTROL switch(es) - RUN • Verify that the oil pressure increases.
	Verify the engine(s) stabilize at idle (i.e., the red maximum start EGT limit line disappears, and starting EGT peaks).

Captain	First Officer
Accomplish the Aborted Engine Start checklist, QRH, NNC.7 for one or more of the following abort start conditions: • there is no oil pressure indication after the EGT increases. • ENG AUTOSTART L, R EICAS message.	
Make a logbook entry for the following: • An autostart attempt fails and is accompanied by a related EICAS message. • The crew has to manually abort an automatic start attempt. • A manual start attempt fails. A logbook entry is not required if the autostart system aborts a start and: • (7101 - 7110) automatically attempts a second or third start, and the second or third start is successful. • (7001 - 7008) automatically attempts a second start, and the second start is successful.	

After Start Procedure

Captain	First Officer
After starting engines:	
	• APU - As required • If APU is not to be used for takeoff: • APU - OFF • ENGINE ANTI-ICE - As required • Refer to SP.16, Cold Weather Operations. • Recall - check
Call "AFTER START CHECKLIST."	Accomplish the After Start checklist.
Receive and return the marshalling agent's taxi salute.	
Prior to aircraft movement:	
Call "SALUTE RECEIVED, FLAPS ____."	Select flaps as directed.
Note: If the WDR is not available, select flaps to the default setting of flaps 5.	

After Start Checklist

Engine anti-ice	as reqd	C
Ensure the anti-ice selectors are in the correct position for the current environmental conditions.		
Recall	ckd	F
Ensure only expected EICAS messages are shown.		
Autobrakes	RTO	F

Taxi Procedure

Captain	First Officer
After WDR has been received:	
Performance data may be loaded into the FMS at any point after receipt of the WDR but should not interfere with other critical crew duties and responsibilities. Refer to SP.5, Communications, Takeoff Data Uplink (TDU) for additional information. The captain's analysis of the WDR shall not be completed while the captain is taxiing the aircraft. The balance of the Taxi Procedure and the reading of the Taxi checklist should be completed during low workload times.	
• Verify the header block for the correct: • flight number, • ship number, • date, and • release number. • Verify the performance data is available for the FMS entered takeoff runway/position • Perform a complete analysis of the following WDR blocks: • FMS, • weather, • performance, and • notes. Refer to FOM, chapter 5, Weight Data Record (WDR).	
For PACKS OFF or APU to PACK takeoff, refer to SP.2, Air Conditioning Packs.	
Referencing the WDR data:	
	• Takeoff Ref page 1 • Verify FMS selected runway and WDR runway/takeoff position agree.
	• FMS PERF INIT page - Select • enter ZFWT into ZFW • verify RMWT with GR WT.

Captain	First Officer
	• FMS THRUST LIM page - Select • select TO, TO-1, TO-2, or • enter Assumed Temperature into SEL, as appropriate. Note: Refer to SP.2, APU to Pack Takeoff or Packs Off Takeoff. Refer to SP.11, Double Derate Takeoff, and Takeoff Bump Thrust Procedure. • verify EICAS thrust setting.
	• FMS TAKEOFF REF 1/2 page - Select • enter flap setting into FLAPS • enter TOCG into CG • enter V1, VR, and V2 • FMS TAKEOFF REF 2/2 page - Update as necessary • EO ACCEL HT (AGL) • ACCEL HT (AGL) • THR REDUCTION (AGL) • MCP- Set • set V2 in IAS/MACH window • Stabilizer trim - Set • position STAB Position Indicator to STAB value

Captain	First Officer
When workload and conditions permit:	
Rudder - Check • Move rudder pedals to full travel in both directions and verify: • freedom of movement • rudder pedals return to center Note: Hold the nose wheel steering wheel during the rudder check to prevent nose wheel movement.	Aileron and Elevator - Check • Move control wheel and column to full travel in both directions and verify: • freedom of movement • controls return to center Note: To avoid nuisance FLIGHT CONTROLS faults, a complete cycle of the control wheel during the flight control check should be done slowly (more than approximately 6 seconds) and not be combined with the check of the pitch controls.
EFBs - Set • Display applicable REF, CO, and Taxi page(s), as needed. • Select the planned assigned SID prior to Departure, as desired.	
Call "TAXI CHECKLIST."	Accomplish the Taxi checklist.

For extended ground time:

Consider shutting down one or more engines. Do not start APU if only one engine is shut down. When departing from ramp areas where taxiing is restricted to both engines, consider shutdown of one engine after exiting the restricted area.

7001 - 7008

If engines are shut down less than 1.5 hours, a 3 minute warm-up period is acceptable, rather than the normal 5 minute engine warm-up period.

Taxi Checklist

Flaps.....	____, ____, ____	C&F
Ensure the FMS and WDR flap values agree.		
Confirm and verbalize:		
• FLAP lever position • flap value from the FMS • indicated flap position		
Takeoff speeds	____, ____, ____, set	C&F
Referencing the FMS, confirm and verbalize V1, VR, and V2 speeds and ensure V2 set in the IAS/MACH window.		
Thrust	____, ____	C&F
Referencing the upper EICAS, verbalize TO (or TO2, as appropriate) for the first blank. If applicable, verbalize assumed temperature for the second blank.		
Flap data	____	C&F
Ensure the FMS and WDR flap values agree.		
Trim	____, 0, 0	C&F
Ensure the STAB Position Indicator is set to TRIM value from FMS.		
“Zero, zero” indicates the rudder and aileron trim are '0'.		
Flight controls	ckd	C&F

Departure Runway Change Checklist

Departure briefing	complete	F
Mode control panel	set	C
Flaps	____, ____	C&F
Confirm and verbalize:		
• the uplinked (or inserted) flap position displayed in the MCDU, and		
• indicated flap position.		
Takeoff speeds	____, ____, ____, set	C&F
Referencing the FMS, confirm and verbalize V1, VR, and V2 speeds and ensure V2 set in the IAS/MACH window.		
Thrust	____, ____	C&F
Referencing the upper EICAS, verbalize TO (or TO2, as appropriate) for the first blank. If applicable, verbalize assumed temperature for the second blank.		
Flap data	____	C&F
Ensure the FMS and WDR flap values agree.		
Trim	____, 0, 0	C&F
Ensure the STAB Position Indicator is set to TRIM value from FMS. “Zero, zero” indicates the rudder and aileron trim are '0'.		
Radios & transponder	set	C
Ensure the communication radios are set as appropriate.		
Ensure the transponder code is set as appropriate and the Transponder mode select switch is set to STBY.		
Runway position	____, ____	C&F
Verify and verbalize:		
• the uplinked (or inserted) runway/intersection displayed in the MCDU, and		
• the actual runway takeoff position observed.		
Takeoff briefing	complete	C
Ensure the takeoff briefing has been completed by the PF.		

Before Takeoff Procedure

Captain	First Officer
When a runway, intersection, departure, or performance change occurs prior to takeoff:	
- FMS data must be modified using the most recent WDR information. Refer to the Taxi Procedure for specifics. - Accomplish the DEPARTURE RUNWAY CHANGE checklist in the ECL. Note: Performance data for an intersection departure is also valid for all other takeoff positions on that runway that afford additional runway length.	

Captain	First Officer
Operate the engines:	
7101 - 7110 - for a minimum of 3 minutes before applying takeoff thrust. Engine oil temperature must be above the bottom of the temperature scale. 7001 - 7008 - for a minimum of 5 minutes (3 minutes if engines have been shut down less than 1.5 hours) before applying takeoff thrust. Engine oil temperature must be above the lower amber band (50°C) before takeoff.	
When in proximity to the departure runway:	
	Notify the flight attendants to finalize preparations for takeoff with the following PA, "FLIGHT ATTENDANTS, PLEASE PREPARE THE CABIN FOR DEPARTURE."
	Receive "THE CABIN IS READY FOR TAKEOFF" report from the flight leader/purser via the interphone. Refer to FOM chapter 3.
Takeoff briefing - Complete	
The Pilot Flying (PF) will verify and verbalize: - runway - outside reference and ND/FMS runway - departure - first fix - H: heading mode - A: altitude constraints - A: airspeed constraints	

Captain	First Officer
- Fuel - Check - Fuel quantity is equal to or greater than MIN FUEL FOR T/O	
	Transponder - TA/RA
Call “BEFORE TAKEOFF CHECKLIST.”	Accomplish the Before Takeoff checklist.
Manage the radar and terrain display as required.	
WARNING: Prior to crossing a runway hold short line to either take off from or cross a runway, both crewmembers should confirm their position by comparing taxiway and runway identification signs to the taxi chart.	

Before Takeoff Checklist

Runway position.....	____, ____	C&F
Verify and verbalize:		
- the uplinked (or inserted) runway/intersection displayed in the MCDU, and - the actual runway takeoff position observed.		
Flaps	____, ____	C&F
Confirm and verbalize:		
- the uplinked (or inserted) flap position displayed in the MCDU, and - indicated flap position.		
Takeoff briefing	complete	C
Ensure the takeoff briefing has been completed by the PF.		
Transponder	TA/RA	F
Flight attendants	notified & acknowledged	F

Takeoff Procedure

Pilot Flying	Pilot Monitoring
When cleared for takeoff:	
Note: If the nose wheel steering tiller is not released before application of takeoff thrust, a CONFIG GEAR STEERING warning may occur due to the aft axle steering being out of the locked position.	
Confirm alignment with the intended departure runway by reference to the ND.	
Verify brakes are released. Advance thrust levers to approximately: 7101 - 7110 • 55% N1 7001 - 7008 • 1.05 EPR Allow the engines to stabilize.	
Push the TOGA switch prior to 50 knots.	
Verify takeoff thrust is set by approximately 80 knots. Adjust as necessary.	
	Monitor engine instruments throughout the takeoff.
After takeoff thrust is set, the captain's hand must be on the thrust levers until V1.	
Monitor airspeed.	
At 80 knots:	
Verify 80 knots.	Announce, "80 KNOTS, HOLD, THRUST NORMAL."
At V1:	
Verify V1 speed.	Confirm automatic V1 callout.
At VR:	
Rotate to the takeoff pitch attitude.	Announce, "ROTATE."
	Monitor airspeed and vertical speed. Verify a positive rate of climb and announce "POSITIVE RATE."

Pilot Flying	Pilot Monitoring
Verify a positive rate of climb on the altimeter. Call “GEAR UP.”	Position the landing gear lever to UP.
Above 400 feet AGL:	
Verify LNAV or call “HDG SELECT” as required.	Select or verify roll mode.
At thrust reduction height:	
Verify climb thrust is set.	
At the acceleration height:	
Reduce pitch attitude and begin acceleration. Verify acceleration. Call “FLAPS___” according to the flap retraction schedule.	Set the FLAPS as directed.
After flaps are selected up:	
	• WING Anti-ice - AUTO • ENGINE Anti-ice - AUTO
Call “AFTER TAKEOFF CHECKLIST.”	Accomplish the After Takeoff checklist.

After Takeoff Checklist

- Flaps up
 Ensure flaps up and indications normal.
- Landing gear up
 Ensure landing gear lever UP and landing gear up indications normal.
- APU off
- Packs AUTO
 Verify pack selector position.
- Anti-ice AUTO

Climb Procedure

Pilot Flying	Pilot Monitoring
Approaching transition altitude:	
	If other than 18,000 feet, call “TRANSITION ALTITUDE.”
Altimeters - Set	

Pilot Flying	Pilot Monitoring
Anti-Ice - As required	
After climbing through approximately 10,000 feet AFE, signal the end of sterile cockpit environment by:	
7101 - 7110 (C) CABIN CHIME switch - Push to sound cabin chime twice 7001 - 7008 (C) NO SMOKING sign selector - Cycle to sound cabin chime twice OR, if conditions permit: (C) SEAT BELTS sign - OFF (C) Ensure PA is made advising passengers to keep seat belts fastened while seated.	
After passing 18,000 feet:	
Call “CLIMB CHECKLIST.”	Accomplish the Climb checklist.
Note: Maintain at least 15 knots above minimum maneuver speed when climbing through FL200 to prevent EICAS caution message, “AIRSPEED LOW” from occurring.	

Climb Checklist

Altimeters STD, xckd C&F

Ensure the captain, first officer, and standby altimeters are correctly set.

Cruise Procedure

Pilot Flying	Pilot Monitoring
• Anti-ice - As required	
After reaching top of climb:	
Enroute:	
• Apply Tactical Cost Index procedures as necessary per FOM. • Monitor fuel trend. • Send turbulence report as necessary. • Send position reports as necessary.	
	If the FUEL IN CENTER message appears: • CENTER FUEL PUMP switches - ON When the FUEL LOW CENTER message appears: • CENTER FUEL PUMP switches - OFF
• EFB - Manage: • Select enroute icon. • Select appropriate HIGH/LOW portion of enroute charts and set an appropriate chart scale. • Monitor the battery power indicator and connect the powered keyboard when necessary. Note: An electrical outlet in the flight deck is not an approved power source. If possible, charge EFBs on rest break in the cabin or crew rest facility. • Connect the powered keyboard when the EFB battery power indicator displays 20% or less. • Conserve battery power as much as possible. During extended cruise, consider shutting down an EFB to preserve battery life. Note: All EFBs may not be off simultaneously. Maintain at least one EFB in sleep or ON mode to provide ready access to data when operational needs dictate.	

Pilot Flying	Pilot Monitoring
When approach procedure is known:	
• FMS ARRIVALS page - Select • Insert/modify the STAR, APPROACH, and TRANS as necessary. • FMS NAV RAD page - Select • Manually tune radios as necessary. • FMS APPROACH REF page - Select • Select FLAPS/VREF as desired.	
• Set RADIO or BARO minimums as appropriate. Note: Refer to NOI.3, Approach Selection Table	
To ensure adequate obstacle clearance in conditions of extreme cold weather (-10°C or lower, or as specified in the Delta Special Page), refer to Airway Manual, Weather, Altimeter Corrections.	
EFB - Configure: • JEPPESEN application - Configure • Select the Jepp FliteDeck PRO tile. • Select the airport (airplane) icon. • Select DESTINATION airport. • Select REF. • Select applicable reference documents, e.g., local ramp procedures. • Select CO. • Select applicable Delta Special Pages, e.g., Critical Performance procedures. • Select TAXI. • Select applicable taxi chart(s). • Select APP. • Select applicable approach chart(s). • Select STAR. • Select applicable arrival procedure charts. • Airwatch Secure Content Locker (SCL) - Configure • Select the DELTA CONTENT LOCKER (Airwatch SCL) tile. • Open the appropriate document/operating manual as desired. • Check the EFB mount for security. Pilots may hold their respective EFBs in their hands when conducting required briefings.	

Pilot Flying	Pilot Monitoring
Secure EFB in the mount after completing briefings. EFBs must be secured during critical phases of flight.	
After FMS data has been entered:	
	• FMS data - Verify
• Approach briefing - Accomplish. Refer to FOM, chapter 3.	• AUTOBRAKE - Select as briefed

Descent Procedure

Pilot Flying	Pilot Monitoring
• Anti-Ice - As required	
At top of descent or approximately 20 minutes prior to landing:	
Notify the flight attendants with a PA that includes “FLIGHT ATTENDANTS PLEASE PREPARE THE CABIN FOR ARRIVAL.”	
• (C) SEAT BELTS sign - ON	
	• Recall - Check • Operational Notes - Check
Approaching transition level:	
	If other than FL 180, call “TRANSITION LEVEL.”
• Altimeters - Set local altimeter setting	
At FL180 or reaching top-of-descent, whichever occurs later:	
Call “DESCENT CHECKLIST.”	Accomplish the Descent checklist.

Descent Checklist

Altimeters	____, xckd	C&F
Ensure the captain, first officer, and standby altimeter barometric settings and barometric reference (IN or HPA) are correctly set.		
Verbalize the altimeter setting (local or STD).		
Minimums	____, ____, xckd	C&F
Ensure the captain's and first officer's PFD minimums reference is set properly and minimums are set to the approach chart value.		
Verbalize “RADIO” or “BARO” for the first blank and the numeric value for the second blank.		
Landing data	____, ____	C&F
Verbalize the displayed landing flap and Vref speed.		
Approach briefing	complete	PM
Ensure the Approach Briefing has been completed by the PF.		
Autobrakes	as reqd	PM
Seat belt signs	ON	PM
Recall	ckd	PM
Ensure only expected EICAS messages are shown.		
Notes	ckd	PM
Recall and review operational notes, if applicable.		

Approach Procedure

Pilot Flying	Pilot Monitoring
Approaching transition level:	
	If other than FL 180, call “TRANSITION LEVEL.”
Altimeters - Set local altimeter setting	

Pilot Flying	Pilot Monitoring
When arrival, approach, or runway changes prior to landing:	
- FMS data must be modified. - Refer to the Approach Runway Change checklist in the ECL for items that should be considered for re-accomplishment in the event of runway change. Note: If the landing runway assignment is changed and the captain determines the runway change can be accomplished visually, the captain may choose to waive the “runway change” items.	

Pilot Flying	Pilot Monitoring
Anti-Ice - As required	
Before descending through approximately 10,000 feet AFE:	
- Flight and navigation instruments - Set - Verify correct arrival and approach selected in FMS.	
At approximately 10,000 feet AFE:	
7101 - 7110 (C) CABIN CHIME switch - Push to sound cabin chime twice. 7001 - 7008 (C) NO SMOKING sign selector - Cycle to sound cabin chime twice.	
Call “APPROACH CHECKLIST.”	Accomplish the Approach checklist.

Approach Checklist

- Flight & nav instruments verified C&F
 Ensure correct arrival and approach procedures are entered.
- Cabin notification complete C
 Ensure that the cabin chime signal has been sounded twice.
- Altimeters ____, xckd C&F
 Ensure the captain, first officer, and standby altimeter barometric
 settings and barometric reference (IN or HPA) are correctly set.
 Verbalize the local altimeter setting.

Approach Runway Change Checklist

Flight and nav instruments	verified	C&F
Ensure correct arrival and approach procedures are entered.		
Minimums	____, ____, xckd	C&F
Ensure the captain's and first officer's PFD minimums reference is set properly and minimums are set to the approach chart value.		
Verbalize “BARO” or “RADIO” and the numeric value.		
Landing data	____, ____	C&F
Verbalize the displayed landing flap and Vref speed.		
Approach briefing	complete	PM
Ensure the Approach Briefing has been completed by the PF.		
Autobrakes	as reqd	PM

Landing Procedure

Pilot Flying	Pilot Monitoring
When ready to configure the aircraft for landing:	
Call “FLAPS ____” according to the flap extension schedule.	Set the FLAP lever as directed.
When cleared for the approach:	
WARNING: When using LNAV to intercept the final approach course, LNAV might parallel the localizer without capturing it. The airplane can then descend on the glide slope with the localizer not captured.	
Manage the approach in accordance with the appropriate Approach Guide and Automation Guidelines.	
Call “GEAR DOWN, FLAPS 20.”	Set the landing gear lever to DN. Set the FLAP lever as directed.
Set the speed brake lever to ARMED.	
At vertical path capture:	
Call “FLAPS ____” as needed for landing.	Set the FLAP lever as directed.
Call “LANDING CHECKLIST.”	Accomplish the Landing checklist.

Pilot Flying	Pilot Monitoring
No later than 1,000 feet AFE:	
Verify missed approach altitude is set.	
Note: Provided stabilized approach criteria are observed, the timing of the configuration may be modified as necessary for a more fuel-efficient operation.	

Landing Checklist

Landing gear	down	C&F
Ensure that DOWN appears on the EICAS.		
Flaps	____, ____	C&F
Confirm and verbalize:		
• FLAP lever position, and		
• indicated flap position.		
Speedbrake	ARMED	PM

Go-Around Procedure

Pilot Flying	Pilot Monitoring
When a go-around is warranted:	
Push either TO/GA switch and announce “GO AROUND”.	Verify FMA pitch, roll, and ATs. Announce pitch mode “TOGA VERIFIED”
Call “FLAPS 20.”	Set the FLAP lever as directed.
Verify: • Rotation to go-around pitch attitude • Thrust setting • Proper FMA mode annunciation	
Verify thrust is sufficient for the go-around or adjust as needed.	
	Monitor rotation, pitch and vertical speed. Verify a positive rate of climb and announce “POSITIVE RATE.”
Confirm a positive rate of climb on the altimeter.	
Call “GEAR UP.”	Position landing gear lever to UP.
	Verify missed approach altitude is set.
Above 400 feet RA:	
Verify, select or call for appropriate roll mode.	Select or verify roll mode.
At acceleration height (normally 1,000 feet AFE):	
Set speed to maneuvering speed for planned flap setting.	
Call “FLAPS ____” according to flap retraction schedule.	Set FLAP lever as directed.
If another approach is warranted at the destination airport:	
Consider leaving flaps at 5 and maintain appropriate maneuvering speed.	Verify flaps 5 and appropriate maneuvering speed as directed.

Pilot Flying	Pilot Monitoring
After planned flaps set and above flap maneuvering speed, if a diversion is required:	
Call or select “FLCH” or “VNAV”, if not previously selected.	Select or verify “FLCH” or “VNAV”.
When at planned flap configuration:	
Call “AFTER TAKEOFF CHECKLIST.”	Accomplish After Takeoff checklist.

Landing Roll Procedure

Pilot Flying	Pilot Monitoring
At main gear touchdown:	
Verify thrust levers at idle.	
	Verify the SPEEDBRAKE lever is UP. Call “SPEEDBRAKES UP.”
WARNING: After reverse thrust is initiated, a full stop must be made.	
Without delay, move the reverse thrust levers to the interlocks and hold light pressure until the interlocks release. Then apply reverse thrust as needed. [AFM]	Verify normal reverse thrust operation.
By 80 KIAS initiate movement of reverse thrust levers to reach reverse idle detent prior to taxi speed. Position levers full down (forward thrust) after engines have decelerated to reverse idle.	At 80 KIAS call “80 KNOTS.”
Prior to taxi speed: • Autobrakes - Disengage	

After Landing Procedure

Captain	First Officer
When clear of the active runway and workload permits:	
Note: Engine may be shutdown after cool down recommendations have been met.	
• SPEED BRAKE lever - DOWN	• Anti-Ice - As required (refer to SP.16, Cold Weather Operations) • FLAP lever - UP • EFIS WXR switches - Off • APU - As required (refer to FOM 3.4, APU Policy) • Transponder - XPNDR
Call "AFTER LANDING CHECKLIST."	Accomplish the After Landing checklist.

