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737-732/ -832/ -932
Operations Manual
Volume 1
Delta Air Lines, Inc.

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**Preface**
Model Identification**Chapter P1**
Section 1**General**

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

Note: The procedures and information contained in this manual also apply to aircraft acquired by Delta Air Lines, Inc. subsequent to the current revision; however, this document may not address all pertinent information for these airplanes. 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 is supplied by Delta Air Lines, Inc. Registry number is supplied by the national regulatory agency. Serial number and tabulation number are supplied by Boeing.

737-700

Ship Number	Registry Number	Serial Number	Tabulation Number
3601	N301DQ	29687	YM701
3602	N302DQ	29648	YM702
3603	N303DQ	29688	YM703
3604	N304DQ	29683	YM704
3605	N305DQ	29645	YM705
3606	N306DQ	29633	YM706
3607	N307DQ	29679	YM707
3608	N308DE	29656	YM708
3609	N309DE	29634	YM709
3610	N310DE	29665	YM710
And Subsequent			

737-800

Ship Number	Registry Number	Serial Number	Tabulation Number
3701	N371DA	29619	YC601
3702	N372DA	29620	YC602
3703	N373DA	29621	YC603
3704	N374DA	29622	YC604
3705	N375DA	29623	YC605
3706	N376DA	29624	YC606
3707	N377DA	29625	YC607
3708	N378DA	30265	YC608
3709	N379DA	30349	YC609
3710	N380DA	30266	YC610
3711	N381DN	30350	YC611
3712	N382DA	30345	YC612
3713	N383DN	30346	YC613
3714	N384DA	30347	YC614
3715	N385DN	30348	YC615
3716	N386DA	30373	YC616
3717	N387DA	30374	YC617
3718	N388DA	30375	YC618
3719	N389DA	30376	YC619
3720	N390DA	30536	YC620
3721	N391DA	30560	YC621
3722	N392DA	30561	YC622
3723	N393DA	30377	YC623
3724	N394DA	30562	YC624
3725	N395DN	30773	YC681
3726	N396DA	30378	YC682
3727	N397DA	30537	YC683



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Ship Number	Registry Number	Serial Number	Tabulation Number
3728	N398DA	30774	YC684
3729	N399DA	30379	YC685
3730	N3730B	30538	YC686
3731	N3731T	30775	YC687
3732	N3732J	30380	YC688
3733	N3733Z	30539	YC689
3734	N3734B	30776	YC690
3735	N3735D	30381	YC691
3736	N3736C	30540	YC692
3737	N3737C	30799	YC693
3738	N3738B	30382	YC694
3739	N3739P	30541	YC695
3740	N3740C	30800	YC696
3741	N3741S	30487	YC625
3742	N3742C	30835	YC626
3743	N3743H	30836	YC627
3744	N3744F	30837	YC628
3745	N3745B	32373	YC629
3746	N3746H	30488	YC630
3747	N3747D	32374	YC631
3748	N3748Y	30489	YC632
3749	N3749D	30490	YC633
3750	N3750D	32375	YC634
3751	N3751B	30491	YC635
3752	N3752	30492	YC636
3753	N3753	32626	YC637
3754	N3754A	29626	YC638
3755	N3755D	29627	YC639

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Ship Number	Registry Number	Serial Number	Tabulation Number
3756	N3756	30493	YC640
3757	N3757D	30813	YC641
3758	N3758Y	30814	YC642
3759	N3759	30815	YC643
3760	N3760C	30816	YC644
3761	N3761R	29628	YC645
3762	N3762Y	30817	YC646
3763	N3763D	29629	YC647
3764	N3764D	30818	YC648
3765	N3765	30819	YC649
3766	N3766	30820	YC650
3767	N3767	30821	YC651
3768	N3768	29630	YC652
3769	N3769L	30822	YC653
3770	N37700	29631	YC654
3771	N3771K	29632	YC655
3772	N3772H	30823	YF441
3773	N3773D	30825	YF442
And Subsequent			



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737-900

Ship Number	Registry Number	Serial Number	Tabulation Number
3801	N801DZ	31912	YH801
3802	N802DN	31917	YH802
3803	N803DN	31919	YH803
3804	N804DN	31918	YH804
3805	N805DN	31913	YH805
3806	N806DN	31914	YH806
3807	N807DN	31921	YH807
3808	N808DN	31920	YH808
3809	N809DN	31915	YH809
3810	N810DN	31922	YH810
3811	N811DN	31916	YH811
3812	N812DN	31923	YH812
3813	N813DN	31925	YH813
3814	N814DN	31924	YH814
3815	N815DN	31926	YH815
3816	N816DN	31927	YH816
3817	N817DN	31929	YH817
3818	N818DN	31928	YH818
3819	N819DN	31930	YH819
3820	N820DN	31931	YH820
And Subsequent			

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General

The manufacturer has developed normal and non-normal procedures for the 737 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

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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 Pilots 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

- 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.
- Non-normal checklists, and
- Non-normal operational information.

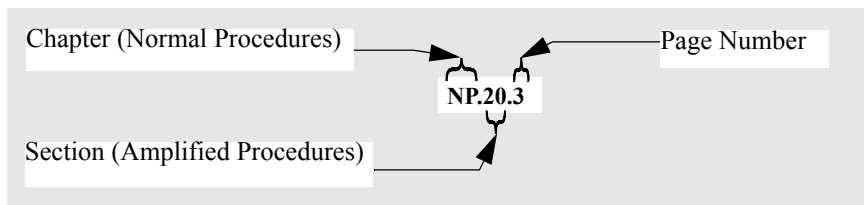
FCTM

- 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.

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). 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.

A	
ABNORM	Abnormal
ABS	Absolute
ABV	Above
A/C	Aircraft
AC	Alternating Current or Aircraft
ACARS	Aircraft Communications Addressing and Reporting System
ACCEL	Accelerate(d) Acceleration
ACE	Actuator Control Electronics
ACM	Air Cycle Machine
ACMP	Alternating Current Motor Pump/Electric Hydraulic Pump
ACMS	Aircraft Condition Monitoring System
ACP	Audio Control Panel
ACT	Active
ADC	Air Data Computer
ADF	Automatic Direction Finder
ADI	Attitude Director Indicator

ADIRS	Air Data Inertial Reference System
ADIRU	Air Data Inertial Reference Unit
ADM	Air Data Module
ADP	Air Driven Pump Air Driven Demand Hydraulic Pump
ADR	Air Data Reference
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
AIDS	Aircraft Integrated Data System
AIL	Aileron
AIMS	Airplane Information Management System
ALFA	Safe Stall Margin Speed
ALT	Altitude
ALT ACQ	Altitude Acquire
ALT HOLD	Altitude Hold
ALTM	Altimeter
ALTN	Alternate
AM	Amplitude Modulation
AMB	Ambient
AMI	Airline Modifiable Information
AMOC	Alternate Method of Compliance
AMP	Amperes
ANNUNC	Annunciator
ANP	Actual Navigational Performance
ANT	Antenna
ANU	Aircraft Nose Up
AOA	Angle of Attack
AOC	Airline Operational Communication Data Link
A/P	Autopilot
APB	Auxiliary Power Breaker or All Pilots Bulletin

APD	Approach Progress Display
APL	Airplane
APP or APPR	Approach
APU	Auxiliary Power Unit
AR	Authorization Required
ARINC	Aeronautical Radio, Incorporated
ARPT	Airport
ARR	Arrival
ART	Automatic Reserve Thrust
A/S	Airspeed
ASA	Autoland Status Annunciator
ASAP	As Soon As Possible
ASI	Airspeed Indicator
A/SKID	Anti-Skid
ASP	Audio Selector Panel
ASR	Airport Surveillance Radar
ASSY	Assembly
ASYM	Asymmetry
A/T	Autothrottle
ATA	Actual Time of Arrival
ATC	Air Traffic Control
A/THR	Auto Thrust Function
ATIS	Automated Terminal Information Service
ATM	Assumed Temperature Method
ATT	Attitude

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ATTND	Attendant
AUG	Augmentation
AUTO	Automatic
AUTO- THROT	Autothrottle
AUX	Auxiliary
AVAIL	Available
AVM	Airborne Vibration Monitor
AVS	Audio Visual System
AWABS	Automated Weight and Balance System
AWI	Altitude Warning Indicator
AWY	Airway
B	
BAL	Balance
BARO	Barometric
BAT	Battery
BCL	Battery Charge Limiter
BFE	Buyer Furnished Equipment
BFO	Beat Frequency Oscillator
BIT	Built-In Test
BITE	Built-In Test Equipment
BK	Brake
BKGRD	Background
BKR	Breaker
BLD	Bleed
BLW	Below
BMC	Bleed Air Monitoring Computer

BMV	Brake Metering Valve
BRG	Bearing
BRT	Bright
BSCU	Braking Steering Control Unit
BTB(S)	Bus Tie Breaker(s)
BTC	Bus Tie Contactor
BTL	Bottle
BTL DISCH	Bottle Discharge (fire extinguisher)
BTMS	Brake Temperature Monitoring System
C	
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
CAS	Calibrated Airspeed
CAWS	Central Aural Warning System
CB or C/B	Circuit Breaker
CCA	Central Control Accuator
CCD	Cursor Control Device
CCW	Counterclockwise

CDI	Course Deviation Indicator
CDL	Configuration Deviation List
CDS	Common Display System
CDU	Control Display Unit
CFDS	Centralized Fault Display System
CFIT	Controlled Flight Into Terrain
CFM	Cubic Feet per Minute
CG	Center of Gravity
CHAN	Channel
CHG	Change
CHKL	Checklist
CHR	Chronograph
CHRGR	Charger
CIDS	Cabin Intercommunication Data System
CIS	Cabin Interphone System
CKD	Checked
CKT	Circuit
CL	Close
CLB	Climb
CLMP	Computer Lockout Manual Power
CLR	Clear
CLSD	Closed
CMD	Command
CMPTR	Computer
CNX	Cancelled
CO	Company

COMM	Communication
COMP	Comparator
COMPT	Compartment
CON	Continuous
COND	Condition
CONFIG	Configuration
CONN	Connection
CONT	Control
COOL	Cooling
CORR	Correction
CO RTE	Company Route
CP	Control Panel
CPCS	Cabin Pressure Control System
CRC	Continuous Repetitive Chime
CRM	Crew Resource Management
CRS	Course
CRT	Cathode Ray Tube
CRZ	Cruise
CSEU	Control System Electronic Unit
CSM/G	Constant Speed Motor/Generator
CSTR	Constraint
CTL	Control
CTR	Center
CU	Control Unit
CVR	Cockpit Voice Recorder
CW	Clockwise
CWS	Control Wheel Steering

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D	
DA	Decision Altitude
DA(H)	Decision Altitude (Height)
DC	Direct Current
DCU	Display Concentrator Unit
DCV	Directional Control Valve
D/D	Direct Descent
DDA	Derived Decision Altitude (MDA +50 feet)
DDG	Dispatch Deviations Guide
DDRMI	Digital Distance & Radio Magnetic Indicator
DECEL	Decelerate(d)
DECR	Decrease
DED	Dedicated
DEG	Degree
DEL	Delete
DEM	Demand
DEP	Departure
DEP ARR	Departure Arrival
DEPR	Depressurize
DES	Descent
DEST	Destination
DET	Detector
DEU	Display Electronic Unit
DEV	Deviation
DFCS	Digital Flight Control System

DFDAU	Digital Flight Data Acquisition Unit
DFDR	Digital Flight Data Recorder
DFGC	Digital Flight Guidance Computer
DFGS	Digital Flight Guidance System
DH	Decision Height
DIFF	Differential
DIR	Direct
DIR TO	Direct To
DISC	Disconnect
DISCH	Discharge
DISCONT	Discontinued
DISP	Dispatch
DIST	Distance
DK	Deck
DMC	Display Management Computer
DME	Distance Measuring Equipment
DN	Down
DNTKFX	Down Track Fix
DPC	Display Processing Computer
DR	Door
DSP	Display Select Panel
DSPL	Display
DTG	Distance to Go
DTW	Distance to Waypoint
DU	Display Unit

E	
EADI	Electronic Attitude Director Indicator
EBU	Engine Build-Up
ECAM	Electronic Centralized Aircraft Monitor
ECB	Electronic Control Box (APU)
ECM	Engine Condition Monitoring
ECON	Economy
ECS	Environmental Control System
ECU	Electronic Control Unit
E/D	End of Descent
EDP	Engine Driven Pump
E/E or E&E	Electrical/Electronic or Electrical & Electronic
EEC	Electronic Engine Control
EFB	Electronic Flight Bag
EFI	Electronic Flight Instruments
EFIS	Electronic Flight Instrument System
EFOB	Estimated Fuel On Board Electronic Flight Operations Bulletin
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
EIU	Engine Interface Unit
ELAC	Elevator Aileron Computer
ELEC	Electrical
ELEV	Elevator
EMER	Emergency
EMER GEN	Emergency Generator
ENG	Engine
ENG OUT	Engine Out
ENT	Entry
ENTMT	Entertainment
EO or E/O	Engine Out
EOAP	Electronic Overhead Annunciation Panel
EPC	Electrical Power Center or Electrical Power Contactor
EPR	Engine Pressure Ratio
EPRL	Engine Pressure Ratio Limit
EQPT or EQUIP	Equipment
ER	Extended Range
ERP	Eye Reference Point
ET	Elapsed Time
ETOPS	Extended Range Operation with Twin Engine Airplanes
ETP	Equal Time Point
EVAC	Evacuation

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EVBC	Engine Vane and Bleed Control
EVMU	Engine Vibration Monitoring Unit
E/WD	Engine/Warning Display
EXEC	Execute
EXH	Exhaust
EXT	Extend or External
EXTIN	Extinguish(ed)
F	
F	Fahrenheit or First Officer
FAC	Final Approach Course
FAA	Federal Aviation Administration
FADEC	Full Authority Digital Engine Control
FAF	Final Approach Fix
FAP	Final Approach Point
FAR	Federal Aviation Regulation
FB	Fleet Bulletin
FCC	Flight Control Computer
FCEU	Flight Control Electronics Unit
FCTL or F/CTL	Flight Control
FCTM	Flight Crew Training Manual
FCU	Flight Control Unit
FD, F/D or FLT DIR	Flight Director
FDAU	Flight Data Acquisition Unit

FDEP	Flight Data Entry Panel
FDR	Flight Data Recorder
FDS	Flight Director System
FEXT	Fire Extinguisher
FF	Fuel Flow
FFM	Force Fight Monitor
FGCP	Flight Guidance Control Panel
FGS	Flight Guidance System
FILT	Filter
FIM	Fault Isolation Manual
FIR	Flight Information Region
FL	Flight Level
FL CH or FLCH	Flight Level Change
FLD	Field
FLT	Flight
FLT CTRL	Flight Control
FLPRN	Flaperon
FLUOR	Fluorescent
FMA	Flight Mode Annunciator
FMC	Flight Management Computer
FMCS	Flight Management Computer System
FMGC	Flight Management Guidance Envelope Computer
FMGS	Flight Management Guidance Envelope System
FMS	Flight Management System

F/O or F O	First Officer
FOM	Flight Operations Manual
FPA	Flight Path Angle
F-PLN	Flight Plan
FPM	Feet Per Minute
FPV	Flight Path Vector
FREQ	Frequency
FRM	Fault Reporting Manual
F/S	Fast/Slow
FSEU	Flaps/Slats Electronic Unit
FT	Feet
FWC	Flight Warning Computer
FWD	Forward
FWSOV	Fire Wall Shut Off Valve
FX	Fix
G	
GA	Go-Around
GAL	Gallon
GB(S)	Generator Breakers
GCU	Generator Control Unit
GE	General Electric
GEN	Generator
GLC	Generator Line Contactor
GLS	GNSS Landing System
GMT	Greenwich Mean Time
GND or GRD	Ground
GNSS	Global Navigation Satellite System

GOMEX	Gulf of Mexico
GP or G/P	Glide Path
GPM	Gallons Per Minute
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
GR	Gear
GS	Ground Speed
G/S	Glide Slope
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
HG	Mercury
HGS	Head-Up Guidance System (HGS® is a registered trademark of Flight Dynamics)
HI	High
HLD	Hold
HMU	Hydrau-Mechanical Unit
HOR or HORIZ	Horizontal
HORZ	Horizon
HP	High Pressure

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HPA	Hectopascals
HPSOV	High Pressure Shut Off Valve
HPV	High Pressure Valve
HSI	Horizontal Situation Indicator
HTR	Heater
HUD	Head-Up Display
HYD	Hydraulic
HZ	Hertz
I	
IAF	Initial Approach Fix
IAN	Integrated Approach Navigation
IAS	Indicated Airspeed
I/C	Inspection/Check or Intercom
ICAO	International Civil Aviation Organization
ICU	Instrument Comparator Unit
IDENT	Identification
IDG	Integrated Drive Generator
IDU	Interactive Display Unit
IFE	In-Flight Entertainment System
IFR	Instrument Flight Rules
IGN	Ignition
IGS	Instrument Guidance System
ILLUM	Illuminate, Illuminated
ILS	Instrument Landing System

IM	Inner Marker
IMC	Instrument Meteorological Conditions
IMP	Imperial
IN	Inch(es)
INC	Incorporated
INCR	Increase
INBD	Inboard
IND	Indicator
IND LTS	Indicator Lights
INFLT	In flight or in-flight
INHIB	Inhibit
INIT	Initialization
INOP	Inoperative
INSTR	Instrument
INT or INTPH	Interphone
INTC	Intercept
INTC CRS	Intercept Course
INV	Static Inverter
IP	Instructor Pilot
IRS	Inertial Reference System
IRU	Inertial Reference Unit
ISA	International Standard Atmosphere
ISDU	Inertial System Display Unit
ISFD	Intergrated Standby Flight Display

ISLN	Isolation
IVSI	Instantaneous Vertical Speed Indicator
J	
JAA	Joint Aviation Authority
K	
K or KTS	Knots
KCAS	Knots Calibrated Airspeed
KEAS	Knots, Equivalent Airspeed
KGS	Kilograms
KHZ	Kilohertz (Kilocycles)
KIAS	Knots Indicated Airspeed
KW(S)	Kilowatt(s)
L	
L	Left
LAF	Load Alleviation Function
LAT	Latitude
LAT REV	Lateral Revision
LAV	Lavatory
LBS	Pounds
LCD	Liquid Crystal Display
LCN	Load Classification Number
LD	Load
LDA	Localizer-type Directional Aid
LDG	Landing
LDG ALT	Landing Altitude
LE	Leading Edge

L/G	Landing Gear
LGW	Landing Gross Weight
LH	Left Hand
LIM	Limit
LIM SPD	Limit Speed
LKD	Locked
LMM or MM	Localizer Middle Marker
LN	Left Nose
L NAV or LNAV	Lateral Navigation
LO	Low
LOC	Localizer
LOGO	Logographic
LOM	Locator Outer Marker
LON or LONG	Longitude
LP	Low Pressure
LPV	Localizer Performance with Vertical Guidance
LR	Long Range or Left Rear
LRC	Long Range Cruise
LRRA	Low Range Radio Altimeter
LRU	Line Replaceable Unit
LSB	Lower Side Band
LSU	Lavatory Service Unit
LSK	Line Select Key
LT	Light
LTRTL	Landing, Taxi, and Runway Turnoff Lights
LVL	Level

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LVL CHG or LVL/CHG	Level Change
LW	Left Wing
LWR	Lower
LWR CTR	Lower Center
LWR DSPLY or LWR DSPL	Lower Display
M	
M	Mach
MAC	Mean Aerodynamic Chord
MAG	Magnetic
MAHP	Missed Approach Holding Point
MAINT	Maintenance
MALF	Malfunction
MAN	Manual
MAP	Missed Approach Point
MASI	Mach/Airspeed Indicator
MAX	Maximum
MB	Millibar
MCC	Maintenance Control Center
MCDP	Maintenance Control and Display Panel
MCDU	Multi-purpose Control and Display Unit
MCO	Maintenance Carry Over
MCP	Mode Control Panel
MCT	Maximum Continuous Thrust
MCU	Modular Concept Unit

MDA	Minimum Descent Altitude
MDA(H)	Minimum Descent Altitude (Height)
MDM	Mechanical Dispatch Manual
MEA	Minimum Enroute Altitude
MED	Medium
MEL	Minimum Equipment List
MEW	Manufacturer's Empty Weight
MFD	Multifunction Display
MHZ	Megahertz
MI	Miles
MIC	Microphone
MIN	Minimum
MKR	Marker
MLS	Microwave Landing System
MLW	Maximum Landing Weight
MM	Middle Marker
MMO	Maximum Mach Operating Speed
MNPS	Minimum Navigation Performance Specification
MOCA	Minimum Obstruction Clearance Altitude
MOD	Modify or Module
MON	Monitor

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MORA	Minimum Off Route Altitude
MPH	Miles Per Hour
MSA	Minimum Safe Altitude
MSG	Message
MSGS RCVD	Messages Received
MSL	Mean Sea Level
M-SPD	Manual Speed
MSU	Mode Selector Unit
MTG	Miles To Go
MTOW	Maximum Take-Off Weight
MTRS	Meters
MTW	Maximum Taxi Weight
MU	Management Unit
MUH	Minimum Use Height
MUX	Multiplexer
MZFW	Maximum Zero Fuel Weight
N	
N	Normal
NAC	Nacelle
NADP	Noise Abatement Departure Procedures
NAR	North American Route
NAV	Navigation
NAV RAD	Navigation Radio
ND	Navigation Display
NEUT	Neutral
NEG	Negative

NGS	Nitrogen Generation System
NLG	Nose Landing Gear
NLT	No Later Than
NM	Nautical Mile(s)
NNC	Non-Normal Checklists
NNM	Non-Normal Maneuvers
NPS	Navigation Performance Scales
NORM	Normal
NW	Nose Wheel
NWS	Nose Wheel Steering
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
OBS	Observer
OCC	Operations Control Center
ODM	Operational Data Manual
OEW	Operating Empty Weight
OFST	Offset
OHU	Overhead Unit

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OM	Outer Marker
OP	Open
OPR	Operate
OPRN	Operation
OUTBD DSPL	Outboard Display
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
PB	Push Button
PBE	Protective Breathing Equipment
PCA	Power Control Actuation
PCP	Pilot Call Panel
PCU	Power Control Unit
PDC	Pitch Data Computer or Performance Data Computer or Pre-Departure Clearance or Pre-Departure Check
PDI	Pictorial Deviation Indication

PERF	Performance
PERF INIT	Performance Initialization
PES	Pitch Enhancement System or Passenger Entertainment System
PF	Pilot Flying
PFAF	Precision Final Approach Fix
PFC	Primary Flight Computer
PFD	Primary Flight Display
PI	Performance Inflight
PIP	Product Improvement Package
PLI	Pitch Limit Indicator
PLT(S)	Pilot(s)
PM	Pilot Monitoring
PMA	Permanent Magnet Alternator
PMC	Power Management Control
PNL	Panel
PO	Outside Air Pressure
POS	Position
POS INIT	Position Initialization
POS REF	Position Reference
PPH	Pounds Per Hour
PPI	Planned Position Indicator
PPOS	Present Position
PRES or PRESS	Pressure

PREV	Previous
PRI	Primary
PRAIM	Predictive Receiver Autonomous Integrity Monitoring
PRED	Prediction
PROC	Procedure
PROC T	Procedure Turn
PROG	Progress
PROT	Protection
PROX	Proximity
P/RST	Push To Reset
PRV	Pressure Regulating Valve
P/S	Pitot/Static
PSI	Pounds Per Square Inch
PSIG	Pounds per Square Inch Gage
PSS	Passenger Service System
PSU	Passenger Service Unit
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

QT	Quart
QTY	Quantity
R	
R	Right
RA	Radio Altitude or Resolution Advisory
RAAC	Rotor Active Clearance Control
RAD	Radio
RAIM	Receiver Autonomous Integrity Monitoring
RAT	Ram Air Temperature or Ram Air Turbine
RCL	Request for Clearance
RDMI	Radio Distance Magnetic Indicator
REC or RCDR	Recorder
RECIR or RECIRC	Recirculation
REF	Reference
RET	Retract
REV	Reverse
RF	Radius-to-Fix (RF) Legs or Refill
RMI	Radio Magnetic Indicator
RMP	Radio Management Panel
RON	Remain Overnight
RNAV or RNV	Area Navigation
RNP	Required Navigational Performance
RPL	Rudder Pressure Limiter

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RPM	Revolutions Per Minute
RPR	Rudder Pressure Reducer
RR	Rolls Royce
RSEP	Rudder System Enhancement Program
RST	Reset
RSV	Reserves
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
RWY	Runway
S	
SA	Special Authorization
SAAAR	Special Aircraft and Aircrew Authorization Required
SAARU	Secondary Attitude Air Data Reference Unit
SAT	Static Air Temperature or Satellite
SB	Service Bulletin
S/B	Speedbrake
SC	Single Chime
S/C	Step Climb
SCL	Secure Content Locker
SD	System Display

S/D	Step Descent
SDAC	System Data Acquisition Concentrator
SDCU	Smoke Detection Control Unit
SDF	Simplified Directional Facility
SEC	Spoiler Elevator Computer
SEI	Standby Engine Indicator
SEL	Select
SELCAL	Selective Calling
SENS	Sensitivity
SERV	Service
SFCC	Slat/Flap Control Computer
SG	Symbol Generator
SID	Standard Instrument Departure
SMGCS	Surface Movement and Guidance Control System
SPD	Speed
SPDBRK	Speedbrake
SPD LIM	Speed Limit
SPLR	Spoiler
SRS	Speed Reference System
STA	Station
STAB	Stabilizer
STAR	Standard Terminal Arrival Route
STAT or STS	Status
STAT INV	Static Inverter

STBY	Standby
STD	Standard
STRG	Steering
SW	Switch
SWTG	Switching
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
TCI	Thrust Computer Indicator
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
THS	Trimmable Horizontal Stabilizer
TK	Tank
TLA	Throttle Lever Angle
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
TO/GA or TOGA	Takeoff/Go-Around
TOGW	Takeoff Gross Weight
T-P	Turn Point
TPR	Turbine Pressure Ratio
TR	Traffic Resolution
TRK	Track
TRP	Thrust Rating Panel
TRU	Transformer Rectifier Unit
TURB	Turbine or Turbulence
U	
UNLK	Unlock
UNLKD	Unlocked

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UNSCHD or UNSCHED	Unscheduled
UPR DSPL	Upper Display
U.S.	United States
USB	Upper Side Band
UTC	Universal Time Coordinated
UTIL	Utility
V	
V	Volt
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
VFE	Maximum Velocity Flaps Extended
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
VSID	Vertical Speed Indicator Display
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
WHC	Window Heat Computer
WHL	Wheel
WPT	Waypoint
WT	Weight
WTB	Wing Tip Brake
WXR	Weather Radar
X	
X-FEED	Crossfeed
XFR	Transfer
XMTR	Transmitter
XPDR or XPNDR	Transponder
XTK	Cross Track
Z	
ZFCG	Zero Fuel Center of Gravity
ZFW	Zero Fuel Weight

Preface

Revision Record

Chapter P1

Section 4

Revision Notification 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
0	October 29, 2001	
2	December 24, 2001	
4	September 4, 2002	
6	January 13, 2003	
8	October 6, 2003	
10	January 12, 2004	
12	January 17, 2005	
14	August 8, 2005	
16	March 30, 2006	
18	December 4, 2006	
20	December 18, 2007	
22	October 31, 2008	
24	June 1, 2009	
26	October 1, 2009	
28	April 19, 2010	
30	March 4, 2011	
32	August 18, 2011	
34	November 7, 2012	

No.	Revision Date	Date Filed
1	November 27, 2001	
3	February 11, 2002	
5	November 25, 2002	
7	May 19, 2003	
9	December 29, 2003	
11	April 26, 2004	
13	April 25, 2005	
15	March 13, 2006	
17	August 28, 2006	
19	August 31, 2007	
21	June 9, 2008	
23	April 1, 2009	
25	August 1, 2009	
27	January 1, 2010	
29	September 8, 2010	
31	July 21, 2011	
33	January 5, 2012	
35	March 26, 2013	

No.	Revision Date	Date Filed
36	September 10, 2013	
38	October 7, 2014	
40	July 2, 2015	
42	December 17, 2015	

No.	Revision Date	Date Filed
37	June 17, 2014	
39	December 2, 2014	
41	August 27, 2015	
43	July 15, 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 be indicated with revision bars.

Chapter P1 - Preface

Section 2 - Introduction

Organization

P1.2.3 - Updated language due to addition of chapters 9 and 10 from the FCTM.

Section 3 - Abbreviations

P1.3.6 - Added ECM - Engine Condition Monitoring.

P1.3.7 - Added First Officer definition for the abbreviation F.

P1.3.7 - Added FAP - Final Approach Point.

P1.3.10 - Added LTRTL - Landing, Taxi, and Runway Turnoff Lights.

P1.3.11 - Changed LVL CH or LVL/CH to LVL CHG or LVL/CHG for Level Change.

P1.3.13 - Added Pre-Departure Check as a PDC definition.

Chapter L - Limitations

Section 10 - Operating Limitations

Operational Limitations

L.10.1 - Changed Delta Special Pages (Green Pages) to Company Pages.

Look-Ahead Terrain Alerting (GPWS)

L.10.11 - Deleted “Traffic Alert and Collision Avoidance System (TCAS)” section; language is now located in Chapter 7 of the FCTM.

Chapter NP - Normal Procedures

Section 11 - Normal Checklist Instructions

Normal Checklist Instructions

NP.11.1 - Added new section.

Section 12 - Operational Procedures

Automation Guidelines

NP.12.2 - Modified language in fourth bullet under Automation Guidelines.

NP.12.2 - Changed “verify” to “verbalize”.

NP.12.2 - Changed “PF” to “PM” for verifying that proper MCP selections have been set when an autopilot is not engaged and changed “verify” to “verbalize”.

Normal VHF Radio Management

NP.12.2 - Added section.

Standard Callouts

NP.12.4 - Added “Crews should focus on the aircraft state during the level-off period.”

NP.12.4 - Changed responsible crew member to F.

NP.12.5 - Added “Approximately” to 1,000 feet below each assigned altitude.

NP.12.6 - Removed ALL APPROACHES (ILS and Non-ILS) table; partial incorporation of FB 16-01.

NP.12.7 - Changed table title from “CAT I, II & III APPROACHES” to “AUTOLAND APPROACHES”.

NP.12.7 - Removed “Autoland approaches.”

NP.12.7 - Removed last three rows from “AUTOLAND APPROACHES” table; this information was duplicated and is located on the following page under “Non-ILS, CAT I, CAT II, & CAT III APPROACHES” table.

NP.12.9 - Added Standard Callouts table for GO-AROUND ALL APPROACHES.

Lights Usage

NP.12.12-13 - Added “(as installed)”.

NP.12.13 - Added “logo” to exterior lights not to be extinguished in flight above 18,000 feet.

Section 20 - Amplified Procedures

Interior Inspection - First Officer

NP.20.2 - Updated Required documents.

NP.20.2 - Added EFB Mounts...Check; Verify 3 EFB mounts on board.

Preflight Procedure - Pilot Flying

NP.20.13 - Removed the Cabin Altitude briefing.

Preflight Procedure - Pilot Monitoring

NP.20.15 - Added “Verify RADIO/INT PTT switch (as installed) selected to the neutral position.” under step for Observer’s Audio control panel.

NP.20.18 - Added effectivity for verifying that the OVERHEAT lights are extinguished.

NP.20.18 - Added guidance for ships 3856-3920 regarding WINDOW HEAT switches.

NP.20.18 - Removed effectivities for PROBE HEAT switches; all modifications are complete.

NP.20.24 - Deleted comment to accomplished GROUND PROXIMITY warning SYSTEM TEST on first flight of the day and on each crew change; redundant to the step and table for first flight of the day items.

NP.20.24 - Added Note: Push down firmly on top of the speed brake handle after ensuring it is all the way forward.

Preflight Procedure - Captain

NP.20.28 - Changed Delta Special Pages to Company Pages.

NP.20.29 - Updated Limitations altimeter reference.

NP.20.31 - Added “In addition to the guidance in the FOM, brief that flight attendants must firmly push down on all inside cabin door handles to prevent inadvertent unlocking.” for mitigating RTOs for DOORS lights.

Preflight Procedure – First Officer

NP.20.32 - Changed Delta Special Pages to Company Pages.

NP.20.33 - Updated Limitations altimeter reference.

Engine Start Procedure

NP.20.41 - In table, under engine start for FO, added information to address Airworthiness Directive 2015-19-03 regarding fuel spar valves.

NP.20.42 - In table, added indication for accomplishing Aborted Engine Start checklist if the FUEL SPAR VALVE CLOSED light does not change from dim to bright, and then extinguishes.

After Start Procedure

NP.20.44 - Modified language to “Receive and return the marshalling agent’s taxi salute.”

NP.20.44 - Changed Command, “FLAPS ____.” to Call “SALUTE RECEIVED, FLAPS ____.”

Before Takeoff Procedure

NP.20.52,54 - Partial incorporation of FB 16-01, Checklist and Automation Changes.

NP.20.52 - Removed row for “(PF) Accomplish a Takeoff briefing. Refer to FOM chapter 3.3, Takeoff Briefing.”

NP.20.54 - Moved Transponder step after step for Engine start switches.

Climb Procedure

NP.20.58 - Updated Altimeters step to “Set to standard and verbalize”.

NP.20.59 - Added comment to verbalize the altimeter setting.

Cruise Procedure

NP.20.60 - Added bullet “Verify/set RNP value for Oceanic airspace. Reference SP.11 for Manual Entry procedures.”

NP.20.61 - Added “...or as specified in the Company Pages”.

NP.20.62 - Changed Delta Special Pages to Company Pages.

NP.20.62 - Removed Fuel Crossfeed Valve Check prior to top of descent.

Descent Procedure

NP.20.63 - Added “and verbalize” to the Altimeters step.

NP.20.64 - Removed (ETOPS) Fuel Crossfeed Valve...Cycled...PM.

Approach Procedure

NP.20.65 - Added “and verbalize” to the Altimeters step.

Landing Procedure

NP.20.67 - Added “...and Automation Guidelines.” and removed Callouts listed in the Landing procedure table; partial incorporation of FB 16-01.

Go-Around Procedure

NP.20.69 - Partial incorporation of FB 15-05 Updated Go-Around Callouts.

Shutdown Procedure

NP.20.74-75 - Updated effectivity; all modifications are complete.

NP.20.75 - For Probe heat, removed OFF as a response.

NP.20.76 - Updated language for completing ACARS Postflight procedures.

NP.20.76 - Added IRS performance monitoring information regarding checking inertial drift rates on aircraft which operate in Class II airspace for more than one hour.

Chapter NOI - Normal Operational Information

Section 3 - Approach Guidance

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

NOI.3.2 - Added “/FAP” to section title.

NOI.3.2 - Added “,cleared for the approach,” and first bullet regarding STAR/RNAV STAR.

ILS CAT I - Approach Guide APP Mode

NOI.3.3 - Changed response for FMS approach procedure step to “Select” and added the following comment: “Verify waypoints, altitude constraints, and descent angle.”

SA ILS CAT I - Approach Guide APP Mode

NOI.3.5 - Changed response for FMS approach procedure step to “Select” and added the following comment: “Verify waypoints, altitude constraints, and descent angle.”

ILS CAT II or SA ILS CAT II - Approach Guide APP Mode

NOI.3.8 - Changed response for FMS approach procedure step to “Select” and added the following comment: “Verify waypoints, altitude constraints, and descent angle.”

ILS CAT III - Approach Guide APP Mode

NOI.3.11 - Changed response for FMS approach procedure step to “Select” and added the following comment: “Verify waypoints, altitude constraints, and descent angle.”

GPS, RNAV(GPS or GNSS), ILS (GS Out), LOC, LDA, LDA W/GS, LDA (GS Out), VOR, or NDB - Approach Guide APP Mode (IAN)

NOI.3.15 - Changed Delta Special Pages (Green Pages) to Company Pages.

NOI.3.15 - Changed response for FMS approach procedure step to “Select” and added the following comment: “Verify waypoints, altitude constraints, and descent angle.”

NOI.3.15 - Changed to bulleted format and updated language in second bullet to specify non-LOC based approaches.

NOI.3.16 - Updated autopilot disengage language to “No later than 100 feet AGL.”.

GPS, RNAV (GPS or GNSS), ILS (GS Out), LOC, LDA, LDA (GS Out), VOR, or NDB - Approach Guide LNAV or VOR/LOC & VNAV Modes - Optional

NOI.3.17 - Changed Delta Special Page (Green Page) to Company Pages.

NOI.3.17 - Changed response for FMS approach procedure step to “Select” and added the following comment: “Verify waypoints, altitude constraints, and descent angle.”

NOI.3.17 - Added bullet regarding STAR/RNAV STAR.

NOI.3.18 - Updated autopilot disengage language to “No later than 100 feet AGL.”.

RNAV (RNP) - Approach Guide LNAV & VNAV Modes

NOI.3.19 - Changed response for FMS approach procedure step to “Select” and added the following comment: “Verify waypoints, altitude constraints, and descent angle.”

NOI.3.19 - Added bullet regarding STAR/RNAV STAR.

NOI.3.20 - Under Speed Intervention, added “165 knots maximum or published lower airspeed from FAF to DA.”

NOI.3.20 - Updated autopilot disengage language to “No later than 100 feet AGL.”.

ILS (GS Out), LOC, LDA, LDA (GS Out), VOR, or NDB Approach Guide LNAV, VOR LOC, or HDG SEL & V/S Modes

NOI.3.24 - Updated autopilot disengage language to “No later than 100 feet AGL.”.

ILS Precision Runway Monitor (PRM) Considerations

NOI.3.25 - Added Note: If conducting an AIII approach, select PRI or IMC to regain HUD Flight Director guidance.

Charted Visual Approach Guide (Procedure in FMS Database) LNAV & VNAV Modes

NOI.3.26 - Changed Delta Special Pages (Green Pages) to Company Pages.

NOI.3.26 - Changed response for FMS approach procedure step to “Select” and added the following comment: “Verify waypoints, altitude constraints, and descent angle.”

Circling Maneuver

NOI.3.28 - Updated autopilot disengage language to “No later than 100 feet AGL.”.

Chapter SP - Supplementary Procedures

Section 05 - Introduction

General

SP.05.1 - Updated for cross fleet standardization.

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

Flight Deck Access System Test

SP.1.1 - Modified step for FLIGHT DECK ACCESS SYSTEM switch.

Tail Stand Operations

SP.1.11 - Revised language for clarity.

Section 2 - Air Systems

Automatic Pressurization Control – Landing Airport Elevation Above 6000 Feet With HIGH ALT LDG Switch

SP.2.6 - Corrected 12,500 feet to 12,650 feet.

CHECK AIR COND PANEL Message

SP.2.6 - Added new section.

Unpressurized Takeoff and Landing

SP.2.8 - Added Note: A CHECK AIR COND PANEL message may be generated 4 minutes after takeoff.

No Engine Bleed Takeoff and Landing

SP.2.10 - Added Note: A CHECK AIR COND PANEL message may be generated 4 minutes after takeoff.

Section 3 - Anti-Ice, Rain

Window Heat System Tests

SP.3.1-2 - Added guidance for ships 3856-3920 regarding WINDOW HEAT switches.

