



MD-88/90

Quick Reference Handbook

QRH

Delta Air Lines, Inc.

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Preface

Chapter PQ

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Section 1

General

The airplanes 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 airplanes. Where data applies to all airplanes listed, no reference is made to individual airplanes.

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

Airplane Number	Registry Number	Serial Number	Model Miscellaneous Data
0901	N901DL	49532	MD-88
0902	N902DL	49533	MD-88
0903	N903DL	49534	MD-88
0904	N904DL	49535	MD-88
0905	N905DL	49536	MD-88
0906	N906DL	49537	MD-88
0907	N907DL	49538	MD-88
0908	N908DL	49539	MD-88
0909	N909DL	49540	MD-88
0910	N910DL	49541	MD-88
0911	N911DL	49542	MD-88
0912	N912DL	49543	MD-88
0913	N913DL	49544	MD-88
0914	N914DL	49545	MD-88
0915	N915DL	49546	MD-88
0916	N916DL	49591	MD-88
0917	N917DL	49573	MD-88
0918	N918DL	49583	MD-88
0919	N919DL	49584	MD-88
0920	N920DL	49644	MD-88

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Airplane Number	Registry Number	Serial Number	Model Miscellaneous Data
0921	N921DL	49645	MD-88
0922	N922DL	49646	MD-88
0923	N923DL	49705	MD-88
0924	N924DL	49711	MD-88
0925	N925DL	49712	MD-88
0926	N926DL	49713	MD-88
0927	N927DL	49714	MD-88
0928	N928DL	49715	MD-88
0929	N929DL	49716	MD-88
0930	N930DL	49717	MD-88
0931	N931DL	49718	MD-88
0932	N932DL	49719	MD-88
0933	N933DL	49720	MD-88
0934	N934DL	49721	MD-88
0935	N935DL	49722	MD-88
0936	N936DL	49723	MD-88
0937	N937DL	49810	MD-88
0938	N938DL	49811	MD-88
0939	N939DL	49812	MD-88
0940	N940DL	49813	MD-88
0941	N941DL	49814	MD-88
0942	N942DL	49815	MD-88
0943	N943DL	49816	MD-88
0944	N944DL	49817	MD-88
0945	N945DL	49818	MD-88
0946	N946DL	49819	MD-88
0947	N947DL	49878	MD-88
0948	N948DL	49879	MD-88

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Airplane Number	Registry Number	Serial Number	Model Miscellaneous Data
0949	N949DL	49880	MD-88
0950	N950DL	49881	MD-88
0951	N951DL	49882	MD-88
0952	N952DL	49883	MD-88
0953	N953DL	49884	MD-88
0954	N954DL	49885	MD-88
0955	N955DL	49886	MD-88
0956	N956DL	49887	MD-88
0957	N957DL	49976	MD-88
0958	N958DL	49977	MD-88
0959	N959DL	49978	MD-88
0960	N960DL	49979	MD-88
0961	N961DL	49980	MD-88
0962	N962DL	49981	MD-88
0963	N963DL	49982	MD-88
0964	N964DL	49983	MD-88
0965	N965DL	49984	MD-88
0966	N966DL	53115	MD-88
0967	N967DL	53116	MD-88
0968	N968DL	53161	MD-88
0969	N969DL	53172	MD-88
0970	N970DL	53173	MD-88
0971	N971DL	53214	MD-88
0972	N972DL	53215	MD-88
0973	N973DL	53241	MD-88
0974	N974DL	53242	MD-88
0975	N975DL	53243	MD-88
0976	N976DL	53257	MD-88

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Airplane Number	Registry Number	Serial Number	Model Miscellaneous Data
0977	N977DL	53258	MD-88
0978	N978DL	53259	MD-88
0979	N979DL	53266	MD-88
0980	N980DL	53267	MD-88
0981	N981DL	53268	MD-88
0982	N982DL	53273	MD-88
0983	N983DL	53274	MD-88
0984	N984DL	53311	MD-88
0985	N985DL	53312	MD-88
0986	N986DL	53313	MD-88
0987	N987DL	53338	MD-88
0988	N988DL	53339	MD-88
0989	N989DL	53341	MD-88
0990	N990DL	53342	MD-88
0991	N991DL	53343	MD-88
0992	N992DL	53344	MD-88
0993	N993DL	53345	MD-88
0994	N994DL	53346	MD-88
0995	N995DL	53362	MD-88
0996	N996DL	53363	MD-88
0997	N997DL	53364	MD-88
0998	N998DL	53370	MD-88
0999	N999DN	53371	MD-88
9000	N900DE	53372	MD-88
9001	N901DE	53378	MD-88
9002	N902DE	53379	MD-88
9003	N903DE	53380	MD-88
9004	N904DE	53409	MD-88

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Airplane Number	Registry Number	Serial Number	Model Miscellaneous Data
9005	N905DE	53410	MD-88
9006	N906DE	53415	MD-88
9007	N907DE	53416	MD-88
9008	N908DE	53417	MD-88
9009	N909DE	53418	MD-88
9010	N910DE	53419	MD-88
9011	N911DE	49967	MD-88
9012	N912DE	49997	MD-88
9013	N913DE	49956	MD-88
9014	N914DE	49957	MD-88
9015	N915DE	53420	MD-88
9016	N916DE	53421	MD-88
9017	N917DE	49958	MD-88
9018	N918DE	49959	MD-88
9019	N919DE	53422	MD-88
9020	N920DE	53423	MD-88
9201	N901DA	53381	MD-90-30
9202	N902DA	53382	MD-90-30
9203	N903DA	53383	MD-90-30
9204	N904DA	53384	MD-90-30
9205	N905DA	53385	MD-90-30
9206	N906DA	53386	MD-90-30
9207	N907DA	53387	MD-90-30
9208	N908DA	53388	MD-90-30
9209	N909DA	53389	MD-90-30
9210	N910DN	53390	MD-90-30
9211	N911DA	53391	MD-90-30
9212	N912DN	53392	MD-90-30

Airplane Number	Registry Number	Serial Number	Model Miscellaneous Data
9213	N913DN	53393	MD-90-30
9214	N914DN	53394	MD-90-30
9215	N915DN	53395	MD-90-30
9216	N916DN	53396	MD-90-30

Purpose

The Boeing Company developed normal and non-normal procedures for the MD-88/90 aircraft. Delta Air Lines has modified some of the procedures for simplification and standardization, when appropriate with other Delta aircraft. Finally, the FAA has approved the procedures presented in the Operations Manual, with the exception of flight crew bulletins.

These procedures are company policy for pilots to follow during ground operations and in flight. Deviations from these policies and procedures should be made only with good cause and based on the safest course of action. If an abnormality occurs that is not covered by these procedures, the Captain must use his best judgement.

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Corrections to the Manual

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, QRH, Flight Crew Training Manual), Normal Checklist, Airway Manual, Flight Operations Manual (FOM), OE/TOE Guide, Flight Crew Bulletin (FCB), or Flight Operations Bulletin (FOB):

Log on to the Delta Flight Operations Portal; <http://dalweb.delta.com/portal> and submit a Publications Change Request (PCR).

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, Technical Writer, and Specialist 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, a list of effective pages, and bulletins.
- Limitations and Normal Procedures chapters cover operational limitations and normal procedures. All operating procedures are based on a thorough analysis of crew activity required to operate the airplane, and reflect the latest knowledge and experience available.
- Supplementary Procedures chapter covers those procedures accomplished as required rather than routinely on each flight.
- Aircraft Differences chapter notes differences between aircraft types.

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

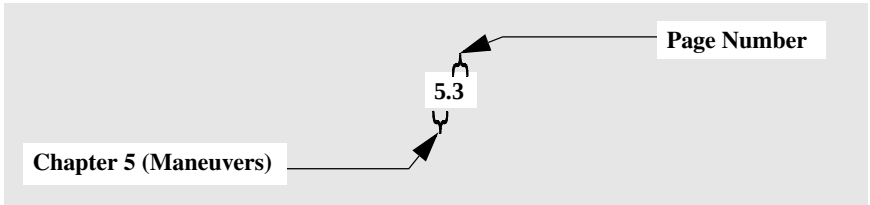
Quick Reference Handbook (QRH) - The QRH covers normal checklists, non-normal checklists, and non-normal maneuvers.

Flight Crew Training Manual (FCTM) - The Flight Crew Training Manual provides information and recommendations on maneuvers and techniques.

Page Numbering

The operations manual uses a decimal page numbering system. The page number is divided into two fields; chapter and page. An example of a page number for the Maneuvers chapter follows:

Example Page Number



Warnings, Cautions, and Notes

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

WARNING

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

CAUTION

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

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

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Preface

Abbreviations

Chapter PQ

Section 3

General

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

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

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

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AIMS	Airplane Information Management System
AMI	Airline Modifiable Information
ANP	Actual Navigational Performance
ANT	Antenna
ANU	Aircraft Nose Up
AOA	Angle of Attack
AOC	Airline Operational Communication Data Link
A/P	Autopilot
APL	Airplane
APP	Approach
APU	Auxiliary Power Unit
ARINC	Aeronautical Radio, Incorporated
ARM	Aircraft Restrictions Manual
ARPT	Airport
ARR	Arrival
ART	Automatic Reserve Thrust
ASA	Autoland Status Annunciator
ASI	Airspeed Indicator
ASR	Airport Surveillance Radar
ASYM	Asymmetry
A/T	Autothrottle
ATA	Actual Time of Arrival
ATC	Air Traffic Control

ATIS	Automated Terminal Information Service
ATM	Assumed Temperature Method
ATT	Attitude
AUTO	Automatic
AUTO–THROT	Autothrottle
AUX	Auxiliary
AVAIL	Available
AWABS	Automated Weight and Balance System
B	
BARO	Barometric
BAT	Battery
B/C or B/CRS or BAC or BCS	Back Course
BFO	Beat Frequency Oscillator
BITE	Built-In Test Equipment
BKR	Breaker
BLD	Bleed
BLW	Below
BRG	Bearing
BRT	Bright
BTL	Bottle
BTL DISCH	Bottle Discharge (fire extinguisher)
C	

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

COMM	Communication
COMP	Comparator
COMPT	Compartment
CON	Continuous
CONFIG	Configuration
CONT	Control
COOL	Cooling
CRS	Course
CRT	Cathode Ray Tube
CRZ	Cruise
CTL	Control
CTR	Center
CWS	Control Wheel Steering
D	
DA	Decision Altitude
DA(H)	Decision Altitude (Height)
DC	Direct Current
DCU	Display Concentrator Unit
D/D	Direct Descent
DDA	Derived Decision Altitude (MDA +50 feet)
DDG	Dispatch Deviations Guide
DEL	Delete
DEP	Departure
DEP ARR	Departure Arrival
DEPR	Depressurize
DES	Descent
DEU	Display Electronic Unit

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DFCS	Digital Flight Control System
DFGC	Digital Flight Guidance Computer
DFGS	Digital Flight Guidance System
DH	Decision Height
DIFF	Differential
DIR	Direct
DISC	Disconnect
DISCH	Discharge
DK	Deck
DME	Distance Measuring Equipment
DN	Down
DSP	Display Select Panel
DSPL	Display
DTG	Distance to Go
DTW	Distance to Waypoint
E	
EADI	Electronic Attitude Director Indicator
ECON	Economy
E/D	End of Descent
E/E	Electrical/Electronic
EEC	Electronic Engine Control
EFI	Electronic Flight Instruments
EFIS	Electronic Flight Instrument System
EGPWS	Enhanced Ground Proximity Warning System

EGT	Exhaust Gas Temperature
EHSI	Electronic Horizontal Situation Indicator
EICAS	Engine Indication and Crew Alerting System
EIS	Electronic Instrument System
ELEC	Electrical
ELEV	Elevator
EMER	Emergency
ENG	Engine
ENG OUT	Engine Out
ENT	Entry
EO or E/O	Engine Out
EOAP	Electronic Overhead Annunciation Panel
EPR	Engine Pressure Ratio
EQPT or EQUIP	Equipment
ETOPS	Extended Range Operation with Twin Engine Airplanes
EVAC	Evacuation
EXEC	Execute
EXT	Extend or External
F	
F	Fahrenheit
FAC	Final Approach Course
FAA	Federal Aviation Administration
FADEC	Full Authority Digital Engine Control
FAF	Final Approach Fix

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FAR	Federal Aviation Regulation
FCB	Flight Crew Bulletin
FCC	Flight Control Computer
FCTL	Flight Control
FCTM	Flight Crew Training Manual
FD, F/D or FLT DIR	Flight Director
FF	Fuel Flow
FFM	Force Fight Monitor
FGCP	Flight Guidance Control Panel
FGS	Flight Guidance System
FILT	Filter
FL CH or FLCH	Flight Level Change
FLT	Flight
FLPRN	Flaperon
FMA	Flight Mode Annunciator
FMC	Flight Management Computer
FMS	Flight Management System
F/O or F O	First Officer
FOM	Flight Operations Manual
FPA	Flight Path Angle
FPM	Feet Per Minute
FPV	Flight Path Vector
FREQ	Frequency
F/S	Fast/Slow
FT	Feet
FWD	Forward

FWSOV	Fire Wall Shut Off Valve
FX	Fix
G	
GA	Go-Around
GEN	Generator
GLS	GPS Landing System
GMT	Greenwich Mean Time
GND	Ground
GP or G/P	Glide Path
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
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
HGS	Head-Up Guidance System (HGS® is a registered trademark of Flight Dynamics)
HI	High
HLD	Hold

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HPA	Hectopascals
HPSOV	High Pressure Shut Off Valve
HSI	Horizontal Situation Indicator
HUD	Head-Up Display
HYD	Hydraulic
I	
IAF	Initial Approach Fix
IAN	Instrument Approach Navigation
IAS	Indicated Airspeed
IDENT	Identification
IFE	In-Flight Entertainment System
IFR	Instrument Flight Rules
IGN	Ignition
IGS	Instrument Guidance System
ILS	Instrument Landing System
IM	Inner Marker
IMC	Instrument Meteorological Conditions
IN	Inches
INBD	Inboard
IND	Indicator
IND LTS	Indicator Lights
INOP	Inoperative
INIT	Initialization
INSTR	Instrument

INT or INTPH	Interphone
INTC	Intercept
INTC CRS	Intercept Course
IP	Instructor Pilot
IRS	Inertial Reference System
IRU	Inertial Reference Unit
ISA	International Standard Atmosphere
ISDU	Inertial System Display Unit
ISFD	Integrated Standby Flight Display
ISLN	Isolation
J	
JAA	Joint Aviation Authority
K	
K or KTS	Knots
KCAS	Knots Calibrated Airspeed
KGS	Kilograms
KIAS	Knots Indicated Airspeed
L	
L	Left
LAT	Latitude
LBS	Pounds
LD	Load
LDA	Localizer-type Directional Aid
LDG	Landing
LDG ALT	Landing Altitude
LE	Leading Edge

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LIM	Limit
LIM SPD	Limit Speed
LKD	Locked
L NAV or LNAV	Lateral Navigation
LOC	Localizer
LOC-BC	Localizer Back Course
LOM	Locator Outer Marker
LON	Longitude
LRC	Long Range Cruise
LRU	Line Replaceable Unit
LSK	Line Select Key
LT	Light
LWR CTR	Lower Center
LWR DSPLY or LWR DSPL	Lower Display
M	
M	Mach
MAG	Magnetic
MAN	Manual
MAP	Missed Approach Point
MASI	Mach/Airspeed Indicator
MAX	Maximum
MCDU	Multi-purpose Control and Display Unit
MCO	Maintenance Carry Over
MCP	Mode Control Panel
MCT	Maximum Continuous Thrust
MDA	Minimum Descent Altitude

MDA(H)	Minimum Descent Altitude (Height)
MDM	Mechanical Dispatch Manual
MEA	Minimum Enroute Altitude
MEL	Minimum Equipment List
MFD	Multifunction Display
MHZ	Megahertz
MIC	Microphone
MIN	Minimum
MKR	Marker
MLS	Microwave Landing System
MM	Middle Marker
MMO	Maximum Mach Operating Speed
MNPS	Minimum Navigation Performance Specification
MOCA	Minimum Obstruction Clearance Altitude
MOD	Modify
MORA	Minimum Off Route Altitude
MSG	Message
MSL	Mean Sea Level
MTRS	Meters
MUH	Minimum Use Height
N	
N	Normal
NAR	North American Route
NAV	Navigation

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NAV RAD	Navigation Radio
ND	Navigation Display
NLT	No Later Than
NM	Nautical Mile(s)
NNC	Non-Normal Checklists
NNM	Non-Normal Maneuvers
NPS	Navigation Performance Scales
NORM	Normal
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
OBL	On-Board Leader
ODM	Operational Data Manual
OFST	Offset
OHU	Overhead Unit
OM	Outer Marker
OP	Open
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
PBE	Protective Breathing Equipment
PCP	Pilot Call Panel
PDC	Pitch Data Computer or Performance Data Computer or Pre-Departure Clearance
PERF	Performance
PERF INIT	Performance Initialization
PES	Pitch Enhancement System
PF	Pilot Flying
PFC	Primary Flight Computer
PFD	Primary Flight Display
PI	Performance Inflight
PIP	Product Improvement Package
PM	Pilot Monitoring
PMC	Power Management Control

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PNL	Panel
POS	Position
POS INIT	Position Initialization
POS REF	Position Reference
PPI	Planned Position Indicator
PPOS	Present Position
PRES or PRESS	Pressure
PREV	Previous
PRI	Primary
PROG	Progress
PROX	Proximity
P/RST	Push To Reset
PRV	Pressure Regulating Valve
PSI	Pounds Per Square Inch
PTH	Path
PTT	Push To Talk
PTU	Power Transfer Unit
PWR	Power
PWS	Predictive Windshear System
Q	
Q	Quantity
QFE	Local Station Pressure
QNH	Altimeter Setting
QRH	Quick Reference Handbook
QTY	Quantity
R	
R	Right

RA	Radio Altitude or Resolution Advisory
RAD	Radio
RAT	Ram Air Temperature or Ram Air Turbine
RCL	Request for Clearance
RDMI	Radio Distance Magnetic Indicator
REC	Recorder
RECIR or RECIRC	Recirculation
REF	Reference
RET	Retract
REV	Reverse
RF	Refill
RMI	Radio Magnetic Indicator
RNAV or RNV	Area Navigation
RNP	Required Navigational Performance
RPL	Rudder Pressure Limiter
RPM	Revolutions Per Minute
RPR	Rudder Pressure Reducer
RSEP	Rudder System Enhancement Program
RST	Reset
RSVR	Reservoir
R/T	Radio Transmit
RTE	Route
RTO	Rejected Takeoff
RTP	Radio Tuning Panel
RUD	Rudder

RVR	Runway Visual Range
RVSM	Reduced Vertical Separation Minimum
S	
SAARU	Secondary Attitude Air Data Reference Unit
SAT	Static Air Temperature or Satellite
SB	Service Bulletin
S/B	Speedbrake
S/C	Step Climb
SDF	Simplified Directional Facility
SEI	Standby Engine Indicator
SEL	Select
SELCAL	Selective Calling
SENS	Sensitivity
SERV	Service
SG	Symbol Generator
SPD	Speed
SPDBRK	Speedbrake
STA	Station
STAB	Stabilizer
STAT	Status
STBY	Standby
STD	Standard
SYS	System
T	
T or TRU	True
T or TK or TRK	Track (to a Navaid)

TA	Traffic Advisory
TACAN	Tactical Air Navigation
TAC	Thrust Asymmetry Compensation
TAI	Thermal Anti-Ice
TAS	True Airspeed
TAT	Total Air Temperature
T/C	Top of Climb
TCA	Terminal Control Area
TCAS	Traffic Alert and Collision Avoidance System
T/D	Top of Descent
TDZ	Touch Down Zone
TDZE	Touch Down Zone Elevation
TE	Trailing Edge
TEMP	Temperature
TERR	Terrain
TFC	Traffic
TFR	Transfer
THR	Throttle or Thrust
THR HOLD	Throttle Hold
TMC	Technical Management Center or Thrust Management Computer
TMI	Track Message Identifier
TMSP	Thrust Mode Select Panel
TO or T/O	Takeoff
TOC	Top of Climb



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TOD	Top of Descent
TO/GA	Takeoff/Go-Around
TR	Traffic Resolution
TRP	Thrust Rating Panel
TRU	Transformer Rectifier Unit
TURB	Turbine or Turbulence
U	
UNLKD	Unlocked
UNSCHD or UNSCHED	Unscheduled
UPR DSPL	Upper Display
U.S.	United States
USB	Upper Side Band
UTC	Universal Time Coordinated
UTIL	Utility
V	
VA	Design maneuvering speed
VAL	Valve
VANP	Vertical Actual Navigational Performance
VASI	Visual Approach Slope Indicator
VDP	Visual Descent Point
VEF	Speed at Engine Failure
VERT	Vertical
VFR	Visual Flight Rules
VG	Vertical Gyro

VHF	Very High Frequency
VIB	Vibration
VLV	Valve
VMC	Visual Meteorological Conditions
VMCA	Minimum Control Speed Air or Single Engine Minimum Control Airspeed
VMCG	Minimum Control Speed Ground
VMO	Maximum Operating Speed
V NAV or VNAV	Vertical Navigation
VOR	VHF Omnidirectional Range
VR	Rotation Speed
VREF	Reference Speed
VRNP	Vertical Required Navigation Performance
V/S	Vertical Speed
VSCF	Variable Speed Constant Frequency
VSD	Vertical Situation Display
VSI	Vertical Speed Indicator
VTK	Vertical Track
V1	Takeoff Decision Speed
V1 (MCG)	Minimum V1 for Control on the Ground
V2	Scheduled Takeoff Target Speed
W	
W	Warm

WATRS	Western Atlantic Route System
WDR	Weight Data Record
WGS-84	World Geodetic System of 1984
WHL	Wheel
WPT	Waypoint
WT	Weight
WXR	Weather Radar
X	
X-FEED	Crossfeed
XPDR or XPNDR	Transponder
XTK	Cross Track

Revision Transmittal Letter

To: All holders of Delta Air Lines, Inc. MD-88/90 Operations Manual, Quick Reference Handbook.

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	April 01, 2004	
2	June 14, 2004	
4	April 11, 2005	
6	December 25, 2006	
8	March 10, 2008	

No.	Revision Date	Date Filed
1	May 17, 2004	
3	January 24, 2005	
5	June 5, 2006	
7	May 7, 2007	

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 operations manual bulletins.

The revision date is the approximate date the revision material is distributed and considered current. The revision should be incorporated as soon as it is received, 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 (PQ.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 (PQ.4) replaces the existing section PQ.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.

Chapter PQ - Preface

Section 4 - Revision Record

Revision Highlights

PQ.4.1-4 - Explanations for each item identified by a change bar in the latest revision.

Section 5 - List of Effective Pages

List of Effective Pages

PQ.5.1-4 - Reflects current pages for latest revision.

Chapter CI - Ckecklists Introduction

Section 2- Non-Normal Checklist

CHECKLIST COMPLETION

CI.2.9 - Changed “pilot not flying” to “pilot monitoring.”

DITCHING & EVACUATION

CI.2.10 - Added “Coast Guard Ditching Recommendations” for cross-fleet standardization.

CI.2.10 - Changed “cockpit” to “flight deck.”

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Preface

Chapter PQ

List of Effective Pages - FAA Approved

Section 5

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* Title Page	March 10, 2008	NNC.0.3-10	April 01, 2004
Preface (tab)		NNC.0.11	May 7, 2007
PQ.TOC.0.1-2	April 01, 2004	NNC.0.12-13	April 01, 2004
PQ.1.1-4	April 01, 2004	NNC.0.14	May 17, 2004
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PQ.2.4	April 01, 2004	NNC.0.24	April 01, 2004
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* PQ.4.1-4	March 10, 2008	NNC.0.27-28	April 01, 2004
* PQ.4.5-6	Deleted	NNC.0.29	April 11, 2005
* PQ.5.1-4	March 10, 2008	NNC.0.30	June 14, 2004
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Checklist Introduction

Chapter CI

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Checklist Introduction

Normal Checklist

Chapter CI

Section 1

Introduction

Normal Checklists contain, in abbreviated form, information required by the trained flight crew to operate the airplane in normal situations.

This introduction gives guidelines for use of the Normal Checklist (NC.)

The NC is organized by phase of flight.

The NC is used to verify that critical items have been done.

Normal Checklist Operation

General

Normal checklists are used by the flight crew after accomplishing all applicable procedural items found in the Amplified Procedures section of Volume 1.

Note: Normal checklists will be used as verification lists, not as do lists.

Reading the Checklists

On the ground, the Captain calls for the checklists and the First Officer reads the checklists after the procedures are accomplished. The Captain may elect to read the Before Start checklist, in which case, the First Officer will respond.

In flight, the Pilot Flying (PF) calls for the checklists and the Pilot Monitoring (PM) reads the checklists after the procedures are accomplished.

If the airplane configuration does not agree with the needed configuration:

- stop the checklist
- complete the respective procedure steps
- continue the checklist

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

- stop the checklist
- complete the entire procedure
- accomplish the checklist from the start

Try to accomplish checklists before or after high work load times. The crew may need to stop a checklist for a short time to do other tasks. If the interruption is short, continue the checklist with the next step. If a pilot is not sure where the checklist was stopped, accomplish the checklist from the start. If the checklist is stopped for a long time, also accomplish the checklist from the start.

On the ground, if any checklist item has not been completed when challenged, or a disagreement between the response and checklist answer occurs, it is mandatory that the checklist be discontinued until the item is accomplished or resolved. However, the PUSHBACK/START checklist may be started while awaiting the “CABIN IS READY FOR PUSHBACK” report from the OBL. The first flight of the day items are only required to be accomplished on the first flight after midnight local time.

If the flight deck is vacated by all pilots during or after accomplishing the BEFORE START checklist, the checklist must be re-accomplished.

The AFTER LANDING checklist will be accomplished only after the aircraft has cleared the active runway, unless a back-taxi is required. In this case, perform the checklist after the 180° turn and at normal taxi speed.

In flight, if any item has not been accomplished, continue with the remaining items. In this case, the pilot reading the checklist will state, “(THOSE ITEMS) TO GO.” When the missing items are accomplished, the checklist may be called complete.

Following the completion of each normal checklist, including those accomplished silently, the crewmember reading the checklist states, “_____ CHECKLIST COMPLETE.”

Checklist Content

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

Normal checklists have items that meet any of the following criteria:

- items essential to safety of flight that are not monitored by an alerting system, or
- items essential to safety of flight that are monitored by an alerting system but if not done, would likely result in a catastrophic event if the alerting system fails, or
- needed to meet regulatory requirements, or
- items needed to maintain fleet commonality between the MD88/90, 737, 757, 767, and 777, or
- items that enhance safety of flight and are not monitored by an alerting system (for example autobrakes), or
- during shutdown and secure, items that could result in injury to personnel or damage to equipment if not done.

Checklist Construction

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

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

Designators

Located on the right side of certain challenge-response items are designators which indicate that verbalization is required. The pilot(s) designated will visually verify switch position or status and then make the response to the pilot challenging.

Items that do not have designators are to be accomplished silently.

Note: Items that are critical to flight safety are indicated by the designators “C&F” or “All” and require a response from both crewmembers or all flight deck occupants.

The following designators are used:

- C - Captain
- F - First Officer
- All - All flight deck positions, including jump seat(s)
- PM - Pilot Monitoring
- C&F - Captain and First Officer

Other Conventions

When alternatives are available in a checklist item, a forward slash “/” will be used (e.g., APU/ external power).

When the printed response to any checklist item is “as reqd”, the proper verbal response is the actual position of that switch or system.

A blank line “____” requires a numerical response and is used when the response is a variable value, such as altimeters, bugs, flaps, slats, or stabilizer trim settings.

When the challenge requires verification of proper system operation, “ckd” is used as the response.

Symbols

A ■ indicates items that should be considered for re-accomplishment in the event of a takeoff runway/intersection change. The Captain should call for "Runway Change Items". The First Officer will either state "No Change" for an item or accomplish the appropriate challenge and response for an item that has changed.

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Checklist Introduction

Non-Normal Checklist

Chapter CI

Section 2

Introduction

These checklists are to be used by the flight crew to manage non-normal situations. They are grouped in logical sections which match the system description chapter arrangement in Volume 2 and are arranged in alphabetical order within each section.

Most checklists correspond to a Master Caution, System Annunciator light, or Overhead Annunciator Panel message. The Master Caution, System Annunciator, and Overhead Annunciator Panel indicate a failure condition and are the cues to select and do the checklist.

Checklists without a visible cue (such as DITCHING) are called unannunciated checklists.

All unannunciated checklists are found in the first section of the Non-Normal checklists chapter. Some unannunciated checklists also appear in an associated systems section (such as FUEL LEAK in the Fuel section).

Checklists may contain both recall and reference items. Recall items are critical steps that must be accomplished from memory and are shown in a solid heavy lined box. Each crewmember is required to know all recall items. Bullets, notes and bracketed items within the recall box support action steps and are not considered recall items. In the Table of Contents for each non-normal checklist section, the titles of checklists containing memory items are printed in bold type and are shown in a solid heavy lined box.

Non-Normal Checklist Symbolology

Aircraft Effectivity Symbol

The following symbols, when appearing next to an action step, procedure title, or conditional statement, indicate aircraft applicability. The absence of any symbol implies applicability to both MD-88 and MD-90 aircraft.

Effectivity Symbol	Aircraft Applicability
(88)	All MD-88 aircraft
(90)	All MD-90 aircraft

Non-Normal Checklist Titles

Non-normal checklist titles are shown in reverse font only on the first page of a procedure.

NNC TITLE

If a non-normal checklist continues to more than one page, the title is shown in large, bold lettering.

NNC TITLE

Light Indication

When practical, the illuminated light will be presented directly below the annunciated message(s) using reverse print. For example:

LIGHT

Recall Items

Items enclosed in a solid heavy line box in the QRH Non-Normal Checklists are recall items. They are to be performed from memory. Items not enclosed in a box are accomplished by reference to the checklist when time permits. The solid heavy line box represents recall item(s) for all crew members.

OXYGEN MASK ON, 100%

Action Steps

Action steps are used to describe the action the crew will accomplish when completing an abnormal procedure. All action steps, including both the challenge and response, should be read aloud.

Action steps are presented in two formats:

Dot Leader Action Step

In many action steps, the challenge and response parts of an action step are separated by a dot leader. This type of action step describes a switch or selector position. The crew member reading the checklist will read both challenge and response aloud. For example:

AUTOTHROTTLES OFF

Statement Action Step

Some action steps are presented without the dot leader format. Typically these action steps that begin with an action verb or make an informational statement. The crew member reading the checklist will read the entire action step aloud. For example:

LAND AT NEAREST SUITABLE AIRPORT.

Conditional Items

Conditional Items are used at a decision point. They are always shown in bold italics and are preceded by one or more black chevrons. All actions associated with a first level conditional will be enclosed in a thin lined box.

➤ ***This is an example of a main level conditional:***

➤ ***This is an example of a first level conditional:***

➤➤ ***This is an example of a second level conditional:***

➤➤➤ ***This is an example of a third level conditional:***

Non-Normal Checklist Operation

| General

Non-normal checklists begin with steps to correct the situation or condition. Information for planning the remainder of the flight is included. When special tasks are required to configure the airplane for landing, the tasks are included as part of the non-normal checklist. Flight patterns for certain non-normal situations are located in the Quick Reference Handbook (QRH) and the Flight Crew Training Manual (FCTM) and show the sequence of configuration changes.

While every attempt is made to establish necessary non-normal checklists, it is not possible to develop checklists for all conceivable situations, especially those involving multiple failures. In certain unrelated multiple failure situations, the flight crew may have to combine elements of more than one checklist and/or exercise judgment to determine the safest course of action. The Captain must assess the situation and use sound judgment to determine the safest course of action.

| Landing at the Nearest Suitable Airport

There are some situations which always require landing at the nearest suitable airport. These situations include, but are not limited to, conditions where:

- the non-normal checklist contains the words “Plan to land at the nearest suitable airport”
- cabin smoke or fire which persists
- normal aircraft pitch, roll or yaw cannot be maintained using aircraft trim systems
- one main AC power source remaining (such as engine or APU)
- any other situation determined by the crew to present a significant adverse effect on safety if the flight is continued.