After Landing Checklist

Anti-ice as reqd
 Flaps up
 Speedbrake DOWN
 Radar off

Shutdown Procedure

Captain	First Officer
Engine cool down recommendations: 7001 - 7008 • Run the engines for at least 1 minute. 7101 - 7110 • Run the engines for at least 3 minutes.	
After engine cool down recommendations have been met and single engine taxi is desired:	
Call for engine shutdown. Note: Either engine may be shut down.	
	• Appropriate FUEL CONTROL switch - CUTOFF

Captain	First Officer
After stopping at the gate:	
• PARK BRAKE - Set • Call for seat belts sign off. • Call for engine shutdown.	• SEAT BELTS selector - OFF, as directed • APU RUNNING message - Verify • FUEL CONTROL switches - CUTOFF • BEACON light switch - OFF • Hydraulic panel - Set • C1 and C2 AIR DEMAND pump selectors - OFF • L ELECTRIC DEMAND pump selector - OFF • C1 and C2 ELEC PRIMARY pump switches - OFF • R ELECTRIC DEMAND pump selector - OFF Note: Depressurize right system last to prevent fluid transfer between systems. • FUEL PUMP switches - OFF • ANTI-ICE selectors - AUTO • Transponder - STBY • F/D switches - OFF • Autobrake selector - OFF
When engines are shut down:	
• PARK BRAKE - As required After the chocks are inserted, the brakes should be released for cooling. Refer to FOM, 6.1, Parking, Brake Release. Refer to SP.16, Cold Weather Operations.	
Call "SHUTDOWN CHECKLIST."	Accomplish the Shutdown checklist.

Shutdown Checklist

Seat belt signs	OFF	C
Fuel control switches	CUTOFF	C
Hydraulic panel	set	C
Fuel pump switches	OFF	C
Engine anti-ice	AUTO	C
Transponder	STBY	C
Beacon	OFF	C
Parking brake	as reqd	C

Captain	First Officer
After the Shutdown Checklist is complete:	
When external power is available:	
• PRIMARY EXTERNAL POWER switch - Push • SECONDARY EXTERNAL POWER switch - Push if AVAIL light illuminated • APU selector - OFF • Configure aircraft for ground air conditioning use. Refer to SP.2, Ground Conditioned Air Use.	
• ACARS information - Enter • Complete ACARS Postflight procedures. Manually send FLT SUMMARY after opening any cabin entry door. • RNAV (RNP) approach reports are required. Refer to SP.5. • Status Messages - Check • Record messages in the aircraft logbook. • Engine oil, oxygen, and hydraulic quantities - Check • If quantities are less than the following values, make a logbook entry and notify maintenance as soon as possible. • Engine oil: No LOs displayed • Oxygen: 1,000 psi. • Hydraulic fluid: No RFs displayed • If the aircraft operated in Class II airspace for more than one hour: • ADIRU DRIFT data - Check • Referencing the FMS: • MAINT page - Select • INERTIAL MONITOR - Select • Record DRIFT data on ACARS FLT SUMMARY page • Logbook - Make required entries for maintenance discrepancies • Flight deck lights and electronic displays - Set as required • Red color-coded circuit breakers - Pull as required • Pull red color-coded circuit breakers based on estimated ground time. Refer to placard instructions on panel. 7101 - 7110 • Position the flight deck access system to OFF. 7001 - 7008 • Install flight deck door mechanical latch pin.	

After shutdown reminders:

- Enter appropriate ACARS information.
- Check oxygen, engine oil, and hydraulic quantities.
- Check status messages.
- Check ADIRU drift error.
- Make appropriate logbook entries.
- Shutdown the APU, unless required for environmental reasons.
- Pull red color-coded circuit breakers as required.

Secure Procedure

Captain	Any Crewmember
After coordination with local maintenance or operations:	
Accomplish the Secure checklist only when the aircraft is to remain for two hours or more. The captain will designate a crewmember to accomplish the Secure checklist. When operating the last flight of any day into a limited or non-maintenance station, accomplish the following: • If a maintenance discrepancy is noted and entered in the logbook, the MCC must be contacted through the dispatcher as soon as possible to facilitate corrective action and avoid delays. If a flight crew placard is applicable, it should be installed prior to departing the aircraft. • Perform a complete exterior inspection, in accordance with the Exterior Inspection - Captain or First Officer or Relief Pilot. If the aircraft will layover in cold weather, ensure it is configured as described in SP.16, Cold Weather Operations.	
When ready to secure the aircraft:	
Call "SECURE CHECKLIST."	Accomplish the Secure Checklist as a "read and do" checklist.
• ADIRU switch - OFF • Emergency lights switch - OFF • Pack switches - OFF • APU and External power - Set as required Note: Do not place the BATTERY switch to OFF while the APU COOLDOWN message is displayed to allow proper cooling and fire detection. • If only ground service power is required: • Verify PRIMARY EXT PWR AVAIL light illuminated • EXT PWR switches and APU selector - OFF • BATTERY switch - OFF • GROUND SERVICE switch (located on the forward Flight Attendant panel) - Push • If electrical power is not required: • APU selector and EXT PWR switches - OFF • BATTERY switch - OFF	

Secure Checklist

- ADIRU OFF
- Emergency lights OFF
- Packs OFF
- APU & external power as reqd
- Battery switch.....OFF

Normal Operational Information

Chapter NOI

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Normal Operational Information

Normal Ops Info

Chapter NOI

Section 1

Normal Ops Info

The Normal Ops Info section includes the Approach Guidance. This section provides quick reference tools for the experienced crew member. For more detailed information, refer to the Airway Manual, the FCTM, the ODM, and the FOM.

Approach Guidance

The approach guidance section begins with the Approach Selection Table. The table lists the approach type, any qualifiers for the approach, and the MCP selection(s). A page number will then direct the pilot to the recommended approach guide to be used.

Following the Approach Selection Table are the Approach Guides. The guides have been developed for each type of authorized approach and are intended to help the pilot prepare for, brief, and conduct the approach procedure. The use of an approach guide is recommended, but not required.

Following the Approach Guides is the RADIO/BARO Minimums Chart. The chart contains the landing minimum settings for all approaches.

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Normal Operational Information
Reserved

Chapter NOI
Section 2

Reserved for future use.

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Normal Operational Information

Approach Guidance

Chapter NOI

Section 3

Approach Selection Table

Approach Type	Qualifier	MCP Selection(s) Page
ILS	For PRM considerations also see pg NOI.3.7	APP CAT I pg NOI.3.5 CAT II pg NOI.3.9 SA CAT II pg NOI.3.9 CAT III pg NOI.3.11
LDA with GS	For PRM considerations also see pg NOI.3.7	APP pg NOI.3.5
RNAV (RNP)	GPS Required	LNAV VNAV pg NOI.3.15
RNAV (GPS) RNAV (GNSS) GPS	GPS Required	LNAV VNAV pg NOI.3.13
ILS (GS out) LOC LOC (BACK CRS) LDA (no GS) VOR *NDB	Procedure in FMS Database with GP	LNAV or LOC VNAV pg NOI.3.19
	Procedure in FMS Database without GP	LNAV or LOC V/S or FPA pg NOI.3.21
	NO Procedure in FMS Database	LOC, HDG SEL or TRK SEL V/S or FPA pg NOI.3.21
Charted Visual Flight Procedures	Procedure in FMS Database	LNAV VNAV pg NOI.3.23
	NO Procedure in FMS Database	Fly using visual references
Circling Maneuver		pg NOI.3.25

*NDB approaches may select an ILS/LOC approach for lateral guidance if available.

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Using VNAV to Meet Altitude Constraints Prior to the Published FAF/PFAF

If above the published FAF altitude and unsure all altitude constraints outside the FAF will be complied with and:

- established on a published segment of the approach, or
- vectored to a final approach course intercept heading and level at the active waypoint altitude, or
- cleared direct to an approach waypoint and level at that waypoint altitude:

LNAV/LOC Select

MCP altitude Set as follows

 ILS Set Precision Final Approach Fix altitude

 Non-ILS Set DA/DDA rounded up to next 100'

VNAV Select or verify

Speed intervention Set as desired

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ILS CAT I, LDA with GS - Approach Guide

APP Mode

For inoperative equipment, refer to the QRH, Non-Normal Ops Info tab, ILS Approach Equipment Requirements.

For any inoperative ground based equipment, refer to the Airway Manual, Ops Specs, IAP.

For ILS Precision Runway Monitor (PRM) Approach, refer to the ILS Precision Runway Monitor (PRM) Approach Breakout Procedures Approach Guide.

Note: Approach may continue to DA(H) if established on the final segment and the controlling visibility decreases below the authorized minimums. Specific foreign country exceptions may apply. For further information, refer to the Airway Manual, Ops Specs, IAP.

Airport diagram Review

Autopilot As required

If operable, both the Autopilot and Flight Director will be utilized for all ILS approaches when the reported weather is below 4,000 feet RVR or 3/4 mile.

FMS approach procedure Select and verify

Minimums Set DA

When cleared for the approach:

If at or above FAF altitude and assured all altitude constraints are complied with:

APP Mode Select

No later than 1,000 feet AGL:

Missed approach altitude Set

Set lowest initial level off altitude on missed approach procedure.

Execute a missed approach after the FAF with the approach lights or runway environment not in sight if any of the following occur:

- criteria listed in the Airway Manual, Ops Specs, IAP.

PRM procedure Brief Jeppesen 11-XX Pages

Breakout procedure.....Briefed

Note: All “Breakouts” must be hand flown.

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ILS CAT II or SA ILS CAT II - Approach Guide

APP Mode

For inoperative equipment, refer to the QRH, Non-Normal Ops Info tab, ILS Approach Equipment Requirements.

For any inoperative ground based equipment, refer to the Airway Manual, Ops Specs, IAP.

Note: Approach may continue to DA(H) if established on the final segment and the controlling RVR goes below minimums. Specific foreign country exceptions may apply. For further information, refer to the Airway Manual, Ops Specs, IAP.

Approaches must be flown using autoland procedures.

Autoland:

For autoland use flaps 30 (normal landing) and flaps 20 (non-normal landing).

Maximum reported wind component to initiate approach and land:

25 knots headwind, 15 knots crosswind, 10 knots tailwind

FMS approach procedure Select and verify

Minimums Set

RA Authorized:

- set published RA

RA Not Authorized:

- set “BARO” bugs to the published DA
- Inner Marker (IM) required
- DA is determined by the IM or the first officer's BARO Altimeter, whichever occurs first

Marker beacon audio (RA Not Authorized) ON

Autobrakes Recommended

Airport diagram and SMGCS chart Review

Callouts Review

FMA Review

When cleared for the approach:

APP mode Select
Select when established on a published inbound segment of the approach or when on a final approach course intercept heading. Adhere to all published step down fix altitudes located outside the final approach segment.

No later than 1000 feet AGL:

Missed approach altitude Set
Set lowest initial level off altitude on missed approach procedure.

Execute a Missed Approach for any of the following:

- criteria listed in the Airway Manual, Ops Specs, IAP,
- SGL SOURCE DISPLAYS, SGL SOURCE RAD ALT, or SINGLE SOURCE ILS EICAS messages displayed,
- for all other EICAS messages not listed above, aural warnings and warning/system failure flags that occur prior to DA/RA, the approach may be continued as long as the AFDS autoland status annunciates LAND 2 or LAND 3 and LOC and GS are within tolerances, or
- below 200 feet AGL, any EICAS Master Caution alert.

Note: If suitable visual reference is established, land.

ILS CAT III - Approach Guide

APP Mode

For inoperative equipment, refer to the QRH, Non-Normal Ops Info tab, ILS Approach Equipment Requirements.

For any inoperative ground based equipment, refer to the Airway Manual, Ops Specs, IAP.

Note: Approach may continue to AH if established on the final segment and the controlling RVR goes below minimums. Specific foreign country exceptions may apply. For further information, refer to the Airway Manual, Ops Specs, IAP.

Approaches must be flown using autoland procedures.

Autoland:

For autoland use flaps 30 (normal landing) and flaps 20 (non-normal landing).

Maximum reported wind component to initiate approach and land:

25 knots headwind, 15 knots crosswind, 10 knots tailwind

Airport diagram and SMGCS chart Review

FMS approach procedure Select and verify

Minimums Set

- set 50' RA

Autobrakes Required, if operable

Callouts Review

- Captain announces “LAND 3” at alert height (AH).

FMA Review

When cleared for the approach:

APP mode Select

Select when established on a published inbound segment of the approach or when on a final approach course intercept heading. Adhere to all published step down fix altitudes located outside the final approach segment.

No later than 1000 feet AGL:

Missed approach altitude Set
Set lowest initial level off altitude on missed approach
procedure.

Execute a Missed Approach for any of the following:

Prior to AH:

- criteria listed in the Airway Manual, Ops Specs, IAP,
- SGL SOURCE DISPLAYS, SGL SOURCE RAD ALT, or SINGLE SOURCE ILS EICAS messages displayed,
- for all other EICAS messages not listed above, aural warnings and warning/system failure flags that occur prior to alert height, the approach may be continued as long as the AFDS autoland status annunciates LAND 3 and LOC and GS are within tolerances, or
- below 200 feet AGL, any EICAS Master Caution alert.

Note: If suitable visual reference is established, land.

At the AH:

- if AFDS autoland status not LAND 3.

GPS, RNAV (GPS), or RNAV (GNSS) - Approach Guide LNAV & VNAV Modes

For approaches with inoperative equipment refer to QRH, Non-Normal Ops Info tab, RNAV Approach Equipment Requirements.

Airport temperature Confirm within limits

Autopilot Required in IMC

FMS approach procedure Select and verify
Verify waypoints, altitude constraints, and descent angle.

Approach RNP Verify 0.3
PROG Page 4/4.

GPS updating Confirm

Minimums Set DA
If LNAV/VNAV minimums are published, they must be used. LPV
minimums are not authorized.

“GPS” displayed (NDs) Monitor

XTK error Monitor

VTK error Monitor by FAF

Brief missed approach plan if approach is discontinued prior to DA due to loss of navigation capability.

When cleared for the approach:

LNAV Select

When:

- established on a published segment of the approach, or
- vectored to a final approach course intercept heading and level at the active waypoint altitude, or
- cleared direct to an approach waypoint and level at that waypoint altitude:

MCP altitude Set
Set DA rounded up to the next highest 100 feet.

VNAV Select or verify

Speed intervention Set

No later than 1,000 feet AGL and at least 300 feet below missed approach altitude:

Missed approach altitude Set

Set lowest initial level off altitude on missed approach procedure.

No later than 200 feet AGL:

Autopilot Disengage

Execute a missed approach with the approach lights or runway environment not in sight if any of the following occur:

- dual GPS failure (GPS no longer displayed on ND and GPS EICAS message),
 - The approach may be continued provided the ANP remains less than the RNP or the aircraft is in VMC conditions.
- criteria listed in the Airway Manual, Ops Specs, IAP,
- VERIFY POSITION FMS message,
- NAV UNABLE RNP EICAS message,
- full-scale lateral NPS deviation or deviation alert occurs,
- XTK error greater than 0.3,
- additionally, after the FAF with approach lights or runway environment not in sight:
 - VTK error exceeds +/- 75 feet, or
 - loss of VNAV PTH.

RNAV (RNP) - Approach Guide

LNAV & VNAV Modes

For approaches with inoperative equipment refer to QRH, Non-Normal Ops Info tab, RNAV Approach Equipment Requirements.

Airport temperature Confirm within limits

Autopilot Required in IMC

Autopilot required in IMC or whenever a segment of the approach features an RF leg, until visual contact with the runway can be maintained or upon arrival at the DA, whichever occurs first.

FMS approach procedure Select and verify

RNP Set by the IAF

Manually enter published RNP on PROG Page 4/4 (no lower than 0.11).

GPS updating Confirm (2)

POS REF page 3/3. Confirm GPS EICAS advisory message is not displayed.

All Radio Nav updating Inhibit

Verify ON (all updating inhibited) is selected on NAV DATA Page.

“GPS” displayed (NDs) Monitor

XTK error Monitor

VTK error Monitor by FAF

Minimums Set DA

Use Category D minimums if the approach or missed approach includes an RF leg.

Altimeters Check within 75 feet

Brief missed approach plan if approach is discontinued prior to DA due to loss of navigation capability.

When cleared for the approach:

LNAV Select

When:

- established on a published segment of the approach, or
- cleared direct to an approach waypoint and level at that waypoint altitude:

MCP altitude Set
Set DA rounded up to the next highest 100 feet.

VNAV Select or verify VNAV PTH

Speed Intervention Set

No later than 1,000 feet AGL and at least 300 feet below missed approach altitude:

Missed approach altitude Set
Set lowest initial level off altitude on missed approach procedure.

No later than 200 feet AGL:

Autopilot Disengage

Conducting a missed approach:

WARNING: Maintaining lateral track is paramount to avoiding terrain or airspace conflicts, especially when on an RF leg.

If at or past the PFAF/GP Intcpt:

TOGA Select

LNAV Verify
Confirm LNAV is engaged or reselect LNAV. Verify active waypoint.

Missed approach altitude Confirm

Autopilot/LNAV Confirm

Execute a missed approach with the approach lights or runway environment not in sight if any of the following occur:

- dual GPS failure (GPS no longer displayed on ND and GPS EICAS message),
 - The approach may be continued provided the ANP remains less than the RNP or the aircraft is in VMC conditions.
- criteria listed in the Airway Manual, Ops Specs, IAP,
- VERIFY POSITION FMS message,
- NAV UNABLE RNP EICAS message,
- full-scale lateral NPS deviation or deviation alert occurs,
- additionally, after the FAF with approach lights or runway environment not in sight:
 - vertical path deviation exceeds +/- 75, or
 - loss of VNAV PTH.

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ILS (GS Out), LOC, LOC (BACK CRS), LDA, VOR, or NDB - Approach Guide LNAV or LOC & VNAV Modes

If the ground based navaid is out of service or compatible avionics is either not installed or not operational, the NDB, NDB/DME, VOR, or VOR/DME approach may be flown using RNAV procedures as long as one GPS is operational and the approach is authorized on the Delta Special Page or flight plan remark.

For RNAV approaches with inoperative equipment refer to QRH, Non-Normal Ops Info tab, RNAV Approach Equipment Requirements.

Autopilot Required in IMC

FMS approach procedure Select and verify

- NDB approaches may select an ILS approach for routing if appropriate.
- If none available, use “Approaches Not In Database” procedure in FCTM.

ILS (GS Out) approaches:

FAF Altitude - Modify, if necessary

Minimums Set DA/DDA

- Set approach chart MDA and use as a DA.
- Set a DDA (MDA + 50 feet) if flying a non-RNAV approach outside the United States and its associated territories.

Raw data and VTK error Monitor

When cleared for the approach:

LNAV or LOC Select

Localizer backcourse approaches will be flown using LNAV.

When:

- established on a published segment of the approach, or
- vectored to a final approach course intercept heading and level at the active waypoint altitude, or
- cleared direct to an approach waypoint and level at that waypoint altitude:

MCP altitude Set

Set DA/DDA rounded up to the next highest 100 feet.

VNAV Select or verify VNAV PTH

Speed intervention Set

No later than 1,000 feet AGL and at least 300 feet below missed approach alt:

Missed approach altitude Set

Set lowest initial level off altitude on missed approach procedure.

No later than 200 feet AGL:

Autopilot Disengage

Execute a missed approach after the FAF with the approach lights or runway environment not in sight if any of the following occur:

- criteria listed in the Airway Manual, Ops Specs, IAP,
- loss of VNAV PTH, or
- vertical path deviation exceeds +/- 75 feet.

Additional Considerations:

Non-localizer based approaches with raw data unavailable:

- confirm GPS updating POS REF page 3/3,
- monitor “GPS” displayed on ND,
- raw data monitoring not required,
- RNP verify 0.3,
- monitor XTK error,
- additionally, execute a missed approach if any of the following occur:
 - dual GPS failure (GPS no longer displayed on ND and GPS EICAS message)
 - The approach may be continued provided the ANP remains less than the RNP or the aircraft is in VMC conditions.
 - VERIFY POSITION FMS message
 - NAV UNABLE RNP EICAS message
 - full-scale lateral NPS deviation or deviation alert occurs
 - XTK error greater than 0.3

ILS (GS Out), LOC, LOC (BACK CRS), LDA, VOR, or NDB - Approach Guide LNAV or LOC & V/S or FPA Modes

Autopilot Required in IMC

FMS approach procedure Select and verify

- NDB approaches may select an ILS approach for routing if appropriate.
- If none available, use “Approaches Not In Database” procedure in FCTM.

Flight and nav instruments Set

Minimums Set DDA

Set MDA + 50 feet.

Raw data Monitor

When cleared for the approach:

LNAV or LOC Select

LOC (BACK CRS) approaches will be flown using LNAV.

When:

- established on a published segment of the approach, or
- vectored to a final approach course intercept heading and level at the active waypoint altitude, or
- cleared direct to an approach waypoint and level at that waypoint altitude:

MCP altitude Set as required

Set next altitude constraint, or if no constraint, set DA/DDA.

When approximately 0.2 nm from the descent point:

V/S or FPA Select

Set the descent rate or angle appropriate for the approach.

Speed Set

No later than 1,000 feet AGL:

Missed approach altitude Set
Set lowest initial level off altitude on missed approach
procedure.

No later than 200 feet AGL:

Autopilot Disengage

Execute a missed approach after the FAF with the approach lights or
runway environment not in sight if any of the criteria listed in the Airway
Manual, Ops Specs, IAP occur.

Charted Visual - Approach Guide (Procedure in FMS Database)

LNAV & VNAV Modes

The following guidance supplements visual approach preparations. FMS guidance is an aid to promote more precise ground track and altitude control. Do not sacrifice outside visual vigilance while using FMS capabilities.

Delta Special Pages
and Attention All Users page Reference as applicable

Autopilot As desired

FMS approach procedure Select and verify

RNAV Visuals are normally coded in the FMS database as RNVV.

Charted Visual Approaches may include waypoints or reference points which differ by name from FMS coded waypoints.

RNVV Glidepath angles may exceed 3.0 degrees.

When cleared for the approach:

LNAV Select

MCP altitude Set

Set TDZE/Rwy Threshold Elevation rounded up to the next highest 100 feet.

VNAV Select or verify VNAV PTH

Speed intervention Set

No later than 1,000 feet AGL:

Missed approach altitude Set as desired

Additional information:

If missed approach instructions are not published, straight-out guidance may be coded into the approach for crew convenience.

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Circling Maneuver

Note: Do not use APP mode.

The following guidance supplements normal approach preparations and procedures for the type of approach to be flown.

Weather requirements Check

- Visibility - 3 miles (4800m) or published visibility for the highest circling speed category, whichever is higher.
- Ceiling - 1000 feet (300m) or the published HAA (height above airport) for the highest circling speed category, whichever is higher.

Autopilot Required in IMC

Minimums Set MDA

Set published MDA or airport elevation plus 1000 feet (300m),
whichever is higher.

When cleared for the approach:

LNAV, LOC, HDG SEL Select

Altitude Set

Set published MDA or airport elevation plus 1000 feet (300m).

At configuration point:

Landing gear and landing flaps Set

Aircraft should be fully configured for landing prior to FAF.

At FAF or descent point:

V/S, FPA, FLCH Select

Speed Set as required

When level at the MDA (ALT HLD):

Missed approach altitude Set

Set lowest initial level off altitude on missed approach
procedure.

When needed to execute circling maneuver:

HDG SEL Select

No later than 200 feet AGL:

Autopilot Disengage

Execute a missed approach if visual contact with the airport is lost.