Section 5 - Communications

Aircraft Communication Addressing and Reporting System (ACARS)

SP.5.7 - Added (The DEPT page does not have a print prompt.)

SP.5.9 - Removed reference to DEPT page.

Cabin Medical Communications System

SP.5.50 - Under HF, observer's audio panel, changed step to "HF # 1 or HF # 2 (as installed) MIC Selector Switch...Push".

SP.5.50 - Under HF, observer's audio panel, changed step to "HF # 1 or HF # 2 (as installed) Receiver Switch volume...Set".

HF System Test

SP.5.61 - Added (if installed).

SP.5.61 - Added "and counterclockwise to decrease sensitivity, and reduce noise and static".

SP.5.61 - Relocated Note.

SP.5.61 - Added Microphone "transmit" Switch.

SP.5.61 - Changed to Press and release.

SP.5.61 - Updated language in Note to include: "A short tone indicates a previously tuned station still in memory. When the HF antenna is properly tuned, the 1,000 Hz ceases and the HF system is ready to transmit."

SP.5.61 - Added "Listen for other traffic on same frequency."

SP.5.61 - Changed "Release" to "Press" for Microphone transmit switch.

SP.5.62 - Added "Attempt to transmit".

SP.5.62 - Added Note.

SP.5.62 - Removed HF Sensitivity step.

SP.5.62 - Added "Reception is successful when a second party transmission is received."

SP.5.62 - Added "If unsuccessful, re-attempt on back-up frequency."

Pitch Awareness Report

SP.5.62 - Removed "Possible Depressurization Condition message" section.

Section 11 - Flight Management, Navigation

RNP Manual Entry Procedures

SP.11.14 - Added new section.

Vertical Navigation (VNAV)

SP.11.27 - Updated effectivity.

SP.11.28 - Removed effectivity.

SP.11.28 - Grammar correction.

SP.11.28 - Changed MCP speed to IAS/MACH.

Critical Terrain Box FMS Loading Procedures

SP.11.34 - Added new section.

Section 12 - Fuel

Fuel Crossfeed Valve Check

SP.12.6 - Updated section to standardize with Boeing.

Section 16 - Adverse Weather

Cold Weather Operation

SP.16.9 - Changed COWL OPEN to COWL VALVE OPEN.

SP.16.11 - Changed Delta Special Page to Company Pages.

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

SP.16.16,19 - Added A321.

SP.16.18 - Updated Dry Snow when determining the contaminate depth from <1.0 inches to ≤1.0 inches. Added A321.

Ground De/Anti-Icing Procedure

SP.16.21 - Revised captain's response on the pre-gate departure communication to include the ship number.

Remote (Engine(s) Running)

SP.16.31 - Changed Delta Special Pages (Green Pages) to Company Pages.

SP.16.31 - Revised the pre-de/anti-icing (to include forced air) communication to include the deicer asking and the captain confirming that engines are at idle.

Cold Soaked Fuel Frost (CSFF)

SP.16.35 - Added new section.

Chapter DF - Differences

Section 10 - 737 Differences

Aircraft General, Emergency Equipment, Doors, Windows

DF.10.2 - Formatting corrections.

Air Systems

DF.10.3 - Auto Probe Heat is installed on all aircraft; removed from table.

Warning Systems

DF.10.10 - Removed rows for Cabin Altitude Warning Light and Takeoff Config Warning Light; modifications complete for all aircraft.

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Preface

Chapter P1

List of Effective Pages - FAA Approved

Section 5

Page	Date
Volume 1	
* Title Page	July 15, 2016
* Blank	July 15, 2016
Preface (tab)	
* P1.TOC.0.1-2	July 15, 2016
* P1.1.1-6	July 15, 2016
* P1.2.1-6	July 15, 2016
* P1.3.1-18	July 15, 2016
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Limitations
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Limitations

Operating Limitations

Chapter L

Section 10

General

The 737NG aircraft must be operated in compliance with the 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 other chapters of this manual, into the Vol. 2, or into the QRH are identified with an [AFM] tag.

Note: The pound 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 Limitations

General Operating Limits

	3601 - 3610	3701 - 3773	3801 - 3900
# Maximum Takeoff and Landing Tailwind Component	10 knots, or as permitted by Company Pages		
# Maximum Operating Altitude	41,000 ft.		
# Maximum Takeoff and Landing Altitude	10,000 ft.	8,400 ft.	8,400 ft.

Maximum Operating Latitudes

Maximum flight operating latitude – 82° North and 82° South, except for the region between 80° West and 130° West longitude, the maximum flight operating latitude is 70° North, and the region between 120° East and 160° East longitude, the maximum flight operating latitude is 60° South.

Overwing Exits

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

Non-AFM Operational Information

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

Escape Slide Girt Bar

Whenever passengers are carried, the escape slide retention bar (girt bar) must be installed during taxi, takeoff and landing.

HF Radio

Do not operate HF radios during refueling operations.

Crosswind

The Delta 737 crosswind limit is 33 knots for takeoff or landing, including gusts.

Note: The crosswind component may be further limited by low visibility approaches, autolands, contamination, or runway width.

Note: Refer to SP.16, Guidelines for Contaminated Runways.

Penetration Airspeed

Severe turbulent air penetration speed is 280 KIAS/.76M.

Maximum Weight Limitations

Weights	3601 - 3610	3701 - 3773	3801 - 3900
Maximum Taxi Weight (MTW)	155,000	174,900	188,200
Maximum Takeoff Weight (MTOW)	154,500	174,200	187,700
Maximum Landing Weight (MLW)	129,200	146,300	157,300
Maximum Zero Fuel Weight (MZFW)	121,700	138,300	149,300

3601 - 3610

Note: Minimum Takeoff Weight – 125,000 lbs. (with 26K full rate thrust). Lower minimum takeoff weights that account for the actual pressure altitude and outside air temperature may be authorized using the WDR

Air Systems

Pressurization

Maximum cabin differential pressure (relief valves) is 9.1 PSI.

Maximum differential pressure for takeoff and landing is 0.125 PSI (236 feet below airport pressure altitude).

Non-AFM Operational Information

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

Operating Differential Pressure

Normal operating differential pressure is allowed within the amber band.

Air Conditioning Packs

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

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

Anti-Ice, Rain

Engines

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

Wings

Do not operate wing anti-ice on the ground when the OAT is above 10° C (50° F).

Autopilot/ Flight Director System

Autopilot

- # Use of aileron trim with the autopilot engaged is prohibited.
- # Do not engage the autopilot for takeoff below 400 feet AGL.
- # For single channel operation during approach, the autopilot shall not remain engaged below 50 feet AGL.
- # Do not use the autopilot below 100 feet RA at airport pressure altitudes above 8400 feet.

Do not use Integrated Approach Navigation (IAN) Final Approach Course (FAC) or Glide Path (G/P) guidance under either of the following conditions:

- The flight crew has entered an AT or AT/BELOW altitude constraint for a final approach fix, or for waypoints between a final approach fix and a runway
- Any altitude constraint specified by the approach procedure for a final approach fix, or for waypoints between a final approach fix and a runway, has been modified by the flight crew, after the aircraft has passed the initial approach fix.

Autoland

Wind Speeds

Maximum allowable wind speeds for autoland operations:

# Headwind	25 knots
# Crosswind	20 knots
# Tailwind	10 knots

Flap Settings

The autoland capability may only be used with flaps 30 or 40 and both engines operative.

Autoland capability may not be used to runways above 8,400 ft pressure altitude.

Electrical

On the ground, limit one generator (engine driven) operation to a maximum of 75KVA (215 amps).

Communications

VHF

ATC Communications

3701 - 3707

Do not use VHF-3 for ATC communications if audio entertainment system is in use.

3725 - 3740, 3745 - 3760

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

HF

3701 - 3715

If one HF radio is selected for transmission, deselect the other HF radio on all audio select panels.

Prohibited Frequencies

3701 - 3773

Flights predicated on the use of the following frequencies are prohibited:

- 29.490 MHz
- 29.489 MHz

3701 - 3773

Flights predicated on the use of the following HF frequencies are prohibited:

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

3725

Flights predicated on the use of HF frequency 16.141 MHz are prohibited.

3733

Flights predicated on the use of HF frequencies 9.673 and 9.674 MHz are prohibited.

Aircraft Communications Addressing and Reporting System/Data Link

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

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

However, Pre-Departure Clearance, Digital Automatic Terminal Information Service, Oceanic Clearances, Weight and Balance and Takeoff Data messages can be transmitted and received over ACARS/Data Link if they are verified per approved operational procedures.

Non-AFM Operational Information

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

Satellite Communications (SATCOM)

3601 - 3603

The Iridium Sat-Phone System (SATCOM) is approved for supplemental use only. The system is not intended to replace the function of required HF or VHF communication systems.

Engines, APU

Engines

Engine Limit Display Markings

Maximum and minimum limits are red.

Caution limits are amber.

Note: The published operating limits for engines relate to predefined normal and abnormal operations. However, if any crew finds itself in a life-threatening situation which requires an application of thrust beyond the certified takeoff limits, they can feel confident that the engine(s) will operate satisfactorily for whatever reasonable time is required to maintain safe control of the aircraft.

EGT Limits

Takeoff	Top of Amber Arc (5 Minutes) *
Maximum Continuous	Top of White Arc
Starting - Ground/Flight	EGT Start Limit Line

* 10 minutes allowed in the event of loss of thrust on one engine during takeoff.

Engine Ignition

Engine ignition must be on for:

- takeoff
- landing
- operation in heavy rain
- anti-ice operation.

Engine Oil

If engine oil pressure is in the yellow band with takeoff thrust set, do not takeoff.

Engine Starter Duty Cycle

Limit each start attempt to a maximum of 2 minutes.

A minimum of 10 seconds is required between start attempts.

Reverse Thrust

Reverse thrust is for ground use only.

APU

Operating Altitudes

Inflight - APU bleed + electrical load: maximum altitude 10,000 ft.

APU bleed: maximum altitude 17,000 ft.

Flight Controls

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

Holding in icing conditions with flaps extended is prohibited.

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

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

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

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

Alternate flap duty cycle:

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

Flight Instruments, Displays

Heads Up Display (HUD)

Maximum allowable crosswind for HUD guided takeoffs is 10 knots.

Approach, AIII Mode

Maximum allowable wind speeds for HUD AIII operations:

# Headwind	25 knots
# Crosswind	15 knots
# Tailwind	10 knots

HUD AIII mode may not be used to runways above 8,400 feet pressure altitude.

For manual CAT II or CAT III approach and landing, AIII mode must be selected and the autopilot (A/P) and autothrottle (A/T) must be disengaged prior to 500 feet above TDZE.

Landing flaps 30 or 40 with both engines operative.

Landing flaps 15 with one engine operative.

Do not use at latitudes greater than 85° latitude.

Non-AFM Operational Information

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

Altimeters

Altitude Display Limits for RVSM Operations

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

Field Elevation	Max Difference Between Captain & F/O	Max Difference Between Captain or F/O & Field Elevation
Sea Level to 5,000 feet	50 feet	75 feet
5,001 to 10,000 feet	60 feet	75 feet

The maximum allowable in-flight difference between Captain and First Officer altitude displays is 200 feet.

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

Flight Management, Navigation

Air Data Inertial Reference Unit (ADIRU)

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

QFE Selection

The use of LNAV and VNAV with QFE selected is prohibited.

The use of Vertical Situation Display during QFE operation is prohibited.

3772 - 3773, 3801-3900

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

Non-AFM Operational Information

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

Weather Radar

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

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

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

Fuel System

Prohibited Fuel Types

The use of Wide Cut Fuels per Class B of GE Specification D50TF2, JP-4 or Jet B, is prohibited.

Temperatures

Maximum tank fuel temperature: 49°C.

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

Fuel Balance

Lateral imbalance between main tanks 1 and 2 must be scheduled to be zero. Random fuel imbalance must not exceed 1,000 lbs for taxi, takeoff, flight or landing.

Warning Systems

Look-Ahead Terrain Alerting (GPWS)

Do not use the terrain display for navigation.

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

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

Note: Crews will be notified of airports not included in the database via EFCB or flight plan remarks.

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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, alerts are the primary means of alerting the flight crew to non-normal conditions or incorrect configurations.

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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 an event such as a taxi delay 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.

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.

First Flight of the Day and After Shutdown Reminders

The Normal Checklist (hardcard) includes first-flight-of-the-day and after shutdown reminders. They are on the hardcard as a convenient means to recall tasks that may have to be performed.

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 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 for panel lights 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, Approach Changes, or Go-Around

A ■ indicates items that should be considered for re-accomplishment in the event of a runway, intersection, departure, performance data, approach change, 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 runway/departure change items. 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 runway/approach change items. 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.

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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:

- VHF1 should be used for communications with ATC.
- VHF 2 should be used for communications with ramp control, station operations, and other company communications. When VHF 2 is not used for ramp or company communications, a listening watch on 121.5 should be maintained as conditions permit.
- VHF 3 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 Policy

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 THR HLD annunciated	PM	“80 KNOTS, THROTTLE HOLD, THRUST NORMAL”
At V1	PM	“V1”
At VR	PM	“ROTATE”
At positive rate of climb	PM	“POSITIVE RATE”

HUD GUIDED TAKEOFF		
Condition	Crew Member	Callout
Monitor runway centerline on PFD and visually (if able) until reaching VR.	F	“STEER LEFT” or “STEER RIGHT”

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)

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AUTOLAND APPROACHES		
Condition	Crew Member	Callout
When annunciated FLARE armed. No later than 500 feet RA	PM	“FLARE ARMED”

HUD APPROACHES (AIII MODE)		
Condition	Crew Member	Callout
• When AIII is flashing on HUD combiner.	C	“SELECT AIII”
• When AIII is displayed on the HUD combiner.	C	“AIII”
• When green AIII is annunciated on the HUD annunciator panel.	F	“AIII ON THE RIGHT”
Above 500 feet AFE:		
• If NO AIII is displayed on HUD combiner.	C	“NO AIII”
• If green AIII annunciation is lost on HUD annunciator panel.	F	“NO AIII”

HUD APPROACHES (AIII MODE)		
Condition	Crew Member	Callout
Below 500 feet AFE:		
If green AIII annunciation is lost and/or red APCH WARN is annunciated on the HUD annunciator panel.	F	“APPROACH WARN”
If NO AIII and/or APCH WARN is displayed on the HUD combiner, and runway is not in sight.	C	“GO AROUND”
When FLARE is annunciated green on the HUD annunciator panel.	F	“FLARE ALIVE”

Non-ILS, CAT I, CAT II, & CAT III 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, announce 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.	

Clearance Type	Action	
	PF	PM
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.	
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. • POSITION lights - STEADY • LOGO lights - ON
Engines running/aircraft moving	Anti-collision lights (beacons) illuminated immediately prior to aircraft movement or engine start, whichever occurs first. • ANTI-COLLISION lights - ON
Taxiing	Taxi light illuminated when moving or intending to move. • TAXI light - AUTO
Crossing a runway	All exterior lights illuminated. Note: Avoid using LANDING and STROBE lights if they will adversely affect the vision of other pilots. • LANDING lights - ON • RUNWAY TURNOFF lights - ON • POSITION lights - STROBE & STEADY • WING 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. • RUNWAY TURNOFF lights - ON • TAXI light - AUTO • POSITION lights - STROBE & STEADY • WING lights - ON
Takeoff	All exterior lights illuminated. • LANDING lights - ON
In flight (at 10,000 feet)	When accelerating through 250 KIAS, set the RETRACTABLE LANDING light switches (as installed) to RETRACT.

Phase of Flight	Lights Usage
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 • WING lights - OFF • LANDING lights - OFF
In flight (below 18,000 feet)	All exterior lights illuminated. Note: Delay extending the RETRACTABLE LANDING lights (as installed) until the aircraft slows through 250 knots. Note: The TAXI light may remain OFF until landing clearance has been received. • LANDING lights - ON • RUNWAY TURNOFF lights- ON • WING LIGHT - ON

Note: LANDING lights may be retracted if necessary to reduce airframe vibration.

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.

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Normal Procedures

Chapter NP

Amplified Procedures

Section 20

Interior Inspection - First Officer

Normally the first officer 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).

FLIGHT DECK ACCESS SYSTEM switch OFF
Guard up, switch up.

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.

Quantities Check

Check the following are sufficient for flight:

- minimum oxygen pressure 1,000 psi;
- hydraulic quantities: no RFs displayed;
- engine oil quantities 12 quarts min.

Required documents Check

- Aircraft Logbook
- Normal Checklists (2)
- 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, and
 - 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;
3701 - 3771
 - ELT - ARMED;
 - Verify properly stowed and the mode switch is in the ARMED position.
3601 - 3610, 3772 - 3773, 3801 - 3900
 - ELT switch - guard closed;
 - Verify the switch guard closed and the ELT light is extinguished.

Jumpseat Secure

Crew luggage Secure

Printer paper Check

Verify printer paper quantity, including spare rolls, is sufficient for the duration of the flight.

Manual gear extension access door Closed

Exterior Inspection - Captain or First Officer

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:

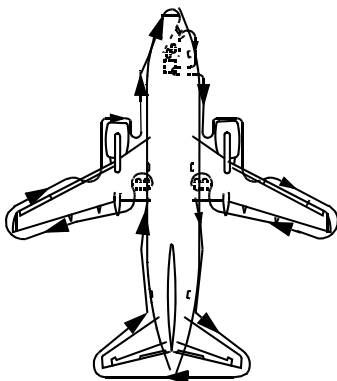
- tread groove is worn completely around the tire;
- tires are worn beyond limits, damaged, or tread is separating;
- layer of cord is showing;
- questionable cut exists;

- 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:

Inspection Route



Left Forward Fuselage

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

Nose

Radome Check
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 wheel spin brake In place

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
Nose wheel steering assembly...	Check
Nose gear steering lockout pin	As required

If towbar is attached, towing lever set to bypass, pin installed.

Right Forward Fuselage

Probes, sensors, ports, vents, and drains (as applicable)	Check
Doors and access panels (not in use)	Latched
Exterior lights	Check
Oxygen pressure relief green disc	In place

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
Fuel sticks	Check
Ram air deflector door	Extended
Leading edge flaps	Check

Number 2 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
Fuel sticks	Check
Leading Edge Slats	Check

Right Wing Tip and Trailing Edge

Exterior lights	Check

B737-900ER with SSW

Ventral strake	Check

Note: If ventral strake is missing or damaged, contact maintenance.

Static discharge wicks	Check
Control surfaces	Check
Flaps and fairings	Check

Right Landing Gear and Wheel Well

Tires, brakes and wheels	Check
Gear strut, actuators, and doors	Check
Hydraulic lines and electrical wires	Check
APU FIRE CONTROL handle	Up
3601 - 3610, 3701 - 3771 (as installed), 3772 - 3773, 3801 - 3900	
NGS operability indicator light	Green
Gear pin	Removed

Right Aft Fuselage and Upper Wing Surface

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

3701 - 3773, 3801 - 3900

Tail skid	Check

Left 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

Left Landing Gear and Wheel Well

Gear strut, actuators, and doors	Check
Hydraulic lines and electrical wires	Check
Tires, brakes and wheels	Check
Gear pin	Removed

Left Wing Tip and Trailing Edge

Exterior lights	Check
B737-900ER with SSW	
Ventral strake	Check
Note: If ventral strake is missing or damaged, contact maintenance.	
Static discharge wicks	Check
Flaps and fairings	Check
Control surfaces	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

Number 1 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
Ram air deflector door	Extended
Leading edge flaps	Check

Left Forward Fuselage

Doors and access panels (not in use)	Latched
Probes, sensors, ports, vents, and drains (as applicable)	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 not available, refer to SP.11, 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).

IRS Panel Set

IRS realignment is required for every flight.

Refer to SP.11, IRS.

The UNABLE REQD NAV PERF-RNP message may show until IRS alignment is complete.

Note: Full alignment is required on all Class II navigation flights and for first flight of the day. Other flights only require fast realignment.

ACARS Set

Refer to SP.5, ACARS Initialization.

Note: On datalink aircraft, do not initialize the ACARS until ready to upload and accept the flight plan and other associated data.

FMS Set

IDENT page – Check

- Verify the aircraft MODEL and ENG RATING.
- Verify the NAV DATA (DAL2)
- Verify that the current database is active based upon the local date of departure.

POS INIT page – Select

- Enter position information.
- Verify GMT is correct.

If datalink is unavailable, refer to SP.5.

RTE page Select
When ROUTE UPLINK READY message is displayed in
scratchpad:

LOAD (6L) - Select

ACTIVATE - Select

EXECUTE - Select

Note: The route uplink includes only the main body of the planned route. Always complete the route - by manually adding the departure runway, SID, and STAR - before loading any wind data.

PERF INIT page Select
When PERF INIT UPLINK READY message is displayed in
scratchpad:

LOAD (6L) - Select

EXEC - Select

LEGS page Select
RTE DATA (6R) - Select
When CRZ WIND UPLINK READY message is displayed in
scratchpad:

LOAD (6L) - Select

EXEC - Select

DES page Select
When FORECAST UPLINK READY message is displayed in
scratchpad:

FORECAST (6L) - Select

LOAD (6R) - Select

EXEC - Select

Departure briefing..... Complete

Refer to FOM, chapter 3, Briefings.

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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).

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 Test	SP.1
Flight Deck Access System Test	SP.1
Flight Recorder	SP.10
GPWS/Windshear	SP.15
Transponder/TCAS	SP.11/SP.15

Note: The GPWS/Windshear test is required on each crew change.

MACH AIRSPEED WARNING

TEST switches Push, one at a time

Verify clacker sounds.

FLIGHT RECORDER panel Check

Verify switch in NORMAL position, guard down, OFF light illuminated.

Note: OFF light extinguishes on engine start.

STALL WARNING TEST switches Push

Verify control column vibration when each switch is pushed.

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

WARNING: Do not establish hydraulic power which will result in flap movement unless the wing/flap area has been cleared of personnel and equipment. Use an outside observer.

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

Observer’s Audio control panel Set

Verify RADIO/INT PTT switch (as installed) selected to the neutral position.

ENGINE panel Set

Verify that the REVERSER lights are extinguished.

Verify that the ENGINE CONTROL lights are extinguished.

EEC switches – ON

ALTN lights – Extinguished

CREW OXYGEN pressure indicator Check

Verify 1,000 PSI minimum pressure for dispatch requirements.

Oxygen panel Set

CAUTION: Switch activation will cause deployment of passenger oxygen masks.

PASS OXYGEN switch – Guard closed

Verify that the PASS OXY ON light is extinguished.

Landing gear indicator lights Verify illuminated

SERVICE INTERPHONE switch As required

DOME WHITE switch As desired

GPS light Verify extinguished

3601 - 3610, 3772 - 3773, 3801 - 3900

ILS light Verify extinguished

3601 - 3610, 3772 - 3773, 3801 - 3900

GLS light Verify extinguished

PSEU light Verify extinguished

Flight control panel Check

FLT CONTROL switches – Guards closed

Verify that the flight control LOW PRESSURE lights are illuminated.

Flight SPOILER switches – Guards closed

YAW DAMPER switch – ON

Verify that the YAW DAMPER light is extinguished.

Verify that the standby hydraulic LOW QUANTITY light is extinguished.

Verify that the standby hydraulic LOW PRESSURE light is extinguished.

Verify that the STBY RUD ON light is extinguished.

ALTERNATE FLAPS master switch – Guard closed

ALTERNATE FLAPS position switch – OFF

Verify that the FEEL DIFF PRESS light is extinguished.

Verify that the SPEED TRIM FAIL light is extinguished.

Verify that the MACH TRIM FAIL light is extinguished.

Verify that the AUTO SLAT FAIL light is extinguished.

NAVIGATION panel Set

VHF NAV transfer switch – NORMAL

IRS transfer switch – NORMAL

-
- FMC source select switch – NORMAL
 - DISPLAYS panel Set
 - SOURCE selector – AUTO
 - CONTROL PANEL select switch – NORMAL
 - Fuel panel Set
 - Verify that the ENG VALVE CLOSED lights are illuminated dim.
 - Verify that the SPAR VALVE CLOSED lights are illuminated dim.
 - Verify that the FILTER BYPASS lights are extinguished.
 - CROSSFEED selector – Closed
 - Verify that the VALVE OPEN light is extinguished.
 - FUEL PUMPS switches – OFF
 - Verify that the center tank fuel pump LOW PRESSURE lights are extinguished.
 - Verify that the main tank fuel pump LOW PRESSURE lights are illuminated. [AFM]
 - Electrical panel Set
 - BAT switch – Guard closed
 - CAB/UTIL power switch – ON
 - IFE/PASS SEAT power switch – ON
 - STANDBY POWER switch – Guard closed
 - Verify that the STANDBY PWR OFF light is extinguished.
 - Verify that the BAT DISCHARGE light is extinguished.
 - Verify that the TR UNIT light is extinguished.
 - Verify that the ELEC light is extinguished.
 - Generator drive DISCONNECT switches – Guards closed
 - Verify that the DRIVE lights are illuminated.
 - BUS TRANS switch – Guard closed

Verify that the TRANSFER BUS OFF lights are extinguished.

Verify that the SOURCE OFF lights are extinguished.

Verify that the GEN OFF BUS lights are illuminated.

CIRCUIT BREAKER and PANEL light controls As desired

EQUIP COOLING switches NORM

Verify that the OFF lights are extinguished.

EMER EXIT LIGHTS switch Guard closed

Verify that the NOT ARMED light is extinguished.

Passenger signs Set

FASTEN BELTS switch – ON

Windshield WIPER selectors PARK

Verify that the windshield wipers are stowed.

WINDOW HEAT switches ON

Position switches ON at least 10 minutes before takeoff.

3601-3610, 3701-3773, 3801-3855

Verify that the OVERHEAT lights are extinguished.

3856-3920

Verify that the OVERHEAT lights extinguish within 5 seconds.

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

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

Window heat tests As desired

Refer to SP.3, Window Heat System Tests.

PROBE HEAT switches AUTO

Refer to SP.16, Adverse Weather section.

TAT TEST As desired

Refer to SP.10, Total Air Temperature test.

WING ANTI-ICE switch OFF

Verify that the VALVE OPEN lights are extinguished.

ENG ANTI-ICE switches OFF

Verify that the COWL ANTI-ICE lights are extinguished.

Verify that the COWL VALVE OPEN lights are extinguished.

Hydraulic panel.....Set

ENG 1 and ENG 2 hydraulic pumps switches – ON

Verify that the LOW PRESSURE lights are illuminated.

ELEC 1 and ELEC 2 hydraulic pumps switches – OFF

Verify that the OVERHEAT lights are extinguished.

Verify that the LOW PRESSURE lights are illuminated.

COCKPIT VOICE RECORDER Check

Refer to SP.5, Cockpit Voice Recorder Test.

Pressurization indicators Check

Cabin DIFF PRESS – Zero

CABIN ALT – Field elevation

Rate of CABIN CLIMB – Zero

3601 - 3610

HIGH ALT LDG switch OFF

Verify that the INOP light is extinguished.

If departure airport elevation is above 8,400 feet:

Refer to SP.2, Automatic Pressurization Control -
Departure Airport Elevation Above 8400 Feet.

Air conditioning panel Set

AIR TEMP source selector – As needed

3701 - 3773, 3801 - 3900

TRIM AIR switch – ON

3601 - 3610

Verify that the DUCT OVERHEAT lights are extinguished.

3701 - 3773, 3801 - 3900

Verify that the ZONE TEMP lights are extinguished.

Temperature selectors – As needed

Verify that the RAM DOOR FULL OPEN lights are illuminated.

3601 - 3610

RECIRC FAN switch – AUTO

3701 - 3773, 3801 - 3900

RECIRC FAN switches – AUTO

Engine BLEED air switches – ON

3601 - 3610

Verify that the PACK TRIP OFF lights are extinguished.

3701 - 3773, 3801 - 3900

Verify that the PACK lights are extinguished.

Verify that the WING–BODY OVERHEAT lights are extinguished.

Verify that the BLEED TRIP OFF lights are extinguished.

If a ground air conditioning/heating source is available:

Refer to SP.2, Air Conditioning/Heating with Ground
Conditioned Air.

If APU bleed air is required for air conditioning/heating:

Refer to SP.2, Air Conditioning/Heating with APU
Pneumatic Air.

If pneumatic air cart is required for air conditioning/heating:

Refer to SP.2, Air Conditioning/Heating with Ground
Pneumatic Air Cart.

Cabin pressurization panel Set

Verify that the AUTO FAIL light is extinguished.

Verify that the OFF SCHED DESCENT light is extinguished.

FLT ALT indicator – Cruise altitude

LAND ALT indicator – As required

If landing at an airport with a field elevation below 6,000 feet:

Set destination field elevation.

If landing at an airport with a field elevation above 6,000 feet:

Refer to SP.2, Automatic Pressurization Control -
Landing Airport Elevation Above 6000 Feet.

Pressurization mode selector – AUTO

Verify that the ALTN light is extinguished.

Verify that the MANUAL light is extinguished.

Lighting panel Set

LANDING light switches – RETRACT and OFF

RUNWAY TURNOFF light switches – OFF

TAXI light switch – OFF

ENGINE START switches OFF

Ignition select switch IGN L or R

Ignition selector should be positioned to IGN L for captain's leg and
IGN R for first officer's leg.

Use IGN R for first flight of the day to ensure ignition is available
using standby power.

Lighting panel Set

POSITION light switch – STEADY

ANTI COLLISION light switch – OFF

WING illumination switch – OFF

WHEEL WELL light switch – OFF

3601 - 3610, 3772 - 3773, 3801 - 3900

LOGO light switch – As required

Mode control panel Set

When selecting a value on the MCP, ensure the corresponding display
on the instrument panel changes, if applicable.

COURSE(S) – Set and crosscheck

F/D switches – ON

Move the switch for the pilot flying to ON first.

A/T switch – OFF

IAS/MACH selector – Set

Set V2 if preliminary information is available.

HEADING – Set runway or departure heading, if known.

Bank angle limit – 30

ALTITUDE – Initial assigned altitude, if known.

A/P – Disengaged

Light test Test

Master LIGHTS TEST and DIM switch – As desired

- Use scan flow to check all lights flashing or illuminated.
- Use individual test switches or push-to-test feature to check appropriate lights which do not illuminate during the light test.
- The fire warning lights are not checked during this test.

3701 - 3771

Standby instruments Check

Standby horizon – Set

Gyro caging control – Pull, then release

Approach mode selector – OFF

Verify that the flight instrument indications are correct.

Verify that no flags are shown.

Standby altimeter – Set

Verify that the flight instrument indications are correct.

Verify that no flags are shown.

3601-3610, 3772 - 3773, 3801 - 3900

Integrated standby flight display Set

Verify that the approach mode display is blank.

Set the altimeter.

Verify that the flight instrument indications are correct.

Verify that no flags or messages are shown. [AFM]

Engine display control panel Set

N1 SET selector – AUTO

SPD REF selector – AUTO

FUEL FLOW switch – RATE

Move switch to RESET, then RATE.

AUTO BRAKE select switch RTO

Verify that the AUTO BRAKE DISARM light is extinguished.

ANTISKID INOP light Verify extinguished

Brake pressure 2,800 PSI minimum

WARNING: Do not establish hydraulic power which will result in flap movement unless the wing/flap area has been cleared of personnel and equipment. Use an outside observer.

If brake pressure is below 2,800 PSI:

System B ELECT 1 HYD PUMP switch – ON.

When the brake pressure indicator reaches 2,800 PSI, or greater:

System B ELECT 1 HYD PUMP switch – OFF.

Engine instruments Check

MFD ENG switch – Push

Note: EGT, fuel flow, oil pressure, and oil temperature pointers and digital readouts are not displayed until the ENGINE START switch is moved to GRD.

Primary and secondary engine indications – Normal

- engine indications display existing conditions;
- no exceedance values are displayed;
- minimum engine oil quantity for dispatch: 12 quarts;
- START VALVE OPEN alert – extinguished;

- OIL FILTER BYPASS alert – extinguished; and
- LOW OIL PRESSURE alerts – illuminated.

Note: Minimum oil quantity reading is determined prior to pushback or engine start, whichever occurs first.

MFD SYS switch - Push

HYDRAULIC QTY indicators – No RF indication displayed

LANDING GEAR lever DN, 3 Green

GROUND PROXIMITY warning SYSTEM TEST As required

Refer to SP.15, GPWS/Windshear Test.

GROUND PROXIMITY panel Check

FLAP INHIBIT switch – Guard closed

GEAR INHIBIT switch – Guard closed

TERR INHIBIT switch – Guard closed

Verify that the INOP light is extinguished.

SPEED BRAKE lever DOWN detent

Note: Push down firmly on top of the speed brake handle after ensuring it is all the way forward.

Verify that the SPEED BRAKE ARMED light is extinguished.

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

Verify that the SPEEDBRAKES EXTENDED light is extinguished.

WARNING: Movement of the reverse thrust lever could result in operation of the engine thrust reverser.

Reverse thrust levers Down

Takeoff configuration warning Check

Advance either or both forward thrust levers to the takeoff position.
Ensure the takeoff warning horn sounds.

(As installed)

If the TAKEOFF CONFIG warning lights are operative, verify that they illuminate when the thrust lever(s) are advanced.

Forward thrust levers Closed

Start levers CUTOFF

Parking brake Set

Verify that the parking brake warning light is illuminated.

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

WARNING: Do not establish hydraulic power which will result in flap movement unless the wing/flap area has been cleared of personnel and equipment. Use an outside observer.

FLAP lever UP

Lever and indicator in agreement and lights extinguished.

If trailing edge flaps indicator does not indicate UP:

Position the FLAP lever to agree with the FLAPS position indicator and verify lights agree with the flap position indicated.

STAB TRIM cutout switches NORMAL

Fire/Overheat warning Check

Refer to SP.8, Fire and Overheat Protection System Test.

L and R BOTTLE DISCHARGED lights – Extinguished

CARGO FIRE system Check

Refer to SP.8, Cargo Fire Protection System Test.

Radio tuning panels Set

PANEL OFF light – Extinguished

No. 1 radio – Set for ATC communication

No. 2 radio – Set as required

No. 3 radio – Set to DATA

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

HF System Test	As required
Refer to SP.5, HF System Test.	
Perform a SELCAL check (if required)	
VHF navigation radios	Set for departure
Weather radar panel	Set
Weather radar TEST	As desired
Refer to SP.11, Weather Radar Test.	
Transponder	Set
XPNDR switch – 1 or 2 (set to corresponding pilot flying)	
ALT SOURCE switch – 1 or 2 (set to corresponding pilot flying)	
Transponder mode selector – STBY	
RUDDER and AILERON trim	Free & zero
Check trim for freedom of movement	
Set trim at zero units	
STAB TRIM override switch	Guard closed
FLOOD and PANEL light controls	As desired
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 NavAids, 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 Company 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

Sun visors Stow

HUD combiner Set or Stow

Adjust combiner brightness control

HUD warm-up time is 2 - 5 minutes.

Refer to SP.10, HUD Combiner Preflight as required.

EFIS control panel Set

MINS reference selector – As desired

FPV switch – As desired

MTRS switch – As desired

BARO reference selector – IN or HPA

VOR switches – As desired

Mode selector – MAP

CTR switch – As desired

Range selector – As desired

TFC switch – As needed

WXR – Off

MAP switches – As desired

Altimeters Set

Set the local altimeter setting.

Verify RVSM and altimeter crosscheck are within limits.

Refer to L.10, Flight Instruments, Displays, Altimeters.

Verify no flag displayed.

Clock Set

TIME/DATE pushbutton – UTC time (as installed)

Display select panel..... Set

MAIN PANEL DUs selector – NORM

LOWER DU selector – NORM

(As installed)

TAKEOFF CONFIG light Verify extinguished

(As installed)

CABIN ALTITUDE light Verify extinguished

Disengage light TEST switch Hold to 1

A/P light – Illuminated steady amber

A/T light – Illuminated steady amber

FMC light – Illuminated steady amber

Disengage light TEST switch Hold to 2

A/P light – Illuminated steady red

A/T light – Illuminated steady red

FMC light – Illuminated steady amber

STAB OUT OF TRIM light Verify extinguished

NOSE WHEEL STEERING switch Guard closed

Flight and nav instruments Check

Note: IRS alignment must be complete.

Verify that the flight instrument indications are correct.

Verify that only these flags are shown:

- NO VSPD until V-speeds are selected, and
- TCAS OFF.

Verify that the flight mode annunciations are correct:

- autothrottle mode is blank;
- roll mode is blank, unless LNAV was armed at the gate;
- pitch mode is blank; and
- AFDS status is FD.

Select the map mode.

- hr/>
- 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.
- Rudder pedals Adjust
Adjust the rudder pedals to allow for full rudder pedal and brake pedal movement.
- Oxygen mask Check
Refer to SP.1, Oxygen Mask and Interphone System Test.
- Audio control panel Set
- HUD Control Panel (HCP) Set
If operable, the HUD should be used for takeoff.

If conducting a HUD guided takeoff, refer to SP.10, HUD Guided Takeoff.
- Window Closed and locked
Verify the lock lever is in the locked (forward) position.
Ensure drain tube is clear of window.
- Parking brake Set
- Flight attendant briefing Complete
Accomplish a flight attendant briefing. Refer to FOM, chapter 3, Communications. In addition to the guidance in the FOM, brief that flight attendants must firmly push down on all inside cabin door handles to prevent inadvertent unlocking.
- 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.

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 Company 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

Sun visors Stow

Oxygen mask Check
Refer to SP.1, Oxygen Mask and Interphone System Test.

EFIS control panel Set

MINS reference selector – As desired

FPV switch – As desired

MTRS switch – As desired

BARO reference selector – IN or HPA

VOR switches – As desired

Mode selector – MAP

CTR switch – As desired

Range selector – As desired

TFC switch – As needed

WXR – Off

MAP switches – As desired

Altimeter Set

Set the local altimeter setting.

Verify RVSM and altimeter crosscheck are within limits.

Refer to L.10, Flight Instruments, Displays, Altimeters.

Verify no flag displayed.

Clock Set

TIME/DATE pushbutton – UTC time (as installed)

Display select panel Set

MAIN PANEL DUs selector – NORM

LOWER DU selector – NORM

(As installed)

TAKEOFF CONFIG light Verify extinguished

(As installed)

CABIN ALTITUDE light Verify extinguished

Disengage light TEST switch Hold to 1

A/P light – Illuminated steady amber

A/T light – Illuminated steady amber

FMC light – Illuminated steady amber

Disengage light TEST switch Hold to 2

A/P light – Illuminated steady red

A/T light – Illuminated steady red

FMC light – Illuminated steady amber

Flight and nav instruments Check

Note: IRS alignment must be complete.

Verify that the flight instrument indications are correct.

Verify that only these flags are shown:

- NO VSPD until V–speeds are selected, and
- TCAS OFF.

Verify that the flight mode annunciations are correct:

- autothrottle mode is blank;
- roll mode is blank, unless LNAV was armed at the gate;
- pitch mode is blank; and
- AFDS status is FD.

Select the map mode.