It should be stressed that for persistent smoke or a fire that cannot be positively confirmed to be completely extinguished, the earliest possible descent, landing, and passenger evacuation should be accomplished.

| Checklists Prescribing Engine Shutdown

Checklists prescribing an engine shutdown must be evaluated by the Captain to ascertain whether an actual shutdown or operation at reduced thrust is the safest course of action. Consideration must be given to probable effects if the engine is left running at minimum required thrust.

Non-Normal Checklist Assumptions

Non-normal checklists assume:

- Continuing to fly the airplane is the single most important consideration in every situation.
- Hurried action may be inappropriate and could result in a more serious situation.

Non-normal checklists also assume:

- During engine start and prior to takeoff, the appropriate non-normal checklist is accomplished if a non-normal condition is identified. Upon completion of the checklist, the Mechanical Dispatch Manual is consulted to determine if Minimum Equipment List relief is available.
- System controls are in the normal configuration for the phase of flight prior to the initiation of the non-normal checklists.
- Aural alerts are silenced and the system reset by the flight crew as soon as the cause of the alert is recognized.
- The EMERGENCY position of the oxygen regulator is used when needed to supply positive pressure in the masks to evacuate contaminants. The 100% position of the oxygen regulator is used when positive pressure is not needed, but contamination of flight deck air exists. The NORMAL position of the oxygen regulator is used if prolonged use is needed and the situation allows. Normal boom mic operation is restored when oxygen use is no longer needed
- Indicator lights are tested to verify suspected faults

CAUTION: Flight crew reset of a tripped circuit breaker in flight is not recommended unless specifically directed to do so in a non-normal checklist. However, a tripped circuit breaker may be reset once, after a short cooling period (approximately 3 minutes), if in the judgment of the Captain, the situation resulting from the circuit breaker trip has a significant adverse effect on safety. A ground reset of a tripped circuit breaker by the flight crew should only be accomplished after maintenance has determined it is safe to reset the circuit breaker. Flight crew cycling (pulling and resetting) of circuit breakers to clear non-normal conditions is not recommended unless directed by a non-normal checklist. If it is determined that the circuit breaker must be reset, turn off the affected component (if possible), and wait 3 minutes to let the circuit breaker cool properly prior to reset. Attempt only one reset.

WARNING: Do not reset a tripped fuel boost pump CB.

Circuit Breaker Locations

Refer to Volume 2, Chapter 6 Electrical for a complete listing of circuit breaker locations.

Circuit Breaker	Panel Location
A1* to C21*	COCKPIT OVERHEAD C/B PANEL
A1 to Z42	ELECTRICAL POWER CENTER (BEHIND CAPTAIN)
Lt GB	LEFT GENERATOR BUS
Rt GB	RIGHT GENERATOR BUS
L CON	LEFT CONSOLE (CAPTAIN'S LEFT SIDEWALL)
C, or F CON	CAPTAIN, OR F/O CONSOLE (FORWARD OF FLIGHT KITS)
STEP	FLIGHT DECK STEP
E & E	E & E COMPARTMENT
EXT	EXTERNAL POWER PANEL
CABIN	VARIOUS CABIN LOCATIONS

Indicator Lights

Testing lights are normal crew actions and may not be listed in any procedure unless there is a specific requirement. Indicator lights should be tested to verify suspected faults.

Checklists Containing Recall Items

The following checklists contain recall items (identified by bold font in each NNC chapter Table of Contents).

- APU FIRE
- ELECTRICAL FAILURE (COMPLETE)
- ENGINE FAILURE/SHUTDOWN
- ENGINE FIRE OR SEVERE DAMAGE
- MANUAL ABORTED START
- RAPID DECOMPRESSION/CABIN ALTITUDE WARNING
- RUNAWAY STABILIZER
- SMOKE OR FUMES AIR CONDITIONING
- SMOKE OR FUMES OR FIRE ELECTRICAL
- SMOKE OR FUMES REMOVAL

Non-Normal Checklist Use

General

Non-normal checklist use commences when the airplane flight path and configuration are properly established. Only a few situations require an immediate response (such as stall warning, ground proximity PULL UP and WINDSHEAR warnings, and rejected takeoff). Usually, time is available to assess the situation before corrective action is initiated. All actions should then be coordinated under the Captain's supervision and performed in a deliberate, systematic manner. Flight path control should never be compromised.

Calling for the Checklist

When a non-normal situation occurs, at the direction of the pilot flying, both crewmembers systematically and without delay accomplish all recall items in their areas of responsibility.

The pilot flying may also direct reference procedures to be done by recall if no hazard is created by such action, or if the situation does not allow reference to a checklist.

The pilot flying calls for the checklist when:

- the flight path is under control
- the airplane is not in a critical stage of flight (such as takeoff or landing)

Reading the Checklist

The checklist is normally read aloud following the accomplishment of the recall items, but the pilot flying is not required to respond except for items that are not in agreement with the checklist.

Checklist reference items, including the response and/or action, are read aloud and accomplished by the pilot not flying.

Notes and information items, except for condition statements, are read aloud. The pilot flying need not repeat these items, but should acknowledge that the items were heard and understood.

Dual Verification of Critical Controls

Prior to actuation of any critical controls when accomplishing a non-normal checklist in flight, a verbal dual response is required. The following are considered critical controls:

- thrust lever reduction of a failed engine
- fuel control switches/engine start levers
- any fire handle
- any IDG/CSD disconnect switch

After determination that a critical control must be actuated in flight, the following steps must be taken:

- Both pilots must verbally and visually identify the affected control.
- The pilot performing the action will place his hand on the affected control.
- The pilot monitoring the action will verbally and visually confirm the proper control has been selected.
- The pilot performing the action then actuates the affected control.

Conditional Items

Conditional items are used at a decision point. Conditional items always begin with “If.” When a conditional item is encountered in a procedure, apply the following logic:

- If the conditional item applies, accomplish the action step(s) immediately following it.
- If the conditional item does not apply, skip the associated action step(s) and proceed to the next procedural step.

Notes and Information

Notes and information items, except for condition statements, are read aloud. The pilot flying need not repeat these items, but should acknowledge that the items were heard and understood.

Checklists show lists of inoperative equipment only when knowledge of the condition of such equipment is essential for planning the rest of the flight.

Checklist Limitations

Pilots must be aware that checklists cannot be created for all conceivable situations and are not intended to replace good judgment. In some cases, deviation from checklists may, at the Captain’s discretion, be necessary.

Checklist Completion

When a procedure has been completed, the following phrase will be depicted:

——— END OF PROCEDURE ———

An End of Procedure phrase can also be in the body of the checklist. This occurs only when a checklist divides into two or more paths. Each path can have an End of Procedure phrase. The End of Procedure phrase shows the end of the applicable path. The crew need not continue the checklist after that point.

Following completion of each non-normal checklist, the pilot monitoring states: **“_____ CHECKLIST COMPLETE.”**

Ditching & Evacuation

Coast Guard Ditching Recommendations

In a ditching situation, the Captain should consider requesting a US Coast Guard Search and Rescue (SAR) aircraft to launch for intercept. Initial contact with SAR may be made on 121.5 MHz. To assist SAR aircraft, squawk 7700 unless assigned another code.

The SAR aircraft may intercept 1000 feet below your aircraft in VFR or 1000 feet above in IFR. Therefore, the altimeters of each aircraft must be compared prior to intercept to ensure safe vertical separation.

If ditching is unavoidable, the Coast Guard may be able to recommend a ditching heading either through the SAR aircraft or from a surface ship. If possible, ditch in the lee of an island, in a lagoon, or near a ship.

Attempt to contact USCG and Navy vessels using VHF on emergency frequency 121.5 MHz.

Coast Guard, Navy, and some merchant ships may have the capability of supplying homing signals, radar for intercept, flares for night ditching, and other aids. Standard low frequency homing signal is 410 kHz, giving the call sign, followed by 2 (two) 10 (ten) second dashes.

Flight Crew Duties Summary For Emergency Landing/Ditching Evacuation

The following flight crew duties summary is designed to assist the crew members in preparing the aircraft's occupants for emergency landing and evacuation. Time is essential in preparing passengers for the evacuation (especially non-ambulatory). Flight attendants should be advised of the problem(s) as soon as flight safety is in doubt. Specific flight attendant duties are outlined in the In-Flight Service On-Board Manual. Additionally, the flight attendants should be informed of any conditions such as high winds, irregular ground condition, sea state, structural damage and/or fire that affect or alter status of the escape slides deployment.

After evaluating all factors, consideration may be given to securing the flight deck door open in preparation for an emergency landing. This could enhance flight deck evacuation, however, this increases the importance of securing all items aft of the flight deck.

Pre Landing/Ditching	
Captain	First Officer
• Advise crew to prepare for emergency landing (or ditching) and order distress message sent. • Set course for most logical point of landing under existing circumstances. • Order cockpit emergency preparation as conditions dictate. • Fasten seat belt and shoulder harness and lock. • Signal cabin crew/passengers when touchdown is imminent, using PA system if operative. • IF DITCHING: don life vest.	• Send distress message (MAY DAY), giving aircraft identification, type, position, heading, airspeed, altitude, fuel remaining in hours and minutes, nature of distress, intentions, and assistance desired. • Assist in cockpit emergency preparations as directed by the Captain and as conditions dictate. • Fasten seat belt and shoulder harness and lock. • IF DITCHING: don life vest.

Post Landing/Ditching	
Captain	First Officer
• Order evacuation. • Proceed to forward cabin area. • Assist in evacuating passengers as conditions dictate. • After evacuation is complete, exit aircraft from the rear, if able, after ensuring that all passengers are off the aircraft. • When all possible assistance has been given, leave the aircraft and assume command outside. • After exiting, assemble pax's/rafts away from the aircraft.	• Remove and carry ELT from crew closet. • Assist in opening forward cabin door and exit the aircraft. • Assist in the evacuation of passengers from the exterior of the aircraft as conditions dictate. • Assist in assembling passengers/rafts away from the aircraft. Board raft.

Passenger Evacuation Checklist

The PASSENGER EVACUATION checklist is published in the Quick Reference Handbook (QRH) and is reproduced on a placard on the back cover of the QRH for easy reference.

- During an unplanned evacuation, the preferred procedural reference document is the back cover of the QRH.
- During a planned evacuation, it is at the pilot's discretion which document to reference; the QRH placard or QRH -- provided the document is readily available.

WARNING

The order in which events occur is critical to a safe evacuation.

Emergency Evacuation Flow/Philosophy

Evacuation flow items listed below are not included within the Passenger Evacuation checklist. They are meant to refresh the logical pattern of procedures that must occur for a successful evacuation. In the unlikely event that the checklist cannot be read due to smoke/fire, darkness, injury or incapacitation, the simple flow or philosophy should lead the pilot to completion of all critical tasks contributing to the safest possible evacuation. The checklist follows the flow pattern of:

STOP
CONFIGURE
SHUTDOWN
EVACUATE

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Smoke/Fumes Principles

General

The following information is critical to survival in a smoke/fumes situation. Though all applicable non-normal checklists can be found in other sections of this manual, Section 8 (Fire Protection) contains all of these checklists.

NOTE: *Pilots should remain at their stations to fly the aircraft, coordinate with ATC and accomplish the procedures. The incapacitation of a pilot fighting a fire would seriously complicate the situation.*

Communications

Continuous communications, via cabin interphone, between the PNF and a designated flight attendant is essential. Direct flight attendants to:

- Quickly inspect the entire cabin, including galleys and lavatories, to locate the smoke source, and relay results giving continuous cabin smoke feedback while cockpit checklist actions are accomplished.
- Move passengers away from the smoke source.

For efficient crew communications, the following setup is recommended:

- Pilot flying - Maintain contact with ATC on VHF-1 (Monitor cockpit/cabin communication as required).
- Pilot not flying - Maintain contact with cabin crew.

Ventilation

- Minimizing exposure time in a smoke environment is the key to survival.
- Smoke inhalation will incapacitate long before the fire is a threat.
- Maximizing airflow has been proven to minimize exposure to smoke. It is not possible to smother a fire by turning the packs off.

WARNING

Do not activate the emergency passenger oxygen system. It provides no smoke protection for passengers as it mixes oxygen with cabin air. It is also an extreme fire hazard.

Identification

Misdiagnosis of smoke source is common in a deteriorating visibility situation. The following information can aid in smoke source identification:

- Turning up panel background lights or using a flashlight will aid visibility.
- Open circuit breakers and/or instrument failure annunciations could highlight faulty components.
- Fluorescent light ballast fires are common and, though spectacular, are usually brief and self-extinguishing.

Smoke/Fumes Priorities

QRH procedures are structured to allow timely and appropriate response to in-flight smoke events. In some situations, safety may be enhanced by additional crew action based upon the particular situation and aircraft systems knowledge that would be inappropriate to detail in time critical QRH procedures.

Known Source

Many smoke events involve smoke or fumes produced by aircraft equipment or materials readily accessible. Rapid, positive extinguishing of the source is the key to preventing escalation of the event. Confirmation that the situation has been resolved is critical. Do not consider flight continuation unless the source is positively identified, confirmed to be extinguished and smoke/fumes are dissipated.

If this positive confirmation cannot be established, follow the priorities table below.

Unknown Source

Many unknown smoke events are later determined to be electrical, substantiating the positive step of depowering specific equipment not crucial to the remaining flight, landing and egress. Historically, flight critical systems have not significantly contributed to smoke events. Inordinate depowering of airplane systems is not likely to benefit an unknown smoke situation because such action significantly reduces airplane capabilities without commensurate likelihood of depowering the unknown smoke source.

When smoke is from an unknown source, follow the priorities table below.

Priorities Table

1	Plan to Land
	Do not delay descent or diversion to find the smoke source. Coordinate with ATC and land at the nearest suitable airport. Consider a passenger evacuation.
2	Ventilate
	Accomplish the SMOKE OR FUMES REMOVAL checklist.
3	Identify
	Accomplish the SMOKE OR FUMES AIR CONDITIONING or SMOKE OR FUMES OR FIRE ELECTRICAL checklists as appropriate.

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Non-Normal Checklists
Unannunciated Checklists

Chapter NNC
Section 0

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AFT PASSENGER STAIRWAY MANUAL OPERATION

➤ ***To lower or raise the aft stairs from inside:***

NOTE: *Pressurizing the right hydraulic system may aid in lowering the aft stairs, but is not necessary.*

OPEN AFT PRESSURE BULKHEAD DOOR.

➤ ***To lower stairs if catwalk is not down from ceiling:***
LOWER CATWALK.

OPERATE LATCH MECHANISM.

- Proceed to aft end of catwalk. Latch is at aft end of catwalk on Captain's side of aircraft. Latch can be identified by reflective tape.
- Cable guide might need to be moved aside.
- Push latch mechanism forward. Hold until stairs are fully extended.

RAISE CATWALK.

➤ ***To raise stairs if catwalk is not down from ceiling:***
LOWER CATWALK.

PRESSURIZE RIGHT HYDRAULIC SYSTEM.

OPERATE LATCH MECHANISM.

- Latch is at aft end of catwalk on Captain's side of aircraft, marked with reflective tape.
- Cable guide might need to be moved aside.
- Push latch mechanism aft. Hold until stairs are fully retracted.

———— **END OF PROCEDURE** ————

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AIRCRAFT OSCILLATING OR DISPLACED IN YAW

SELECT OPPOSITE POSITION ON DIGITAL FLIGHT GUIDANCE CONTROL SWITCH.

➤ ***If oscillation or yaw displacement ceases:***

AUTOPILOT/AUTOTHROTTLES AS REQD

——— **END OF PROCEDURE** ———

➤ ***If aircraft continues to oscillate or is displaced in yaw:***

RUD HYD CONT LEVER MANUAL

- Observe RUD CONTROL MANUAL message displayed.

➤ ***If oscillation or yaw displacement ceases:***

LEAVE RUD HYD CONT LEVER IN MANUAL.

- For manual rudder approaches, maintain $V_{REF} + 5$ KIAS but not less than 135 knots until landing is assured.
- **Do not execute an autoland.**

➤ ***If aircraft continues to oscillate or is displaced in yaw:***

YAW DAMPER OVRD

- Observe YAW DAMP OFF message is displayed.
- Yaw damper is now inoperative.

RUD HYD CONT LEVER PWR

AUTOPILOT/AUTOTHROTTLES AS REQD

——— **END OF PROCEDURE** ———

ALL ENGINES FLAMEOUT

➤ *If two engine flameout was caused by fuel starvation in left and right main tanks with fuel in center wing tank:*

THE OPTIMUM ATTITUDE FOR SCAVENGING FUEL FROM THE RIGHT MAIN TANK FOR APU OR RIGHT ENGINE IS 0° PITCH ATTITUDE AND 1.5° RIGHT WING UP.

EMER PWR SWITCH ON
(90) IGNITION ON
(88) IGNITION OVRD
CABIN ALT CONTROL LEVER MANUAL
OUTFLOW VALVE POSITION INDICATOR CLOSE
OXYGEN MASKS ON / 100%
THUNDERSTORM LIGHT SWITCH AS REQD
THROTTLES IDLE
DC START PUMP ON
BOOST PUMPS ON
(88) FUEL LEVERS ON
(90) FUEL SWITCHES OFF, THEN ON
FUEL X FEED LEVER OFF
ENGINE ANTI-ICE SWITCHES ON
USE MINIMUM MANEUVERING AIRSPEED.

(Continued on next page)

ALL ENGINES FLAMEOUT (Continued)

➤ ***If neither engine starts:***

(88) APU DOORS SWITCH AUTO
APU MASTER SWITCH START

➤ ***If APU starts:***

(88) LEFT AND RIGHT APU BUS SWITCHES ON

➤ ***If APU does not start:***

CONTINUE ENGINE START ATTEMPTS.

➤ ***When one or both engines start:***

CABIN ALT CONTROL LEVER AUTO
(88) EMER PWR SWITCH OFF
(90) EMER PWR SWITCH ARM
THUNDERSTORM LIGHT SWITCH OFF
DC START PUMP OFF
ENGINE ANTI-ICE SWITCHES AS REQD
(88) IGNITION AS REQD
(90) IGNITION AUTO

NOTE: Continue engine and/or APU start attempts until at least two sources of power are running.

——— END OF PROCEDURE ———

ALTERNATE GEAR EXTENSION (RIGHT HYDRAULIC SYSTEM LOSS)

AIRSPEED MAX 300 KIAS / .70M

LANDING GEAR HANDLE DOWN

- Aircraft may have to slow to V_{REF} to allow nose gear to latch down.

PULL EMERGENCY LANDING GEAR EXTENSION LEVER FULL UP.

- Ensure lever is locked in **UP** position.

CHECK LANDING GEAR WARNING LIGHTS.

SYSTEM STATUS:

- **GEAR DOOR OPEN** light will be illuminated.

STOP ON RUNWAY.

- Gear doors will drag the ground at low speeds.

CAUTION

Do not stow the emergency landing gear extension lever until the malfunction has been corrected or until the gear door hydraulic bypass lever has been activated.

► Prior to taxiing:

INSTALL LANDING GEAR PINS.

CLOSE MAIN GEAR DOORS.

- After contacting ground crew, coordinate emergency gear lever stowing to allow gear doors to be latched in the **UP** position.
- Apply left pressure at base of hold open arm initially while pulling back on the emergency landing gear extension lever.

——— **END OF PROCEDURE** ———

BATTERY START

This procedure is to be utilized when APU generator and ground electrical power are unavailable. Both engines should be started prior to taxi.

CHOCK AIRCRAFT.

COMPLETE EXTERIOR/INTERIOR PREFLIGHT.

COMPLETE FOLLOWING BEFORE START AND ENGINE START CHECKLIST ITEMS.

- Check CB's.
- Throttles - **IDLE**.
- FUEL levers/switches - **OFF**.
- Battery - **ON/lock**.
- Check fire warning.
 - Agent low lights are not powered.

EMER PWR SWITCH **ON**

PNEU X FEED VALVES **OPEN**

AIR CONDITIONING SUPPLY SWITCHES **OFF**

(88) AC X TIE SWITCH **OPEN**

DC X TIE SWITCH **OPEN**

(88) IGNITION **SYS A OR SYS B**

(90) IGNITION **ON**

CHECK PNEUMATIC PRESSURE.

► *If using ground air supply:*

- (88) 36 psi minimum at sea level less 1 psi per 1000 feet pressure altitude above sea level.
- (90) 25 psi minimum.

► *If using APU air supply:*

- (88) Positive pressure indication.
- (90) Pressure indication may only be observed after START switch is pulled.

(Continued on next page)

BATTERY START

(Continued)

DC START PUMP ON

ANTI-COLLISION LIGHT ON

START RIGHT ENGINE.

- Start valve closing can be verified by observing an increase in pneumatic pressure as start switch is released.
- Verify START VALVE OPEN message is no longer displayed after generator comes on line.

SYSTEM STATUS:

- Only the following engine instruments/warning lights will be operative during start:
 - OIL PRESS LOW message.
 - EGT.
 - N₁.
 - N₂.

CHECK RIGHT GENERATOR VOLTS/FREQUENCIES.

(88) AC X TIE SWITCH AUTO

CHECK ENGINE INSTRUMENTS.

MAIN TANK FUEL PUMPS ON

DC START PUMP OFF

(90) IGNITION AUTO

(88) EMER PWR SWITCH OFF

(90) CHECK EMER PWR SWITCH ARMED.

- Do not move switch through **OFF** position.

COMPLETE BEFORE START CHECKLIST.

- BEFORE START checklist must be completed after starting engine since electrical power was not available prior to start.

START LEFT ENGINE.

COMPLETE AFTER START CHECKLIST.

———— END OF PROCEDURE ————

DITCHING/CRASH LANDING

NOTE: Refer to Chapter CI.2, Checklist Introduction, Non-Normal Checklist for Flight Crew Duties Summary for Emergency Landing/Ditching Evacuation.

Communicate.

- Brief flight attendants.
 - Nature of problem
 - Available time.
 - Method of notifying to assume brace position.
 - Signal/command to evacuate.
 - Other pertinent items.
- Broadcast to any VHF station.
 - Advise of your situation and action to be taken.
 - Give position, heading, IAS, altitude, etc., as time permits.
 - Indicate assistance required.
 - Set transponder code to 7700.
 - Make last broadcast of ditching intention and position.
- Locate and head for nearest ship if ditching.
- Consider burning off fuel prior to ditching if situation permits.
 - This will provide greater buoyancy and a lower approach speed.
- After ditching airplane assumes a slight taildown attitude.
 - At high gross weights the wings will be awash.
 - At lower gross weights the upper wing surface will be clear of water.

NO SMOKING/SEAT BELT SIGNS. ON
EGPWS OVRD

(Continued on next page)

DITCHING / CRASH LANDING

(Continued)

➤ ***Below 5,000 feet:***

AIR CONDITIONING SUPPLY SWITCHES. OFF

NOTE: *Expect high rates of cabin climb until outflow valve closes.*

DEPRESSURIZE CABIN MANUALLY.

- Move CABIN ALTITUDE control lever to **MAN**, then push in and rotate CABIN ALTITUDE control wheel to position the OUTFLOW VALVE indicator toward **VALVE OPEN** to obtain desired rate.

NOTE: *Manual control wheel forces will be high unless airspeed is low.*

(Continued on next page)

DITCHING / CRASH LANDING

(Continued)

► When depressurized:

CABIN ALT CONTROL WHEEL VALVE CLOSED

NOTE: *This action closes pressurization cabin air outflow nozzle and cabin air outflow butterfly valve in order to present a smoother fuselage surface during ditching and improve flotation. The outflow valve and nozzle will be below the water line following ditching.*

RADIO RACK SWITCH FAN

PLAN APPROACH AND LANDING.

- Select best touchdown site available, considering winds.
- If ditching, plan touchdown parallel to the primary swells on upwind side of swell unless surface winds are strong.
- Contact at minimum forward and sink speeds but do not stall prior to touchdown.

GEAR HANDLE AS REQD

- **DOWN** for crash landing
 - Landing gear is extended to absorb impact forces.
- **UP** for ditching.
 - Pull CAWS, SSRS-1, LDG GEAR, T/O, A/P, CABIN ALT, SPD BRAKE CB (P 38) to silence landing gear warning.

FLAP / SLAT HANDLE. 28 / LAND

- The approach body angles will be slightly higher than a 40 / LAND approach.

► At 500 feet AFE:

ADVISE CABIN.

- Command “BRACE POSITION”.

► Prior to touchdown:

EMERGENCY LIGHTS SWITCH ON

(Continued on next page)

DITCHING / CRASH LANDING

(Continued)

➤ After aircraft stops:

PULL ENG FIRE HANDLES.

DISCHARGE FIRE AGENT AS REQUIRED.

- BATT switch must be **ON** to discharge fire extinguishing agent.

INITIATE EVACUATION.

- Proceed to evacuation area.
- Direct evacuation of passengers.

———— END OF PROCEDURE ————

EMERGENCY DESCENT

ESTABLISH COMMUNICATIONS.

AUTOPILOT / AUTOTHROTTLES AS DESIRED

THROTTLES IDLE

EXTEND SPEEDBRAKES.

BEGIN DESCENT.

CAUTION

The normal speed profiles (Mach .80-.82/320-340 KIAS) are based upon loss of pressurization associated with no loss in structural integrity. Known failures that would affect structural integrity and/or turbulence might dictate other speed profiles. Descent not to exceed 10 degrees pitch or 30 degrees bank.

———— **END OF PROCEDURE** ————

ENGINE FAILURE/SHUTDOWN

WARNING

Both pilots must identify the correct throttle and fuel lever/switch prior to activation.

AUTOTHROTTLLES	OFF
THROTTLE (AFFECTED ENGINE)	IDLE

FUEL LEVER/SWITCH (AFFECTED ENGINE) OFF

EVALUATE ENGINE CONDITION.

- Verify rotation by checking engine oil/hydraulic pressure instruments.

➤ If severe engine damage is suspected:

NOTE: Indications of severe damage may include airplane vibration and on affected side:

- N_1 and/or N_2 tachometers indicating 0% [(90): dashes in EDP].
- rapid loss of hydraulic pressure.
- sudden loss of generator power.

REFER TO ENGINE FIRE or SEVERE DAMAGE CHECKLIST.

——— END OF PROCEDURE ———

ALIGN THROTTLLES.

- Move shutdown engine throttle symmetrically with the operating engine throttle to ensure proper operation of the autospoilers.
- Use autothrottles if desired.

TRP MCT

(90) SELECT 28K ON TRP.

PNEU X FEED VALVE (AFFECTED ENGINE) CLOSE

AUX/TRANSFER PUMPS ON

(Continued on next page)

ENGINE FAILURE/SHUTDOWN (Continued)

CHECK ELECTRICAL LOADS.

NOTE: Start APU (if available) to reduce electrical load on operating generator.

MAINTAIN FUEL BALANCE.

- Open fuel X FEED lever as necessary.

► **Clean up items:**

AIR CONDITIONING SHUTOFF OVRD

ENG SYNC SELECTOR OFF

AIR CONDITIONING SUPPLY SWITCH (AFF. ENG) . . . OFF

CHECK DRIFTDOWN PERFORMANCE.

- Consult ODM, Abnormals Section and low altitude charts for the nearest suitable airports and driftdown data.
- If FMS is available, engine out data may be obtained by selecting the ENG OUT prompt.
- The FMS may not be used for range calculations or fuel management.

TRANSPONDER FUNCTION SELECTOR. TA

- Aircraft performance with an engine inoperative may not meet RA requirements.

LANDING FLAP CONFIGURATION 28 / LAND

- In the event of a missed approach, the go-around flap setting is 11.

AUTOPILOT MUST BE DISCONNECTED PRIOR TO GLIDE SLOPE CAPTURE.

(Continued on next page)

ENGINE FAILURE/SHUTDOWN

(Continued)

CAUTION

If engine failure occurs at high airspeed (rudder restriction in effect), the possibility exists for the rudder to remain restricted throughout the approach and landing.

➤ *If rudder remains restricted during approach:*

- *To restore rudder travel for the appropriate airspeed:*
**MOMENTARILY CENTER RUDDER PEDALS AND TRIM
AS AIRSPEED DECREASES.**
 - Ensure full unrestricted rudder travel is available.
- *If full rudder travel is not restored, when below 160 knots:*
GENTLY WALK RUDDER PEDALS.
 - Allows limiter to drop out of the rudder control mechanism.
- *If unrestricted rudder is still not attained:*
**ACCOMPLISH APPROPRIATE ABNORMAL PROCEDURE
IN FLIGHT CONTROLS SECTION.**

——— END OF PROCEDURE ———

ENGINE FIRE or SEVERE DAMAGE

NOTE: A fire warning may or may not appear with severe engine damage. Indications of severe damage may include airplane vibration and on affected side:

- N_1 and/or N_2 tachometers indicating 0% [(90): dashes in EDP].
- rapid loss of hydraulic pressure
- sudden loss of generator power.

WARNING

Both pilots must identify the correct throttle and fuel lever/switch prior to activation.

AUTOTHROTTLES OFF
THROTTLE (AFFECTED ENGINE). IDLE

➤ ***If fire warning ceases at any time or severe engine damage is not suspected:***

CONTINUE IDLE ENGINE OPERATION AT CAPTAIN'S DISCRETION.

CONTINUE PROCEDURE WITH CLEAN-UP ITEMS.

➤ ***If fire warning continues or severe engine damage is suspected:***

FUEL LEVER/SWITCH (AFFECTED ENGINE) OFF

- (90) Red FUEL switchlight will extinguish.

ENG FIRE HANDLE (AFFECTED ENGINE). PULL

DISCHARGE FIRE AGENT.

- Pull handle completely out while turning to discharge bottle.

➤ ***If ENG FIRE remains illuminated after 30 seconds:***

DISCHARGE REMAINING AGENT.

(Continued on next page)

ENGINE FIRE or SEVERE DAMAGE (Continued)

ALIGN THROTTLES.

- Move shutdown engine throttle symmetrically with the operating engine throttle to ensure proper operation of the autospoilers.
- Use autothrottles if desired.

► *Clean-up items:*

TRP MCT

(90) SELECT 28K ON TRP.

PNEU X FEED VALVE (AFFECTED ENGINE) CLOSE

AUX/TRANSFER PUMPS ON

CHECK ELECTRICAL LOADS.

NOTE: Start APU (if available) to reduce electrical load on operating generator.

MAINTAIN FUEL BALANCE.

- Open X FEED lever as necessary.

AIR COND SHUTOFF SWITCH. OVRD

ENG SYNC SELECTOR OFF

AIR COND SUPPLY SWITCH (AFF. ENG) AS REQD

- OFF, unless engine remains running in idle.

CHECK DRIFTDOWN PERFORMANCE.

- Consult ODM, Abnormals Section and low altitude charts for driftdown data.
- If FMS is available, engine out data may be obtained by selecting the ENG OUT prompt.
- The FMS may not be used for range calculations or fuel management.

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

(Continued on next page)

ENGINE FIRE or SEVERE DAMAGE
(Continued)

TRANSPONDER FUNCTION SELECTOR. TA

- Aircraft performance with an engine inoperative may not meet RA requirements.

LANDING FLAP CONFIGURATION 28/LAND

- In the event of a missed approach, the go-around flap setting is 11.

AUTOPILOT MUST BE DISCONNECTED PRIOR TO GLIDE SLOPE CAPTURE (FOR SINGLE ENGINE OPS ONLY).

CAUTION

If engine failure occurs at high airspeed (rudder restriction in effect), the possibility exists for the rudder to remain restricted throughout the approach and landing.

➤ ***If rudder remains restricted during approach:***

➤ ***To restore rudder travel for the appropriate airspeed:***

MOMENTARILY CENTER RUDDER PEDALS AND TRIM AS AIRSPEED DECREASES.

- Ensure full unrestricted rudder travel is available.