Conducting a missed approach:

Use normal missed approach procedures except:

- Make the initial climbing turn towards the landing runway to reach the missed approach heading. Turn may be more than 180 degrees and not in the shortest direction.
- Maintain the missed approach flap setting until close in maneuvering is complete.
- Fly the published missed approach corresponding to the instrument approach procedure just flown until alternate instructions are received.

RADIO/BARO Minimums Chart

	APPROACH TYPE	BARO MIN REF	RADIO MIN REF	
	ILS TO CAT I	PUBLISHED DA	N/A	
	CAT II	N/A	PUBLISHED RA	
	CAT II RA NOT AUTH	PUBLISHED DA	N/A	
	CAT III	N/A	50'	
	STRAIGHT-IN (NON-ILS)	PUBLISHED DA or DDA (MDA + 50')	N/A	
	CIRCLE-TO- LAND	HIGHER OF: PUBLISHED MDA OR AIRPORT ELEV + 1000'	N/A	
	VISUAL	APPROACH MINIMUMS (1)	N/A	
	<i>(1) Set the approach minimums for the instrument approach used to back up the visual approach. If no instrument approach is available, bias out of view.</i>			

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Supplementary Procedures

Introduction

Chapter SP

Section 05

General

This chapter contains procedures that are organized by system and covers:

- Procedures (adverse weather operation, etc.) that are accomplished as required rather than routinely performed on each flight,
- Any first-flight-of-the-day test or other systems test,
- Guidance on lengthy operating procedures, and
- Adverse weather procedures and guidance.

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Cabin Inspection

Flights without Flight Attendants

For a flight without a flight attendant staff (ferry flight, test flight, delivery flight, training flight, etc.) the pilots must secure the cabin.

- Doors - Secured and at least the 1L and 1R doors armed.
- Galley (coffee pots, doors, and drawers, etc.) - Secured.
- Beverage carts - Stowed and locked in position.
- Overhead bins - Closed.
- Closets - Closed and locked.
- Lavatories - Inspect for general security; doors locked.

After block-in, pilots should DISARM all doors and pass a thumbs up to the gate agent when the main entry door is ready to be opened.

Electronic Flight Bag (EFB) Mount

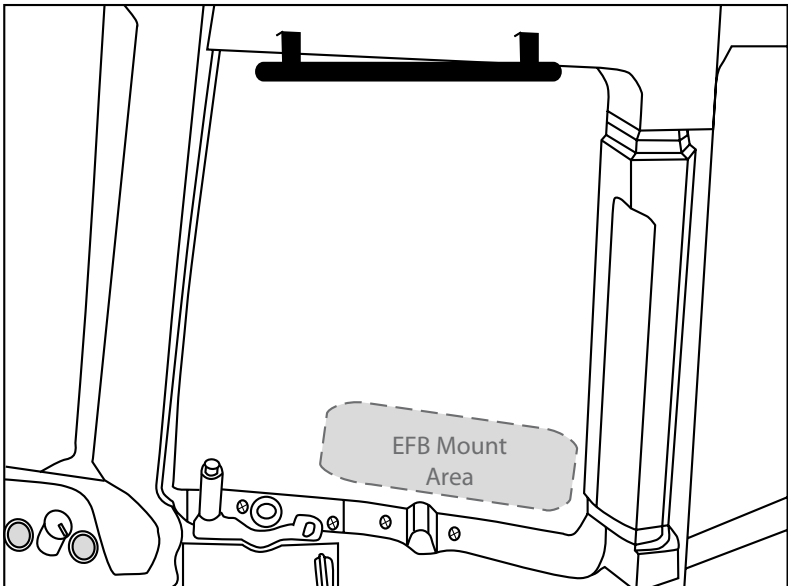
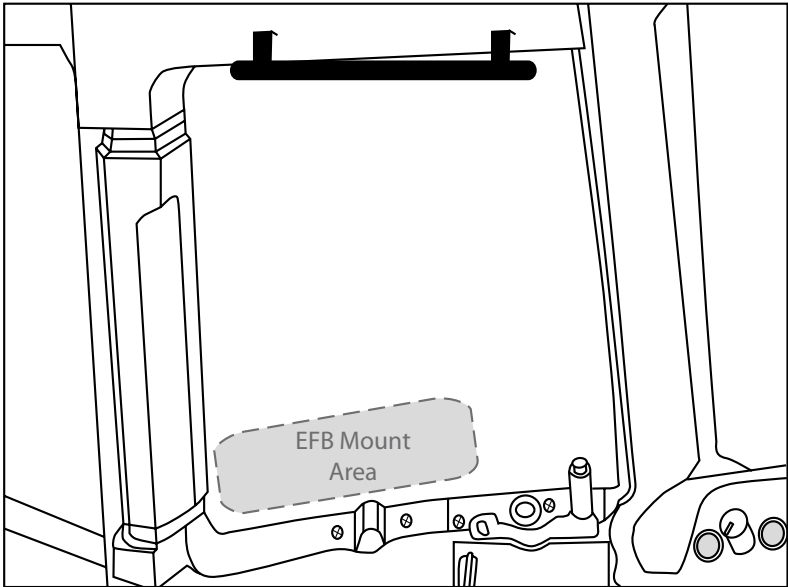
Note: Prior to the first flight of the day, the EFB mounting system must be installed/reinstalled to ensure the mount attachment is secure. During subsequent flights, mount security may be verified with a gentle tug. Reinstall the mount as required.

CAUTION: Do not place the EFB in direct sunlight on the glareshield.

Do not use any other mounting or securing system other than the provided approved system.

To secure the EFB mount in the aircraft:

- Ensure the side window and suction cups are clean. If necessary, wipe with pretreated lens/screen cloth or moist cloth.
- Sunshades (as installed) should be stowed prior to securing the mount.
- Ensure the locking levers are in the OFF position.
- Position the suction cups in the mounting zone indicated in the following diagrams.
- To remove trapped air, press each cup against the window until completely compressed.
- Move the locking levers to the ON position.
- Ensure the EFB and mount are free and clear of all flight controls, and do not restrict access to egress, tiller, oxygen mask, or line of sight.
- Squeeze the gray tabs together to expand the mounting tabs and insert the EFB into the mount.
 - If the EFB is in the portrait mode, the fixed tabs should be positioned at the bottom of the mount to prevent the EFB from slipping.
- Use caution when deploying sunshades with the EFB mount installed to avoid damage.



Entry/Service Door Closing

- Gust lock latch Release
- Door Close
- Manually position the door aft and inboard to cover the entry.
- Door handle Rotate
- Rotate forward 180° to the closed position. The door lowers into position, latches, and locks.
- Mode select lever ARM
- Observe yellow forward and aft girt bar flags are in view.

Entry/Service Door Opening

- Mode select lever (interior only) DISARM
- Note:** Escape slide/raft and powered door opening is disarmed automatically when the door is opened from outside.
- Door handle Rotate
- Rotate aft 180° to the open position. The door is lifted clear of the pressure stops.
- Door Open
- Manually position the door outboard and forward to open. The gust lock latch automatically engages and locks door in the open position.

Flight Deck Door Access System Test

7101 - 7110 [AFM]

INDICATOR LIGHTS TEST switch..... Push and hold
Verify the AUTO UNLK and LOCK FAIL lights on door control
panel illuminate.

INDICATOR LIGHTS TEST switch..... Release

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 amber keypad LED illuminates momentarily.

Verify AUTO UNLK light illuminates.

Flight deck door lock selector DENY

Verify AUTO UNLK light extinguishes.

Verify red keypad LED illuminates.

Flight deck door lock selector UNLK

Flight deck access system switch OFF

Verify LOCK FAIL light illuminates.

Flight deck access system switch NORM

Guard - Down

Verify LOCK FAIL light extinguishes.

Flight Deck Door Access System Test

7001 – 7008 [AFM]

The following procedures is normally accomplished prior to the first flight of the day:

INDICATOR LIGHTS TEST switch Push and hold
Verify the AUTO UNLK and LOCK FAIL lights on door control panel illuminate.

INDICATOR LIGHTS TEST switch Release

With the flight deck door open:

ENT key Push

Access code Enter

ENT key Push

Verify alert sounds.

Verify amber keypad LED illuminates momentarily.

Verify AUTO UNLK light illuminates.

FLIGHT DECK DOOR selector UNLK

Verify AUTO UNLK light extinguishes.

Verify green keypad LED illuminates.

Verify door lock solenoid disengages (audible click).

Note: The door lock solenoid will remain disengaged until the FLT DK DOOR selector is released.

FLIGHT DECK DOOR selector Release

Flight deck door lock catch Push and hold

Depress and hold door lock catch mechanism, inside strike plate box on door jamb, to simulate a door closed condition.

ENT key Push

Access code Enter

ENT key Push

FLIGHT DECK DOOR selector DENY

Hold the FLT DK DOOR selector to DENY position.

Verify red keypad LED illuminates for five seconds.

Verify door lock solenoid remains engaged (no audible click).

Verify AUTO UNLK light remains extinguished.

Verify no alert sounds.

FLIGHT DECK DOOR selector Release

Flight deck door lock catch Release

Note: The DENY mode will remain active until door lock catch is released or FLT DK DOOR selector positioned to UNLK.

Emergency Oxygen Use

Emergency oxygen should be used when necessary to provide positive pressure in the masks and goggles to prevent or evacuate contaminants. When positive pressure is not required, but contamination of flight deck air exists, 100% oxygen must be used. If prolonged use is required and the situation permits, oxygen availability should be extended by selecting normal flow. When oxygen use is no longer required, close the right hand oxygen compartment door and push the RESET/TEST switch to restore normal boom microphone operation.

Oxygen Mask Test

Full face oxygen mask Stowed
Verify doors closed.

MFD STATUS page Select
Note oxygen pressure (1,000 PSI minimum).

Regulator selector EMER
Rotate the regulator selector to EMERGENCY position.

RESET/TEST switch Push and hold
Verify the OXY ON indicator appears in switch.

Verify yellow cross appears continuously in the oxygen flow
indicator.

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

Note: If the oxygen cylinder valve is not in the full open position,
pressure may reduce rapidly, decrease more than 100 PSI, or
slowly increase back to normal.

RESET/TEST switch Release
Verify the OXY ON indicator no longer appears in switch.

Verify yellow cross does not appear in the oxygen flow indicator.

Verify the crew oxygen pressure returns to normal.

Regulator selector 100%
Rotate the regulator selector to 100% position.

Upper Crew Rest Compartments

7101 - 7110 [AFM]

Door 1 upper crew rest compartment may be occupied in all phases of flight with the following conditions:

- maximum occupancy during taxi, takeoff and landing is two
- maximum occupancy during remaining phases of flight is four.
- entrance door must be latched open for taxi, takeoff, climb, and landing

Door 4 upper crew rest compartment may be occupied above 25,000 feet with the following condition:

- maximum occupancy is six.

When occupying the Door 1 upper crew rest compartment:

SUPPLY AIRFLOW OFF light Check

Verify SUPPLY AIRFLOW OFF light is extinguished.

If AIRFLOW OFF light is illuminated:

AIRFLOW/SMOKE RESET switch – Push and release

Push the AIRFLOW/SMOKE RESET switch one (1) time
and wait ten minutes before closing compartment door.

If SUPPLY AIRFLOW OFF light remains illuminated:

Latch open compartment door to provide proper ventilation.

When occupying the Door 4 upper crew rest compartment:

**WARNING: The Door 4 upper crew rest area should not be
occupied when the amber AIRFLOW OFF light is
illuminated.**

AIRFLOW OFF light Check

Verify AIRFLOW OFF light is extinguished.

If AIRFLOW OFF light is illuminated:

AIRFLOW/SMOKE RESET switch – Push and release

Push the AIRFLOW/SMOKE RESET switch one (1) time
and wait ten minutes before closing compartment door.

If AIRFLOW OFF light remains illuminated:

Do not occupy the crew rest compartment.

Upper Crew Rest Compartments

7001 – 7008 [AFM]

WARNING: The upper crew rest area should not be occupied when the amber AIRFLOW OFF light is illuminated.

Door 1 upper crew rest compartment may be occupied above 25,000 feet with the following condition:

- maximum occupancy is four.

Door 3 upper crew rest compartment may be occupied above 25,000 feet with the following condition:

- maximum occupancy is six.

Note: The upper crew rest compartments may not be occupied below 25,000 feet.

When occupying an upper crew rest compartment:

AIRFLOW OFF light..... Check
Verify AIRFLOW OFF light is extinguished.

If AIRFLOW OFF light is illuminated:

AIRFLOW RESET switch – Push and hold in both crew rest areas

Hold switch for two seconds.

Note: The AIRFLOW RESET switch is inoperative when the airplane is below 25,000 feet.

AIRFLOW RESET – Release

If AIRFLOW OFF light remains illuminated:

Do not occupy the crew rest compartment.

Note: If a smoke test is initiated, or a smoke condition exists, partial aft galley power isolation will occur. Galley power can be restored by depressing the AIRFLOW RESET switch in both crew rest areas.

Supplementary Procedures

Air Systems

Chapter SP

Section 2

Air Conditioning Packs

Ground Conditioned Air Use

Before connecting ground conditioned air:

PACK switches (both) – OFF

[Prevents pack operation when conditioned air is supplied to the airplane. The pack or pack components can be damaged if operated with conditioned air.]

RECIRCULATION FANS switches (both) – OFF

[This step allows the conditioned air unit to operate at maximum efficiency.]

After disconnecting ground conditioned air:

PACK switches (both) – AUTO

RECIRCULATION FANS switches (both) – ON

Packs Off Takeoff

Before takeoff:

PACK switches (both) – OFF

Wait 30 seconds before setting takeoff thrust.

[This step allows packs to shut down and EECs time to recompute maximum EPR/N1 line and reference/target EPR/N1 indications.]

After takeoff:

PACK switches (both) – AUTO

After engine thrust is reduced from takeoff to climb and reaching 3000 feet above field elevation, position both pack switches to AUTO.

APU to Pack Takeoff

7101 - 7110

Note: APU to Pack Takeoff is prohibited at airport altitudes above 6,900 feet field elevation.

Before start:

PACK switches (both) – AUTO

On the THRUST LIMIT Page, select one of the following takeoff thrust ratings as directed by the WDR:

- TO (full takeoff thrust)
- TO B (takeoff bump)

Enter “APU” into the scratchpad and line select to the “SEL-APU” field. “APU” appears in small font representing the armed mode.

Note: The APU must be running before “APU” can be selected as the armed mode.

After engine start:

Leave APU running to supply air to the left pack.

Approximately one minute after second engine start, “APU” displays in large font representing the active mode.

Confirm proper configuration by noting a green “A-TO or A-TO B on EICAS.

Note: If cabin temperature becomes excessive during extended ground operation, establish dual pack operation by deleting the APU selection. To re-establish APU to Pack operation, enter “APU” into the scratchpad and line select to the “SEL-APU” field.

Note: If an engine is shutdown after selecting APU to Pack operation, the engine cannot be started until APU to Pack takeoff mode has been deleted. To re-establish APU to Pack operation after start, re-enter “APU” into the scratchpad and line select to the “SEL-APU” field on the thrust limit page.

After climb thrust reduction:

APU Selector - Off.

Supplementary Procedures

Anti-Ice, Rain

Chapter SP

Section 3

Anti-Ice Operation

Requirements for use of anti-ice and operational procedures for engine and wing anti-ice are contained in Supplementary Procedures, Adverse Weather Section SP.16.

Windshield Wiper Use

CAUTION: Windshield scratching will occur if the windshield wipers are operated on a dry windshield.

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Supplementary Procedures

Automatic Flight

Chapter SP

Section 4

AFDS

AFDS Operation

FLIGHT DIRECTOR switches ON

Verify FLT DIR is displayed in the AFDS system status annunciator.

If the autopilot is desired:

AUTOPILOT engage switch Push

Verify A/P is displayed in the AFDS system status annunciator.

Heading Hold

If the airplane is operating in polar regions:

HEADING REFERENCE switch..... TRUE

HEADING/TRACK reference switch Push

Verify HDG is displayed in the HDG/TRK window.

Heading/track HOLD switch Push

Verify HDG HOLD is displayed in the roll mode annunciator.

Heading Select

Maintains the airplane heading the same as the selected heading.

If the airplane is operating in polar regions:

HEADING REFERENCE switch..... TRUE

HEADING/TRACK reference switch Push

Verify HDG is displayed in the HDG/TRK window.

Heading/track SELECT switch.....Push

Verify HDG SEL is displayed in the roll mode annunciator.

Heading/track selector Rotate

Set desired heading in the HDG/TRK window.

Track Hold

If the airplane is operating in polar regions:

- HEADING REFERENCE switch TRUE
- HEADING/TRACK switch Push
Verify TRK is displayed in the HDG/TRK window.
- Heading/track HOLD switch Push
Verify TRK HOLD is displayed in the roll mode annunciator.

Track Select

Maintains the airplane track the same as the selected track.

If the airplane is operating in polar regions:

- HEADING REFERENCE switch TRUE
- HEADING/TRACK reference switch Push
Verify TRK is displayed in the HDG/TRK window.
- Heading/track SELECT switch Push
Verify TRK SEL is displayed in the roll mode annunciator.
- Heading/track selector Rotate
Set desired track in the HDG/TRK window.

Altitude Hold

- Altitude HOLD switch Push
Verify ALT is displayed in the pitch mode annunciator.

Flight Level Change, Climb or Descent

- ALTITUDE selector Rotate
Set the desired altitude in the MCP ALTITUDE window.
- FLCH switch Push
Verify FLCH SPD is displayed in the pitch mode annunciator.
- IAS/MACH selector Rotate
Set the desired speed in the IAS/MACH window.

Vertical Speed, Climb or Descent

ALTITUDE selector Rotate
Set the desired altitude in the MCP ALTITUDE window.

VERTICAL SPEED/FLIGHT PATH ANGLE reference switch Push
Verify V/S is displayed in the vertical speed/flight path angle window.

VERTICAL SPEED/FLIGHT PATH ANGLE switch Push
Verify V/S is displayed in the pitch mode annunciator.

VERTICAL SPEED/FLIGHT PATH ANGLE selector Rotate
Set the desired vertical speed in the VERTICAL SPEED/FLIGHT PATH ANGLE window.

If a climb is desired:

Select climb thrust limit on the CDU THRUST LIM page.

Flight Path Angle, Climb or Descent

ALTITUDE selector Rotate
Set the desired altitude in the MCP ALTITUDE window.

VERTICAL SPEED/FLIGHT PATH ANGLE Reference switch Push
Verify FPA is displayed in the vertical speed/flight path angle window.

VERTICAL SPEED/FLIGHT PATH ANGLE switch Push
Verify FPA is displayed in the pitch mode annunciator.

VERTICAL SPEED/FLIGHT PATH ANGLE selector Rotate
Set the desired flight path angle in the VERTICAL SPEED/FLIGHT PATH ANGLE window.

If a climb is desired:

Select climb thrust limit on the CDU THRUST LIM page.

Autothrottle Operation

AUTOTHROTTLE ARM switches ARM

If the pitch mode is TO/GA:

TO/GA switch Push

Verify that THR REF is displayed in the autothrottle mode annunciator. THR REF changes to HOLD at 80 knots.

If the pitch mode is ALT, V/S, FPA, G/S, or no pitch mode:

AUTOTHROTTLE switch Push

Verify that SPD is displayed in the autothrottle mode annunciator.

If a constant speed is desired:

IAS/MACH selector Rotate

Set the desired speed in the IAS/MACH window.

If climb or continuous thrust is desired:

CLB CON switch Push

Verify that THR REF is displayed in the autothrottle mode annunciator.

If FLCH or VNAV is desired:

FLCH or VNAV switch Push

Verify that THR REF, THR, SPD, IDLE, or HOLD as appropriate is displayed in the autothrottle mode annunciator.

If TO/GA is desired:

TO/GA switch Push

The pitch mode will change to TO/GA. Verify that THR or THR REF is displayed in the autothrottle mode annunciator.

If the pitch mode is VNAV PTH, VNAV ALT, VNAV SPD, or FLCH SPD:

AUTOTHROTTLE switch Push

Verify THR REF, THR, SPD, IDLE, or HOLD as appropriate is displayed in the autothrottle mode annunciator.

Autoland Documentation

When an autoland has not been recorded within a thirty-day period, the MEL ITEMS FOR SHIP NUMBER section of the flight release will contain an "S" item as follows:

- S22-00-00A ACCOMPLISH LLM AUTO LANDING

If the autoland is successful, document it on the ACARS Flight Summary page by the fields provided. If the autoland was attempted and unsuccessful, make a log book entry. Include as much pertinent information as possible.

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Supplementary Procedures Communications

Chapter SP Section 5

Flight Deck Communications System (Datalink)

The following procedures are one means which may be used to verify Pre-Departure Clearance, Digital-Automatic Terminal Information Service (D-ATIS), Oceanic Clearances, Weight and Balance and Takeoff Data messages transmitted via the COMPANY format.

Pre-Departure Clearance

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

Digital-Automatic Terminal Information Service

The flight crew shall verify that the D-ATIS altimeter setting numeric value and alpha value are identical. If the D-ATIS altimeter setting numeric value and alpha value are different, or the alpha value is not present, the flight crew must verify the altimeter setting by other means.

Oceanic Clearances

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

Weight and Balance

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

Takeoff Data

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

Digital Flight Information (ARINC 623)

To communicate via text instead of voice, access the FLIGHT INFORMATION page.

To Access

- DSP COMM switch Select
- FLIGHT INFORMATION Select
- DESIRED FUNCTION Select

At this time, the following features are normally not used: TWIP REQUEST, PUSHBACK REQUEST, and EXPECTED TAXI REQUEST.

ATC	FLIGHT INFORMATION	COMPANY
REVIEW	MANAGER	NEW MESSAGE
FLIGHT INFORMATION		
DEPARTURE CLEARANCE REQ		TWIP REQUEST
OCEANIC CLEARANCE REQ		PUSHBACK REQUEST
ATIS REQUEST		EXPECTED TAXI REQUEST

FLIGHT INFORMATION Menu

Departure Clearance Request

Datalink Departure Clearances (DCL) are available at certain airports. If an airport has DCL available, it will be annotated on the 10-0 (Delta Special Page).

From the Flight Information Menu select DEPARTURE CLEARANCE REQ:

ATC	FLIGHT INFORMATION	COMPANY
REVIEW	MANAGER	NEW MESSAGES
1234Z DEPARTURE CLEARANCE REQUEST		
(1) → FLT NUMBER:	ATC FACILITY:	(4) ←
(2) → DEPARTURE:	DESTINATION:	(5) ←
(3) → ATIS:	GATE:	(6) ←
FREE TEXT:		
SEND	PRINT	RESET
	RETURN	EXIT

(1) **FLIGHT NUMBER**

Flight defaults to the FMC flight number, if entered.

(2) **DEPARTURE**

Departure airport defaults to the FMC departure airport.

Valid entry is an ICAO identifier.

(3) **ATIS**

Valid entry is any character A through Z.

(4) **ATC FACILITY**

Insert departure airport ICAO identifier.

(5) **DESTINATION**

Destination airport defaults to FMC destination airport.

(6) **GATE**

Valid entry is a gate number at reference airport.