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.	
Rudder pedals	Adjust
Adjust the rudder pedals to allow for full rudder pedal and brake pedal movement.	
Interphone and Chime systems	Check
Check flight deck to cabin and cabin to flight deck if not accomplished by prior communication.	
Audio control panel	Set
Window	Close and lock
Verify the lock levers are in the locked (forward) position.	
Ensure drain tube is clear of window.	
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
Nav & displays switches	NORMAL & AUTO	C
Passenger signs	ON	C
Window heat	ON	C
Engine BLEED air switches.....	ON	C
Pressurization panel	set	C
Pressurization mode selector	AUTO	C
■ Mode control panel	set	C
Oxygen mask	ckd	ALL
Refer to SP.1, Oxygen Mask and Interphone System Test.		
Altimeters	____, xckd	C&F
Confirm the captain's, first officer's, and standby altimeter barometric settings and barometric reference (IN or HPA) are correctly set.		
Verbalize the altimeter setting.		
Flight & nav instruments	ckd	C&F
Warning & annunciator lights	ckd	C
Speedbrake	DOWN	C
Takeoff warning	ckd & closed	C
Engine start levers	CUTOFF	C
Stab trim cutout switches	NORMAL	C
Fire warning	ckd	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
Rudder & aileron trim	free & 0	C
Parking brake	set	C
Windows	closed & locked	C&F
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 onboard.		
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.	
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 • turn electric hydraulic pump switches ON • Fuel panel - Set • AFT and FWD fuel pump switches - ON and verify LOW PRESSURE lights are extinguished. • CTR fuel pump switches ON and verify LOW PRESSURE lights extinguished if the fuel quantity exceeds: 3601-3610, 3772-3773, 3801-3900 • 1,000 pounds. 3701-3771 • 5,000 pounds. • Transponder - XPNDR, or as required by local airport operating procedures
Call “PUSHBACK CHECKLIST.”	Accomplish the Pushback checklist.
Note: 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.

Captain	First Officer
When pushback clearance has been received:	
• ANTI-COLLISION light - ON • Parking Brake - OFF Note: Do not turn the anti-collision light on or release brakes until cleared for pushback or engine start.	
Call "BEACON ON, BRAKES RELEASED, CLEARED TO PUSH."	
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 exterior door annunciator lights extinguished.		
Hydraulic panel.....	set	F
Fuel panel	set	F
Flight deck door	closed & locked	F
Ensure the LOCK FAIL light is extinguished.		
Transponder	XPNDR	F

Engine Start Procedure

Captain	First Officer
Single engine taxi unless an operational necessity dictates otherwise. The captain should determine engine taxi configuration after considering aircraft weight, ramp conditions, taxiway, and maneuvering requirements. Single engine taxi out using the number 2 engine is the normal procedure, conditions permitting. Single engine taxi out using the number 1 engine is permitted. 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.	
	• Air conditioning PACKS -OFF
CAUTION: Re-engagement of starter with N2 in excess of 20% will result in serious damage to starter and engine.	
	Position ENGINE START switch to GRD. Observe START VALVE OPEN alert.

Captain	First Officer
	Position engine start lever to IDLE detent when N2 rpm reaches maximum motoring (25% minimum) and N1 rotation is observed. Maximum motoring occurs when N2 acceleration is less than 1% in approximately 5 seconds. As the engine start lever is moved to the IDLE position, verify the SPAR VALVE CLOSED indication light on the Overhead panel for that engine changes from dim to bright (valve is in transit), and then extinguishes (valve is open). If this sequence does not occur, perform the Aborted Engine Start checklist, QRH, NNC.7. If a failure is discovered, complete an aircraft maintenance logbook entry and contact maintenance so that resolution (i.e., repair or MEL) can be made prior to the revenue flight. Note: At times, the APU cannot accelerate an engine to 25% N2. In this case the engine start lever may be placed to IDLE at a minimum of 20% N2; however, the higher the rpm prior to adding fuel, the cooler the start.
Verify fuel flow and EGT indication. Note: An abnormal start advisory is indicated by the white box surrounding the EGT digital readout flashing. If this advisory occurs, continue to monitor other engine indications and abort the start if necessary.	
At 56% N2 RPM: - ENGINE START switch moves to OFF automatically; if not, position start switch to OFF. - Verify START VALVE OPEN alert extinguishes and report "STARTER CUTOUT."	

Captain	First Officer
	Monitor N1, N2, EGT, fuel flow, and oil pressure for normal indications as engine accelerates and stabilizes at idle.
	Verify oil pressure increase by idle, N1 rotation, and N2 rotation.
	After the engine is stabilized at idle, repeat procedure to start the remaining engine as required.
	Stabilized idle occurs when the maximum start EGT limit line disappears and the EGT peaks.
Accomplish the Aborted Engine Start checklist, QRH, NNC.7 for one or more of the following abort start conditions: • N1 or N2 does not increase or increases very slowly after the EGT increases; • there is no oil pressure indication by the time that the engine is stabilized at idle; • EGT does not increase by 10 seconds after the engine start lever is moved to IDLE; or • the EGT quickly nears or exceeds the start limit. • the FUEL SPAR VALVE CLOSED indication light on the Overhead panel does not change from dim to bright, and then extinguishes.	

After Start Procedure

Captain	First Officer
After starting engine(s):	
	• APU - as required • GEN switch(es) - ON • GEN OFF BUS light(s) - Extinguished • SOURCE OFF light(s) - Extinguished • PROBE HEAT switches - ON • Anti-Ice - As required • Refer to SP.16. • Air conditioning panel - Set • Single Engine Taxi: • Configure the Air Conditioning system in accordance with the following table:
CAUTION: Do not select a combination that will back pressure the APU.	

Taxi Configuration	APU BLEED	Engine Bleed		Packs		Isolation Valve
		Left	Right	Left	Right	
No. 2 Engine & APU	ON	ON	ON	AUTO	AUTO	CLOSE
No. 1 Engine & APU	ON	OFF	ON	AUTO	AUTO	AUTO/ OPEN
No. 2 Engine	OFF	ON	ON	OFF	AUTO	AUTO/ OPEN
No. 1 Engine	OFF	ON	ON	OFF	AUTO	AUTO/ OPEN

Captain	First Officer
	• Two Engine Taxi: • PACK switches - AUTO • APU BLEED air switch - OFF • ISOLATION VALVE switch - AUTO • Recall - Check • Press and hold either pilot's annunciator panel. • Check that all annunciator and MASTER CAUTION lights illuminate on both sides. • Release the annunciator panel and observe only expected lights are illuminated.
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 1.	

After Start Checklist

Generator(s)	ON	F
Probe heat	ON	C&F
Anti-ice	as reqd	C
Ensure the anti-ice switches are in the correct position for the current environmental conditions.		
Air conditioning panel	set	F
Recall	ckd	F
Ensure only expected annunciator lights are illuminated.		
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. 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 BLEEDS OFF takeoff, refer to SP.2.	

Captain	First Officer
Referencing the WDR data:	
	• TAKEOFF REF page 1/2 - Select • Verify FMS selected runway and WDR runway/takeoff position agree.
	• FMS PERF INIT page - Select • LOAD - Select 6L • Verify RMWT with GW • EXEC - Select • TAKEOFF REF page 1/2 - Select • REJECT - Select 5L OR • ACCEPT - Select 5R • MCP - Set • set V2 in IAS/MACH window • Stabilizer trim - Set • position STAB TRIM indicator to STAB value
Referencing the WDR, verify FMS Takeoff Data Uplink data (if TDU uplink is unavailable, manually enter and verify the data from the WDR). All crewmembers should verify performance data.	
• Verify FMS and WDR data agree: • ZFW • FLAPS • Thrust • CG TRIM • RWY/POS (verify planned Takeoff position is still valid) • V speeds • GW	

Captain	First Officer
	• TAKEOFF REF 2/2 - Update as necessary • EO ACCEL HT • ACCEL HT (AGL) • (Thrust) REDUCTION (AGL) • CUTBACK (ON or OFF) • MCP - Set • Set V2 in IAS/MACH window • Stabilizer trim - Set • Position STAB TRIM indicator to STAB value
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
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. When departing from ramp areas where taxiing is restricted to both engines, consider shutdown of one engine after exiting the restricted area.

Taxi Checklist

- Flaps ____, ____, ____, green C&F
 Ensure the FMS and WDR flap values agree.
 Confirm and verbalize:
 - FLAP lever position,
 - flap value from the FMS,
 - indicated flap position,
 - green LE FLAPS EXT light is illuminated.

- 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 Thrust Mode Display, verbalize TO, TO1, or TO2 for the first blank and, if applicable, assumed temperature for the second blank.

- Stab trim ____ C&F
 Ensure the STAB TRIM is set to TRIM value from either the WDR or the FMS. The FMS computed value may be used in lieu of the WDR value if the difference is 0.75 or less.

- Flight controls ckd C&F

Delayed Start Procedure

Captain	First Officer
Initiate the Delayed Start procedure to ensure proper engine warm up. If performing a crossbleed start, refer to SP.7, Engine Crossbleed Start.	
When ready to start:	
Announce engine start.	
	• Air conditioning panel - Set • with No. 2 engine operating: • L PACK switch - OFF • with No. 1 engine operating: • L PACK and R PACK switches - OFF
	• Engine Start procedure - Accomplish

Captain	First Officer
After engine start:	
	• GEN switch(es) - ON • GEN OFF BUS light(s) - Extinguished • SOURCE OFF light(s) - Extinguished • Anti-Ice - As required • refer to SP.16. • Air conditioning panel - Set • APU BLEED switch - OFF • Engine BLEED switches - ON • Pack switches - AUTO • ISOLATION VALVE switch - AUTO • Recall - Check • press and hold either pilot's annunciator panel. • check that all annunciator and MASTER CAUTION lights illuminate on both sides. • release the annunciator panel and observe all lights extinguish.
Call "DELAYED AFTER START CHECKLIST."	Accomplish the Delayed After Start checklist.

Delayed After Start Checklist

Generator	ON	F
Anti-ice	as reqd	C
Ensure the anti-ice switches are in the correct position for the current environmental conditions.		
Air conditioning panel	set	F
Recall	ckd	F
Ensure all annunciator lights extinguished.		

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. - After updating/verifying any changed items, complete the runway change boxed items and any associated procedural steps for all previously completed checklists. 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 for a minimum of 2 minutes before applying takeoff thrust. Verify an increase in engine oil temperature 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
• Takeoff configuration warning - Check • cycle both thrust levers past the vertical position and back within 2 seconds. Takeoff warning should not occur. • HUD - Set for takeoff • the HUD should be used for takeoff if operable.	• AUTOTHROTTLE switch - ARM • APU START switch - As required • ENGINE START switches - CONT
Verify CTR fuel pump switches - OFF if center tank fuel is less than: 3601-3610, 3772-3773, 3801-3900: • 1,000 pounds. 3701-3771: • 5,000 pounds (disregard amber CONFIG indication).	
• 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 ____, ____, green	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.	
	Takeoff warning ckd	C
	Autothrottle ARM	F
	Engine start switches CONT	F
	Transponder TA/RA	F
	Flight attendants notified & acknowledged	F

Takeoff Procedure

Pilot Flying	Pilot Monitoring
When cleared for takeoff:	
Confirm alignment with the intended departure runway by reference to the ND.	
Verify brakes are released.	
Advance thrust levers to approximately 40% N1.	
Allow the engines to stabilize.	
Push the TO/GA switch.	
Verify takeoff thrust is set by approximately 60 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, THROTTLE 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."
Verify a positive rate of climb on the altimeter. Call "GEAR UP."	Position the landing gear lever to UP.

Pilot Flying	Pilot Monitoring
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 acceleration height:	
Call for “VNAV”.	Push VNAV switch.
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 - As required. • ENGINE Anti-ice - As required. • PACKS - AUTO. • Engine bleeds - Set or verify. • ENGINE START switches - As required. • APU - OFF. • AUTO BRAKES - OFF. • Landing GEAR lever - OFF.
Call “AFTER TAKEOFF CHECKLIST.”	Accomplish the After Takeoff checklist.

After Takeoff Checklist

Flaps up
 Ensure flaps up and no lights illuminated.

Landing gear up & OFF
 Ensure landing gear up indications normal, no lights illuminated,
 and landing gear lever OFF.

Packs AUTO
 Verify pack selector position.

Engine bleeds ON

Pressurization panel ckd
 Ensure the cabin is pressurizing.

Engine start switches as reqd

APU off

Climb Procedure

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

Pilot Flying	Pilot Monitoring
Anti-Ice - As required	
After climbing through approximately 10,000 feet AFE, signal the end of sterile cockpit environment by:	
(C) NO SMOKING sign selector - Cycle to sound cabin chime twice. OR, if conditions permit: (C) SEATBELTS sign - OFF (C) Ensure PA is made advising passengers to keep seat belts fastened while seated.	
Fuel management:	
	3601-3610, 3772-3773, 3801-3900 When a center tank pump LOW PRESSURE light illuminates: - Affected center tank fuel pump switch - OFF When a center tank fuel pump LOW PRESSURE light illuminates, if the center tank is empty: - Both center tank pump switches - OFF

Pilot Flying	Pilot Monitoring
	3701-3771 If the center tank contains more than 1,000 pounds: - CTR tank fuel pumps - ON after pitch attitude is reduced to accelerate to 250 knots or greater When center tank quantity reaches 1,000 pounds: - CTR tank fuel pumps - OFF Note: After takeoff, with less than 1,000 pounds of fuel in the center tank, the CTR tank fuel pump switches may not be moved from OFF to ON unless there is a low fuel situation (approximately 5,000 pounds total fuel).
After passing 18,000 feet:	
Call "CLIMB CHECKLIST."	Accomplish the Climb checklist.

Climb Checklist

Altimeters STD, xckd C&F

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

Verbalize the altimeter setting.

Cruise Procedure

Pilot Flying	Pilot Monitoring
• Anti-ice - As required	
After reaching top of climb:	
Enroute:	
• Verify/set RNP value for Oceanic airspace. Reference SP.11 for Manual Entry procedures. • Apply Tactical Cost Index procedures as necessary per FOM. • Monitor fuel trend. • Send turbulence report as necessary. • Send position reports as necessary.	
Fuel management:	
	3601-3610, 3772-3773, 3801-3900 When established in a level flight attitude and the center tank contains usable fuel: • CTR tank fuel pump switches - ON When a center tank fuel pump LOW PRESSURE light illuminates: • Affected CTR tank fuel pump switch - OFF When a center tank fuel pump LOW PRESSURE light illuminates and the center tank is empty: • Both CTR tank fuel pump switches - OFF
	3701-3771 When center tank quantity reaches approximately 1,000 pounds: • Both CTR tank fuel pump switches - OFF

Pilot Flying	Pilot Monitoring
• 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 the sleep mode or ON mode to provide ready access to data when operational needs dictate.	
When approach procedure is known:	
• FMS ARRIVALS page - Select • Insert/modify the STAR, APPROACH, and TRANS as necessary • FMS APPROACH REF page - Select • Select FLAPS/VREF as desired • For FLAPS 15 landing, • GROUND PROXIMITY FLAP INHIBIT switch - FLAP INHIBIT	
• Radios - Manually tune as necessary • 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 Company Pages), refer to Airway Manual, Weather, Altimeter Corrections.	

Pilot Flying	Pilot Monitoring
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 Company 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. 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.	• AUTO BRAKES - Select 2 or greater

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) FASTEN BELTS sign - ON.	
Fuel management:	
	3601-3610, 3772-3773, 3801-3900 When a center tank fuel pump LOW PRESSURE light illuminates: • Affected CTR tank fuel pump switch - OFF When a center tank fuel pump LOW PRESSURE light illuminates, if center tank is empty: • Both CTR tank fuel pump switches - OFF
	3701-3771 During descent, when the center tank fuel quantity reaches 3,000 pounds: • Both CTR tank fuel pump switches - OFF
	• Pressurization panel - Set. • Confirm LAND ALT set to landing airport field elevation. Note: For airports with elevation above 6,000, refer to SP.2.
	• Recall - Check.
Approaching transition level:	
	If other than FL 180, call “TRANSITION LEVEL.”
• Altimeters - Set local altimeter setting and verbalize	
At FL180 or reaching top-of-descent, whichever occurs later:	
Call “DESCENT CHECKLIST.”	Accomplish the Descent checklist.

Descent Checklist

- I** 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
Autobrakes "2" (or greater) should be used, if operable.
- Seat belt signs ON PM
- Pressurization panel set PM
- Recall ckd PM
Ensure only expected annunciator lights are illuminated.

Approach Procedure

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

Pilot Flying	Pilot Monitoring
When arrival, approach, or runway changes prior to landing:	
- FMS data must be modified. - After updating/verifying any changed items, complete the runway change boxed items for the Descent and Approach checklists and their associated procedures. 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. - VHF NAV frequency and course set. - HUD - Set - HUD should be used for approach if operable.	
At approximately 10,000 feet AFE:	
(C) CHIME switch - 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.
 - Ensure the proper frequency and course/radial are set as appropriate.

- 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.

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:	
Vertical Situation Display - Must be displayed by one or both pilots at night or in IMC, or as required for situational awareness.	
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 15."	Set the landing gear lever to DN. Verify three green gear lights. Set the FLAP lever as directed. Set engine start switches to CONT.
Set the speed brake lever to ARMED. Verify that the SPEED BRAKE ARMED light is illuminated.	
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 the gear handle is in the DN position with 3 green lights illuminated and red lights extinguished.		
Flaps	____, ____ , green	C&F
Confirm and verbalize:		
• FLAP lever position, and		
• indicated flap position.		
LE FLAPS EXT green light is illuminated.		
Speedbrake	ARMED	PM
Ensure the speedbrake lever is in the ARMED position and the speedbrake armed green light is illuminated.		
Engine start switches	CONT	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 15."	Set 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 the landing gear lever to UP.
	Verify missed approach altitude is set.
If the airspeed is within the amber band, limit bank angle to 15°.	
Above 400 feet RA:	
Verify or call for the appropriate roll mode.	Select or verify roll mode.
At acceleration height (normally 1,000 feet AFE):	
Call "FLAPS ____" according to the flap retraction schedule.	Set the FLAP lever as directed.
If desired, after flap retraction to the planned flap setting, remain in TO/GA, select LVL CHG, or select VNAV.	
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
When at the planned flap configuration:	
Call “AFTER TAKEOFF CHECKLIST.”	Accomplish the After Takeoff checklist.

Landing Roll Procedure

Pilot Flying	Pilot Monitoring
At main gear touchdown:	
Verify thrust levers CLOSED.	
	Verify the SPEEDBRAKE lever is UP. Call “SPEEDBRAKES UP.”
WARNING: After reverse thrust is initiated, a full stop must be made.	
Without delay, rapidly raise the reverse thrust levers up and aft to the interlock position, then to the number 2 reverse thrust detent. Maintain reverse thrust as required until 80 knots.	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 - Disarm	

After Landing Procedure

Captain	First Officer
When clear of the active runway and workload permits:	
CAUTION: If a MASTER CAUTION, ENG annunciation and ENGINE CONTROL light illuminate after landing, maintenance must be notified and the fault corrected prior to the next dispatch of the airplane.	
Note: Engine may be shutdown after cool down recommendations have been met.	
• SPEED BRAKE lever - DOWN detent	• Anti-Ice - As required (refer to SP.16) • ENGINE START switches - As required • 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

Engine start switches as reqd
Flaps up
Speedbrake DOWN
Radar off

Shutdown Procedure

Captain	First Officer
Engine cool down recommendations: • Run the engines for at least 3 minutes. • Engines may be shutdown after a 1-minute cool down period for gate arrival.	
After engine cool down recommendations have been met and single engine taxi is desired:	
Call for engine shutdown. Note: Normally ENG #2 is shut down.	• Air conditioning panel - Set per table below
CAUTION: Do not select a combination that will back pressure the APU.	

Taxi Configuration	APU BLEED	Engine Bleed		Packs		Isolation Valve
		Left	Right	Left	Right	
No. 2 Engine & APU	ON	ON	ON	AUTO	AUTO	CLOSE
No. 1 Engine & APU	ON	OFF	ON	AUTO	AUTO	AUTO/ OPEN
No. 2 Engine	OFF	ON	ON	OFF	AUTO	AUTO/ OPEN
No. 1 Engine	OFF	ON	ON	OFF	AUTO	AUTO/ OPEN

	• Appropriate START LEVER - OFF
After stopping at the gate:	
CAUTION: Do not operate the center tank fuel pumps with the flight deck unattended.	
CAUTION: Center tank fuel pump switches should be positioned ON only if the fuel quantity in the center tank exceeds 1,000 pounds.	

Captain	First Officer
• PARKING BRAKE - Set • Call for seat belts sign off. • Call for engine shutdown. • HUD combiner - Stow	• FASTEN BELTS - OFF, as directed • APU or external power - Set • Establish APU power: • Verify APU GEN OFF BUS light is illuminated, • APU GEN switches - ON, and • Verify SOURCE OFF lights extinguished. • Engine start levers - CUTOFF • Transponder - STBY • ANTI COLLISION light - OFF • FUEL PUMP switches - As required (refer to SP.7 for APU operation) • WINDOW HEAT switches - As required • PROBE HEAT switches - AUTO • WING and ENGINE ANTI-ICE switches - OFF • ELEC HYD PUMP switches - OFF • RECIRC FAN switch(es) - As desired • F/D switches - OFF • STAB TRIM - 5 units • AUTOBRAKE select switch - OFF

Captain	First Officer
When engines are shut down:	
• PARKING 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

Fuel pump switches	as reqd	C
Seat belt signs	OFF	C
Window heat	as reqd	C
Probe heat	AUTO	C
Anti-ice	OFF	C
Electric hydraulic pumps	OFF	C
Air conditioning panel	set	C
Anti-collision light	OFF	C
Engine start levers	CUTOFF	C
Transponder	STBY	C
Parking brake	as reqd	C

Captain	First Officer
After the Shutdown Checklist is complete:	
When external power is available:	
• GRD POWER switch - ON • Verify SOURCE OFF lights extinguished. • APU switch - OFF • Configure aircraft for ground air conditioning use. Refer to SP.2.	
• ACARS information - Enter • Complete ACARS Postflight procedures. • RNAV (RNP) approach reports are required. Refer to SP.5. • Autoland attempts must be recorded. Refer to SP.4. • 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: • Maintenance stations: 16 quarts • Non-maintenance stations: 13 quarts • Oxygen: 1,000 psi • Hydraulic fluid: No RFs displayed • If the aircraft operated in Class II airspace for more than one hour: • IRS drift error rates - Check • Referencing the FMS: • Display the INIT REF/INDEX page • Select MAINT (6R) • Select FMCS (1L) • Select FMC L (1L) or FMC R (2L) • Select the IRS MONITR (4R) • The inertial drift rates are displayed at 2L and 4L • Make a logbook entry if either inertial drift rate is greater than 2 NM per hour.	
• 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. • Position the flight deck access system to OFF.	

After shutdown reminders:

- Enter appropriate ACARS information.
- Check oxygen, engine oil, and hydraulic quantities.
- 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.	
If the aircraft will layover in cold weather, ensure it is configured as described in SP.16.	
When ready to secure the aircraft:	
Call “SECURE CHECKLIST.”	Accomplish the Secure checklist as a “read and do” checklist.

Captain	Any Crewmember
• Stabilizer trim - As required • IRS mode selectors - OFF • Selectors must be OFF for 30 seconds prior to removing electrical power. 3601-3610, 3701-3773 • CAB/UTIL power switch - OFF 3801-3900 • CAB/UTIL power switch - ON • IFE/PASS SEAT power switch - OFF • EMERGENCY EXIT lights switch - OFF • PACK switches - OFF • Engine BLEED air switches - remain ON 3701 - 3773, 3801 - 3900 • TRIM AIR switch - OFF • HUD combiner - Covered and stowed • Install the combiner protective cover. • Raise the combiner to its stowed position. • APU and External power - Set as required • If only ground service power is required: • Verify GRD POWER AVAILABLE light illuminated • GROUND POWER switch - OFF • GROUND SERVICE switch (located on the forward Flight Attendant panel) - Latched • APU switch - OFF • Fuel pump (left manifold) - OFF • BATTERY switch - OFF • If electrical power is not required: • APU switch and/or GRD PWR switch - OFF • Fuel pump (left manifold) - OFF • BATTERY switch - OFF	

Secure Checklist

- Stab trim as reqd
- IRS mode selectors OFF
- (3601-3610, 3701-3773) CAB/UTIL power OFF
- (3801-3900) CAB/UTIL power ON
- IFE/PASS SEAT power OFF
- Emergency lights OFF
- Packs OFF
- Engine BLEED air switches ON
- (3701 - 3773), (3801 - 3900) Trim air OFF
- APU & external power as reqd
- Battery switch OFF

Normal Operational Information
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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 page NOI.3.25	APP CAT I page NOI.3.3 SA CAT I page NOI.3.5 CAT II page NOI.3.8 SA CAT II page NOI.3.8 CAT III page NOI.3.11
LDA with GS	For PRM considerations also see page NOI.3.25	APP page NOI.3.15
RNAV (RNP)	GPS Required	LNAV VNAV page NOI.3.19
RNAV (GPS) RNAV (GNSS) GPS	GPS Required Procedure in FMS Database with GP	*APP page NOI.3.15
LOC LDA (GS out) NDB VOR ILS (GS out)	Procedure in FMS Database with GP	*APP page NOI.3.15
	Procedure in FMS Database without GP	LNAV or VOR/LOC V/S page NOI.3.23
	NO Procedure in FMS Database	LNAV, VOR/LOC, or HDG SEL V/S page NOI.3.23
Charted Visual Flight Procedures	Procedure in FMS Database	LNAV VNAV page NOI.3.26
	NO Procedure in FMS Database	Fly using visual references
Circling Maneuver		page NOI.3.27

* LNAV or VOR/LOC and VNAV Modes - Optional, page NOI.3.17

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

When cleared for the approach:

LNAV or VOR LOC Select

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

- established on a STAR/RNAV STAR with common runway transition waypoint, or
- 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 follows

ILS Set Precision Final Approach Fix altitude

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

VNAV Select or verify

Speed intervention Set as desired

ILS CAT I - 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, the HUD or 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

Verify waypoints, altitude constraints, and descent angle.

Flight and nav instruments Set

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.

SA ILS CAT I - 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.

Approaches must be flown by the captain.

Autoland:

Must be monitored in AIII.

Must be accomplished using flaps 30 or 40.

Manually flown:

Must be flown in AIII.

Two engines operating: Flaps 30 or 40.

One engine operating: Flaps 15.

Maximum reported wind component to initiate approach and land:

25 knots headwind, 15 knots crosswind, 10 knots tailwind

Airport diagram Review

FMS approach procedure Select

Verify waypoints, altitude constraints, and descent angle.

Flight and nav instruments Set

HUD HCP Set and arm AIII

Note: If a reference runway length entered into the HGS is less than 5,000 feet or greater than 18,000 feet, the HGS loses capability to provide rollout guidance below 500 feet AGL. A rollout caution (“RO CTN”) is displayed in the HUD combiner and on the digital HAP on the FO side. The approach may continue with a “RO CTN”.

Minimums Set DA

Set radio altimeter bugs to published RA.

Autobrakes Recommended

Callouts Review

- Autoland: “FLARE ARMED” no later than 500 feet RA.
- HUD AIII Approach
 - AIII active: Captain “AIII” - F/O “AIII ON THE RIGHT”
 - FLARE annunciated: F/O “FLARE ALIVE”
 - Approach warnings: Call “NO AIII” and/or “APPROACH WARN” as observed.

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.

Second Autopilot Select for autoland

Verify FLARE ARMED no later than 500 feet RA.

Note: Approach may continue to DA(H) if established on the final segment and the controlling RVR goes below minimums.

No later than 1000 feet AGL:

Missed approach altitude Set

Set lowest initial level off altitude on missed approach procedure.

Autopilot Disengage

- Autoland: disengage autopilot after touchdown
- HUD AIII: disengage autopilot no later than 500 feet above touchdown zone elevation

Autothrottles Disconnect

- HUD AIII: disconnect autothrottles no later than 500 feet above touchdown zone elevation

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

- full-scale localizer deviation, or
- below 500 feet above touchdown zone elevation:
 - APPROACH WARN, or
 - NO AIII with APPROACH WARN.

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 or HUD AIII procedures.

Autoland:

Must be accomplished using flaps 30 or 40.

Consider monitoring with HUD in AIII.

Manually flown HUD AIII approach and landing:

Two engines operating: Flaps 30 or 40.

One engine operating: Flaps 15.

Maximum reported wind component to initiate approach and land:

25 knots headwind, 15 knots crosswind, 10 knots tailwind

FMS approach procedure Select

Verify waypoints, altitude constraints, and descent angle.

Flight and nav instruments Set

For AIII approaches:

HUD HCP Set and arm AIII

Note: If a reference runway length entered into the HGS is less than 5,000 feet or greater than 18,000 feet, the HGS loses capability to provide rollout guidance below 500 feet AGL. A rollout caution (“RO CTN”) is displayed in the HUD combiner and on the digital HAP on the FO side. The approach may continue with a “RO CTN”.

Minimums Set

RA Authorized:

- Set radio altimeter bugs to published RA.

RA Not Authorized:

Set baro altimeter bugs to published DA

- DA is 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

- Autoland: "FLARE ARMED" no later than 500 feet RA.
- HUD AIII Approach
 - AIII active: Captain "AIII" - F/O "AIII ON THE RIGHT"
 - FLARE annunciated: F/O "FLARE ALIVE"
 - Approach warnings: Call "NO AIII" and/or "APPROACH WARN" as observed.

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.

Second Autopilot Select

No later than 1000 feet AGL:

Missed approach altitude Set

Set lowest initial level off altitude on missed approach procedure.

Autopilot Disengage

- Autoland: disengage autopilot after touchdown
- HUD AIII: disengage autopilot no later than 500 feet above touch down zone elevation.

Autothrottles Disconnect

- HUD AIII: disconnect autothrottles no later than 500 feet above touch down zone elevation.

Execute a Missed Approach for any of the following:

- criteria listed in the Airway Manual, Ops Specs, IAP, or
- Below 500 feet above touch down zone elevation:
 - APPROACH WARN, or
 - NO AIII with APPROACH WARN.

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: If the aircraft is established on the final approach segment and the controlling RVR decreases below the authorized minima, the approach may not continue to DA(H).

Approaches must be flown using autoland procedures or HUD AIII procedures.

Autoland:

Must be accomplished using flaps 30 or 40.

Consider monitoring with HUD in AIII.

Manually flown HUD AIII approach and landing:

Two engines operating: Flaps 30 or 40.

One engine operating: Flaps 15.

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

Verify waypoints, altitude constraints, and descent angle.

Flight and nav instruments Set

For AIII approaches:

HUD HCP Set and arm AIII

Note: If a reference runway length entered into the HGS is less than 5,000 feet or greater than 18,000 feet, the HGS loses capability to provide rollout guidance below 500 feet AGL. A rollout caution (“RO CTN”) is displayed in the HUD combiner and on the digital HAP on the FO side. The approach may continue with a “RO CTN”.

Minimums Set

- Set radio altimeter bug to 50 feet.

Autobrakes Required, if operable

Callouts Review

- Autoland: “FLARE ARMED” no later than 500 feet RA.
- HUD AIII Approach
 - AIII active: Captain “AIII” - F/O “AIII ON THE RIGHT”
 - FLARE annunciated: F/O “FLARE ALIVE”
 - Approach warnings: Call “NO AIII” and/or “APPROACH WARN” as observed.

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.

Second Autopilot Select

No later than 1000 feet AGL:

Missed approach altitude Set

Set lowest initial level off altitude on missed approach procedure.

Autopilot Disengage

- Autoland: disengage autopilot after touchdown
- HUD AIII: disengage autopilot no later than 500 feet above touchdown zone elevation

Autothrottles Disconnect

- HUD AIII: disconnect autothrottles no later than 500 feet above touchdown zone elevation

Execute a Missed Approach for any of the following:

- criteria listed in the Airway Manual, Ops Specs, IAP, or
- any controlling RVR goes below minimums, or
- Below 500 feet above touchdown zone elevation:
 - APPROACH WARN, or NO AIII with APPROACH WARN.
- Additionally, at DA(H):
 - visual reference with the TDZ lights or TDZ has not been established.

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GPS, RNAV(GPS or GNSS), ILS (GS Out), LOC, LDA, LDA W/GS, LDA (GS Out), VOR, or NDB -

Approach Guide

APP Mode (IAN)

If the ground based navaid is out of service or compatible avionics is either not installed or not operational, the approach may be flown using RNAV procedures as long as one GPS is operational and the approach is authorized on the Company Pages or flight plan remark.

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

Airport temperature
[RNAV (GPS or GNSS)] Confirm within limits

Autopilot Required in IMC

FMS approach procedure Select

Verify waypoints, altitude constraints, and descent angle.

LOC-based approaches
with no GS or GS inop Select or verify GS OFF

LDA approaches with glideslope Select GS ON

Flight and nav instruments Set

- For LOC based approaches, tune the localizer frequency in both nav radios.
- For non-LOC based approaches, tune a VOR frequency in both nav radios.

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.
- LNAV only minimums:
 - If LNAV minimums are accompanied by a ball note, use MDA(H) as DA(H).
 - If no ball note is present, use DDA (MDA + 50 feet).

Raw data (if available) Monitor

RNP Verify .30 by FAF

When cleared for the approach:

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

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. For VOR approach, do not select VOR/LOC.

No later than 1000 feet AGL:

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

I No later than 100 feet AGL:

Autopilot Disengage

Execute a Missed Approach if any of the following messages appear:

- “FMC DISAGREE” or “FMC DISAGREE-VERTICAL” or “VERIFY POSITION” or “UNABLE REQ’D NAV PERF-RNP”
- Additionally, after the FAF and runway environment not in sight:
 - Full scale lateral deviation occurs or vertical path deviation exceeds +/- 75 feet.

GPS, RNAV (GPS or GNSS), ILS (GS Out), LOC, LDA, LDA (GS Out), VOR, or NDB - Approach Guide LNAV or VOR/LOC & VNAV Modes - Optional

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 Company Pages or flight plan remark.

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

Airport temperature [RNAV (GPS or GNSS)] Confirm within limits

Autopilot Required in IMC

FMS approach procedure Select

Verify waypoints, altitude constraints, and descent angle.

Flight and nav instruments Set

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.
- LNAV only minimums:
 - If LNAV minimums are accompanied by a ball note, use MDA(H) as DA(H).
 - If no ball note is present, use DDA (MDA + 50 feet).

Raw data and VTK error Monitor

When cleared for the approach:

LNAV or VOR LOC Select

When:

- established on a STAR/RNAV STAR with common runway transition waypoint, or
- 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 MDA/DA/DDA rounded to the next highest 100 feet.

VNAV Select or verify VNAV PTH

Speed intervention Set as desired

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 100 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 FMS NAV STATUS page 1,
- raw data monitoring not required,
- RNP verify 0.3,
- monitor XTK error,
- additionally, execute a missed approach if any of the following occur:
 - VERIFY POSITION FMC message
 - UNABLE RNP messages
 - FMC DISAGREE
 - FMC DISAGREE-VERTICAL
 - Additionally, after the FAF with approach lights or runway environment not in sight:
 - XTK error greater than 0.3.

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

Verify waypoints, altitude constraints, and descent angle.

RNP Set by the IAF

Minimum allowable RNP is 0.10.

GPS updating Confirm (2)

NAV STATUS Page 1.

VOR and DME updating Inhibit

NAV OPTIONS Page 2.

Minimums Set DA

Altimeters Check within 75 feet

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

When cleared for the approach:

LNAV Select

When:

- established on a STAR/RNAV STAR with common runway transition waypoint, or
- 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 to the next highest 100 feet.

VNAV Select or verify VNAV PTH

Speed Intervention As desired

165 knots maximum or published lower airspeed from FAF to
DA.

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 100 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 above 1,000 AFE:

ALT HLD Select

Missed approach altitude Set

Climb or descend to the missed approach altitude, as
appropriate, honoring all constraints.

Autopilot/LNAV Confirm

Continue to fly approach track to the MAP.

If below 1,000 AFE:

TOGA Select

LNAV Verify

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

Missed approach altitude Set

Autopilot/LNAV Confirm

Execute a missed approach 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,
- VERIFY POSITION message appears,
- FMC DISAGREE message appears,
- FMC DISAGREE-VERTICAL message appears,
- UNABLE REQ'D NAV PERF-RNP message appears,
- full-scale lateral NPS deviation or deviation alert occurs,
- additionally, after the FAF with approach lights or runway environment not in sight:
 - loss of VNAV PTH
 - vertical path deviation exceeds +/- 75feet.

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ILS (GS Out), LOC, LDA, LDA (GS Out), VOR, or NDB Approach Guide LNAV, VOR LOC, or HDG SEL & V/S Modes

Autopilot Required in IMC

FMS approach procedure (if available) Select and verify
Approaches not in the database may be built.

NDB approach must be in the database to fly the approach.

Flight and nav instruments Set

Minimums Set DDA
Set MDA + 50 feet.

Raw data Monitor

When cleared for the approach:

LNAV, VOR LOC, or HDG SEL 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 as required
Set next altitude constraint, or if no constraint, set DDA rounded up to the next highest 100 feet.

When approximately 0.2 nm from the descent point:

V/S Select
Set the descent rate 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 100 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.

ILS Precision Runway Monitor (PRM) Considerations

PRM procedure Brief Jeppesen 11-XX Pages

Primary and Monitor Frequencies - Briefed

Breakout procedure Briefed

“Breakout” Procedure

Note: All “Breakouts” must be hand flown.

Pilot Flying	Pilot Monitoring
If ATC calls “Traffic Alert” during the PRM approach:	
A/P - Disengage	F/D (both) - OFF
Maneuver as directed by ATC Note: If ATC “breakout” instructions coincide with a TCAS RA, follow the vertical guidance of the RA and the lateral guidance directed by ATC. Note: If descending, vertical speed should not exceed 1,000 FPM.	Communicate with ATC as required.
	When established on the “breakout” heading: • F/D (both) - ON
When “breakout” is complete, reset automation to appropriate level. Note: If conducting an AIII approach, select PRI or IMC to regain HUD Flight Director guidance.	

**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.

Company Pages
and Attention All Users page Reference as applicable

Autopilot As desired

FMS approach procedure Select

Verify waypoints, altitude constraints, and descent angle.

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

Do not use the APP mode. IAN is not compatible.

MCP altitude Set

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

VNAV Select

Speed intervention Set as desired

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.

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 or VOR LOC Select

Altitude Set

Set published MDA or airport elevation plus 1000 feet (300m), rounded up to the next higher 100 feet.

At configuration point:

Landing gear and landing flaps Set

Aircraft should be fully configured for landing prior to FAF.

At FAF or descent point:

VNAV or V/S Select

Do not use APP mode as it will not level off at MDA.

MCP 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 100 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.

FMS utilization techniques:

- Prior to commencing the approach, if desired, select the landing runway from the DEP/ARR page, line select it to 1L on the LEGS page, making it the active way point, and extend the centerline to provide guidance for maneuvering to land. Do not execute the LEGS page modification until abeam the landing runway. Doing so will delete the programmed missed approach procedure. Upon execution, VNAV path information will be available from present position to the landing runway.
- If desired, enter the airport reference (e.g., KATL) point on the fix page and enter a range circle to improve situational awareness in the maneuvering phase. (a 3.5 mile arc will approximate 2.5 to 3 miles from the end of the runways).