➤ ***If full rudder travel is not restored, when below 160 knots:***

GENTLY WALK RUDDER PEDALS.

- Allows limiter to drop out of the rudder control mechanism.

➤ ***If unrestricted rudder is still not attained:***

ACCOMPLISH APPROPRIATE ABNORMAL PROCEDURE IN FLIGHT CONTROLS SECTION.

——— **END OF PROCEDURE** ———

FUEL LEAK

Fuel leaks might be indicated by main tank imbalance and/or the illumination of the L or R INLET FUEL PRES LO message, significant differences between fuel quantity and fuel used, or uncommanded filling of a tank. **It may be possible to visually observe fuel/fuel vapor leaking from the wing area.**

BOOST PUMPS (TANK WITH LESSER QUANTITY) OFF

BOOST PUMPS (TANK WITH GREATER QUANTITY). . . . ON

➤ ***If there is a leak overboard (difference between fuel quantity decrease and fuel used):***

FUEL X FEED LEVER OFF

➤ ***If engine using suction feed fails:***

THROTTLE IDLE

FUEL LEVER/SWITCH OFF

PULL ENG FIRE HANDLE (DO NOT ROTATE).

FUEL X FEED LEVER AS REQD

- Crossfeed fuel as necessary to maintain balance.

LAND AT NEAREST SUITABLE AIRPORT.

**ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE
IN POWER PLANT ABNORMALS, IF APPROPRIATE.**

➤ ***If a tank quantity changes (quantity increasing/decreasing) at other than normal rate:***

FUEL X FEED LEVER AS REQD

- Use FUEL CROSSFEED lever as required to make fuel available and to maintain balance. Do not **open** if leak overboard is suspected.
- Maintaining at least 2,500 pounds in right main tank will minimize chance of left engine drawing air if it is on suction feed.

LAND AT NEAREST SUITABLE AIRPORT.

——— END OF PROCEDURE ———

PASSENGER EVACUATION

Notify ATC and flight attendants as required.

SET PARKING BRAKE.

RETRACT SPOILERS.

FLAPS/SLATS 28/LAND

CABIN ALT CONT LEVER MANUAL

**CABIN ALT CONT WHEEL
(OUTFLOW VALVE) FULL BACK**

EMERGENCY LIGHTS SWITCH ON

EMERGENCY POWER SWITCH ON

FUEL LEVERS/SWITCHES OFF

PULL BOTH ENGINE FIRE HANDLES.

DISCHARGE ENGINE FIRE BOTTLES.

- Rotate each fire handle in opposite direction to discharge fire agent into each engine compartment.

INITIATE PASSENGER EVACUATION.

BATTERY SWITCH OFF

——— END OF PROCEDURE ———

PITOT SYSTEM FAILURE

PITOT HEAT ON

CROSSCHECK INSTRUMENTS (MACH / IAS).

- Attempt to determine which pitot instruments are correct, considering power setting, configuration, and weight. Utilize the correct systems for continuing aircraft operation.
- During approach, the FAST/SLOW indicators may be utilized to crosscheck airspeeds, since they are independent of the pitot/static system.
- Depressurizing the aircraft prior to approach may decrease the pitot error.
- If BOTH pitot systems appear to be inoperative, refer to ODM Abnormal Section for appropriate power settings for operation without airspeed indication.

——— END OF PROCEDURE ———

RAPID DECOMPRESSION / CABIN ALTITUDE WARNING

OXYGEN MASKS.	ON, 100%
CREW COMMUNICATIONS	ESTABLISH

NOTE: *If unable to establish immediate communications with ATC and descent is begun without clearance, squawk 7700.*

CABIN ALT CONT LEVER MANUAL

**CABIN ALT CONT WHEEL
(OUTFLOW VALVE) FULL FORWARD**

PNEUMATIC X FEED VALVES CLOSED

➤ ***If cabin altitude exceeds 14,000 feet:***

DEPLOY PASSENGER OXYGEN MASKS.

➤ ***If cabin pressure uncontrollable:***

INITIATE EMERGENCY DESCENT (THIS SECTION).

➤ ***If cabin pressure controllable:***

CABIN ALT CONT LEVER. AS REQD

——— END OF PROCEDURE ———

**Intentionally
Blank**

RUNAWAY STABILIZER

CAUTION

Avoid manual pitch inputs until autopilot is disconnected.

NOTE: Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.

NOTE: Extended trim operation may cause trim motor thermal shutdown. Trim motor operation may return after sufficient cooling period.

AUTOPILOT DISCONNECT
CONTROL WHEEL TRIM SWITCHES
. TRIM OPPOSITE DIRECTION OF RUNAWAY

NOTE: Do not oppose runaway using longitudinal trim handles.

➤ ***If LONG TRIM indicator moves in opposite direction of runaway:***

PULL AUTOPILOT AND ALTERNATE LONGITUDINAL TRIM CB'S D-9, D-10, AND D-11.

- Continue flight using primary trim system.
- Autopilot is available, but alternate trim motor is inoperative. After trimming, autopilot may be engaged, but should be disconnected/retrimmed periodically as needed.

——— **END OF PROCEDURE** ———

➤ ***If LONG TRIM indicator stops moving or continues to runaway:***

STABILIZER TRIM BRAKE SWITCH STOP
RETRIM USING ALTERNATE LONGITUDINAL TRIM SWITCH

PULL PRIMARY LONGITUDINAL TRIM CB'S (3 ON LEFT GENERATOR BUS BEHIND CAPTAIN'S SEAT).

- Continue flight using alternate trim system.
- Autopilot is available.

——— **END OF PROCEDURE** ———

SEVERE RAIN / ICE / TURBULENCE

NOTE: Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.

(88) IGNITION SWITCH BOTH

(90) IGNITION SWITCH ON

PNEU X-FEED VALVE LEVERS OPEN

ENG AND AIR FOIL ANTI-ICE SWITCHES AS REQUIRED

NOTE: Engine and air foil anti-ice systems should be off if RAT is above 10°C or icing will not be encountered or is not anticipated. Reduced engine bleeds will increase engine flameout margin during periods of heavy water ingestion.

APU START

► **If in Severe Turbulence only:**

AIRSPEED MAINTAIN 280 KIAS

- During extreme turbulence, fly attitude indicator as primary pitch reference. Sacrifice altitude to maintain attitude. Descend if necessary to improve buffet margin.

ENG SYNC SELECTOR OFF

AIRSPEED. MONITOR

NOTE: Recommended turbulence airspeed is 275 to 285 KIAS or .75M to .79M (whichever is lower). At 10,000 feet and below, minimum recommended speed is 250 KIAS or minimum maneuvering (whichever is greater). Do not fly less than minimum maneuvering speed for existing configuration.

AUTOTHROTTLES AS REQD

- Disconnect autothrottles to avoid throttle burst, if necessary.

THROTTLES SET

NOTE: Use speed brakes to slow airplane. Adjust throttles only as necessary to avoid excessive airspeed variations. Use smooth power changes and maintain thrust as high as practicable. Do not chase airspeed.

(Continued on next page)

SEVERE RAIN / ICE / TURBULENCE (Continued)

NOTE: *If throttles are at idle when extreme precipitation is encountered, N2 should be monitored for spool-down below idle RPM. Delay throttle advance as long as possible and, when necessary, very slowly advance one throttle at a time while monitoring N2 for response. If no response is noted, return throttle to idle and wait for indications of spool-up to idle RPM.*

NOTE: *During an unavoidable encounter of exceptionally severe icing conditions (those that occur on an infrequent basis), it is desirable to maintain a minimum of (88) 70% N1; (90) 60% N1.*

NOTE: *Left and right windshields consist of primary and secondary de-ice areas. Under severe icing conditions, secondary de-ice areas may not completely de-ice. Due to geometry of these windshields, heat flow to secondary de-ice area is not adequate to remove ice.*

NOTE: *Increased engine vibration during low thrust operation in severe icing conditions, with or without engine anti-ice, may be due to fan blade icing. This is especially suspect if more than one engine experiences higher than normal vibration levels. If fan blade icing is suspected, verify IGNITION is on. If engine anti-ice is off, reduce thrust (one engine at a time) to idle and turn on engine anti-ice. Accelerate affected engine to (88) 70% N1; (90) 60% N1 while closely monitoring engine instruments (especially EGT) for any abnormalities. If vibration decreases (indicating ice removal), resume normal operation for existing conditions. If vibration does not decrease after 1 minute, consider engine shutdown.*

——— END OF PROCEDURE ———

SINGLE PNEUMATIC SOURCE DESCENT

RADIO RACK SWITCH FAN

➤ *If BOTH air conditioning systems are operable:*

PNEUMATIC X FEED VALVES (BOTH) OPEN

➤ *If ONE air conditioning system is operable:*

ADVANCE THROTTLE.

- Advance throttle slowly on engine supplying pneumatic pressure until pack supply pressure/flow ceases to rise.
 - (88) Approximately 21 psi.
 - (90) Approximately 2:30 position.

SPEEDBRAKES AS REQD

—— END OF PROCEDURE ——

SMOKE OR FUMES AIR CONDITIONING

OXYGEN MASKS AND SMOKE GOGGLES. ON, 100% CREW COMMUNICATIONS ESTABLISH

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

***NOTE:** If smoke/fumes are severe, first accomplish the smoke or fumes removal checklist.*

WARNING

Do not turn off packs in an effort to smother the fire.

➤ ***If smoke or fumes are present in the cockpit:***

COCKPIT DOOR AS REQD

- Open door to ventilate if smoke or fumes confined to cockpit.

LEFT AIR CONDITIONING SUPPLY SWITCH. OFF

RADIO RACK SWITCH VENTURI

➤ ***If smoke or fumes continue:***

LEFT AIR CONDITIONING SUPPLY SWITCH AUTO

RIGHT AIR CONDITIONING SUPPLY SWITCH OFF

**LOCATE AND PULL RECIRCULATING FAN CONTROL
C/B (J7).**

***NOTE:** Use of the SMOKE OR FUMES OR FIRE
ELECTRICAL checklist may aid in identifying and eliminating
the source.*

—— **END OF PROCEDURE** ——

(Continued on next page)

SMOKE OR FUMES AIR CONDITIONING
(Continued)

➤ *If smoke or fumes are confined to passenger cabins:*

COCKPIT DOOR (AND LOUVER PANEL). CLOSED

- Prevents smoke or fumes from penetrating into cockpit.

LOCATE AND PULL RECIRCULATING FAN CONTROL C/B (J7).

➤ *If smoke or fumes continue:*

**RIGHT AIR CONDITIONING
SUPPLY SWITCH. OFF**

NOTE: Use of the *SMOKE OR FUMES OR FIRE ELECTRICAL* checklist may aid in identifying and eliminating the source.

———— **END OF PROCEDURE** ————

88	SMOKE OR FUMES OR FIRE ELECTRICAL	88

OXYGEN MASKS AND SMOKE GOGGLES. ON, 100%
CREW COMMUNICATIONS ESTABLISH

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

***NOTE:** If smoke/fumes are severe, first accomplish the smoke or fumes removal checklist.*

WARNING

Do not turn off packs in an effort to smother the fire.

CABIN ALT CONTROL LEVER MANUAL (DOWN)

RADIO RACK SWITCH. VENTURI

EMER POWER SWITCH ON/CHECK

➤ ***If Emergency power operation is normal:***

L AND R GEN SWITCHES. OFF

APU L AND R BUS SWITCHES OFF

➤ ***If smoke or fumes stop:***

➤➤ ***If nearest suitable airport is 30 minutes or less and
at Captain's discretion:***

AVOID IMC FLIGHT.

CAUTION

***Depressurize cabin prior to landing. Manual pressurization
control forces may be high. Apply force as required.***

SYSTEM STATUS

- Stab trim inoperative.
- Anti-skid/auto-brakes inoperative.
- Autospoilers inoperative.

(Continued on next page)

88

SMOKE OR FUMES OR FIRE ELECTRICAL

88

(Continued)

- For additional items refer to EMERGENCY POWER SUMMARY OF OPERATIVE EQUIPMENT in Volume 1, SP.6 Supplementary Procedures - Electrical.

➤➤➤ *If aircraft is trimmed and flaps are 28 or 40:*

LANDING FLAPS EXISTING
FLAP SETTING

LANDING SPEED AS APPROPRIATE
FOR FLAP SETTING

➤➤➤ *If aircraft is out of trim or flaps are less than 28:*

LANDING FLAPS 15/EXT

NOTE: *Do not reduce power until flare has been initiated and sink has been reduced.*

COMPUTE LANDING THRESHOLD SPEEDS.

- V_{REF} is flaps 15 speedbook minimum maneuver speed,

PLUS:

- Add knot value for adjusted takeoff weight C.G. Interpolate as necessary from table below:

STAB ANGLE	MD-88 TAKEOFF C.G.				
	0	5	10	15	20
-2	40	32	24	17	8
0	29	22	15	8	0
2	20	14	7	1	0
4	13	7	1	0	0
6	6	1	0	0	0

————— END OF PROCEDURE —————

(Continued on next page)

88

**SMOKE OR FUMES OR FIRE
ELECTRICAL**

88

(Continued)

➤➤ *If nearest suitable airport is more than 30 minutes:*

AC AND DC BUS X TIE SWITCHES OPEN

R GEN OR APU R BUS SWITCH ON/CHECK

➤➤➤ *If smoke or fumes do not reappear:*

EMER PWR SWITCH OFF

*NOTE: DFGC 2 may be used after electrical
system check is completed.*

—— END OF PROCEDURE ——

➤➤➤ *If smoke or fumes reappear:*

L GEN AND APU L BUS
SWITCH ON/CHECK

R GEN AND APU R BUS SWITCH OFF

EMER PWR SWITCH OFF

*NOTE: DFGC 1 may be used after electrical
system check is completed.*

—— END OF PROCEDURE ——

➤ *If smoke or fumes continue:*

L AND R GEN SWITCHES. ON/CHECK

CONTINUE AT “IF EMERGENCY POWER OPERATION IS
ABNORMAL” IN THIS CHECKLIST.

(Continued on next page)

88

**SMOKE OR FUMES OR FIRE
ELECTRICAL**
(Continued)

88

➤ *If Emergency power operation is abnormal:*

CABIN ALT CONTROL LEVER AUTO (UP)

EMER LTS SWITCH OFF

LOCATE AND PULL THE FOLLOWING CIRCUIT BREAKERS:

- ALTERNATE EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMER DC BUS FEED (N37).
- CHARGER AND TRANSFER RELAY (C16*).
- BATTERY RELAY (C17*).
- EMERGENCY INVERTER (C18*).

EMER PWR SWITCH OFF

BATTERY SWITCH OFF

NOTE: *APU, if running, will shut down.*

LOCATE AND PULL THE FOLLOWING CIRCUIT BREAKER:

- BATT CHARGER (LCON).

➤ *If smoke or fumes continue:*

**AT THE CAPTAIN'S DISCRETION, PULL THE BATTERY
DIRECT BUS FEED CIRCUIT BREAKER (LOCATED IN
THE E AND E COMPARTMENT, UNDER THE COCKPIT
FLOOR).**

RESET THE FOLLOWING CIRCUIT BREAKERS:

- ALTERNATE EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMER DC BUS FEED (N37).

EMER LTS SWITCH ARM

———— **END OF PROCEDURE** ————

(Continued on next page)

88

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

88

► *If smoke or fumes stop:*

RESET DC TRANSFER BUS FEED C/B (N36).

►► *If smoke or fumes reappear:*

LOCATE AND PULL DC TRANSFER BUS FEED C/B (N36).

WARNING

Fire Detection and Protection capabilities are lost.

RESET THE FOLLOWING CIRCUIT BREAKERS:

- ALTERNATE EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- EMER DC BUS FEED (N37).

EMER LTS SWITCH. ARM

——— **END OF PROCEDURE** ———

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL**

90

OXYGEN MASKS AND SMOKE GOGGLES ON, 100%
CREW COMMUNICATIONS ESTABLISH

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

NOTE: *If smoke/fumes are severe, first accomplish the smoke or fumes removal checklist.*

WARNING

Do not turn off packs in an effort to smother the fire.

CABIN ALT CONTROL LEVER. MANUAL (DOWN)

RADIO RACK SWITCH VENTURI

EMER POWER SWITCH ON/CHECK

➤ ***If Emergency power operation is normal:***

L, R, AND APU GEN SWITCHES 3 OFF

L AND R BUS TIE SWITCHES OPEN

➤ ***If smoke or fumes stop:***

➤➤ ***If nearest suitable airport is 30 minutes or less and
at Captain's discretion:***

AVOID IMC FLIGHT.

CAUTION

***Depressurize cabin prior to landing. Manual pressurization
control forces may be high. Apply force as required.***

SYSTEM STATUS

- Stab trim inoperative.
- Anti-skid/auto-brakes inoperative.
- Autospoilers inoperative.

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL**
 (Continued)

90

- For additional items refer to EMERGENCY POWER SUMMARY OF OPERATIVE EQUIPMENT in Volume 1, SP.6 Supplementary Procedures - Electrical.

➤➤➤ ***If aircraft is trimmed and flaps are 28 or 40:***

LANDING FLAPS **EXISTING
FLAP SETTING**

LANDING SPEED. **AS APPROPRIATE
FOR FLAP SETTING**

➤➤➤ ***If aircraft is out of trim or flaps are less than 28:***

LANDING FLAPS **15/EXT**

NOTE: *Do not reduce power until flare has been initiated and sink has been reduced.*

COMPUTE LANDING THRESHOLD SPEEDS.

- V_{REF} is flaps 15 speedbook minimum maneuver speed,

PLUS:

- Add knot value for adjusted takeoff weight C.G. Interpolate as necessary from table below:

STAB ANGLE	MD-90 TAKEOFF C.G.				
	0	5	10	15	20
-2	22	16	11	5	0
0	12	5	1	0	0
2	3	0	0	0	0

———— **END OF PROCEDURE** ————

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

90

►► *If nearest suitable airport is more than 30 minutes:*

R GEN OR APU GEN SWITCH ON

NOTE: For APU power, move R BUS TIE switch to AUTO.

►►► *If smoke or fumes reappear:*

L GEN OR APU GEN SWITCH ON

NOTE: For APU power, move L BUS TIE switch to AUTO.

R GEN SWITCH OFF

R BUS TIE SWITCH OPEN

EMER PWR SWITCH OFF THEN ARM

CABIN ALT CONTROL LEVER . . . AUTO (UP)

NOTE: Use Center tank fuel boost pumps as necessary.

——— END OF PROCEDURE ———

►►► *If smoke or fumes do not reappear:*

EMER PWR SWITCH OFF THEN ARM

CABIN ALT CONTROL LEVER . . . AUTO (UP)

NOTE: Use Center tank fuel boost pumps as necessary.

——— END OF PROCEDURE ———

(Continued on next page)

90	SMOKE OR FUMES OR FIRE ELECTRICAL (Continued)	90

► *If smoke or fumes continue:*

L, R, AND APU GEN SWITCHES	ON
CABIN ALT CONTROL LEVER	AUTO (UP)
EMER LTS SWITCH	OFF
EMER POWER SWITCH	OFF

WARNING

Verify First Officer's flight instruments are normal before proceeding to next step.

LOCATE AND PULL THE FOLLOWING CIRCUIT BREAKERS.

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMERGENCY DC BUS FEED (N37 or D15*).
- CHARGER & TRANS RELAY (C17*).
- BATTERY RELAY (C18*).
- EMERGENCY INVERTER (D13*).

BATTERY SWITCH	OFF

WARNING

Fire Detection and protection capabilities are lost.

NOTE: *APU, if operating, will shutdown.*

NOTE: *If emergency DC bus and/or DC transfer bus are not powered, use engine fire handle when engine shutdown is required.*

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

90

➤➤ *If smoke or fumes stop:*

RESET DC TRANSFER BUS FEED C/B (N36).

➤➤➤ *If smoke or fumes reappear:*

**LOCATE AND PULL DC TRANSFER BUS
FEED C/B (N36).**

**LOCATE AND RESET THE FOLLOWING
CIRCUIT BREAKERS:**

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- EMERGENCY DC BUS FEED (N37 or D15*).

———— END OF PROCEDURE ————

➤➤ *If smoke or fumes continue:*

**LOCATE AND PULL BATTERY DIRECT BUS FEED
C/B (D17).**

**LOCATE AND RESET THE FOLLOWING CIRCUIT
BREAKERS:**

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMERGENCY DC BUS FEED (N37 or D15*).

EMER LTS SWITCH ARM

———— END OF PROCEDURE ————

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

90

► ***If Emergency power operation is abnormal:***

CABIN ALT CONTROL LEVER AUTO (UP)
EMER LTS SWITCH OFF
EMER PWR SWITCH OFF

WARNING

Verify First Officer's flight instruments are normal before proceeding to next step.

LOCATE AND PULL THE FOLLOWING CIRCUIT BREAKERS.

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMERGENCY DC BUS FEED (N37 or D15*).
- CHARGER & TRANS RELAY (C17*).
- BATTERY RELAY (C18*).
- EMERGENCY INVERTER (D13*).

BATTERY SWITCH OFF

NOTE: APU, if running, will shut down.

NOTE: If emergency DC bus and/or DC transfer bus are not powered, use engine fire handle when engine shutdown is required.

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL**

90

(Continued):

► *If smoke or fumes stop:*

RESET DC TRANSFER BUS FEED CIRCUIT BREAKER (N36).

►► *If smoke or fumes reappear:*

LOCATE AND PULL DC TRANSFER BUS FEED C/B (N36).

LOCATE AND RESET THE FOLLOWING CIRCUIT BREAKERS:

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- EMERGENCY DC BUS FEED (N37 or D15*).

———— **END OF PROCEDURE** ————

► *If smoke or fumes continue:*

LOCATE AND PULL BATTERY DIRECT FEED BUS FEED C/B (D17).

LOCATE AND RESET THE FOLLOWING CIRCUIT BREAKERS:

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMERGENCY DC BUS FEED (N37 or D15*).

EMER LTS SWITCH ARM

———— **END OF PROCEDURE** ————

SMOKE OR FUMES REMOVAL

OXYGEN MASKS AND SMOKE GOGGLES. ON, 100%
CREW COMMUNICATIONS ESTABLISH

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

WARNING

Do not turn off packs in an effort to smother the fire.

COCKPIT DOOR (AND LOUVER PANEL) AS REQD

- Close door and louver panel to prevent smoke or fumes from penetrating into cockpit.
- Open door to ventilate if smoke or fumes are confined to cockpit.

GALLEY POWER SWITCH. OFF

➤ *If aircraft altitude is above 10,000 feet::*

PRESSURE RATE INCR KNOB MAX
CABIN PRESSURE LANDING
ALTITUDE SELECTOR. 9,500
ALL COCKPIT AIR OUTLETS. FULL OPEN
WHEN DESCENT BELOW 10,000 FEET IS COMPLETE,
ACCOMPLISH 10,000 FEET OR BELOW PROCEDURES.

➤ *If aircraft altitude is 10,000 feet or below:*

CABIN ALT CONTROL LEVER MANUAL (DOWN)
OUTFLOW VALVE OPEN

(Continued on next page)

SMOKE OR FUMES REMOVAL

(Continued)

► *If smoke or fumes are evident in cockpit:*

REDUCE AIRSPEED TO 165 KIAS.

- Flaps and slats as required.

OPEN CLEARVIEW WINDOW.

- Open either clearview window 1/3 to 2/3, after cabin has been depressurized.
- Do not open clearview window above 165 KIAS due to resultant high noise level.

CAUTION

Noise level with a window open may prevent crew from hearing landing gear warning horn.

NOTE: *Use of the SMOKE OR FUMES OR FIRE ELECTRICAL and/or SMOKE OR FUMES AIR CONDITIONING checklists may aid in identifying and eliminating the source.*

———— **END OF PROCEDURE** ————

STATIC SYSTEM FAILURE

NOTE: *Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.*

STATIC SELECTORS (ONE AT A TIME). ALTERNATE

- Select **ALTERNATE** for each system, pausing between selections to check indications of pitot/static instruments.

➤ ***If Mach/IAS, altimeter, and VSI agree:***

CONTINUE OPERATION.

- Continue flight leaving appropriate static selector in **ALTERNATE**.

➤ ***If Mach/IAS, altimeter, and VSI do not agree:***

CROSSCHECK INSTRUMENTS.

- Attempt to determine which pitot instruments are correct, considering power setting, configuration, and weight. Utilize the correct systems for continuing aircraft operation.
- During approach, the FAST/SLOW indicators may be utilized to crosscheck airspeeds, since they are independent of the pitot/static system.
- Depressurizing the aircraft prior to approach may decrease the pitot error.
- If BOTH pitot systems appear to be inoperative, refer to ODM Abnormal Section for appropriate power settings for operation without airspeed indication.

——— **END OF PROCEDURE** ———

TAILPIPE FIRE OR TORCHING

CAUTION

Tailpipe fires are not displayed in the cockpit. The first notification of a tailpipe fire may be from an external source. Discharging the engine fire extinguishing agent will not extinguish the fire. If the fire cannot be extinguished by motoring, or if motoring is not possible, the use of ground fire fighting equipment may be required.

➤ ***In the event of a fire warning system indication:***

ACCOMPLISH ENGINE FIRE OR SEVERE DAMAGE CHECKLIST.

FUEL LEVER/SWITCH OFF

➤ ***If the engine START switch is ON:***

MOTOR ENGINE.

➤ ***After fire extinguishes:***

ENGINE START SWITCH OFF

(88) ENGINE IGN SELECTOR OFF

——— **END OF PROCEDURE** ———

➤ ***If the engine START switch is OFF:***

N2 RPM AT 20% MAX

ENGINE START SWITCH (CRASH ENGAGE). ON

- Motoring will not be possible if the engine and APU have been shut down. Under these conditions, it will be necessary to extinguish the fire using ground equipment.

➤ ***After the fire extinguishes:***

ENGINE START SWITCH OFF

(88) ENGINE IGN SELECTOR OFF

——— **END OF PROCEDURE** ———

VOLCANIC ASH ENCOUNTER IN FLIGHT

AVOID FLIGHT IN AREAS OF KNOWN VOLCANIC ASH.

- Airborne weather radar cannot be relied upon to detect ash clouds.
- Indications of volcanic ash include:
 - Smoke or dust in the cockpit, acrid odor, lighted particles in the air, St. Elmo's fire around the windshield.
 - Multiple malfunctions such as engine stalls, increasing EGT, decreasing N_1 and N_2 , and engine flameout.
 - Volcanic dust may block the pitot static system and result in unreliable airspeed indications.
 - Comm difficulties may be experienced due to electrostatic conditions.

NOTE: Should volcanic dust be encountered, accomplish the following and exit immediately via the shortest route at the least practical thrust setting.

OXY MASKS ON, 100%

- Manual deployment of PAX O_2 is not recommended if cabin pressure is normal.
 - O_2 will be diluted with contaminated air.

(88) IGNITION. OVRD

(90) IGNITION. ON

AUTOTHROTTLES OFF

RETARD THROTTLES (ALTITUDE PERMITTING).

- Increases engine surge margin and limits EGT rise.

ENGINE/AIRFOIL ANTI-ICE ON

START APU (IF AVAILABLE).

- APU may be used as a backup source of electrical power.

MONITOR ENGINE PARAMETERS.

MONITOR AIRSPEED INDICATION.

(Continued on next page)

VOLCANIC ASH ENCOUNTER IN FLIGHT

(Continued)

PRECAUTIONARY LANDING AS REQD

- Avoid use of windshield wipers.
- Avoid reverse thrust to prevent engine damage, visibility restriction, and bleed air re-ingestion.

———— END OF PROCEDURE ————

VOLCANIC ASH ENCOUNTER ON GROUND

INSPECT FOR ASH DURING PREFLIGHT.

- Wash off ash deposits with water.
- Verify all inlets, scoops, and openings are free of ash.
- Inspect leading edges of aerodynamic surfaces.

BLEED AIR/AIR CONDITIONING. AS REQD

- Discontinue bleed air prior to use of thrust reverse.
- Avoid use of air conditioning if possible.
- If air conditioning is necessary with visible dust, operate at full cold setting.

LIMIT USE OF THRUST REVERSE.

- Re-ingestion of ash may further damage engine.
- Reverser use may reduce visibility.

USE CAUTION DURING TAXI PROCEDURES.

- Maintain greater than normal separation from other aircraft.
- Taxi at low speed with all engines and minimum thrust.
- Limit braking if possible, but be aware the ash may reduce tire adhesion and, if wet, will reduce braking efficiency.

———— END OF PROCEDURE ————

Non-Normal Checklists

Chapter NNC

**Airplane General, Emergency Equipment,
Doors, Windows**

Section 1

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DOOR MESSAGE ILLUMINATES	NNC.1.2
LOCK FAIL	NNC.1.3
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AFT PASSENGER STAIRWAY MANUAL OPERATION

➤ *To lower or raise the aft stairs from inside:*

NOTE: Pressurizing the right hydraulic system may aid in lowering the aft stairs, but is not necessary.

OPEN AFT PRESSURE BULKHEAD DOOR.

➤ *To lower stairs if catwalk is not down from ceiling:* **LOWER CATWALK.**

OPERATE LATCH MECHANISM.

- Proceed to aft end of catwalk. Latch is at aft end of catwalk on Captain's side of aircraft. Latch can be identified by reflective tape.
- Cable guide might need to be moved aside.
- Push latch mechanism forward. Hold until stairs are fully extended.

RAISE CATWALK.

➤ *To raise stairs if catwalk is not down from ceiling:* **LOWER CATWALK.**

PRESSURIZE RIGHT HYDRAULIC SYSTEM.

OPERATE LATCH MECHANISM.

- Latch is at aft end of catwalk on Captain's side of aircraft, marked with reflective tape.
- Cable guide might need to be moved aside.
- Push latch mechanism aft. Hold until stairs are fully retracted.

———— **END OF PROCEDURE** ————



DOOR MESSAGE ILLUMINATES

NOTE: All cargo/accessory compartment doors are of the plug type.

NOTE: Do not abort takeoff if a cargo/accessory compartment door message illuminates after takeoff roll is started.

CHECK PRESSURIZATION.

➤ *If pressurization is normal:*

CHECK CABIN ALTITUDE.

- Verify cabin altitude can be maintained within limits.

➤ *If pressurization remains normal:*

CONTINUE FLIGHT.

- Periodically check that pressurization remains normal.

➤ *If pressurization is not normal:*

CHECK CABIN ALTITUDE.

➤ *If cabin altitude cannot be maintained below 10,000 feet:* CONSIDER LANDING AT NEAREST SUITABLE AIRPORT.

OR

CONTINUE FLIGHT AT OR BELOW 10,000 FEET.

———— END OF PROCEDURE ————

LOCK FAIL

LOCK FAIL

NOTE: The red LOCK FAIL light remains illuminated when the door locking solenoid is retracted either because of a solenoid or keypad failure.

➤ **If the LOCK FAIL light remains illuminated:**

PULL RAS KEYPAD CIRCUIT BREAKER (P-24) AND RAS CONTROL CIRCUIT BREAKER (R-34).

- Removing power from the system will silence the aural alert.

DEADBOLT LOCK LOCKED, KEY INOPERABLE

NOTE: The deadbolt position allowing access with a key is to be used on the ground only.

NOTE: A second crew member is required to secure the flight deck door deadbolt when a pilot leaves the flight deck. Reference FOM for flight deck entry/exit procedures.

———— **END OF PROCEDURE** ————



TAILCONE UNSAFE MESSAGE

NOTE: If notified prior to dispatch of a *TORN/MISSING TAILCONE MECHANICAL RELEASE* placard (located above rear passenger door), contact Maintenance for disposition.

Illumination of the TAILCONE UNSAFE message indicates the latching mechanism for the tailcone has been compromised.

➤ **If on the ground:**

REFER TO M.E.L.

➤ **If in flight:**

DETERMINE GEOGRAPHIC POSITION.

➤ **If time permits:**

INSPECT TAILCONE.

- Attempt to determine status of tailcone through aft entrance door viewing port. Emergency lighting may be used to illuminate the tailcone area.

CONTINUE FLIGHT.