SEND.....Select

Datalink Oceanic Clearance Request

Oceanic clearances may be requested / received from participating Oceanic Area Control Centers via datalink. Currently datalink oceanic clearances can be obtained from Gander, Reykjavik, Shanwick, and Santa Maria.

From the Flight Information Menu select OCEANIC CLEARANCE REQ:

ATC		FLIGHT INFORMATION		COMPANY	
REVIEW		MANAGER		NEW MESSAGES	
1234Z OCEANIC CLEARANCE REQUEST					
(1) →	FLT NUMBER:		ATC FACILITY:		← (4)
(2) →	ENTRY POINT:		FLIGHT LEVEL:		← (5)
(3) →	ETA:	Z	MACH:		← (6)
(7) →	FREE TEXT:				
SEND		PRINT	RESET	RETURN	EXIT

(1) **FLIGHT NUMBER**

Flight defaults to the FMC flight number.

(2) **ENTRY POINT**

Valid entry is up to 15 characters.

Enter the Oceanic Entry Point. Reference Jeppesen FD Pro or Enroute Charts to identify the Oceanic Entry Point.

(3) **ETA**

If an Entry Point has been entered, and it is a waypoint on the active route, the ETA box defaults to the predicated ETA at that waypoint.

(4) **ATC FACILITY**

Select the appropriate OCA four letter identifier (e.g. CZQX for Gander).

(5) **FLIGHT LEVEL**

Enter requested flight level.

(6) **MACH**

Enter requested Mach number.

(7) **FREE TEXT**

Enter alternative track and FL plus Max FL (e.g. 2ND NAT Z (if on FP) 2ND F340 M340).

SEND.....Select

An acknowledgement of the request for clearance will be received within 5 minutes. Upon receipt of Oceanic Clearance, PM and PF should:

- Check clearance ends with “END OF MESSAGE”
- Select “ACCEPT”

ATIS Request

Airports that have datalink ATIS available will be identified on the Jeppesen -9 Airport page with D-ATIS in the ATIS frequency block.

From the Flight Information Menu select ATIS REQUEST:

ATC	FLIGHT INFORMATION	COMPANY
REVIEW	MANAGER	NEW MESSAGES
1234Z	ATIS REQUEST	
(1) → AIRPORT:		
(2) → {		
☐ DEPARTURE		
☐ ENROUTE		
☐ ARRIVAL		
	☐ AUTO	(3) ←
(4) → ☐ TERMINATE AUTOMATIC UPDATE		
SEND	PRINT	RESET RETURN EXIT

(1) AIRPORT

Defaults to the FMC departure airport on the ground and the FMC destination airport while in flight.

(2) ATIS SELECTOR GROUP

The default is none selected. The SEND key becomes active with a selection.

(3) AUTOMATIC UPDATE

If ARRIVAL is selected, the AUTO update selection box displays. If ENROUTE is selected, updating is automatic.

(4) **TERMINATE AUTOMATIC UPDATE**

Displays when ENROUTE or ARRIVAL AUTO update has been selected. Selection cancels automatic updating and sets the ATIS selector to none selected.

SEND.....Select

AWABS Update

Pilot requests for changes to the Weight Data Record (WDR) are made using the AWABS request page.

Rather than uplinking an entire WDR which would require many uplink blocks, the Takeoff Performance Request (TOPR) extracts pertinent information from the resulting WDR and uplinks only this information.

Because the TOPR depends upon flight identification data in the header of every downlink message, assure that ACARS is properly initialized.

AWABS Update Request

To perform an AWABS update:

Note: An AWABS update for a takeoff position other than the positions on the ACARS Predeparture Message (D-7) may be sent anytime after the D-7 is received.

Note: Additional AWABS updates may be requested anytime after the initial WDR is produced.

COMM page Select

COMPANY menu Select

AWABS UPDATE Select

Selection displays the AWABS UPDATE REQUEST page.

ATC		FLIGHT INFORMATION		COMPANY	
REVIEW		MANAGER		NEW MESSAGES	
1234Z		AWABS UPDATE REQUEST		XXXXXXXXXX	
SN:	RWY:	CONTAMINANT:			
JS:	WIND DIR:	☐	DRY		
CC:	WIND VEL:	☐	WET		
YC:	ALTIMETER:	☐	ICE		
TOLERANCE		☐	QUARTER		
CGO/FUEL:	E1:	☐	HALF		
CGO/FUEL:	E2:	TEMP: ± C			
ADJ ZFW:		☒	C		
MEL-CDL:		☐	F		
SEND		PRINT		RESET	
				RETURN	
				EXIT	

AWABS UPDATE REQUEST data Enter

Enter information into the appropriate fields.

Note: The AWABS request message consists of several fields. The first three fields are mandatory and the remaining fields are optional.

SEQUENCE NUMBER – No entry required

RUNWAY IDENTIFIER (required) – Enter

Enter the desired takeoff runway. AWABS data will only be sent for this runway. This identifier must be recognizable by AWABS (consult the existing WDR for the exact label).

Examples include:

- 26R - Runway 26 Right
- 26L-E13 - Runway 26 Left at taxiway E 13

- 25LPOSNF - Runway 25 Left at takeoff position NF (this is an FRA runway.)
- For a list of possible runway labels enter either an impossible or non-existent runway (e.g., 99). This list will indicate the possible runways and a one- or two-character identifier. The system keeps track of the uplinked runway list, and subsequent requests may utilize either the full identifier or the one- or two-character identifier.

Note: Do not use a slash character within the runway identifier field.

CONTAMINANT TYPE (defaults to DRY) – Enter

Selections are DRY, WET, ICE, QUARTER, and HALF. When within weight tolerance for the requested contaminant, an Uplink WDR will be sent which will contain data for all available contaminant types

If overgross for the requested contaminant, an error response will be sent and no WDR will be received.

The remaining fields on the AWABS page are optional and are used only when a change from the existing WDR is desired.

TEMP (optional) – Enter

Current temperature in degrees Fahrenheit (default) or Celsius (C).

WIND DIR/VEL (optional) – Enter

ALTIMETER (optional) – Enter

The altimeter setting is specified without the decimal point. For example, 30.06 would be reported 3006. Metric or US standard are permitted. Entries between 915 and 1083 are assumed to be millibars; entries between 2700 and 3200 are assumed to be in Hg.

FC/CC/YC (optional) – Enter

Passenger count. Enter data only in the classes you wish to change. The 777 is currently configured as a two-class airplane (C and Y). If a class remains unchanged, leave the place blank.

Examples: To change C class passengers to 20, enter “20”; to change Y class passengers to 118, enter “118”.

Note: When passenger counts are not entered the system displays the most current passenger and cargo information available in AWABS. This assures that in the event a payload correction has been made in AWABS you will receive the most current data.

TOLERANCE – fields are not used at this time.

ACARS Landing Performance Request (LPR)

There are two ways to request landing performance data: Misc Report and Free Text. Misc Report is used to request default values for a runway. Free Text is used to request desired weight and configuration for a runway. Both methods are described below.

Misc Report

This method defaults to FLAPS 30, ABS 3, and the calculated flight plan landing weight. Use the following format to request landing performance:
LPR4ATL27L

LPR = Landing Performance Request

4 = Runway Condition Code/Braking Action Report

ATL = Arrival Airport

27L = Desired Runway

Runway Condition Code/Braking Action Report:

6 = DRY

5 = GOOD

4 = GOOD/MED

3 = MED

2 = MED/POOR

1 = POOR

Free Text

This method is used to request a desired weight and configurations from the Dispatcher. Send the following information via Free Text:

- Airport
- Runway
- Flap and autobrake setting
- Estimated landing weight
- Braking action
- Any additional data (inop items)

The dispatcher will manually enter the data and uplink the requested report.

Landing Performance Request Uplink

'*' Indicates fields selected or default.

LDIST = Calculated Landing Distance includes a 1500' air run from threshold to touchdown, plus stopping distance, plus a 15% safety margin. LDIST will never be greater than the available runway length.

LTP = Latest Touchdown Point to protect the LDIST on the available runway (default is 1500'). LTP varies between 1000' to 3000'. A landing beyond the LTP reduces the 15% safety margin included in the LDIST.

'()' = The LDIST and LTP are in parentheses when LTP is less than 1500'.

'- - -' = Dashes appear when the 15% safety margin cannot be met or data is not available for requested conditions.

Page 1: Provides station, runway and available runway landing distance.

Flaps 30, Autobrakes 3 and GOOD braking action were requested (*).

The LDIST for the requested conditions is 9400'. The actual stopping distance is less since LDIST includes a 15% safety margin. LDIST is 2290' shorter than the available runway length. As autobrake and flap selections increase, LDIST decreases and LTP increases. LTP will never be greater than 1/3rd of the runway length up to 3000'.

ATL 27R		11690
6*DRY	LDIST	LTP
F30 B-AB2	10500	2700
F30*B-AB3	9400	3000
F30 B-AB4	7900	3000
F30 B-MAX	6300	3000
W 285/18G26 HW18	XW05	

Page 2: Provides additional data for requested conditions as well as other Runway Condition Codes or Braking Actions Reports.

F30 B-AB3	LDIST	LTP
6*DRY	9400	3000
5 GOOD	9400	3000
4 G/M	9800	3000
3 MED	10200	3000
2 M/P	11400	1800
1 POOR	----	----

Page 3: System status page.
Includes ship number, flight
number/date, landing weight as
well as braking system status and
production time stamp.

SHIP 7105	FLT 0007/08
WT 460.0	VREF PLUS 00
TEMP 8	A30.36
REVSEER OK	WING AI OFF
ANTSKD OK	ASPOIL OK
LDIST INCL 15	PCT MARGIN
TEST ONLY - DO NOT USE	
END DISPATCHER LPR 1734Z	

Cabin Medical Communication

At the Captain's discretion, this procedure may be used during a medical emergency to allow direct communication between the cabin and a ground based medical consultant.

Note: Audio jacks are installed above center seats near rows 3, 12, 33, 40, 47 and 55, and the cabin is equipped with a headset.

When cabin medical communication is required:

Medical consultant communications Establish

First observer's audio panel Set

Configure speaker and microphone select buttons.

Cabin communications Initiate

Inform cabin crew that communication with the medical consultant has been established and is available for their use.

If Flight Attendant reports difficulty establishing communication inform them to:

- Check that the headset jacks are well-seated for proper connectivity
- Check that the volume knob on the headphone earpiece is turned up and headset microphone is close to mouth.

If possible, monitor the cabin/medical communication through first observer's audio control panel.

When cabin medical communication is no longer required:

First observer’s audio panel Reset
Reconfigure first observer’s audio control panel and instruct
Flight Attendants to stow headset.

Note: Under no circumstances should a passenger be allowed to plug
a personal headset into a cabin medical communications audio
jack.

Cockpit Voice Recorder Test

TEST switch Push and hold
Push and hold the TEST button for 5 seconds.

7101 - 7110
Verify status indicator light illuminates.

7001 - 7008
Observe the indicator pointer in the green band.

Note: If indicator fails to remain in the green band, plug headset
into recorder jack. A tone should be heard for each channel
during test.

TEST switch Release

Inadvertent ADS-C Emergency Activation

If ADS EMERGENCY is noted by ATC, with the absence of follow-up
emergency measures (communication or divergence from track/altitude),
ATC will call with a “CONFIRM ADS” request.

- If ADS EMERGENCY ON was inadvertently selected:
 - Respond immediately with “ADS RESET”, then select ADS
EMERGENCY OFF under DSP COMM \ MANAGER \ ADS.
- If ADS EMERGENCY ON was intentionally selected:
 - If able, respond immediately with flight status and intentions.
 - If clarification/communication is not possible, continue with
ADS EMERGENCY ON selected.

Controller Pilot Data Link Communication (CPDLC) and Automatic Dependent Surveillance (ADS)

For ADS and CPDLC operations, theater differences, logon codes, and phraseology refer to the Airway Manual, ATC & Flt Control Communication, ATC Communication.

CPDLC Procedures

Refer to Operations Manual, Volume 2, Communications section, for explanation of individual CPDLC functions.

CPDLC Preflight / Logon

CPDLC logon should occur 15 minutes prior to FIR boundary.

DSP COMM Switch Select
ATC Select
LOGON/STATUS Select
Displays the LOGON/STATUS page.

ATC	FLIGHT INFORMATION	COMPANY
REVIEW	MANAGER	NEW MESSAGES
0534Z LOGON/STATUS ACTIVE CENTER: NEXT CENTER: ATC CONNECTION: NOT ESTABLISHED MAX UPLINK DELAY: -- -- SEC LOGON TO: BIRD FLIGHT NUMBER: DAL12 TAIL NUMBER: N860DA AIRLINE: DL SEND RETURN EXIT		

MFD

Ensure the following are filled in properly:

LOGON TO
Type in appropriate FIR identifier.

FLIGHT NUMBER DAL _ _ _ _

After route activated ensure proper format (e.g., DAL12)

Note: Do not put zero as first digit (e.g., DAL12, not DAL012)

TAIL NUMBER N _ _ _ _

Verify FAA registration number is properly filled in.

AIRLINE DL

Verify “DL” is filled in.

Note: If ADS-C is available, the ADS logon may occur automatically within a few seconds or as late as five minutes prior to FIR boundary. See ADS-C section below and follow ADS Logon verification procedure whenever you send a LOGON.

Note: While the logon is accomplished on the same page, ADS and CPDLC are two separate and unrelated connections.

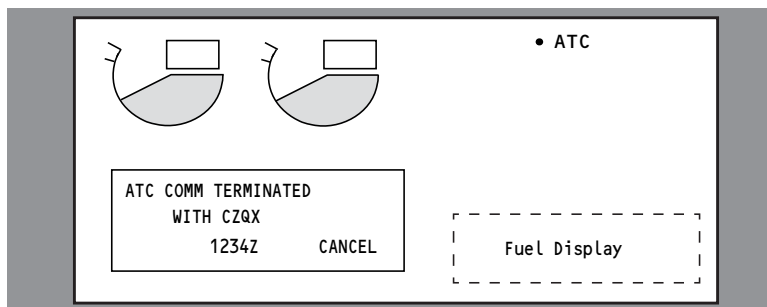
SEND Select

Refer to Airway Manual, ATC & Flt Control Communication, ATC Communication for information regarding when to send logon.

After selecting SEND, the controlling ATC facility will reply to the LOGON downlink when the aircraft is within the facility’s LOGON parameters. An uplink will then be sent to confirm the CPDLC connection.

Logon Verification for CPDLC

Logon is confirmed when “ATC COMM ESTABLISHED WITH ____” appears in ATC Uplink Message Block on upper EICAS display. When controlling ATC facility disconnects CPDLC, or CPDLC connection is lost, an ATC Uplink Message Block “ATC COMM TERMINATED” displays.



Downlinks

Selecting “ATC” from the COMM menu page accesses CPDLC downlink message pages. Refer to Operations Manual, Vol. II, Communications section for explanation of individual downlink pages.

ATC Uplinks

Most ATC clearances will display automatically on the upper EICAS in the ATC Uplink Message Block accompanied by an aural chime. All ATC uplinks can be viewed on the Lower MFD by selecting “COMM” on the DSP. If “LARGE ATC UPLINK” is displayed in Uplink Message Block, the clearance is too large to display on the Upper EICAS and must be viewed on the Lower MFD. For most ATC uplinks requiring crew response, “ACCEPT, REJECT or CANCEL” can be selected using the switches on the glareshield, or by using command keys located at the bottom of the communication page on the Lower MFD. Traditional PF/PM communication and flying duties will apply to all CPDLC clearances.

ATC Requested Reports

Some ATC clearances contain requirements for future reports (e.g., “report level”). Some ATC reports may be armed for automatic transmission at the appropriate time.

After airplane systems configured and uplink response sent:

ATC menu Select

ATC REQUESTED REPORTS Select

Select the appropriate report.

ARM Select

When report condition is satisfied, the downlink report sends automatically. A message verifying the report was sent will display in the ATC Uplink Message Block.

ADS-C Procedures

ADS-C Logon

Ensure the following are filled in properly:

LOGON TO
Type in appropriate FIR identifier.

FLIGHT NUMBER DAL
After route activated ensure proper format (e.g., DAL12)

Note: Do not put zero as first digit (e.g., DAL12, not DAL012)

TAIL NUMBER N
Verify FAA registration number is properly filled in.

AIRLINE DL
Verify “DL” is filled in.

Note: If ADS is available, the ADS logon may occur automatically within a few seconds or as late as 5 minutes prior to FIR boundary. See ADS section below and follow ADS Logon verification procedure whenever you send a LOGON or transfer to another ADS sector.

ADS Logon Verification

DSP COMM switch Select
MANAGER Select
ADS Select

The logon is confirmed when “XXXXXZ - ADS CONNECTION ESTABLISHED - XXXXXXXX” is displayed.

FRM Code Downlinks Via ACARS

Note: If a maintenance irregularity is discovered prior to pushback, a phone call to the MCC is preferable to an ACARS downlink.

To send a FRM code via ACARS:

DSP COMM

COMPANY Select

FREE TEXT Select

MAINT BOX Select

Green check mark should appear.

Enter the FRM code number on the FRM line. Do not include spaces from the FRM code. Example: 33163247.

Note: If possible, provide details of non-normal using free text on page 2.

SEND Select

ATC	FLIGHT INFORMATION	COMPANY
REVIEW	MANAGER	NEW MESSAGES
1234Z	FREE TEXT	
 FLT CTRL	 MISC RPT	
 MAINT	 OTHER	1
FRM: _____	CDL: ____	
FRC: _____		
FRC: _____		2
FRC: _____		
FRC: _____		
FRC: _____		
SEND	PRINT	RESET
	RETURN	EXIT

Note: The FRM code should be entered in the FRM code block of the aircraft logbook. Also, a brief description of the maintenance irregularity should be entered in the Irreg. block of the aircraft logbook.

After shutdown:

If arrival is at a maintenance station, no further action is required.

If arrival is at a non-maintenance station, contact the TMC via telephone.

FMC Data Link Reset

Uplink of FMC data is limited to once per release number. A new release number unlocks the limit and will allow FMC data requests (one each) of the needed data.

If current release number data resend is desired, an FMC Data Link reset is required:

DSP/COMM Select

COMPANY Select

FREE TEXT Select

MISC RPT Select

Key words - FMC RESET Enter in text block

Note: Enter any characters in the box to the right of the MISC RPT prompt in order to display the send prompt.

SEND Select

Note: A successful reset will be identified by the following ACARS message: ****DATA LINK ADVISORY** FMC DATA LINK STATUS SUCCESSFULLY RESET.**

Note: After FMC RESET confirmation is received, requests for uplinks may be made via the prompts on the FMC for individual data (i.e. ROUTE REQUEST) or an ACARS INIT REQUEST may be sent if all preflight data is desired.

Note: The FMC RESET does not involve the dispatcher or the FMC itself but simply resets the FMC Data Link ground automation.

Note: The dispatcher has no role or input into any FMC Data Link functions. Contact the dispatcher only to report FMC Data Link failure.

Automatic Wind Updates

Automatic wind updating provides uplinks of new enroute and descent forecast wind data at new wind forecast release times.

Other Considerations

At or around new wind forecast times (0410Z, 1010Z, 1610Z and 2210Z), an FMC EICAS COMM alert with a Hi-Lo chime will accompany the WIND DATA UPLINK READY scratchpad message indicating arrival of the enroute winds uplink. Follow loading instructions described in the “Wind Data” section FMC Data Link and updating is complete.

Note: If less than 3 hours remain to ETA at the new forecast times, then only new descent forecast winds will be sent. If less than 30 minutes remain until ETA no new wind data will be sent. Wind updates which occur after the “OUT” event will not be sent to aircraft until 30 minutes after takeoff.

Note: The enroute winds update will contain data at all remaining wind fixes for FL240, FL300, FL340 and FL390. Temperature data sent is for the next higher pressure level above expected cruise altitudes at the wind fixes based on flight planning system predictions.

If automatic uplinks are not received within 15 minutes of new forecast times, a manual request may be made directly from the FMC (FMC Reset may be required). As with the current process, sending a request for either WIND or DESCENT FORECAST will deliver both uplinks.

Automatic Waypoint Position Reporting (WPR)

A WPR trigger uplink configures the FMS to automatically send position reports at designated waypoints. During preflight, ****DAL POSN**** waypoints are sent to the FMS in a WPR configuration uplink. The crew is not advised of this initial uplink; however, the FMS is ready to report those fixes.

If the auto-report does not send, the manual FMS company report prompt may be selected. This must be done immediately at waypoint sequencing to ensure proper data is sent. Selecting the SEND prompt past or prior to waypoint sequencing sends erroneous data and can disrupt flight following and ETAs. ACARS company position reports should be sent whenever WPR is not functional or if not in close proximity to the waypoint.

Due to FAA flight following requirements, it is important to comply with company position reporting. The dispatcher will send an ACARS request if position reports are not being received.

If WPR waypoints are deleted from the active route, the WPR function and all associated wind/temperature data will be lost. The wind/temperature data may be re-entered manually; however, WPR for those waypoints is lost unless until WPR Reset is sent.

ABEAM Points

When abeam points are selected as part of a “direct to” consider the following:

- If 65NM or less abeam an FPS waypoint, manual WPR may be sent. Select at or as close as possible to waypoint sequencing.
- If more than 65NM abeam an FPS waypoint, an ACARS company position report is required.

Note: When more than 65NM abeam, automatic or manual WPR will not update ground systems even though the aircraft will automatically send WPR up to 99NM abeam.

WPR Reset

The WPR Reset downlink triggers the uplink of a new WPR configuration containing company reporting points from the most recent flight plan release. A WPR Reset uplink is accompanied by the ACARS advisory WPR VERIFIED.

It is important that the Flight Planning System (FPS) route and the FMS route are the same. Track changes and reroutes may produce different ****DAL POSN**** waypoints in FPS. If necessary, confirm the dispatcher has updated FPS with the current ATC cleared routing before sending a WPR Reset.

WPR Reset Procedure

The WPR Reset procedure should be used for any of the following reasons:

- The FMC fails to indicate SENDING/REPORT SENT on the POSITION REPORT page after sequencing a ****DAL POSN**** waypoint
- If the NO COMPANY POSN REPORT RECEIVED ACARS advisory is received for more than one ****DAL POSN**** waypoint
- The dispatcher advises WPR is not working
- ****DAL POSN RPT**** fixes are replaced or changed due to reroute or track change

Prior to sending a WPR Reset, ensure the FMC route matches the current ATC clearance. Also, ensure the dispatcher has acknowledged that the Flight Planning System has been updated if required (e.g., track change).

COMM/FREE TEXT/MISC RPT Select

Enter Key Phrase WPR RESET

Note: Any 1 or 2 characters must be entered in the box to the right of MISC RPT to display the SEND prompt.

Send Prompt Select

When the configuration uplink is sent to the FMC, the WPR VERIFIED ACARS message will also be sent to confirm WPR has been enabled.

Note: Revert to manual ACARS reporting if the dispatcher advises that WPR is not working or the WPR VERIFIED message is not received after two attempts.