Radio/Baro Minimums Chart

Radio/Baro Minimums Chart		
APPROACH TYPE	BARO MIN REF	RADIO MIN REF
ILS to CAT I	PUBLISHED DA	N/A
SA CAT I / Any CAT II	N/A	PUBLISHED RA
CAT II RA NOT AUTH	PUBLISHED DA	N/A
CAT III	N/A	50 FT
NON-ILS	PUBLISHED DA/ DDA	N/A
CIRCLE TO LAND	HIGHER OF: PUBLISHED MDA or AIRPORT ELEV + 1,000 ft	N/A
VISUAL	APPROACH MINS(1)	N/A
(1) Set the approach minimums for the instrument approach used to back up the visual approach. If no instrument approach is available, the captain may choose an appropriate minimums setting. Airport elevation is not recommended. Both the captain's and first officer's bugs should agree.		

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Supplementary Procedures
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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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Supplementary Procedures

Chapter SP

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

Cabin Inspection

For a flight without a flight attendant staff (ferry flight, test flight, delivery flight, training flight, etc.) the pilots verify the following:

- Doors - Secured and at least the Forward entry door armed
- Beverage cart - Stowed and locked in position
- Galley (coffee pots, doors, and drawers, etc.) - Secured
- Overhead bins - Closed
- Closets - Closed and locked
- Lavatories - Inspect for general security; doors closed.

After block-in, pilots must disarm all doors and partially open the main entry door, to be fully opened by the gate agent.

Flight Deck Access System Test

The following procedure is normally accomplished prior to the first flight of the day.

FLIGHT DECK ACCESS SYSTEM switch NORMAL

Switch down, guard down. [AFM]

Verify the LOCK FAIL light extinguishes.

With the flight deck door open:

FLIGHT DECK DOOR rotary switch AUTO

Access code Enter

ENT key Push

Verify alert sounds.

Verify amber keypad LED illuminates.

Verify AUTO UNLK light illuminates.

FLIGHT DECK DOOR rotary switch DENY

Verify AUTO UNLK light extinguishes.

FLIGHT DECK DOOR rotary switch UNLOCKED

Push and turn the FLT DK DOOR rotary switch to UNLOCKED position.

Verify red keypad LED extinguishes.

Verify green keypad LED illuminates.

Note: The door lock solenoid will disengage until the FLT DK DOOR rotary switch is released.

FLIGHT DECK ACCESS SYSTEM switch OFF

Guard up, switch up.

Verify the LOCK FAIL light illuminates.

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, suction cup 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.

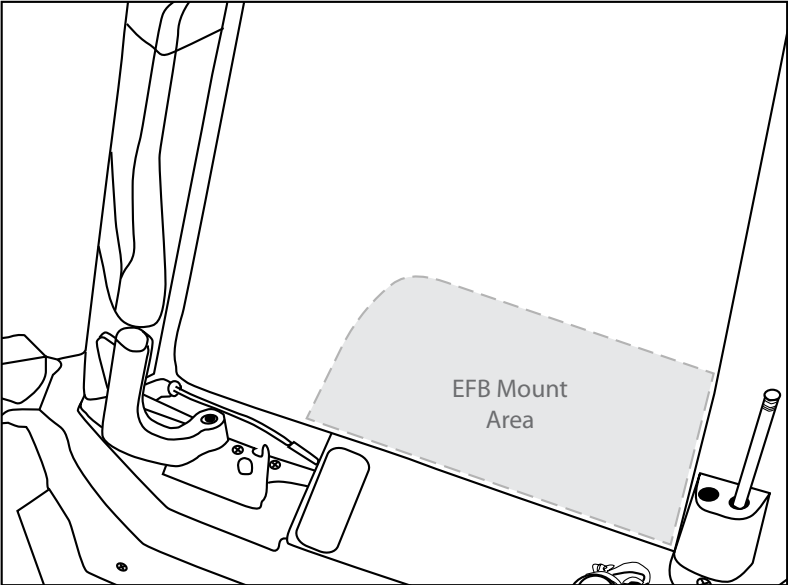
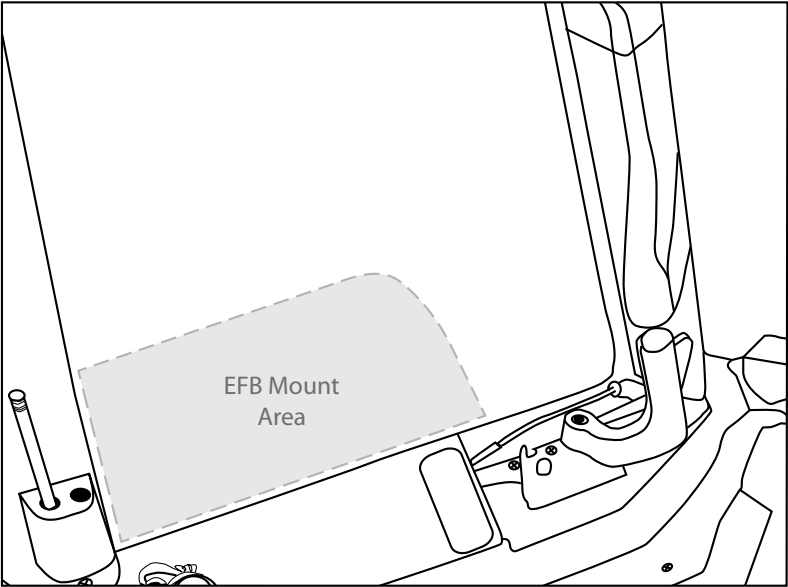
Do not use any other mounting or securing system other than the provided approved systems.

To secure the suction cup style 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.
- Ensure the locking levers are in the OFF position.
- Position the suction cups in the mounting zone indicated in the diagram below.
- 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.

To secure the tray style EFB mount in the aircraft:

- Ensure the tray is installed in the proper location and inspect the spring loaded clip.
- Insert the EFB in the mount in landscape position.



Oxygen Mask and Interphone System Test

3601 - 3610, 3701 - 3773

Audio control panel Set

Push FLIGHT INTERPHONE transmitter selector, FLIGHT INTERPHONE receiver switch and SPEAKER receiver switch.

Adjust volume on FLIGHT INTERPHONE and SPEAKER receiver switches.

Oxygen panel Set

Oxygen mask – Stowed and doors closed.

Regulator selector – Rotate to EMERGENCY

TEST-RESET switch – Push down and hold for 5 seconds.

Observe yellow cross in oxygen flow indicator and oxygen flow is audible. The test indicator will remain and oxygen flow will be audible until the TEST-RESET button is released.

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

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

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

TEST-RESET button – Release

Regulator selector – Rotate to 100%

TEST-RESET button – Push down and hold

Ensure the test indicator blinks.

Ensure the test indicator goes out, showing that the oxygen system is leak free.

Control wheel Push-To-Talk switch – INT or Audio control panel Push-To-Talk switch – I/C

Tap on stowage box or mask and verify that tapping is audible in the headset and or speakers. The mask mic will remain active until the TEST-RESET button is released.

TEST-RESET button and PUSH-TO-TALK switch – Release

Regulator selector – Leave at 100%

Note: It is not necessary to don the mask for preflight adjustment. The entire preflight test can be performed with the mask stowed.

Oxygen Mask and Interphone System Test - MF-20 Mask

3801 - 3900 (As installed)

Oxygen Mask

Note: It is not necessary to don the mask for preflight adjustment. The entire preflight test can be performed with the mask stowed.

Oxygen panel Set

Oxygen mask – Stowed and doors closed.

RESET TEST control lever – Press and hold.

PRESS TO TEST control knob – Press.

Observe that the blinker turns yellow and oxygen flow is audible.

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

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

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

RESET TEST control lever – Release.

PRESS TO TEST control knob – Release.

Observe that the blinker returns to black and oxygen flow is no longer audible.

PRESS TO TEST control knob – Press.

After a short time, observe that the blinker stays black.

PRESS TO TEST control knob – Release.

Regulator selector – Set to 100 %.

Interphone Test

Audio control panel Set

Push INT MIC SELECTOR and receive switches, and SPKR receiver switches.

Adjust volume on INT and SPKR receiver switches.

RESET TEST control lever – Press and hold.

Control wheel Push-To-Talk switch – INT or Audio control panel
Push-To-Talk switch – I/C.

Tap on stowage box or mask and verify that tapping is audible in the headset and or speakers. The mask mic will remain active until the RESET TEST control lever is released.

RESET TEST control lever and PUSH-TO-TALK switch – Release.

Regulator selector – Leave at 100%.

Oxygen Mask and Interphone System Test - MF-40 Mask

3801 - 3900 (As installed)

Audio control panel Set

Push the FLIGHT INTERPHONE transmitter selector, FLIGHT INTERPHONE receiver switch and SPEAKER receiver switch.

Adjust volume on FLIGHT INTERPHONE and SPEAKER receiver switches.

Note: It is not necessary to don the mask for preflight adjustment. The entire preflight test can be performed with the mask stowed.

Oxygen panel Set

Oxygen mask – Stowed and doors closed.

Regulator selector – Rotate to 100% mode.

Test of the PRESS TO TEST AND RESET button:

PRESS TO TEST AND RESET button – Hold for 1 second

Yellow cross in oxygen flow indicator - Visible (momentary)

Ensure the yellow cross goes out, showing that the mask is leak tight.

The oxygen flow is audible. The OXY ON flag will remain and oxygen flow will be audible until the PRESS TO TEST AND RESET button is released.

PRESS TO TEST AND RESET button – Release

Note: If the yellow cross stays visible, have maintenance check for leakage in the system.

Test of the EMERGENCY/PRESS TO TEST control knob:

PRESS TO TEST AND RESET button and PRESS TO TEST button
– Hold for 5 seconds

Yellow cross in oxygen flow indicator - Visible

Ensure that the yellow cross goes out, showing that the
regulator-demand mechanism is operating correctly.

Control Wheel Push-To-Talk switch - or

Audio Control panel Push-To-Talk switch - Select INT

Verify that the oxygen flow is audible in the headsets or
speaker.

Verify that the crew oxygen pressure does not decrease more than
100 PSI and pressure is adequate for dispatch.

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

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

PRESS TO TEST AND RESET button – Release

PRESS TO TEST button – Release

Wait one second to allow the regulator to empty the circuit of
oxygen.

Regulator selector – Leave in 100% mode

Pushback without Nose Gear Steering Lockout Pin

The following procedure is to be used for pushback when the nose gear steering lockout pin is not installed.

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

A HYDRAULIC PUMP switches OFF
Verify that system A pump LOW PRESSURE lights are illuminated.

B HYDRAULIC PUMP switches ON
Verify that system B electric pump LOW PRESSURE light is extinguished.

After the pushback and the airplane is stopped:

Parking brake Set
Ground equipment Removed
System A HYDRAULIC PUMP switches ON
System A and B pressure 2800 psi minimum

Tail Stand Operations

737-900ER aircraft

The aircraft is susceptible to tail tipping during offloading/deplaning in some circumstances. A tail stand has been designed to mitigate this threat. Its use is not required. Delta ACS will follow tail tip standard operating procedures outlined in the Ground Operations Manual (GOM) when offloading aircraft both with and without a tail stand. Normally, flight crews will not need to intervene.

CAUTION: During divert or charter operations (alternate or off-line airports) support ground crew may not be aware of the tail tip hazard. Tail stands may not be available. Refer to At Non-Delta Stations procedure below.

At Delta Stations

Note: Flight crew participation is not required at Delta stations.

If a tail stand is available:

- ACS will install the tail stand into the aft jack point (near the tailskid) once the aircraft is parked at the gate. It will stay in place during the cargo/baggage offload and passenger deplaning process.
- When performing duties near the tail stand, exercise extreme caution not to bump into the device. Should this occur, notify a ramp crewmember. Do not attempt to reinsert the tail stand.
- The tail stand is not utilized during the cargo/baggage loading or passenger boarding process.

If a tail stand is not available:

- Baggage/cargo offloading and passenger deplaning is allowed. Delta ACS will revert to aircraft no tail stand standard operating procedures.

At Non-Delta Stations

CAUTION: Do not allow passenger and/or baggage/cargo offload until coordination with local operations, ramp crew, boarding agents, and charter coordinator (if present) is accomplished.

When no offloading/deplaning is required (remaining loaded at gate or ramp position):

- Advise local operations/ramp crew of intentions.
- No additional crew procedures required.

When offloading/deplaning is required:

- Advise local operations/ramp crew of intentions.

COMMUNICATIONS Establish

Initiate contact with dispatcher.

Facilitate contact of non-Delta station ground crew coordinator with
OCC ACS above/below-wing representative to relay aircraft
offload standard operating procedures.

After offloading/deplaning plan has been communicated:

- Allow aft baggage/cargo bin to be offloaded.
- Allow passenger deplaning by boarding agent(s) and/or flight attendant crew.
- Forward baggage/cargo bin may be offloaded after standard operating procedure determined delay.

Note: Ensure all passengers are deplaned.

Note: Comply with DOT passenger and PA requirements.

When ready to board/load aircraft:

- No special procedures apply. Normal boarding/loading may take place.

Water System Draining

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

Galley water supply shutoff valves SUPPLY ON

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

Drain line Connect to drain ports

There are two drain port locations:

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

Water service panel Open

Tank drain valve handle OPEN

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

Forward lavatory drain valve OPEN

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

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

All galley and lavatory water faucets Open

Close faucets when water flow stops.

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

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

Forward lavatory drain valve CLOSED

Tank drain valve handle CLOSED

Water service panel Close

Drain line Disconnect from drain ports

If the potable water tank will not be refilled immediately after the system is emptied, open the following circuit breakers:

P18-3 circuit breaker panel

- LAVATORY WATER HEATER A

- LAVATORY WATER HEATER D
- LAVATORY WATER HEATER E

Power distribution panel number 1

- POT WATER COMPRESSOR
- WATER QTY IND

Supplementary Procedures

Air Systems

Chapter SP

Section 2

Wing–Body Overheat Test

- Wing–body OVHT TEST switch Push
Hold for a minimum of 5 seconds.
- Both WING–BODY OVERHEAT lights – illuminated
- MASTER CAUTION – illuminated
- AIR COND system annunciator – illuminated
- Wing–body OVHT TEST switch Release
- Both WING–BODY OVERHEAT lights – extinguished
- MASTER CAUTION lights – extinguished
- AIR COND system annunciator – extinguished

Air Conditioning/Heating with Ground Conditioned Air

Before connecting ground conditioned air source:

- PACK switches OFF
Allows cart to operate at maximum efficiency.

After disconnecting ground conditioned air source:

- PACK switches As required

Note: To allow more efficient cooling/heating of the aircraft interior,
select the RECIRCULATION fan switch(es) OFF.

Air Conditioning/Heating with APU Pneumatic Air

- Pack switches AUTO/HIGH
- ISOLATION VALVE switch OPEN
- Engine bleed air switches ON
- APU bleed air switch ON
- Wait one minute prior to utilizing APU pneumatics.

Air Conditioning/Heating with Ground Pneumatic Air Cart

CAUTION: The BAT switch should always be on when using the airplane air conditioning system since the protective circuits are DC. This ensures protection in the event of loss of AC power.

APU BLEED air switch OFF

ISOLATION VALVE switch OPEN

3601 - 3610

RECIRC FAN switch AUTO

3701 - 3773, 3801 - 3900

RECIRC FAN switches AUTO

3701 - 3773, 3801 - 3900

TRIM AIR Switch ON

PACK switches AUTO/HIGH

Temperature selectors As desired

Duct pressure 20 psi minimum

If pneumatic air source cannot maintain 20 psi minimum :

ISOLATION VALVE switch AUTO

Single pack operation only.

Isolated Pack Operation during Engine Start

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

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

Engine No. 2 Start

After engine No. 2 stabilized:

ISOLATION VALVE switch CLOSE

Right PACK switch AUTO

Duct pressure Stabilized

Engine No. 1 Start

After engine No. 1 stabilized:

ISOLATION VALVE switch AUTO

Pressurization System Manual Mode Test

PACK switches OFF

Pressurization mode selector MAN

AUTO FAIL and ALTN lights – extinguished.

MANUAL light – illuminated.

Outflow valve switch CLOSE

Verify outflow valve position indicator moves toward CLOSE.

Outflow valve switch OPEN

Verify outflow valve position indicator moves toward OPEN.

Pressurization mode selector AUTO

Verify outflow valve position indicator moves toward OPEN.

MANUAL light – extinguished.

Manual Mode Operation

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

Pressurization mode selector MAN

MANUAL light – illuminated

CABIN/FLIGHT ALTITUDE placard Check

Determine the desired cabin altitude.

If a higher cabin altitude is desired:

Outflow valve switch (momentarily) OPEN

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

If a lower cabin altitude is desired:

Outflow valve switch (momentarily) CLOSE

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

During descent:

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

Outflow valve switch (momentarily) CLOSE

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

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

Pressurization Control Operation – Landing at Alternate Airport

At top of descent:

LAND ALT Indicator Reset
Reset to new destination field elevation.

Automatic Pressurization Control – Departure Airport Elevation Above 8400 Feet

3601 - 3610

After electrical power is applied to the airplane:

HIGH ALT LDG switch Off

Monitor CABIN ALT and CABIN rate of CLIMB indicators during climb to ensure altitude is descending below 8,500 feet at which time the cabin altitude warning system is automatically reset to 10,000 feet.

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

Note: If departure airport elevation is above 9,000 feet, the high altitude landing mode may be active and the warning system set for the High Altitude set point. When the cabin altitude descends below 8,500 feet, the cabin altitude warning system is automatically reset to 10,000 feet.

If landing altitude is at or below 6,000 feet:

LAND ALT indicator Destination field elevation

If landing altitude is above 6,000 feet:

Do the Automatic Pressurization Control – Landing Airport Elevation Above 6000 Feet With HIGH ALT LDG Switch procedure.

**Automatic Pressurization Control – Landing Airport Elevation
Above 6000 Feet With HIGH ALT LDG Switch**

3601 - 3610

Do the normal Preflight Procedure except as modified below.

Prior to takeoff:

LAND ALT indicator 6000 feet

At initial descent or approximately 20 minutes prior to landing:

If landing elevation is above 8,400 feet:

HIGH ALT LDG switch ON

Reprograms initiation of cabin altitude warning from
10,000 to 12,650 feet.

LAND ALT indicator..... Destination field elevation

**Automatic Pressurization Control – Landing Airport Elevation
Above 6000 Feet Without HIGH ALT LDG Switch**

3701 - 3773, 3801 - 3900

Do the normal Preflight Procedure except as modified below.

Prior to takeoff:

LAND ALT indicator..... 6000 feet

At initial descent or approximately 20 minutes prior to landing:

LAND ALT indicator..... Destination field elevation

CHECK AIR COND PANEL Message

If the bleed or pack switches are not in the normal configuration during takeoff, a message will be generated and uplinked approximately 4 minutes after takeoff. A chime is associated with the uplink. The message reads:

AIR COND panel Check

BLEED switches As reqd

PACK switches As reqd

ISOLATION VALVE As reqd

If the CHECK AIR COND PANEL message is received, accomplish the following:

BLEED switch position(s) Check

PACK switch position(s) Check

ISOLATION VALVE position Check

Note: Bleeds-off takeoffs and MEL required configurations may generate the CHECK AIR COND PANEL message.

Unpressurized Takeoff and Landing

When making a no engine bleed takeoff or landing with the APU inoperative, or operative but not providing bleed air:

Takeoff

PACK switches AUTO
ISOLATION VALVE switch CLOSE
Engine BLEED air switches OFF
APU BLEED air switch OFF

Note: Cross-check the FMS supplied OAT with the ATIS OAT. If there is a difference, overwrite (change to large font) the temperature in the FMC with the OAT reported on ATIS.

CAUTION: Enter a slash before the temperature (/XX) in the TAKEOFF REF page to avoid an unintentional Assumed Temperature entry.

After Takeoff

Note: If engine failure occurs, do not position engine BLEED air switches ON until reaching 1500 feet or until obstacle clearance height has been attained.

At not less than 400 feet, and prior to 2000 feet above field elevation:

Engine No. 2 BLEED air switch ON

When CABIN rate of CLIMB indicator stabilizes:

Engine No. 1 BLEED air switch ON

ISOLATION VALVE switch AUTO

Note: A CHECK AIR COND PANEL message may be generated 4 minutes after takeoff.

Landing

When below 10,000 feet and starting final approach turn:

Engine BLEED air switches OFF

Avoid high rates of descent for passenger comfort.

No Engine Bleed Takeoff and Landing

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

Note: If the APU is inoperative, refer to Unpressurized Takeoff and Landing, this section.

Takeoff

Note: If wing anti-ice is required for taxi, configure for a “No Engine Bleed Takeoff” just prior to takeoff.

Note: If anti-ice is not required for taxi, configuration for a “No Engine Bleed Takeoff” may be accomplished just after engine start.

Right PACK switch AUTO

ISOLATION VALVE switch CLOSE

Left PACK switch AUTO

Engine No. 1 BLEED air switch OFF

APU BLEED air switch ON

Engine No. 2 BLEED air switch OFF

3701-3773, 3801 - 3900

TRIM AIR Switch ON

WING ANTI-ICE switch OFF

The WING ANTI-ICE switch must remain OFF until the engine BLEED air switches are repositioned to ON and the ISOLATION VALVE switch is repositioned to AUTO.

After Takeoff

Note: If engine failure occurs, do not position engine BLEED air switches ON until reaching 1500 feet or until obstacle clearance height has been attained.

Engine No. 2 BLEED air switch ON

APU BLEED air switch OFF

When CABIN rate of CLIMB indicator stabilizes:

Engine No. 1 BLEED air switch ON
ISOLATION VALVE switch AUTO

Note: A CHECK AIR COND PANEL message may be generated 4 minutes after takeoff.

Landing

If additional go-around thrust is desired, configure the pressurization system for a no engine bleed landing.

When below 10,000 feet:

WING ANTI-ICE switch OFF
Right PACK switch AUTO
ISOLATION VALVE switch CLOSE
Left PACK switch AUTO
Engine No. 1 BLEED air switch OFF
APU BLEED air switch ON
Engine No. 2 BLEED air switch OFF

Supplementary Procedures

Anti-Ice, Rain

Chapter SP

Section 3

Anti-Ice Use

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.

Window Heat System Tests

Overheat Test

The overheat test simulates an overheat condition to check the overheat warning function of the window heat system.

WINDOW HEAT switches ON

3856-3920

Verify that the OVERHEAT lights extinguish within 5 seconds.

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

WINDOW HEAT TEST switch OVHT

OVERHEAT lights – On

ON lights – Extinguish

Lights extinguish after approximately 1 minute.

MASTER CAUTION – On

ANTI-ICE system annunciator – On

WINDOW HEAT switches Reset

Position the WINDOW HEAT switches OFF, then ON.

3856-3920

Verify that the OVERHEAT lights extinguish within 5 seconds.

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

Power Test

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

WINDOW HEAT switches ON

3856-3920

Verify that the OVERHEAT lights extinguish within 5 seconds.

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

Note: Do not perform the power test when all ON lights are illuminated.

WINDOW HEAT TEST switch PWR

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

WINDOW HEAT ON lights Illuminated

If any ON light remains extinguished, the window heat system is inoperative. Observe the maximum airspeed limit of 250 kts below 10,000 feet.

Supplementary Procedures

Automatic Flight

Chapter SP

Section 4

Intervention of FMC Altitude Constraints during VNAV Climb

MCP altitude selector Set new altitude
New altitude must be higher than the FMC altitude constraint(s) to be deleted.

ALT INTV switch Push
Each push of the ALT INTV switch will delete an FMC altitude constraint, up to MCP altitude.

Intervention of FMC Cruise Altitude during VNAV Cruise

U12 not installed

MCP altitude selector Set

ALT INTV switch Push

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

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

Intervention of FMC Cruise Altitude during VNAV Cruise

Aircraft installed with U12

MCP altitude selector Set

ALT INTV switch Push

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

If the airplane is more than 50 nm from T/D, if a lower altitude is selected, a CRZ descent will be started if the selected altitude is above any FMC altitude constraint.

If the airplane is more than 50 nm from T/D, if a lower altitude is selected, an early descent will be started if the selected altitude is below any FMC altitude constraint.

If the airplane is 50 nm or less from T/D, if a lower altitude is selected, an early descent will be started.

Intervention of FMC Altitude Constraints during VNAV Descent

- MCP altitude selector Set new altitude
New altitude must be lower than the FMC altitude constraint (s) to be deleted.
- ALT INTV switch Push
Each push of the ALT INTV switch will delete an FMC altitude constraint, down to MCP altitude.
If all FMC altitude constraints are deleted, the descent mode will revert to a VNAV speed descent.

Intervention of FMC Airspeed Constraints during VNAV

- SPD INTV switch Push
MCP IAS/MACH display shows current FMC target speed.
- IAS/MACH Selector Set desired speed
VNAV remains engaged.
- To resume former FMC speed:
- SPD INTV switch Push
MCP IAS/MACH display blanks and FMC commanded VNAV speed is active.

Aircraft Communication Addressing and Reporting System (ACARS)

Pre-Departure Clearance

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

Digital-Automatic Information Service

The flight crew shall verify that the D-ATIS altimeter setting numeric value and alpha value are identical. The alpha value is the numeric altimeter setting spelled out (i.e., two niner niner two). This will be depicted on the ACARS ATIS message. If the D-ATIS altimeter setting altimeter numeric value and alpha values are different, the flight crew must not accept the D-ATIS altimeter setting.

Reports and Requests

Downlinks are divided into two categories: “Reports” and “Requests”.

Menu Navigation

Main Menu

The prompts on the main MENU are divided into three general categories: data, requests, and reports.

- Data includes:
 - DATA INIT (1L)
 - DEPT / ENROUTE (3L)
 - SUMMARY / ARR DATA (4L)
 - SENT MESSAGES (5L)
 - RECEIVED MESSAGES (3R)
- Requests include:
 - ATC REQUESTS (1R)
 - DAL REQUESTS (2R)
- Reports include:
 - REPORTS FLT PROGRESS (4R)
 - REPORTS MAINTENANCE (5R)



Most pages contain RETURN (6L) and MENU (6R) prompts. The RETURN prompt will take you back to the most recently viewed page. The MENU prompt will always return you to the main menu and will appear any time there is not a higher priority message at (6R). For instance, the MENU prompt will be temporarily replaced with a MESSAGE prompt when a new message is received. After the message is read, the MENU prompt will return to (6R).

INIT DATA 1/2

INIT DATA menu page 1/2 has familiar initialization fields, including the INIT RQST (5L) prompt which initializes the ACARS for your flight and requests uplinks for aircraft equipped with FMC datalink capability.

Estimated Time Enroute, ETE (1R), must be manually entered.

This page displays a UTC clock with seconds (2R) as does the DEPT menu page.

A new FMC RESET (3R) prompt easily resets the datalink function if necessary.

Fuel On Departure, FOD (4R), requires no pilot input. It will automatically capture and downlink with the OUT event.

ACARS - N N N N F L I G H T N O . [] [] [] [] F L T R L S D A T E [] [] D E P T S T N [] [] [] D E S T S T N [] [] [] * INIT RQST < RETURN H H : M M	INIT DATA 1 / 2 ETE [] [] : [] [] UTC 185608Z FMC RESET * F O D LBS [] [] [] [] I D / R L S D A T A NEXT PAGE > MENU*

INIT DATA 2/2

INIT DATA menu page 2/2 is set up to record CAPT ID (1L), F/O ID (2L), and Flight Release (3R). These fields should be completed on initialization or the ACARS will prompt the pilots after the IN event.

ACARS - N N N N INIT DATA 2 / 2

CAPT HUD CAPT

[] [] [] [] [] [] [] [] [] []

F / O F / O 2

[] [] [] [] [] [] [] [] [] []

F / A FLT RLS #

[] [] [] [] [] [] []

<HELP RLS AMEND

*SEND [] []

<RETURN HH : MM MENU*

ACARS will verify the release number entered is the most current and respond with RLS OK message; if not, the crew will be notified by a RLS ERR response.

F/A (3L), HUD CAPT (1R), and RLS AMEND (4R) are provisioned for future use. F/O 2 (2R) is the standard display on all Delta aircraft. This feature is not functional on the B737.

ATC REQUESTS

The ATC REQUEST menu page contains prompts for US/Canada Predeparture Clearance (PDC RQST) (1L), and digital ATIS (3R).

The following are provisioned for future use:

PUSH RQST (2L) and TAXI RQST (3L). (For 737 operations OCEANIC CLX (2R) is not used.)



DAL REQUESTS

The DAL REQUESTS menu page provides options to address FREE TEXT (1L) downlinks to various ground based users, and to make both WEATHER (3L) and PERF TAKEOFF (3R) requests.

The following are provisioned for future use:

PERF CRUISE (4R), PERF LANDING (5R), REQUEST VOICE (4L), TURB PLOT (2L), and CONNECTING GATES (1R).

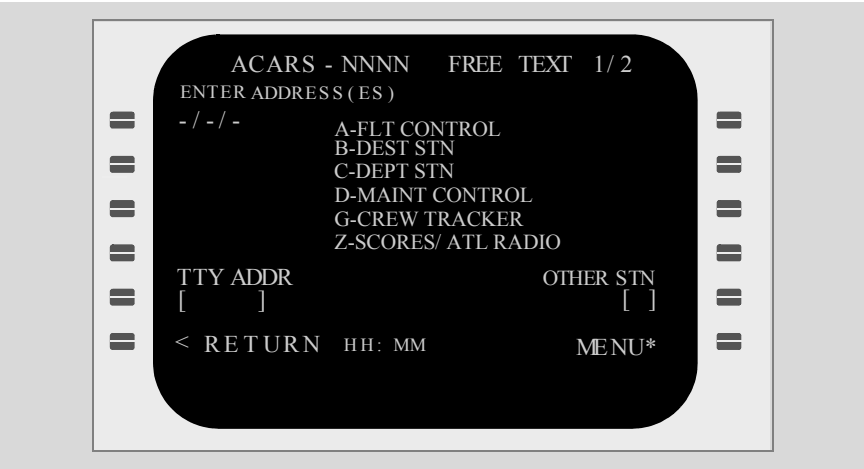


FREE TEXT REPORT

A FREE TEXT prompt (found on the DAL REQUESTS screen) allows the flight crew to designate an address for free text message routing by entering the corresponding code letter(s) at 1L. (e.g., to send a message to Flight Control, enter “A” in the scratchpad and select (1L)).

FREE TEXT messages support eight lines of text. However, the first line of text must be entered at 1L or the SEND prompt will not appear. Text is entered directly on the applicable pages.

To assist in text entry, each line of text has an adjacent arrow symbol that points to its corresponding line select key. The first line of text is entered at 1L, the second line at 1R, then 2L, 2R, 3L, 3R, 4L and 4R.



DEPT/ENROUTE

The DEPT/ENROUTE data page consolidates flight progress information on one page. It can be selected anytime, and is displayed automatically at the OFF event.

The OUT time (1L) records the first time the parking brake is released after all cabin and cargo doors are closed. Two additional metrics capture the time when all cabin and cargo doors are closed (2L).

Additionally, the INS/GPS OUT time records the first aircraft movement during pushback. This page also displays a Time-To-Go (TTGO) field that counts down the remaining flight time based on the most recent arrival estimate.

The estimated time of arrival is called Estimated On (EON), and all arrival estimates are based on this time. (The DEPT page does not have a print prompt.)

The following are provisioned for future use:

DLY REASONS (4R), GATE/ELEC/AIR indications (4L), and GATE *REQUEST (5L).

ACARS - NNNN OUT / OFF ----/----Z CAB / CARGO CLSD ----/----Z EST GATE OPEN ----Z GATE / ELEC / AIR ---/-/- GATE * REQUEST < RETURN	DEPT 183659Z INS / GPS OUT ----Z TTGO --:-- EON ----Z APU/ DLY REASONS > ! T/O PWR & !T/O + LAND ID > MENU *

FLT PROGRESS REPORTS

In addition to the Free Text prompt, the REPORTS menu page provides prompts to send In-range Gate Requests and communicate flight progress updates to Flight Control.

DIVERT (2R), POSITION (3L), ENTER/CONTINUE HOLD (3R), EON UPDATE / EXIT HOLD (4R), TURBULENCE (4L), and Taxi Out/In DELAY (5R) reports are also found on the REPORTS page.

The HOLD report structures communication between pilot and dispatcher during holding, and has an option to complete “Considering Divert”. This report will alert dispatch to a possible divert decision.

The FCR (Flight Crew Report) prompt at (2L) is provisioned for future use.



SUMMARY/ARR DATA

The ARRIVAL menu page displays OUT/OFF/ON/IN times (1L & 2L), as well as the total (actual) ACT BLOCK (3L) time for the segment. Fuel Remaining (FREM) (1R) will be automatically filled. RNP APPR (2R) and AUTOLAND (3R) allow for reporting and tracking of those events.

Flight times for current or previous flights can be viewed and/or printed by selecting PREV FLTS (5L). (The ARRIVAL page does not have a print prompt.) PREV FLTS also contains a new metric that captures the number of seconds that elapse from the IN time until the cabin door is opened.

The “!” symbol next to an item indicates that required data has not yet been entered. Select (5R) to access the T/O + LAND page, then (5L), which allows selection of TO, TO1, or TO2. Enter Assumed Temp (AT) at (5R).

ACARS - NNNN		ARRIVAL	
=	OUT / OFF ----/----Z	FREM □□□□	=
=	OUT / IN ----/----Z	OPD / RNP APPR >	=
=	ACT BLOCK -- : --	AUTOLAND	=
=	GATE / ELEC / AIR ---/-/-	APU / DLY REASON >	=
=	PRINT /	! T/O PWR & !T/O + LAND ID >	=
=	< PREV FLTS		=
=	< RETURN HH:MM	MENU *	=

ACARS - NNNN		T/O + LAND	
=	TAKEOFF * CAPT	LAND 965311 >> *	=
=	*<< F/O	657116 *	=
=			=
=	T/O PWR ↓ □□□	PWR DERATE AT [] >	=
=	< RETURN HH:MM	MENU *	=

Arrival Delay Reporting

Use the ACARS Taxi-In Delay Reason function to report the reason(s) for delays incurred while taxiing to the gate. This function is selected directly from the ACARS Arrival Data page, which is automatically displayed after landing. The arrival gate number is displayed on this page. After reviewing the gate assignment, Delay Reasons can be selected, and delay times should be entered by category (in minutes).

ACARS - NNNN

ARRIVAL

OUT / OFF

-----Z

OUT / IN

-----Z

ACT BLOCK

-- : --

GATE / ELEC / AIR

C06 / - / -

PRINT /

< PREV FLTS

< RETURN

HH:MM

FREM

015.0

ODP

RNP APPR >

AUTOLAND

APU /

DLY REASON >

! T/O PWR &

!T/O + LAND ID >

MENU*

Enter delay minutes in applicable categories. The completed arrival delay report below shows a 3 minute delay for safety zone not clear; a 12 minute delay due to an occupied gate, and a 2 minute delay while awaiting the marshaller.

ACARS - NNNN

ARR DLY RSNS

TAXI CONGEST

[:]

RAMP CONGEST

[:]

GATE OCCPD

00 : 12

↓[N] ELEC

HOURS

00172.7

< RETURN

HH:MM

GATE AGENT

[:]

SAFETY ZONE

00 : 03

MARSHALLER

00 : 02

COND AIR [N]↓

APU

CYCLES

000613

MENU*

TAKEOFF PERFORM

T/O PERF page 2/3 offers easy to use runway contaminant choices of WET, DRY, ¼ or ½ INCH SLUSH EQUIVALENT, and ICY.

The following are all provisioned for future use:
FLAPS (2R), THRUST (3R), and ENG A/I ON (4R).

The diagram illustrates the ACARS - NNNN T/O PERF 2/3 screen. At the top, the text "ACARS - NNNN" is on the left and "T/O PERF 2/3" is on the right. Below this, the word "RUNWAY" is centered. A dashed line follows. The main menu items are listed below the dashed line, with "CONTAMINANT / RWY COND" centered at the top of the list. The items are: "> WET", "SLUSH EQUIVALENT", "> 1/4 INCH", "1/2 INCH <", "> ICY", "HELP >", "* SEND", "OTHER INPUTS >", "< RETURN", "HH:MM", and "MENU*".

MAINTENANCE REPORTS

Cabin FRC Codes, cockpit FRM codes, or other discrepancies may be sent using the WRITE-UP ENROUTE MAINT (1L) prompt on the REPORTS MAINTENANCE menu.

Enter the numeric code (e.g. 253-12) and the three character location (e.g. 401 or 01A). Do not enter the letters “FRC”.

Engine Data and APU Time/Cycle data is sent automatically and therefore is not displayed with use of this menu.

The following are all provisioned for future use:
HELP (2L) and DIAGNOSTICS (3R).

ACARS - NNNN REPORTS

WRITE - UP

< ENROUTE MAINT

< HELP

COLD START

< APU DIAGNOSTICS >

< ENG RPT

< RETURN HH: MM MENU*

ACARS - NNNN WRITE - UP 1/2

CABIN FRC CODE FRM CODE

[] [] >

LOCATION

LOCATION MSG ROUTED TO

LOCATION BOTH DEST LINE

LOCATION MTC AND

MAINT CTRL

* SEND REMARKS >

< RETURN HH: MM MENU*

SENT MESSAGES

Sent Messages allows the crew to view previously sent downlinks. However, Departure Clearance, Oceanic Clearance, and ATIS are not archived.

RECEIVED MESSAGES

The REC MSGS menu page allows the flight crew to retrieve previously viewed messages. The *DELETE ALL (5L) prompt allows the flight crew to manually delete all messages (after confirmation).

ACARS - NNNN		REC MSGS	MM/NN
=	1416Z	VIEWED	=
	←SEA ATIS	INFO K	1353Z.
=	1358Z	VIEWED	=
	←ATL DEP	INFO Q	1352Z.
=	1357Z	VIEWED	=
	←ATL DEP	INFO Q	1352Z.
=	1355Z	VIEWED	=
	←ATL DEP	INFO Q	1352Z.

=	* DELETE ALL	ATS LOG>	
=	< RETURN HH: MM	MENU*	

ACARS -601 Flight Tips

- (1) From the Main Menu select DATA INIT followed by INIT RQST. Flight Number, Date, and City Pair should uplink automatically. Manually enter ETE and any other data that fails to automatically initialize. FMC Datalink (as installed) is automatically requested via INIT RQST. Enter CAPT ID and F/O ID on page 2.
- (2) Request ATIS and PDC from ATC REQUESTS page
- (3) WDR is uplinked like PMDL ACARS. If another WDR is needed due to runway change, etc., select DAL REQUESTS, then select PERF TAKEOFF. Enter desired runway, but do not precede with “88”. Use a dash for intersection departures (e.g. 27R-M18).
- (4) To send a text message to Flight Control, select DAL REQUESTS from the main menu, then select FREE TEXT. Enter address “A” in the scratchpad and select 1L. Enter desired text and press SEND.
- (5) OUT and OFF times, door closings, and INS/GPS movement times can be reviewed on the DEPT/ENROUTE page from the Main Menu. OUT time is triggered by parking brake release after all cabin and cargo doors are closed.
- (6) Takeoff Delay, Position Reports, Holding, and In-Range messages can be sent via the REPORTS FLIGHT PROGRESS menu.
- (7) Entries for T/O PWR can be made using either the ARR DATA or ENROUTE page.
- (8) After gate arrival, OUT/OFF/ON/IN times can be viewed on the ARR DATA page or printed via the PREV FLTS prompt. IN time is defined as the last time the parking brake is set before the cabin door is open.