- Airloads at speeds greater than 90 KIAS will keep tailcone on aircraft. If latches are compromised, tailcone may detach on landing roll.
- Advise tower of possible jettison.

———— **END OF PROCEDURE** ————

Non-Normal Checklists
Air Systems

Chapter NNC
Section 2

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Intentionally
Blank

AIR COND TEMP HIGH

L or R AIR COND TEMP HIGH

If airfoil anti-ice is in use, it is not necessary to turn it off.

NOTE: *If both messages illuminate, close the crossfeed associated with the first message annunciated. Wait approximately 1 minute before switching crossfeed valve positions, if necessary.*

PNEUMATIC X FEED VALVE CLOSE

- With airfoil anti-ice **ON** and **CL** power selected, the EPR limit displays dashes and the **NO MODE** light will illuminate.

AIR CONDITIONING SUPPLY SWITCH HP BLEED OFF

► ***If AIR COND TEMP HI message remains illuminated for more than one minute:***

MONITOR A/C PRESSURE (88) / FLOW (90) GAUGE.

► ***If pressure (88)/flow (90) is normal:***
CONTINUE FLIGHT.

- In established configuration.
- When below FL 300, attempt to restore automatic operation. If **AUTO** operation cannot be restored to at least one pack, it may be necessary to advance throttle(s) to maintain normal cabin pressure.

► ***If pressure/flow goes to (88) zero; (90) LO:***

RADIO RACK SWITCH FAN

AIR CONDITIONING SUPPLY SWITCH OFF

- If this is the only functioning pack, an immediate descent to below 10,000 feet should be considered.
- Aircraft flight altitude may be maintained provided cabin altitude can be maintained below 10,000 feet.

(Continued on next page)

AIR COND TEMP HIGH **(Continued)**

➤ ***If AIR COND TEMP HI message extinguishes within one minute:***

CONTINUE FLIGHT.

- In established configuration.
- When below FL 300, attempt to restore automatic operation. If **AUTO** operation cannot be restored to at least one pack, it may be necessary to advance throttle(s) to maintain normal cabin pressure.

———— **END OF PROCEDURE** ————

AUTO PRESSURIZATION INOP / MANUAL PRESSURIZATION

NOTE: After a single pressurization controller fails, the blue **INOP** light illuminates and the system automatically switches to the operative controller. When both controllers have failed, the amber **AUTO INOP** light illuminates. If this occurs and automatic pressurization cannot be restored through the switch, continue with the following procedure.

► **Manual pressurization:**

CABIN ALT CONTROL LEVER MANUAL

- Push CABIN ALT control lever down to **MANUAL**.
- Be prepared to hold the control wheel firmly as high control forces may be encountered with maximum cabin differential pressure.
- Adjust to desired rate of climb/descent using control wheel. Forward rotation (descends cabin) increases differential; rearward rotation (climbs cabin) decreases differential.
- Maximum recommended cabin rates of climb/descent for passenger comfort are 500 fpm climb and 300 fpm descent.

CONTROL CABIN ALTITUDE.

- Takeoff.
 - As soon as practical after rotation, move the control wheel forward so that the indicator is moved forward one-third from the full **OPEN** position.
 - Adjust wheel to maintain desired rate of climb (approximately 500 fpm) until desired cabin altitude is achieved.
- Cruise.
 - Maintain desired cabin altitude (reference cockpit pressurization placard) by adjusting the control wheel.

(Continued on next page)

**AUTO PRESSURIZATION INOP /
MANUAL PRESSURIZATION**
(Continued)

- Descent.
 - As power is reduced, move the control wheel forward (toward **CLOSED**) to compensate for bleed airflow reduction.
 - After descent power is stabilized, adjust the control wheel to obtain the desired rate of descent.
 - Be prepared to make adjustments during engine power changes.
 - When cabin altitude is equal to 2,000 feet AFE, adjust cabin descent rate to zero.
 - When aircraft altitude equals cabin altitude, (approximately 2,000 feet) slowly move the control wheel to the full **OPEN** position to ensure cabin is unpressurized for landing.

———— **END OF PROCEDURE** ————

DUAL AIR CONDITIONING SYSTEM FAILURE DURING OR IMMEDIATELY AFTER TAKEOFF

Failure of both air conditioning systems during or immediately after takeoff with cabin differential pressure less than 1.3 psi where a thermal shut-down is not suspected indicates failure of the automatic shutoff system.

**AFTER TAKEOFF AND ABOVE 400' AFE OR OBSTACLE
CLEARANCE ALTITUDE, WHICHEVER IS HIGHER:**

AIR CONDITIONING SHUTOFF SWITCH OVRD

► ***If both packs are restored:***

CONTINUE FLIGHT WITH SWITCH IN OVRD.

► ***If both packs are not restored:***

**REFER TO LOSS OF AIR CONDITIONING PACK OR
UNPRESSURIZED OPERATION PROCEDURES.**

——— END OF PROCEDURE ———

EMERGENCY DESCENT

ESTABLISH COMMUNICATIONS.

AUTOPILOT / AUTOTHROTTLES AS DESIRED

THROTTLES IDLE

EXTEND SPEEDBRAKES.

BEGIN DESCENT.

CAUTION

The normal speed profiles (Mach .80-.82/320-340 KIAS) are based upon loss of pressurization associated with no loss in structural integrity. Known failures that would affect structural integrity and/or turbulence might dictate other speed profiles. Descent not to exceed 10 degrees pitch or 30 degrees bank.

——— END OF PROCEDURE ———

FLOW LIGHT

CHECK AIR CONDITIONING SUPPLY SWITCHES IN AUTO.

RADIO RACK SWITCH FAN

► ***If throttles are retarded and conditions permit:***

ADVANCE THROTTLES.

- Advance throttles until air conditioning (88) pack supply pressure or (90) pack air flow ceases to rise.
 - (88) Approximately 21 psi.
 - (90) Approximately 2:30 position.

► ***If FLOW light remains illuminated:***

CHECK CABIN RATE OF CLIMB.

► ***If unable to maintain cabin pressurization:***

DESCEND AIRCRAFT.

- Descend to an altitude where normal pressurization can be maintained.

——— **END OF PROCEDURE** ———

JAMMED CABIN PRESSURE CONTROLLER

Attempt to gain manual control of the pressurization system by performing the AUTO PRESSURIZATION INOP/MANUAL PRESSURIZATION procedure this section. If unsuccessful, accomplish the following procedure:

RADIO RACK SWITCH FAN
NO SMOKING / CHIME SWITCH ON
INITIATE DESCENT.

AIR CONDITIONING SUPPLY SWITCH (ONE). OFF

- Maintain comfortable cabin descent rate by varying throttle on side of operating air conditioning system.
- Descend to below 10,000 feet.

REMAINING AIR CONDITIONING SUPPLY SWITCH OFF

- Approximately 2000 feet above destination altitude, turn remaining AIR CONDITIONING SUPPLY switch **OFF** to allow cabin and aircraft altitude to equalize.

➤ ***When cabin altitude and aircraft altitude are equal:***

RAM AIR SWITCH ON

➤ ***After landing:***

OPEN CLEAR VIEW WINDOW(S).

- If air conditioning system will be used after landing to prevent pressurizing aircraft.

AIR CONDITIONING SUPPLY SWITCH AS DESIRED

- Do not close clear view window with air conditioning system operating.

——— END OF PROCEDURE ———

LOSS OF AIR CONDITIONING PACK / SUPPLY PRESSURE (88) OR FLOW (90) DROPS TO ZERO

AIR CONDITIONING SUPPLY SWITCH OFF

NOTE: Selecting **OFF** will allow pack temperatures to decrease to normal values to allow reinstating the system. Allow sufficient time for cooling.

➤ ***If applicable temp control valve indicator indicates in HOT range:***

ROTATE TEMP SELECTOR TOWARD COLD.

APPLICABLE AIR CONDITIONING
SUPPLY SWITCH. AUTO

➤ ***If applicable temp control valve indicator indicates in COLD range:***

ROTATE TEMP SELECTOR TOWARD HOT.

APPLICABLE AIR CONDITIONING
SUPPLY SWITCH. AUTO

➤ ***If pressure/flow remains at zero:***

SYSTEM STATUS:

- Pack is inoperative.

➤ ***If pressure/flow is increasing:***

TEMPERATURE SELECTOR AS DESIRED

➤ ***If duct temperature increases:***

OPERATE TEMP SELECTOR IN MANUAL CONTROL.

➤ ***If affected air conditioning pack does not operate:***

MONITOR CABIN ALTITUDE.

- Aircraft may maintain flight altitude provided cabin altitude can be maintained below 10,000 feet.

——— END OF PROCEDURE ———

**PASSENGER MASKS DOORS
FAIL TO OPEN**

ACTUATE MANUAL DOOR RELEASE.

- A manual release is available through a small hole in the compartment door.
 - Pushing a small rod into the hole will contact and trip the latch, allowing the door to fall open.

———— **END OF PROCEDURE** ————

90

PNEU SYSTEM FAULT

90

L or R PNEU SYSTEM FAULT

PNEUMATIC X FEED VALVE

(AFFECTED SIDE) CLOSE

AIR CONDITIONING SUPPLY SWITCH

(AFFECTED SIDE) OFF

NOTE: *When both pneumatic crossfeed valves are open, an overpressure fault on one side may result in display of both L and R PNEU SYSTEM FAULT messages. Closing either crossfeed valve will isolate source of fault. PNEU SYSTEM FAULT message on fault side will remain displayed.*

———— **END OF PROCEDURE** ————

RADIO FAN OFF

RADIO FAN OFF

► ***In flight:***

RADIO RACK SWITCH. VENTURI

- If unable to maintain pressurization, return RADIO RACK switch to **FAN**.

► ***After parking:***

ELECTRICAL POWER AS REQD

- Prolonged use of electrical systems for ground operations will cause overheating of radio and electrical equipment.

——— **END OF PROCEDURE** ———

**RAPID DECOMPRESSION /
CABIN ALTITUDE WARNING**

OXYGEN MASKS ON, 100%
CREW COMMUNICATIONS ESTABLISH

NOTE: *If unable to establish immediate communications with ATC and descent is begun without clearance, squawk 7700.*

CABIN ALT CONT LEVER MANUAL
CABIN ALT CONT WHEEL
(OUTFLOW VALVE). FULL FORWARD
PNEUMATIC X FEED VALVES. CLOSED

➤ ***If cabin altitude exceeds 14,000 feet:***

DEPLOY PASSENGER OXYGEN MASKS.

➤ ***If cabin pressure uncontrollable:***

INITIATE EMERGENCY DESCENT (THIS SECTION).

➤ ***If cabin pressure controllable:***

CABIN ALT CONT LEVER AS REQD

———— **END OF PROCEDURE** ————

SINGLE PNEUMATIC SOURCE DESCENT

RADIO RACK SWITCH FAN

► ***If BOTH air conditioning systems are operable:***

PNEUMATIC X FEED VALVES (BOTH) OPEN

► ***If ONE air conditioning system is operable:***

ADVANCE THROTTLE.

- Advance throttle slowly on engine supplying pneumatic pressure until pack supply pressure/flow ceases to rise.
 - (88) Approximately 21 psi.
 - (90) Approximately 2:30 position.

SPEEDBRAKES AS REQD

——— **END OF PROCEDURE** ———

SMOKE OR FUMES AIR CONDITIONING

OXYGEN MASKS AND SMOKE GOGGLES ON, 100%
CREW COMMUNICATIONS ESTABLISH

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

NOTE: *If smoke/fumes are severe, first accomplish the SMOKE OR FUMES REMOVAL checklist.*

WARNING

Do not turn off packs in an effort to smother the fire.

➤ ***If smoke or fumes are present in the cockpit:***

COCKPIT DOOR AS REQD

- Open door to ventilate if smoke or fumes confined to cockpit.

LEFT AIR CONDITIONING SUPPLY SWITCH OFF

RADIO RACK SWITCH VENTURI

➤ ***If smoke or fumes continue:***

**LEFT AIR CONDITIONING
SUPPLY SWITCH. AUTO**

**RIGHT AIR CONDITIONING
SUPPLY SWITCH. OFF**

**LOCATE AND PULL RECIRCULATING FAN CONTROL
C/B (J7).**

NOTE: *Use of the SMOKE OR FUMES OR FIRE
ELECTRICAL checklist may aid in identifying and eliminating
the source.*

———— END OF PROCEDURE ————

(Continued on next page)

SMOKE OR FUMES AIR CONDITIONING
(Continued)

➤ *If smoke or fumes are confined to passenger cabins:*

COCKPIT DOOR (AND LOUVER PANEL). CLOSED

- Prevents smoke or fumes from penetrating into cockpit.

LOCATE AND PULL RECIRCULATING FAN CONTROL C/B (J7).

➤ *If smoke or fumes continue:*

RIGHT AIR CONDITIONING

SUPPLY SWITCH OFF

NOTE: Use of the *SMOKE OR FUMES OR FIRE ELECTRICAL* checklist may aid in identifying and eliminating the source.

——— **END OF PROCEDURE** ———

88

TAIL COMP TEMP HIGH

88

NOTE: The right pack should be operated during hot ramp conditions. The right pack heat exchanger draws air from the tail compartment. This reduces the likelihood of **TAIL COMP TEMP HIGH** light.

PNEUMATIC X FEED VALVES CLOSE

AIRFOIL ICE PROTECTION OFF

AIR CONDITIONING SUPPLY SWITCHES
. HP BLEED OFF

CHECK **TAIL COMP TEMP HIGH LIGHT.**

➤ ***If light extinguishes (within two minutes):***

AVOID ICING CONDITIONS.

➤ ***If icing is unavoidable:***

PLAN FLAPS 28 LANDING.

**INCREASE NORMAL MANEUVERING AND APPROACH
SPEEDS BY 5 KIAS.**

———— END OF PROCEDURE ———

➤ ***If light remains illuminated:***

AUTOTHROTTLES OFF

LEFT ENGINE. IDLE

RIGHT AIR CONDITIONING SUPPLY SWITCH AUTO

LEFT AIR CONDITIONING SUPPLY SWITCH OFF

(Continued on next page)

88

TAIL COMP TEMP HIGH
(Continued)

88

► ***If light extinguishes:***

ATTEMPT TO RESTORE LEFT ENGINE THRUST.

- If the light illuminates while restoring thrust, continue engine operation at a reduced thrust necessary to keep light extinguished.
- Maintain fuel balance.

AIRFOIL ICE PROTECTION AS REQD

- Airfoil ice protection from the opposite side may be restored if the side causing the warning is determined.

——— **END OF PROCEDURE** ———

► ***If light remains illuminated:***

RESTORE LEFT ENGINE THRUST.

RIGHT ENGINE. IDLE

LEFT AIR CONDITIONING SUPPLY SWITCH. AUTO

RIGHT AIR CONDITIONING SUPPLY SWITCH OFF

► ***If light extinguishes:***

ATTEMPT TO RESTORE RIGHT ENGINE THRUST.

- If the light illuminates while restoring thrust, continue engine operation at a reduced thrust necessary to keep light extinguished.
- Maintain fuel balance.

AIRFOIL ICE PROTECTION AS REQD

- Airfoil ice protection from the opposite side may be restored if the side causing the warning is determined.

——— **END OF PROCEDURE** ———

(Continued on next page)

88

TAIL COMP TEMP HIGH
(Continued)

88

➤ ***If light remains illuminated:***

RESTORE RIGHT ENGINE THRUST.

LAND AT NEAREST SUITABLE AIRPORT.

AIR CONDITIONING SUPPLY SWITCHES. HP BLEED OFF

AVOID ICING CONDITIONS.

➤ ***If icing is unavoidable:***

PLAN FLAPS 28 LANDING.

INCREASE NORMAL MANEUVERING AND APPROACH SPEEDS BY 5 KIAS.

———— END OF PROCEDURE ————

90

TAIL TEMP FAULT

90

L or R TAIL TEMP FAULT

➤ ***If on ground:***

CONTACT MAINTENANCE.

► ***If in flight:***

NO ACTION REQUIRED.

———— END OF PROCEDURE ————

90

NOTE: If both **TAIL TEMP HIGH** lights are illuminated, assume that the **affected side** is the **TAIL TEMP HIGH** light that illuminated first and/or the side with the LO air conditioning flow indication.

PNEUMATIC X FEED VALVE (AFFECTED SIDE)
 CLOSE

AIR CONDITIONING SUPPLY SWITCH (AFFECTED SIDE) OFF

CHECK TAIL TEMP HIGH LIGHTS AFTER TWO MINUTES.

➤ **If both TAIL TEMP HIGH lights remain illuminated:**

LAND AT NEAREST SUITABLE AIRPORT.

———— **END OF PROCEDURE** ————

➤ **If one TAIL TEMP HIGH light remains illuminated:**

PNEUMATIC X FEED VALVE (OPPOSITE SIDE)
. CLOSED

AIRFOIL ICE PROTECTION OFF

- Minimize time in icing conditions.
- With both X feeds closed, affected side is effectively isolated. However, tail compartment temp may take 20 minutes to cool down to a level that will extinguish the **TAIL TEMP HIGH** light.
- Continue operation in established configuration.

———— END OF PROCEDURE ————

(Continued on next page)

90

TAIL TEMP HIGH
(Continued)

90

➤ **If TAIL TEMP HIGH light(s) extinguished:**

CONTINUE OPERATION IN ESTABLISHED CONFIGURATION

——— END OF PROCEDURE ———

UNPRESSURIZED OPERATION

**PULL CABIN PRESSURE CONTROL CB'S (4)
(J2, H2, U22, W22).**

- At altitudes above 9,500 feet, cabin altitude warnings may occur.
- Limit altitude to 10,000 feet or below.
- Plan altitude changes with consideration of passenger comfort.

CABIN ALTITUDE CONTROL LEVER MANUAL (DOWN)

OPEN OUTFLOW VALVE.

- Move outflow valve open to full decrease (aft) position and lock.

➤ **If air conditioning packs are available:**

AIR CONDITIONING PACK(S) AS DESIRED

➤ **If NO air conditioning packs are available:**

RAM AIR SWITCH ON

——— END OF PROCEDURE ———

Non-Normal Checklists
Anti-Ice, Rain

Chapter NNC
Section 3

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AIRFL ICE PRESS ABNML, AIRFOIL ANTI-ICE SWITCH OFF

AIRFL ICE PRESS ABNML

- *If AIRFOIL ANTI-ICE switch has been OFF less than 2 1/2 minutes:*

PNEUMATIC X FEEDS. OPEN

- Allow tail de-ice cycle to complete.

CHECK PNEUMATIC PRESSURE.

- Advance throttles to ensure greater than 22 psi.

- *If AIRFOIL ANTI-ICE switch has been OFF more than 2 1/2 minutes:*

PNEUMATIC X FEEDS. CLOSE

CAUTION

Do not open either pneumatic crossfeed valve. DO NOT turn APU AIR switch ON.

——— END OF PROCEDURE ———

AIRFL ICE PRESS ABNML, AIRFOIL ANTI-ICE SWITCH ON

AIRFL ICE PRESS ABNML

CHECK PNEUMATIC X FEEDS OPEN.

CHECK PNEUMATIC PRESSURE.

- Advance throttles to ensure greater than 22 psi.

CHECK / RESET SUPPLY AIR PRESS REG CB (N21), IF TRIPPED.

CHECK / RESET WING / TAIL DE-ICE VALVES CB (M24), IF TRIPPED.

CHECK AIRFL ICE PRESS ABNML MESSAGE.

➤ ***If message is extinguished:***

CONTINUE OPERATION.

➤ ***If message remains illuminated:***

AVOID ICING CONDITIONS.

PUSH TAIL DE-ICE BUTTON.

CHECK AIRFL ICE PRESS ABNML MESSAGE.

➤ ***If message extinguishes:***

COMPLETE TAIL DE-ICE CYCLE.

SYSTEM STATUS:

- Consider airfoil anti-ice inoperative.
- Tail de-ice is available if icing is encountered.

➤➤ ***If tail deice is no longer required:***

AIRFOIL ANTI-ICE SWITCH. OFF

PNEUMATIC X FEEDS. CLOSE

- Close crossfeeds after completion of tail cycle.

(Continued on next page)

**AIRFL ICE PRESS ABNML,
AIRFOIL ANTI-ICE SWITCH ON
(Continued)**

➤ *If message remains illuminated:*

AIRFOIL ANTI-ICE SWITCH. OFF

PNEUMATIC X FEEDS. CLOSE

LANDING FLAPS MAX 28

- If icing is encountered, increase maneuvering and flare speeds by 5 knots.

——— END OF PROCEDURE ———

AIRFOIL ANTI-ICE ON WING ANTI-ICE LIGHT EXTINGUISHED

CHECK / RESET AIRFOIL ADVISORY CB (M21), IF TRIPPED.

PNEUMATIC X FEED VALVES CLOSE

CHECK AIRFL ICE PRESS ABNML MESSAGE.

➤ ***If AIRFL ICE PRESS ABNML message is extinguished:***

AIRFOIL ICE PROTECTION SWITCH OFF

- Leave pneumatic X feed valves closed.

AVOID ICING CONDITIONS.

➤ ***If unavoidable icing is encountered:***

**INCREASE ALL MANEUVERING, APPROACH AND
FLARE SPEEDS 5 KNOTS.**

DO NOT EXTEND LANDING FLAPS BEYOND 28.

➤ ***If AIRFL ICE PRESS ABNML message illuminates:***

PNEUMATIC X FEED VALVES OPEN

CHECK AIRFL ICE PRESS ABNML MESSAGE.

- Light should extinguish within one (1) minute.

➤ ***If AIRFL ICE PRESS ABNML message extinguishes:***

CHECK WING LEADING EDGE.

- **WING ANTI-ICE ON** light is malfunctioning.
- Visually check wing leading edge for proper operation of airfoil anti-ice system.

(Continued on next page)

**AIRFOIL ANTI-ICE ON
WING ANTI-ICE LIGHT EXTINGUISHED
(Continued)**

- *If AIRFL ICE PRESS ABNML message remains illuminated:*
AIRFOIL ICE PROTECTION SWITCH OFF
PNEUMATIC X FEED VALVES CLOSE
AVOID ICING CONDITIONS.

➤➤➤ *If unavoidable icing is encountered:*
INCREASE ALL MANEUVERING, APPROACH
AND FLARE SPEEDS 5 KNOTS.

DO NOT EXTEND LANDING FLAPS BEYOND
28.

——— END OF PROCEDURE ———

April 01, 2004

ANTI-ICE SUPPLY HIGH

ANTI-ICE SUPPLY HIGH

MODULATE BOTH PNEUMATIC X FEED LEVERS.

- Modulate pneumatic crossfeed levers toward **CLOSE** to extinguish ANTI-ICE SUPPLY HIGH message (approximately 25 psi on PNEUMATIC PRESSURE indicator).
- Adjust pneumatic X feed levers to maintain desired pressure when power, speed, or altitude is changed.

———— END OF PROCEDURE ———

CABIN PRESSURIZATION SURGES WHEN AIRFOIL ANTI-ICE ACTUATED

AIRFOIL ANTI-ICE SWITCH OFF

PNEUMATIC X FEED VALVES CLOSE

AVOID ICING CONDITIONS.

➤ *If unavoidable icing is encountered:*

INCREASE ALL MANEUVERING, APPROACH, AND FLARE
SPEEDS 5 KNOTS.

DO NOT EXTEND LANDING FLAPS BEYOND 28.

———— END OF PROCEDURE ———

90

DRAIN MAST HEAT

90

DRAIN MAST HEAT

ADVISE CABIN CREW NOT TO USE FORWARD GALLEY OR LAVATORY SINK DRAINS IF FWD DRAIN MAST HEATER CIRCUIT BREAKER (X-27) IS TRIPPED, OR IF INOPERATIVE DRAIN MAST HEATER CANNOT BE DETERMINED.

———— END OF PROCEDURE ———

ENG VALVE

L or R ENG VALVE

Illumination of this message indicates one or more anti-ice valves is not in agreement with the ENGINE ANTI-ICE switch. If the problem cannot be corrected, depart icing area as soon as possible. Maintain engine operation at desired thrust level while minimizing throttle movement until clear of icing area.

CHECK / RESET ENGINE ANTI-ICING VALVE CB'S, IF TRIPPED.

- Left engine.
 - (88) K30, 31, 32.
 - (90) S33.
- Right engine.
 - (88) L30, 31, 32.
 - (90) T33.

———— END OF PROCEDURE ————

90

**ICE FOD ALERT / ICE FOD DETECT
INOP**

90

L or R ICE FOD ALERT or L or R ICE FOD SYS FAIL

➤ *On the ground:*

**INSPECT UPPER WING SURFACE FOR ICE.
HAVE AIRCRAFT DE-ICED IF NECESSARY.**

———— END OF PROCEDURE ————

ICE PROT TEMP HIGH

L or R ICE PROT TEMP HIGH

NOTE: If both messages illuminate, close the crossfeed associated with the first message annunciated. (The message located on the top left screen of the O.A.P. will have been the first to illuminate). Wait approximately 1 minute before switching X feed valve positions, if necessary.

PNEUMATIC X FEED VALVE. CLOSE

——— END OF PROCEDURE ———

ICE PROT TEMP LOW

L or R ICE PROT TEMP LOW

CHECK PNEUMATIC X FEED VALVE OPEN.

➤ *If at low engine power.*

INCREASE ENGINE THRUST.

(88) CHECK / RESET ICE PROTECTION AUGMENTATION VALVE CB (LEFT M23, RIGHT N23), IF TRIPPED.

(90) CHECK / RESET WING AND TAIL VALVES CB (M24), IF TRIPPED.

➤ *If unable to correct low temperature:*

PNEUMATIC X FEED VALVE CLOSE

——— END OF PROCEDURE ———

OVERWING HEATER SYSTEM FAIL L OR R FAIL

OVERWING HEATER SWITCH. OFF

USE ALTERNATE FUEL BURN SCHEDULE.

——— END OF PROCEDURE ———

PITOT HEAT INOP OR PITOT/STALL HEAT OFF

PITOT/STALL HEAT OFF

CHECK PITOT HEAT CURRENT.

- Check pitot heat current in all positions.

➤ If current does not indicate in any position:

CHECK/RESET CIRCUIT BREAKERS, IF TRIPPED.

- Captain - emergency DC bus.
 - (88) (C12*.)
 - (90) (C13*)
- Aux (M28).
- F/O (N28).
- Angle of attack/vane heater (X22, Z22).
- Rudder Q limiter (Z30).

➤ If PITOT/STALL HEAT OFF message extinguishes:

CONTINUE NORMAL OPERATIONS.

➤ If PITOT/STALL HEAT OFF message remains illuminated:

MONITOR AFFECTED INSTRUMENTS/SYSTEMS.

- Airspeed and Mach may be restored by moving CADC selector to **BOTH ON 1** or **BOTH ON 2** as appropriate.

AVOID ICING CONDITIONS, IF POSSIBLE.

➤ If both airspeed indicators are inoperative:

REFER TO OPERATIONS DATA MANUAL (ODM) ABNORMAL SECTION.

———— END OF PROCEDURE ————

SEVERE RAIN / ICE / TURBULENCE

NOTE: Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.

(88) IGNITION SWITCH BOTH

(90) IGNITION SWITCH ON

PNEU X-FEED VALVE LEVERS OPEN

ENG AND AIR FOIL ANTI-ICE SWITCHES AS REQUIRED

NOTE: Engine and air foil anti-ice systems should be off if RAT is above 10°C or icing will not be encountered or is not anticipated. Reduced engine bleeds will increase engine flameout margin during periods of heavy water ingestion.

APU START

► **If in Severe Turbulence only:**

AIRSPEED MAINTAIN 280 KIAS

- During extreme turbulence, fly attitude indicator as primary pitch reference. Sacrifice altitude to maintain attitude. Descend if necessary to improve buffet margin.

ENG SYNC SELECTOR OFF

AIRSPEED MONITOR

NOTE: Recommended turbulence airspeed is 275 to 285 KIAS or .75M to .79M (whichever is lower). At 10,000 feet and below, minimum recommended speed is 250 KIAS or minimum maneuvering (whichever is greater). Do not fly less than minimum maneuvering speed for existing configuration.

AUTOTHROTTLES AS REQD

- Disconnect autothrottles to avoid throttle burst, if necessary.

THROTTLES SET

NOTE: Use speed brakes to slow airplane. Adjust throttles only as necessary to avoid excessive airspeed variations. Use smooth power changes and maintain thrust as high as practicable. Do not chase airspeed.

(Continued on next page)

SEVERE RAIN / ICE / TURBULENCE (Continued)

NOTE: If throttles are at idle when extreme precipitation is encountered, N2 should be monitored for spool-down below idle RPM. Delay throttle advance as long as possible and, when necessary, very slowly advance one throttle at a time while monitoring N2 for response. If no response is noted, return throttle to idle and wait for indications of spool-up to idle RPM.

NOTE: During an unavoidable encounter of exceptionally severe icing conditions (those that occur on an infrequent basis), it is desirable to maintain a minimum of (88) 70% N1; (90) 60% N1.

NOTE: Left and right windshields consist of primary and secondary de-ice areas. Under severe icing conditions, secondary de-ice areas may not completely de-ice. Due to geometry of these windshields, heat flow to secondary de-ice area is not adequate to remove ice.

NOTE: Increased engine vibration during low thrust operation in severe icing conditions, with or without engine anti-ice, may be due to fan blade icing. This is especially suspect if more than one engine experiences higher than normal vibration levels. If fan blade icing is suspected, verify IGNITION is on. If engine anti-ice is off, reduce thrust (one engine at a time) to idle and turn on engine anti-ice. Accelerate affected engine to (88) 70% N1; (90) 60% N1 while closely monitoring engine instruments (especially EGT) for any abnormalities. If vibration decreases (indicating ice removal), resume normal operation for existing conditions. If vibration does not decrease after 1 minute, consider engine shutdown.

———— **END OF PROCEDURE** ————

**TAIL DE-ICE LIGHT DOES NOT ILLUMINATE
OR EXTINGUISHES PRIOR TO NORMAL
TAIL DE-ICE CYCLE COMPLETION**

**CHECK / RESET TAIL DE-ICE TIMER CB (N31), IF TRIPPED.
PUSH / HOLD TAIL DE-ICE BUTTON.**

➤ ***While button is being held:***

CHECK TAIL DE-ICE ON LIGHT.

➤ ***If light is illuminated:***

SYSTEM STATUS:

- Tail de-ice timer inoperative.

➤➤ ***When tail de-ice is required and immediately prior to system shutdown:***

PUSH / HOLD TAIL DE-ICE BUTTON.

- Hold tail de-ice button **IN** for approximately 2 1/2 minutes.

➤ ***If light does not illuminate:***

SYSTEM STATUS:

- Tail de-ice is inoperative.

AVOID ICING CONDITIONS.

➤➤ ***If unable to avoid icing conditions:***

**INCREASE ALL MINIMUM MANEUVERING,
APPROACH, AND FLARE SPEEDS BY 5 KIAS.**

DO NOT EXTEND FLAPS BEYOND 28.

——— **END OF PROCEDURE** ———

TAIL DE-ICE LIGHT ON CONTINUOUSLY

Illumination of this light indicates a stuck timer.

NOTE: (90) With airfoil ice selected, moving the flaps to 40 will activate both wing and tail anti-ice simultaneously, and the **WING ANTI-ICE ON** and **TAIL DE-ICE ON** lights will illuminate until the aircraft is on the ground or flaps are repositioned to less than 40.

PULL WING AND TAIL VALVE CB (M24).

- AIRFL ICE PRESS ABNML message illuminates.
- **WING ANTI-ICE ON** light will not illuminate, but the wing valve opens and the tail valve closes.

CHECK WING LEADING EDGE.

- Visually check wing leading edge for proper operation of airfoil anti-ice system.

► If tail de-icing is required:

RESET THEN PULL WING AND TAIL VALVE CB (M24).

- Reset CB for normal tail cycle time and then pull (to simulate de-ice cycle).