Turbulence/WX Reporting

Turbulence is not included in WPR downlinks. Delta Meteorology relies on turbulence reports to support the TP system and provide better turbulence avoidance information for future flights. Flight crews should proactively use the ACARS POSITION REPORT page to provide turbulence or other weather information when encountered or not encountered (i.e., smooth ride in a TP forecast area). Use closest charted fix or LAT/LON for proper location and successful updating of weather systems and the TP process.

Note: An ACARS Position Report fix specifically used to report Turb/Wx does not need to be a flight planned fix. Use “standard” LAT/LON format (i.e., N4030W05000, S10E175) or exact charted fix names to ensure receipt.

SATCOM

Pre-Programmed Dialed Calls

The SATCOM DIRECTORY contains pre-programmed facilities for the region selected and their associated phone numbers for one-touch dialing.

Manually Dialed Calls

7101 - 7110

Select SAT 1 or SAT 2 on audio control panel

Select SATCOM MAIN MENU

Enter desired phone number in the scratch pad using the following format:

Access code (00) - Country Code - City Code - Phone Number

Example: ATL RADIO is entered as "00 1 404 715 0160"

Line select manually entered phone number just below SAT 1 or SAT 2

Select PLACE CALL

Manually Dialed Calls

7001 - 7008

Select SAT 1 or SAT 2 on audio control panel

Select DIRECTORY

Select MANUAL CALL

Enter desired phone number in the scratch pad using the following format:

Access code (00) - Country Code - City Code - Phone Number

Example: ATL RADIO is entered as "00 1 404 715 0160"

Line select manually entered phone number from the scratch pad.

Select MAKE CALL

To Terminate Call

Select END CALL

Flights with Nontraditional Call Signs

Delta flights occasionally operate with an ATC-filed call sign that differs from the Delta flight number. This occurs on certain military charter flights (e.g. "Camber") and on stub flights. Refer to FOM chapter 5.2, Stub Flights.

Verify or enter the ATC-filed call sign in the FMS. This will assure ADS and transponder information are properly transmitted to ATC. The ACARS flight number will be populated with the ATC-filed number and must remain unchanged. ACARS messages will be received by Delta dispatchers automatically; however, an ACARS error message will be transmitted to the flight. This message can be ignored.

The flight plan will include the following dispatcher remarks for any flight operated with a call sign differing from the Delta flight number:

FLIGHT PLAN FILED AS CMBxxx

CMB CALL SIGN MUST BE ENTERED IN THE FMS AND USED
FOR ALL ATC COMMUNICATIONS

ENTER DELTA FLIGHT NUMBER IN ACARS FOR COMPANY
COMMUNICATIONS

Note: Ensure the non-Delta call sign is uplinked/entered in the FMS and ignore the flight plan note regarding ACARS flight number entry.

RNAV (RNP) Approach Recording Via ACARS

An important part of RNAV (RNP) certification is data collection. Upon completion of an RNAV (RNP) approach, send a free text ACARS message to address F - "CREW SKDS" with the following information:

- Airport, RNP approach conducted, and runway, e.g. KMDW RNP 22LY (spaces ok but not required).
- For data collection purposes, the free text report must include "RNP".
- SAT or UNSAT.
 - UNSAT indicates a failure of aircraft or procedure.
 - ATC clearance changes, traffic conflicts, or weather changes do not constitute an UNSAT.
 - If UNSAT, provide the reason (e.g., loss of GPS PRIMARY, excessive track deviation, GPWS warning, autopilot disconnect, navigation database error, etc.).
- Provide any other pertinent comments.
- Sample entries: KMDWRNP22LYSAT or
KDCARNAVRNP19UNSAT EXCESSIVE TRK DEV.

Note: Address "F" is listed in ACARS as "CREW SKDS"; however, it is used for data collection in this case.

Takeoff Data Uplink (TDU)

Takeoff Data Uplink (TDU) enables uplinking of WDR performance values directly to the FMC. This reduces manual key strokes and the likelihood of entry errors. When the WDR is sent, two FMC uplinks will follow:

- PERF INIT (with the ACTUAL ZFW)
- TAKEOFF DATA UPLINK (with performance data)

CAUTION: If differences exist between the PERF/TDU and the WDR, the WDR is the controlling document.

Uplink Logic for Runways:

Takeoff Data Uplinks contain data for:

- Any full length runways on the WDR.
- Only one Thrust/Flap per runway.
- Only the Primary Contaminant data will be uplinked.
- If ****RWY IS OVERWT FOR ALL THRUST/FLAPS****, scratchpad will display “INVALID TAKEOFF XXX”.

Note: Intersections and cutbacks (e.g. 27R-L2000CB) will not be uplinked and must be manually entered if used.

Uplink Logic for Thrust:

Thrust will be selected in the following priority:

- The second AT Thrust/Flap line (with or without TO1/TO2)
- If only one AT Thrust/Flap line exists, it will be uplinked
- FULL (TO)
- APU to Pack
- BUMP Thrust

Procedure

After the WDR is produced and sent for uplink, a Hi-Lo chime will sound, “● FMC” EICAS message will be displayed, and “PERF INIT UPLINK” message will appear in the scratchpad. The PERF INIT page will display the uplinked ZFW and the new GR WT in small font with the previous values (in large font) displaced to the right.

Note: If the PERF INIT or TDU fail to arrive, manual entry procedures should be used. An ACARS AWABS UPDATE request may be sent for desired takeoff position or to trigger new PERF INIT and TDU uplinks.

Note: Accepting a new PERF INIT uplink after accepting a TDU will cause that data to be deleted and the TAKEOFF SPEEDS DELETED message to display.

Note: The boxed WDR data below is uplinked to the PERF INIT and TAKEOFF REF pages for the selected runway. Due to message size, TDU may arrive before the WDR.

RMWT 619.0 ZFWT 401.8
TOWT 617.9 TOCG 28.4
FLAP/STAB 05 / FMS

WX 21705KT 10C A30.14

(Runway 9L Taxiway M2)

NRT 34L 13123FT 03TW 04XW
T/F CLIMB RATOW WIND V1 VR V2
D40/05 615.2 649.3 58 65 69
D39/05 620.2 630.4 57 64 68
D38/05 625.2 635.5 56 64 68
D20/05 707.7 627.8 61 61 68
W20/05 707.7 620.5 51 61 68

After selecting ACCEPT, small font numbers will become large font.

```

PERF INIT UPLINK
GR WT 619.0 / 619.9 CRZ ALT FL310
FUEL 217.2 LB CALC COST INDEX 69
ZFW 401.8 / 402.7 FUEL FRZ TEMP -40°C
RESERVES 18.0 CRZ CG 30.0%
---- PERF INIT DATA ----
<REJECT ACCEPT>
<INDEX THRUST LIM>
PERF INIT UPLINK
  
```

```

TAKEOFF REF UPLINK 1 / 2
FLAPS REF V1
5° 157 157
THRUST VR
39°C TO 164 164
CG V2
28% 168 168
RWY / POS GR WT TO GW
34L / +0FT 619.0 620.2
TAKEOFF DATA
<REJECT ACCEPT>
-----
<INDEX THRUST LIM>
TAKEOFF DATA UPLINK
  
```

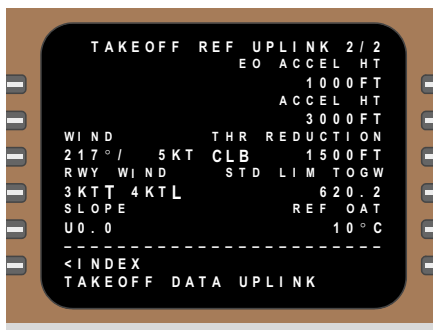

Takeoff Data Uplink

After the PERF INIT is accepted, a Hi-Lo chime will sound, an “FMC” EICAS message will be displayed, and “TAKEOFF DATA UPLINK” will appear in the scratchpad.

Review the data on TAKEOFF REF page 1 and accept. GR WT is the aircraft current weight and must be less than or equal to STD LIM GW at takeoff.

Note: If the active FMC RWY is not listed on the WDR, "INVALID TAKEOFF UPLINK" will be displayed in the scratchpad.

On TAKEOFF REF page 2, wind, wind components, and temperature are displayed. Altitudes for THR REDUCTION and ACCEL HT are uplinked when special takeoff profile values exist for any runway. Verify and manually correct these values as required. STD LIM TOGW is the lesser of RATOW or CLIMB limit weight.



On TAKEOFF REF pg 1 or 2, select ACCEPT. After accepting, small font values become large and toggling between pages will provide easy reference to all pertinent takeoff data.

Note: Slope value will always display U0.0 and is not an actual runway slope value or pertinent. On LR aircraft "/DRY" will display next to the slope value for dry WDR data and "/WET" will display for WDR primary contaminant data whether W, Q or H. No TDU will be sent for I (Icy).

Requesting new WDRs

If data is required for a runway not listed on the WDR, an ACARS AWABS Update should be sent to trigger new uplinks.

Runway Changes

If a different takeoff runway is required and listed on the current WDR, select the desired runway from the DEP/ARR page and clean up any DP route changes. TAKEOFF DATA for that runway will load automatically.

Note: Whenever the takeoff runway is changed, review the FMC departure procedure to ensure there are no discontinuities on the LEGs page. Complete the Departure Runway Change Checklist.

Note: Crews retain the option to REJECT uplinks and enter takeoff data manually. Once data has been uplinked and accepted, it is permissible to manually overwrite CG, V-speeds, THR REDUCTION or ACCEL HT. Other manual changes on TAKEOFF REF page 1 or 2 will delete previously accepted values and "TAKEOFF SPEEDS DELETED" message will display. Deleted data can be retrieved by reentering the runway.

Note: Do not depart with unresolved differences between Takeoff Data Uplinks and the WDR.

Wi-Fi

Wi-Fi Handset Procedures

The following procedure describes using voice over internet using either Wi-Fi handset. Using the handset for voice over internet is considered a backup if SATCOM is inoperative. Both the cabin and cockpit handsets are available for crew use above 10,000 feet. Similar to SATCOM, there is no satellite coverage near the poles so service interruptions can be expected when above 75° latitude.

For complete system description on Wi-Fi refer to Volume 2, chapter 5. The guarded INTERNET SWITCH above the cabin handset must be ON. Follow these steps on either handset:

1. Press and hold SND for 5 seconds to turn handset on
2. Enter D-A-L (325) to unlock handset
3. Press RCL to access handset menu
4. Use up/down keys to locate PAX WIFI NETWORK
5. Press SND
6. Select ATL RADIO
7. Press SND to initiate call
8. Press END to end call
9. Enter S-T-O (786) to relock handset

Note: The volume may be adjusted by selecting FCN 4, User Configuration, Earpiece Volume.

Note: Handset communication will have a significant delay, characteristic of geosynchronous satellites.

Wi-Fi System Deactivation (not associated with QRH procedure)

There are two types of system deactivation, complete deactivation and passenger deactivation. Complete deactivation disconnects the Wi-Fi system for all users. Passenger deactivation disconnects Wi-Fi for the passengers, but allows the crew to use voice over internet via handset.

Complete Wi-Fi Deactivation (passenger & both handsets):

1. Contact cabin crew
2. Instruct them to turn the INTERNET switch OFF

Passenger Wi-Fi Deactivation (passenger only):

Follow these steps on either handset:

1. Press FNC
2. Press 8
3. Use up/down keys to locate PAX WIFI NETWORK
4. Press SND
5. Use up/down keys to locate PAX WIFI OFF
6. Press SND

Electrical Power Down

The following procedure is accomplished to remove all electrical power from the airplane.

Before accomplishing the following steps, verify ADIRU, EMER LIGHTS, and PACK switches are off and HYD PRESS SYS L+C+R message is displayed.

APU selector and/or EXTERNAL POWER switch(es) OFF
BATTERY switch OFF

Electrical Power Up

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

- BATTERY switch..... ON
- C1 and C2 PRIMARY pump switches OFF
- DEMAND pump selectors OFF
- WIPER selectors OFF
- Landing gear lever..... DN
- ALTERNATE FLAPS selector OFF
- Electrical power Establish

BUS TIE switches – AUTO

If external power is desired:

PRIMARY EXTERNAL POWER AVAIL light – Illuminated

PRIMARY EXTERNAL POWER switch – Push

If the SECONDARY EXTERNAL POWER AVAIL light is illuminated:

SECONDARY EXTERNAL POWER switch – Push

If APU power is desired:

APU GENERATOR switch – ON

APU selector – START, then ON

Supplementary Procedures

Engines, APU

Chapter SP

Section 7

APU Cold Soaked Start Procedures

General

An APU cold soaked start procedure is commonly scheduled by MTC to maintain the ETOPS program. Also, certain MEL items require the same or similar procedure to operate a cold soaked APU. Notification for either requirement is noted on the flight plan. In all cases, a logbook entry is required to document the performance or start attempt(s).

Routine Start Attempt

When a scheduled routine ETOPS maintenance program start attempt is necessary, accomplish the procedures below. The requirement will be noted on the Dispatch release. The MEL ITEMS FOR SHIP NUMBER section will contain an item as follows: S49-00-00A COLD START RQRD-SEE AOM VOL1 SP.7.

MEL Required Start Attempt

When a cold soaked start verification is required by the MEL, an item will be listed in the MEL ITEMS FOR SHIP NUMBER section of the Dispatch Release stating APU SYSTEM - COLD SOAK NOT VERIFIED. Prior to dispatch, refer to the MDM and accomplish the appropriate (O) procedures.

Procedures

Attempt the APU start prior to the TOD between FL270 and FL410 after at least two hours at cruise altitude. If the APU fails to start on the first attempt, two subsequent start attempts may be attempted. The APU must maintain a stable operating speed for at least five minutes to be considered a successful APU in-flight start.

After attempting an APU cold soaked start procedure, record the following in the aircraft logbook:

- For successful start, enter “APU Start Successful”,
- For unsuccessful start, enter “APU Start Unsuccessful”,
- Length of time at cruise,
- Number of start attempts required,
- Static Air Temperature,
- Flight level, and
- Peak EGT during start.

APU Ground Pneumatic Start

- Duct pressure Observe
Observe duct pressure is a minimum of 15 PSI (less 1 PSI per 1000 feet of pressure altitude).
- Accomplish normal APU start.

Engine Battery Start

Accomplish the normal Exterior Inspection and the normal preflight procedures.

- BATTERY switch ON
- C1 and C2 PRIMARY pump switches OFF
- DEMAND pump selectors OFF
- WIPER selectors OFF
- Landing gear lever DN
- ALTERNATE FLAPS selector OFF
- STANDBY POWER switch
(overhead maintenance panel) Push to BAT, release to AUTO
- Center bleed ISOLATION switch OFF
- Ground pneumatic source (if available) Connect
- If the APU is required for pneumatic power:
- APU selector START, then ON
- Speedbrake lever Down
- Reverse thrust levers Down
- Thrust levers Closed
- Flap position indication and flap lever Agree
- Parking brake Set
- FUEL CONTROL switches CUTOFF
- Captain's audio control panel Set

Start the left engine using the normal Engine Start procedure. Bleed air is available only to the left engine.

Limit start attempts to one autostart or two manual start attempts.

After left engine is started:

Ground pneumatic source (if used) Disconnect

Center bleed ISOLATION switch AUTO

Complete the normal Preflight, Before Start, and Engine Start procedures.

Engine Crossbleed Start

The APU must be shutdown or the APU Bleed switch must be turned off.

Crossbleed start guidelines while attached to the tug:

- Crossbleed starts are not permitted during pushback or when an aircraft is under tow.
- Crossbleed starts are permitted when attached to a pushback tug provided the parking brake is set.

Verify the area behind the airplane is clear of equipment and personnel prior to increasing thrust on operating engine.

Thrust lever (operating engine) Advance

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Increase thrust until 5% N2 above idle (25 PSI minimum duct pressure).

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Increase thrust until 5% N3 above idle (25 PSI minimum duct pressure).

Accomplish normal engine start.

Engine Ground Pneumatic Start

Note: Inform ground personnel two air start carts are required.

Duct pressure Observe

[Observe duct pressure is a minimum of 25 PSI (less 1 PSI per 1000 feet of pressure altitude)].

Accomplish normal engine start one engine at a time.

Manual Engine Start - GE-90

7101 - 7110

Captain	First Officer
Announce start sequence.	Position AUTOSTART switch to OFF.
Call “START _____ ENGINE.”	Position _____ START selector to START.
Observe oil pressure increase.	
	Position _____ FUEL CONTROL switch to RUN at maximum motoring (maximum motoring occurs when N2 acceleration is less than approximately 1% in 5 seconds).
Observe initial EGT rise and EGT within limits.	
	When engine is stabilized at idle, push AUTOSTART switch ON, if AUTOSTART is available. If more than one engine is to be started manually, AUTOSTART switch may remain OFF between manual starts.

Monitor engine displays for start parameters listed below until engine is stabilized at idle:

- Oil pressure should rise before selecting RUN.
- EGT should rise within 20 seconds after selecting RUN.
- N1 rotation must be indicated by 50% N2.
- EGT must stay within limits.
- N2 should reach idle within two minutes after selecting RUN.

If both engines are to be started manually, the AUTOSTART switch may remain OFF between manual starts.

Repeat procedure to start remaining engine.

Manual Engine Start - RR-895

7001 – 7008

Captain	First Officer
Announce start sequence.	Position AUTOSTART switch to OFF.
Call “START _____ ENGINE.”	Position _____ START selector to START.
Observe oil pressure increase.	
	Position _____ FUEL CONTROL switch to RUN when: • EGT less than 100 degrees C, and • at maximum motoring speed, or N3 greater than 25%, whichever occurs first (maximum motoring occurs when N3 acceleration is less than 1% in approximately 5 seconds).
Observe initial EGT rise and EGT within limits.	
	When engine is stabilized at idle, push AUTOSTART switch ON, if AUTOSTART is available. If more than one engine is to be started manually, AUTOSTART switch may remain OFF between manual starts.

Monitor engine displays for start parameters listed below until engine is stabilized at idle:

- Oil pressure should rise before selecting RUN.
- EGT should rise within 30 seconds after selecting RUN.
- N1 rotation must be indicated by 45% N3.
- EGT must stay within limits.
- N3 should reach idle within two minutes after selecting RUN.

If both engines are to be started manually, the AUTOSTART switch may remain OFF between manual starts.

Repeat procedure to start remaining engine.

Manual Override Engine Start

Start the engine using normal engine start procedure, except direct the ground crew to:

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For GE90 engines:

- manually open the start valve after positioning START selector to START
- manually close the start valve at 62% N2.

7001 - 7008

For RR 895 engines:

- manually open the start valve after positioning START selector to START
- manually close the start valve at 50% N3.

Full Thrust Takeoff Documentation

When a full thrust takeoff has not been recorded within a sixty-day period, the MEL ITEMS FOR SHIP NUMBER section of the flight release will contain an "S" item as follows:

- S72-00-83F ACCOMPLISH FULL THRUST TAKEOFF

If the full thrust takeoff is successful, document it on the ACARS Flight Summary page by selecting the TO prompt. If the engine fails to attain takeoff thrust, make a log book entry and subsequent maintenance action is required.

Engine Condition Monitoring (ECM) Report Documentation

Accomplish an ECM report when directed by an MEL (O) Procedure or when the MEL ITEMS FOR SHIP NUMBER section of the flight release contains an “S” item as follows:

- S72-00-82E ACCOMPLISH ENGINE ECM REPORT

For flights between one and three hours, accomplish a single report during cruise. For flights greater than six hours, accomplish a report every three hours.

Procedure

Locate Engine Performance Report from the Engine Performance Log Book (green binder).

When the aircraft is stabilized in cruise:

Autothrottles Disengage

Allow engines to stabilize (3 to 5 minutes).

From the upper and lower EICAS display, record data onto the Engine Performance Report. Refer to TOPP 50-10-25 in the TDD section of the MDM.

Autothrottles Re-engage

Intentionally
Blank

Fire Warning System Test

FIRE/OVERHEAT TEST switch Push and hold

Verify the following:

- Fire bell rings intermittently
- APU fire handle – Illuminated
- FWD and AFT CARGO FIRE warning lights – Illuminated
- Master WARNING lights – Illuminated
- FIRE TEST IN PROGRESS EICAS message – Displayed
- FUEL CONTROL switches – Illuminated
- LEFT and RIGHT engine FIRE handles – Illuminated.

Note: The test is complete when the FIRE TEST PASS EICAS message is displayed.

FIRE/OVERHEAT TEST switch Release

Intentionally
Blank

Supplementary Procedures

Flight Instruments, Displays

Chapter SP

Section 10

QNH Altimetry Procedures in a QFE Environment

Arrival Procedures

- Use ACARS/ATIS to obtain the current METAR and QNH altimeter setting (i.e. Q1009).
- It is common to be descended to the TL; do not reset altimeters until ATC assigns an altitude below the TL.
- A QFE altimetry setting will be given when cleared **below** the TL; repeat the QFE setting to ATC, request QNH and set in the altimeters.
- Turn the MTRS switch off.
- When descended below the TL, use the ALT/HEIGHT CONVERSION chart on the STAR or approach plate to convert from QFE Meters (right column) to QNH Feet (left column). Cross out the center column to avoid confusion.

ALT/HEIGHT CONVERSION		
QNH		(QFE)
4570'	~~(3940' - 1200m)~~	
3920'	~~(3290' - 1000m)~~	
3590'	~~(2980' - 900m)~~	
2600'	~~(1970' - 600m)~~	

- Enter that altitude in the MCP Altitude Select window.

Note: Set or round to nearest 100' (i.e. in the above example 900m = 3600').

Note: When assigned an Arrival and/or Approach, verify that the FMC altitudes match the QNH altitudes published on the chart.

Departure Procedures

- Use ATIS or Ground Control for the QNH altimeter setting. The altimeters should read field elevation.
- Leave the MTRS switch off.

- Below the Transition Altitude/Height use the ALT/HEIGHT CONVERSION chart on the SID to convert assigned QFE metric altitudes to QNH altitudes in feet and enter that altitude in the MCP Altitude Selector window.
- When cleared to an altitude above the Transition Altitude/Height, set altimeters to QNE.

Note: When assigned a Departure procedure, verify that the FMC altitudes match the QNH altitudes published on the chart.

ADIRU Alignment/Position Update

If an ADIRU position update is desired during an automatic realignment (on ground only):

CDU – SET

When dash prompts appear on the SET INERTIAL POS line of the POS INIT page, enter the most accurate position.

If a manual ADIRU alignment is desired (on ground only):

ADIRU switch – OFF 30 seconds, then ON

Wait an additional 30 seconds.

CDU – SET

Enter the most accurate position in the boxes on the SET INERTIAL POS line of the POS INIT page.

Alignment requires from six to fifteen minutes depending on latitude (six minutes at the equator, ten minutes average).

Departure or Destination Airport Not in the FMC Navigation Database

When departing from or landing at an airport that is not in the FMC navigation database, the following items are affected:

- Cabin pressurization schedule
- Availability of departure, arrival, and approach procedures in the FMC
- Automatic tuning of VOR, DME, and ILS radios for departure, arrival, and approach procedures
- Format of altitudes and flight levels on the ND and CDU
- Barometric transition altitude alerts (amber display and box) on the PFD
- Landing altitude reference bar (white/amber bar) on the PFD altitude tape
- Landing altitude indication (amber crosshatched area) on the PFD altitude tape.