ACARS Communication

Flight Plan S-MELs

S-MELs are included in the FPS flight plan to communicate important information concerning the aircraft or flight. S-MELs used include:

- MEL S 22-00-LNG ACCOMPLISH LLM AUTOLANDING:

A request from MCC to perform an autoland. This message is generated a few days prior to the autoland expiration date. This is only a request; if an autoland cannot be accomplished for operational reasons, no action is required.

See Autoland Recording in this section for ACARS recording procedure.

- Note:** This request is auto-generated and does not consider weather conditions, airport capabilities, or other MELs, which may restrict the aircraft.

- MEL S 72-82-ECM ACCOMPLISH ENGINE ECM REPORT:

A request from MCC to perform a manual Engine Condition Monitoring report.

See Engine Condition Monitoring in this section for ACARS recording procedure.

- MEL S 72-83-FTT ACCOMPLISH FULL THRUST TAKEOFF:

A request from MCC to perform a full thrust takeoff.

CAUTION: Some takeoff weights preclude full power takeoffs when performance limited by VMCG/VMCA. Do not takeoff with full TO power unless WDR provides TO data.

See TOGA Takeoff Recording in this section for ACARS recording procedure.

ACARS Data Collection

Autoland Recording

Per Delta's Lower Landing Minimums (LLM) program, aircraft must accomplish and record an autoland periodically.

- Note:** When the aircraft is approaching its autoland due date, MCC will request the crew perform an autoland using an S-MEL. This is only a request; if an autoland cannot be accomplished for operational reasons, no action is required.

Autoland Criteria

An autoland is successful if no malfunctions occur which would prevent an autoland under CAT III conditions. Additionally, the aircraft must land within the normal touchdown zone (approximately 1,500 to 3,000 feet from the threshold), within 27 feet of the centerline.

Note: Data on the ARRIVAL page must be entered within 7 minutes of the “IN” time or the data will be lost.

Note: Entering autoland data updates autoland currency for both pilots (Reference FOM Part 2, Chapter 15).

Use the following procedure to record when an autoland is accomplished, whether it is for aircraft currency, weather, or pilot proficiency.

After an autoland, complete the ACARS ARRIVAL page at destination as follows:

From the ACARS Main Menu page:



Select SUMMARY/ARR DATA at LSK 4L

	ACARS - NNNN	ARRIVAL	
=	OUT / OFF	FREM	=
=	----/----Z	□□□□	=
=	OUT / IN	OPD /	=
=	----/----Z	RNP APPR >	=
=	ACT BLOCK	AUTOLAND	=
=	-- : --	APU /	=
=	GATE / ELEC / AIR	DLY REASON >	=
=	---/-/-	! T/O PWR &	=
=	PRINT /	!T/O + LAND ID >	=
=	< PREV FLTS	MENU*	=
=	< RETURN HH:MM		=

Select AUTOLAND at LSK 3R

	ACARS -	AUTOLAND	
=	CATEGORY		=
=	↓SELECT CAT		=
=			=
=			=
=			=
=	< RETURN HH:MM	MENU*	=

Enter “CAT I”, “CAT II”, “CAT IIIA”, or “CAT IIIB” (for actual weather category) into the CATEGORY field at LSK 1L



ACARS - AUTOLAND

CATEGORY
↓CAT 1
SUCCESSFUL
↓YES

RUNWAY
□□□□□□

< RETURN HH:MM MENU*

Select “YES” or “NO” into the SUCCESSFUL field at LSK 2L. If the autoland was attempted and unsuccessful, make a logbook write-up including as much pertinent information as possible. Do not enter “NO” unless an autoland was unsuccessful due to aircraft automation reasons.

If “NO” was selected, enter remarks (as needed) on lines 3-5.



ACARS - AUTOLAND

CATEGORY
↓CAT 1
SUCCESSFUL
↓NO

RUNWAY
□□□□□□

ENTER REMARKS:

←]
[↑
←]
[↑
←]

< RETURN HH:MM MENU*

Enter the approach runway (i.e., RW25R) at LSK 2R.

Note: There is no SEND prompt. This report is automatically downlinked.

ACARS Engine Condition Monitoring (ECM) Report

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:

- S72-82-ECM ACCOMPLISH ENGINE ECM REPORT

Note: Accomplish the report(s) during cruise for flights over one hour. For flights over 2.5 hours, complete two reports.

Note: If ACARS is inoperative, the data should be recorded on the Engine Trend Data Sheets.

Use the following procedure to complete the report:

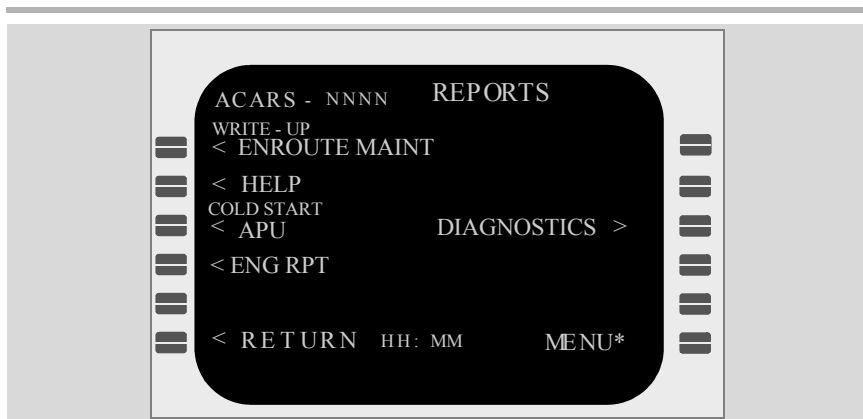
When the aircraft is stabilized in cruise:

Autothrottles Disengage
Allow engines to stabilize for 5 minutes without changing thrust.

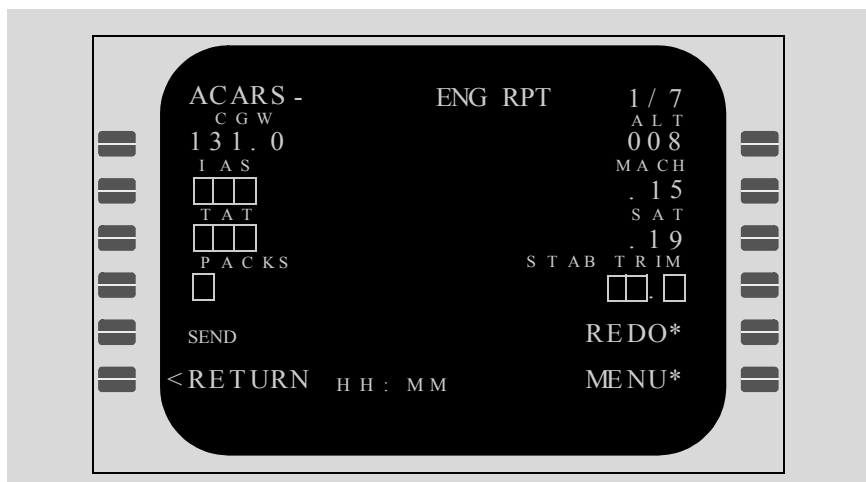
From the ACARS Main Menu page:



Select REPORTS MAINTENANCE at LSK 5R.



Select ENG RPT at LSK 4L.

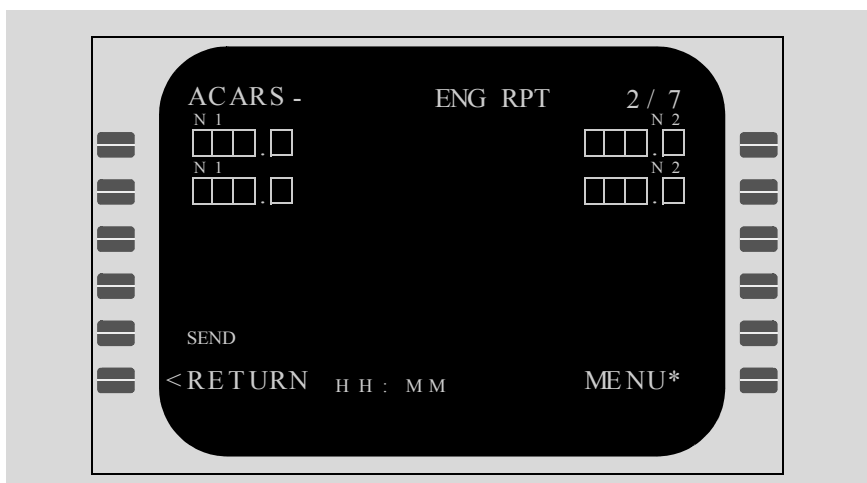


- Enter the Cruise Gross Weight (CGW) at LSK 1L
- Enter/verify Indicated Air Speed (IAS) at LSK 2L
- Enter Total Air Temperature (TAT) at LSK 3L

Note: Sign entry is optional, if no sign is entered the value will default to negative

- Enter number of operating packs (PACKS) at LSK 4L
- Enter/verify the flight level (ALT) at LSK 1R
- Enter/verify the Mach Number (MACH) at LSK 2R

- Enter/verify the Static Air Temperature (SAT) at LSK 3R
 - Note:** Sign entry is optional, if no sign is entered the value will default to negative
- Enter stabilizer trim (STAB TRIM) at LSK 4R
 - Note:** Sign entry is optional, if no sign is entered the value will default to positive
- Select NEXT PAGE key



- Enter N1 for ENGINE 1 and 2 at LSK 1L and 2L
- Enter N2 for ENGINE 1 and 2 at LSK 1R and 2R
- Select NEXT PAGE key

ACARS - ENG RPT 3 / 7

ENGINE 1 THROTL

ENGINE 2 THROTL

SEND

<RETURN HH:MM MENU*

- Do not enter throttle (THROTL) information; it is not used by the B737 Engineering
- Select NEXT PAGE key

ACARS - ENG RPT 4 / 7

EPR

EPR

EPR

EPR

SEND

<RETURN HH:MM MENU*

- Do not enter Engine Pressure Ratio (EPR) information; it is not used by the B737 Engineering
- Enter Exhaust Gas Temperature (EGT) for ENGINE 1 and 2 at LSK 1R and 2R
- Select NEXT PAGE key

ACARS - ENG RPT 5 / 7

FF ENGINE 1 OIL PRS

FF ENGINE 2 OIL PRS

SEND

<RETURN H H : M M MENU*

- Enter Fuel Flow (FF) for ENGINE 1 and 2 at LSK 1L and 2L
- Enter Oil Pressure (OIL PRS) for ENGINE 1 and 2 at LSK 1R and 2R
- Select NEXT PAGE key

ACARS - ENG RPT 6 / 7

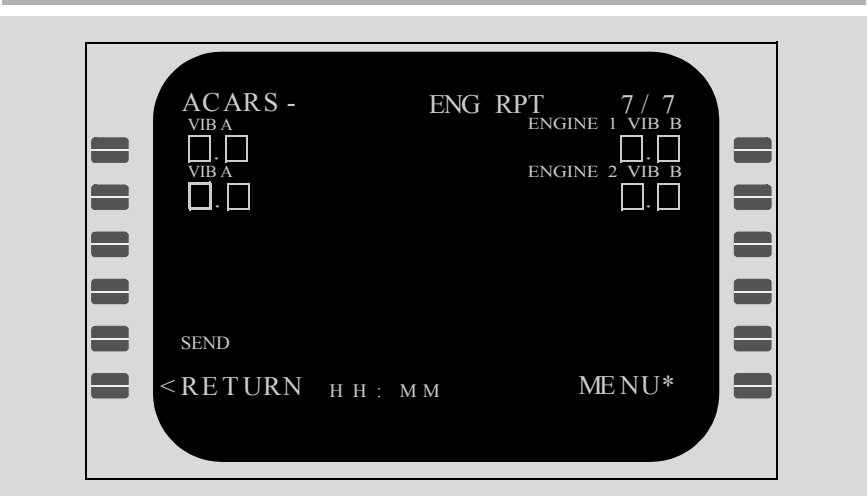
OIL TMP ENGINE 1 OIL QTY

OIL TMP ENGINE 2 OIL QTY

SEND

<RETURN H H : M M MENU*

- Enter Oil Temperature (OIL TMP) for ENGINE 1 and 2 at LSK 1L and 2L
- Enter Oil Quantity (OIL QTY) for ENGINE 1 and 2 at LSK 1R and 2R
- Select NEXT PAGE key



- Enter Vibration (VIB A) for ENGINE 1 and 2 at LSK 1L and 2L
- Do not enter Vibration (VIB B) information; it is not used by the B737 Engineering
- Select SEND at LSK 5L

Autothrottles Re-engage

CAUTION: Failure to re-engage the autothrottles could lead to a low or high speed condition.

Full Thrust Takeoff Recording

Delta aircraft must accomplish and record a full thrust takeoff periodically for engine currency.

Following any takeoff (requested or otherwise), complete the ACARS ARRIVAL page at destination as follows:

Note: Data on the ARRIVAL page must be entered within 7 minutes of the “IN” time or the data will be lost.

CAUTION: Some takeoff weights preclude full power takeoffs when performance limited by VMCG/VMCA. Do not takeoff with full TO power unless WDR provides TO data.

From the ACARS Main Menu page:



- Select SUMMARY/ARR DATA at LSK 4L

ACARS - NNNN		ARRIVAL	
OUT / OFF		FREM	
---/---Z		□□□	
OUT / IN		OPD /	
---/---Z		RNP APPR >	
ACT BLOCK		AUTOLAND	
--:--		APU /	
GATE / ELEC / AIR		DLY REASON >	
---/---/		! T/O PWR &	
PRINT /		!T/O + LND ID >	
< PREV FLTS			
< RETURN	HH:MM	MENU*	

- Select T/O PWR & T/O+LND ID at LSK 5R

Note: The “!” symbol indicates that required data has not been entered.

ACARS - NNNN		T/O + LAND	
TAKEOFF		LAND	
* CAPT		000001 >> *	
* << F/O		000002 *	
T/O PWR		PWR DERATE	
↓ □□□		AT [] >	
< RETURN	HH:MM	MENU*	

- Select “TO” into the T/O PWR field at LSK 5L
 - PWR DERATE at LSK 5R
- Do not enter a temperature for full TO power takeoffs.

Note: There is no SEND prompt; this report is automatically downlinked.

ACARS RNAV (RNP) Approach Documentation

The ACARS RNP display page is used to report and collect data for RNAV (RNP) approaches. Operational reports are required and will allow Delta to exercise the full potential of RNAV (RNP) operations worldwide.

Use the following procedure to complete the report:

From the ACARS Main Menu page:



- Select SUMMARY/ARR DATA at LSK 4L

ACARS - NNNN ARRIVAL

OUT / OFF
----/----Z

OUT / IN
----/----Z

ACT BLOCK
-- : --

GATE / ELEC / AIR
---/-/-

PRINT /

< PREV FLTS

< RETURN HH:MM

FREM
□□□

OPD /

RNP APPR >

AUTOLAND

APU /

DLY REASON >

! T/O PWR &

!T/O + LND ID >

MENU*

- Select OPD/RNP APPR at LSK 2R

ACARS - SAT/UNSAT

↓ □□□□

TYPE

↓ □□□□□□□□

PROCEDURE NAME

[]

RNP APPR 1 / 2

RUNWAY

□□□□□

RNP LEVEL

. []

SEND

REMARKS >

< RETURN HH : MM

MENU*

- Select SAT or UNSAT into the SAT/UNSAT field at LSK 1L
- Select RNAV (RNP) into the TYPE field at LSK 2L
- Enter the procedure name into PROCEDURE NAME field at LSK 3L
- Enter the runway into the RUNWAY field at LSK 1R
- Enter the RNP value into the RNP LEVEL field at LSK 2R
- Select REMARKS at LSK 5R or the NEXT PAGE key

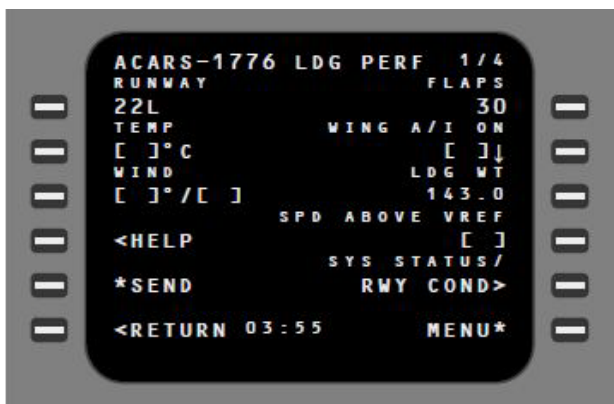
ACARS - RNP APPR 2 / 2
ENTER REMARKS:
←
[
←
[
←
[
←
[
SEND
<RETURN H H : M M MENU*
] ↑
] ↑
] ↑
] ↑
] ↑
] ↑
] ↑
] ↑

- Enter REMARKS (as needed) into lines 1-4
- Select *SEND at LSK 5L

ACARS Landing Performance Request (LPR)

Note: LPR is intended for normal landing distances. For non-normal landing configurations, use the ODM charts.

From the ACARS main menu page, line select DAL REQUESTS, then PERF LANDING.



Desired runway must be entered. If flap and landing weight are not entered, they will default to Flaps 30 and estimated or max landing weight. Temperature and wind are automatically captured but may be entered manually if desired. Wing A/I can be toggled on if necessary.

Calculations assume the aircraft will decelerate during the flare and touchdown at VREF minus 5 knots. Speed above VREF is not entered for headwinds; however, additives for gusts are carried through to touchdown and should be entered.

Entering a value in the SPD ABOVE VREF block increases the touchdown speed by the same amount and landing distance will increase.

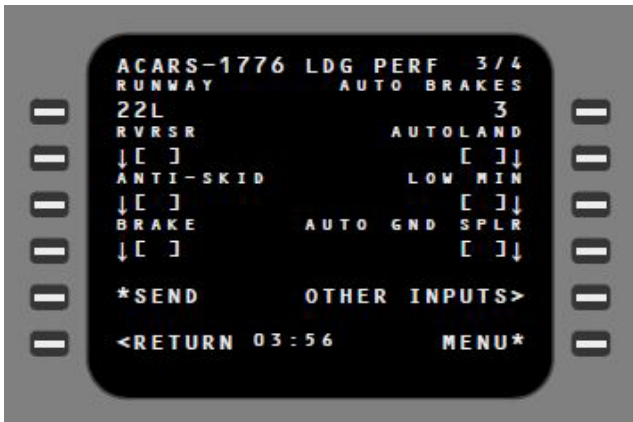
Select the RWY COND prompt, then line select the desired Runway Condition Code (e.g. 5) or Braking Action Report (e.g. GOOD).



Select SYS STATUS to display page 3.

Enter desired autobrake selection.

- 0 = Max manual
- 1-3 = Normal autobrake
- 4 or 5 = Max auto



Pg 3 also allows calculation adjustments for inoperative braking systems. LOW MIN is not used.

Defaults: If the blocks for flaps, autobrakes, and landing weight are left blank, the system will default to Flaps 30, Autobrakes 2 and estimated or max landing weight. Crews must always enter weight when landing above the aircraft max landing weight.

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 7400'. The actual stopping distance is less since LDIST includes a 15% safety margin. LDIST is 1000' shorter than the available runway length; therefore LTP can increase from 1500' to 2500'. 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'.

JFK 22L		8400
5*GOOD	LDIST	LTP
F30*B-AB3	7400	2500
F30 B-MAX	6100	2800
F40 B-AB3	7000	2800
F40 B-MAX	6000	2800
W 304/14	HW03	XW14
*PRINT		

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	7300	2600
5*GOOD	7400	2500
4 G/M	7800	2100
3 MED	8300	1600
2 M/P	(8400)	(1000)
1 POOR	----	----
*PRINT		

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

SHIP 3714	FLT 1776/02
WT 143.0	VREF PLUS 00
TEMP -01	A29.92
REVSER OK	WING AI OFF
ANTSKD OK	ASPOIL OK
END ACARS	LPR 2011Z
* PRINT	

Takeoff Data Uplink (TDU)

Introduction

Takeoff Data Uplink enables uplinking of WDR performance values directly to the FMS. This reduces manual keystrokes and entry errors. When a WDR is sent, two new FMS uplinks will follow:

- PERF INIT with the actual ZFW and GW, and
- TAKEOFF DATA UPLINK with the performance data.

Note: WDR verification procedures remain unchanged. Once takeoff data is received, crews can ACCEPT or REJECT the uplink. In either case, comparison of the FMS entries to the WDR is required.

Uplink Logic for Runways

- Cutbacks will not be uplinked.
- Only WET and DRY data will be uplinked.
- Only one takeoff position per runway. If a runway and intersection exist on the WDR, the intersection has priority unless OVERWT.
- Only the requested position of an ACARS Takeoff Performance Update will be uplinked.
- The D-7 Pre-Pushback Message provides crews with the available runways and intersections that will be published on the WDR. The crew can use this information to insert the proper runway and intersection into the TAKEOFF REF page 1 to enable the ACCEPT prompt during the TAKEOFF DATA UPLINK.

Sample D-7 Message:

PRE-PUSHBACK MSG
FLT 2343/20JUN
A/C 3602 ATL/EWR RLS 1
EFSR
TOTAL 15.0 TAXI 0.4
MEL: NONE
WDR RWYS:
8R
9L-M2
10
IF RWY CHG IS REQD:
SEND ACARS T/O PERF
RQST OR CTC LCL OPS

Uplink Logic for Thrust

- Default thrust uplink is the second AT Thrust/Flap line unless only one or no AT exists with TO thrust as a backup.
- The thrust selection was chosen to minimize being overweight when taxi burn is required. Full TO power (no AT) is always available for unstable weather conditions.

Operating Procedures

There are no chimes associated with the PERF INIT or TDU uplinks, only the D-7 and WDR uplinks. Once the WDR is produced and uplinked, the PERF INIT UPLINK READY message appears in the scratchpad and a LOAD prompt appears at 6L. Selecting LOAD displays the uplinked ZFW and new GW in small font. Select EXECUTE to activate the change and the numbers will change to large font.



Takeoff Data Uplink

Normally, after the PERF INIT is uplinked, the TAKEOFF DATA UPLINK message will appear in the scratchpad. On the TAKEOFF REF page 1 there should be REJECT and ACCEPT prompts at 5L and 5R. Select ACCEPT and then verify with the WDR that the information is correct. The uplinked data will be in small font and the Stab Trim setting and Thrust Mode Display will not show the selected data until the ACCEPT prompt is selected.

Missing REJECT and ACCEPT prompts may be the result of being overweight for the selected runway, the lack of an intersection (e.g., ATL 9L TWY M2 or JFK 31L TWY KE), or a TDU failure. Review the WDR to see if an intersection is needed for the selected runway. If so, enter the intersection at 5L on the TAKEOFF REF page and select ACCEPT. The crew can always manually load desired numbers from the WDR.



Requesting New WDRs

If data is required for a takeoff position not listed on the WDR, an ACARS Takeoff Performance Update can be sent. See Vol. 1, SP.5.

Note: If performance numbers are available for an intersection takeoff and ATC subsequently assigns full length, there is no need to get new numbers since there is extra performance available.

Runway Changes and Intersections

If a different runway is required, select the desired runway from the DEP/ARR page and clean up any DP route changes. TAKEOFF DATA LOADED will appear in the scratch pad when the new runway data is loaded. Whenever a takeoff position is changed, it will be necessary to review the FMS departure procedure and ensure there are no discontinuities on the LEGS page.

If multiple takeoff positions for the same runway exist on the WDR, (e.g., JFK 31L and 31L-KE or EWR 4L and 4L-PB), data for the shortest available intersection will be uplinked. If no intersection is available, full length will be sent.

If the full length was entered in the FMS and an intersection is available, the crew may receive an ACARS message:

THE FOLLOWING TAKEOFF POSITIONS WERE INTENTIONALLY
NOT UPLINKED TO FMS PER FLT OPS
RULE
4L
PLEASE REFERENCE WDR

The message is intended to alert the crew that an intersection is available and needs to be entered in the FMS to activate the uplink.

Note: Crews always retain the option to REJECT uplinks and enter takeoff data manually. Once data has been accepted, crews can manually overwrite the uplinked data.

TDU Quick Start Guide

Note: Takeoff data must be verified with WDR. Crews can always reject the uplink or load takeoff data manually.

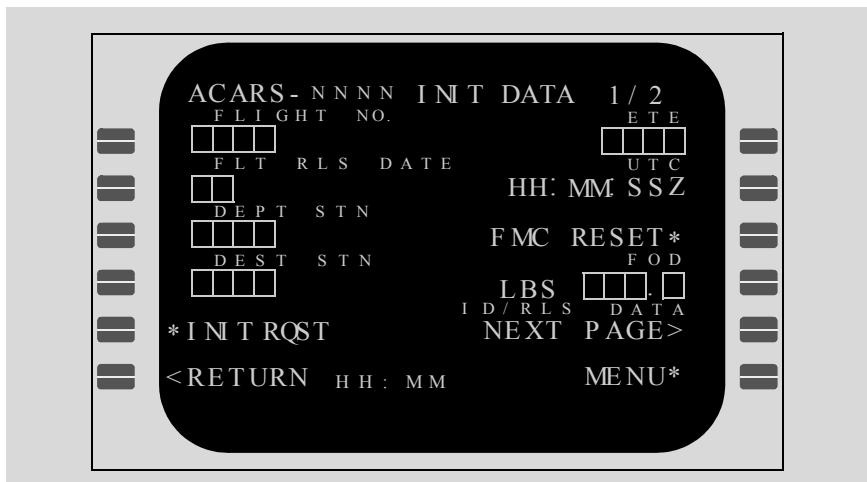
- Check the D-7 Pre-Pushback Message for available runways and intersections currently in use.
- The PERF INIT and TDU normally arrive (without chime) before the WDR.
- Only one position per runway can be uplinked (intersection has priority if both on WDR). No cutbacks.
- Only WET and DRY data will be uplinked. Contaminants must be manually entered.
- When PERF INIT arrives, LOAD and EXECUTE.
- When TDU arrives, select ACCEPT. (Stab Trim and Thrust Mode Display are not shown until the ACCEPT prompt is selected.)
- When the WDR arrives, analyze and compare uplinked PERF INIT and TDU values for reasonableness.
- TDU will normally uplink the second line on the WDR unless there is only one or no AT power available.
- If there is no REJECT/ACCEPT prompt, check for intersection on WDR and enter required intersection at 5L on TAKEOFF REF page 1. Example: (ATL) LC/RW27R or (JFK) KE/RW31L.
- If a runway change is required, first enter new runway from DEP/ARR page. This ensures the runway will match the WDR. After selection of the new runway, the TAKEOFF REF page will uplink the new data and show TAKEOFF DATA LOADED in the scratch pad. Select ACCEPT and then verify with the WDR.
- If the crew desires a runway not listed on the WDR, new data can be obtained using the PERF TAKEOFF> prompt on the ACARS DAL REQUEST page. When requesting data via this prompt, a new PERF INIT, TDU, and WDR will be uplinked using only the requested takeoff position.
- When selecting a new runway, complete the Runway Change items and confirm the departure is valid without discontinuities.

FMC Data Link

Initialization

Ensure ACARS is in the DATA mode, and ensure the FMS has the current navigation data base. Changing the database during or after the uplink process erases all route-related FMS entries, dumps any waiting uplinks, and may block incoming uplinks.

CAUTION: Data link does not replace the need for vigilance; it simply allows the uplink of flight planning information quickly and with fewer data entry errors. Compare the uplinked data against the current flight plan release; cross-check to ensure the FMS route complies with the actual ATC clearance.



Perform the ACARS INIT RQ. Data fields update automatically, with the exception of ETE.

The INIT RQ function automatically generates uplink requests for additional FMC preflight data. Uplinks are annunciated by the FMC Alert Lights (Captain and First Officer forward panel), along with following CDU Scratchpad messages:

- ROUTE UPLINK READY (Flight Plan Route Data)
- PERF INIT UPLINK READY (Flight Plan Performance Data)
- CRZ WIND UPLINK READY (Cruise Winds)
- FORECASTS UPLINK READY (Descent Winds)

The order of receipt may vary, but all four data streams should be ready for loading in less than a minute.

RTE Data

The following is an example of the Route Uplink Ready message:



Select the LOAD key at 6L. The CDU Scratchpad Message will change to "ROUTE DATA LOADING", then "ROUTE DATA UPLINK".



Select ACTIVATE and then select EXEC to complete the route data upload.

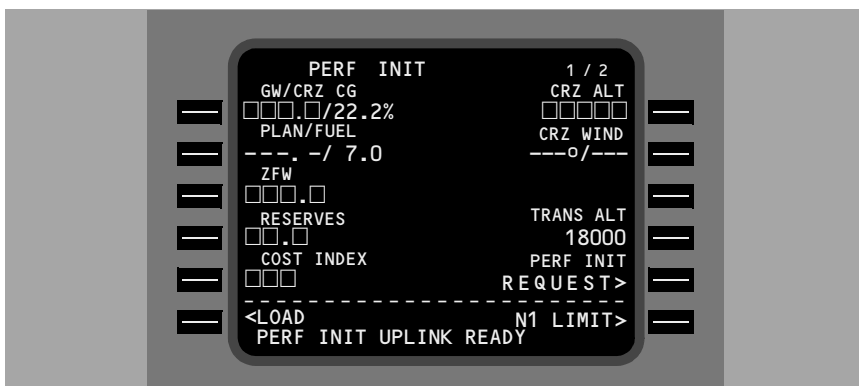


The route uplink includes only the main body of the planned route. Always complete the route - by manually adding the departure runway, any Departure Procedure, and the expected STAR - before loading any wind data.

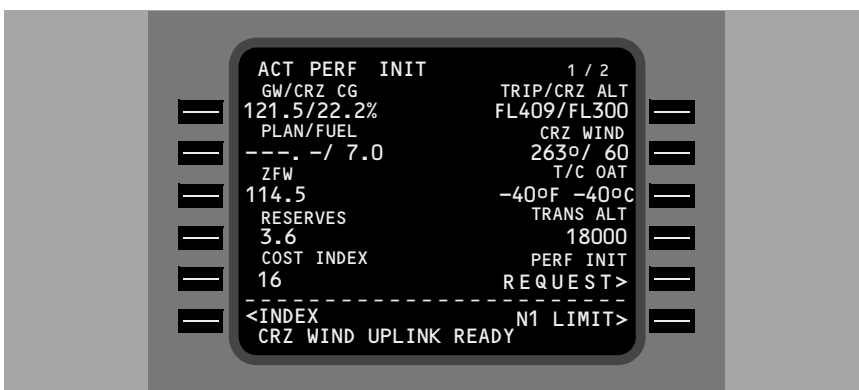
Performance Data

Performance data is loaded in a similar manner. Select the PERF INIT prompt from the ACT RTE page, 6R, or select the INIT REF key on the FMS CDU.

Select the LOAD key at 6L.



The CDU Scratchpad Message will change to "PERF INIT LOADING", then "PERF INIT UPLINK". Select EXEC to activate the performance data.



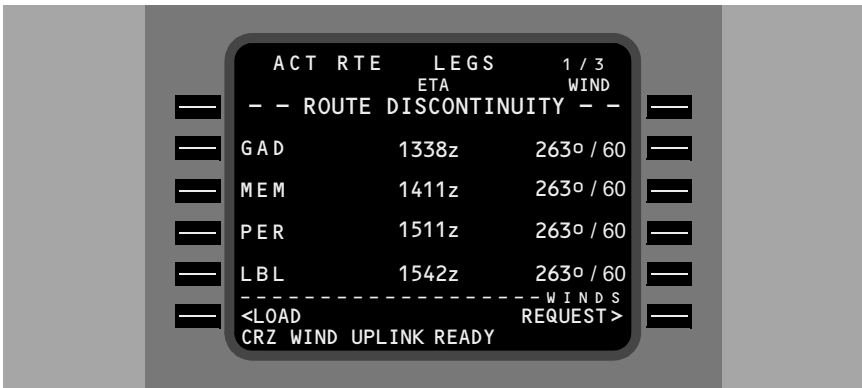
Cruise Winds

Cruise Winds are loaded in a similar manner.

- Select the LEGS page;



- then select RTE DATA at 6R to display the cruise wind LOAD prompt:



Select the LOAD key at 6L. The CDU Scratchpad Message will change to "CRZ WIND LOADING", then "CRZ WIND FLXXX UPLINK". Select EXEC to activate the CRZ WIND data.

An ERASE prompt displays once the uplink is loaded in the event the crew wishes to discard the uplinked data. Select EXEC to activate the wind data.

	MOD	RTE	LEGS	1 / 3
			ETA	WIND
---	ROUTE DISCONTINUITY			---
---	GAD			263° / 60
---	MEM			263° / 60
---	PER			263° / 60
---	LBL			263° / 60
---	----- MOD WINDS			
---	<ERASE			REQUEST>
	CRZ WIND FL300 UPLINK			

Note: The scratchpad message in this example has FL300 in the title. FL300 is simply a tag that reflects the initial planned cruise altitude. The uplink reflects forecast winds along the entire route, including any planned altitude changes. You may also note the wind direction may differ slightly from values listed on the flight plan. The flight plan winds are rounded; uplinked winds are more precise.

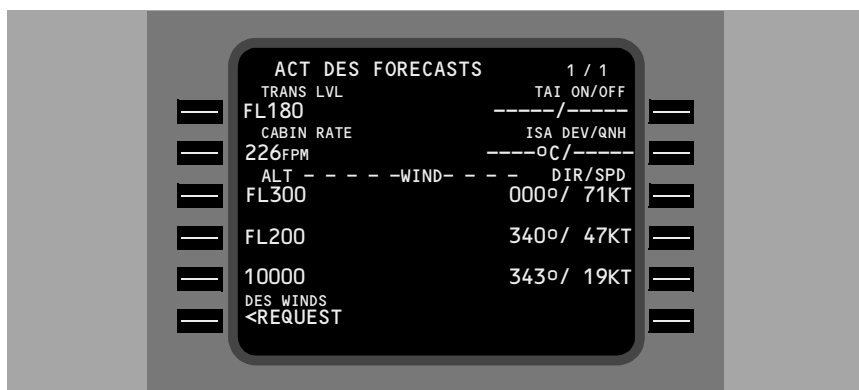
Descent Winds

Forecast descent winds complete the data uplink.

Select the DES page, then select FORECAST. Select LOAD at 6R.

	ACT DES FORECASTS	1 / 1
---	TRANS LVL	TAI ON/OFF
---	FL180	-----/-----
---	CABIN RATE	ISA DEV/QNH
---	226FPM	-----OC/-----
---	ALT - - - - -WIND- - - -	DIR/SPD
---	-----	---O/---KT
---	-----	---O/---KT
---	-----	---O/---KT
---	DES WINDS	
---	<REQUEST	LOAD>
	FORECASTS UPLINK READY	

Again, you may overwrite entries or select ERASE to discard the uplink. Select EXEC to activate the forecast data. Notice that TAI ON/OFF, ISA DEV, and QNH are all manual entries.



While the flight plan may contain five separate descent wind values, the FMS is only capable of accepting three. Therefore, the Data Link default altitudes are FL300, FL200, and 10,000' for flights planned above FL300. For flights below FL300, default altitudes are provided automatically.

Manual Downlink Requests

Since data is automatically uplinked during the preflight process when the ACARS “INIT RQ” is sent, crews should not normally need to perform a manual downlink request. However, if the situation requires the Dispatcher to amend previously uplinked data, or if a specific uplink was not received, the REQUEST function is available. Selecting a REQUEST prompt will start a downlink request for data. REQUEST prompts are on the following pages (* indicates future capability):

- PERF INIT
- PERF LIMITS*
- TAKEOFF REF*
- PROGRESS*
- DES FORECASTS
- RTE (FLIGHT PLAN)
- RTE DATA (CRUISE WINDS)
- ALTERNATE DEST WX*
- SUPP NAV DATA*

PERF INIT uplinks are available only on the ground and after an origin airport has been entered on the RTE page. Cruise winds are available when not in descent and cruise altitude and a flight plan route exist. DES FORECAST winds are available if a cruise altitude exists.

Currently, if winds are requested en-route, the uplinked winds will reflect the values calculated when the Dispatcher prepared the existing flight release. If, for example, the crew received a new routing from ATC or desired amended wind information for a different cruising level, the crew should first contact the Dispatcher. Once the Dispatcher has amended the flight parameters in the Delta Flight Planning System (FPS), or performed an in-flight revision when a new wind forecast became available, the crew could REQUEST an updated cruise wind uplink. One goal of Data Link Phase II is an automatic uplink of amended cruise winds whenever new forecasts are available.

Dispatcher Initiated Uplinks

Data uplinked from the Dispatcher directly to the FMC is a future enhancement; the Dispatcher currently has no uplink capability.

FMC Data Link Reset

Uplink of FMC data is limited to once per release number. A new release number unlocks this limit and will allow FMC requests (one each) of the needed data. If inadvertent or additional FMC requests for current release number data are made, expect to receive the following ACARS message:



Note: XXX is the type of data, i.e., ROUTE, WIND, etc.

If for any reason it becomes necessary to re-request current release number uplinks, perform an FMC RESET by sending the key words “FMC RESET” in the text block of an ACARS MISC RPT.

The following message confirms successful Data Link reset:



After receipt of the above ACARS message:

ROUTE, WIND or PERF

REQUEST.....Select

Request uplink of data from appropriate FMC page(s).

The ACARS INIT REQUEST trigger for uplink of all preflight FMC data is only available once per flight segment. After an FMC RESET only requests directly from the FMC are possible. FMC RESET is a fully automatic function that resets the FMC Data Link server and does not involve the dispatcher or the FMC itself.

CDU Data Link Status Displays

Data link operation is verified when the correct line title appears above the related prompt. See examples below:

PERF INIT
<REQUEST

FLT PLAN
<REQUEST

WINDS
<REQUEST

When the Data Link system is not operating and unable to process FMC downlinks, CDU page prompts change to FAIL, VOICE, NO COMM, or FULL and the line title changes to DATALINK.

DATALINK
FAIL

DATALINK
VOICE

DATALINK
NO COMM

DATALINK
FULL

The status messages mean:

- FAIL - The ACARS management unit is inoperative.
- VOICE - Radio is operating in Voice Mode.
- NO COMM - Radio is operational but not available.
- FULL - All available Data Link space is full.

Data Link Helpful Tips

FMC Data Link Phase I is available on all Delta B737 aircraft, allowing automatic uplinks of preflight performance data, flight plan route data (except runway, DP, STAR and approach), cruise winds, and descent winds. The ACARS INIT RQ function automatically generates data uplink.

Let the ACARS do the work for you. Sending the ACARS INIT RQ generates the data uplinks. Of course, if you are ACARS NO COMM on the ground, you'll have to load the FMS manually.

Load the complete route before attempting to load any wind data. Be sure to add the runway, any Departure Procedure, and the expected STAR for the arrival.

If you attempt to load the CRZ WIND data before a complete route exists, you will likely receive a "CRZ WIND INVALID" message. Wind values uplinked for points that don't exist in the active route cause the message.

If you load the data manually rather than using the uplinked data, you'll get nuisance messages throughout the flight telling you the uplinks are ready. To remove an "Uplink Ready" message, clear the scratchpad message or just LOAD and then ERASE the affected data.