———— **END OF PROCEDURE** ————

90

WINDSHIELD HEAT BEEPING / BUZZ

90

NOTE: *This noise has been verified to not be a safety hazard as long as there is no interference with routine crew duties.*

► ***If time and duties permit:***

PULL THE FOLLOWING WINDSHIELD HEAT CIRCUIT BREAKERS, ONE AT A TIME, WHILE LISTENING FOR THE BUZZ TO DIMINISH:

- Windshield anti-ice, left (X24).
- Windshield anti-ice, center (X25).
- Windshield anti-ice, right (Z24).

► ***If time and duties do not permit:***

WINDSHIELD HEAT SWITCH OFF

- Turn off windshield heat and observe windshield heat inoperative speed limitations.
 - Below 10,000 feet MSL: 315 KIAS
 - Above 10,000 feet MSL: no restrictions.

———— **END OF PROCEDURE** ————

WINDSHIELD OVERTEMP / CRACKED WINDSHIELD/ WINDSHIELD HEAT INOPERATIVE

WINDSHIELD OVERTEMP

CAUTION

Below 10,000 feet, do not exceed 315 KIAS if the windshield anti-ice is inoperative or if the outer glass ply is cracked. Do not exceed 235 KIAS below 10,000 feet if the inner windshield ply is cracked.

➤ If windshield is cracked:

WINDSHIELD ANTI-ICE/ANTI-FOG SWITCHES. OFF

➤ If inner glass ply is cracked:

PULL AFFECTED WINDOW ANTI-FOG CB

- Capt., F/O, Center (X26).
- Clearview and eyebrow (Z26).

PULL AFFECTED WINDSHIELD ANTI-ICE CB

- Left (X24).
- Center (X25).
- Right (Z24).

WINDSHIELD ANTI-ICE AND

ANTI-FOG SWITCHES AS REQD

DO NOT EXCEED 235 KIAS BELOW 10,000 FEET MSL.

————— END OF PROCEDURE —————

➤ If inner glass ply is not cracked:

PULL AFFECTED WINDSHIELD ANTI-ICE CB

- Left (X24).
- Center (X25).
- Right (Z24).

WINDSHIELD ANTI-ICE AND

ANTI-FOG SWITCHES AS REQD

DO NOT EXCEED 315 KIAS BELOW 10,000 FEET MSL.

————— END OF PROCEDURE —————

(Continued on next page)

**WINDSHIELD OVERTEMP /
CRACKED WINDSHIELD /
WINDSHIELD HEAT INOPERATIVE**
(Continued)

➤ ***If WINDSHIELD OVERTEMP is displayed:***

WINDSHIELD ANTI-FOG SWITCH OFF

CHECK WINDSHIELD ANTI-ICE CB'S.

- Pull windshield anti-ice CB's one at a time while pausing to observe overheat message.
 - Left (X24).
 - Center (X25).
 - Right (Z24).

➤ ***If WINDSHIELD OVERTEMP message extinguishes:***

LEAVE RESPECTIVE CB PULLED.

- Windshield anti-ice and anti-fog may be used for remaining windows.

DO NOT EXCEED 315 KIAS BELOW 10,000 FEET MSL.

——— **END OF PROCEDURE** ———

➤ ***If WINDSHIELD OVERTEMP message remains illuminated:***

WINDSHIELD ANTI-ICE SWITCH OFF

DO NOT EXCEED 315 KIAS BELOW 10,000 FEET MSL.

——— **END OF PROCEDURE** ———

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Blank**

Non-Normal Checklists
Automatic Flight

Chapter NNC
Section 4

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AUTOPILOT FAILS TO DISCONNECT	NNC.4.2
AUTOTHROTTLE FAILS TO DISCONNECT	NNC.4.3

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AUTOLAND TEST FAILS (GROUND)

➤ If **NO AUTOLAND** *annunciates after an autoland test:*

CHECK BOTH NAV RADIOS ON SAME ILS FREQUENCY.

➤ If both VHF nav radios are not tuned to the same ILS frequency:

TUNE ILS FREQUENCY.

PRESS FMA RESET.

REINITIATE AUTOLAND TEST.

➤ If both VHF nav radios were tuned to the same ILS frequency:

PRESS FMA RESET.

REINITIATE AUTOLAND TEST.

➤ If autoland test fails on both DFGC's and dispatch requires operational autoland system:

CONTACT MAINTENANCE.

——— END OF PROCEDURE ———

AUTOPILOT FAILS TO DISCONNECT

NOTE: *The autopilot may be used as desired.*

PRESS AND HOLD AUTOPILOT RELEASE BUTTON.

- Press and hold either yoke (yellow) autopilot RELEASE button while continuing to fly the aircraft manually. The AP will remain disengaged while depressing the button.
- When the autopilot RELEASE button is released, the AP will engage and all AP functions should work normally.

➤ ***To silence the aural warning:***

PULL CAWS CIRCUIT BREAKER (P38).

- Circuit breaker is located behind the Captain's seat.
- Pulling circuit breaker will disable the stall warning SSRS-1, landing gear, takeoff, cabin altitude, speedbrake aural warnings, in addition to the autopilot aural warning.

CAUTION

Do not attempt to overpower the autopilot. When the autopilot is engaged, applying force to the column may allow the alternate trim to reposition the stabilizer. If the force is applied long enough, it will result in an out-of-trim condition.

——— **END OF PROCEDURE** ———

AUTOTHROTTLE FAILS TO DISCONNECT

NOTE: *If the autothrottle (AT) disconnects when either throttle disconnect button is depressed, AND re-engages when throttle disconnect button is released, the autothrottle may be used as desired.*

PRESS AND HOLD AUTOTHROTTLE RELEASE BUTTON.

- Press and hold either button until flashing red A/T annunciation is illuminated. Flashing red light indicates autothrottle is disconnected.
- Autothrottle RELEASE button may then be released.
- The FMA AT window will annunciate as though the AT is engaged.
- The flashing red AT annunciation of the FMA cannot be extinguished with repeated depression of the autothrottle release button.
- If the throttle levers are retarded to the idle stop, the flashing red A/T annunciation will extinguish, and the AT system will re-engage.
- If the DFGC is selected to the IAS mode and the AT SPEED mode is selected, the AT system will re-engage.

——— **END OF PROCEDURE** ———

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**Non-Normal Checklists
Communications**

**Chapter NNC
Section 5**

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ACARS - NO COMM (TOUCHSCREEN)

Frequency changes are automatically controlled by the ACARS unit as long as the aircraft is in range of a datalink ground station. However, within oceanic airspace or isolated areas out of VHF range, a **NO COMM** condition may occur. In **NO COMM**, all messages are stored in memory and will be downlinked when comm is automatically re-established at the next landfall.

➤ **If **NO COMM** exists when in range of a ground station:**

TOUCH COMM CTRL.

TOUCH LINK TEST.

- This action should establish a good link if one is available. If successful, the VHF frequency of the ground station will appear below the **FREQ** label. The frequency is also continually displayed on all menu pages.

➤ **If **NO COMM** message remains:**

➤ **To force the datalink box on to that network:**

MANUALLY SELECT THE FREQUENCY OF THE AREA SERVICE PROVIDER.

- Select ARINC in the USA.
- Select SITA in Europe.
- Select CANADA in Canada.
- Normally, the aircraft management unit changes all frequencies automatically.

——— **END OF PROCEDURE** ——— **April 01, 2004**

ACARS SYSTEM INOP

THE FOLLOWING ITEMS MUST BE MANUALLY COMPLETED.

- Stations Time Slip.
- Required company radio reports.
- Written Engine Performance Reports as follows.

➤ ***When the aircraft is stabilized in cruise:***

AUTOTHROTTLES OFF
ENG SYNC OFF
ALLOW ENGINES TO STABILIZE.
RECORD DATA ON ENGINE PERFORMANCE REPORT
FORM.

➤ ***When Engine Performance Report is complete:***

AUTOTHROTTLES / VNAV AS REQD
ENG SYNC N₁

——— END OF PROCEDURE ———

ACARS TOUCHSCREEN/PRINTER INOP OR RESET

➤ ***If touchscreen/printer is inoperative, or a reset of the system is required:***

OPEN ACARS CIRCUIT BREAKERS.

- DATALINK MU - F8 or F25.
- PRINTER - F18 or F23.
- ACARS IDU - F14 or F26.
- ACARS MU - F25 or F26.
- ACARS DC - B18* or B19*.

NOTE: *Circuit breakers should remain open simultaneously. All uplinked memory data and all downlinked data present is lost.*

RESET CIRCUIT BREAKERS AFTER ONE MINUTE.

- This allows all system capacitors to discharge.

REINITIALIZE ACARS MANUALLY.

- Update ACARS clock by using the UTC UPDATE page.
- Add update date manually.

NOTE: *Inoperative functions cannot be corrected by accessing the MAINT MENU page.*

——— **END OF PROCEDURE** ———

ATTENDANT CALL BUTTON INOP

The ATTENDANT CALL button may become inoperative due to electrical transients. To clear this problem, the ALL CALL button on the forward flight attendants intercom panel should be pushed and released. Test the ATTENDANT CALL button to determine that the problem has cleared.

——— **END OF PROCEDURE** ———

90

AUDIO CONTROL PANEL FAULT

90

PRESS **ALT SWITCH-LIGHT.**

- Pressing the **ALT** switch-light should select the alternate Station Control Card (SCC) extinguishing the **FAULT** light.
- Priority for use of the alternate SCC is:
 - Captain.
 - First Officer.
 - Observer.

► **If **FAULT** light remains illuminated**

SYSTEM STATUS:

- The alternate SCC is not available.
- Default mode remains available on either Captain's or First Officer's audio control panel by selecting VHF-1, INT, or PA microphone switch-lights.

NOTE: **FAULT** light remains illuminated while in default mode. Default mode provides audio control through the VHF-1, NAV-1, INT, or PA switch-lights.

———— **END OF PROCEDURE** ————

CABIN INTERPHONE SYSTEM INOPERATIVE

ENSURE ALL CABIN HANDSETS ARE PROPERLY STOWED.

- Improperly stowed handsets may be the cause of the malfunction.

► *If interphone still inoperative:*

NOTIFY FLIGHT ATTENDANTS.

- Contact OBL and establish plan for communications under normal conditions.
- Avoid use of PA for direct messages to flight attendants except in an emergency.
- Brief the flight attendants on the following alternate emergency procedures.

Cabin Interphone System Inoperative			
Source of Abnormal		Pilot Action	Briefing Items
Cockpit	Cabin		
Smoke/Fire		Use PA.	Use the following procedure if an evacuation is required: Pilots will use the PA to contact the flight attendants. Subsequent communication will be face-to-face, time permitting.
Emergency Landing			
Ditching			
Evacuation or Rejected Takeoff			
	Smoke/Fire	Monitor PA.	Flight attendant will use the emergency signal to notify pilots to monitor the PA.
	Hijacking		Flight attendant will use the emergency signal to notify pilots to monitor the PA.
	Passenger Problem (Medical/ Disturbance)		Flight attendant will use the emergency signal to notify pilots to monitor the PA. If not possible, flight attendant will come to the cockpit door and use the briefed entry method.

———— END OF PROCEDURE ————

PA SYSTEM INOPERATIVE

NOTIFY FLIGHT ATTENDANTS.

- Contact OBL and establish a plan for communications under normal conditions, including:
 - Use of standard cockpit/cabin call signals.
 - Advising OBL to review location and operation of portable megaphones with flight attendants.
 - Use of evacuation signal.
- Advise OBL 20 minutes and 5 minutes before landing.

NOTE: *With the PA inoperative, the F/A's must individually (few seats at a time) brief passengers before takeoff and landing. Coordinate as required to provide sufficient time to meet these requirements.*

(Continued on next page)

PA SYSTEM INOPERATIVE

(Continued)

- Brief OBL on the following alternate emergency procedures.

Public Address System Inoperative			
Source of Abnormal		Pilot Action	Briefing Items
Cockpit	Cabin		
Smoke/Fire		Use cabin interphone.	No changes to current procedures. Pilots and flight attendants will use the cabin interphone for communication. Any public announcements will be made by the flight attendants using megaphones.
Emergency Landing		Use emergency signal followed by cabin interphone or face-to-face.	Pilots will use the emergency signal to alert the flight attendants to an emergency situation. Subsequent communication will then be via the interphone or face-to-face, time permitting. The interphone will be used to command an evacuation. Any public announcements will be made by the flight attendants using megaphones.
Ditching			
Evacuation or Rejected Takeoff			
	Smoke/Fire	Use cabin interphone.	No changes to current procedures. Pilots and flight attendants will use the cabin interphone for communication. Any public announcements will be made by the flight attendants using megaphones.
	Hijacking		
	Passenger Problem (Medical/ Disturbance)		

———— **END OF PROCEDURE** ————

RADAR MALFUNCTIONS

MAJOR FAULTS

➤ *If one or more of the following fault codes appear on the radar scope:*

R/T FAULT	IND FAULT
ANT FAULT	ATT FAULT
CON FAULT	COOL FAULT
MODE SELECTOR OFF	
• If the system is left on, further damage will occur.	

PARTIAL FAILURES

When the system is in WX, TURB or MAP mode, partial failures will appear as yellow caution annunciations in the corner of the display unit. Radar data will still be displayed but the flight crew should be aware that the display may not be accurate.

ANNUNCIATION EFFECT/CREW ACTION

CAL

Weak targets, use caution.

STAB

System stabilized with respect to aircraft, no pitch or roll stabilization.

COOL

System may fail if operation is continued.
Use only long enough to analyze weather,
then turn off to allow cooling of the
transceiver.

———— **END OF PROCEDURE** ————

VOICE COMMUNICATION WITH VHF-3

► *If ACARS 201:*

TOUCH MAIN MENU.

TOUCH MISC MENU.

TOUCH COMM CTRL.

TOUCH CHANGE MODE.

- Note that the MODE prompt at top of COMM CTRL page changes from DATA to VOICE. Channel tuning is then done by typing in a frequency from the numeric keypad. Use this feature only when VHF #1 and VHF #2 fail.
- Return to DATA by touching CHANGE MODE again. The unit will scan for an available frequency automatically to establish link. When frequency appears in the FREQ area, select LINK TEST.
- If a data message is attempted with the unit in the VOICE mode, the DATAMD advisory will appear. Touch the advisory, and the IDU will shift to the COMM CTRL page for mode change.

——— **END OF PROCEDURE** ———

► *If ACARS 501:*

TOUCH INDX.

TOUCH MISC MENU.

TOUCH LINK STATUS.

TOUCH VHF CTRL.

TOUCH CHANGE MODE.

- Note that the MODE prompt at top of VHF CTRL page changes from DATA to VOICE. Channel tuning is then done by typing in a frequency from the numeric keypad. Use this feature only when VHF #1 and VHF #2 fail.

(Continued on next page)

VOICE COMMUNICATION WITH VHF-3

(Continued)

- Return to DATA by touching CHANGE MODE again. The unit will scan for an available frequency automatically to establish link. When frequency appears in the FREQ area, select LINK TEST.
- If a data message is attempted with the unit in the VOICE mode, the DATAMD advisory will appear. Touch the advisory, and the IDU will shift to the VHF CTRL page for mode change.

———— END OF PROCEDURE ————

Non-Normal Checklists
Electrical

Chapter NNC
Section 6

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88	AC CROSSTIE LOCKOUT AND GENERATOR OFF IN FLIGHT/ AC BUS OFF	88

**AC CROSSTIE LOCKOUT
L or R GEN OFF
L or R AC BUS OFF**

NOTE: The **ON BATT** light on the IRS mode select panel and **NO AIR** message on OAP will illuminate.

FUEL BOOST PUMPS AS REQD

NOTE: With an AC bus failure, only one fuel boost pump per tank will be operating. In order to use center tank fuel, the appropriate main tank fuel pump(s) must be turned off.

AFFECTED GENERATOR RESET/OFF

- Only one reset attempt is permitted.

CHECK VOLTS AND FREQUENCY ON AFFECTED SIDE.

➤ ***If generator volts and frequency are normal:***

GEN SWITCH ON

(Continued on next page)

88

**AC CROSSTIE LOCKOUT AND
GENERATOR OFF IN FLIGHT/
AC BUS OFF**
(Continued)

88

➤ *If generator fails to reset, is out of limits or will not connect to bus:*

GEN SWITCH OFF
DC X TIE SWITCH CLOSE
MONITOR DC LOAD METERS.
APU BUS SWITCHES OFF
APU START
APU BUS SWITCH (OPERATING GENERATOR) ON
SYSTEM STATUS:

- Affected AC bus unpowered.
- Affected INST bus (28 VAC) unpowered.
- Affected radio AC bus unpowered.
- Affected radio bus (28 VAC) unpowered. Circuit Breakers by bus are listed in Volume 2, Chapter 6, Electrical.

➤ *If center tank has fuel remaining:*

ACCOMPLISH CENTER FUEL PRESS LO/CENTER TANK
FAILS TO FEED IN FLIGHT PROCEDURE, QRH NNC.12 FUEL
SECTION.

(Continued on next page)

88	AC CROSSTIE LOCKOUT AND GENERATOR OFF IN FLIGHT/ AC BUS OFF	88
	(Continued)	

➤ ***Prior to landing with only one AC bus operative:***

NOTE: Refer to ILS Airborne Equipment Requirements Chart in Volume 1, NP.10 Normal Procedures after reviewing inoperative components.

DO NOT USE AUTOLAND.

FLIGHT DIRECTOR OFF

AUTOPILOT OFF

AUTOTHROTTLE. OFF

AIR COND SUP SWITCH (AFFECTED SIDE). OFF

GALLEY POWER OFF

——— **END OF PROCEDURE** ———

90

AC BUS OFF

90

L or R AC BUS OFF

**RESET LEFT/RIGHT CONV AC BUS SENSING CB'S
(IF TRIPPED) EPC (GENERATOR BUS PANEL).**

——— **END OF PROCEDURE** ———

90

**AC EMER BUS OFF/
DC EMER BUS OFF/DC TRANSFER
BUS OFF**

90

**AC or DC EMER BUS OFF
or DC TRANSFER BUS OFF**

EMER PWR SWITCH ON

VERIFY AFFECTED BUS STATUS.

- Verify bus power by observing instruments powered by that bus:
 - Emergency AC bus - Captain's flight instruments.
 - Emergency DC bus - Captain's pitot heater.
 - DC transfer bus - STANDBY HORIZON indicator.

➤ ***If affected bus is powered:***

**CHECK/RESET BUS SENSING CB (AFFECTED BUS), IF
TRIPPED.**

- Emergency AC bus sensing CB C7*.
- Emergency DC bus sensing CB B12*.
- DC transfer bus sensing CB X37.

EMER PWR SWITCH OFF, THEN ARM

➤ ***If CB will not reset or trips again:***

SYSTEM STATUS:

- Sensing circuit is faulty.

EMER PWR SWITCH. OFF

——— **END OF PROCEDURE** ——

(Continued on next page)

88	AC CROSSTIE LOCKOUT AND GENERATOR OFF IN FLIGHT/ AC BUS OFF	88
	(Continued)	

➤ ***Prior to landing with only one AC bus operative:***

NOTE: Refer to ILS Airborne Equipment Requirements Chart in Volume 1, NP.10 Normal Procedures after reviewing inoperative components.

DO NOT USE AUTOLAND.

FLIGHT DIRECTOR OFF

AUTOPILOT OFF

AUTOTHROTTLE. OFF

AIR COND SUP SWITCH (AFFECTED SIDE). OFF

GALLEY POWER OFF

——— **END OF PROCEDURE** ———

90

AC BUS OFF

90

L or R AC BUS OFF

**RESET LEFT/RIGHT CONV AC BUS SENSING CB'S
(IF TRIPPED) EPC (GENERATOR BUS PANEL).**

——— **END OF PROCEDURE** ———

90

**AC EMER BUS OFF/
DC EMER BUS OFF/DC TRANSFER
BUS OFF**

90

**AC or DC EMER BUS OFF
or DC TRANSFER BUS OFF**

EMER PWR SWITCH ON

VERIFY AFFECTED BUS STATUS.

- Verify bus power by observing instruments powered by that bus:
 - Emergency AC bus - Captain's flight instruments.
 - Emergency DC bus - Captain's pitot heater.
 - DC transfer bus - STANDBY HORIZON indicator.

➤ ***If affected bus is powered:***

**CHECK/RESET BUS SENSING CB (AFFECTED BUS), IF
TRIPPED.**

- Emergency AC bus sensing CB C7*.
- Emergency DC bus sensing CB B12*.
- DC transfer bus sensing CB X37.

EMER PWR SWITCH OFF, THEN ARM

➤ ***If CB will not reset or trips again:***

SYSTEM STATUS:

- Sensing circuit is faulty.

EMER PWR SWITCH. OFF

——— **END OF PROCEDURE** ———

(Continued on next page)

90

**AC EMER BUS OFF/
DC EMER BUS OFF/
DC TRANSFER BUS OFF
(Continued)**

90

➤ ***If affected bus is not powered:***

EMER PWR SWITCH OFF

- Affected bus is not available.

NOTE: *If DC transfer bus is not powered, engines can only be shut down using respective engine fire handle. Fire handle initiated engine shutdown is not immediate when DC transfer bus is not powered.*

➤ ***If DC transfer bus is the affected bus:***

LAND AT NEAREST SUITABLE AIRPORT.

——— **END OF PROCEDURE** ———

88

AC EMERGENCY BUS OFF

88

NOTE: *Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.*

► ***If both Captain's and F/O's primary flight instruments are affected:***

EMER PWR SWITCH ON

- When no longer required, turn **OFF**.

► ***If F/O's primary flight instruments are not affected:***

VERIFY AC EMERGENCY BUS POWER LOSS.

SYSTEM STATUS:

- Captain's PFD and ND blank.
- Captain's airspeed, altimeter and VSI fail flags.
- F/O's instruments unaffected, except for RDMI.

► ***If AC emergency bus power loss not verified:***

CHECK/RESET EMERGENCY AC BUS SENSING CB, IF TRIPPED.

- Overhead C7*.
- Fault is on bus sensing circuit, and flight may be continued, disregarding the light.

—— **END OF PROCEDURE** ——

(Continued on next page)

88

AC EMERGENCY BUS OFF
(Continued)

88

➤ ***If AC emergency bus power loss verified:***

**CHECK EMER AC BUS FEED (K7) AND ALTERNATE
EMER AC BUS FEED (L8) CB'S.**

➤ ***If alternate emer AC bus feed CB (L8) is tripped:***
RESET ALT EMER AC BUS FEED (L8) CB.

- Attempt one reset only.
- DO NOT reset emer AC bus feed CB (K7).

➤➤ ***If alternate emer AC bus feed CB will not reset or
trips again:***
LEAVE EMER PWR SWITCH OFF.

➤ ***If alternate emer AC bus feed CB has not tripped:***
EMER PWR SWITCH ON

- Use emergency power as desired to restore Captain's instruments.
- Fully charged batteries will provide approximately 30 minutes of power.
 - Use only equipment essential to flight.

CHECK EMERG AC BUS OFF LIGHT.

➤ ***If EMERG AC BUS OFF light is extinguished:***
EMER PWR SWITCH AS DESIRED

➤ ***If EMERG AC BUS OFF light is illuminated:***
EMER PWR SWITCH OFF

- Continue flight using unaffected instruments.

———— **END OF PROCEDURE** ————

90

AC POWER FAULT

90

L or R AC PWR FAULT

NOTE: *L or R AC PWR FAULT is displayed when a mechanical or electrical malfunction occurs in the left or right AC power system. Generator may fail immediately or it may operate for some time depending on severity of malfunction.*

START APU (IF AVAILABLE).

- Use APU as a backup power source. Associated engine generator will continue to supply its AC bus for an unknown period of time.

➤ *If on the ground:*

GEN SWITCH OFF

- Maintenance action required.

——— END OF PROCEDURE ———

➤ *If in flight:*

➤ *If GEN OFF message is not displayed:*
MONITOR ELECTRICAL SYSTEM.

——— END OF PROCEDURE ———

➤ *If GEN OFF message is displayed:*
GEN SWITCH RESET/ON

- Attempt one reset only.

➤➤ *If GEN OFF message remains on:*
GEN SWITCH OFF

➤➤ *If GEN OFF message is not displayed:*
MONITOR ELECTRICAL SYSTEM.

——— END OF PROCEDURE ———

(Continued on next page)

90

AC POWER FAULT
(Continued)

90

➤ ***If time permits:***

PRESS STATUS BUTTON.

- Note any second level messages for log book entry and report to Maintenance Coordinator if time permits.

—— **END OF PROCEDURE** ——

90

APU AC POWER FAULT

90

APU AC PWR FAULT

NOTE: *APU AC PWR FAULT* is displayed when a mechanical or electrical malfunction occurs in the APU generator. Generator may fail immediately or it may operate for some time depending on the severity of the malfunction.

➤ **If on the ground:**

APU GEN SWITCH OFF

- Maintenance action required.

——— **END OF PROCEDURE** ———

➤ **If in flight:**

➤ **If APU GEN OFF message is not displayed:**
MONITOR ELECTRICAL SYSTEM.

——— **END OF PROCEDURE** ———

➤ **If APU GEN OFF message is displayed:**
APU GEN SWITCH RESET/ON

- Attempt one reset only.

➤➤ **If APU GEN OFF message remains on:**
APU GEN SWITCH. OFF

NOTE: *If message was due to an APU generator overheat, APU AC PWR FAULT message will disappear when generator temperature drops below a predetermined value.*

➤➤ **If APU GEN OFF message is not displayed:**
MONITOR ELECTRICAL SYSTEM.

——— **END OF PROCEDURE** ———

88

APU GENERATOR OFF

88

APU GEN OFF

APU BUS SWITCHES OFF

- Message is normal if APU MASTER switch is **ON**, but APU generator is not in use.

APU GENERATOR RESET/ON

- Reset one time only.

CHECK APU VOLTS AND FREQUENCY.

➤ ***If volts/frequency are out of limits:***

SYSTEM STATUS:

- APU generator is inoperative.

——— **END OF PROCEDURE** ———

➤ ***If volts/frequency are normal:***

APU BUS SWITCHES ON

➤ ***If volts/frequencies zero and APU GEN OFF annunciated:***
APU GENERATOR IS INOPERATIVE.

APU BUS SWITCHES OFF

——— **END OF PROCEDURE** ——

➤ ***If volts/frequencies are normal and APU GEN OFF is not annunciated:***

CONTINUE NORMAL OPERATION.

——— **END OF PROCEDURE** ——

90

BATTERY BUS OFF

90

BATTERY BUS OFF

BATTERY SWITCH ON/LOCKED

TEST ANNUNCIATOR/DIGITAL LIGHTS.

CHECK AC/DC EMER BUS OFF LIGHTS.

➤ ***If both **AC EMER BUS OFF** and **DC EMER BUS OFF** lights
ARE illuminated during the test:***

CHECK/RESET BATT BUS SENSING CB (B21*), IF TRIPPED.

➤ ***If CB will not reset or is not tripped:***

SYSTEM STATUS:

- The sensing circuit is faulty.

——— **END OF PROCEDURE** ———

➤ ***If both **AC EMER BUS OFF** and **DC EMER BUS OFF** lights are
NOT illuminated during the test:***

SYSTEM STATUS:

- Battery power is not available.
- Expect loss of:
 - Emergency electrical power.
 - APU.

LAND AT NEAREST SUITABLE AIRPORT.

——— **END OF PROCEDURE** ———

90

BUS TIE LOCKOUT

90

L or R BUS TIE LOCKOUT

➤ ***If on the ground:***

MAINTENANCE ACTION REQUIRED.

———— **END OF PROCEDURE** ————

➤ ***If in flight:***

BUS TIE SWITCH (AFFECTED BUS) OPEN

NOTE: Moving affected BUS TIE switch to OPEN enables system to automatically attempt generator reset.

➤ ***IF AC BUS OFF message not displayed:***

- Associated generator is restored. No electrical backup from opposite engine or APU generator is required.

———— **END OF PROCEDURE** ————

➤ ***If AC BUS OFF message is displayed:***

DC BUS X-TIE SWITCH CLOSE

- Loss of power to generator bus will cause affected IRS to operate on battery power. IRS battery power cannot be relied on for more than 30 minutes.

APU START

- APU will provide electrical backup to operating bus.

➤ ***If center tank has fuel remaining:***

CENTER TANK PUMP SWITCHES ON

MAIN TANK PUMP SWITCHES (ONE AT A TIME) . . OFF

WHEN CENTER FUEL QTY REACHES 500 POUNDS,

MAIN TANK PUMP SWITCHES ON

———— **END OF PROCEDURE** ————

➤ ***If center tank is empty:***

NO FURTHER ACTION NECESSARY.

———— **END OF PROCEDURE** ————

88

CSD OIL PRESS LOW

88

L or R CSD OIL PRESS LOW

➤ ***If associated GEN OFF message displayed:***

ASSOCIATED GEN SWITCH. OFF

CSD switch action is irrevocable.

ASSOCIATED CSD. DISC

- Hold disconnect switch for 3 seconds.
- Verify that CSD has disconnected by the following:
 - Observing AC volts and frequency go to extreme left of scale.

START APU, IF AVAILABLE.

———— END OF PROCEDURE ————

➤ ***If associated GEN OFF message is not displayed:***

➤ ***If APU available:***

APU BUS SWITCHES OFF

APU. START

**APU BUS SWITCHES
(FOR INOPERATIVE SYSTEM) ON**

CSD switch action is irrevocable.

ASSOCIATED CSD. DISC

- Hold disconnect switch for 3 seconds.
- Verify that CSD has disconnected by the following:
 - Observing AC volts and frequency go to extreme left of scale.

———— END OF PROCEDURE ————

(Continued on next page)

88

CSD OIL PRESS LOW
(Continued)

88

► *If APU is not available:*
**CONTINUE OPERATION OF ENGINE GENERATOR AT
CAPTAIN'S DISCRETION.**

——— **END OF PROCEDURE** ———

88

CSD OIL OUT TEMPERATURE HIGH

88

➤ ***If CSD OIL OUTLET TEMPERATURE increasing into caution (yellow) zone:***

➤ ***If temperature remains in caution zone and frequency within limits:***

**MONITOR TEMPERATURE AND FREQUENCY TO
ENSURE THEY ARE WITHIN LIMITS.**

——— **END OF PROCEDURE** ———

➤ ***If CSD OIL OUTLET TEMPERATURE is increasing toward danger (red) zone, or frequency out of limits or fluctuating:***

ASSOCIATED GEN SWITCH. OFF

➤ ***If temperature stabilizes below danger zone and frequency within limits:***

**CONTINUE OPERATION WITH GEN SWITCH OFF.
START APU, IF AVAILABLE.**

——— **END OF PROCEDURE** ——

(Continued on next page)

88	CSD OIL OUT TEMPERATURE HIGH	88
	(Continued)	

➤ ***If CSD OIL OUTLET TEMPERATURE increases and stabilizes in danger (red) zone or frequency is out of limits:***

ASSOCIATED GEN SWITCH OFF

CSD switch action is irrevocable.

ASSOCIATED CSD DISC

- Hold disconnect switch for 3 seconds.
- Verify that CSD has disconnected by the following:
 - Observing AC volts and frequency go to extreme left of scale.
 - CSD OIL PRESS LOW will be displayed.

START APU, IF AVAILABLE.

——— END OF PROCEDURE ———

DC BUS OFF

DC BUS OFF

CHECK DC LOADMETERS/VOLTMETERS.

► ***If load meters are normal:***

**CHECK/RESET DC BUS OFF SENSING CB (R23),
IF TRIPPED.**

NOTE: *If message is still displayed and DC load meters are normal, sensing circuit is faulty.*

——— END OF PROCEDURE ———

► ***If load meters are abnormal:***

**CHECK TRANSFORMER RECTIFIER CIRCUIT BREAKERS
(LEFT - K1 THROUGH K6 OR RIGHT - L1 THROUGH L3 AND
GROUND SERVICE BUS - LEFT CONSOLE).**

► ***If T/R circuit breakers are not tripped:***

DC BUS X TIE SWITCH CLOSE

——— END OF PROCEDURE ———

► ***If T/R circuit breakers on the affected side (Left or Right)
are tripped:***

RESET T/R-1 OR -2 CIRCUIT BREAKERS.