Use the following procedures when departing from or landing at an airport that is not in the FMC navigation database.

Departure Airport Not in the FMC Navigation Database

CDU Preflight Procedure - Captain and First Officer

RTE key Select

If ORIGIN contains an ICAO identifier:

The following steps clear the ORIGIN and erase the previous route.

INIT REF key Select

INDEX Select

IDENT Select

Inactive date range Select

ACTIVE date range Select

Transfers the inactive navigation database to the ACTIVE line
and removes the previously entered route.

Clear the NAV DATA OUT OF DATE scratchpad message.

Inactive date range Select

ACTIVE date range Select

Transfers the inactive navigation database to the ACTIVE line.

Verify that the ACTIVE date range is current.

RTE key Select

Leave ORIGIN blank.

DEST Enter

Route Enter

LEGS key Select

Enter the latitude and longitude of the departure airport as the first
waypoint on the route.

ACTIVATE and execute the route.

VNAV key Select

Shows the CLB page.

- TRANS ALT Enter
- NAV RAD key Select
- Departure navaid frequency and CRS (as needed) Enter
- LDG ALT selector Pull

Rotate to set the departure airport altitude manually. This reduces crew workload in the event of a return to the departure airport.

Do not accomplish the following checklist:

LANDING ALTITUDE

After engine start, override the LANDING ALTITUDE checklist.

Note: The LDG ALT flag is shown on the PFD.

Note: The landing altitude reference bar (white/amber bar) is not shown on the PFD altitude tape.

Note: The landing altitude indication (amber crosshatched area) is not shown on the PFD altitude tape.

When no longer needed, delete the departure navaid frequency and CRS.

Before Descent

- LDG ALT selector Push
- The FMC sets the destination altitude automatically.
- VNAV key Select
- NEXT PAGE key Select
- FORECAST Select
- Shows the DESCENT FORECAST page.
- TRANS LVL Enter
- Overwrites the manually entered departure airport transition altitude.

Destination Airport Not in the FMC Navigation Database

CDU Preflight Procedure - Captain and First Officer

The following steps can also be done in flight.

LEGS key Select

Enter the latitude and longitude of the destination airport as the final waypoint on the route.

Enter a speed/altitude constraint for the final waypoint. The speed constraint should be the planned approach speed and the altitude constraint should be the destination airport elevation.

ACTIVATE (if needed) and execute the route.

Before Descent

VNAV key Select

NEXT PAGE key Select

FORECAST Select

Shows the DESCENT FORECAST page.

TRANS LVL Enter

LDG ALT selector Pull

Rotate to set the destination airport altitude manually.

Do not accomplish the following checklist:

LANDING ALTITUDE

Override the LANDING ALTITUDE checklist.

Note: The LDG ALT flag is shown on the PFD.

Note: The landing altitude reference bar (white/amber bar) is not shown on the PFD altitude tape during approach.

Note: The landing altitude indication (amber crosshatched area) is not shown on the PFD latitude tape during landing.

Note: The ARRIVALS page is not available for the destination airport.

Before Approach

Refer to Approaches Not In the Database procedure, FCTM, chapter 5.

Double Derate Takeoff Procedure

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A double derate takeoff is permitted when authorized by the WDR.

CAUTION: Do not use double derated thrust when conditions exist that affect braking (e.g., slush, snow, ice on runway), or when windshear conditions exist.

Before start:

THRUST LIM page Select

TO 1 or TO 2 Select

Note: Selecting a double derate arms CLB and inhibits
APU-to-Pack Takeoff.

Assumed Temperature Enter

Thrust reference mode Check

Verify D-TO 1 or D-TO 2 displayed:

- at top of THRUST LIM page and
- at top of EICAS display in green.

CAUTION: With either TO 1 or TO 2 selected, the thrust setting parameters are a limitation for takeoff. Except in an emergency, the thrust levers should not be advanced further. A thrust increase following an engine failure could result in a loss of directional control.

Engine Out SIDs (FMS Programmed)

The DEPARTURES page displays an EO SID title line after all normal SIDs and is selectable via the Line Select Key. If an EO SID does not exist, NONE will be displayed. All EO SIDs contained in the FMC will have an associated Engine Out Delta Special Page procedure.

If an engine fails during takeoff, the FMC automatically selects the EO SID as a route modification. To fly the procedure, the route modification should be executed and LNAV engaged. If the EO SID route is not desired, it should be erased.

Preflight/Prior to Takeoff

Prior to departing from a runway with an FMC programmed EO SID, brief and review the EO SID procedure.

- After the route, runway and SID have been activated, display the DEPARTURES page.
- Select the EO SID and verify the waypoint sequence and altitude constraints.
- Compare the Engine Out Delta Special Page with the LEGS page and ND to ensure accurate coding of the procedure.

After Takeoff

If an engine failure occurs prior to flap retraction, the FMC automatically selects the EO SID as a route modification.

If EO SID is desired:

LEGS Key (if not already displayed) Push
Confirm desired EO SID is displayed. Engine out modification
will also be displayed in white on ND.

Verify/Select proper active waypoint, then:

EXEC Key Push
LNAV Select or Verify Engaged

If EO SID is not desired:

LEGS Key (if not already displayed) Push
ERASE [6L] Push

FMS Position Update

When the FMC message VERIFY POSITION is displayed, the FMC position may require updating.

POS REF page 2/3 Select

POS REF 2/3 is the second page of POS INIT 1/3.

Compare the FMS positions with the displayed GPS, RADIO, and INERTIAL positions.

Select the most appropriate source for FMC position updating.

UPDATE ARM key Select

The ARM prompt changes to ARMED and NOW prompts appear to the right of the remaining position sources.

Appropriate source UPDATE NOW key Push

FMS Manual Flight Plan Entry

IDENT page – Check

Verify aircraft model, engines, and navigation database information for currency and correctness.

Compare FF Factor on flight plan to FF at 5R. If values are not identical, update using the following steps:

- Type ARM in the scratchpad and line select to 5R.
- Type forward slash / followed by FF Factor value from FP in scratchpad and line select to 5R. Include negative sign if necessary.

Ex: Enter PLUS 2.7 as /2.7 and MINUS 3.5 as /-3.5

POS INIT line select key (6R) – Push

Verify time correct.

REF AIRPORT - Enter

Inertial position – Enter

Enter inertial position using the most accurate latitude and longitude (GPS position if available).

ROUTE line select key (6R) – Push

Enter:

- ORIGIN and DEST airports
- RUNWAY (if known)
- FLT NO (e.g., DAL31)
- SID (DEP ARR key)
- Route
- Arrival (DEP ARR key).

Verify route is correct

Activate

Execute

PERF INIT line select key (6R) – Push

Enter:

- ZFW (zero fuel weight) or GR WT (gross weight), as desired.
- RESERVES (FMS RESERVE FUEL on the flight plan).
- CRZ ALT (initial cruise altitude).
- COST INDEX (enter the initial cost index).
- Set STEP SIZE to 1000 or 2000 as appropriate for airspace.

TAKEOFF line select key (6R) – Push

Verify PRE-FLT is not displayed (unless a discontinuity is desired from the runway to the first waypoint).

When a Special Takeoff (Close-In/ICAO NADP 1) climb profile is planned, select **TAKEOFF REF** Page 2 and enter “1500” on the **THR REDUCTION** prompt and “3000” on the **ACCEL HT** prompt.

VNAV key – Push

Verify correct:

- CRZ ALT (initial cruise altitude).
- SPD TRANS (transition speed/altitude).
- TRANS ALT (transition altitude).

Enter

- SPD RESTR (speed restriction, if applicable for departure).

Execute

LEGS Key - Push

If required, enter step climb information from flight plan and execute. This overrides PERF page step climb information.

Enter altitudes and winds for applicable waypoints along route of flight. Entering higher and lower altitudes and forecast winds for these waypoints allows for optimum FMC altitude data.

For these waypoints, enter planned altitude and temperature from the flight plan.

Waypoint Winds

RTE LEGS page Select

RTE DATA page Select

WINDS page Select

 To load additional winds, select the associated right line select key
 for desired WPT.

Altitude, OAT, Direction, Speed Enter

EXEC key Push

To load winds for subsequent waypoints, select the NEXT PAGE key
after each entry.

To enter descent forecast winds, access the DESCENT page by selecting
VNAV, PREV PAGE, FORECAST.

FMS Waypoint Loading Procedure

FMC LEGS/ROUTE PAGES:

Unnamed waypoints are to be loaded via FMS LAT/LON format.ex. N4300.0/E17000.0 can be loaded as either N43E170, N4300E17000 or N4300.0E17000.0.

Regardless of how they are entered, waypoints entered as latitude and longitude will display in a seven character format on the RTE and LEGS pages. To verify full LAT/LON coordinates have been entered properly, line select the entry from the LEGS/RTE page into the scratchpad and check the full LAT/LON coordinates match the coordinates on the flight plan. Utilizing this format allows for proper ADS position reporting.

ACARS (Company position Reports):

ACARS position reporting of unnamed waypoints should be entered in the 47N170E format in order to be accepted by the Delta “Flight Following” Computer.

FMC FIX PAGE:

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Valid entries are waypoints from the navigation database. LAT/LON waypoints must be loaded using the ARINC 424 format shown on the flight plan (e.g. 43E70).

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Valid entries are FMS LAT/LON format (e.g. N43E170 or N4300.0E17000.0), or waypoints from the navigation database (e.g. 43E70).

Navaid Inhibit

Note: GPS position updates should be used during all approaches in which the FMC database and approach procedures are referenced to the WGS-84 reference datum. GPS updates should be inhibited for other approach operations not based on WGS-84 unless other appropriate procedures are used. GPS position updates should be used for all other operations unless a specific state requires the use of other update provisions within their airspace (eg, to accommodate a non-WGS reference datum or other reason).

To inhibit GPS:

- POS REF page 3/3 Select
POS REF 3/3 is the third page of POS INIT 1/3.
- GPS NAV key Push
Verify OFF displays in large font.

To inhibit VORs, VOR/DMEs, VORTACs, or DMEs:

- INIT REF key Push
- INDEX key Push
- NAV DATA key Push

To enable/disable radio updating:

- RAD NAV INHIBIT key Push
First “push” enables all radio updating. Verify OFF.
Second “push” inhibits VOR/DME updating. Verify VOR.
DME/DME updating is operable.
Subsequent “push” inhibits all radio updating; ON displays.

Note: The default state of RAD NAV INHIBIT is ON; all radio updating is inhibited. “ON” displays.

Navigation Accuracy Check

The following check must be performed prior to entering Class II airspace.
On the ND, ensure the ANP is less than the RNP.

Flight plan Annotate

Place check in flight plan block indicating the navigation accuracy
check has been completed.

Note: A “NAV UNABLE RNP” EICAS message will not be
displayed if ANP is less than RNP.

RNAV Departure/Arrival Procedures

Note: Notify ATC of any degradation of performance or inability of the FMS to provide accurate navigation and request amended clearance.

During Preflight

Ensure the waypoints, speed, and altitude constraints of the RNAV SID selected from the database match those depicted on the published Jeppesen procedure for the departure runway.

Before Takeoff

Verify the selected runway position in the FMS match the latest ATC departure clearance.

During/After Takeoff

Pay close attention to takeoff clearance. “Delta 123, cleared for takeoff” is the standard clearance issued to fly the RNAV SID as published.

Use of the autopilot is strongly encouraged. Optimum course adherence is ensured if the autopilot is engaged at approximately 1,000 ft. AFE.

Whenever a significant course change is depicted, expect the FMC to use turn anticipation for fly-by waypoints (waypoints depicted on Jeppesen charts without a circle around them).

RNAV SID/STAR design is based on path-keeping accuracy within 0.5 nm. Pilots may use the base of the airplane symbol on 10 nm scope (the base of the airplane symbol represents approximately 1 nm on the 10 nm scope) or the appropriate progress page in the FMS to monitor path-keeping accuracy.

Arrival

Some RNAV STARs are runway specific. Ensure the waypoints, speed, and altitude constraints of the RNAV STAR selected from the database match those depicted on the published Jeppesen procedure for your arrival runway.

Note: There is no requirement to enter a specific RNP value or to monitor raw data.

RNP Manual Entry

The FMC automatically supplies default RNP values based on phase of flight. When the airplane is on a procedure or airway that has an RNP requirement, and does not have an RNP value stored in the navigation database, a manual RNP entry may be made.

RNP PROGRESS page 4 Select

If the current RNP or Approach RNP are different than desired:

Desired RNP Enter (2L)

When the manually entered RNP is no longer required:

RNP PROGRESS page 4/4 Select

RNP Delete (2L)

Runway Change Procedures

Departure Runway Change

- Note:** Refer to Airway Manual Delta Special Pages for specific runway considerations.

Two crew members must refer to the final AWABS/WDR to verify the takeoff performance and configuration data.

FMC info Entered

DEP ARR key – Push

Select new runway and departure procedure.

INIT REF key – Push

TAKEOFF – Select

Selection displays TAKEOFF REF page 1/2.

Enter FLAPS setting.

Enter THRUST setting

- Full thrust
- Assumed Temperature derate.

Check TRIM setting.

Check RUNWAY/POSITION (if intersection takeoff)

Check V1, VR, V2 speeds.

NEXT PAGE key – Push

Displays TAKEOFF REF page 2/2.

Verify the following items:

- ENGINE OUT ACCELERATION HEIGHT
- ACCELERATION HEIGHT
- THRUST REDUCTION point.

ROUTE key – Push

Check for route discontinuity.

Runway position , ____

Verify and verbalize:

- the uplinked (or inserted) runway/intersection displayed in the MCDU, and
- the actual runway takeoff position observed.

Flaps , ____

Confirm and verbalize:

- the uplinked (or inserted) flap position displayed in the MCDU, and
- indicated flap position.

Trim Units, zero, zero

Stabilizer trim – ____ UNITS

Set the trim for takeoff.

Verify that the trim is in the greenband.

Aileron trim – 0 units

Rudder trim – 0 units

Mode Control Panel Set

IAS/MACH selector – Set V2

Arm LNAV as required.

Verify VNAV is armed.

Initial heading or track – Set

Initial altitude – Set

Departure briefing Complete

Review any changes to original departure briefing to include Delta Special Pages, threats, etc.

Captain calls “DEPARTURE RUNWAY CHANGE CHECKLIST.”

First Officer accomplishes the DEPARTURE RUNWAY CHANGE checklist.

Approach Runway Change

Radio/baro minimums ____, xckd

Approach briefing Complete

Update the approach briefing as required.

PFD/ND Set

Verify correct approach procedures are selected. Update changes to the arrival and approach procedures as required. Update changes to the RNP as required.

Captain calls “APPROACH RUNWAY CHANGE CHECKLIST.”

First Officer accomplishes the Approach Runway Change checklist.

Runway Dependant (R/D) STAR Programming

Runway Dependant STARs are procedures that require pilots to select a specific runway in order for the FMC to properly load the entire STAR.

When programming an R/D STAR, it is important to verify that the waypoints and any associated altitude and airspeed restrictions match the charted procedure prior to selecting the EXECUTE key. Ensure FMC programming will comply with ATC clearance.

- DEP/ARR page Select
- Arrival Select
- Transition (if required) Select
- Approach Select
- Approach Transition (if required) Select
- LEGS page Select
 - Clean up any route discontinuities to the clearance limit
- Waypoint sequence, altitudes, and airspeeds Check
 - Modify as necessary to agree with clearance
- EXEC key Push

Takeoff Bump Thrust Procedure

7101 - 7110

Takeoff bump thrust is permitted when authorized by the WDR.

Before start:

THRUST LIM page Select

TO B (Takeoff Bump) Select

Note: Selecting TO B selects additional takeoff thrust, arms CLB,
and inhibits the Assumed Temperature derate.

Thrust reference mode Check

Verify TO B displayed:

- at top of THRUST LIM page and
- at top of EICAS display in green.

If APU-to-Pack Takeoff is accomplished concurrently with
Takeoff Bump (typical):

Verify A-TO B displayed:

- at top of THRUST LIM page and
- at top of EICAS display in green.

MultiScan Weather Radar

Test

TEST switch Push

Tests weather radar system operation without transmitting. It displays test pattern and PWS symbol at the end of the test and any fault message on ND with WXR selected (except in PLAN, CTR VOR, and CTR APP modes)

The test pattern and PWS symbol remain displayed until WXR is selected off on the EFIS control panel, another mode is selected on the Mode Selector, or an actual PWS alert is detected. The source of any faults displays in the weather radar tilt field on the ND.

When on the ground, selecting WXR on the EFIS control panel and TEST on the weather radar control panel activates a 12 second test. To activate the aural messages, TEST must be selected after WXR is selected on the EFIS control panel. Initially, the amber WINDSHEAR annunciation displays and the aural MONITOR RADAR DISPLAY sounds. Next, Master Warning Light illuminates and the EICAS alert message WINDSHEAR SYS displays. Finally, the red WINDSHEAR annunciation displays and the aural GO AROUND WINDSHEAR AHEAD, and then WINDSHEAR AHEAD, WINDSHEAR AHEAD sounds

Automatic Mode (Recommended)

The Automatic mode is the standard mode of operation for this radar. The automatic antenna tilt and gain, Ground Clutter Suppression (GCS), Path Attenuation Compensation (PAC) and OverFlight protection features are enabled in this mode.

If automatic operation fails, no radar returns will be displayed and a “NO AUTOTILT” annunciation will appear on the navigation display. Select the Manual mode when the NO AUTOTILT alert is annunciated.

Note: When using AUTO, ensure the GAIN control knob is in the “calibrated” position. The calibrated position is achieved by aligning the word “GAIN” horizontally with the arrow at the 12 o’clock position pointing down.

Manual Mode

In the Manual mode, the radar can be operated in the same manner as the previous radar system. However, the features provided in the Automatic mode have proven to be far superior in conveying comprehensive weather information with greater accuracy.

Note: Ground Clutter Suppression (GCS), Path Attenuation Compensation (PAC) Alerting, and Over-Flight Protection are not active when the manual mode is selected.

Fuel Balancing

If fuel leak is suspected accomplish the FUEL LEAK non-normal checklist.

If fuel balancing is desired prior to display of the FUEL IMBALANCE alert message, accomplish the FUEL IMBALANCE non-normal checklist.

Fuel Freeze Program (Polar Operations)

During the winter months, certain B-777 operations will encounter extremely cold weather, which can affect enroute fuel temperatures. This program mitigates fuel freeze issues and is planned for all polar and non-polar Asian departures to and from ATL, DTW, MSP, and JFK. The Fuel Freeze Program will commence annually on November 1 and will remain in effect until April 30.

Preflight

These procedures are applicable to all polar and non-polar flights between Asia and the United States.

Continue to use the FMC default value of -40°C as the fuel freeze point for Jet A fuel. The fuel synoptic display will show a value of -37°C (3 degrees warmer than the FMC value).

The Minimum Predicted Fuel Temperature and its associated ETE can be found in the Dispatcher's remarks section. These values are informational only and should not be used for FMC entry. In addition, the Actual Fuel Freeze Temperature will be communicated to the flight crew for all polar flights and any other flight route affected by enroute fuel temperatures colder than -37° C.

After Departure

Westbound Polar Flights

Within two hours after departure, westbound crews should expect an ACARS message from the dispatcher with the Actual Fuel Freeze Temperature. If notification is not received within two hours, query the dispatcher. If there was sufficient ground time, the Dispatcher may include the actual fuel freeze value on the flight plan.

All Flights

Enter the Actual Fuel Freeze Temperature on the PERF INIT page at R3. The fuel synoptic will display 3°C warmer than the value loaded in the FMC.

If at any time the fuel temperature is in question, contact the Dispatcher for assistance in coordinating a plan of action with ATC.

Supplementary Procedures

Adverse Weather

Chapter SP

Section 16

Introduction

Airplane operation in adverse weather conditions may require additional considerations due to the effects of extreme temperatures, precipitation, turbulence, and windshear. Procedures in this section supplement normal procedures and should be observed when applicable.

Fuel Freeze Program

Refer to SP.12, Fuel Freeze Program, for procedures that are applicable to all polar and non-polar flights between Asia and the United States, annually from November 1 until April 30.

Cold Weather Operation

Considerations associated with cold weather operation are primarily concerned with low temperatures and with ice, snow, slush, and standing water on the airplane, ramps, taxiways, and runways.

Icing conditions exist when OAT (on the ground) or TAT (in flight) is 10°C or below and any of the following exist: [AFM]

- visible moisture (clouds, fog with visibility of one statute mile (1600m) or less, rain, snow, sleet, ice crystals, etc.) is present; or
- ice, snow, slush or standing water is present on the ramps, taxiways, or runways.

CAUTION: Do not use engine anti-ice when OAT (on the ground) is above 10°C. Do not use engine or wing anti-ice when TAT (in-flight) is above 10°C.

Preflight Procedure

Although removal of surface snow, ice or frost is normally an ACS function, the flight crew should carefully inspect areas where surface snow, ice or frost could change or affect normal system operations.

Exterior Inspection

Do the normal Exterior Inspection with the following additional steps:

Surfaces Check

Ensure all leading edge devices, all control surfaces, and the upper wing, are free of snow, ice, and frost. The upper wing surfaces should be confirmed free of frozen contamination by inspection from the best vantage points.

Note: After inspection, monitor environmental conditions and ensure control surfaces remain free of contamination.

Note: Takeoff with light coatings of frost, up to 1/8 inch (3mm) in thickness on lower wing surfaces due to cold fuel is allowable.

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.

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

Check all probes, sensors, ports, vents, and drains are free of ice and snow. Water rundown after snow removal may refreeze 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 themselves are clear.

Pack inlets and outlets Check

Verify the air inlets and outlets, including the outflow valve, are free of snow and ice.

Engine inlets Check

Verify the inlet cowling is free of snow and ice.

Landing gear Check

Gear strut, actuators, doors, tires, brakes, and wheels should be free of snow or ice.

APU air inlet Check

The APU inlet door must be free of snow or ice prior to APU start.

Engine Start Procedure

Do the normal Engine Start procedure with the following modifications:

- Oil pressure may be slow to rise
- Initial oil pressure rise may be higher than normal
- Additional warm-up time may be needed to allow oil temperature to reach the normal range
- Display units may require additional warm-up time before displayed engine indications accurately show changing values.
- Display units may appear less bright than normal.

7101-7110

- If the engine has been cold soaked for more than four hours at ambient temperatures below -40°C , do not start or motor the engine. Maintenance personnel should do appropriate procedures for adverse weather heating of the fuel system components.

Engine Anti-ice Operation - On the Ground

Engine anti-ice must be selected ON immediately after engine start and remain on during all ground operations when icing conditions exist or are anticipated, except when the temperature is below -40°C OAT. [AFM]

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. [AFM]

CAUTION: Do not use engine anti-ice when OAT is above 10°C . [AFM]

When engine anti-ice is needed:

ENGINE ANTI-ICE selector(s) ON

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE selector(s) AUTO

Taxi Procedure

Do the normal Taxi procedure with the following modifications:

CAUTION: Avoid taxiing in deep snow or slush since steering will be more difficult. Brakes, landing gear and flaps may also freeze after takeoff if contaminated with snow or slush.