Keep in mind, Data Link does not replace the need for vigilance; it simply allows the uplink of flight planning information quickly and with fewer data entry errors. Compare the uplinked data against the current flight plan release; cross-check to ensure the FMS route complies with the actual ATC clearance.

Cabin Medical Communications System

3601-3610, 3701-3771 (Post Modification), 3772-3773, 3801 - 3900

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. Consider using HF, VHF, or SATCOM.

Cabin medical headset jacks are located:

3601 - 3610

- Above seats 1CD, 15DEF, 28DEF

3701-3771

- Above seats 10DEF, 20DEF, 29DEF

3772 - 3773

- Above seats 3CD, 20DEF, 33DEF

3801 - 3900

- Above seats 5CD, 16DEF, 24DEF, 30DEF

When communication between the cabin and a ground based medical consultant is required:

Note: De-select all observer audio panel receiver switches except the radio required for communication (see below).

If **VHF** is used:

On observer’s audio panel:

VHF # 2 MIC Selector Switch Push

VHF # 2 Receiver Switch volume Set

If **HF** is used:

On observer’s audio panel:

HF # 1 or HF # 2 (as installed) MIC Selector Switch. Push

Radio tuning panel AM light Verify Extinguished

HF # 1 or HF # 2 (as installed) Receiver Switch volume Set

If **SATCOM** is used:

Refer to SATCOM Operating Instructions, this section.

Cabin communications Initiate

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

Flight attendants may depress the headset microphone switch continuously and still hear the ground based consultant, similar to a telephone conversation.

If flight deck duties permit, monitor the cabin/medical communication.

When cabin medical communication is no longer required:

Observer's audio control panel: Reset

Reconfigure observer's audio control panel and instruct flight attendants to restow the 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

3701-3771

After a slight delay, observe that the monitor indicator rises into the green band. A tone may be heard through a headset plugged into the headset jack.

The indicator remains in the green band and the tone continues until the switch is released.

3601-3610, 3772-3773, 3801-3900

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

SATCOM

3601-3603

SATCOM is to be used for company communications only. Its primary use is for ACARS data transmission and company communications. However, when VHF/HF communications with ATC is not possible, ATC can be contacted using SATCOM. SATCOM numbers can be manually dialed or speed dialed using the speed dial directory. ATC phone numbers can also be found on Enroute Charts, in Flight Plan Remarks or in Delta Bulletins. Additionally the Dispatcher may be reached via Atlanta Radio (14047151317) to pass information to the appropriate ATC sector.

All company calls, including those to the dispatcher, should be routed through ATL Radio for security and transcribing purposes. Crews should not call Flight Control, Meteorology, Maintenance, etc., directly.

SATCOM does not have the capability to initiate a conference call; however, an incoming conference call can be answered.

SAT-PHONE Main Menu

To display the SAT-PHONE Main Menu, press the MENU key on the MCDU and then press the line select key (LSK) adjacent to <SAT.

The <SAT page has controls for placing calls, answering calls, ending calls, and manually dialing numbers.

For each channel, SAT-PHONE shows this data:

- Channel status
- Call commands or status

Channel Status Field

The MCDU Channel status field can have values as follows:

Channel Status	Function Definition
READY	The SAT Channel is registered onto the Network and is available for making a voice call.
CABIN USE	The SAT Channel is in use by one of the cabin station ports.
DIALING	The NxtLink (SDU) is processing the call.
RINGING	The call has been passed through to the ground telephone network, is ringing, and is waiting for the remote party to pick up.
ACTIVE	The placed call was answered and the call is active.
CALL FAIL	The call has failed.
INCOMING	Incoming Call - Awaiting flight crew answer.
UNAVAILABLE	The SAT Channel is not available, insufficient signal level.
CALL ENDED	The call has been terminated.

The MCDU LSK (under the Channel Status line) varies based on SAT Channel Status as follows:

Line Select Key	Function Definition
<MAKE CALL	Make a call to the dialed Phone Number displayed below the Line Select Key text.
>CLR STATUS	Clear the CALL FAIL Channel Status.
<ANSWER	Answer Incoming Call.
<END CALL	Terminate current active call.

Operating Instructions

Manual Dialing

Configure Audio Control Panel:

SAT transmitter selector switch Press

From the SATCOM MAIN MENU:

Desired phone number Enter

Use the following format, enter the phone number into the MCDU scratch pad: [Country Code - City Code - Phone Number]

Example: ATL RADIO is entered as "14047151317".

SAT.....Select

Line select the manually entered phone number from the scratch pad.

Note: A manually entered and selected phone number cannot be cleared, only replaced by entering and line selecting another number.

<MAKE CALL Press

Select MAKE CALL for appropriate SAT 1 channel. The system will automatically switch to SAT 2 if SAT 1 is not available.

Note: If the voice channel 1 fails, then the Channel Status field on the MCDU by SAT select will show “UNAVAILABLE”. In actuality, the system will switch over to voice channel 2 – and it will still be possible to place a call.

A phone call is initiated and the SATCOM MAIN MENU displays an IN PROGRESS call status. An audible ring tone should be heard. When the call is connected, an ACTIVE call status is displayed and the SAT call light illuminates on the ACP.

Push-to-talk / transmit switch..... Press

If desired, the switch may be held continuously to conduct a telephone style conversation.

Answering Ground-to-Air Calls

When there is an incoming call, the SAT channel status will change to INCOMING. The <ANSWER prompt will appear on the left and the <REJECT prompt will appear beneath the <ANSWER prompt. In addition, a chime will sound in the cockpit and a SAT call light will illuminate on the ACP.

Answering Calls Using Audio Control Panel

SAT MIC selector switch..... Press

Push-to-talk / transmit switch..... Press

If desired, the switch may be held continuously to conduct a telephone style conversation.

Answering Calls Using MCDU

MENU function key Press

SATCOM page (SAT)..... Select

The INCOMING CALL is displayed next to SAT 1.

<ANSWER Press

The call status will display ACTIVE.

On the Audio Control Panel:

SAT MIC selector switch Press

Push-to-talk / transmit switch..... Press

If desired, the switch may be held continuously to conduct a telephone style conversation.

To Terminate the Call from the SATCOM MAIN MENU:

<END CALL Press

Other SATCOM Features

Placing a Call on Hold

On the audio control panel:

Any MIC selector switch (other than SAT MIC) Press

Places SATCOM call on hold and CALL light will remain illuminated.

To reconnect the phone line:

SAT MIC selector switch Press

Reconnects to the SATCOM call.

Air/Ground Initiated Call Termination

When a call ends, initiated by either air or ground, the SAT channel status displays CALL ENDED, and the prompt <CLR STATUS appears. After a short period of time, the SAT channel status reverts back to READY and the prompt <MAKE CALL re-appears.

ACARS

ACARS will automatically select the best data communication (SATCOM or VHF) method and is transparent to the pilot. ACARS function and message alerting annunciations are unaffected.

Non-Normals Procedures

If the SATCOM system fails or in any way interferes with required aircraft systems, contact the Maintenance Control Coordinator for guidance.

In the event SATCOM becomes inoperative, refer to the Airway Manual, ATC & Flt Control Communication, Communication Equipment Requirements for specific theater guidance. For SATCOM dispatch relief, refer to the MEL.

Speed Dial Directory

The DIRECTORY page includes phone numbers for AOC (Airline Operations Communications) and ATS (Air Traffic Services) for easy access.



The HISTORY page shows the last five calls placed by the MDCU for easy access to frequently called numbers. Pressing any of the LSKs associated with the number dialed will cause the unit to return to the SAT-PHONE page with the number in the scratchpad area in preparation for selecting the SATCOM channel. Power cycling the SATCOM unit in the E&E compartment will clear the HISTORY.



Audio Control Panel Transmitter Selector Switch.....	SAT
FMC MENU Key.....	Select

SAT LSK Press

If the HISTORY LSK appears after the SAT key is pressed, the ATL RADIO selection is probably already located in the HISTORY Menu. If so, the next two steps can be skipped.

DIRECTORY LSK Press

Note: AOC and ATS Line Select Keys appear on DIRECTORY page.

To call Airline Operations Control (AOC):

AOC LSK Press

Currently, the only phone number in the AOC directory is
ATL Radio (0014047151317).

ATL Radio LSK Press



To call Air Traffic Services Facility (ATS) (functional, but not normally used):

ATS LSK.....Press

Desired region LSK.....Select



Desired country LSK.....Select



Desired facility LSK.....Select



MAKE CALL LSK Select



When call is complete:

END CALL LSK Select



HF System Test

CAUTION: Do not operate the HF transmitter while fueling operations are in progress.

3601-3610, 3801-3852

Mode Selector HF 1

3701-3773, 3853-3900

Mode Selector HF 1 or HF 2

Radio tuning panel AM light (if installed) Verify Extinguished

Note: If AM is inadvertently selected, USB reception may be garbled or unintelligible. All operational HF frequencies use USB.

HF Frequency Select

See Airway Manual, ATC & Flt Control Communication, High Frequency Radio for HF frequency chart.

HF Sensitivity Select

Rotate HF Sensitivity (HF SENS) control knob clockwise to increase sensitivity and counterclockwise to decrease sensitivity, and reduce noise and static.

Note: Sensitivity is usually set at 95% or higher. Decreasing sensitivity too far prevents reception, including SELCAL monitoring of HF radio.

HF MIC Selector Switch. Push

Microphone transmit Switch Press and release

Note: A 1,000 Hz coupler tone can be heard up to 15 seconds during HF antenna tuning. A short tone indicates a previously tuned station still in memory. When the HF antenna is properly tuned, the 1,000 Hz ceases and the HF system is ready to transmit.

Listen for other traffic on same frequency.

Microphone transmit Switch Press

Attempt to transmit.

Note: After engaging the transmit switch, delay momentarily before speaking. Ensure a good sidetone is heard while transmitting. Sidetone is noise picked up by the transmitting microphone, namely, the operator's voice heard clearly in the operator's headset/speaker. Absence of a good sidetone is evidence of transmission failure.

Reception is successful when a second party transmission is received.

If unsuccessful, re-attempt on back-up frequency.

Pitch Awareness Report

Pitch Awareness Reports are automatically generated and printed after the airplane passes through 18,000 feet during climb, and at the end of the flight when the aircraft slows to less than 20 knots. The reports contain takeoff pitch, takeoff pitch rate, CAS (computed airspeed) at rotation, landing pitch rates, and CAS at landing.

There are no crew procedures associated with these reports. They are meant for crew awareness only. For guidance and details of typical pitch rate and tail clearance during takeoff and landing, refer to FCTM, Chapters 3 and 6.

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 OCC dispatchers as a result of an automated process; 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
DO NOT ATTEMPT TO ENTER DELTA FLIGHT NUMBER IN FMS OR
ACARS

The message below will be sent via ACARS:

--DATALINK ADVISORY- - FLIGHT TO BE OPERATED AS xxx

DO NOT CHANGE UPLINKED FLIGHT NO IN FMS
CONFIRM CITY PAIR AND FLT RLS DATE ON ACARS FLT DATA PAGE
IGNORE FLT DATA ERROR MESSAGES WHEN RECEIVED. ACARS
MESSAGES WILL BE DELIVERED AS EXPECTED.

Intentionally
Blank

Supplementary Procedures
Electrical

Chapter SP
Section 6

Electrical Power Up

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

WARNING: Do not establish any hydraulic power which will result in flap movement unless the wing/flap area has been cleared of personnel and equipment. Use an outside observer.

Battery switch ON
3601-3610, 3772-3773, 3801-3900

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

Battery Check
DC METERS selector – BAT
Ensure minimum voltage 22 volts.

Standby Power switch AUTO

Bus Transfer switch AUTO

Electric Hydraulic Pump switches OFF

APU BLEED switch OFF

Landing Gear Lever DOWN/3 Green

FLAP lever and Flap Position indicator Check
The FLAP lever should be in agreement with the indicator. If the FLAP lever and indicator do not agree, position the FLAP lever to the same position as the indicator.

ALTERNATE FLAPS master switch OFF (Guard down)

ALTERNATE FLAPS position switch OFF

Electrical Power Establish

If external power is desired:

GROUND POWER AVAILABLE light Illuminated

GROUND POWER switch ON

SOURCE OFF light – Extinguished

If APU power is desired:

Accomplish Supplementary Fire Protection section, Fire and
Overheat System Test procedure.

Fuel pump (left manifold) ON

APU switch START & on bus

When the APU GEN OFF BUS light illuminates:

APU GENERATOR bus switches – ON

SOURCE OFF lights – Extinguished

Note: It is recommended that the APU be operated for one
minute before using as a bleed air source.

Note: If extended APU operation is required on the ground,
place an AC operated fuel pump ON. If fuel is loaded
in the center tank, place the left center tank fuel pump
switch ON to prevent a fuel imbalance before takeoff.

If external power and APU power are unavailable:

Accomplish Supplementary Engines, APU section, Engine
Battery Start procedure.

**CAUTION: Center tank fuel pump switches should be positioned
ON only if the fuel quantity in the center tank exceeds
1000 lbs.**

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

Electrical Power Down

The following flight deck procedures are accomplished to permit removal of electrical power from the airplane.

Before accomplishing the following steps, verify IRS, EMERGENCY EXIT lights, and PACK switches are OFF.

APU switch and/or GRD PWR switch OFF

If APU was operating:

Delay approximately 2 minutes after the APU GEN OFF BUS light extinguishes before placing the BATTERY switch OFF.

Fuel pump (left manifold) OFF

Battery switch OFF

Standby Power Test

3601 - 3610, 3772 - 3773, 3801-3900

Battery switch ON

AC–DC meter selectors STBY PWR

If APU generator is on–line:

BUS TRANSFER switch OFF

APU GEN No. 2 switch or GRD PWR switch OFF

Turn OFF appropriate switch depending on power source in use.

Removes power from TR 3.

STANDBY POWER switch OFF

Check STANDBY PWR OFF light illuminated.

AC–DC voltmeters Zero

STANDBY POWER switch BAT

Check STANDBY PWR OFF Light extinguished

AC–DC voltmeters Check

AC voltmeter 115 +/-5 volts

DC voltmeter 24 +/-2 volts

Frequency meter Check

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

STANDBY POWER switch AUTO

BUS TRANS switch AUTO

APU GEN No. 2 switch or GRD PWR switch ON

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

Standby Power Test

Ships 3701-3771

Note: Ground service must be disconnected to get correct test indications.

Battery switch ON

AC–DC meter selectors STBY PWR

If APU generator is on–line:

APU GEN No. 1 switch OFF

APU GEN No. 2 switch OFF

If ground power is on–line:

GRD PWR switch OFF

STANDBY POWER switch OFF

STANDBY PWR OFF light - illuminated.

AC–DC voltmeters Zero

STANDBY POWER switch BAT

STANDBY PWR OFF Light - extinguished.

AC–DC voltmeters Check

AC voltmeter 115 +/-5 volts

DC voltmeter 24 +/-2 volts

Frequency meter Check

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

DC meter selector BAT

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

Check DC ammeter for discharge indication: a negative value.

DC meter selector AUX BAT

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

Check DC ammeter for discharge indication: a negative value.

STANDBY POWER switch AUTO

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

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

Supplementary Procedures

Engines, APU

Chapter SP

Section 7

Battery Start

(With APU bleed or ground air available)

Prior to a battery start, ensure the following procedures have been accomplished:

- Exterior Inspection (except items requiring electrical power)
- Flight Deck Inspection (except IRS Alignment)
- Electrical Power Up.

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

Oxygen & interphone	Check
CAB/UTIL power switch	ON
IFE/PASS SEAT power switch	ON
EMER EXIT LIGHTS switch	ARMED
Passenger signs	Set
HYD PUMP switches	ON
Air conditioning panel	Set
PACK switches - AUTO or HIGH	
Engine BLEED air switches - ON	
APU BLEED air switch - ON	
SPEED BRAKE lever	DOWN detent
Reverse thrust levers	Down
Forward thrust levers	Closed

Parking brake Set

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

Engine start levers CUTOFF

Accomplish SP.8, Fire and Overheat System Test procedure.

When cleared for Engine Start, do the following:

Air conditioning PACK switches OFF

ANTI COLLISION light switch ON

Ignition select switch IGN-R

Engine Start

Engine No. 1 start Accomplish

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

Generator No. 1 switch ON

IRS mode selectors OFF, then NAV

Verify that the ON DC lights illuminate, then extinguish

Verify that the ALIGN lights are illuminated

FMC/CDU Set IRS position

WARNING: If engine No. 1 was started using a ground air source, to minimize the hazard to ground personnel, the external air should be disconnected and engine No. 2 started using the Engine Crossbleed Start procedure.

Engine No. 2 start Accomplish

Generator No. 2 switch ON

Cabin pressurization panel Set

FLIGHT ALTITUDE indicator - Cruise altitude

LANDING ALTITUDE indicator - Destination field elevation

If landing at an airport with a field elevation above 6,000 feet:

Refer to SP.2 for applicable landing procedure.

Pressurization mode selector - AUTO

Pushback/Start checklist Complete

After Start checklist Complete

Preflight checklist Complete

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

Starting with Ground Air Source (AC electrical power available)

Prior to start:

Ground personnel briefing Accomplish
Communication between captain and ground personnel required prior to start. The communication should include:

- Location of pneumatic air cart (normally right side)
- Engine to be started (normally left engine)
- Timing of removal of pre-conditioned air and electrical power

WARNING: Due to ACS safety concerns, when the APU is inoperative, it is preferred that the left engine be started at the gate. Exceptions to start cart location and engine to be started are permitted as operational requirements dictate, but the plan must be coordinated and clearly understood by both flight deck and ground personnel prior to start. The second engine start must be delayed until after pushback.

When cleared to start:

APU BLEED air switch OFF

Engine No. 1 start Accomplish

Use normal start procedures.

WARNING: To minimize the hazard to ground personnel, the external air should be disconnected, and engine No.2 started using the Engine Crossbleed Start procedure.

Engine Crossbleed Start

Prior to using this procedure, ensure that the area to the rear is clear.

- 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.

Engine BLEED air switches ON

APU BLEED air switch OFF

PACK switches OFF

ISOLATION VALVE switch AUTO

Ensures bleed air supply for engine start.

Engine thrust lever
(operating engine) Advance thrust lever until bleed
duct pressure indicates 30 PSI

Non-operating engine Start

Use normal start procedures with crossbleed air.

After starter cutout, adjust thrust on both engines, as required.

Setting N1 Bugs with No Operative FMC

Reference the ODM to determine N1 setting for desired phase of flight.

N1 SET outer knob BOTH

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

N1 SET inner knob Set N1

Note: If the N1 SET outer knob is returned to the AUTO position, the bugs and readouts will revert to the last FMC computed value or 104% if the FMC has not calculated an input since power up.

APU Start

Note: With at least one generator operating, subsequent start attempts should be made at succeeding lower altitudes until a satisfactory start is accomplished.

Note: During the APU start cycle, the APU EGT indication may fluctuate from 0° to 1100° C prior to normal EGT rise and the LOW OIL PRESSURE light may cycle on and off several times. These indications have no adverse effect on starting the APU. It is not necessary to monitor EGT during start. Automatic shutdown occurs in the event of EGT exceedance. If the LOW OIL PRESSURE light illuminates after the start cycle is complete, accomplish the APU LOW OIL PRESSURE non-normal checklist.

APU Switch START

Momentarily position APU switch to START and release to ON.

Check LOW OIL PRESSURE light illuminates, then extinguishes.

Check APU GEN OFF BUS light illuminates.

Note: The start cycle may take as long as 120 seconds.

Note: If extended APU operation is required on the ground, place an AC operated fuel pump ON. If fuel is loaded in the center tank, place the left center tank fuel pump switch ON to prevent a fuel imbalance before takeoff.

CAUTION: Center tank fuel pump switches should be positioned ON only if the fuel quantity in the center tank exceeds 1000 lbs.

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

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

APU Cold Start Report

When an APU Cold Start Report is required, flight crews will be notified in one of two ways:

- (1) The FLIGHT OPERATIONS AND MAINTENANCE REMARKS section of the flight plan will contain the following note: *APU COLD START RQRD*, or
- (2) The Maintenance Control Center (MCC) will send an ACARS message requesting an APU Cold Start Report.

Flight crews should attempt an APU start prior to TOD above FL270 after at least two hours at cruise. If the APU fails to start on the first attempt, two subsequent starts may be attempted. The APU must maintain stable operations (i.e., no failure annunciations) for at least five minutes to be considered a successful APU in flight start.

Note: The crew is only required to make an aircraft logbook entry after a third unsuccessful APU start.

Procedure

In Flight APU Starts

Pilots should observe the peak EGT while starting the APU. Once started, allow the APU to run for five minutes.

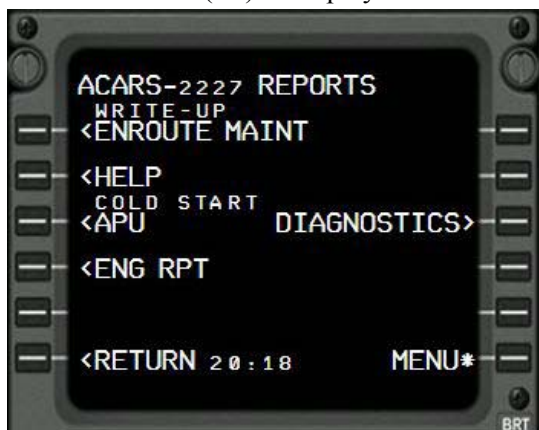
Successful APU Start

Flight crews should complete the following steps to report a successful start:

- From the ACARS MENU page, select REPORTS MAINTENANCE (5R) to display the REPORTS page.



- Select COLD START APU (3L) to display the APU DATA page.



- If the APU successfully started in the first three attempts and maintained stable operations (i.e., no failure annunciations) for at least five minutes:

Verify ↓YES (default value) is displayed under START IN 3 ATTEMPTS? (1L)



- Enter the Static Air Temperature (SAT) (2L).

Note: SAT is located on line 2 of the FLT xxx PROGRESS page 2/4.

- Enter the peak exhaust gas temperature (EGT) (3L).
- Enter the number of start attempts (4L).
- Enter the Flight Level (2R).
- Select *SEND (5L).

Unsuccessful APU Starts

Do not complete the ACARS APU Cold Start Report after three unsuccessful starts. Instead, flight crews should record the following information in the logbook:

- Enter "APU START UNSUCCESSFUL"
- Enter the Static Air Temperature

Note: SAT is located on line 2 of the FLT xxx PROGRESS page 2/4.

- Enter the peak exhaust gas temperature.
- Enter the number of starts attempted.
- Enter the Flight Level.

High Altitude Airport Engine Start (Above 8400 Feet)

3601 - 3610

Engine start Accomplish

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

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

Thrust Instability Events

Background

Since 2008, a small number of B737NG aircraft operated by three different airlines have experienced Thrust Instability Events (TIE). None of these events occurred on Delta aircraft.

Investigation led Boeing, GE/CFMI and other specialists involved to suspect intermittent fuel contamination as the most likely, prevailing casual factor. Contamination temporarily disrupts the Fuel Metering Valve (within the Hydro-Mechanical Unit) and causes oscillatory engine behavior.

Characteristics of the Thrust Instability Events are as follows:

- All airplanes were fueled at Seattle Tacoma (SEATAC) airport within one month of the event.
- Fuel was being supplied from the wing tanks during the events.
- Most events occurred during climb in a non-critical phase of flight. No event occurred during takeoff or approach.

The root cause of these events is still under investigation, and further information will be provided as soon as a permanent solution is determined.

Operating Procedures

Pilots should use the following procedures to appropriately mitigate these events:

- Accomplish the Engine Limit or Surge or Stall non-normal checklist. During the memory items, retard the thrust lever continuously and smoothly, rather than incrementally and/or rapidly. Analysis has shown that gradual thrust lever movement may reduce the duration of the event. During critical flight phases, controlling the airplane is the first priority.
- Allow sufficient time for the affected engine to stabilize prior to making a decision whether to shut down the engine.
- When the engine recovers, smoothly and deliberately advance the thrust lever to attain the desired airspeed.

Supplementary Procedures
Fire Protection

Chapter SP
Section 8

Fire and Overheat System Test

Fault/Inop detection Check

OVERHEAT DETECTOR switches - NORMAL

TEST switch - Hold to FAULT/INOP

Verify MASTER CAUTION, OVHT/DET annunciator, FAULT and APU DET INOP lights are illuminated.

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

If APU DET INOP light fails to illuminate, do not operate APU.

Fire/Overheat warning Check

TEST switch - Hold to OVHT/FIRE

Verify fire warning bell sounds, master FIRE WARN lights, MASTER CAUTION lights and OVHT/DET annunciator illuminate.

Master FIRE WARNING light - Push

3848-3900

Verify that the engine No. 1 and engine No. 2 start lever lights stay illuminated.

Verify master FIRE WARN lights and fire warning bell cancel.

Verify engine No. 1, APU, and engine No. 2 fire warning switch and engine No. 1 and engine No. 2 OVERHEAT lights are illuminated. If AC busses are powered, verify WHEEL WELL fire warning light is illuminated.

If an engine fire warning switch and an ENG OVERHEAT light do not illuminate, a detection loop is inoperative.

Refer to Supplementary Fire and Overheat Test - Inoperative Loop procedure in this section.

Extinguisher test Check

EXTINGUISHER TEST switch - Hold to 1

Verify the green extinguisher test lights are illuminated. Release switch and verify the lights are extinguished. Repeat test for position 2.

Verify the L and R BOTTLE DISCHARGED lights are extinguished.

Fire and Overheat System Test - With an Inoperative Loop

3601-3610, 3701-3773, 3801-3847

To determine the specific inoperative loop:

OVHT DET switches A

TEST switch OVHT/FIRE

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

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

OVHT DET switches B

TEST switch OVHT/FIRE

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

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

OVHT DET switches As required

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

TEST switch OVHT/FIRE

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

Fire and Overheat System Test - With an Inoperative Loop

3848-3900

To determine the specific inoperative loop:

OVHT DET switches A

TEST switch OVHT/FIRE

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

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

OVHT DET switches B

TEST switch OVHT/FIRE

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

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

OVHT DET switches As required

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

TEST switch OVHT/FIRE

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

Cargo Fire Protection System Test

DETECTOR SELECT switches NORM

TEST switch Push

Verify fire warning bell sounds and master FIRE WARN lights illuminate.

Master FIRE WARN light Push

Verify master FIRE WARN lights and fire warning bell cancel.

Verify cargo fire (FWD, AFT) warning lights are illuminated.

Verify DETECTOR FAULT light remains extinguished.

Note: If a cargo fire warning light does not illuminate and the DETECTOR FAULT light illuminates, a detection loop is inoperative.

Verify the green EXTINGUISHER test lights are illuminated.

Verify the cargo fire bottle DISCH light is illuminated.

Intentionally
Blank

Supplementary Procedures

Flight Controls

Chapter SP

Section 9

Flight Controls Check

This is a check of normal flight control functions and is not a complete check of the flight control system. Two people are required; both on INT.

FLIGHT DECK ACTION	GROUND RESPONSE
Electrical power (APU or external) – On bus	
System A and B electric hydraulic pump switches – OFF	
Control wheel – Left	“LEFT AILERON UP, TAB DOWN; RIGHT AILERON DOWN, TAB UP”
Control wheel – Right	“LEFT AILERON DOWN, TAB UP; RIGHT AILERON UP, TAB DOWN”
Control wheel – Neutral	
Control column – Forward	“ELEVATOR DOWN, TABS UP”
Control column – Aft	“ELEVATOR UP, TABS DOWN”
Control column – Neutral	
Request hydraulic clearance	“CLEAR FOR HYDRAULIC PRESSURE, WING AND CONTROL AREAS CLEAR”
System A and B electric hydraulic pump switches – ON Verify System A & B pressure indicators and brake pressure indicator read 2800 psi minimum	
Parking brake – Set	

FLIGHT DECK ACTION	GROUND RESPONSE
Rudder trim – Turn left Verify left rudder pedals move forward	
Rudder trim – Turn right Verify right rudder pedals move forward	
Rudder trim – Zero, pedals centered	
Aileron trim – Turn left Verify control wheel turns to left	
Aileron trim – Turn right Verify control wheel turns to right	
Aileron trim – Zero, control wheels centered	
Flap lever – UP Verify flap position indicator reads zero	
Nose gear steering wheel – Hold Control wheel – Left Control column – Forward Rudder pedal – Left	“LEFT AILERON UP, TAB DOWN; LEFT FLIGHT SPOILERS UP; RIGHT AILERON DOWN, TAB UP; RUDDER LEFT; ELEVATORS DOWN, TABS UP”
Nose gear steering wheel – Hold Control wheel – Right Control column – Aft Rudder pedal – Right	“LEFT AILERON DOWN, TAB UP; RIGHT FLIGHT SPOILERS UP; RIGHT AILERON UP, TAB DOWN; RUDDER RIGHT; ELEVATORS UP, TABS DOWN”
Flight controls – Neutral	

 DELTA
737 Operations Manual

FLIGHT DECK ACTION	GROUND RESPONSE
Alternate flaps master switch – ARM	
Flap lever – Position 1 Verify no flap movement	

FLIGHT DECK ACTION	GROUND RESPONSE
Alternate flaps position switch – hold DOWN until flap position indicator indicates 1	“FLAPS MOVING DOWN”
Flap position indicator – flaps 1 Verify aft overhead leading edge devices annunciator panel indicates all green (FULL EXTEND) with no amber lights illuminated. Verify LE FLAPS TRANSIT light remains illuminated	“ALL LEADING EDGE DEVICES FULLY EXTENDED”
Alternate flaps master switch – OFF Verify Aft overhead leading edge devices annunciator panel indicates all leading edge flaps full extended and all leading edge slats in extend position Verify LE FLAPS EXT light illuminated	“LEADING EDGE FLAPS FULLY EXTENDED, ALL LEADING EDGE SLATS RETRACTED TO EXTEND POSITION”
Speed brake lever – UP	“ALL SPOILERS UP”
Speed brake lever – DOWN	“ALL SPOILERS DOWN”
Stabilizer trim switches – NOSE DOWN	“STABILIZER LEADING EDGE MOVING UP”
Stabilizer trim switches – NOSE UP	“STABILIZER LEADING EDGE MOVING DOWN”

FLIGHT DECK ACTION	GROUND RESPONSE
With stabilizer still moving: Stabilizer trim cutout switches – CUTOUT Verify trim motor stops	
Stabilizer trim cutout switches – NORMAL Verify Trim motor resumes Control column – Forward Verify Trim motor stops Column actuated stab trim override – OVERRIDE Verify Trim motor resumes	
Stabilizer trim switches – Trim into green band	
Column actuated stab trim override – NORMAL Switch guard – Close	
Request clearance to flaps 30	“FLAPS CLEAR”
Flap lever – Position 30	“FLAPS MOVING DOWN”
Control column – Forward	“ELEVATOR DOWN, TABS DOWN”
Control column – Aft	“ELEVATOR UP, TABS UP”
Control column – Neutral	
Flap lever – UP	“FLAPS MOVING UP”
Parking Brake – As desired Electrical power – As desired	

Supplementary Procedures

Flight Instruments, Displays

Chapter SP

Section 10

Altimeter Difference

Note: If flight in RVSM airspace is planned use the RVSM table in the limitations section.

This procedure is accomplished when there is a noticeable difference between the altimeters. Accomplish this procedure in stabilized level flight or on the ground.

Altimeter barometric settings Check
Check all altimeters set to proper barometric setting for phase of flight.

Standby altimeter baro set control Rotate and reset
Rotate to a different setting, then reset proper barometric setting.

Altimeters Crosscheck
Maximum differences between the altimeter readings:

Altitude	CDS/CDS	CDS/Standby
Sea Level	50 feet	50 feet
5,000 feet	50 feet	80 feet
10,000 feet	60 feet	120 feet
15,000 feet	70 feet	(see note)
20,000 feet	80 feet	(see note)
25,000 feet	100 feet	(see note)
30,000 feet	120 feet	(see note)
35,000 feet	140 feet	(see note)
40,000 feet	160 feet	(see note)
41,000 feet	170 feet	(see note)

Note: Above 10,000 feet and 0.4 Mach, position error causes the tolerance to diverge rapidly and direct crosscheck becomes inconclusive. Between 10,000 feet and 29,000 feet, differences greater than 400 feet should be suspect and verified by ground maintenance checks. Between 29,000 feet and the maximum operating altitude, differences greater than 500 feet should be suspect and verified by ground maintenance checks.

If it is not possible to identify which altimeter is indicating the correct altitude:

ATC Notify

Flight Recorder Test

The following procedure is normally accomplished prior to the first flight of the day.

Flight Recorder Test

FLIGHT RECORDER OFF light – Illuminated

FLIGHT RECORDER switch – TEST

FLIGHT RECORDER OFF light – Extinguished

FLIGHT RECORDER switch – NORMAL

HUD Control Panel (HCP) Test

The following test procedure verifies all HCP display legends are functioning. Accomplish as desired.

Note: Test capability is only available on the ground.

HCP TEST key Press and hold for 4 seconds

All HCP display lines and annunciators will blank, except the test dot.

Subsequently, the following keys should illuminate for 2 seconds then blank:

- MODE
- STBY
- RWY annunciator dot
- G/S annunciator dot
- CLR annunciator dot
- FAULT

The entire cycle repeats until TEST is deselected.

HCP TEST key Press

Terminates test.

HUD Combiner Preflight

The following steps are used for combiner preparation and optimum seat positioning for HUD operations. Accomplish as desired.

HUD combiner Lower

CAUTION: If combiner is inadvertently displaced forward into the breakaway position, do not allow the combiner to spring back on its own.

- Select IMC or VMC on the HCP to verify proper HUD combiner alignment. Reposition the combiner if "ALIGN HUD" appears in the display.

HCP TEST key Press momentarily and release
Selection enters the HCP TEST MENU.

Note: Anytime the TEST key is pressed, all of the First Officer's HGS annunciators will illuminate for 2 - 5 seconds, then extinguish.

Note: Test capability is only available on the ground.

- Look into the combiner, move the cursor to "HGS TEST DISPLAY" using the HCP +/- keys and press ENTER.
- Adjust seat position to enable a full view of the HUD symbology.

HCP TEST key Press momentarily and release
Selection exits HGS TEST MENU.

HUD Guided Takeoff

The HUD is a repeater display that can enhance situational awareness during all flight operations. Additionally, low visibility takeoffs can be accomplished using the HUD's flight guidance capabilities.

If HUD flight guidance is to be used for takeoff, accomplish the following during the Captain's cockpit preparation procedure:

HUD Control Panel (HCP) Set-up

The following must be accomplished when using the HUD for HUD guided takeoff in actual low visibility (less than 500 RVR to 300 RVR):

HUD System Set

Combiner – Lowered, cover removed

Runway Data – Set in control panel

Enter runway length

The runway length entered must be between 5,000 and 18,000 feet.

Enter TDZE for the expected runway if the flight must return for landing.

Enter glideslope angle for the expected approach if the flight must return for landing.

The glideslope angle must be set between -2.51° and -3.00° for an AIII approach.

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

Low Visibility Takeoff

The following must be accomplished when using the HUD for HUD guided takeoff in actual low visibility (less than 500 RVR to 300 RVR):

Ensure Jeppesen 10-9A plate shows RVR 300 takeoff minimums for the takeoff runway.

Ensure crosswind component is 10 knots or less.

VHF NAV radios Set

Set both to departure runway ILS frequency and identify.

MCP COURSE selectors Set

Set both to published runway heading.

HCP mode PRI

MCP COURSE selectors Update

Position aircraft on center of runway. Align HUD localizer deviation symbol with runway centerline. Set First Officer's MCP COURSE to match the Captain's MCP COURSE. This will ensure the amber disagreement warning will not be displayed in the PFDs.

Verify HUD ground roll guidance cue is displayed.

Note: Use the minimum necessary display intensity to enable viewing of both the runway markings and the HUD symbology.

WARNING: Do not initiate a rolling takeoff.

Takeoff:

**WARNING: Use 80 knots as an abort speed for HUD failure.
After this speed use runway centerline to
complete takeoff.**

The Captain should utilize HUD symbology throughout takeoff roll and use the centerline lights as a visual backup.

The First Officer should monitor runway centerline on PFD and visually (if able) until reaching VR. If left or right of localizer centerline call "Steer Left or Steer Right."

Note: Captain must meet the Experience Requirements listed in the Airway Manual, Ops Specs, Takeoff Minima to conduct a HUD takeoff in low visibility. |

Note: Captain must review Takeoff Minima listed in the Airway Manual, Ops Specs, Takeoff Minima for takeoff below 500 RVR. |

Note: For inoperative equipment, refer to the QRH, Non-Normal Ops Info tab, HUD Takeoff Equipment Requirements.

HUD Guided Approach

The HUD is a repeater display that can enhance situational awareness during all flight operations. Additionally, AIII approaches are accomplished using the HUD's flight guidance capabilities.

HUD Control Panel (HCP) Set-up

The following must be accomplished for HUD guided AIII approaches. It is recommended that this set-up be used for all approach modes:

HUD System Set

Combiner – Lowered, cover removed

Runway Data – Set in control panel

Enter runway length.

The runway length entered must be between 5,000 and 18,000 feet for an AIII guided landing rollout.

Note: If a reference runway length entered into the HGS is less than 5,000 feet or greater than 18,000 feet, the HGS loses capability to provide rollout guidance below 500 feet AGL. A rollout caution ("RO CTN") is displayed in the HUD combiner and on the digital HAP on the FO side. The approach may continue with a "RO CTN".

For runways with a displaced threshold:

Enter the usable length listed as "Landing Beyond - Threshold" on the 10-9A page.

Enter runway TDZE (if available) for the landing runway.

Note: If TDZE is not available, use the closest airport elevation.

Enter glideslope angle

The glideslope angle must be set between -2.51° and -3.00° for an AIII approach.

HCP mode Select

AIII - The guidance cue is controlled by independently derived pitch and roll command signals from the HGS computer. Consider this mode when accomplishing hand-flown or autopilot/flight director approaches in low visibility.

Note: The AIII mode can be activated manually or by arming for automatic engagement.

Note: If the HUD is capable of providing AIII guidance, "AIII" is displayed on the right side of the "STBY" line.

Note: Approach On Course (AOC) conditions must be satisfied at the time AIII mode is selected.

Note: The AIII mode can only be selected above 500 feet AGL. Below 500 feet AGL, all AIII capability messages are removed and the AIII mode is no longer available.

PRI - Flight Director guidance and navigation raw data are displayed. Consider using one of the "de-cluttered" approach modes (IMC, VMC or AIII) for landing.

IMC - Flight Director guidance is displayed. Primarily used to back-up Autopilot/Flight Director approaches.

Enter published glideslope/descent angle into the HCP.

VMC - No Flight Director or HUD guidance is displayed.

Enter published glideslope/descent angle into the HCP.

HUD Recorded Faults

If desired, use the following steps to determine recorded faults associated with an AIII "APCH WARN" message.

Note: This capability is only available on the ground.

HCP TEST key Press momentarily and release
Selection enters the HCP TEST MENU

RECORDED FAULTS Select

Look into the combiner, move the cursor to "RECORDED FAULTS" using the HCP +/- keys and press ENTER.

Fault(s) for the leg just flown will appear (leg number 1).

Note: To view faults recorded for legs previous to that just flown (leg number 1), type in the sequential leg number (e.g., 2, 3, 4, 5, etc.).