►► ***If T/R-1 C/Bs will not reset, try resetting T/R-2 C/Bs.
If T/R circuit breakers will not reset:***

**CONTINUE WITH AFFECTED EQUIPMENT
INOPERATIVE.**

►►► ***If RT DC Bus cannot be powered:***

COCKPIT DOOR DEADBOLT LOCKED

CAUTION

***Do not attempt to move DC BUS X TIE switch to CLOSE if
circuit breakers cannot be reset.***

——— END OF PROCEDURE ———

**Intentionally
Blank**

88

DC EMERGENCY BUS OFF

88

SYSTEM STATUS:

- #1 Comm and Navigation radios inoperative.
- Captain's overhead speaker inoperative.
- Interphone inoperative.
- PA inoperative.
- No current to Captain's pitot heat.
- Emergency evacuation lights illuminate.

PULL/RESET EMERGENCY DC BUS SENSING CB (B12*).

➤ ***If reset is successful in restoring normal indications:***

FLIGHT MAY CONTINUE.

- Fault is on bus sensing circuit.

——— **END OF PROCEDURE** ———

➤ ***If reset is not successful in restoring normal indications:***

➤ ***If emergency DC bus feed CB (N37) is not tripped:***

**FLIGHT MAY CONTINUE WITH AFFECTED CIRCUITS
INOPERATIVE.**

OR

EMERGENCY POWER SWITCH ON

- Fully charged batteries will provide approximately 30 minutes of power.
- Use only equipment essential to flight.

——— **END OF PROCEDURE** ——

➤ ***If emergency DC bus feed CB (N37) is tripped:***

RESET EMERGENCY DC BUS FEED CB (N37).

- Attempt one reset only.

CAUTION

***If CB will not reset or trips again, do not move EMERGENCY
POWER switch to ON; a bus fault may exist.***

——— **END OF PROCEDURE** ——

88

DC TRANSFER BUS OFF

88

DC TRANSFER BUS OFF

VERIFY LOSS OF DC TRANSFER BUS:

- Standby horizon off flag in view.
- Left OAP screen inoperative.
- Fire warning test inoperative.

► If loss of DC transfer bus is verified:

CHECK DC TRANSFER BUS FEED CB (N36).

► If DC transfer bus feed CB is tripped:

RESET DC TRANSFER BUS FEED CB (N36)

►► If CB trips again or will not reset:

LAND AT NEAREST SUITABLE AIRPORT

SYSTEM STATUS:

- Consider DC TRANSFER BUS unpowered.
- Master warning and master caution system inoperative.
- Engine/APU fire detection and protection inoperative.
- APU door actuator inoperative
—No APU start.
- First Officer's audio panel receive functions inoperative.

—— END OF PROCEDURE ——

(Continued on next page)

88

DC TRANSFER BUS OFF
(Continued)

88

➤ *If DC transfer bus feed CB is not tripped:*

PULL DC TRANSFER BUS FEED CB (N36).

PULL CHARGER AND TRANSFER RELAY CONTROL CB (N38).

- The battery should restore power to the DC transfer bus.

SYSTEM STATUS:

- Battery charger is inoperative.
- Fully charged batteries will provide approximately 30 minutes of power.
- Use only equipment essential to flight.

LAND AT NEAREST SUITABLE AIRPORT.

——— **END OF PROCEDURE** ———

➤ *If loss of DC transfer bus is not verified:*

CHECK DC TRANSFER BUS SENSING CB (X37)

➤ *If DC transfer bus sensing CB is not tripped:*

FLIGHT MAY CONTINUE

➤ *If DC transfer bus sensing CB is tripped:*

RESET DC TRANSFER BUS SENSING CB (X37)

➤➤ *If CB trips again or will not reset:*

FLIGHT MAY CONTINUE

- Fault is on bus sensing circuit.

——— **END OF PROCEDURE** ———

88

ELECTRICAL FAILURE (COMPLETE)

88

EMER PWR SWITCH ON

- **AC EMER BUS OFF** and **DC EMER BUS OFF** lights should go off.
- Airplane should be flown straight and level until Captain's warning flags disappear.

VERIFY THE CAPTAIN'S PFD/ND, THE **EMER PWR IN USE LIGHT, LEFT EOAP, AND THE STANDBY HORIZON ARE POWERED.**

➤ If not powered, reset BAT DIRECT BUS FEED CIRCUIT BREAKER.

- Pull mechanical remote handle, lower left rear of center pedestal.

BATTERY SWITCH. CHECK ON

SYSTEM STATUS

- Only the Captain's radio (except ADF) and cockpit speaker are operative.
- A fully charged battery will power all aircraft equipment listed on overhead emergency circuit breaker panel and DC Transfer bus for approximately 30 minutes.
- Use only equipment essential to flight.

(Continued on next page)

88 ELECTRICAL FAILURE (COMPLETE) 88
(Continued)

COCKPIT DOOR DEADBOLT LOCK

GALLEY PWR SWITCH. OFF

| CABIN ALT CONT LEVER MANUAL (DOWN)

CKPT/CABIN TEMP SELECTORS MANUAL

AC BUS X TIE SWITCH. OPEN

LEFT AND RIGHT

GEN SWITCHES RESET/OFF/CHECK

- If the generator will not reset or is out of limits, leave the
GENERATOR CONTROL switch **OFF**.

OPERATIVE GEN SWITCH(ES) ON

NOTE: *A generator must be reset only once for a given fault. If fault trips generator after reset, faults should be located and corrected before attempting to place generator on its bus again.*

(Continued on next page)

88	ELECTRICAL FAILURE (COMPLETE)	88
	(Continued)	

➤ *If one or both generator operation(s) are abnormal:*

AFFECTED GEN SWITCH(ES) OFF
DC START PUMP SWITCH ON

➤ *If APU is not running:*

APU L/R BUS SWITCHES. OFF
APU MASTER SWITCH START/RUN

APU OIL PRESS LOW ANNUNCIATION
(PRIOR TO 95%). OFF

- There may be no RPM indications for over 1 minute and a complete start may take in excess of 2 minutes.
- Multiple start attempts are acceptable, if required.
- APU may not start if cold-soaked more than 30 minutes.

➤➤ *If APU will not start:*

DC START PUMP SWITCH OFF

➤ *If APU is running:*

APU L/R BUS SWITCHES. OFF
APU GEN SWITCH RESET/NORM/CHECK

- If the generator will not reset or is out of limits, leave the APU BUS switches **OFF**.

APU L/R BUS SWITCHES. ON
DC START PUMP SWITCH OFF

(Continued on next page)

88 ELECTRICAL FAILURE (COMPLETE) 88 (Continued)

► *If aircraft is trimmed and flaps are 28 or 40:*

LANDING FLAPS EXISTING FLAP SETTING

LANDING SPEED
. AS APPROPRIATE FOR FLAP SETTING

► *If aircraft is out of trim or flaps are less than 28:*

LANDING FLAPS 15/EXT

NOTE: Do not reduce power until flare has been initiated and sink has been reduced.

COMPUTE LANDING THRESHOLD SPEEDS.

- V_{REF} is flaps 15 speedbook minimum maneuver speed,

PLUS:

- Add knot value for adjusted takeoff weight C.G.
Interpolate as necessary from table below:

STAB ANGLE	MD-88 TAKEOFF C.G.				
	0	5	10	15	20
-2	40	32	24	17	8
0	29	22	15	8	0
2	20	14	7	1	0
4	13	7	1	0	0
6	6	1	0	0	0

——— END OF PROCEDURE ———

90

ELECTRICAL FAILURE (COMPLETE)

90

EMER PWR SWITCH ON

- **ARC** or **ROSE** should be selected for heading to be displayed on the Captain's ND.
- A fully charged battery will power all equipment listed on overhead emergency circuit breaker panel and DC transfer bus for approximately 45 minutes.
- Use only that equipment essential to flight
- Captain's and First Officer's instrument panel white incandescent floodlights illuminate automatically to a preset level.
 - Intensity of illumination can be controlled by adjusting the white floodlight controls (small knobs).
 - Floodlights cannot be turned off with white floodlight controls.

➤ ***If cockpit lighting is inoperative and EOAP is not displaying any messages:***

RESET BATTERY DIRECT BUS FEED CB (D17*).

COCKPIT DOOR DEADBOLT LOCKED

| CABIN ALT CONTROL LEVER. MANUAL (DOWN)

BUS TIE SWITCHES OPEN

LEFT AND RIGHT GEN SWITCHES RESET/OFF

- If the generator will not reset or is out of limits, leave the GENERATOR CONTROL switch **OFF**.

LEFT AND RIGHT GEN SWITCHES ON

- Generator may be reset only once for a given fault.

(Continued on next page)

90 ELECTRICAL FAILURE (COMPLETE) 90
(Continued)

➤ *If APU generator was in use:*

APU GEN SWITCH. RESET/ON
BUS TIE SWITCH (SIDE PREVIOUSLY
POWERED BY APU). AUTO

APU (IF AVAILABLE). START

- In flight APU start attempt is an electric start.
 - Only one start attempt should be made to avoid compromising battery life.
 - A descent to FL 300 will ensure a more reliable start.

CHECK APU PWR AVAIL LIGHT ILLUMINATED.

(Continued on next page)

90 ELECTRICAL FAILURE (COMPLETE) 90
(Continued)

➤ ***If both GEN buses restored:***

NOTE: *If FMA's are blank, push either autopilot release button to reset DFGC.*

CABIN ALT CONTROL LEVER AUTO (UP)
EMER PWR SWITCH OFF THEN ARM
APU AS REQD

——— **END OF PROCEDURE** ———

BUS TIE SWITCHES (ONE AT A TIME) AUTO

➤ ***If APU generator trips off line:***

BUS TIE SWITCH (AFFECTED SIDE) OPEN
APU GEN SWITCH RESET/ON
BUS TIE SWITCH
(OPERATING SIDE IF ANY) AUTO

➤ ***If one GEN bus restored:***

CABIN ALT CONTROL LEVER AUTO (UP)
EMER PWR SWITCH OFF THEN ARM

➤ ***If center tank fuel available:***

CENTER TANK PUMP SWITCHES ON
MAIN TANK PUMP SWITCHES(ONE AT A TIME) . . OFF
MAIN TANK PUMP SWITCHES ON

- When CTR FUEL QTY indicates 500 pounds.

NOTE: *Remaining center tank fuel may be used by leaving both tank pump switches in one tank off. When CTR FUEL QTY reaches zero, move both tank pump switches in that tank to ON.*

——— **END OF PROCEDURE** ———

(Continued on next page)

90 ELECTRICAL FAILURE (COMPLETE) 90
(Continued)

➤ ***If no GEN bus restored:***

AVOID IMC FLIGHT.

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CAUTION

Depressurize cabin prior to landing. Manual pressurization control forces may be high. Apply force as required.

SYSTEM STATUS

- Stab trim inoperative.
- Anti-skid/auto-brakes inoperative.
- Autospoilers inoperative.
- For additional items refer to EMERGENCY POWER SUMMARY OF OPERATIVE EQUIPMENT in Volume 1, SP.6 Supplementary Procedures - Electrical.

➤ ***If aircraft is trimmed and flaps are 28 or 40:***

LANDING FLAPS EXISTING FLAP SETTING

**LANDING SPEED AS APPROPRIATE FOR
FLAP SETTING**

➤ ***If aircraft is out of trim or flaps are less than 28:***

LANDING FLAPS 15/EXT

NOTE: Do not reduce power until flare has been initiated and sink has been reduced.

(Continued on next page)

90 ELECTRICAL FAILURE (COMPLETE) 90
(Continued)

COMPUTE LANDING THRESHOLD SPEEDS.

- V_{REF} is flaps 15 speedbook minimum maneuver speed,

PLUS:

- Add knot value for adjusted takeoff weight C.G.
Interpolate as necessary from table below:

STAB ANGLE	MD-90 TAKEOFF C.G.				
	0	5	10	15	20
-2	22	16	11	5	0
0	12	5	1	0	0
2	3	0	0	0	0

——— END OF PROCEDURE ———

90 EMERGENCY POWER AUTO FAULT 90

EMERG PWR AUTO FAULT

Message will be displayed when EPCU commands emergency power to auto and the emergency power relay fails to close.

➤ ***If emergency power is required:***

EMER PWR SWITCH ON

——— END OF PROCEDURE ———

90

EMERGENCY POWER ON

90

EMER POWER ON

- *If EMER POWER ON and L or R AC BUS OFF are displayed:*

ACCOMPLISH 90 ELECTRICAL FAILURE (COMPLETE) 90.

EMER PWR SWITCH. OFF

- *If DC XFER BUS OFF message is not displayed, or AC EMER BUS OFF and DC EMER BUS OFF lights are not illuminated:*

EMER PWR SWITCH ARM

- *If EMER POWER ON message is NOT displayed:*
MONITOR SYSTEM.

——— **END OF PROCEDURE** ———

- *If EMER POWER ON message is displayed:*
EMER PWR SWITCH OFF

NOTE: When emergency power is required, rotate EMER PWR switch to **ON**. Battery power cannot be relied upon for more than 45 minutes.

——— **END OF PROCEDURE** ———

(Continued on next page)

90

EMERGENCY POWER ON
(Continued)

90

➤ ***If DC XFER BUS OFF message is displayed, or
AC EMER BUS OFF or DC EMER BUS OFF lights are
illuminated:***

EMER PWR SWITCH ON

- Use emergency power as required. Battery power cannot be relied upon for more than 45 minutes.

➤ ***When time permits:***

**CHECK AND RESET AFFECTED BUS FEED CB'S, IF
TRIPPED.**

Do not reset emer AC bus feed CB K7.

- Alternate emergency AC bus feed CB L8.
- Emergency DC bus feed CB N37 or D15*.
- DC transfer bus feed CB N36.

——— **END OF PROCEDURE** ———

**GENERATOR BUS CIRCUIT BREAKERS
(35 OR 50 AMP) TRIPPED**

(88) NOTE: *When APU is operating in flight, only one APU BUS (left or right) should be on in order to assure cross-tie protection.*

(88) OPEN AC X TIE SWITCH.

**PULL ASSOCIATED CIRCUIT BREAKERS
(GENERATOR BUS PANEL).**

- Cooling time of approximately 3 minutes should be observed before a circuit breaker is reset
- If CB's of one or two phases of a particular load are tripped, associated CB(s) should also be pulled.

RESET ALL CIRCUIT BREAKERS.

➤ ***If reset is successful:***

(88) AC X TIE SWITCH AUTO

——— **END OF PROCEDURE** ———

88

GENERATOR OFF

88

L or R GEN OFF

ASSOCIATED GEN SWITCH RESET/OFF

- Attempt one reset only.

➤ ***If associated generator AC volts and frequency are within limits:***

ASSOCIATED GEN SWITCH ON

➤ ***If associated generator volts, frequency, and AC load are within limits:***

MONITOR SYSTEM.

———— **END OF PROCEDURE** ————

➤ ***If associated generator AC volts, frequency, and AC load are out of limits or will not connect to its load bus:***

ASSOCIATED GEN SWITCH OFF

- All buses will be powered through AC crosstie relay.

MONITOR AC LOAD METER.

➤ ***If APU is operable:***

APU BUS SWITCHES OFF

APU START

CHECK APU VOLTS AND FREQUENCY.

APU BUS SWITCH FOR INOPERATIVE SYSTEM ON

NOTE: *If there is only one source of normal AC power (one engine generator or APU), land at nearest suitable airport.*

➤ ***Prior to landing:***

GALLEY POWER OFF

ONE AIR COND SUPPLY SWITCH OFF

➤➤ ***If only APU generator operating prior to landing:***
REMAINING APU BUS SWITCH ON

- APU will crosstie in flight but not on the ground.

———— **END OF PROCEDURE** ————

90

GENERATOR OFF

90

L, R, or APU GEN OFF

ASSOCIATED GEN SWITCH RESET/ON

- Attempt one reset only.

➤ ***If associated GEN OFF message is not displayed:***

MONITOR ELECTRICAL SYSTEM.

———— END OF PROCEDURE ———

➤ ***If associated GEN OFF message is displayed:***

ASSOCIATED GEN SWITCH OFF

- If the affected generator is an engine generator, start APU if available.

NOTE: *If there is only one source of normal AC power (one engine generator or APU), land at nearest suitable airport.*

———— END OF PROCEDURE ———

88

**INTERMITTENT AC POWER
INTERRUPTIONS**

88

CAUTION

Do not use this procedure for a bus or generator fault accompanied by an AC X -TIE lockout annunciation.

THIS CONDITION MAY BE CHARACTERIZED BY:

- A buzzing/chattering sound.
- Any combination of circuit breaker trips.
- Rapid OAP annunciations.
- CAWS messages, generator(s) trip(s).
- EFIS blanking, or
- Flashing cockpit or cabin lights.

AC X TIE SWITCH OPEN

EVALUATE ELECTRICAL SYSTEMS STATUS.

**ACCOMPLISH OTHER ABNORMAL PROCEDURES IF
NECESSARY.**

DO NOT RETURN AC X TIE SWITCH TO AUTO.

➤ If APU is operative:

APU BUS SWITCHES OFF

APU. START

- Refer to APU START procedure and envelope.

LEFT AND RIGHT APU BUS SWITCHES ON

OPERATE ELECTRICAL SYSTEMS ISOLATED.

- Use APU as required for inoperative engine generator(s) and to back up operative engine generator(s) for redundancy.

➤ If APU is unavailable:

———— END OF PROCEDURE ————

88

**SMOKE OR FUMES OR FIRE
ELECTRICAL**

88

OXYGEN MASKS AND SMOKE GOGGLES ON, 100%
CREW COMMUNICATIONS ESTABLISH

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

NOTE: *If smoke/fumes are severe, first accomplish the smoke or fumes removal checklist.*

WARNING

Do not turn off packs in an effort to smother the fire.

CABIN ALT CONTROL LEVER. MANUAL (DOWN)

RADIO RACK SWITCH VENTURI

EMER POWER SWITCH ON/CHECK

➤ ***If Emergency power operation is normal:***

L AND R GEN SWITCHES OFF

APU L AND R BUS SWITCHES OFF

➤ ***If smoke or fumes stop:***

➤➤ ***If nearest suitable airport is 30 minutes or less and
at Captain's discretion:***

AVOID IMC FLIGHT.

CAUTION

***Depressurize cabin prior to landing. Manual pressurization
control forces may be high. Apply force as required.***

SYSTEM STATUS

- Stab trim inoperative.
- Anti-skid/auto-brakes inoperative.
- Autospoilers inoperative.

(Continued on next page)

88

**SMOKE OR FUMES OR FIRE
ELECTRICAL**

88

(Continued)

- For additional items refer to EMERGENCY POWER SUMMARY OF OPERATIVE EQUIPMENT in Volume 1, SP.6 Supplementary Procedures - Electrical.

➤➤➤ ***If aircraft is trimmed and flaps are 28 or 40:***

LANDING FLAPS **EXISTING
FLAP SETTING**

LANDING SPEED. **AS APPROPRIATE
FOR FLAP SETTING**

➤➤➤ ***If aircraft is out of trim or flaps are less than 28:***

LANDING FLAPS **15/EXT**

NOTE: *Do not reduce power until flare has been initiated and sink has been reduced.*

COMPUTE LANDING THRESHOLD SPEEDS.

- V_{REF} is flaps 15 speedbook minimum maneuver speed,

PLUS:

- Add knot value for adjusted takeoff weight C.G. Interpolate as necessary from table below:

STAB ANGLE	MD-88 TAKEOFF C.G.				
	0	5	10	15	20
-2	40	32	24	17	8
0	29	22	15	8	0
2	20	14	7	1	0
4	13	7	1	0	0
6	6	1	0	0	0

———— **END OF PROCEDURE** ————

(Continued on next page)

88

**SMOKE OR FUMES OR FIRE
ELECTRICAL**
(Continued)

88

➤➤ *If nearest suitable airport is more than 30 minutes:*

AC AND DC BUS X TIE SWITCHES. OPEN

R GEN OR APU R BUS SWITCH ON/CHECK

➤➤➤ *If smoke or fumes do not reappear:*

EMER PWR SWITCH OFF

*NOTE: DFGC 2 may be used after electrical
system check is completed.*

—— END OF PROCEDURE ——

➤➤➤ *If smoke or fumes reappear:*

L GEN AND APU L BUS
SWITCH. ON/CHECK

R GEN AND APU R BUS SWITCH OFF

EMER PWR SWITCH OFF

*NOTE: DFGC 1 may be used after electrical
system check is completed.*

—— END OF PROCEDURE ——

➤ *If smoke or fumes continue:*

L AND R GEN SWITCHES ON/CHECK

CONTINUE AT “IF EMERGENCY POWER OPERATION IS
ABNORMAL” IN THIS CHECKLIST.

(Continued on next page)

88

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

88

► ***If Emergency power operation is abnormal:***

CABIN ALT CONTROL LEVER AUTO (UP)

EMER LTS SWITCH OFF

LOCATE AND PULL THE FOLLOWING CIRCUIT BREAKERS:

- ALTERNATE EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMER DC BUS FEED (N37).
- CHARGER AND TRANSFER RELAY (C16*).
- BATTERY RELAY (C17*).
- EMERGENCY INVERTER (C18*).

EMER PWR SWITCH. OFF

BATTERY SWITCH OFF

NOTE: *APU, if running, will shut down.*

LOCATE AND PULL THE FOLLOWING CIRCUIT BREAKER:

- BATT CHARGER (LCON).

► ***If smoke or fumes continue:***

**AT THE CAPTAIN'S DISCRETION, PULL THE BATTERY
DIRECT BUS FEED CIRCUIT BREAKER (LOCATED IN
THE E AND E COMPARTMENT, UNDER THE COCKPIT
FLOOR).**

RESET THE FOLLOWING CIRCUIT BREAKERS:

- ALTERNATE EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMER DC BUS FEED (N37).

EMER LTS SWITCH ARM

——— **END OF PROCEDURE** ———

(Continued on next page)

88

**SMOKE OR FUMES OR FIRE
ELECTRICAL**
(Continued)

88

➤ *If smoke or fumes stop:*

RESET DC TRANSFER BUS FEED C/B (N36).

➤➤ *If smoke or fumes reappear:*

LOCATE AND PULL DC TRANSFER BUS FEED C/B
(N36).

WARNING

Fire Detection and Protection capabilities are lost.

RESET THE FOLLOWING CIRCUIT BREAKERS:

- ALTERNATE EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- EMER DC BUS FEED (N37).

EMER LTS SWITCH ARM

———— **END OF PROCEDURE** ————

90	SMOKE OR FUMES OR FIRE ELECTRICAL	90

OXYGEN MASKS AND SMOKE GOGGLES. ON, 100% CREW COMMUNICATIONS ESTABLISH

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

NOTE: *If smoke/fumes are severe, first accomplish the smoke or fumes removal checklist.*

WARNING

Do not turn off packs in an effort to smother the fire.

CABIN ALT CONTROL LEVER MANUAL (DOWN)

RADIO RACK SWITCH. VENTURI

EMER POWER SWITCH ON/CHECK

➤ *If Emergency power operation is normal:*

L, R, AND APU GEN SWITCHES 3 OFF

L AND R BUS TIE SWITCHES. OPEN

➤ *If smoke or fumes stop:*

**➤➤ *If nearest suitable airport is 30 minutes or less and
at Captain's discretion:***

AVOID IMC FLIGHT.

CAUTION

***Depressurize cabin prior to landing. Manual pressurization
control forces may be high. Apply force as required.***

SYSTEM STATUS

- Stab trim inoperative.
- Anti-skid/auto-brakes inoperative.
- Autospoilers inoperative.

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL**

90

(Continued)

- For additional items refer to EMERGENCY POWER SUMMARY OF OPERATIVE EQUIPMENT in Volume 1, SP.6 Supplementary Procedures - Electrical.

►►► *If aircraft is trimmed and flaps are 28 or 40:*

LANDING FLAPS EXISTING
FLAP SETTING

LANDING SPEED AS APPROPRIATE
FOR FLAP SETTING

►►► *If aircraft is out of trim or flaps are less than 28:*

LANDING FLAPS 15/EXT

NOTE: *Do not reduce power until flare has been initiated and sink has been reduced.*

COMPUTE LANDING THRESHOLD SPEEDS.

- V_{REF} is flaps 15 speedbook minimum maneuver speed,

PLUS:

- Add knot value for adjusted takeoff weight C.G. Interpolate as necessary from table below:

STAB ANGLE	MD-90 TAKEOFF C.G.				
	0	5	10	15	20
-2	22	16	11	5	0
0	12	5	1	0	0
2	3	0	0	0	0

————— **END OF PROCEDURE** —————

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL**

90

(Continued)

➤➤ *If nearest suitable airport is more than 30 minutes:*

R GEN OR APU GEN SWITCH ON

NOTE: For APU power, move R BUS TIE switch to AUTO.

➤➤➤ *If smoke or fumes reappear:*

L GEN OR APU GEN SWITCH ON

NOTE: For APU power, move L BUS TIE switch to AUTO.

R GEN SWITCH OFF

R BUS TIE SWITCH OPEN

EMER PWR SWITCH OFF THEN ARM

CABIN ALT CONTROL LEVER. . . AUTO (UP)

NOTE: Use Center tank fuel boost pumps as necessary.

——— **END OF PROCEDURE** ———

➤➤➤ *If smoke or fumes do not reappear:*

EMER PWR SWITCH OFF THEN ARM

CABIN ALT CONTROL LEVER. . . AUTO (UP)

NOTE: Use Center tank fuel boost pumps as necessary.

——— **END OF PROCEDURE** ———

(Continued on next page)

90	SMOKE OR FUMES OR FIRE ELECTRICAL (Continued)	90

► *If smoke or fumes continue:*

L, R, AND APU GEN SWITCHES ON
CABIN ALT CONTROL LEVER AUTO (UP)
EMER LTS SWITCH OFF
EMER POWER SWITCH OFF

WARNING

Verify First Officer's flight instruments are normal before proceeding to next step.

LOCATE AND PULL THE FOLLOWING CIRCUIT BREAKERS.

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMERGENCY DC BUS FEED (N37 or D15*).
- CHARGER & TRANS RELAY (C17*).
- BATTERY RELAY (C18*).
- EMERGENCY INVERTER (D13*).

BATTERY SWITCH. OFF

WARNING

Fire Detection and protection capabilities are lost.

NOTE: *APU, if operating, will shutdown.*

NOTE: *If emergency DC bus and/or DC transfer bus are not powered, use engine fire handle when engine shutdown is required.*

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

90

➤➤ *If smoke or fumes stop:*

RESET DC TRANSFER BUS FEED C/B (N36).

➤➤➤ *If smoke or fumes reappear:*

LOCATE AND PULL DC TRANSFER BUS
FEED C/B (N36).

LOCATE AND RESET THE FOLLOWING
CIRCUIT BREAKERS:

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- EMERGENCY DC BUS FEED (N37 or D15*).

———— END OF PROCEDURE ————

➤➤ *If smoke or fumes continue:*

LOCATE AND PULL BATTERY DIRECT BUS FEED
C/B (D17*).

LOCATE AND RESET THE FOLLOWING CIRCUIT
BREAKERS:

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMERGENCY DC BUS FEED (N37 or D15*).

EMER LTS SWITCH. ARM

———— END OF PROCEDURE ————

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

90

➤ ***If Emergency power operation is abnormal:***

CABIN ALT CONTROL LEVER AUTO (UP)
EMER LTS SWITCH OFF
EMER PWR SWITCH. OFF

WARNING

Verify First Officer's flight instruments are normal before proceeding to next step.

**LOCATE AND PULL THE FOLLOWING CIRCUIT
BREAKERS.**

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMERGENCY DC BUS FEED (N37 or D15*).
- CHARGER & TRANS RELAY (C17*).
- BATTERY RELAY (C18*).
- EMERGENCY INVERTER (D13*).

BATTERY SWITCH OFF

NOTE: APU, if running, will shut down.

NOTE: If emergency DC bus and/or DC transfer bus are not powered, use engine fire handle when engine shutdown is required.

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL**

90

(Continued):

► *If smoke or fumes stop:*

RESET DC TRANSFER BUS FEED CIRCUIT BREAKER (N36).

►► *If smoke or fumes reappear:*

LOCATE AND PULL DC TRANSFER BUS FEED C/B (N36).

LOCATE AND RESET THE FOLLOWING CIRCUIT BREAKERS:

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- EMERGENCY DC BUS FEED (N37 or D15*).

———— **END OF PROCEDURE** ————

► *If smoke or fumes continue:*

LOCATE AND PULL BATTERY DIRECT FEED BUS FEED C/B (D17).

LOCATE AND RESET THE FOLLOWING CIRCUIT BREAKERS:

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMERGENCY DC BUS FEED (N37 or D15*).

EMER LTS SWITCH ARM

———— **END OF PROCEDURE** ————

90

TIE BUS FEEDER FAULT

90

TIE BUS FEEDER FAULT

LEFT AND RIGHT BUS TIE SWITCHES OPEN

APU GEN SWITCH OFF

———— END OF PROCEDURE ————

Non-Normal Checklists
Engines, APU

Chapter NNC
Section 7

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Intentionally
Blank

ALL ENGINES FLAMEOUT

► *If two engine flameout was caused by fuel starvation in left and right main tanks with fuel in center wing tank:*

THE OPTIMUM ATTITUDE FOR SCAVENGING FUEL FROM THE RIGHT MAIN TANK FOR APU OR RIGHT ENGINE IS 0° PITCH ATTITUDE AND 1.5° RIGHT WING UP.

EMER PWR SWITCH	ON
(90) IGNITION	ON
(88) IGNITION	OVRD
CABIN ALT CONTROL LEVER.	MANUAL (DOWN)
OUTFLOW VALVE	CLOSE
OXYGEN MASKS	ON / 100%
THUNDERSTORM LIGHT SWITCH	AS REQD
THROTTLES	IDLE
DC START PUMP	ON
BOOST PUMPS.	ON
(88) FUEL LEVERS	ON
(90) FUEL SWITCHES	OFF, THEN ON
FUEL X FEED LEVER	OFF
ENGINE ANTI-ICE SWITCHES.	ON
USE MINIMUM MANEUVERING AIRSPEED.	

(Continued on next page)

ALL ENGINES FLAMEOUT
(Continued)

➤ ***If neither engine starts:***

(88) APU DOORS SWITCH AUTO
APU MASTER SWITCH START

➤ ***If APU starts:***

(88) LEFT AND RIGHT APU BUS SWITCHES ON

➤ ***If APU does not start:***

CONTINUE ENGINE START ATTEMPTS.

➤ ***When one or both engines start:***

I CABIN ALT CONTROL LEVER. AUTO (UP)
(88) EMER PWR SWITCH OFF
(90) EMER PWR SWITCH ARM
THUNDERSTORM LIGHT SWITCH OFF
DC START PUMP OFF
ENGINE ANTI-ICE SWITCHES AS REQD
(88) IGNITION. AS REQD
(90) IGNITION. AUTO

NOTE: Continue engine and/or APU start attempts until at least two sources of power are running.

———— **END OF PROCEDURE** ————

APU FIRE

APU FIRE CONTROL SWITCH. . . . OFF AND AGENT ARM

➤ **If APU FIRE light is illuminated:**

DISCHARGE APU FIRE AGENT.

➤ **If APU FIRE light remains on:**
DISCHARGE REMAINING APU FIRE AGENT.
LAND AT NEAREST SUITABLE AIRPORT.

➤ **If APU FIRE light not illuminated:**
APU MASTER SWITCH OFF

——— END OF PROCEDURE ———

➤ **If APU FIRE light is not illuminated:**

APU MASTER SWITCH OFF

——— END OF PROCEDURE ———

APU NO START / NO ROTATION / HUNG START

NOTE: If APU FAULT message is illuminated, see APU FAULT message procedure.

CHECK RPM GAUGE.

► If no indication:

BATTERY SWITCH ON/LOCK

APU FIRE CONT SWITCH NORM

(88) APU DOORS SWITCH AUTO

START PUMP SWITCH ON

CHECK DC VOLTS / AMPS METER.