CAUTION: Taxi at a reduced speed. Use smaller tiller and rudder inputs, and apply minimum thrust smoothly. Differential thrust may be used to help maintain airplane momentum during turns. At all other times, apply thrust evenly. Taxiing on slippery taxiways or runways at excessive speed or with high crosswinds may start a skid.

CAUTION: When operating the engines over significant amounts of standing deicing or anti-icing fluid, limit thrust to the minimum required. Excessive ingestion of deicing 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: [AFM]

- Check that the area behind the airplane is clear.
 - Run the engines up to a minimum of 50% N1 for approximately 1 second duration at intervals no greater than 60 minutes.
- [AFM]

Taxi-Out in Freezing Fog Procedure

7001 - 7008

This procedure is applicable whenever freezing fog with visibility 300 meters/1,000 feet or less and OAT less than 0°C) is reported. This procedure does not apply to operations in snow, hail, sleet, freezing rain, or freezing drizzle. [AFM]

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

- the engine was manually deiced,

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

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

If takeoff can be achieved within 45 minutes total time, takeoff must be preceded by a static run-up to a minimum of 50% N1 and stable engine operation checked prior to start of the takeoff roll (Engine Anti-Ice Use Supplementary Procedure). The core ice shed procedure is not required.

If the previous flight taxi in time cannot be determined, accomplish the core ice shed procedure as soon as possible on taxi out when clear of the ramp area and conditions permit.

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

- If OAT is 0°C to -6°C, run-up the engines to 50% N1 for 60 seconds every 45 minutes.
- If OAT is -7°C to -13°C, run-up the engines to 59% N1 for 60 seconds every 45 minutes.
- If OAT is colder than -13°C, there is no effective run-up procedure and manual deicing is required.

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

Take off is not permitted if total taxi time in freezing fog exceeds 60 minutes without having accomplished the above core ice shed procedure. The engine core must be manually deiced. [AFM]

Before Takeoff Procedure

Refer to the Takeoff Runway Contaminant Decision Tree in this section. For performance corrections, refer to the WDR.

Takeoff Procedure

Refer to the Takeoff Runway Contaminant Decision Tree in this section, if applicable.

Do the normal Takeoff Procedure with the following modifications:

When engine anti-ice is required and the OAT is 3°C or below, the takeoff must be preceded by a standing takeoff.

A standing takeoff is accomplished by holding the brakes while in position on the assigned runway until the engines are:

7001 - 7008

stabilized at or above 50% N1 before the start of the takeoff roll.

7101 - 7110

run-up to as high a thrust setting as practical (minimum of 50% N1), confirm stable engine operation, and if vibration indications are available, ensure engine vibration indications are below 4 units before the start of the takeoff roll.

7101 - 7110

Note: Operation in icing conditions may result in engine vibration indications above the normal operating range during ice shedding.

Rejected Takeoff

When aborting a takeoff on a slippery runway, extend spoilers if not deployed and use maximum allowable symmetrical reverse thrust. If a side slip develops, correct back to centerline by reducing reverse thrust to reverse idle and releasing brakes. This allows the tire cornering forces to be used for realignment to runway centerline. Use rudder, steering and differential braking, as required, to prevent over correcting past the centerline. When reestablished on centerline, apply maximum braking and reverse thrust to stop the aircraft.

Climb, Cruise, and Descent Procedures

Engine Anti-Ice Operation – In Flight

Engine anti-ice must be AUTO or ON during flight when icing conditions exist or are anticipated, except when the temperature is below -40°C OAT. [AFM]

Manual Use of Engine Anti-ice

When using the engine anti-ice system manually in areas of possible icing, activate engine anti-ice before entering icing conditions.

WARNING: If using the engine anti-ice system manually, do not rely on airframe visual icing cues before activating engine anti-ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.

CAUTION: Do not use engine anti-ice when TAT is above 10°C.

When manual use of engine anti-ice is needed:

ENGINE ANTI-ICE selectors ON

When manual use of engine anti-ice is no longer needed:

ENGINE ANTI-ICE selectors AUTO

Fan Ice Removal

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

7101 - 7110

During flight in moderate to severe icing conditions for prolonged periods with N1 settings at or below 70%, or when fan icing is suspected due to high engine vibration, the fan blades must be cleared of any ice. Do the following procedure every 15 minutes on both engines, one engine at a time: reduce thrust toward idle then increase to a minimum of 70% N1 for 10 to 30 seconds.

Note: Operation in icing conditions may result in displayed vibration levels up to and exceeding the normal operating range.
Extended operation at high vibration levels in icing conditions will not result in engine damage.

7001 - 7008

During flight in moderate to severe icing conditions for prolonged periods, if fan icing is suspected due to high engine vibration, the fan blades must be cleared of any ice. Do the following procedure on both engines, one engine at a time: quickly reduce thrust to idle for 5 seconds then restore the required thrust. If vibration persists, advance thrust lever to 90% N1 momentarily.

Wing Anti-Ice Operation – In Flight

Ice accumulation on the flight deck window frames, windshield center post, side windows, or windshield wiper arm may be used as an indication of structural icing conditions and the need to turn on wing anti-ice.

CAUTION: Do not use wing anti-ice when TAT is above 10°C.

When manual use of wing anti-ice is needed:

WING ANTI-ICE selector ON

When manual use of wing anti-ice is no longer needed:

WING ANTI-ICE selector AUTO

Cruise Procedure

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.

To ensure adequate obstacle clearance in conditions of extreme cold weather (-10°C or lower, or as specified in the Delta Special Page), refer to Airway Manual, Weather, Altimeter Corrections.

Approach and Landing Procedures

Refer to the Guidelines for Contaminated Runways procedure in this section, if applicable.

After Landing Procedure

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 landing on a runway contaminated with ice, snow, or slush:

Do not retract the flaps until the flap areas have been checked to be free of contaminants.

Refer to Taxi procedure in this section for engine anti-ice, engine run up, and taxi guidance.

Secure Procedure

Do the normal Secure procedure with the following modifications whenever the temperature falls below 0°C (32°F) or the aircraft may be de/anti-iced during overnight parking:

Parking brake As required

 If the ramp is contaminated with ice or snow, parking brake should remain set.

OUTFLOW VALVE switches MAN

OUTFLOW VALVE MANUAL switches CLOSE

The above procedure positions the outflow valve fully closed to inhibit intake of snow, ice, or deicing fluid.

Note: Additional cold weather securing procedures are required to be accomplished by maintenance and/or ACS personnel. Stations have the responsibility for draining the water system.

Guidelines for Takeoff on Contaminated Runways or Landing with Braking Action Less than Good

When there is contamination on the runway or the braking action is less than good, captains must evaluate crew, aircraft, and environmental conditions in determining the safety of operating their flight.

Procedure Guidance

General

- Consider crew capability.
- Consider current Maintenance Carry Overs (MCOs) - reversers, antiskid, etc.
- Consider type and amount of contaminant.
- Consider source and age of reported braking action.
- Consider usable runways and taxiways (NOTAMS, ATIS, etc.).

Taxi

- Be aware that ramps and taxiways may be very slippery.
- Be cautious of jet blast effect on ground personnel and equipment.
- Taxi onto and off runways at an extremely slow speed. Nose wheel slippage may occur causing the aircraft to continue straight ahead and possibly off the paved surface.

Crosswind Guidance

- On slippery runways, crosswind guidelines are a function of runway surface condition, airplane loading, and proper pilot technique.
- The following crosswind guidelines are applicable for takeoff and landing:

Braking Action	Runway Condition	ICAO	MU	RCR	Takeoff Crosswind Component	Landing Crosswind Component ***	Tailwind *
--	Dry	6	≥40	≥19	40	40	10 (15)
Good	Damp Frost (<1/8")	5					
Good/ Medium	Wet	4	39-36	--	Refer to Takeoff Crosswind Chart on the following page	35	0
Medium (Fair)	Dry Snow**	3	35-30	13-18			
Medium / Poor	Wet Snow / Standing Water / Slush	2	29-26	--		20	
Poor	Ice - No Melting**	1	25-21	6-12		17	
Nil	Do Not Operate						

* Recommend rolling takeoff above 20 knots crosswind or 10 knots tailwind (15 knots where approved).

** Takeoff 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 31 knots. This recommendation ensures adequate ground clearance and is based on maintaining adequate control margin.

Takeoff Crosswind Chart

TO Weight 1,000 lbs	Runway Condition	Center of Gravity (% MAC)		
		30% or less	35%	39%
		Crosswind Component (knots)		
≥ 550 lbs	Dry	40	40	40
	Wet	40	40	34
	Slush/Standing Water	35	31	27
	Snow - No Melting	35	29	24
	Ice - No Melting	15	15	15
< 550 lbs & > 390 lbs	Dry	40	40	33
	Wet	40	34	29
	Slush/Standing Water	31	27	23
	Snow - No Melting	30	25	21
	Ice - No Melting	15	15	15
≤ 390 lbs	Dry	40	33	28
	Wet	35	29	24
	Slush/Standing Water	28	24	20
	Snow - No Melting	27	22	19
	Ice - No Melting	15	15	15
Interpolation is permitted for intermediate gross weights and CG positions.				

Note: Crosswind guidelines are not considered limitations. Refer to the Limitations chapter for crosswind limits.

Note: Reduce crosswind guidelines by 5 knots on wet or contaminated runways whenever asymmetric reverse thrust is used.

Note: When multiple reports are present, e.g. “Braking Action Fair to Good”, use the lower crosswind value.

Takeoff

- Refer to the Takeoff Runway Contaminant Decision Tree, this section.
- Do not take off with braking action report of NIL by any air carrier aircraft or airport operator.
- A rolling takeoff is strongly advised when the crosswind exceeds 20 knots.
- Do not take off with standing water, slush, or wet snow in excess of 1/2 inch (1.2 cm) depth.
- Do not take off in dry snow in excess of four inches (10 cm) depth.

AWABS Determinations

Airport Customer Service (ACS) maintains a template in AWABS which describes conditions on each runway. ACS will enter the runway contaminant type and depth when more than 25% of the runway is affected. AWABS interprets this information according to rules established by Flight Operations to automatically select the contaminant type.

Note: For the A319, A320, A321, B717, B737NG, B757-300, B767-400, A330 and B777-200LR, W (WET) is automatically selected by AWABS when the runway is reported wet. For other aircraft types, the Captain must notify the gate agent or Operations if he wants Load Control Center (LCC) to load plan for W (WET) numbers.

AWABS limits the takeoff weight, as appropriate, based upon the selected contaminant type.

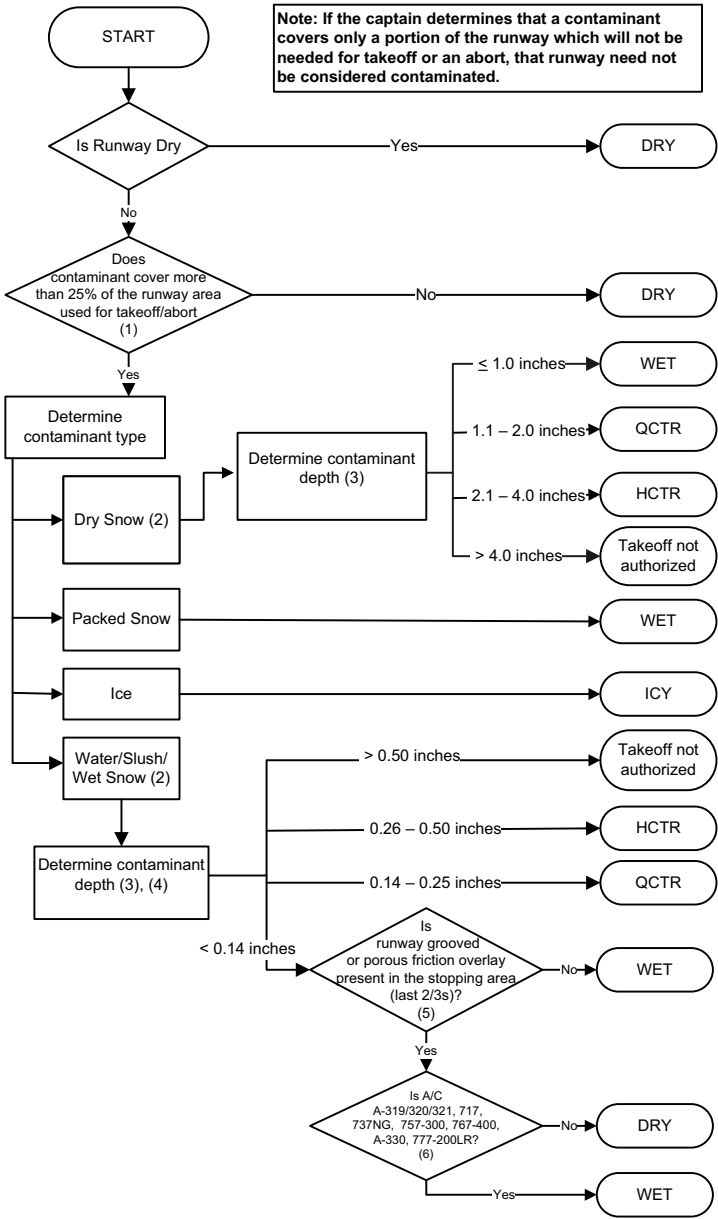
If the Captain determines that a contaminant covers only a portion of the runway which will not be needed for takeoff or an abort, that runway need not be considered contaminated. The Captain's determination affects his flight only and should be communicated to the dispatcher so AWABS can be updated appropriately, via LCC.

Category Definitions

- **DRY** - A runway is dry, or can be considered dry, based upon the considerations discussed in the Takeoff Runway Contaminant Decision Tree.
- **Slippery** - Under slippery conditions it is assumed that only the aircraft's braking capability is degraded; the aircraft's ability to accelerate is assumed to be unaffected.
 - **W (WET)** - A runway which is wet and on which the Captain considers the aircraft's braking capability to be degraded, or a runway covered with packed snow.
 - **I (ICY)** - A runway whose surface is covered by ice.
- **Cluttered** - Under cluttered conditions it is assumed that there is sufficient depth of contaminant that both the aircraft's acceleration and braking capability are degraded.
 - **QCTR (1/4 inch clutter)** - A runway whose surface is covered by an equivalent standing water depth of between .14 and .25 inches.
 - **HCTR (1/2 inch clutter)** - A runway whose surface is covered by an equivalent standing water depth of between .26 and .50 inches. Refer to the Takeoff Runway Contaminant Decision Tree, this section, for dry snow equivalent depths.

Takeoff Runway Contaminant Decision Tree

Use the following decision tree to determine runway condition for takeoff.



Takeoff Runway Contaminant Decision Tree Notes		
1	If the Captain determines that a contaminant covers only a portion of the runway which will not be needed for takeoff or an abort, that runway need not be considered contaminated. Note: There are circumstances that permit the Airport Authority to clear only the center 100 feet of the runway. In those circumstances, only the contaminant coverage within the cleared area is used to establish the percentage coverage.	
2	Snow	AWABS determines if snow is dry or wet on the basis of temperature. Snow is considered: • Wet when the temperature is 30 deg F or above • Dry when the temperature is below 30 deg F Note: A good operational test is: If a well compacted snowball can be made, the snow is wet; if the snowball falls apart, then the snow is dry.
3	A runway can be covered at varying depths over its length/width. When contaminant depths vary along the runway, a weighted average may be required. The contaminant depth along the runway where the aircraft will be at higher speeds should be weighed more heavily than at other points.	
4	A weighted average depth: • Less than or equal to 1/4 inch equates to QCTR, • Over 1/4 inch and up to 1/2 inch equates to HCTR Note: When the average depth exceeds 1/2 inch, takeoff will not be attempted.	
5	Grooved runways and runways with special porous overlays are designed to drain water from the runway surface in order to reduce the possibility of hydroplaning and increase the effective friction coefficient. Properly maintained runways with grooves or porous pavement have been shown to provide braking action approximately equivalent to a dry runway.	
6	A319, A320, A321, B717, B737NG, B757-300, B767-400, A330 and B777-200LR aircraft cannot consider a wet runway dry even if it is grooved or has a porous friction course overlay.	

Contaminant Millimeters to Inches Conversion

Use the following table for foreign stations that report runway clutter depth in millimeters (mm).

mm	0	6.35	12.7	25.4	50.8	101.6	152.4
Inches	0	1/4	1/2	1	2	4	6

Landing

- If FCTM, Quick Reference Landing Length chart does not apply, determine braking action. If braking action is less than good, accomplish an ACARS Landing Performance Request or refer to the ODM, Quick Reference Tab, Operational Landing Distance table.
- Do not land with a braking action report of NIL by any air carrier aircraft or airport operator in the landing or rollout portion of the runway.
- Do not land with standing water, slush, or wet snow in excess of one inch (2.5 cm) depth.
- Do not land in dry snow in excess of four inches (10 cm) depth.
- Consider using autobrakes for maximum stopping effectiveness.
- Land as early in the touchdown zone as possible.
- Do not assume the last 2,000 feet of the runway will have braking action as good as the touchdown zone.
- Avoid abrupt steering inputs.
- Use maximum allowable symmetrical reverse thrust.
- If side slipping off the runway, select reverse idle and release brakes to return to centerline.
- Aircraft will tend to drift off the runway nose first with forward thrust and tail first with reverse thrust.
- Be aware of the possibility of white out effect from reverse thrust use in dry snow.

Intentionally
Blank

Ground De/Anti-Icing Procedure

Pre-Gate Departure Communication

The captain can expect to talk to several different people during the deicing process, however, only two call signs are used.

- “Iceman” is a person who communicates with the captain via the VHF radio from a position within operations, the control center or the deice pad tower. This person will refer to the aircraft’s “Ship Number” in all communications.
- “Deicer/Coordinator” is the person who will be in direct control of the actual deicing operation on the aircraft. He/she will be plugged into the aircraft interphone system or on VHF radio and must be in direct communication with the captain at all times. This person will not know the flight number and will refer to the aircraft’s “Ship Number” in all communications.

The following communication procedures will be used:

PRE-GATE DEPARTURE COMMUNICATION	
CAPTAIN:	“This is ship #_____, we will require deicing.”
ICEMAN:	“Ship #_____, your aircraft will be deiced with the engines running. OR “Ship #_____, your aircraft will be deiced_____ (at the gate, off the gate, or at the remote) with the engines shut down.”
CAPTAIN:	“Roger, ship #_____.”

Use the appropriate procedure for deicing at the gate or at the remote site with engines running or shut down.

Note: Advise deicer/coordinator if the APU will be running during de/anti-icing.

Note: Ensure engine inlets have been inspected and are clear prior to engine start.

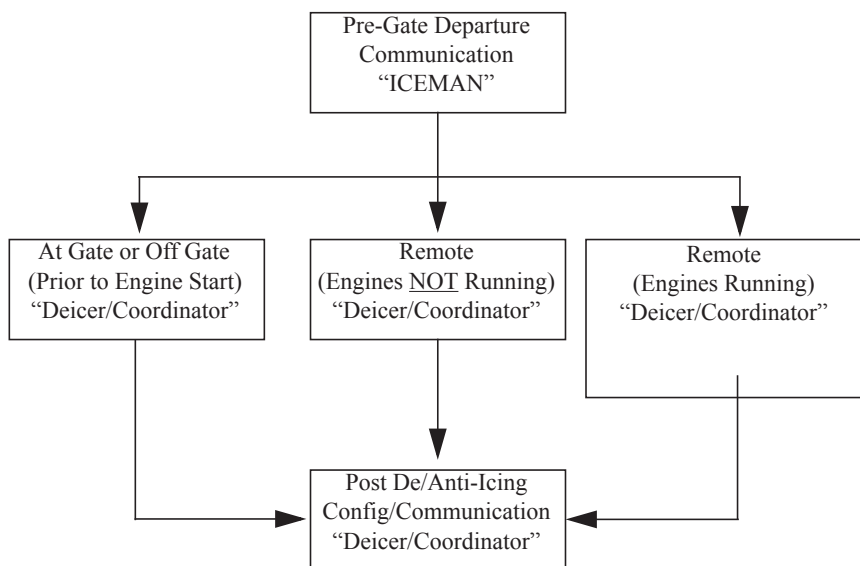
Aircraft Configuration and Communication

Prior to departure from the gate, when conditions warrant, the captain will contact “Iceman” and follow the Pre-Gate Departure Communication. The Iceman will describe one of three de/anti-icing scenarios:

- At Gate or Off Gate (Prior to Engine Start)
- Remote (Engines Not Running)
- Remote (Engines Running)

Follow the communication and configurations described in the appropriate procedure. Once complete, follow the Post De/Anti-Icing configuration and communication.

Note: If the APU is inoperative, advise Iceman.



Intentionally
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At Gate or Off Gate (Prior to Engine Start)

Make a PA to the passengers regarding the deicing process.

Approximately one minute prior to deicing:

PRE-DEICING COMMUNICATION	
DEICER/COORD:	"Ship # ____, brakes set?"
CAPTAIN:	"Roger, ship # ____, brakes set."
DEICER/COORD:	"Ship # ____ Type II / IV with (fluid brand name) will be used for anti-icing (if anti-icing required)."
CAPTAIN:	"Roger, ship # ____."
DEICER/COORD:	"Ship # ____, ready for deicing?"
CAPTAIN:	"Stand by." (Follow procedure below).

OR

PRE-DEICING COMMUNICATION USING FORCED AIR	
DEICER/COORD:	"Ship # ____, brakes set?"
CAPTAIN:	"Roger, ship # ____, brakes set."
DEICER/COORD:	"Ship # ____, the final process used will be forced air with Type I fluid (or forced air only) with no holdover time."
CAPTAIN:	"Roger, ship # ____." OR "Negative, ship # ____, holdover time required."
DEICER/COORD:	"Ship # ____, ready for deicing?" OR "Ship # ____, Type II / IV with (fluid brand name) will be used for anti-icing (if anti-icing required). Ready for deicing?"
CAPTAIN:	"Stand by." (Follow procedure below).

Prior to de/anti-icing:

Aircraft configuration for de/anti-icing:

CAUTION: Snow, slush, or ice ingestion in the APU inlet duct while the APU is running can cause serious damage. Coordinate with ground personnel to ensure that APU inlet area is clear before starting APU. Ingestion of deicing fluid causes objectionable fumes and odors to enter the airplane.

APU or external power As required

HYDRAULIC panel Set
Refer to Pushback procedure.

Flaps Extend
Extend the flaps to the anticipated takeoff position.

PACK control switches OFF

Engine BLEED air switches OFF

APU bleed air switch (when APU running) OFF
Reduces the possibility of fumes entering the air conditioning system.

WARNING: Once the deicing operation begins, any aircraft movement or changes in configuration must be coordinated with the ground crew.