HCP TEST key Press momentarily and release
Selection exits HGS TEST MENU.

QFE Operation

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

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

Altimeters Set
Set altimeters to QFE when below transition altitude/level.

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

Landing altitude indicator Set at zero

3772-3773

Terrain inhibit switch TERRAIN INHIBIT

Setting Airspeed Bugs with No Operative FMC

Reference the ODM and/or WDR to determine airspeed settings for desired phase of flight.

Setting Reference Airspeed Bugs for Takeoff

Speed reference selector (outer) V1
 Default speed of 80 knots is displayed.

Speed reference selector (inner) Set V1 speed
 V1 bug is displayed when a speed greater than 80 knots is set. The
 NO VSPD flag is displayed until both V1 and VR are set.

Speed reference selector (outer) VR
 Default speed of 80 knots is displayed.

Speed reference selector (inner) Set VR speed
 VR bug is displayed when a speed greater than 80 knots is set. The
 NO VSPD flag is removed after both V1 and VR are set.

MCP speed selector Set V2
 Airspeed cursor and V2+15 bug move to the correct speeds.

Speed reference selector (outer) WT
 Default weight of 70,000 lbs is displayed.

Speed reference selector (inner) Set takeoff gross weight
 Flaps up maneuver speed bug is displayed.

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

To set the spare bug, if desired:

Speed Reference selector (outer) Spare bug
 Default speed of 60 knots is displayed.

Speed reference selector (inner) Set
 Set speed as desired.

Speed reference selector (outer) SET

Digital readout is removed.

Note: When the flap lever is set to any takeoff flap setting above flaps 1, a bug comes into view for the next smaller flap maneuvering speed, between takeoff flaps and flaps up. For example, if the flap lever is set to 15 for takeoff, a bug for flaps 5 maneuvering speed will appear. For a flaps 1 takeoff, the flaps 1 maneuvering speed will be displayed.

Setting Reference Airspeed Bugs for Approach

Speed reference selector (outer) WT

Default weight of 70,000 lbs is displayed.

Speed reference selector (inner) Set current gross weight

Flaps up maneuver speed bug is displayed.

Speed reference selector (outer) VREF

Default speed of 80 knots is displayed.

Speed reference selector (inner) Set VREF speed

3601-3610

The green VREF bug and white VREF +15 bug are shown when a speed greater than 80 knots is set.

3701-3773, 3801-3900

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

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

To set the spare bug, if desired:

Speed reference selector (outer) Spare bug

Default speed of 60 knots is displayed.

Speed reference selector (inner) Set

Set speed as desired.

Speed reference selector (outer) SET

Digital readout is removed.

Total Air Temperature (TAT) Test

This procedure is for testing Total Air Temperature probe heat.

Total Air Temperature probe Test

TEMP PROBE light – Illuminated

TAT TEST switch – Push and hold

TEMP PROBE light – Extinguished

TAT TEST switch – Release

Intentionally
Blank

Supplementary Procedures

Flight Management, Navigation

Chapter SP

Section 11

Transponder Test

Transponder mode selector TEST switch Push momentarily

Check FAIL light illuminates.

Check all code segments illuminate. Verify no error codes exist.

Verify aural indicates TCAS system test passed.

Note: TCAS TEST is displayed on the navigation display during the test followed by TCAS TEST PASSED or TCAS TEST FAILED. This test remains in view for 8 seconds then blanks. An aural annunciation sounds at the completion of the test.

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

Weather Radar Test

EFIS mode selector MAP, MAP CTR, VOR, or APP

Weather Radar Mode TEST

WXR (EFIS control panel)..... ON

Verify test pattern consisting of the following colors appears:

- Green
- Yellow
- Red
- Magenta.

If testing of the PWS system is desired:

Weather Radar Mode Deselect TEST

WXR (EFIS control panel) ON

Weather Radar Mode TEST

Verify the amber WINDSHEAR caution, red WINDSHEAR warning and PWS FAIL annunciations display momentarily and then extinguish.

Note: In the short time the weather radar is on and not in the TEST position, it will radiate.

WXR (EFIS control panel) OFF

Weather Radar Operation

3701 - 3771

The recommended tilt and range settings are guidelines for good radar operation. The flight crew is not limited to these settings. Operational needs often dictate flexibility in tilt and range selections.

Before Takeoff

Confirm RADAR operation with a confidence check.

Set tilt 15° UP, WX mode, and short range.

Slowly lower tilt until weather or ground returns are displayed.

If no returns can be detected, suspect an inoperative radar.

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

To evaluate terminal area weather before takeoff:

Set tilt at 15° UP, RANGE at 40 nm or less.

The radar height of weather targets displayed is at least (Tilt x Distance x 100). Weather targets displayed at:

10 nm	are at least 15,000 feet AGL
15 nm	are at least 22,500 feet AGL
20 nm	are at least 30,000 feet AGL

Slowly lower tilt from 15° UP to 5° UP while evaluating weather returns in the area.

Takeoff

During takeoff, tilt is initially set at 5° UP, with range at shortest appropriate for terminal area conditions.

During initial climb (below 10,000 feet AGL) set the tilt between 2° to 7° UP, with 5° tilt being a good compromise. (Maintain the radar display clear of ground returns while allowing weather returns to be displayed).

Climb

As climb continues above 10,000 feet AGL, lower tilt as necessary to maintain ground returns at the outer edge of the display.

A range selection of 80 nm or less is optimal during climb, unless a longer range setting is needed for deviation planning.

Cruise

To establish enroute park:

Set RANGE at 80 nm or less.

Adjust tilt to produce ground returns at the outer edge of radar display.

This tilt setting guards against over scanning nearby weather areas and provides continuous confirmation that the radar is working.

Weather targets will separate from ground returns and move toward the bottom of the display.

Range settings above 100 nm should be selected occasionally for long-range planning.

Set tilt to produce a scattering of ground returns beyond 100 nm.

Storms detected at long range will increase in displayed intensity as they are approached. Plan early deviations accordingly.

Note: Nearby weather areas may not be detected due to over scanning. When returning to a shorter range, lower tilt to enroute park position.

At cruise altitudes above 30,000 feet:

Use sufficient down tilt to direct the beam into unfrozen areas of nearby storms.

Recommended Over Water Settings:

Altitude (feet)	40 NM	80 NM	160 NM
40,000	-7°	-3°	-2°
35,000	-6°	-2°	-1°
30,000	-4°	-1°	0°
25,000	-3°	-1°	0°
20,000	-2°	0°	+1°

Descent

On descent from cruise altitude, raise tilt as necessary to maintain ground returns at the outer edge of the display.

Low Altitude Park

Generally used at altitudes below 10,000 feet AGL.

To observe weather:

Set tilt 2° to 5° UP, range at shortest appropriate distance.

Note: If ground returns flood display, raise tilt until ground returns are removed, and weather can be displayed.

Approach

Approach Park

On final approach:

Set tilt at 10° UP, range at 20 nm.

At 10° UP tilt the radar height of weather returns displayed will be above aircraft altitude by at least (Tilt x Distance x 100). Weather areas will be developed above aircraft altitude by at least:

10 nm	10,000 ft.
15 nm	15,000 ft.
20 nm	20,000 ft.

Strong returns at mid to upper levels indicates hazardous convective activity.

In a thunderstorm environment, occasionally lower tilt to produce ground returns and detect radar shadows, then return tilt to approach park.

MultiScan Radar Operation

3601 - 3610, 3772 - 3773, 3801 - 3900

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.

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) is not active when the manual mode is selected.

IRS

Full Alignment

Prior to commencing procedure the airplane must be parked and not moved until procedure is complete and ALIGN lights extinguish.

If the present position cannot be entered through the FMC MCDU, it may be entered through the ISDU keyboard (See ISDU Entries procedure below).

IRS mode selectors NAV

Observe that ON DC lights illuminate momentarily, then the ALIGN lights illuminate steadily.

Note: Alignment time varies from 5 to 17 minutes depending on airplane latitude.

MCDU Set

POS INIT page – Select

Using the most accurate information available, enter present position on the SET IRS POSITION line. Confirm that the box prompts are replaced by the entered present position.

Set initial position using the following priorities:

- First choice – GPS
- Second choice – Gate position
- Third choice – Airport Reference Point (ARP)

Verify GMT is correct.

Align Light(s) Flashing

Do not move IRS Mode selector to OFF except where called for in procedure.

POS INIT page Select

Set IRS position Enter present position

Enter present position using the most accurate latitude and longitude available. If the present position is being entered via the CDU and a position is already displayed on the SET IRS POS line, enter new position over displayed position.

If ALIGN light continues to flash:

Set IRS position Enter present position

Re-enter same present position.

If ALIGN light continues to flash after re-entry:

IRS OFF

Rotate IRS Mode Selector to OFF and verify ALIGN light extinguished.

Note: Light must be extinguished before continuing with procedure (approximately 30 seconds.)

IRS NAV

Rotate IRS Mode Selector to NAV and verify ALIGN light illuminated.

Set IRS position Enter present position

Enter present position.

Note: Approximately five to seventeen minutes are required for alignment.

If ALIGN light flashes:

Set IRS position Enter present position

Re-enter same present position over displayed position.

If ALIGN light continues to flash:

Maintenance action is required.

Fast Realignment

Prior to commencing procedure the airplane must be parked and not moved until procedure is complete and ALIGN lights extinguish.

Note: Fast re-alignment may be accomplished at intermediate stops if groundspeed indication is not more than 20 on either ND.

IRS mode selectors ALIGN

Rotate IRS mode selectors to ALIGN from NAV, and observe ALIGN lights illuminated.

MCDU Set

POS INIT page – Select

Using the most accurate information available, enter present position on the SET IRS POSITION line. Confirm that the box prompts are replaced by the entered present position.

Set initial position using the following priorities:

- First choice – GPS
- Second choice – Gate position
- Third choice – Airport Reference Point (ARP)

Verify GMT is correct.

IRS mode selector NAV

Observe ALIGN light extinguished within 30 seconds.

Note: If time permits it is preferable to perform a full alignment of the IRS. A more precise alignment will result.

Note: If the mode selector is accidentally switched to OFF or ATT, position mode selector to OFF, wait for ALIGN light(s) to extinguish, then perform full alignment procedure.

Inadvertent Selection of Attitude Mode (while on the ground)

Inadvertent selection of the attitude mode may be due to physically overpowering the switch during turn-on or may be the result of a faulty switch which prevents the flight crew from accurately determining which mode is selected.

If ATT position is selected inadvertently when switching to NAV

IRS mode selectors OFF

Observe ALIGN lights extinguish.

After ALIGN lights extinguish, initiate a full alignment.

IRS Entries

Present Position Entry

IRS mode selector NAV

ALIGN lights must be illuminated (steady or flashing).

IRS display selector PPOS

Latitude Enter

Key—in latitude in the data display, beginning with N or S, then press the ENT Key (the Cue Lights extinguish).

Longitude Enter

Key—in longitude in the data display, beginning with E or W, then press the ENT key (the cue lights extinguish). Observe that proper latitude and longitude are displayed and that the ALIGN light is not flashing.

Heading – Enter through CDU

FMC/CDU POS INIT page Select

Enter the correct heading into the CDU scratch pad then press line select key 5R. Verify entered heading appears on line 5R. Select HDG on the IRS display selector and verify that the entered heading is displayed on the navigation displays.

Heading – Enter through ISDU

IRS display selector HDG

Press the H key to initiate a heading entry.
Key—in present magnetic heading. Press the ENT key (the cue lights extinguish). Observe proper heading displayed on the navigation displays.

Manual Flight Plan Entry

FMS Set

IDENT page – Check

- Verify airplane and engine MODEL and NAV DATA ACTIVE dates are correctly displayed.

POS INIT page – Select

- Enter position information.
- Verify GMT is correct.

RTE page – Select

- Enter route by company route identifier or origin and destination airports, then waypoints and/or airways.

DEPARTURES page – Select

- Select the active runway and departure/transition procedure if known.

RTE page – Select

- Verify selected departure and route.
Correct route discontinuities, ACTIVATE and EXEC.

PERF INIT page – Select

- Verify total fuel quantity is displayed on the CDU and that the fuel quantity indicators agree.

Enter:

- gross weight or zero fuel weight,
- FMS RESERVE,
- COST INDEX, and
- CRZ ALT,
- cruise altitude.

If known enter:

- CRZ WIND, and
- ISA DEV or T/C OAT.

Press EXEC.

CLIMB page – Select

SPD REST:

If departure procedure contains an airspeed restriction,
verify or enter restriction on SPD REST line.

Additional speed restrictions may be entered on TGT SPD line.

Press EXEC.

TAKEOFF REF 2/2 - Select

- **NADP2 TAKEOFF**
 - Verify ACCEL HT - 1,000 (AGL)
 - Verify thrust REDUCTION - 1,000 (AGL)
- **NADP1 TAKEOFF**
 - ACCEL HT - enter 3,000 (AGL)
 - Enter thrust REDUCTION - 1,500 (AGL)

Thrust mode display – Check

- Verify TO is displayed.

Takeoff Ref page 1 Verify
Observe FMS selected runway and WDR runway/takeoff position
agree.

FMS PERF INIT page Select
Enter ZFWT into ZWT.
Verify RMWT with GW.

FMS N1 LIMIT page Select
Enter Assumed Temperature into SEL as appropriate.
Select TO, TO-1, or TO-2.
Select CLB, CLB-1, or CLB-2 as desired.
Verify thrust setting in Thrust Mode Display.

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
ACCEL HT (AGL)
(Thrust) REDUCTION (AGL)
CUTBACK (ON or OFF)

MCP Set
Set V2 in IAS/MACH window.

Stabalizer trim.....Set
Position STAB TRIM indicator to STAB value.

RNP Manual Entry Procedures

All flights operating in Oceanic airspace will verify/manually set FMC values.

If manual entry of RNP value is required, accomplish the following.

Oceanic Entry Point

- Manually enter correct Oceanic value (e.g., 10.0) as required in the FMS scratchpad and select it into one of the following positions:
 - POS SHIFT page 3/3 LSK 4L
 - PROGRESS page 4/4 LSK 2L/6L
 - LEGS page LSK 6L (or 5L, U12.0)
- Verify RNP and that ANP is less than RNP.

Oceanic Exit Point

- Select the MCDU DELETE key to place the DELETE message into the scratchpad and select it into one of the RNP value positions described above to return RNP to the appropriate default cruise value.
- If the Oceanic RNP value that was entered is left in the FMS at oceanic exit point, the FMS will prompt a VERIFY RNP VALUE scratchpad message.

Lateral Navigation (LNAV)

Proceeding Direct to a Waypoint (overwrite)

RTE LEGS page Select

On page 1/XX, line 1L, enter desired waypoint over the presently active waypoint.

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

If abeam waypoints are desired:

ABEAM PTS key Push

EXEC key Push

Observe the MOD RTE LEGS page changes to ACT.

Intercepting a Leg (Course) to a Waypoint

RTE LEGS page Select

On page 1/XX, line 1L, enter desired waypoint over presently active waypoint.

Observe INTC CRS prompt displayed in line 6R.

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

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

EXEC key Push

Observe MOD RTE LEGS page changes to ACT.

LNAV may disengage after execution of an intercept leg to a waypoint. If LNAV disengages, turn to a heading to satisfy LNAV capture criteria, as described in Chapter 11, and then engage LNAV.

Route Modification

U12 not installed

RTE LEGS or RTE page Select

Line select existing waypoints in the desired sequence.

Key-in any new waypoints in the scratch pad and line select into the flight plan. Correct any ROUTE DISCONTINUITY.

EXEC key Push

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

Active Route Modification

Aircraft Installed with U12

ACT RTE x LEGS or ACT RTE x page Select

Line select existing waypoints in the desired sequence.

Key-in any new waypoints in the scratch pad and line select into the flight plan. Correct any ROUTE DISCONTINUITY.

EXEC key Push

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

Inactive Route Modification

Aircraft Installed with U12

RTE x LEGS or RTE x page Select

Line select existing waypoints in the desired sequence.

Key-in any new waypoints in the scratch pad and line select into the flight plan. Correct any ROUTE DISCONTINUITY.

Note: The flight number should not be changed in the inactive route as it will change the flight number in the active route.

Route Copy

Aircraft Installed with U12

ACT RTE x LEGS or ACT RTE x page Select

RTE COPY line select key Push

Inactive Route Activation

Aircraft Installed with U12

RTE x LEGS or RTE x page Select

ACTIVATE line select key Push

Correct any ROUTE DISCONTINUITY.

EXEC key Push

Route Removal

RTE page Select

ORIGIN Enter

If EXEC key illuminates

EXEC key Push

Linking a Route Discontinuity

Correct the ROUTE DISCONTINUITY by entering or deleting waypoints in a sequence that provides a continuous flight-plan path.

EXEC key Push

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

Determining ETA and Distance to Cross Radial (Bearing) or Distance from a Fix

FIX INFO page Select

Enter the identifier of the reference waypoint (normally an off-route waypoint) onto the FIX line. Enter the desired radial or distance from the FIX on a RAD/DIS line, or line select the ABM prompt if the desired radial from the FIX is perpendicular to the present route/course.

Time and distance to go Check

Check ETA and DTG, as desired.

Note: If ETA and DTG are not displayed, the fix radial and/or distance do not intersect the route.

Changing Destination

RTE page Select

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

EXEC key Push

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

Note: If destination is changed during climb, performance predictions may be blanked if the new flight plan is incompatible with the entered cruise altitude. Correct by entering a lower CRZ ALT on the CLB page.

Entering Holding Fix Into Route

HOLD key Push

(If RTE HOLD page is displayed, observe NEXT HOLD prompt. Line select 6L until (RTE LEGS) HOLD AT page is displayed.)

Observe HOLD AT box prompts and PPOS prompt (if in flight) are displayed. Enter the holding fix in line 6L, or line select PPOS.

If the holding fix is a waypoint in the active route, or PPOS was selected, observe MOD RTE HOLD page displayed. If the holding fix is a waypoint not in the active route, observe message HOLD AT XXXXX displayed in the scratch pad. Enter the holding fix into the route by line selecting in the desired waypoint sequence. Observe the MOD RTE HOLD page displayed. If displayed holding details are incorrect or inadequate, enter correct information on appropriate line(s).

EXEC key Push

Observe MOD RTE HOLD page changes to RTE HOLD (ACT RTE HOLD if holding at PPOS).

Exiting Holding Pattern

HOLD key Push
Observe EXIT HOLD prompt displayed.

EXIT HOLD line select key Push
Observe EXIT HOLD prompt changes to EXIT ARMED.

EXEC key Push
Observe EXIT ARMED is highlighted in reverse video and LNAV flight returns to the holding fix and resumes the active route.

Note: The holding pattern may be exited by performing a DIRECT TO modification if desired. In this case, the flight path may not return to the holding fix before proceeding to the selected waypoint.

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Note: A late sequencing of the hold exit waypoint may occur if multiple route modifications are performed just prior to exiting the hold. LNAV guidance may be temporarily interrupted while sequencing the hold exit waypoint.

Intercepting a Leg (Radial) from a Waypoint

RTE or RTE LEGS page Select

On page 1/XX, line 1L, enter the originating waypoint (anchor point) or the outbound radial. Observe the ROUTE DISCONTINUITY displayed in line 2L.

Line select waypoint at 1L to the scratch pad and add the outbound radial to intercept, a slash, and then a distance sufficiently placed in front of the aircraft (i.e., ATL090/200).

Line select this to the ROUTE DISCONTINUITY at 2L.

Line select the created waypoint at 2L to 1L.

Observe INTC CRS prompt displayed in line 6R.

Line select the displayed course at 6R.

Observe large font after selection and verify the white dashed line on the ND is correct.

EXEC key Push
Observe the MOD RTE LEGS page change to ACT.

Airway Intercept

RTE LEGS page Select

On page 1/XX, line 1L, enter the originating waypoint (anchor point) of the airway.

Observe ROUTE DISCONTINUITY displayed in line 2L.

RTE page Select

Following the origination waypoint (anchor point), enter the new clearance on the route page.

RTE LEGS page Select

On the ND, determine the next active waypoint.

Line select the next waypoint on the new route (airway); 1L on page 1/XX.

Observe INTC CRS prompt displayed in line 6R.

Note: The course should be similar to the charted course, but may not be exact.

Line select the displayed course at 6R.

Observe large font after selection and verify the white dashed line on the ND is correct.

EXEC key Push

Observe the MOD RTE LEGS page change to ACT.

Sequence remaining waypoints.

Refer to Supplementary Procedures chapter, Flight Management, Navigation section, Route Modification procedure.

Along Track Displacement

RTE LEGS page Select

Line select the reference waypoint to the scratch pad. Add a “/” and the + or – distance desired. (EX: SEA/15 for a point 15 miles downtrack from SEA)

Line select the reference waypoint. (The FMC will automatically position the created waypoint to appropriate position.)

EXEC key Push

Observe the MOD RTE LEGS page change to ACT.

Entering Created Waypoints on the Route or Route Legs Pages

Note: Created waypoints are stored in the temporary navigation data base for one flight only.

RTE or RTE LEGS page Select

Using any of the following methods, key into the scratch pad the parameters which define the new created waypoint (place identifiers must already be stored in one of the FMC data bases):

- Place bearing/distance (for example, SEA250/40);
- Place bearing/place bearing (for example, SEA180/ELN270);
- Along-track displacement (for example, SEA/-10);
- Latitude and longitude (for example, N4731.8W12218.3).

Enter into the route by line selecting to the appropriate waypoint sequence.

Repeat the above steps to define additional created waypoints as desired. Correct any ROUTE DISCONTINUITY.

EXEC key Push

Observe the MOD RTE or MOD RTE LEGS page changes to ACT (for an inactive route, activate and execute on the RTE or RTE LEGS page).

Entering a Crossing Radial (Bearing) or Distance from a Fix as a Route Waypoint

FIX INFO page Select

Enter identifier of the reference waypoint (normally an off-route waypoint) onto the FIX line. Enter the desired radial or distance from the FIX on a RAD/DIS line, or line select the ABM prompt if the desired radial or distance from the FIX is perpendicular to the present route/course.

Line select the desired intersection (lines 2L–5L) into the scratch pad and observe the new created waypoint displayed as FIX/Radial/Distance.

RTE LEGS page Select

Line select the new created waypoint, displayed in the scratch pad, to the desired waypoint sequence.

Repeat the above steps to define additional created waypoints as desired. Correct any ROUTE DISCONTINUITY.

EXEC key Push

Observe the MOD RTE LEGS page changes to ACT.

Note: These created waypoints are stored in the temporary navigation data base for one flight only.

Entering a Lateral Offset

RTE page Select

Observe the OFFSET prompt displayed.

LATERAL OFFSET page Select

Observe dash prompts for OFFSET DIST.

OFFSET DIST Enter

Enter desired offset distance using format Lxx or Rxx for left or right offset up to 99 nm. Observe dash prompts for START WAYPOINT and END WAYPOINT.

START/END WAYPOINT Enter

If no start/end waypoint is entered, offset will begin/end at first/last valid offset leg.

Change SID or Runway

This entire procedure must be accomplished when a SID is used and the runway or SID is changed. This will prevent the possibility of incorrect routing or inadequate obstacle clearance.

DEPARTURES page Select
 RUNWAY Reselect
 SID Reselect
 TRANSITION (if required) Reselect
 RTE LEGS page Select
 WAYPOINT SEQUENCE and ALTITUDES Check
 Modify as necessary to agree with clearance.
 EXEC key Push

Change STAR, PROF DES, or APP

The associated airport must be entered as route origin or destination.

ARRIVAL page Select
 STAR or PROFILE DESCENT (if required) Select
 TRANSITION (if required) Select
 APPROACH Select
 APPROACH TRANSITION (if required) Select
 RTE LEGS page Select
 WAYPOINT SEQUENCE CHECK
 Modify as necessary to agree with clearance.
 EXEC key Push

Delete Procedure Turn

DEP/ARR page Select

Approach Select

Reselecting same approach or selecting a new approach will remove
procedure turn and select a straight in approach on the LEGS page.

EXEC key Push

or

RTE LEGS page Select

Select last waypoint of procedure turn to scratchpad and
overwrite PROC TURN line. Check waypoint sequencing to
comply with clearance.

EXEC key Push

Other Operations

FMC Navigation Check

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

Actual position Determine and compare with FMC position
Determine actual airplane position using raw data from VHF navigation.

If radio nav aids are unavailable:

FMC position Compare with the IRS position
Use the POS SHIFT page of the FMC CDU. If the two IRS positions are in agreement and the FMC position is significantly different, the FMC position is probably unreliable. The POS SHIFT page may be used to shift FMC position to one of the IRS positions. This is accomplished by line selecting the IRS or radio position and then pressing the EXEC Key.

Actual position Confirm with ATC radar or visual reference points.

Navigate using most accurate information available (continue to monitor FMC position using VOR/ADF raw data displays on non-flying pilot's navigation display).

CAUTION: Navigating in LNAV mode with an unreliable FMC position may result in significant navigation errors.

Navigate by conventional VOR/ADF procedures, radar vectors from ATC, dead reckoning from last known position, and/or use of visual references.

Inhibiting VOR/DME Use for Position Updating

This procedure inhibits the use of VOR/DME information for FMC position updating.

PROG page Select
Observe NAV STATUS prompt displayed.

NAV STATUS page Select

NAV OPTIONS page Select (NEXT/PREV page)

To inhibit specific VOR or DME inputs:
Observe dash prompts for VOR/DME INHIBIT. Enter desired VOR/DME identifier (a previous entry may be overwritten but will no longer be inhibited). Use DEL key to remove a specific VOR/DME from inhibit status.

To inhibit all VOR updating:
VOR UPDATE ON/OFF (4L) OFF

To inhibit all DME updating:
DME UPDATE ON/OFF (3L) OFF

Reselect VOR/DME UPDATE ON/OFF prompt to return to update status.

Inhibiting GPS Updating

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

PROG page Select
Observe NAV STATUS prompt displayed.

NAV STATUS page Select

NAV OPTIONS page Select (NEXT/PREV page)

GPS UPDATE OFF

Vertical Navigation (VNAV)

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

MCP altitude selector Set desired altitude

Verify ALT HOLD is annunciated on the flight mode annunciator when leveling at the selected MCP altitude.

MCP N1 light will extinguish if leveling from a climb.

N1 Limit changes to CRZ if leveling from a climb.

To continue climb/descent:

MCP altitude selector Set desired altitude

VNAV switch Push

Climb or descent is initiated. Mode annunciations appear as initial climb or descent.

Intervention of FMC Altitude Constraints during VNAV Climb

MCP altitude selector Set new altitude

New altitude must be higher than the FMC altitude constraint(s) to be deleted.

ALT INTV switch Push

Each push of the ALT INTV switch will delete an FMC altitude constraint.

Intervention of FMC Cruise Altitude during VNAV Cruise

U12 not installed

MCP altitude selector Set desired altitude

ALT INTV switch Push

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

If a lower altitude is selected, a VNAV descent will be started.

Intervention of FMC Cruise Altitude during VNAV Cruise

Aircraft installed with U12

MCP altitude selector Set desired altitude

ALT INTV switch Push

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

If the airplane is more than 50 nm from T/D, if a lower altitude is selected, a CRZ descent will be started if the selected altitude is above any FMC altitude constraint.

If the airplane is more than 50 nm from T/D, if a lower altitude is selected, an early descent will be started if the selected altitude is below any FMC altitude constraint.

If the airplane is 50 nm or less from T/D, if a lower altitude is selected, an early descent will be started.

Intervention of FMC Altitude Constraints during VNAV Descent

MCP altitude selector Set desired altitude

New altitude must be lower than the FMC altitude constraint(s) to be deleted.

ALT INTV switch Push

Each push of the ALT INTV switch will delete an FMC altitude constraint.

If all FMC altitude constraints are deleted, the descent mode will revert to a VNAV speed descent.

Intervention of FMC Airspeed Constraints during VNAV

SPD INTV switch Push

MCP IAS/MACH display shows current FMC target speed.

IAS/MACH selector Set desired speed

VNAV remains engaged.

To resume former FMC speed:

SPD INTV switch Push

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

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

RTE LEGS page Select

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

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

Line select to desired waypoint line.

EXEC key Push

Observe MOD RTE LEGS page changes to ACT.

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

Deleting Waypoint Speed and Altitude Restriction

RTE LEGS page Select

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

EXEC key Push

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

Changing Speed and/or Altitude Restriction during Climb or Descent

CLB/DES page Select

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

EXEC key Push

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

Changing Climb/Cruise/Descent Speed Schedule

CLB/CRZ/DES page Select

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

EXEC key Push

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

Early Descent

MCP altitude selector Set

Set next level-off altitude.

DES page Select

Line select DES NOW prompt.

EXEC key Push

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

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

Step Climb or Descent from Cruise

MCP altitude selector Set

Set new level-off altitude.

CRZ page Select

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

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

EXEC key Push

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

Performance and Progress Functions

Determining ETA and Fuel Remaining for New Destination

RTE page Select

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

PROGRESS page Select

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

RTE page Select

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

Estimated Wind Entries for Cruise Waypoints

RTE LEGS page Select

Observe the DATA prompt displayed.

RTE DATA page Select

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

Step Climb Evaluation

CRZ page Select

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

Step climb savings Determine

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

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

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

Entering Descent Forecasts

DES page Select
Observe FORECAST prompt displayed.

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

EXEC key Push
Observe MOD DES FORECASTS page changes to ACT.

Engine Out

Engine out climb and cruise pages provide advisory information for engine out operation. Refer to Volume II, Flight Management, Navigation, sections 41 and 42, for a complete description of ENG OUT CLB and ENG OUT CRZ pages.

Critical Terrain Box FMS Loading Procedures

If the Dispatcher Remarks and body of the flight plan are annotated with THEATER CO ROUTES and CO ROUTE/TERRAIN BOX remarks, the flight is planned to enter or be in close proximity to a Critical Terrain Box. When this occurs, prior to the entry point, accomplish the following:

Identify the CO ROUTE theater designation associated with the Critical Terrain Box entry point (e.g., SAT01) on the flight plan.

Note: Refer to the Airway Manual, Mountainous Terrain.

- Identify and review the relevant Coverage Area chart associated with the theater on the flight plan
- Referencing the terrain box and routing, locate and assess the suitability of the divert/alternate airports listed in the remarks section of the flight plan

Load the appropriate CO ROUTE into Route 2 of the FMS:

RTE 2 Select
Load the Critical Terrain Box CO ROUTE (e.g., SAT01).

Note: The origin and destination airports that are automatically loaded have no operational significance.

LEGS (RTE 2 LEGS) Select

- Page through and delete all DLETE waypoints
- Do not close the route discontinuities

Note: Do not activate or execute RTE 2.

Note: Repeat process whenever a new CO RTE is loaded.

Prior to entering Restricted Critical Terrain areas:

One pilot should have RTE 2 displayed on the ND (for situational awareness).

Check weather at Diversion Airport.

Note: Do not ACTIVATE/EXECUTE RTE 2.

Required Time of Arrival (RTA)

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

Entering an RTA Waypoint and Time

RTA PROGRESS page Select

On PROGRESS page 3, line 1L, enter the flight plan waypoint where required time of arrival is applicable. Observe the MOD RTA PROGRESS page displayed with the computed ETA, for the entered waypoint, displayed in line 1R.

RTA Enter

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

EXEC key Push

Observe ACT RTA PROGRESS page displayed.

Entering Speed Restrictions for RTA Navigation

PERF LIMITS page Select

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

EXEC key Push

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

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

Entering New Time Error Tolerances for RTA Navigation

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

RNAV Procedures

Entering Required Navigational Performance (RNP)

- LEGS Page Select
- Enter RNP value from the approach plate into the scratch pad.
- Line Select Key 6L Push

Resetting RNP to Default Value

- LEGS Page Select
- DELETE Key Push
- Line Select Key 6L Push

Additional CDU Functions

Navigation Display Plan Mode (Center Step Operation)

- EFIS Control Panel Mode Selector PLAN
- RTE LEGS page Select
- EFIS Control Panel Range Selector As required
- MAP CTR STEP key Push
- Each push moves the CTR label to the next geographically fixed
waypoint in the route. Selecting PREV PAGE or NEXT PAGE
moves the CTR label to the first geographically fixed waypoint on
the new page.
- EFIS Control Panel Mode Selector As required

Enter Position Shift on Runway

TAKEOFF REF page..... Select

TO SHIFT distance Enter

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

If position shift must be removed

RTE page Select

RWY Enter

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

Nav Accuracy Check

Prior to entry into Class II airspace, a nav accuracy check will be performed. Completion of this check should be annotated on the International Flight Plan.

Use the following:

- Select LEGS Page in the FMS.
- Verify ANP value is less than or equal to RNP.
- Place check in flight plan block indicating nav accuracy check completed.

FMC Inoperative

Use conventional navigation. LNAV and VNAV modes are not available.

Set N1 reference and Airspeed bugs using the ODM and/or WDR.

Refer to Supplementary Engines, APU section, Setting N1 Bugs with no Operative FMC procedure.

Refer to Supplementary Flight Instruments, Displays section, Setting Airspeed Bugs with no Operative FMC procedure.

Accomplish the following procedures, in conjunction with normal procedures, during appropriate phases of flight.

Preflight

IRS alignment Complete

Use ISDU to enter present position information.

See Supplementary IRS - Full Alignment, Fast Realignment and ISDU Entries procedures in this section.

CAUTION: IRS ALIGN lights must be extinguished prior to aircraft movement.

After WDR Received

N1 reference bugs As required

Airspeed bugs As required

Note: VREF is not set for takeoff.

Set V2 in MCP IAS/MACH display window.

Before Takeoff

Autothrottle Off

Note: Autothrottle may be used after takeoff.

FLIGHT DIRECTOR switches On

Press either TO/GA switch when applying takeoff thrust to activate the flight director.

Climb and Cruise

Autothrottle As required

Rotate MCP speed selector knob to desired speed.

If autothrottle is engaged during climb:

MCP SPD or N1 appears on the FMAs.

If autothrottle is engaged during cruise:

MCP SPD appears on the FMAs.

N1 reference bugs As required

EFIS control panel mode selector As required

Set mode selector switch to APP or VOR as required.

Tune navigation radios manually.

Autopilot As required

Descent, Approach and Before Landing

Autothrottle As required

Rotate MCP speed selector knob to desired speed.

**CAUTION: If the TO/GA switch is used for go-around, only
reduced thrust is available. Maximum thrust
go-around must be performed manually.**

N1 reference bugs As required

Airspeed bugs As required

EFIS control panel mode selector As required

Set mode selector switch to APP or VOR as required.

Autopilot As required

Dual autopilots are available for autoland.

FMS Preflight for Origins/Destinations/Waypoints Not Contained in FMS Database

Certain offline airports, waypoints, and/or navaids may not be included in the permanent FMS database. If necessary, the Lat./Long. for the offline airport or Lat./Long. for a navaid or waypoint can be loaded into the FMS SUPP NAV DATA pages.

Also, display and use raw data as applicable for all Departure Procedures/STARs/ Approaches/Missed Approaches at airports not included in the permanent FMC database. Set EFIS mode selector to APP or VOR as required for each phase of flight.

Supplemental Navigation Database

Access to the SUPP NAV DATA pages is available only on the ground. To access the database, type “SUPP” in the scratchpad from the INIT/REF INDEX page, then select the NAV DATA prompt.

Note: Data entered into the supplemental database is retained indefinitely, whereas data entered into the temporary database (entered on the REF NAV DATA pages) is erased after the completion of each flight.

Refer to Vol. 2, 11.42, Navigation Summary for additional guidance.

To determine if SUPP NAV DATA is present:

IDENT page Select
SUPP DATA (5R) Check
If no date is displayed, no data in supplemental database. If a date is displayed, data is stored in the supplemental database.

To display the SUPP NAV DATA page:

INIT/REF INDEX page Select
 “SUPP” Type into scratchpad
 NAV/DATA prompt (1R) Select
 EFF FROM MMMDY/YR (3R) Check
 If no date is displayed, no data in supplemental database. If a date is
 displayed, data is stored in the supplemental database.
 EFF FROM MMMDY/YR (3R) Enter
 Entry of date is required before any entries can be made to SUPP
 NAV DATA.
 EXEC key Push

To clear supplemental database memory:

DELETE ALL SUPP DATA (6R) Select
 Must be accomplished prior to entry of origin airport.
 EXEC key Push

Note: The supplemental database should be cleared prior to use to
 prevent the FMS from accessing incorrectly entered data.

To clear individual supplemental database entries:

WPT IDENT, NAVAID IDENT, AIRPORT IDENT Enter
 DEL key Push
 EXEC key Push

To display all data in supplemental and temporary databases:

SUMMARY prompt (2R) Select
 TEMP NAV SUMMARY pages are followed by SUPP NAV
 SUMMARY pages.

**Entering Created Airports, Navigational Aids, and Waypoints
on the NAV DATA Pages**

The supplemental navigation database shares memory storage with the temporary navigation database, the two being limited to a total of 40 navaids and 6 airports. Forty (40) waypoints may be stored, with 20 dedicated to the temporary database and the remaining 20 shared.

To enter airport data:

- Four letter ICAO AIRPORT IDENT (2L) Enter
The display changes to airport data.
- RUNWAY IDENT (1L) Enter
- LATITUDE (3L) Enter
- LONGITUDE (3R) Enter
- Airport ELEVATION in feet MSL (4R).....Enter
MAG VAR computes automatically.
- EXEC key Push

To enter navigation aid data:

- NAVAID IDENT (maximum 5 characters) (1R).....Enter
The display changes to airport data.
- LATITUDE (3L) Enter
- LONGITUDE (3R) Enter
- FREQ (4L) Enter
- CLASS (2R) Enter
- Navaid ELEVATION in feet MSL (4R) Enter
MAG VAR computes automatically.
- EXEC key Push

To enter waypoint data:

WPT IDENT (maximum 5 characters) (1L)..... Enter
The display changes to airport data.

To define the waypoint by Lat./Long.:

LATITUDE (3L) Enter

LONGITUDE (3R) Enter

To define the waypoint by Radial/Distance:

REF IDENT (6L) Enter

REF IDENT must be already stored in a FMC database.

RADIAL/DIST (5R) Enter

MAG VAR is computed by FMS.

EXEC key Push

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Supplementary Procedures

Fuel

Chapter SP

Section 12

Fuel Balancing

If an engine fuel leak is suspected:

Accomplish the ENGINE FUEL LEAK checklist.

Maintain main tank No. 1 and No. 2 fuel balance within limitations.

Note: Fuel pump pressure should be supplied to the engines at all times. At high altitude, without fuel pump pressure, thrust deterioration or engine flameout may occur.

If the center tank contains fuel:

Center tank fuel pump switches OFF

Crossfeed selector Open

Fuel pump switches (low tank) OFF

When quantities are balanced:

Fuel pump switches (main tank) ON

Center tank fuel pump switches ON

Crossfeed selector Close

If the center tank contains no fuel:

Crossfeed selector Open

Fuel pump switches (low tank) OFF

When quantities are balanced:

Fuel pump switches ON

Crossfeed selector Close

Refueling

Fuel Load Distribution

Main tanks No. 1 and No. 2 should normally be serviced equally until full. Additional fuel is loaded into the center tank until the desired fuel load is reached.

Note: Main tanks No. 1 and No. 2 must be scheduled to be full if the center tank contains more than 1,000 lbs of fuel.