- Check battery voltage while applying APU starter load.
- It takes approximately 20 seconds for APU doors to open.

► If battery voltage is less than 22:

DISCONTINUE START ATTEMPT.

- Notify Maintenance for battery replacement.

► If battery voltage is more than 22:

APU MASTER SWITCH OFF

CHECK / RESET APU CONTROL CB, IF TRIPPED.

- (88) (B21*).
- (90) (B22*).

CHECK / RESET APU DOOR CONTROL CB (U39), IF TRIPPED.

RESET BAT DIRECT BUS CB.

- (88) CB reset handle is located on Captain's side lower rear pedestal.
- (90) (D17*).

(Continued on next page)

APU NO START / NO ROTATION / HUNG START (Continued)

➤➤ *If on ground:*

CHECK GEAR HDL REL BUTTON EXTENDED.

NOTE: A retracted GEAR HDL REL button indicates an extended nose strut and failure of ground shift mechanism to go into ground mode.

(88) APU MASTER SWITCH RUN

(88) CHECK APU DOOR POSITION.

➤➤➤ *(88) If doors are open:*

ATTEMPT START.

➤➤➤ *(88) If doors are closed:*

APU DOORS

**SWITCH. NON RAM 24 SECONDS,
MINIMUM, THEN OFF**

ATTEMPT START.

- If start attempt successful, continue operation using manual door control.

—— **END OF PROCEDURE** ——

➤ *If stabilized at less than idle rpm:*

APU MASTER SWITCH OFF

START PUMP SWITCH ON

ATTEMPT ANOTHER START AFTER 5 MINUTES.

➤ *If APU does not operate properly:*

APU MASTER SWITCH OFF

(88) APU DOORS SWITCH AUTO

—— **END OF PROCEDURE** ——

APU IDLE TEMPERATURE HIGH (NO LOAD)

This procedure is to be used when no-load idle EGT is stabilized considerably above normal idle values (60-70%), APU AIR switch is **ON**, and all pneumatic powered systems are off.

NOTE: It is not uncommon to see up to 80% EGT on the APU once the AIR switch had been turned **ON** and is currently **OFF**. Even though the APU air is no longer in use, the surge valve remains open causing the EGT to be high. Do not turn AIR switch **ON** until air is required.

APU AIR SWITCH. **OFF**

APU MASTER SWITCH. **OFF**

———— END OF PROCEDURE ————

APU OIL PRESS LOW / APU FAULT

APU OIL PRESS LOW

APU FAULT

If an APU FAULT message illuminates in flight and APU is required for in flight operations, i.e., MEL item, etc., a shutdown is not necessary as long as the APU is operated within allowable limits while monitoring rpm and EGT.

APU FIRE CONT SWITCH **OFF AND AGENT ARM**

APU AIR SWITCH. **OFF**

(88) APU DOORS SWITCH **AUTO**

APU MASTER SWITCH. **OFF**

APU FIRE CONT SWITCH **NORM**

———— END OF PROCEDURE ————

88

ART INOP WITH SWITCH IN AUTO

88

ART INOP

➤ ***On the ground:***

RESET ART SWITCH.

CHECK / RESET ART SOLENOID CB'S (X32, Z32), IF TRIPPED.

➤ ***If message remains illuminated:***

DETERMINE TAKEOFF THRUST / FLAPS.

- With the ART switch **OFF**, normal power takeoffs are not permitted. An alternate or maximum power takeoff must be made.

➤ ***In flight:***

ART SWITCH OFF, THEN AUTO

CHECK / RESET ART SOLENOID CB'S (X32, Z32), IF TRIPPED.

➤ ***If message remains illuminated:***

SYSTEM STATUS:

- ARTS inoperative.

———— **END OF PROCEDURE** ————

90

AUTO - ABORTED STARTS

90

FUEL SWITCH (AFFECTED ENGINE) OFF

MONITOR AUTO ABORT SEQUENCE.

- If start valve was open and fuel valve was commanded open, auto abort system will dry motor the engine.
- After auto abort is complete, start valve will automatically be closed.

NOTE: Automatic engine start auto abort system aborts a start if N_2 is 50% or less, after detecting a hot start, hung start, locked N_1 , ignition failure, or high EGT (both EEC channels).

NOTE: Automatic engine start auto abort system will not abort for low oil pressure or high vibrations.

➤ **If no engine limitations were exceeded:**

ATTEMPT ANOTHER NORMAL START.

➤ **If normal start is unsuccessful and if no engine limitations were exceeded:**

ATTEMPT A MANUAL START.

➤ **If manual start is unsuccessful:**

CONTACT MAINTENANCE.

——— **END OF PROCEDURE** ———

BATTERY START

This procedure is to be utilized when APU generator and ground electrical power are unavailable. Both engines should be started prior to taxi.

CHOCK AIRCRAFT.

COMPLETE EXTERIOR/INTERIOR PREFLIGHT.

COMPLETE FOLLOWING BEFORE START AND ENGINE START CHECKLIST ITEMS.

- Check CB's.
- Throttles - **IDLE**.
- FUEL levers/switches - **OFF**.
- Battery - **ON**/lock.
- Check fire warning.
 - Agent low lights are not powered.

EMER PWR SWITCH ON

PNEU X FEED VALVES. OPEN

AIR CONDITIONING SUPPLY SWITCHES. OFF

(88) AC X TIE SWITCH OPEN

DC X TIE SWITCH OPEN

(88) IGNITION. SYS A OR SYS B

(90) IGNITION. ON

CHECK PNEUMATIC PRESSURE.

► *If using ground air supply:*

- (88) 36 psi minimum at sea level less 1 psi per 1000 feet pressure altitude above sea level.
- (90) 25 psi minimum.

► *If using APU air supply:*

- (88) Positive pressure indication.
- (90) Pressure indication may only be observed after START switch is pulled.

(Continued on next page)

BATTERY START

(Continued)

DC START PUMP ON

ANTI-COLLISION LIGHT ON

START RIGHT ENGINE.

- Start valve closing can be verified by observing an increase in pneumatic pressure as start switch is released.
- Verify START VALVE OPEN message is no longer displayed after generator comes on line.

SYSTEM STATUS:

- Only the following engine instruments/warning lights will be operative during start:
 - OIL PRESS LOW message.
 - EGT.
 - N₁.
 - N₂.

CHECK RIGHT GENERATOR VOLTS/FREQUENCIES.

(88) AC X TIE SWITCH AUTO

CHECK ENGINE INSTRUMENTS.

MAIN TANK FUEL PUMPS ON

DC START PUMP OFF

(90) IGNITION AUTO

(88) EMER PWR SWITCH OFF

(90) CHECK EMER PWR SWITCH ARMED.

- Do not move switch through **OFF** position.

COMPLETE BEFORE START CHECKLIST.

- BEFORE START checklist must be completed after starting engine since electrical power was not available prior to start.

START LEFT ENGINE.

COMPLETE AFTER START CHECKLIST.

———— **END OF PROCEDURE** ————

EGT HIGH

SLOWLY RETARD THROTTLE.

CHECK EPR, N₁, N₂, AND FUEL FLOW.

➤ ***If EGT exceeds [(88) 630°C, (90) 610°C], and cannot be reduced or exceeds [(88) 645°C, (90) 620°C]:***

SHUT DOWN ENGINE.

ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE.

➤ ***If EGT exceeds [(88) 630°C, (90) 610°C], but does not exceed [(88) 645°C, (90) 620°C] and throttle reduction decreases EGT below [(88) 625°C, (90) 610°C]:***

CONTINUE ENGINE OPERATION AT REDUCED THRUST.

- Make log book entry of amount and duration of overtemp limit.

——— **END OF PROCEDURE** ———

ENGINE FAILURE/SHUTDOWN

WARNING

Both pilots must identify the correct throttle and fuel lever/switch prior to activation.

AUTOTHROTTLLES	OFF
THROTTLE (AFFECTED ENGINE)	IDLE

FUEL LEVER/SWITCH (AFFECTED ENGINE) OFF

EVALUATE ENGINE CONDITION.

- Verify rotation by checking engine oil/hydraulic pressure instruments.

➤ If severe engine damage is suspected:

NOTE: Indications of severe damage may include airplane vibration and on affected side:

- N_1 and/or N_2 tachometers indicating 0% [(90): dashes in EDP].
- rapid loss of hydraulic pressure.
- sudden loss of generator power.

REFER TO ENGINE FIRE or SEVERE DAMAGE CHECKLIST.

——— END OF PROCEDURE ———

ALIGN THROTTLLES.

- Move shutdown engine throttle symmetrically with the operating engine throttle to ensure proper operation of the autospoilers.
- Use autothrottles if desired.

TRP MCT

(90) SELECT 28K ON TRP.

PNEU X FEED VALVE (AFFECTED ENGINE) CLOSE

AUX/TRANSFER PUMPS ON

(Continued on next page)

ENGINE FAILURE/SHUTDOWN (Continued)

CHECK ELECTRICAL LOADS.

NOTE: Start APU (if available) to reduce electrical load on operating generator.

MAINTAIN FUEL BALANCE.

- Open fuel X FEED lever as necessary.

► Clean up items:

AIR CONDITIONING SHUTOFF OVRD

ENG SYNC SELECTOR OFF

AIR CONDITIONING SUPPLY SWITCH (AFF. ENG) . . . OFF

CHECK DRIFTDOWN PERFORMANCE.

- Consult ODM, Abnormals Section and low altitude charts for the nearest suitable airports and driftdown data.
- If FMS is available, engine out data may be obtained by selecting the ENG OUT prompt.
- The FMS may not be used for range calculations or fuel management.

TRANSPONDER FUNCTION SELECTOR TA

- Aircraft performance with an engine inoperative may not meet RA requirements.

LANDING FLAP CONFIGURATION 28 / LAND

- In the event of a missed approach, the go-around flap setting is 11.

**AUTOPILOT MUST BE DISCONNECTED PRIOR TO GLIDE
SLOPE CAPTURE.**

(Continued on next page)

ENGINE FAILURE/SHUTDOWN

(Continued)

CAUTION

If engine failure occurs at high airspeed (rudder restriction in effect), the possibility exists for the rudder to remain restricted throughout the approach and landing.

➤ *If rudder remains restricted during approach:*

- *To restore rudder travel for the appropriate airspeed:*
**MOMENTARILY CENTER RUDDER PEDALS AND TRIM
AS AIRSPEED DECREASES.**

 - Ensure full unrestricted rudder travel is available.

➤ *If full rudder travel is not restored, when below 160 knots:*
GENTLY WALK RUDDER PEDALS.

 - Allows limiter to drop out of the rudder control mechanism.

➤ *If unrestricted rudder is still not attained:*
**ACCOMPLISH APPROPRIATE NON-NORMAL
CHECKLIST IN FLIGHT CONTROLS SECTION.**

———— **END OF PROCEDURE** ————

ENGINE FIRE or SEVERE DAMAGE

NOTE: A fire warning may or may not appear with severe engine damage. Indications of severe damage may include airplane vibration and on affected side:

- N_1 and/or N_2 tachometers indicating 0% [(90): dashes in EDP].
- rapid loss of hydraulic pressure
- sudden loss of generator power.

WARNING

Both pilots must identify the correct throttle and fuel lever/switch prior to activation.

AUTOTHROTTLES OFF
THROTTLE (AFFECTED ENGINE) IDLE

➤ ***If fire warning ceases at any time or severe engine damage is not suspected:***

CONTINUE IDLE ENGINE OPERATION AT CAPTAIN'S DISCRETION. CONTINUE PROCEDURE WITH CLEAN-UP ITEMS.

➤ ***If fire warning continues or severe engine damage is suspected:***

FUEL LEVER/SWITCH (AFFECTED ENGINE) OFF • (90) Red FUEL switchlight will extinguish.

ENG FIRE HANDLE (AFFECTED ENGINE) PULL DISCHARGE FIRE AGENT.

- Pull handle completely out while turning to discharge bottle.

➤ ***If ENG FIRE remains illuminated after 30 seconds:***

DISCHARGE REMAINING AGENT.

(Continued on next page)

ENGINE FIRE or SEVERE DAMAGE (Continued)

ALIGN THROTTLES.

- Move shutdown engine throttle symmetrically with the operating engine throttle to ensure proper operation of the autospoilers.
- Use autothrottles if desired.

► **Clean-up items:**

TRP MCT

(90) SELECT 28K ON TRP.

PNEU X FEED VALVE (AFFECTED ENGINE) CLOSE

AUX/TRANSFER PUMPS ON

CHECK ELECTRICAL LOADS.

NOTE: Start APU (if available) to reduce electrical load on operating generator.

MAINTAIN FUEL BALANCE.

- Open X FEED lever as necessary.

AIR COND SHUTOFF SWITCH. OVRD

ENG SYNC SELECTOR OFF

AIR COND SUPPLY SWITCH (AFF. ENG) AS REQD

- OFF, unless engine remains running in idle.

CHECK DRIFTDOWN PERFORMANCE.

- Consult ODM, Abnormals Section and low altitude charts for driftdown data.
- If FMS is available, engine out data may be obtained by selecting the ENG OUT prompt.
- The FMS may not be used for range calculations or fuel management.

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

(Continued on next page)

ENGINE FIRE or SEVERE DAMAGE (Continued)

TRANSPONDER FUNCTION SELECTOR TA

- Aircraft performance with an engine inoperative may not meet RA requirements.

LANDING FLAP CONFIGURATION 28/LAND

- In the event of a missed approach, the go-around flap setting is 11.

AUTOPILOT MUST BE DISCONNECTED PRIOR TO GLIDE SLOPE CAPTURE (FOR SINGLE ENGINE OPS ONLY).

CAUTION

If engine failure occurs at high airspeed (rudder restriction in effect), the possibility exists for the rudder to remain restricted throughout the approach and landing.

➤ If rudder remains restricted during approach:

➤ To restore rudder travel for the appropriate airspeed:

MOMENTARILY CENTER RUDDER PEDALS AND TRIM AS AIRSPEED DECREASES.

- Ensure full unrestricted rudder travel is available.

➤ If full rudder travel is not restored, when below 160 knots:

GENTLY WALK RUDDER PEDALS.

- Allows limiter to drop out of the rudder control mechanism.

➤ If unrestricted rudder is still not attained:

ACCOMPLISH APPROPRIATE ABNORMAL PROCEDURE IN FLIGHT CONTROLS SECTION.

——— END OF PROCEDURE ———

ENGINE INSTRUMENT/SYSTEM DISPLAY PANEL FAILURE

A power interruption may cause a partial blanking of the engine instruments/system display. Dashes in either display panel indicate a loss of input signal.

► ***If either panel is blank:***

**PULL / RESET ENGINE INSTRUMENT DISPLAY PANEL
CIRCUIT BREAKERS.**

Left Panel	Right Panel
(88) X36, B15*	(88) X35, C15*
(90) Z36, B16*	(90) X35, C16*

**PULL / RESET SYSTEM DISPLAY PANEL CIRCUIT
BREAKERS.**

Left Panel	Right Panel
(88) S34	(88) T34
(90) S32	(90) T32

———— END OF PROCEDURE ————

► ***If dashes are displayed in either panel:***

**PULL / RESET INSTRUMENT TRANSFORMER CIRCUIT
BREAKERS K-09 (LEFT) OR L-09 (RIGHT).**

———— END OF PROCEDURE ————

ENGINE PARAMETERS EXCEEDED OR EXCEEDANCE IS SUSPECTED IN FLIGHT

- *If able, record the value and approximate duration of exceedence:*

**CONTACT THE TECHNICAL MANAGEMENT CENTER (TMC)
AS SOON AS PRACTICAL.**

- TMC may request you interrogate engine display panel (EDP) as outlined below.

- *If unable to provide value and approximate duration of exceedence:*

**CONTACT THE TECHNICAL MANAGEMENT CENTER (TMC)
AS SOON AS PRACTICAL.**

- *Once on the ground, prior to shutting down #2 engine on taxi-in:*

**PUSH RECESSED ENGINE DISPLAY PANEL (EDP)
SELF-TEST BUTTON TWICE AND HOLD.**

- Similar to double-clicking a computer mouse button.
- A single push and hold still operates a system self test.

- *If panel performs a self-test:*
PANEL IS NOT MODIFIED.

REPORT INFORMATION TO TMC.

- *If engine parameters flash:*
**RECORD EXCEEDED PARAMETER AND DURATION
FOR THE AFFECTED ENGINE(S).**

- Highest value will flash followed by duration.
Numbers will alternate.

REPORT VALUES TO TMC.

- *If engine parameters do not flash and no self test performed:*

NO ENGINE PARAMETERS WERE EXCEEDED.

REPORT INFORMATION TO TMC.

——— **END OF PROCEDURE** ———

88

ENGINE SURGE/COMPRESOR STALL

88

CAUTION

Avoid operating engines in a persistent surge or compressor stall condition. Surges or compressor stalls may not always be audible. Surges or compressor stalls are evidenced by engine thrust loss and rapidly rising or abnormally high EGT. Multiple surges or continuous compressor stall may cause compressor damage and possible engine failure.

NOTE: If an engine surge or compressor stall occurs during ground operations, or a takeoff is rejected due to an engine surge or compressor stall, a maintenance inspection is required prior to flight.

NOTE: For any loss of thrust during takeoff, the TAKEOFF - ENGINE FAILURE profile should be flown until reaching a safe altitude, or until obstacle clearance is assured. In the event of dual engine surging, both engines may be reduced to CLIMB thrust at or above 400 feet AGL.

**AUTOTHROTTLES OFF
THROTTLE(S) (AFFECTED ENGINE[S]). . . RETARD TO IDLE
(OR MINIMUM FOR SAFE FLIGHT)**

ENGINE IGNITION SELECTOR OVRD

ENGINE ANTI-ICE SWITCHES ON

► ***Engine(s) compressor stall(s) stops:***

**OPERATE ENGINE(S) AT LEVELS WHICH COMPRESSOR
STALL(S) DOES NOT RECUR.**

ENGINE IGNITION SELECTOR AS REQD

ENGINE ANTI-ICE SWITCHES AS REQD

MONITOR ENGINE(S) FOR REMAINDER OF FLIGHT.

——— END OF PROCEDURE ———

(Continued on next page)

88 ENGINE SURGE/COMPRESSOR STALL 88 (Continued)

➤ ***Dual engine compressor stalls continue:***

FUEL LEVERS

(ONE AT A TIME) OFF THEN IMMEDIATELY ON

➤ ***Dual-engine compressor stalls stop:***

ENGINE IGNITION SELECTOR AS REQD

ENGINE ANTI-ICE SWITCHES AS REQD

**MONITOR ENGINE PARAMETERS FOR REMAINDER OF
FLIGHT.**

——— **END OF PROCEDURE** ———

➤ ***Dual-engine compressor stalls continue:***

OPERATE AT MINIMUM THRUST FOR SAFE FLIGHT

——— **END OF PROCEDURE** ———

➤ ***Single engine compressor stalls continue:***

FUEL LEVER

(AFFECTED ENGINE) OFF THEN IMMEDIATELY ON

➤ ***Single engine compressor stalls continue:***

**REFER TO THE ENGINE FAILURE/SHUTDOWN
CHECKLIST.**

NOTE: Normally an engine should not be restarted if it was shut down due to a compressor stall/surge. However, at the Captain's discretion, a restart may be attempted if the engine is critical for sustaining safe flight. In this case, engine operation should be carefully monitored after restart and for the remainder of the flight, to ensure that a compressor stall/surge has not resulted in engine damage.

LAND AT NEAREST SUITABLE AIRPORT

——— **END OF PROCEDURE** ———

(Continued on next page)

88 ENGINE SURGE/COMPRESSOR STALL 88

(Continued)

► *Single engine compressor stalls stop:*

ENGINE IGNITION SELECTOR AS REQD

ENGINE ANTI-ICE SWITCHES AS REQD

MONITOR ENGINE PARAMETERS FOR REMAINDER OF
FLIGHT.

———— END OF PROCEDURE ————

90

ENGINE SURGE/COMPRESOR STALL

90

CAUTION

Avoid operating engines in a persistent surge or compressor stall condition. Surges or compressor stalls may not always be audible. Surges or compressor stalls are evidenced by engine thrust loss and rapidly rising or abnormally high EGT. Multiple surges or continuous compressor stall may cause compressor damage and possible engine failure.

NOTE: If an engine surge or compressor stall occurs during ground operations, or a takeoff is rejected due to an engine surge or compressor stall, a maintenance inspection is required prior to flight.

NOTE: For any loss of thrust during takeoff, the TAKEOFF - ENGINE FAILURE profile should be flown until reaching a safe altitude, or until obstacle clearance is assured.

AUTOTHROTTLES OFF

THROTTLE(S) (AFFECTED ENGINE[S]) RETARD

- Retard throttle(s) on affected engine(s) (minimum for safe flight) until the engine stabilizes or the throttle reaches idle, whichever occurs first.

ENGINE ANTI-ICE SWITCH (AFFECTED ENGINE[S]) ON

AIR FOIL ANTI ICE ON

► If EGT, N1, N2 indications normal:

**OPERATE ENGINE(S) AT LEVEL(S) WHICH STALLS /
SURGES DO NOT REOCCUR.**

**ENGINE ANTI-ICE SWITCH
(AFFECTED ENGINE[S]). AS REQD**

AIR FOIL ANTI-ICE. AS REQD

**CLOSELY MONITOR ENGINE PARAMETERS FOR
REMAINDER OF FLIGHT.**

——— **END OF PROCEDURE** ———

(Continued on next page)

90 ENGINE SURGE/COMPRESSOR STALL 90
(Continued)

➤ ***if EGT, N1, N2 indications not normal:***

**FUEL SWITCH(ES) (AFFECTED ENGINE[S])
(ONE AT A TIME) OFF THEN ON**

➤ ***If EGT, N1, N2 indications return to normal:***

**OPERATE ENGINE(S) AT LEVEL(S) WHICH STALLS/
SURGES DO NOT REOCCUR.**

**ENGINE ANTI-ICE SWITCH
(AFFECTED ENGINE[S]). AS REQD**

AIR FOIL ANTI-ICE AS REQD

**CLOSELY MONITOR ENGINE PARAMETERS FOR
REMAINDER OF FLIGHT.**

——— **END OF PROCEDURE** ———

➤ ***If EGT, N1, N2 indications do not return to normal:***

FUEL SWITCH (AFFECTED ENGINE). OFF

**ENGINE ANTI-ICE SWITCH
(AFFECTED ENGINE) OFF**

AIR FOIL ANTI-ICE AS REQD

**REFER TO THE ENGINE FAILURE/SHUTDOWN
CHECKLIST.**

NOTE: *Normally an engine should not be restarted if it was shut down due to a compressor stall/surge. However, at the Captain's discretion, a restart may be attempted if the engine is critical for sustaining safe flight. In this case, engine operation should be carefully monitored after restart and for the remainder of the flight, to ensure that a compressor stall/surge has not resulted in engine damage.*

LAND AT NEAREST SUITABLE AIRPORT

——— **END OF PROCEDURE** ———

90	(L/R) ENGINE SURGE	90

CAUTION

Avoid operating engines in a persistent surge or compressor stall condition. Surges or compressor stalls may not always be audible. Surges or compressor stalls are evidenced by engine thrust loss and rapidly rising or abnormally high EGT. Multiple surges or continuous compressor stall may cause compressor damage and possible engine failure.

NOTE: If an engine surge or compressor stall occurs during ground operations, or a takeoff is rejected due to an engine surge or compressor stall, a maintenance inspection is required prior to flight.

NOTE: For any loss of thrust during takeoff, the TAKEOFF - ENGINE FAILURE profile should be flown until reaching a safe altitude, or until obstacle clearance is assured.

AUTOTHROTTLES OFF

THROTTLE(S) (AFFECTED ENGINE[S]) RETARD

- Retard throttle(s) on affected engine(s) (minimum for safe flight) until the engine stabilizes, and/or “(L/R) ENGINE SURGE” alert is no longer displayed or throttle reaches idle, whichever occurs first.

ENGINE ANTI-ICE (AFFECTED ENGINE[S]) ON

AIR FOIL ANTI-ICE ON

► If EGT, N1, N2 normal:

**OPERATE ENGINE(S) AT LEVEL(S) WHICH STALLS/
SURGES DO NOT REOCCUR.**

ENGINE ANTI-ICE (AFFECTED ENGINE[S]) AS REQD

AIR FOIL ANTI-ICE AS REQD

**CLOSELY MONITOR ENGINE PARAMETERS FOR
REMAINDER OF FLIGHT.**

——— **END OF PROCEDURE** ———

(Continued on next page)

90

(L/R) ENGINE SURGE
(Continued)

90

➤ ***If EGT, N1, N2 indications not normal:***

**FUEL SWITCH(ES) (AFFECTED ENGINE[S])
(ONE AT A TIME) OFF THEN ON**

➤ ***If EGT, N1, N2 indications return to normal:***

**OPERATE ENGINE(S) AT LEVEL WHICH STALLS/
SURGES DO NOT REOCCUR.**

ENGINE ANTI-ICE (AFFECTED ENGINE[S]) . . AS REQD

AIR FOIL ANTI-ICE AS REQD

**CLOSELY MONITOR ENGINE PARAMETERS FOR
REMAINDER OF FLIGHT.**

——— **END OF PROCEDURE** ———

➤ ***If EGT, N1, N2 indications do not return to normal:***

FUEL SWITCH (AFFECTED ENGINE). OFF

**ENGINE ANTI-ICE SWITCH
(AFFECTED ENGINE) OFF**

AIR FOIL ANTI-ICE AS REQD

**REFER TO THE ENGINE FAILURE/SHUTDOWN
CHECKLIST.**

NOTE: *Normally an engine should not be restarted if it was shut down due to a compressor stall/surge. However, at the Captain's discretion, a restart may be attempted if the engine is critical for sustaining safe flight. In this case, engine operation should be carefully monitored after restart and for the remainder of the flight, to ensure that a compressor stall/surge has not resulted in engine damage.*

LAND AT NEAREST SUITABLE AIRPORT

——— **END OF PROCEDURE** ———

ENGINE SYNC FAILURE/OPERATION

➤ ***If EPR split exists with autothrottles engaged and ENG SYNC switch OFF:***

AUTOTHROTTLES OFF (MORE THAN 5 SECONDS)

- Engine synchronization actuator may have traveled to its limit and requires approximately 5 seconds to recenter.

MATCH THROTTLE EPR SETTINGS MANUALLY.

AUTOTHROTTLES ON

➤ ***If EPR split redevelops or a different sync mode desired:***

ENG SYNC SELECTOR OFF

AUTOTHROTTLES OFF (MORE THAN 5 SECONDS)

- Allow 5 seconds to center actuator.

(88) MATCH THROTTLES EITHER N₁ OR N₂ RPM (± 1%).

- Use of N₁ is recommended.

(90) MATCH THROTTLES N₁ RPM (± 1%).

(88) SELECT ENG SYNC SELECTOR TO N₁ OR N₂.

- Select the same mode rpm matched to in step above.
- Use of N₁ is recommended.

(90) SELECT ENG SYNC SELECTOR TO N₁.

AUTOTHROTTLES ON

——— **END OF PROCEDURE** ———

90

**ENGINE SYNC FAULT/
ENGINE SYNC ON**

90

**ENGINE SYNC FAULT
ENGINE SYNC ON**

NOTE: *ENGINE SYNC FAULT* message is displayed any time an engine synchronizer malfunction is detected. *ENGINE SYNC ON* message is displayed when ENG SYNC switch is positioned to N_1 and the EEC's are in TOGA or approach idle mode.

ENGINE SYNC SWITCH OFF

——— **END OF PROCEDURE** ———

90

ENGINE VIBRATION HIGH

90

L or R ENG VIB HI

CHECK ENGINE VIBRATION INDICATOR.

➤ ***If VIB indicator is below 4.0:***

MONITOR ENGINE INDICATIONS.

——— **END OF PROCEDURE** ———

➤ ***If VIB indicator is at or above 4.0:***

AUTOTHROTTLES OFF

RETARD THROTTLE (AFFECTED ENGINE).

- Slowly retard throttle until VIB indication is below 4.0 or idle, whichever occurs first.

CONTINUE FLIGHT.

- With affected engine at reduced thrust.

MONITOR ENGINE INDICATIONS.

NOTE: *Thrust required for safe flight may be used at any time.*

——— **END OF PROCEDURE** ———

EPR ERRATIC OR FIXED

➤ ***If icing conditions exist:***

(88) IGNITION. SYS A OR B

(90) IGNITION. ON

ENGINE ANTI-ICE ON

CHECK NORMAL OPERATION OF EPR GAUGE.

- If EPR gauge is operating normally, turn ignition off and when no longer in icing conditions, engine anti-ice off.

➤ ***If EPR gauge is not operating normally:***

AUTOTHROTTLES OFF

COMPARE EPR, N₁, N₂ AND FUEL FLOW.

- Move throttles while observing engine parameters.

➤ ***If these indications respond to throttle changes and EPR gauge remains erratic or fixed:***

SET ENGINE POWER USING N₁.

- Align throttle to engine with operating EPR gauge.

CHECK EPR CB'S.

- (88) C8* & L25.
- (90) C16* & X36.
- May be reset one time.

➤ ***If both EPR gauges are inoperative:***

CONSULT OPERATIONAL DATA MANUAL.

- Initial N₁ data can be obtained from ODM, Abnormal Section-Operation Without Airspeed Indication.
- Adjust throttles as necessary to maintain desired airspeed.

——— **END OF PROCEDURE** ———

90

**HUNG START DURING
MANUAL START**

90

NOTE: *This procedure applies when a hung start occurs during a manual start. During an auto start, if the EEC detects a hung start, engine start will be automatically aborted.*

Engine does not continue acceleration to idle and other indications are in normal range.

**ENGINE HYDRAULIC PUMP SWITCH
(AFFECTED ENGINE). OFF**

➤ ***If engine does not accelerate to IDLE rpm within 2 minutes after fuel on, or indications are abnormal:***

SHUT DOWN ENGINE.

➤ ***After rpm ceases:***
MOTOR ENGINE FOR 30 SECONDS.

——— END OF PROCEDURE ———

➤ ***If engine accelerates to IDLE within 2 minutes of fuel on:***

CONTINUE NORMAL OPERATION.
ENGINE HYDRAULIC PUMP ON

——— END OF PROCEDURE ———

88

**HUNG START/
NO ACCELERATION TO IDLE**

88

CHECK ENGINE INSTRUMENTS.

➤ ***If N_2 fails to increase above 42%:***

ACCOMPLISH MANUAL ABORTED START PROCEDURE.

- Abort the start prior to reaching 475°C.

➤ ***If a second start is to be attempted:***

ENGINE ANTI-ICE ON

ENGINE HYDRAULIC PUMP OFF

MONITOR EGT.

- Ensure EGT is below 100°C prior to fuel on.
- Monitor EGT until N_2 stabilized at or above 50%.

➤➤ ***If engine response and indications are normal:***

ENGINE ANTI-ICE AS REQD

HYDRAULIC PUMP ON

➤ ***If N_2 is above 42%, but below 50% and other engine instruments are normal:***

ADVANCE THROTTLE.

- Advance throttle to momentarily increase N_2 to 65% while closely monitoring EGT. This should close the surge valve.

➤ ***If engine does not ACCELERATE to idle rpm within 2 minutes after FUEL lever is placed ON:***

ACCOMPLISH MANUAL ABORTED START PROCEDURE.

——— **END OF PROCEDURE** ———

88	IN FLIGHT START	88

THROTTLE IDLE
FUEL LEVER OFF
HYDRAULIC PUMP OFF
PNEU X FEED VALVE. CLOSE
GEN CONTROL SWITCH. OFF
ENGINE ANTI-ICE ON
FUEL TANK PUMPS (ALL) ON
AIRSPEED AS REQD

• See normal relight chart, next page.

CHECK OIL PRESSURE INDICATING.

IGNITION OVERRIDE

FUEL LEVER (N₂ INDICATING) ON

• Fuel flow may flash and be higher than 1,100 pph. This is acceptable as long as a 625° EGT is not exceeded.