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CAPTAIN:	“Ship # ____, aircraft ready for deicing.”
POST DE/ANTI-ICING COMMUNICATION	
DEICER/COORD:	“Ship # __de/anti-icing and aircraft inspection complete.” OR “Ship # __de/anti-icing and aircraft inspection complete. The final process used was forced air with Type I fluid (or forced air only) with no holdover time.”
CAPTAIN:	“Roger, ship # ____.”
DEICER/COORD:	“Ship # __Type I fluid application started ____ minutes ago. The freeze point is ____°C. No Type II or IV was used.” OR “Ship # __Type II/IV fluid application with (fluid brand name) started ____ minutes ago.” OR (Non-US locations): “Ship # __Type II/IV fluid application (fluid brand name) started ____ minutes ago using a fluid mixture of ____ (% concentrate).”
CAPTAIN:	“Roger, ship # __Type I started ____ minutes ago. The freeze point is ____°C. No Type II or IV was used.” OR “Roger, ship # __Type II/IV (fluid brand name) started ____ minutes ago.” OR (Non-US locations): “Roger, ship # __Type II/IV (fluid brand name) started ____ minutes ago using a fluid mixture of ____ (% concentrate).”
DEICER/COORD:	“Ship # ____, clear to start engines (when applicable). Do not move the aircraft under power until you have been given the all clear salute.”
CAPTAIN:	“Roger, ship # ____.”

Post de/anti-icing:

WARNING: An All Clear salute is required to verify de/anti-icing procedures are complete.

Aircraft configuration post de/anti-icing:

Complete the Pushback procedure, if not already accomplished.

APU As required

Wait approximately 1 minute after deicing is complete to restore bleed air for pack operation to ensure deicing fluid has been cleared from the engines and APU.

APU bleed air switch AUTO

Engine (s) Start

Accomplish the After Start procedure.

Engine BLEED air switches ON

PACK control switches AUTO

Accomplish the Taxi procedure.

Remote (Engines Not Running)

If remote deicing with engines not running is anticipated, the APU should be left operating. If the APU or a portion of the APU is inoperative, confirm that electric and/or air carts are available at the remote location before departing the gate.

CAUTION: Snow, slush, or ice ingestion in the APU inlet duct while the APU is running can cause serious damage. Coordinate with ground personnel to ensure that APU inlet area is clear before starting APU. Ingestion of deicing fluid causes objectionable fumes and odors to enter the airplane.

Approaching the icepad:

- Contact “Iceman”.
- Start the APU if it is not already operating.
- Make a PA to the passengers regarding the deicing process.

Just prior to entering the deicing area:

- Verify flaps are in the intended takeoff position.

When the aircraft is in position for deicing:

PRE-DEICING COMMUNICATION	
DEICER/COORD:	“Ship # ____, brakes set?”
CAPTAIN:	“Roger, ship # ____, brakes set.”
DEICER/COORD:	“Ship # ____ Type II / IV with (fluid brand name) will be used for anti-icing (if anti-icing required).”
CAPTAIN:	“Roger, ship # ____.”
DEICER/COORD:	“Ship # ____, ready for deicing?”
CAPTAIN:	“Stand by.” (Follow procedure below).

OR

PRE-DEICING COMMUNICATION USING FORCED AIR	
DEICER/COORD:	“Ship # ____, brakes set?”
CAPTAIN:	“Roger, ship # ____, brakes set.”
DEICER/COORD:	“Ship # ____, the final process used will be forced air with Type I fluid (or forced air only) with no holdover time.”
CAPTAIN:	“Roger, ship # ____.” OR “Negative, ship # ____, holdover time required.”
DEICER/COORD:	“Ship # ____, ready for deicing?” OR “Ship # ____, Type II / IV with (fluid brand name) will be used for anti-icing (if anti-icing required). Ready for deicing?”
CAPTAIN:	“Stand by.” (Follow procedure below).

Prior to de/anti-icing:

Aircraft configuration for de/anti-icing.

APU or external power As required

PACK control switches OFF

Wait approximately 10 seconds after pack switches are off before positioning bleed switches to off to reduce pack wear.

APU bleed air switch OFF

Reduces the possibility of fumes entering the air conditioning system.

Engines Shut down

WARNING: Once the deicing operation begins, any aircraft movement or changes in configuration must be coordinated with the ground crew.

CAPTAIN:	“Ship # ____, aircraft ready for deicing.”

POST DE/ANTI-ICING COMMUNICATION	
DEICER/COORD:	“Ship # ____ de/anti-icing and aircraft inspection complete.” OR “Ship # ____ de/anti-icing and aircraft inspection complete. The final process used was forced air with Type I fluid (or forced air only) with no holdover time.”
CAPTAIN:	“Roger, ship # ____.”
DEICER/COORD:	“Ship # ____ Type I fluid application started ____ minutes ago. The freeze point is ____°C. No Type II or IV was used.” OR “Ship # ____ Type II/IV fluid application with (fluid brand name) started ____ minutes ago.” OR (Non-US locations): “Ship # ____ Type II/IV fluid application (fluid brand name) started ____ minutes ago using a fluid mixture of ____ (% concentrate).”
CAPTAIN:	“Roger, ship # ____ Type I started ____ minutes ago. The freeze point is ____°C. No Type II or IV was used.” OR “Roger, ship # ____ Type II/IV (fluid brand name) started ____ minutes ago.” OR (Non-US locations): “Roger, ship # ____ Type II/IV (fluid brand name) started ____ minutes ago using a fluid mixture of ____ (% concentrate).”
DEICER/COORD:	“Ship # ____, clear to start engines (when applicable). Do not move the aircraft under power until you have been given the all clear salute.”
CAPTAIN:	“Roger, ship # ____.”

Post de/anti-icing:

WARNING: Do not move aircraft until ATC taxi clearance and the All Clear Salute have been received.

Aircraft configuration post de/anti-icing:

APU As required

Wait approximately 1 minute after deicing is complete to restore bleed air for pack operation to ensure deicing fluid has been cleared from the engines and APU.

APU bleed air switch AUTO

Engines Start

Accomplish the After Start procedure.

APU OFF

PACK control switches AUTO

Accomplish the Taxi procedure.

Remote (Engines Running)

Note: Deicing with the engines running is authorized only at stations identified in the Delta Special Pages.

Approaching the icepad:

- Contact “Iceman”
- Make a PA to the passengers regarding the deicing process.

Just prior to entering the deicing area:

- Verify flaps are in the intended takeoff position.

When the aircraft is in position for deicing:

PRE-DEICING COMMUNICATION	
DEICER/COORD:	“Ship # ____, brakes set, engines at idle?”
CAPTAIN:	“Roger, ship # ____, brakes set, engines at idle.”
DEICER/COORD:	“Ship # ____ Type II / IV with (fluid brand name) will be used for anti-icing (if anti-icing required).”
CAPTAIN:	“Roger, ship # ____.”
DEICER/COORD:	“Ship # ____, ready for deicing?”
CAPTAIN:	“Stand by.” (Follow procedure below).

OR

PRE-DEICING COMMUNICATION USING FORCED AIR	
DEICER/COORD:	“Ship # ____, brakes set, engines at idle?”
CAPTAIN:	“Roger, ship # ____, brakes set, engines at idle.”
DEICER/COORD:	“Ship # ____, the final process used will be forced air with Type I fluid (or forced air only) with no holdover time.”
CAPTAIN:	“Roger, ship # ____.” OR “Negative, ship # ____, holdover time required.”
DEICER/COORD:	“Ship # ____, ready for deicing?” OR “Ship # ____, Type II / IV with (fluid brand name) will be used for anti-icing (if anti-icing required). Ready for deicing?”
CAPTAIN:	“Stand by.” (Follow procedure below).

Prior to de/anti-icing:

Aircraft configuration for de/anti-icing:

- Thrust levers IDLE
- ENGINE ANTI-ICE selectors As required
- APU OFF
- PACK control switches OFF
- Engine BLEED air switches OFF
- APU bleed air switch OFF
- Reduces the possibility of fumes entering the air conditioning system.

WARNING: Once the deicing operation begins, any aircraft movement or changes in configuration must be coordinated with the ground crew.

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CAPTAIN:	“Ship # ____, aircraft ready for deicing.”

POST DE/ANTI-ICING COMMUNICATION	
DEICER/COORD:	“Ship # __ de/anti-icing and aircraft inspection complete.” OR “Ship # __ de/anti-icing and aircraft inspection complete. The final process used was forced air with Type I fluid (or forced air only) with no holdover time.”
CAPTAIN:	“Roger, ship # ____.”
DEICER/COORD:	“Ship # __ Type I fluid application started ____ minutes ago. The freeze point is ____°C. No Type II or IV was used.” OR “Ship # __ Type II/IV fluid application with (fluid brand name) started ____ minutes ago.” OR (Non-US locations): “Ship # __ Type II/IV fluid application (fluid brand name) started ____ minutes ago using a fluid mixture of ____ (% concentrate).”
CAPTAIN:	“Roger, ship # __ Type I started ____ minutes ago. The freeze point is ____°C. No Type II or IV was used.” OR “Roger, ship # __ Type II/IV (fluid brand name) started ____ minutes ago.” OR (Non-US locations): “Roger, ship # __ Type II/IV (fluid brand name) started ____ minutes ago using a fluid mixture of ____ (% concentrate).”
DEICER/COORD:	“Ship # ____, clear to start engines (when applicable). Do not move the aircraft under power until you have been given the all clear salute.”
CAPTAIN:	“Roger, ship # ____.”

Post de/anti-icing:

WARNING: Do not move aircraft until ATC taxi clearance and the All Clear Salute have been received.

Taxi may be commenced prior to restoring bleed air and pack operation.

Aircraft configuration post de/anti-icing:

Wait approximately 1 minute after deicing is complete to restore bleed air for pack operation to ensure deicing fluid has been cleared from the engines and APU.

Engine BLEED air switches ON

APU BLEED air switch AUTO

PACK control switches AUTO

Accomplish the Taxi procedure.

Hot Weather Operation

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

- If a ground source of conditioned air is available, the supply should be plugged in immediately after engine shutdown and should not be removed until just prior to engine start.
- If a ground source of conditioned air is not available, both packs and recirculation fans should be used (when possible) for maximum cooling.
- All doors, including cargo doors, and windows should be 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.
- Flight deck cooling can be improved by closing the flight deck door and lowering the side trays adjacent to the pilot seats.
- All flight deck air outlets should be opened.
- All passenger cabin gasper outlets should be opened and all window shades on the sun-exposed side of the passenger cabin should be closed.

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 FMS may not accept an assumed temperature derate. Delay selecting an assumed temperature derate until after bleed air is available.

During takeoff performance evaluation consider the following:

- High temperatures inflict performance penalties which must be taken into account on the ground before takeoff.
- Alternate takeoff procedures (Packs Off Takeoff, etc.)

Moderate to Heavy Rain, Hail or Sleet

Flight should be conducted to avoid thunderstorms, hail activity or visible moisture over storm cells. To the maximum extent possible, moderate to heavy rain, hail or sleet should also be avoided.

Turbulence

During flight in light to moderate turbulence, the autopilot and/or autothrottle may remain engaged unless airspeed, altitude or attitude deviations require use of manual control.

The turbulent air penetration speed provides ample protection from stall and high speed buffet, while also providing protection from exceeding the structural limit. Refer to the Limitations section for the turbulent air penetration speed.

Passenger signs ON

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

Severe Turbulence

If severe turbulence cannot be avoided, an increased buffet margin is recommended. This can be obtained by descending approximately 4,000 feet below optimum altitude. The autothrottle should be off in severe turbulence.

Climb, Cruise, and Descent Considerations

After takeoff, and when established in a clean climb configuration, use of the autoflight system is recommended for flight through turbulence.

During climb and descent, use of VNAV or flight level change may result in excessive pitch changes as the AFDS attempts to fly speed with the elevators. Therefore, vertical speed mode (speed on autothrottles) is recommended for climb and descent in severe turbulence.

During cruise, VNAV and altitude hold modes both fly speed on autothrottles and can be used in turbulence.

7101 - 7110

In severe turbulence during cruise, it may be necessary to disconnect the autothrottles to prevent excessive thrust changes. Thrust setting guidance is available on EICAS when VNAV is engaged. Set N1 at or slightly above the magenta VNAV target N1 indication. Change thrust setting only if required to modify an unacceptable speed trend.

7001 – 7008

In severe turbulence during cruise, it may be necessary to disconnect the autothrottles to prevent excessive thrust changes. Thrust setting guidance is available on EICAS when VNAV is engaged. Set EPR at or slightly above the magenta VNAV target EPR indication. Change thrust setting only if required to modify an unacceptable speed trend.

Manual Flight in Severe Turbulence

If manual flight in severe turbulence becomes necessary, trim the airplane for the turbulent air penetration speed. Control the airplane pitch attitude with the elevators using the attitude indicator as the primary instrument. In extreme drafts, large altitude changes may occur. Do not make sudden large control inputs. Corrective actions to regain the desired attitude should be smooth and deliberate. Altitude variations are likely in severe turbulence and should be allowed to occur if terrain clearance is adequate. Control airplane attitude first, then make corrections for airspeed, altitude, and heading.

Note: If an approach must be made into an area of severe turbulence, delay flap extension as long as possible. The airplane can withstand higher gust loads in the clean configuration. Diversion to another airfield is the best policy if severe turbulence persists in the area.

Volcanic Ash Encounter

Ground Operations

Aircraft should not operate into or out of airports where there is falling ash and/or ash-covered runways/taxiways. If an airport's operational surfaces are contaminated with ash, the taxiways and runways to be used must be swept prior to use, and if possible, sprayed with water to minimize aircraft contamination from any remaining ash.

Restrict ground use of the APU to engine starts. Use ground starting air and electrical power, if available.

Do not use windshield wipers for dust removal. Coordinate with Maintenance to hose off ash deposits with water and wipe residue away with a soft cloth.

Avoid the use of air conditioning packs on the ground as long as recirculation fans will maintain adequate cabin comfort. If air conditioning is required, operate at full cold setting. Use preconditioned air at the terminal from a filtered ground cart, if available. If possible, keep engine bleeds off.

Avoid static operations of engines above idle power.

To prevent contamination of air conditioning system, consider a takeoff with packs off.

Use rolling takeoff procedures to minimize engine dust ingestion.

During landing, limit reverse thrust to avoid impairing visibility and minimize ingesting dust into the engines. Exercise caution as braking may be less effective than normal due to contamination on the runway.

In Flight

CAUTION: If volcanic ash is encountered in flight, refer to the Volcanic Ash non-normal in the ECL, or the QRH, section 0, Volcanic Ash.

Operation in a Sandy or Dusty Environment

The main hazards of a sandy or dusty environment are airplane surface erosion, especially of engine fan blades, accumulation of sand or dust on critical surfaces, and blockage. The effects of sand ingestion occur predominantly during takeoff, landing and taxi operations. The adverse effects, however, can occur if the airplane's flight path was through a cloud of visible sand or dust, or the airplane was parked during a sand or dust storm. Premature engine deterioration can result from sand or dust ingestion, causing increased fuel burn and reduced EGT margins.

CAUTION: After a sandstorm, if all taxiways and runways are not carefully inspected and swept for debris before flight ops are conducted, the risk of engine damage and wear is increased.

Exterior Inspection

Although removal of sand and dust contaminants is primarily a maintenance function, during the exterior inspection, the captain or first officer should carefully inspect areas where accumulation of sand or dust could change or affect normal system operations.

Do the normal Exterior Inspection with the following additional steps:

Windshield Check
Verify that the windshield has been cleaned.

Note: Do not use windshield wipers for sand or dust removal.

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.

Surfaces Check
Verify that the upper surfaces of the wings and other control surfaces are free of sand.

Air conditioning inlets and exits Check
Verify that the air inlets and exits are free of sand and dust.
Verify that the cabin pressure outflow valves 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 is free of sand and dust before APU start.

I

Preflight Procedure - Pilot Monitoring

Do the normal Preflight Procedure - Pilot Monitoring 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 switch OFF

If APU bleed air will be used and the APU is not operating:

APU START, then ON

Do not allow the APU selector to spring back to the ON position.

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

ENG BLEED switches OFF

APU BLEED switch AUTO

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 selector START

Verify that the N2 RPM increases.

Allow maximum motoring for 2 minutes to help remove contaminants.

7101-7110

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

7001-7008

Note: Maximum motoring occurs when N3 acceleration is less than 1% in approximately 5 seconds.

FUEL CONTROL switch RUN

After Start Procedure

Do the normal After Start 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, then ON

Do not allow the APU selector to spring back to the ON position.

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

ENG BLEED switches OFF

APU BLEED switch AUTO

Flight controls Check

Verify that there is no increase in control forces due to sand or dust contaminants.

Taxi-Out

Do the following, conditions permitting, to minimize sand and dust ingestion by the engines and to improve visibility during taxi:

- Use all engines during taxi and taxi at low speed. Limit ground speed to 10 knots and maintain thrust below 40% N1 whenever possible to avoid creating a vortex during ground operations.
- Maintain a greater than normal separation from other aircraft while taxiing and avoid the ingestion of another engine's wake.
- Avoid engine overhang of unprepared surfaces.
- In the event of a crosswind during 180° turns, turn away from the wind if possible to minimize sand and dust ingestion.
- Whenever possible, avoid situations that would require the airplane to be brought to a complete stop.
- Avoid excessive braking. The presence of sand or dust will increase brake wear.

Before Takeoff

Do the normal Before Takeoff procedure with the following modification:

If APU bleed air was used:

ENG BLEED switches ON

APU selector As needed

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.
- Prior to takeoff, allow sand and dust to settle.
- Do not take off into a sand or dust cloud.
- Use a rolling takeoff. Whenever possible, avoid setting high thrust at low speed.
- Use maximum climb power to minimize time spent in dusty conditions.
- When visible sand and dust exist, consider delaying flap retraction until above the dust cloud, if operations permit.
- Avoid the use of "bump thrust".

Landing

Do the following to minimize sand and dust ingestion by the engines during landing:

- Use autobrakes on landing to help minimize the need for reverse thrust.
- Performance permitting, minimize the use of reverse thrust to prevent ingestion of dust and sand and to prevent reduction of visibility. Reverse thrust is most effective at high speed.

After Landing Procedure

Do the normal After Landing Procedure with the following modifications:

If bleed air is needed to maintain tolerable flight deck and cabin temperatures, use APU bleed air rather than engine bleed air during the taxi-in. Limit APU bleed air use as much as possible to reduce sand and dust ingestion.

If APU bleed air will be used and the APU is not operating:

APU START, then ON

Do not allow the APU selector to spring back to the ON position.

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

ENG BLEED switches OFF

APU BLEED switch AUTO

Taxi-In

Do the following, conditions permitting, to minimize sand and dust ingestion by the engines and to improve visibility during the taxi-in:

- Use all engines and taxi at low speed. Limit ground speed to 10 knots and maintain thrust below 40% N1 whenever possible.
- Maintain a greater than normal separation from other aircraft while taxiing and avoid the ingestion of another engine’s wake.
- Avoid engine overhang of unprepared surfaces.
- Minimize engine thrust on the outboard side of the turn during 180° turns.
- In the event of a crosswind during 180° turns, turn away from the wind if possible to minimize sand and dust ingestion.
- Whenever possible, avoid situations that would require the airplane to be brought to a complete stop.
- Avoid excessive braking. The presence of sand or dust will increase brake wear.

Secure Procedure

Do the normal Secure Procedure with the following modifications:

OUTFLOW VALVE switches (both) MAN

OUTFLOW VALVE MANUAL switches (both) CLOSE

Position the outflow valves fully closed to inhibit the intake of sand and dust.

Additional procedures for securing the airplane during sandy or dusty conditions may be needed. These procedures are normally done by maintenance personnel, and include, but are not limited to:

- Verify that engine covers, if applicable, are in place while the airplane is parked.
- Verify that airplane doors are closed.
- Verify that all openings are plugged or covered while the airplane is parked. Streamers should be used to remind personnel to remove before flight.
- Ensure all compartments are closed.

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Differences

Chapter DF

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Differences

777 Differences

Chapter DF

Section 10

Airplane General, Emergency Equipment, Doors, Windows

Item	777-232ER (7001 - 7008)	777-232LR (7101 - 7110)
Door 1 Pilot Upper Crew Rest Compartment	Single panel door Above 25,000 feet, 2 crewmembers may occupy the Door 1 rest compartment. Below 25,000 feet, no crewmember may occupy the Door 1 rest compartment.	Bifold door Maximum occupancy during taxi, takeoff and landing is 2. Maximum occupancy during remaining phases of flight is 4.
Door 3 FA Upper Crew Rest Compartment	Above 25,000 feet, 6 crewmembers may occupy the Door 3 rest compartment. Below 25,000 feet, no crewmember may occupy the Door 3 rest compartment.	Not installed
Door 4 FA Upper Crew Rest Compartment	Not installed	Above 25,000 feet, 6 crewmembers may occupy the Door 4 rest compartment. Below 25,000 feet, no crewmember may occupy the Door 4 rest compartment.
Emergency Equipment	Refer to Emergency Equipment Location charts in Volume 2	
Emergency Evacuation Signal System	Installed (not used)	Not installed
Emergency Locator Transmitter (ELT)	Two portable units, one in flight deck, one in cabin.	One permanently mounted in top center of fuselage with switch installed on overhead panel in flight deck. One portable unit in cabin.
Cabin Crew Notification	NO SMOKING Selector	CABIN CHIME switch

Item	777-232ER (7001 - 7008)	777-232LR (7101 - 7110)
Flight Deck Door Access System Switch	Not installed	Installed (on side flight deck door post)
Flight Deck Door Locking Mechanism	Mechanical Latch Pin	Deadbolt
Flight Deck Door Lock Panel Location	Overhead panel	Aft aisle stand
Maximum Weights	See Limitations chapter.	
Wing Tip Radius	144.9 feet	152.5 feet
Wingtips	Conventional	Raked Tip
Turning Radius	155.8 feet (47.5 meters)	157.4 feet (48 meters)

Air Systems

Item	777-232ER (7001 - 7008)	777-232LR (7101 - 7110)
APU to Pack Takeoff	Not installed	Installed

Communications

Item	777-232ER (7001 - 7008)	777-232LR (7101 - 7110)
Cockpit Voice Recorder (CVR) Test Indicator	Meter	Light
Second Observer's Audio Panel	Not installed	Installed

Engines, APU

Item	777-232ER (7001 - 7008)	777-232LR (7101 - 7110)
Engine Type	Rolls Royce Trent 895	General Electric GE90-110B1
Simultaneous Engine Starting	Available	Not Available
Takeoff Bump Thrust Reference Mode	Not installed	Installed (See SP.11)

Fuel

Item	777-232ER (7001 - 7008)	777-232LR (7101 - 7103)	777-232LR (7104 - 7110)
Fuel Tank Capacities	Refer to Vol. 2, 12.20, Fuel Tank Locations and Capacities.		
Nitrogen Generation System (NGS)	As Installed (Mods begin Jan 2015)		Installed

Landing Gear

Item	777-232ER (7001 - 7008)	777-232LR (7101 - 7110)
Tire Pressure Indication	Not installed	Installed

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