Note: If the main tanks No. 1 and No. 2 are not full, up to 5,000 pounds of fuel may remain in, or may be loaded in, the center tank for takeoff, climb and cruise provided the Zero Fuel Gross Weight of the airplane plus the weight of the center tank fuel does not exceed Maximum Zero Fuel Gross Weight by more than 5,000 pounds and the effects of balance (CG) have been considered. Receipt of the WDR confirms loading and CG considerations have been satisfied. If main tanks No. 1 and No. 2 are not full, up to 3,000 pounds of fuel may remain in the center tank for descent and landing. [AFM]

Fuel Pressure

Apply from a truck or fuel pit. A nozzle pressure of 50 psi provides approximately 300 U.S. gallons per minute.

Normal Refueling

When a full fuel load is required, the fuel shutoff system closes the fueling valves automatically when the tanks are full. When a partial fuel load is required, the fuel quantity indicators are monitored and the fueling valves are closed by manually positioning the fueling valve switches to CLOSED when the desired fuel quantity is aboard the airplane.

Refueling with Battery Only

When the APU is inoperative and external power is not available, refueling can be accomplished as follows:

Battery switch ON

Note: The refueling system will operate normally. Operation is limited only by battery life.

Refueling with No AC or DC Power Source Available

When it becomes necessary to refuel with the APU inoperative, the aircraft battery depleted, and no external power source available, refueling can still be accomplished:

Fueling hose nozzle Attached to the refueling receptacle

Fueling valves Open for the tanks to be refueled

Note: Main tanks No. 1 and No. 2, and the center tank refueling valves each have a red override button that must be pressed and held while fuel is being pumped into the tank. Releasing the override button allows the spring in the valve to close the valve.

Caution must be observed not to overfill a tank, since there is no automatic fuel shutoff during manual operation. When the desired amount of fuel has been pumped into the tanks, the refueling valves for the respective tanks can be released.

Ground Transfer of Fuel

3601-3610, 3772-3773, 3801-3900

Fuel can be transferred from one tank to another tank by using the appropriate fuel pumps, the fueling valve, the defueling valve, and the crossfeed valve. AC power must be available.

Prior to transferring fuel or defueling, conduct a lamp test of the respective fuel pump LOW PRESSURE lights. When transferring fuel or defueling from either the center or main wing tanks, monitor the fuel pump LOW PRESSURE lights and turn the fuel pumps OFF at the first indication of fuel pump low pressure.

Fuel may be transferred from tank to tank or the aircraft may be defueled with passengers on board, provided the fuel quantity in the tank from which fuel is being taken is maintained at not less than 2000 pounds. Deplane all passengers and non-essential crew when defueling or transferring fuel from a tank that has less than 2000 pounds. Wait until the process has been completed and the respective fuel pumps turned OFF before reloading non-essential crew and passengers.

To transfer fuel from the main tanks to the center tank:

Main tank fuel pump switches ON

Crossfeed selector	Open
Manual defueling valve	Open
Center tank fueling valve switch	OPEN
Fuel transfer	Monitor
The center tank fuel quantity indicator shows an increase in fuel.	
The main tank indicators show a decrease in fuel.	
Center tank fueling valve switch	CLOSED
When the required amount of fuel has been transferred, the switch is closed at the fueling panel.	
Manual defueling valve	Close
Crossfeed selector	Close
Main tank fuel pump switches	OFF
Main Tanks	Refill
Refueling panel and defuel panel access doors	Close

Ground Transfer of Fuel

3701-3771

Fuel can be transferred from one tank to another tank using the fuel pumps, fueling valve, defueling valve, and crossfeed valve. AC power must be available.

Prior to transferring fuel or defueling, conduct a lamp test of the respective fuel pump LOW PRESSURE lights. When transferring fuel or defueling from either the center or main wing tanks, monitor the fuel pump LOW PRESSURE lights and turn the fuel pumps OFF at the first indication of fuel pump low pressure.

CAUTION: Transferring fuel with passengers onboard is prohibited.

To transfer fuel from the main tanks to the center tank:

Main tank fuel pump switches ON

Crossfeed selector Open

Manual defueling valve Open

Center tank fueling valve switch OPEN

Fuel transfer Monitor

The center tank fuel quantity indicator shows an increase in fuel.

The main tank indicators show a decrease in fuel.

When a FUEL PUMP LOW PRESSURE light illuminates, turn OFF the associated fuel pump.

Center tank fueling valve switch CLOSED

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

Manual defueling valve Close

Crossfeed selector Close

Main tank fuel pump switches OFF

Main Tanks Refill

Refueling panel and defuel panel access doors Close

Fuel Crossfeed Valve Check

- Crossfeed selector Open
Verify crossfeed VALVE OPEN light illuminates bright and then dim.
- Crossfeed selector Close
Verify crossfeed VALVE OPEN light illuminates bright and then extinguishes.

Supplementary Procedures

Warning Systems

Chapter SP

Section 15

GPWS/Windshear Test

The following procedure is normally accomplished prior to the first flight of the day and on each crew change.

Ground Proximity Warning System

TEST switch Push momentarily

Verify proper operation of the following:

- BELOW G/S and GPWS INOP lights illuminate
- PULL UP and WINDSHEAR alerts illuminate
- “GLIDESLOPE,” “PULL UP,” and “WINDSHEAR” aural sound
- TERR FAIL and TERR TEST show on navigation displays
- terrain display test pattern shows on navigation displays
- terrain caution aural sound and TERRAIN caution message shows on navigation displays.

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

TCAS System Test

The following procedure is normally accomplished prior to the first flight of the day.

Transponder mode selector TEST switch Push momentarily

TCAS TEST is displayed on the navigation display for 8 seconds then blanks.

One of the following aural annunciations will sound at the completion of the test:

Aural Alerts	Definition
“TCAS SYSTEM TEST FAIL”	Test failed. Maintenance required.
“TCAS SYSTEM TEST OK”	Test complete. System operable.

CAUTION: Absence of an aural warning should be investigated prior to flight.

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Supplementary Procedures
Adverse Weather**Chapter SP**
Section 16

Introduction

Airplane operation in adverse weather conditions may require additional considerations due to the effects of extreme temperatures, precipitation, turbulence, and windshear. Procedures in this section supplement normal procedures and should be observed when applicable.

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:

- 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 or wing anti-ice when OAT (on the ground) or 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, tab surfaces, all control surfaces, and the upper wing and winglets/split scimitar winglets, 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.

Control surface balance panel cavities Check

Check drainage after snow removal. Puddled water may refreeze in flight.

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.

If the APU is operating, verify the outflow valve is fully open.

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 and cooling air inlet must be free of snow or ice
prior to APU start.

Preflight Procedure

Do the following step after completing the normal Preflight Procedure -
First Officer:

PROBE HEAT ON
Verify that all probe heat lights are extinguished.

Engine Start Procedure

Note: When anticipating taxiing on a slippery or contaminated surface, consider starting both engines.

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.
- If the engine has been cold soaked for one or more hours at ambient temperatures below -40°C , do not start or motor the engine. Maintenance personnel should do appropriate procedures for adverse weather heating of the Hydro-Mechanical Unit.
- If the engine has been cold soaked for three or more hours at ambient temperatures below -40°C , do not start or motor the engine. Maintenance personnel should do appropriate procedures for adverse weather starter servicing.
- If ambient temperature is below -35°C , idle the engine for two minutes before changing thrust lever position.
- Several minutes may be needed for oil pressure to reach the normal operating pressure. During this period, oil pressure may go above the normal range and the FILTER BYPASS light may illuminate. Operate the engine at idle thrust until oil pressure returns to the normal range.
- If the oil pressure remains above the normal range after the oil temperature has stabilized within limits, shut down the engine.

Note: If a precautionary shutdown was accomplished due to lack of oil pressure after start, the engine heat generated may provide adequate warming for a subsequent start to be successful (allow 10 to 15 minutes for internal heat distribution to warm the oil system). If available, a hot air source may be used to warm the oil tank and engine gearbox prior to the next start.

After Start Procedure

GENERATOR 1 and 2 switches ON

Normally engine IDGs stabilize within one minute, although due to cold oil, up to five minutes may be required to produce steady power.

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.

WARNING: Do not rely on airframe visual icing cues before activating engine anti-ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.

CAUTION: Do not use engine anti-ice when OAT is above 10°C.

When engine anti-ice is needed:

ENGINE START switch(es) CONT

ENGINE ANTI-ICE switch(es) ON

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

Verify that the COWL ANTI-ICE lights are extinguished.

Note: If the COWL VALVE OPEN lights remain illuminated bright with engines at IDLE, position APU BLEED air switch to OFF and increase thrust slightly (up to a maximum of 30% N1).

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE switch(es) OFF

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

ENGINE START switches OFF

Wing Anti-ice Operation - On the Ground

Use wing anti-ice during all ground operations between engine start and takeoff when icing conditions exist or are anticipated, unless the airplane is, or will be protected by the application of Type II or Type IV fluid in compliance with Delta’s deicing program.

WARNING: Do not use wing anti-ice as an alternative for ground de/anti-icing. Close inspection is still needed to ensure that no frost, snow or ice is adhering to the wing, leading edge devices, stabilizer, control surfaces or other critical airplane components at takeoff.

WARNING: Ground use of the wing anti-ice system is intended to complement, and not replace, ground de/anti-icing and inspection procedures.

CAUTION: Do not use wing anti-ice when OAT is above 10°C.

When wing anti-ice is needed:

WING ANTI-ICE switch ON

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

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

When wing anti-ice is no longer needed:

WING ANTI-ICE switch OFF

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

If the aircraft has been protected by de/anti-icing fluid and icing conditions exist or are anticipated:

Configure airplane per the following chart:

Fluid Type	Operating Engine(s)	Wing Anti-Ice
Type I	2	ON
Type II or Type IV	1* or 2	OFF
* Single engine taxi permitted.		

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 nose wheel steering and rudder inputs and apply minimum thrust evenly and smoothly. Taxiing on slippery taxiways or runways at excessive speed or with high crosswinds may start a skid.

CAUTION: When operating the engines over significant amounts of standing 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.

Flight controls Check

Note: Increase in control forces can be expected at low temperatures because of increased resistance in cables and thickened oil in snubbers and bearings.

Flaps Extend

Set the flaps to the applicable WDR takeoff setting.

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

- Check that the area behind the airplane is clear.
- Run the engines up to a minimum of 70% N1 for approximately 30 seconds duration at intervals no greater than 30 minutes.

Note: Fan blade ice build up is cumulative. If the fan spinner and fan blades were not deiced prior to taxi out, the time the engines were operating during the taxi in should be included in the 30 minute interval.

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

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

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 stabilized at or above 70% N1 before the start of the takeoff roll. A thirty second run-up is highly recommended whenever possible.

Climb, Cruise, and Descent Procedures

Engine Anti-Ice Operation – In Flight

Engine anti-ice must be ON during all flight operations when icing conditions exist or are anticipated, except during climb and cruise when the temperature is below -40°C SAT. Engine anti-ice must be ON before, and during descent in all icing conditions, including temperatures below -40°C SAT.

When operating in areas of possible icing, activate engine anti-ice before entering icing conditions.

WARNING: Do not rely on airframe visual icing cues before activating engine anti-ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.

CAUTION: Do not use engine anti-ice when TAT is above 10°C.

When engine anti-ice is needed:

ENGINE START switches CONT

ENGINE ANTI-ICE switches ON

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

Verify that the COWL ANTI-ICE lights are extinguished.

Note: If the COWL VALVE OPEN lights remain illuminated bright with engines at IDLE, increase thrust slightly (up to a minimum of 30% N1).

When engine anti-ice is no longer needed:

ENGINE ANTI-ICE switches OFF

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

ENGINE START switches OFF

Fan Ice Removal

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

Severe icing can usually be avoided by a change in altitude and/or airspeed. If flight in moderate to severe icing conditions cannot be avoided, do the following on both engines, one engine at a time at approximately 15 minute intervals:

Thrust Increase

Increase thrust to a minimum of 80% N1 for approximately one second to ensure the fan blades and spinner are clear of ice.

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

ENGINE START switch FLT

Thrust Adjust

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

Note: Engine vibration may reduce to a low level before 80% N1 is reached, however, thrust increase must continue to a minimum of 80% N1 to remove ice from the fan blades.

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

If vibration does not decrease, do the High Engine Vibration procedure if not in icing conditions.

Wing Anti-Ice Operation – In Flight

Note: Do not use wing anti-ice prior to 400 feet AGL.

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.

CAUTION: Use of wing anti-ice above approximately FL350 may cause bleed trip off and possible loss of cabin pressure.

Note: Prolonged operation in icing conditions with the leading edge and trailing edge flaps extended is not recommended. Holding in icing conditions with flaps extended is prohibited.

When wing anti-ice is needed:

WING ANTI-ICE switch ON

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

When wing anti-ice is no longer needed:

WING ANTI-ICE switch OFF

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

After flying in icing conditions with temperature at destination airport below 46°F, and/or if landing will be made with anti-icing in use, and/or the flight required the use of wing anti-ice, check that required corrections have been made to go-around climb limit weight. Use WDR or ODM data, as available.

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 Company Pages), refer to Airway Manual, Weather, Altimeter Corrections.

Approach and Landing Procedures

Refer to the Guidelines for Contaminated Runways procedure in this section, if applicable.

Do the normal Approach and Landing procedures with the following modifications:

Use normal procedures and reference speeds unless a flaps 15 landing is planned.

If a flaps 15 landing will be made:

Set VREF 15

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

- engine anti-ice will be used during landing;
- wing anti-ice has been used any time during the flight;
- icing conditions were encountered during the flight and the landing temperature is below 10°C.

The combined airspeed corrections for steady wind, gust, and icing should not exceed the maximum of 20 knots.

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 to less than flaps 15 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.

Shutdown Procedure

Do the following step before starting the normal Shutdown procedure:

After landing in icing conditions:

WARNING: Ensure that the stabilizer trim wheel handles are stowed before using electric trim to avoid personal injury.

Stabilizer trim Set 4 units

Prevents melting snow and ice from running into balance bay areas. Water in these areas can freeze and lock controls.

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:

WARNING: Ensure that the stabilizer trim wheel handles are stowed before using electric trim to avoid personal injury.

Stabilizer trim Set 4 units

Prevents melting snow and ice from running into balance bay areas. Water in these areas can freeze and lock controls.

Parking brake As required

If the ramp is contaminated with ice or snow, parking brake should remain set.

Pressurization mode selector MAN

Outflow valve switch 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/ Landing Max Recommended Crosswind Component	Tailwind Limit
--	Dry	6	≥ 40	≥ 19	33	10*
Good	Damp Frost ($<1/8''$)	5				
Good / Medium	Wet	4				
Medium (Fair)	Dry Snow	3	35-30	13-18	20	5
Medium / Poor	Wet Snow/ Standing Water/ Slush	2	29-26	—	20	0
Poor	Ice - No Melting	1	25-21	6-12	10	
Nil	Do Not Operate					

* Unless the aircraft and airport are authorized for 15 knots.

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 LCC to load plan for W (WET) numbers.

AWABS limits the takeoff weight, as appropriate, based upon the selected contaminant type.

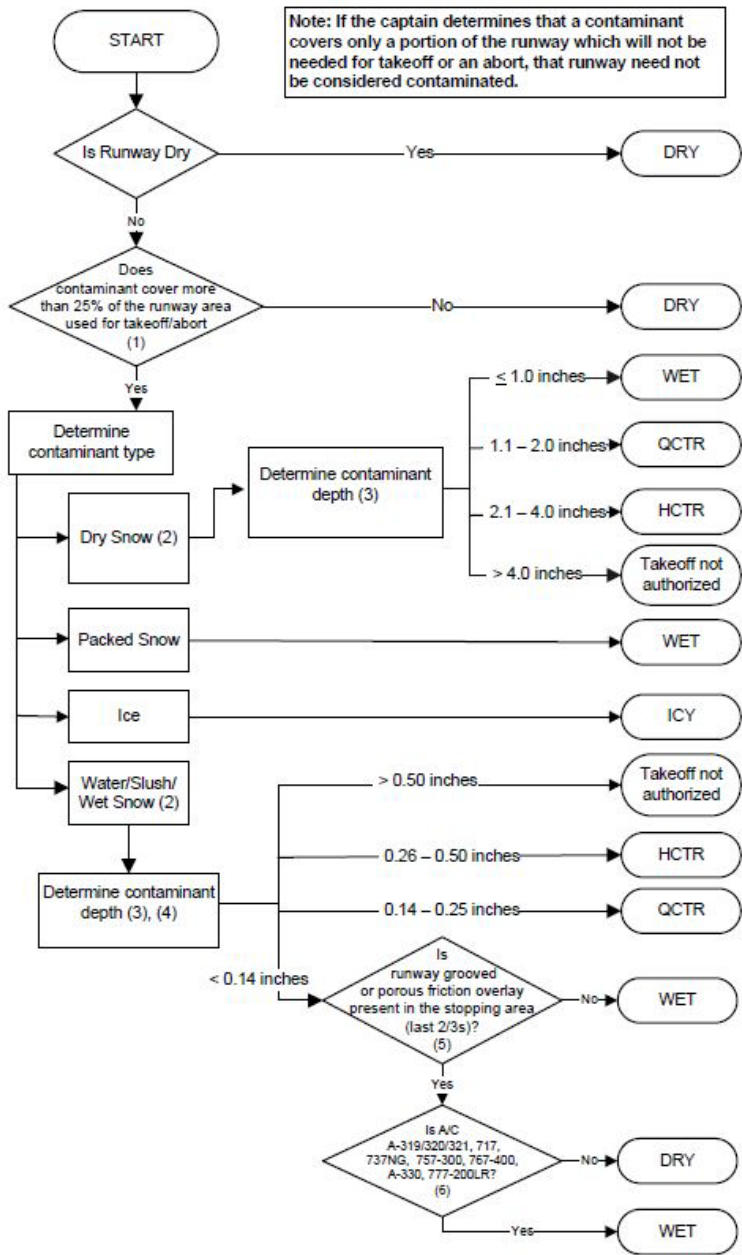
If the Captain determines that a contaminant covers only a portion of the runway which will not be needed for takeoff or an abort, that runway need not be considered contaminated. The Captain's determination affects his flight only and should be communicated to the dispatcher so AWABS can be updated 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.

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 engine(s) 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.

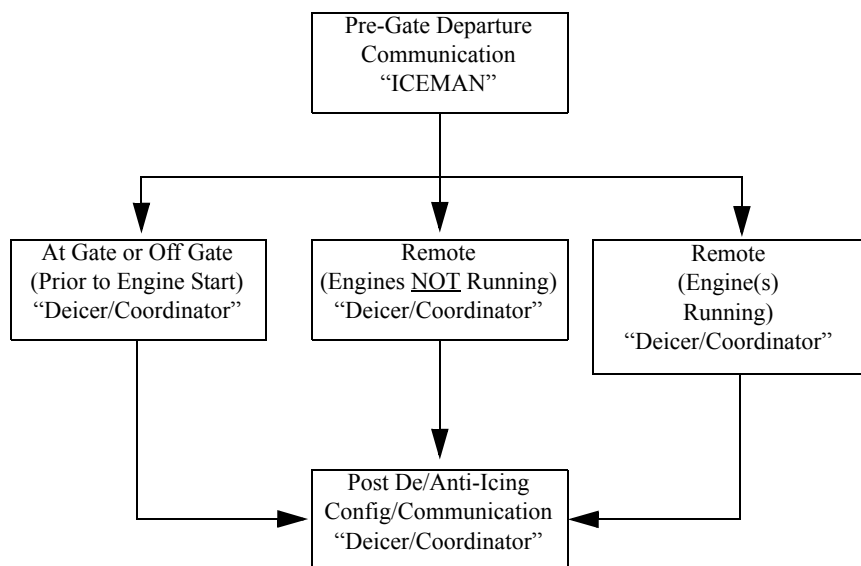
Aircraft Configuration and Communication

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 (Engine(s) 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.



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

Flaps Extend

Extend the flaps to the anticipated takeoff position.

Stabilizer trim Set

Set the stabilizer trim to the WDR takeoff setting (in the green band).

PACK 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.

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 ON

Engine bleeds OFF
Due to system design, the engines will start with the engine bleeds off.

Engine(s) Start

Accomplish the After Start procedure.

Engine BLEED air switches ON

PACK switches As required

Wing Anti-ice As required

- If Type I fluid was applied and icing conditions do not exist, taxi operations may proceed on single engine and wing anti-ice should remain OFF.
- If Type I fluid was applied and icing conditions exist or are anticipated, start both engines and select wing anti-ice ON.
- If Type II or Type IV fluid was applied, taxi operations may proceed on single engine and wing anti-ice should remain OFF.

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 switches OFF

Engine BLEED air switches OFF

APU bleed air switch OFF

Reduces the possibility of fumes entering the air conditioning system.

Engines Shut down

Stabilizer trim Set

Set the stabilizer trim to the WDR takeoff setting (in the green band).

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 ON

Engine bleeds OFF

Due to system design, the engines will start with the engine bleeds off.

Engine(s) Start

Accomplish the After Start procedure.

Engine BLEED air switches As required

PACK switches As required

Wing Anti-ice As required

- If Type I fluid was applied and icing conditions do not exist, taxi operations may proceed on single engine and wing anti-ice should remain OFF.
- If Type I fluid was applied and icing conditions exist or are anticipated, start both engines and select wing anti-ice ON.
- If Type II or Type IV fluid was applied, taxi operations may proceed on single engine and wing anti-ice should remain OFF.

Accomplish the Taxi procedure.

Remote (Engine(s) Running)

Note: Deicing with the engines running is authorized only at stations identified in the Company 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

Stabilizer trim Set

Set the stabilizer trim to the WDR takeoff setting (in the green band).

APU OFF

PACK 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.

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

PACK switches As required

Wing Anti-ice As required

- If Type I fluid was applied and icing conditions do not exist, taxi operations may proceed on single engine and wing anti-ice should remain OFF.
- If Type I fluid was applied and icing conditions exist or are anticipated, start both engines and select wing anti-ice ON.
- If Type II or Type IV fluid was applied, taxi operations may proceed on single engine and wing anti-ice should remain OFF.

Accomplish the Taxi procedure.

Cold Soaked Fuel Frost (CSFF)

Cold Soaked Fuel Frost (CSFF) forms when supercooled fuel during flight comes into contact with the wing skin during high humidity conditions. Under wing CSFF is common and relief allows up to 1/8 inch depth to be present.

Upper wing CSFF occurs when the aircraft arrives with significant fuel in the wing tanks and the supercooled fuel contacts the top side of the wing. Until now, upper wing frost must be removed. However, the FAA now allows takeoff operations with CSFF on the upper wing surfaces. In preparation, black lines are being painted on the upper wing to delineate the CSFF permissible areas.

CAUTION: Do not confuse the thin walkway lines that span the length of the wing with the new thick CSFF lines.

Note: All pre-modification (i.e., non-painted) aircraft will have the following Flight Plan Remark: “COLD-SOAKED FUEL FROST (CSFF) AREAS ARE NOT DEFINED ON THIS AIRCRAFT. TAKEOFF WITH UPPER WING CSFF IS PROHIBITED.”

Exterior Inspection

Surfaces Check
Visually inspect the lower and upper wing surfaces.

Note: Aircraft limitations involving fuel frost on the bottom of the wing have not changed. Takeoff with light coatings of frost, up to 1/8 inch (3 mm) in thickness on the lower wing surfaces due to cold fuel (i.e., CSFF) is allowed.

CAUTION: If frost or ice appears on the lower wing surface, crews are required to inspect the upper wing surface.

Aircraft With Defined Cold-Soaked Fuel Frost Areas

Takeoff with CSFF on the upper wing surfaces is allowed, provided the following conditions are met:

- The upper wing surfaces have a painted CSFF permissible area.
- The frost is contained within the CSFF defining area.
- No frost is present on the leading edges, control surfaces, or blended winglets/split scimitar winglets (if installed).
- The fuel tank temp is above -16°C.
- The ambient temp is above 4°C.
- No precipitation or visible moisture with less than 1 mile visibility.

When the above conditions are assured, advise ACS that deicing is not required.

Note: Do not make a general PA concerning CSFF. Instead, advise the FAs so they can reassure passengers as required.

Aircraft Without CSFF Painted Area (Pre-mod)

Takeoff with CSFF on upper wing surfaces is not allowed. Any upper wing frost must be removed using appropriate deicing procedures.

Note: Advise ACS/Station Operations deicing/anti-icing is required.

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.
- While the airplane is electrically powered, packs should be run or cooling air supplied to the airplane when the OAT exceeds 40°C (103°F) to protect the reliability of electrical and electronic equipment in the airplane.
- 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.
- 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.

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If these actions do not reduce cabin temperature sufficiently:

PASSENGER CABIN temperature selector AUTO COOL

PACK switches HIGH

If the cabin temperature remains high:

PASSENGER CABIN temperature selector MAN COOL

Brake temperature levels may be reached which can cause the wheel fuse plugs to melt and deflate the tires. Consider the following actions:

- Be aware of brake temperature buildup when operating a series of short flight segments. The energy absorbed by the brakes from each landing is cumulative.
- Extending the landing gear early during the approach provides additional cooling for tires and brakes.

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 (No Engine Bleed Takeoff, Improved Climb Performance, 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.

If moderate to heavy rain, hail or sleet is encountered:

ENGINE START switches CONT

Autothrottle Disconnect

Thrust Levers Adjust slowly

If thrust changes are necessary, move the thrust levers slowly.

Avoid changing thrust lever direction until engines have stabilized at a selected setting. Maintain an increased minimum thrust setting.

IAS/MACH Use a slower speed

Using a slower speed improves engine tolerance to heavy precipitation intake.

Consider starting the APU (if available).

Operation in a Sandy or Dusty Environment

The main hazards of a sandy or dusty environment are erosion (especially of engine fan blades), accumulation of sand or dust on critical surfaces and blockage. The effects of sand ingestion occur predominantly during takeoff, landing and taxi operations. The adverse effects, however, can occur if the airplane's flight path was through a cloud of visible sand or dust or the airplane was parked during a sand or dust storm. Premature engine deterioration can result from sand or dust ingestion, causing increased fuel burn and reduced EGT margins.

CAUTION: After a sandstorm, if all taxiways and runways are not carefully inspected and swept for debris before flight ops are conducted, the risk of engine damage and wear is increased.

Exterior Inspection

Although removal of sand and dust contaminants is primarily a maintenance function, during the exterior inspection the captain or first officer should carefully inspect areas where accumulation of sand or dust could change or affect normal system operations.

Do the normal Exterior Inspection with the following additional steps:

Windshield Check

Verify that the windshield has been cleaned.

Note: Do not use windshield wipers for sand or dust removal.

Wash deposits off with water and wipe residue off with a soft cloth.

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.

Probes, sensors, ports, ram turbine doors,
vents, and drains (as applicable) Check

Verify that the left and right ram air inlets are free of sand and dust.

Verify that the cabin pressure outflow valve and both positive pressure relief valves are free of sand and dust.

Leading edge flaps	Check
Verify that all leading edges are undamaged.	
Engine inlets	Check
Verify that the inlet cowling is free of sand and dust.	
Verify that the fan is free to rotate and fan blades are undamaged.	
Fuel tank vents	Check
Verify that all vents are free of sand and dust.	
Landing gear	Check
Verify that gear struts and doors are free of sand and dust build-up.	
Vertical and horizontal stabilizers	Check
Verify that all leading edges are undamaged.	
APU air inlets	Check
Ensure that the APU inlet door and cooling air inlet are free of sand and dust before APU start.	

Preflight Procedure - 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 air switch OFF

If APU bleed air will be used and the APU is not operating:

APU START

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

Engine BLEED air switches OFF

APU BLEED air switch ON

Engine Start Procedure

Do the normal Engine Start Procedure with the following modifications:

Note: Use a filtered ground cart for pneumatic air for engine start, if available.

ENGINE START switch GRD

Verify that the N2 RPM increases.

Motor the engine for 2 minutes to help remove contaminants.

Engine start lever IDLE

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

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

Engine BLEED air switches OFF

APU BLEED air switch ON

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 engine vortices during ground operations.
- Maintain a greater than normal separation from other aircraft while taxiing and avoid the ingestion of another engine's wake.
- Avoid engine overhang of unprepared surfaces.
- Minimize thrust on the outboard engine 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.

Takeoff

Do the following to minimize sand and dust ingestion by the engines during takeoff:

- Use the maximum fixed derate and/or assumed temperature thrust reduction that meets performance requirements.
- Make an No Engine Bleed Takeoff if operations permit. If cabin and flight deck temperatures can be maintained at a tolerable temperature, consider an Unpressurized Takeoff.
- 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.
- When visible sand and dust exist, consider delaying flap retraction until above the dust cloud, if operations permit.

Approach

Do the following, conditions permitting, to minimize sand and dust ingestion:

- Make an No Engine Bleed Landing if operations permit. If cabin and flight deck temperatures can be maintained at a tolerable temperature, consider an Unpressurized Landing.

Landing

Do the following to minimize sand and dust ingestion by the engines during landing:

- Use autobrakes on landing to help minimize the need for reverse thrust.
- Performance permitting, minimize the use of reverse thrust to prevent ingestion of dust and sand and to prevent reduction of visibility. Reverse thrust is most effective at high speed.

After Landing Procedure

Do the normal After Landing Procedure with the following modifications:

If bleed air is needed to maintain tolerable flight deck and cabin temperatures, use APU bleed air rather than engine bleed air during the taxi in. Limit APU bleed air use as much as possible to reduce sand and dust ingestion.

If APU bleed air will be used and the APU is not operating:

APU START

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

Engine BLEED air switches OFF

APU BLEED air switch ON

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 thrust on the outboard engine 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:

CAUTION: Do not leave the interior unattended with a pack operating and all doors closed. With the main outflow valve closed, an unscheduled pressurization of the airplane may occur.

PACK switches Verify OFF

Pressurization mode selector MAN

Outflow VALVE switch CLOSE

Position the outflow valve fully closed to inhibit the intake of sand or dust.

Additional procedures for securing the airplane during sandy or dusty conditions may be needed. These procedures are normally done by maintenance personnel, and include, but are not limited to:

- 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.

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. Increased thrust lever activity can be expected when encountering wind, temperature changes and large pressure changes. Short-time airspeed excursions of 10 to 15 knots can be expected.

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

Yaw Damper switch ON
 Autothrottle Disconnect
 AUTOPILOT CWS
 A/P status annunciators display CWS for pitch and roll.
Note: If sustained trimming occurs, disengage the autopilot.
 ENGINE START switches FLT
 Thrust Set
 Set thrust as needed for the phase of flight. Change thrust setting only if needed to modify an unacceptable speed trend.

PHASE OF FLIGHT	AIRSPEED
CLIMB	280 knots or .76 Mach
CRUISE	Use FMC recommended thrust settings. If the FMC is inoperative, refer to the ODM for N1 settings that maintain near optimum penetration airspeed.
DESCENT	.76 Mach/280/250 knots. If severe turbulence is encountered at altitudes below 15,000 feet and the airplane gross weight is less than the maximum landing weight, the airplane may be slowed to 250 knots in the clean configuration.

Note: If an approach must be made into an area of severe turbulence, delay flap extension as long as possible. The airplane can withstand higher gust loads in the clean configuration. 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 QRH, section 0, Volcanic Ash.

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Differences

Chapter DF

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Differences

737 Differences

Chapter DF

Section 10

Aircraft General, Emergency Equipment, Doors, Windows

Item	3601-3610	3701-3771	3772-3773	3801-3900
Weight Limits				
MTW	155,000	174,900		188,200
MTOW	154,500	174,200		187,700
MLW	129,200	146,300		
MZFW	121,700	138,300		149,300
Maximum Takeoff and Landing Altitude	10,000 feet	8,400 feet		8,400 feet
Maximum Autoland Altitude	8,400 feet			
Approach Category	C	D		
Aircraft Length	110 feet 4 inches	129 feet 6 inches		138 feet 2 inches
Minimum Pavement Width for 180° Turn	66 feet	79 feet		86 feet
Windshield Vortex Generators	Installed.	Not Installed.	Installed.	Installed.
Emergency Equipment	Refer to Volume 2, chapter 1 for locations.			
ELT (Flight Deck)	One fixed with control panel.	One portable.	One fixed with control panel.	One fixed with control panel.



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Item	3601-3610	3701-3771	3772-3773	3801-3900
LED Lights System (LTRL)	Not installed.			3801-3845 Not installed. 3846-3900 Installed.
Logo Lights	Installed.	Not installed.	Installed.	
Potable Water Quantity Indicator	Located on service panel (40 gallon capacity).	Located on aft flight attendant panel (60 gallon capacity).		Accessed via attendant control panel (door 2L) (60 gallon capacity).
Waste Indicator	Located on service panel (door 2R).			Accessed via attendant control panel (door 2L).
Lav Facilities	3	3	3	4
Overwing Exit Doors	2 doors	4 doors		4 doors
Passenger Seats	124	160		180
Marketing Identification	73W	738 - overhead IFE (3701-3743) 73H - in-seat IFE (3744-3773)		739
First Class Coat Closet	By door 1L.	By door 1L.		Behind first class (on right side of cabin).
Luggage Bins	Standard.	Standard.		3801-3852 New Pivot Bins. 3853-3900 Space Bins.

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Air Systems

Item	3601-3610	3701-3771	3772-3773	3801-3900
Recirculation Fan	One	Two (Left and Right)		
Air Temperature Selectors	AUTO and MANUAL	AUTO and OFF		
Temperature Selectors	CONT CABIN (flight deck) and PASS CAB.	CONT CAB (flight deck), FWD CAB, and AFT CAB.		
Pack Trip Off	Labeled PACK TRIP OFF.	Labeled PACK.		
Trim Air System	Not installed.	Installed.		
High Altitude Landing Switch	Installed.	Not installed.		
TRIP RESET Switch	Resets BLEED TRIP OFF, PACK TRIP OFF, and DUCT OVERHEAT lights.	Resets BLEED TRIP OFF, PACK, and ZONE TEMP lights.		
Digital Flight and Landing Indicator	Not installed.			Installed.

Automatic Flight

Item	3601-3610	3701-3771	3772-3773	3801-3900
Mode Control Panel (MCP)	Collins - Green switchlights. Labelling located inside switchlight.	Honeywell - Switchlight labelling located on panel.	Collins - Green switchlights. Labelling located inside switchlight	

Communications

Item	3601-3610	3701-3771	3772-3773	3801-3900
HF	One	Two		One
SATCOM	3601-3603 only.	Not installed.		
Cabin Medical Communications System	Installed (3 locations).	Not installed.	Installed (3 locations).	Installed (4 locations).
Glareshield Microphone Switch	Installed.	Not installed.	Installed.	
PTT Switches Labels	R/T	R/T	R/T	RADIO
Ground Crew Call Light	Functional	Inop	Functional	Inop
Cockpit Voice Recorder Backup Power	N/A	N/A	10 minutes	10 minutes

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Electrical

Item	3601-3610	3701-3771	3772-3773	3801-3900
Battery Installation	One (1) 48-Amp Hour	Two (2) 48-Amp Hour	One (1) 48-Amp Hour	

Engines, APU

Item	3601-3610	3701-3771	3772-3773	3801-3900
Engines	Tech Insertion Engines (CFM56-7B)	Standard Engines (CFM56-7B)	Tech Insertion Engines (CFM56-7B)	Tech Insertion Engines (CFM56-7B27-B1/F)
Available Thrust				
TO	26K			27BI
TO1	24K			26K
TO2	22K			24K

Fire Protection

Item	3601-3610	3701-3771	3772-3773	3801-3900
Cargo Fire Bottle(s)	1	1	1	3801-3852 1 3853-3900 2 (ETOPS)

Flight Controls

Item	3601-3610	3701-3771	3772-3773	3801-3900
Speedbrake Load Alleviation System	Installed.	3701-3743 only.	Not installed.	Installed.
Flap Load Relief	Flaps 30 & 40			Flaps 10 - 40
Autoslats	Flaps 1, 2, 5			Flaps 1, 2, 5, 10, 15, 25

3601-3610, 3701-3773

Flap Sequencing	
Up to 1, 2, or 5	TE flaps move to commanded position LE flaps move to full extended position Slats move to extend position
Flaps >5	TE flaps move to commanded position LE flaps remain at full extended position Slats move to full extended position

3801-3900

Flap Sequencing	
Up to 1, 2, 5, 10, 15, or 25	TE flaps move to commanded position LE flaps move to full extended position Slats move to extend position
Flaps >25	TE flaps move to commanded position LE flaps remain at full extended position Slats move to full extended position

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Flight Instruments, Displays

Item	3601-3610	3701-3771	3772-3773	3801-3900
Standby Altimeter/ Airspeed Indicator	Not installed.	Installed.	Not installed.	
Standby Attitude Indicator	Not installed.	Installed.	Not installed.	
Integrated Standby Flight Display (ISFD)	Installed.	Not installed.	Installed.	

Flight Management, Navigation

Item	3601-3610	3701-3771	3772-3773	3801-3900
GLS Light on IRS Panel	Installed.	Not installed.	Installed.	
ILS Light on IRS Panel	Installed. Indicates failure of both ILS sensor units.	Not installed.	Installed. Indicates failure of both ILS sensor units.	Installed.
Multi-Mode NAV Frequency Panel	Installed.	Not installed.	Installed.	
VHF NAV Frequency Panel	Not installed.	Installed.	Not installed.	
MultiScan Radar	Installed. WXR-2100 V1	Not installed. XRT-701	Installed. WXR-2100 V1	As installed. WXR-2100 V1
MultiScan Threat Track Radar	Not installed.			3801-3827 WXR-2100 V1 3828-3900 WXR-2100 V2 Threat Track
FMC Comm CDU Key	Not installed.			Installed.
ATC Key	Not installed.			Installed.
CDU brightness control	Knob	Knob	Knob	Rocker type control switch

737 Operations Manual
Fuel

Item	3601-3610	3701-3771	3772-3773	3801-3900
Nitrogen Generation System	Installed.	As installed.	Installed.	
Fuel Pump AMOC for FAA AD 2002-24-51	Boeing AMOC System Installed.	TDG Aerospace System Installed.	Boeing AMOC System Installed.	

	Fuel Configuration Alert
3601-3610, 3772-3773, 3801-3900	CONFIG annunciates when: • either engine is running, and • center tank quantity greater than 1600 lbs., and • both center tank pump switches are OFF. Master Caution FUEL light illuminates when: • both center tank pump switches are ON, and • one low pressure light is illuminated continuously for 10 seconds.
3701-3771	CONFIG annunciates when: • either engine is running, and • center tank quantity greater than 1600 lbs., and • both center tank pumps producing low or no pressure. Master Caution FUEL light illuminates when: • both center tank pump switches are ON, and • both low pressure lights are illuminated. On RECALL, Master Caution FUEL light illuminates if: • one low pressure light illuminated while both center tank pump switches were ON.

Landing Gear

Item	3601-3610	3701-3771	3772-3773	3801-3900
Brakes	Carbon.	Steel.		Carbon.
Tail skid	Not installed.	Single position tail skid installed.		Two position tail skid installed.

Warning Systems

Item	3601-3610	3701-3771	3772-3773	3801-3900
Airspeed Low Aural Warning	As installed.			
TCAS 7.1	Not installed.			Installed.

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