CHECK ENGINE INSTRUMENTS.

➤ *If light off does not occur within 20 seconds:*

DISCONTINUE START ATTEMPT.

➤ *If second start is attempted:*

RE-ACCOMPLISH PROCEDURE, AFTER ALLOWING ENGINE TO COOL BELOW 100° EGT.

➤ *If start successful:*

GEN CONTROL SWITCH. ON
HYDRAULIC PUMPS AS REQD

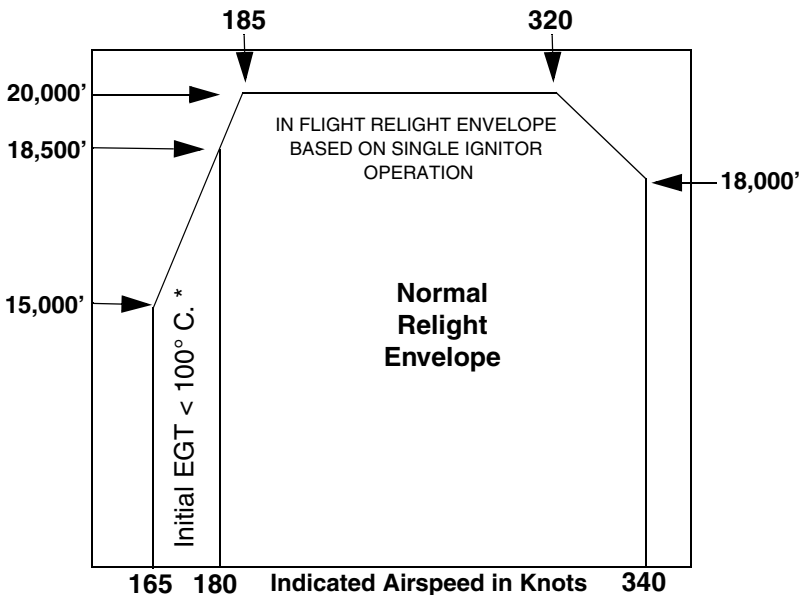
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88

IN FLIGHT START (Continued)

88

FUEL, PNEUMATICS AND PRESSURIZATION . . . AS REQD
 AIR CONDITIONING SHUTOFF SWITCH AUTO
 ENGINE ANTI-ICE AS REQD
 IGNITION AS REQD



* Temperatures higher than 100° C might result in a hot start at these airspeeds.

➤ *If in flight start is unsuccessful:*

ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE.

——— END OF PROCEDURE ———

90	IN FLIGHT START	90

AUTOTHROTTLES OFF
THROTTLE IDLE
FUEL SWITCH OFF
ENGINE FIRE HANDLE. FULL FORWARD
MAIN TANK FUEL PUMP SWITCHES ON

NOTE: Oil pressure will not be displayed until approximately 20% N₂.

➤ ***If N₂ is below 10%:***

AIRFOIL ANTI-ICE OFF
PNEUMATIC X FEED VALVES OPEN

CHECK PNEUMATIC PRESSURE.

- Verify pressure of 25 psi minimum.
- APU air is available up to 20,000 feet.

PULL START SWITCH.

- When N₂ is above 10% continue with “***If N₂ is above 10%***” conditional below.

➤ ***If N₂ is above 10%:***

FUEL SWITCH ON

*NOTE: If EGT and rpm rise do not occur within 20 seconds or if EGT exceeds 635° after FUEL switch has been moved to **ON**, move FUEL switch to **OFF**.*

ENGINE INSTRUMENTS STABILIZED

CAUTION

Allow engine to operate at idle for one minute and an additional minute at 74% N₂ before advancing throttle to higher power settings.

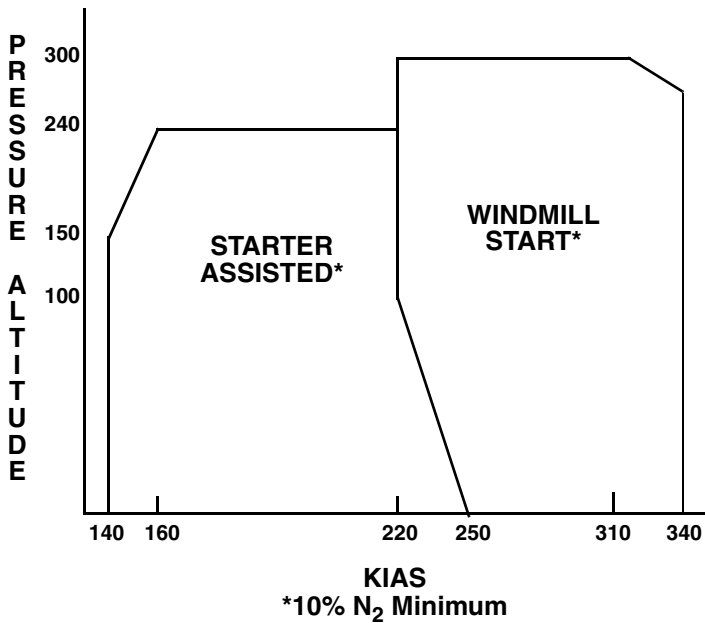
FUEL, PNEUMATIC, HYDRAULIC AND
AIR CONDITIONING SYSTEMS AS REQD

(Continued on next page)

90

IN FLIGHT START
(Continued)

90



—— END OF PROCEDURE ——

MANUAL ABORTED STARTS

FUEL LEVER/SWITCH	OFF
(88) IGNITION	OFF
(90) IGNITION	AUTO

➤ ***If START switch is still engaged:***

CONTINUE ENGINE ROTATION.

- Continue rotation (88):20; (90):30 seconds to clear fuel.

START SWITCH. OFF

CAUTION

If start was aborted for an EGT exceeding max limit, contact Maintenance prior to attempting another start.

(90) NOTE: At N_2 rotation between 20% and max motoring, N_1 could be just beginning to indicate in the 0 - 1% range. However, N_1 must begin to indicate by 33% N_2 .

(90) NOTE: After shutting down for engine vibrations above 4.0, a maximum of 3 restarts can be attempted.

(Continued on next page)

MANUAL ABORTED STARTS (Continued)

➤ ***If another start is to be attempted:***

CLEAR ENGINE.

- Rotate engine at max motoring for [(88) 20 seconds] or [(90) 30 seconds] with starter if not previously accomplished.
- If start abort due to no N₁ rotation, refer to the N1 - NO ROTATION checklist.
- For no oil pressure, check (88) A1, A10; (90) S21, T21.
- If start abort due to no indicated N₂ rotation, refer to the N2 - NO ROTATION checklist.
- If start abort due to rapid EGT rise toward limit, allow engine to cool below [(88) 100°C, (90) 250°C] EGT prior to FUEL lever/FUEL switch **ON**.
- (88) If abort due to no ignition, select opposite system.

CHECK CIRCUIT BREAKERS FOR NO IGNITION.

- (88) K26, L 26, C18*.
- (90) K26, L 26, D13*

(90) NOTE: *If no ignition on start, attempt another start to force ignition to switch to opposite side, or attempt a manual start with ignition **ON**.*

- For Hung Start, refer to the (88) HUNG START/NO ACCELERATION TO IDLE, (90) HUNG START DURING MANUAL START checklists.
- Use normal start procedure.

——— **END OF PROCEDURE** ———

90

MANUAL START

90

COMPLETE PUSHBACK/START CHECKLIST.

IGNITION ON

NOTE: With **IGNITION** switch in **ON** position, auto-abort is not available.

CONTINUE WITH ENGINE START IN THE NORMAL MANNER.

➤ ***After engine start is complete:***

IGNITION AUTO

—— **END OF PROCEDURE** ——

88

N1 AND/OR N2 OVERSPEED

88

REDUCE THROTTLE THRUST.

➤ ***If N_1 exceeded 102% or N_2 exceeded 103%:***

SHUT DOWN ENGINE.

ACCOMPLISH ENGINE FAILURE / SHUTDOWN PROCEDURE.

➤ ***If N_1 did not exceed 102%, and N_2 did not exceed 103%,
and all engine indicators are normal:***

CONTINUE ENGINE OPERATION.

- Make log book entry of amount and duration of overspeed.

——— **END OF PROCEDURE** ———

90

N1 MODE DEFAULT

90

PUSH AFFECTED N₁ MODE SWITCHLIGHT.

- Observe **DEFAULT** light extinguishes and **SELECT** light illuminates.

PUSH AFFECTED N₁ MODE SWITCHLIGHT.

➤ If N₁ MODE **DEFAULT** light is extinguished:

EPR THRUST CONTROL MODE. RESTORED
CONTINUE NORMAL ENGINE OPERATION.

——— END OF PROCEDURE ———

➤ If N₁ MODE **DEFAULT** light is illuminated:

SYSTEM STATUS:

- EPR thrust control mode not available on affected engine.
- Autothrottle is inoperative when either engine is in N₁ mode.

NOTE: When an engine is in N₁ mode, left and right throttle positions may be staggered when N₁ settings are aligned.

At pilot's discretion, N₁ mode may be selected on opposite engine to eliminate throttle stagger.

——— END OF PROCEDURE ———

88

N1 - NO ROTATION

88

DISCONTINUE START.

➤ If dispatched with inoperative N₁:

CONFIRM N₁ ROTATION WITH GROUND CREW WHILE
ACCOMPLISHING NORMAL START.

——— END OF PROCEDURE ———

88

N2 - NO ROTATION

88

CHECK N₁ GAUGE/OIL PRESSURE GAUGE.

- Confirm N2 rotation by rising oil pressure and N1 rotation prior to FUEL lever/switch ON.

➤ ***If rotation is confirmed:***

CONTINUE START.

FUEL LEVER ON AT 5% N₁

START SWITCH OFF AT 16% N₁

——— **END OF PROCEDURE** ———

88

OIL PRESSURE HIGH

88

CHECK OIL QUANTITY.

➤ ***If oil pressure is above 55 psi and quantity is increasing:***

SHUT DOWN ENGINE.

ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE.

➤ ***If oil pressure is above 55 psi and quantity is normal:***

REDUCE THROTTLE.

- Engine may be operated at reduced thrust.
- Normal operation may be maintained if flight conditions require.

CHECK REMAINING ENGINE INSTRUMENTS.

➤ ***If engine instruments indicate another malfunction:***

SHUT DOWN ENGINE.

ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE.

——— **END OF PROCEDURE** ——

OIL PRESSURE LOW

L or R OIL PRESS LOW

SLOWLY RETARD THROTTLE.

CHECK OIL PRESSURE.

➤ ***If oil pressure is above [(88) 35 psi] or [(90) 80 psi]:***

CHECK OIL TEMPERATURE/QUANTITY.

➤ ***If oil temperature/quantity are normal:***

CONTINUE NORMAL ENGINE OPERATION.

- Assume faulty OIL PRESS LOW message circuit.

➤ ***If oil temperature/quantity are not normal:***

SHUT DOWN ENGINE.

**ACCOMPLISH ENGINE FAILURE / SHUTDOWN
PROCEDURE.**

➤ ***If oil pressure is at/below [(88) 35 psi] or [(90) between 60 and 80 psi]:***

CHECK / TEST OVERHEAD ANNUNCIATOR PANEL.

➤ ***If OIL PRESS LOW message is extinguished and OAP tests normally:***

CONTINUE ENGINE OPERATION AT REDUCED THRUST.

- Maintain fuel balance.
- Consider using flaps 28 for landing.

➤ ***If OIL PRESS LOW message is illuminated or [(90) oil pressure is below 60 psi:***

SHUT DOWN ENGINE.

**ACCOMPLISH ENGINE FAILURE / SHUTDOWN
PROCEDURE.**

(Continued on next page)

OIL PRESSURE LOW (Continued)

➤ *(90) If oil pressure is below 60 psi:*

SHUT DOWN ENGINE.

ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE.

——— END OF PROCEDURE ———

OIL QUANTITY DECREASING

CHECK OIL PRESSURE/TEMPERATURE/FUEL FLOW.

➤ *If oil pressure/temperature and fuel flow are normal:*

CONTINUE ENGINE OPERATION.

- Anticipate an oil pressure loss.

➤ *If oil pressure is fluctuating:*

REDUCE ENGINE THRUST.

- Anticipate an oil pressure loss.

➤ *If oil pressure is below [(88) 35 psi] or [(90) 60 psi]:*

SHUT DOWN ENGINE.

ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE.

——— END OF PROCEDURE ———

88

OIL QUANTITY INCREASING

88

CHECK ENGINE OIL PRESSURE.

➤ *If oil pressure exceeds 55 psi:*

SHUT DOWN ENGINE.

ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE.

——— END OF PROCEDURE ———

88

OIL STRAINER CLOG - IN FLIGHT

88

L or R OIL STRAINER CLOG

SLOWLY RETARD THROTTLE.

- Reduce thrust towards **IDLE** to attempt to extinguish OIL STRAINER CLOG message.

➤ If OIL STRAINER CLOG message extinguishes:

CONTINUE ENGINE OPERATION.

- Engine may be operated at thrust settings necessary to keep the OIL STRAINER CLOG message extinguished.
- Maintain fuel balance.
- Consider using flaps 28 for landing.

➤ If OIL STRAINER CLOG message does not extinguish:

➤ If engine oil temperature and/or pressure remain within limits and there are no indications of engine damage, such as vibrations:

- Engine may be operated at idle power.

➤ If engine oil temperature and/or pressure exceed limits, or if engine vibrations occur:

SHUT DOWN THE ENGINE.

ACCOMPLISH ENGINE FAILURE/SHUTDOWN OR ENGINE FIRE/SEVERE DAMAGE PROCEDURE AS APPROPRIATE.

——— END OF PROCEDURE ———

90

OIL STRAINER CLOG - IN FLIGHT

90

L or R OIL STRAINER CLOG

CONTINUE NORMAL ENGINE OPERATION. MONITOR OIL SYSTEM.

——— END OF PROCEDURE ———

OIL STRAINER CLOG - ON THE GROUND

L or R OIL STRAINER CLOG

➤ *If oil temperature is above [(88) 25°C, (90) 32°C]:*

SHUT DOWN ENGINE.

➤ *If oil temperature is below [(88) 25°C, (90) 32°C]:*

WARM UP ENGINE.

- The OIL STRAINER CLOG message may illuminate for up to 10 minutes as a result of extremely cold oil.
- Do not accelerate from idle until the message extinguishes.

➤ *If OIL STRAINER CLOG message remains illuminated after 5 additional minutes:*

SHUT DOWN ENGINE.

ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE.

——— END OF PROCEDURE ———

88

OIL TEMPERATURE HIGH

88

An increase in oil temperature is generally caused by reduced thrust (fuel flow). Oil temperatures between 135° and 165° are acceptable for fifteen (15) minutes. Increasing thrust will provide higher fuel flows to improve oil cooling until lower fuel flows are capable of maintaining oil temperature within limits.

INCREASE ENGINE THRUST (IF PRACTICAL).

CHECK OIL TEMPERATURE.

➤ *If oil temperature exceeds 135°C for more than 15 minutes or 165° at any time:*

SHUT DOWN ENGINE.

ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE.

——— END OF PROCEDURE ———

90

OIL TEMPERATURE HIGH

90

Oil temperatures between 155°C and 165°C are acceptable for 15 minutes.

THROTTLE IDLE

CHECK OIL TEMPERATURE.

➤ *If oil temperature is above 155°C for more than 15 minutes or exceeds 165°C at any time:*

SHUT DOWN ENGINE.

ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE.

➤ *If oil temperature within limits:*

CONTINUE ENGINE OPERATION.

MONITOR OIL TEMPERATURE.

——— END OF PROCEDURE ———

88

REVERSE UNLOCK LIGHT

88

THROTTLE (AFFECTED ENGINE) IDLE

➤ *If engine **REVERSE UNLOCK** light does not extinguish:*

CONTINUE ENGINE OPERATION AT IDLE.

——— END OF PROCEDURE ———

88

REVERSER ACCUMULATOR LOW

88

L or R REVERSER ACCUM LOW

➤ ***If on ground:***

HYDRAULIC PUMPS (ENG, AUX, TRANS) ON

➤ ***If message extinguishes:***
TURN HYDRAULIC PUMPS OFF.

➤ ***If message does not extinguish:***
CONTACT MAINTENANCE.

➤ ***If in flight:***

HYDRAULIC PUMPS (ENG, AUX, TRANS). ON

**PULL / RESET THRUST REVERSER ACCUMULATOR CB
(LEFT S28, RIGHT T28).**

- While observing hydraulic quantity, pull applicable CB for 3 seconds and reset.
- Reset CB immediately if quantity decreases.

**CHECK HYDRAULIC PRESSURE/QUANTITY/REVERSER
ACCUM LOW MESSAGE.**

➤ ***If pressure and quantity are normal:***
CONTINUE NORMAL USE HYDRAULIC SYSTEM.

➤ ***If pressure or quantity drops or REVERSER ACCUM LOW
message remains illuminated for approach and landing:***
THRUST REVERSERS. AS NECESSARY

(Continued on next page)

88

REVERSER ACCUMULATOR LOW

88

(Continued)

► *If quantity is low:*

**ACCOMPLISH HYDRAULIC QUANTITY LOW OR
DECREASING PROCEDURE IN HYDRAULICS SECTION.**

- Use thrust reversers after landing as necessary for deceleration within limits of directional controllability.
- Affected reverser may not extend.

If leak is in the reverser control valve/accumulator, the reverser accumulator isolation valve will open on touchdown. This allows a loss of fluid in the respective system **regardless** of thrust reverser position.

——— **END OF PROCEDURE** ———

88

REVERSER EXTENSION IN FLIGHT

88

AUTOTHROTTLES OFF

AFFECTED THROTTLE IDLE

AFFECTED REVERSER LEVER FULL DOWN

- Reverser may not stow above 200 KIAS.
- Leave throttle in **IDLE** position until reverser is stowed.
- If reverser stows, return to normal engine operation.

➤ ***If reverser does not stow and is accompanied by buffeting and/or yawing:***

HYDRAULIC PUMPS (ALL) ON

- If reverser stows, return to normal engine operation.

➤ ***If reverser does not stow:***

FUEL LEVER OFF

SHUT DOWN ENGINE.

**ACCOMPLISH ENGINE FAILURE/SHUTDOWN
PROCEDURE.**

——— **END OF PROCEDURE** ———

90

**REVERSER EXTENSION/
UNLOCK IN FLIGHT**

90

NOTE: EEC will reduce engine power to **IDLE** whenever throttle position disagrees with reverser position.

AUTOTHROTTLES OFF

AFFECTED THROTTLE. IDLE

AFFECTED REVERSER LEVER FULL DOWN

➤ ***If aircraft is buffeting or yawing:***

SHUT DOWN ENGINE.
ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE.
LAND AT NEAREST SUITABLE AIRPORT.

———— **END OF PROCEDURE** ————

➤ ***If aircraft behavior is normal:***

AFFECTED ENGINE IDLE
• Engine may be operated at **IDLE** power.
LAND AT NEAREST SUITABLE AIRPORT.

———— **END OF PROCEDURE** ————

90	REVERSER FAULT	90

L or R REVERSER FAULT

Anticipate asymmetrical reverse on landing rollout. Affected reverser may not deploy.

———— **END OF PROCEDURE** ————

90	REVERSER INTERLOCK WILL NOT RELEASE/REVERSER LEVER RETURNS TO REDUCED THRUST	90

AFFECTED REVERSER FWD IDLE

- Use unaffected thrust reverser as necessary for deceleration within limits of directional controllability.

———— **END OF PROCEDURE** ————

90	REVERSER PRESSURIZED	90

L or R REV PRESSURIZED

AUTOTHROTTLES OFF

THROTTLE IDLE

LAND AT NEAREST SUITABLE AIRPORT.

———— **END OF PROCEDURE** ————

REVERSER UNAVAILABLE FOR LANDING

THROTTLE (AFFECTED ENGINE). FORWARD IDLE

- Use operating thrust reverser as necessary for deceleration within the limits of directional capability.

———— **END OF PROCEDURE** ————

START VALVE FAILS TO OPEN

CHECK PNEUMATIC PRESSURE.

**CHECK / RESET START VALVE / START SWITCH CIRCUIT
BREAKERS, IF TRIPPED.**

- (88) U41, U42.
- (90) U34, X39, W32, X32, B14*, B15*.

➤ ***If start valve still will not open electrically:***

MAINTENANCE INTERPHONE SWITCH ON

- Enables use of handset.
- Ground crewman should plug in interphone at the reverser dump valve access area interphone receptacle.
- Ground crewman operating start valve manually will need hand and arm cover protection.

COMPLETE PUSHBACK/START CHECKLIST.

➤ ***When ready to start:***

ENERGIZE STARTER.

- Use interphone to command start valve open.
- Activate START switch **ON**.
- START VALVE OPEN message should illuminate.

FUEL LEVER / SWITCH ON

- Place FUEL lever/switch **ON** at maximum motoring N₂.

➤ ***After light-off:***

CLOSE PNEU X FEED LEVER AT:

- (88) 40% N₂.
- (90) 43% N₂.

(88) RELEASE START SWITCH.

- Use interphone to command start valve closed.

(90) START SWITCH OFF

- Use interphone to command start valve closed.

———— **END OF PROCEDURE** ————

88

START VALVE OPEN IN FLIGHT

88

L or R START VALVE OPEN

AUTOTHROTTLES OFF
THROTTLE (AFFECTED ENGINE). IDLE
PNEU X FEED VALVE (AFFECTED ENGINE) CLOSE
AIR CONDITIONING SUPPLY SWITCH
(AFFECTED SIDE) HP BLD OFF
CHECK START SWITCH FOR AFFECTED ENGINE IS OFF.
PULL ENG START VALVE CB (U41 OR U42).
MONITOR ENGINE INSTRUMENTS.

CAUTION

Start valve open in flight could result in an uncontained starter failure leading to engine fire or severe damage.

——— **END OF PROCEDURE** ———

90

START VALVE OPEN IN FLIGHT

90

L or R START VALVE OPEN

PNEU X FEED VALVE (AFFECTED SIDE). CLOSE
AIR CONDITIONING SUPPLY SWITCH
(AFFECTED SIDE) OFF

NOTE: *Start valve is now isolated.*

CONTINUE FLIGHT WITH MESSAGE DISPLAYED.

——— **END OF PROCEDURE** ——

START VALVE REMAINS OPEN AFTER START

L or R START VALVE OPEN

PNEU X FEED LEVER CLOSE

FUEL LEVER / SWITCH OFF

(88) IGNITION OFF

*Shutdown should be completed prior to ground personnel
approaching the engine.*

———— END OF PROCEDURE ————

90

STATOR VANE FAIL

90

L or R STATOR VANE FAIL

➤ *If on ground:*

SHUT DOWN ENGINE.

———— END OF PROCEDURE ————

➤ *If in flight:*

AUTOTHROTTLES OFF

- Move throttle slowly. Keep engine out of idle range.

NOTE: Engine may shut down if allowed to idle.

———— END OF PROCEDURE ————

TAILPIPE FIRE OR TORCHING

CAUTION

Tailpipe fires are not displayed in the cockpit. The first notification of a tailpipe fire may be from an external source. Discharging the engine fire extinguishing agent will not extinguish the fire. If the fire cannot be extinguished by motoring, or if motoring is not possible, the use of ground fire fighting equipment may be required.

➤ ***In the event of a fire warning system indication:***

ACCOMPLISH ENGINE FIRE OR SEVERE DAMAGE CHECKLIST.

FUEL LEVER/SWITCH OFF

➤ ***If the engine START switch is ON:***

MOTOR ENGINE.

➤ ***After fire extinguishes:***

ENGINE START SWITCH OFF

ENGINE IGN SELECTOR OFF

——— **END OF PROCEDURE** ———

➤ ***If the engine START switch is OFF:***

N2 RPM AT 20% MAX

ENGINE START SWITCH (CRASH ENGAGE). ON

- Motoring will not be possible if the engine and APU have been shut down. Under these conditions, it will be necessary to extinguish the fire using ground equipment.

➤ ***After the fire extinguishes:***

ENGINE START SWITCH OFF

ENGINE IGN SELECTOR OFF

——— **END OF PROCEDURE** ———

VOLCANIC ASH ENCOUNTER IN FLIGHT

AVOID FLIGHT IN AREAS OF KNOWN VOLCANIC ASH.

- Airborne weather radar cannot be relied upon to detect ash clouds.
- Indications of volcanic ash include:
 - Smoke or dust in the cockpit, acrid odor, lighted particles in the air, St. Elmo's fire around the windshield.
 - Multiple malfunctions such as engine stalls, increasing EGT, decreasing N₁ and N₂, and engine flameout.
 - Volcanic dust may block the pitot static system and result in unreliable airspeed indications.
 - Comm difficulties may be experienced due to electrostatic conditions.

NOTE: *Should volcanic dust be encountered, accomplish the following and exit immediately via the shortest route at the least practical thrust setting.*

OXY MASKS ON, 100%

- Manual deployment of PAX O₂ is not recommended if cabin pressure is normal.
Intentionally
 - O₂ will be diluted with contaminated air.
Blinded

(88) IGNITION OVRD

(90) IGNITION ON

AUTOTHROTTLES OFF

RETARD THROTTLES (ALTITUDE PERMITTING).

- Increases engine surge margin and limits EGT rise.

ENGINE/AIRFOIL ANTI-ICE ON

START APU (IF AVAILABLE).

- APU may be used as a backup source of electrical power.

MONITOR ENGINE PARAMETERS.

MONITOR AIRSPEED INDICATION.

(Continued on next page)

VOLCANIC ASH ENCOUNTER IN FLIGHT (Continued)

PRECAUTIONARY LANDING AS REQD

- Avoid use of windshield wipers.
- Avoid reverse thrust to prevent engine damage, visibility restriction, and bleed air re-ingestion.

———— END OF PROCEDURE ———

VOLCANIC ASH ENCOUNTER ON GROUND

INSPECT FOR ASH DURING PREFLIGHT.

- Wash off ash deposits with water.
- Verify all inlets, scoops, and openings are free of ash.
- Inspect leading edges of aerodynamic surfaces.

BLEED AIR/AIR CONDITIONING AS REQD

- Discontinue bleed air prior to use of thrust reverse.
- Avoid use of air conditioning if possible.
- If air conditioning is necessary with visible dust, operate at full cold setting.

LIMIT USE OF THRUST REVERSE.

- Re-ingestion of ash may further damage engine.
- Reverser use may reduce visibility.

USE CAUTION DURING TAXI PROCEDURES.

- Maintain greater than normal separation from other aircraft.
- Taxi at low speed with all engines and minimum thrust.
- Limit braking if possible, but be aware the ash may reduce tire adhesion and, if wet, will reduce braking efficiency.

———— END OF PROCEDURE ———

**Intentionally
Blank**

Non-Normal Checklists
Fire Protection

Chapter NNC
Section 8

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APU FIRE

APU FIRE CONTROL SWITCH. . . . OFF AND AGENT ARM

➤ **If APU FIRE light is Illuminated:**

DISCHARGE APU FIRE AGENT.

➤ **If APU FIRE light remains on:**

DISCHARGE REMAINING APU FIRE AGENT.

➤ **If APU FIRE light not illuminated:**

APU MASTER SWITCH OFF

——— **END OF PROCEDURE** ———

➤ **If APU FIRE light is not illuminated:**

APU MASTER SWITCH OFF

——— **END OF PROCEDURE** ———

CARGO COMPARTMENT FAULT LIGHT ILLUMINATED

SET CARGO COMPARTMENT LOOP SELECTOR TO OPERATIVE LOOP.

➤ ***If FAULT light does not extinguish:***

➤ ***If on the ground:***

FAULT LIGHT REMAINS ILLUMINATED WITH CARGO LOOP SELECTOR SET IN ANY POSITION.

- System status: Fire detection for associated compartment is inoperative.

MAINTENANCE OR MEL ACTION REQUIRED.

———— **END OF PROCEDURE** ————

➤ ***If in flight:***

FAULT LIGHT REMAINS ILLUMINATED WITH CARGO LOOP SELECTOR SET IN ANY POSITION.

- System status: Fire detection for associated compartment is inoperative.

LAND AT NEAREST SUITABLE AIRPORT.

———— **END OF PROCEDURE** ————

➤ ***If FAULT light extinguishes:***

SYSTEM IS IN SINGLE LOOP OPERATION. AN ALARM OF ANY DETECTOR OF THE OPERATIVE LOOP WILL CAUSE ILLUMINATION OF THE **CARGO FIRE LIGHT AND AUTOMATICALLY ARM THE SUPPRESSION SYSTEM.**

———— **END OF PROCEDURE** ————

CARGO FIRE

NOTE: The **CARGO FIRE** light, accompanied by the fire aural alerter, the affected **FIRE/ARMED** light on the cargo fire detection panel, and **MASTER WARNING** lights will be illuminated.

NOTE:

► **If the affected cargo compartment **FIRE/ARMED** light and the #1 BTL **DISCH** light are illuminated:**

PRESS #1 BTL **DISCH SWITCH.**

- #1 BTL **DISCH** light should extinguish within 15 seconds and **AGT LOW** light should illuminate.
- #2 BTL **DISCH** light should illuminate.
- #2 bottle will automatically discharge after approximately 15 minutes and the #2 BTL **DISCH** light should extinguish and **AGT LOW** light should illuminate within 20 minutes after discharge of the #2 bottle.

► **If the affected cargo compartment **ARMED** light and the #1 BTL **DISCH** light are NOT illuminated:**

PRESS CORRESPONDING **FIRE/ARMED SWITCH.**

- Ensure switch corresponds to the correct cargo **FIRE** light on the cargo fire detection panel.

PRESS #1 BTL **DISCH SWITCH.**

- #1 BTL **AGT LOW** light should illuminate within 15 seconds.

► **After approximately 15 minutes:**

PRESS #2 BTL **DISCH SWITCH.**

- #2 BTL **AGT LOW** light should illuminate within 20 minutes after discharge of the #2 bottle.

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

——— **END OF PROCEDURE** ———

ENGINE FIRE or SEVERE DAMAGE

NOTE: A fire warning may or may not appear with severe engine damage. Indications of severe damage may include airplane vibration and on affected side:

- N_1 and/or N_2 tachometers indicating 0% [(90): dashes in EDP].
- rapid loss of hydraulic pressure
- sudden loss of generator power.

WARNING

Both pilots must identify the correct throttle and fuel lever/switch prior to activation.

AUTOTHROTTLES	OFF
THROTTLE (AFFECTED ENGINE)	IDLE

➤ **If fire warning ceases at any time or severe engine damage is not suspected:**

CONTINUE IDLE ENGINE OPERATION AT CAPTAIN'S DISCRETION.

CONTINUE PROCEDURE WITH CLEAN-UP ITEMS.

➤ **If fire warning continues or severe engine damage is suspected:**

FUEL LEVER/SWITCH (AFFECTED ENGINE) OFF

- (90) Red FUEL switchlight will extinguish.

ENG FIRE HANDLE (AFFECTED ENGINE) PULL

DISCHARGE FIRE AGENT.

- Pull handle completely out while turning to discharge bottle.

➤ **If ENG FIRE remains illuminated after 30 seconds:**

DISCHARGE REMAINING AGENT.

(Continued on next page)

ENGINE FIRE or SEVERE DAMAGE (Continued)

ALIGN THROTTLES.

- Move shutdown engine throttle symmetrically with the operating engine throttle to ensure proper operation of the autospoilers.
- Use autothrottles if desired.

► **Clean-up items:**

TRP MCT

(90) SELECT 28K ON TRP.

PNEU X FEED VALVE (AFFECTED ENGINE). . . . CLOSE

AUX/TRANSFER PUMPS ON

CHECK ELECTRICAL LOADS.

NOTE: Start APU (if available) to reduce electrical load on operating generator.

MAINTAIN FUEL BALANCE.

- Open X FEED lever as necessary.

AIR COND SHUTOFF SWITCH OVRD

ENG SYNC SELECTOR OFF

AIR COND SUPPLY SWITCH (AFF. ENG) AS REQD

- OFF, unless engine remains running in idle.

CHECK DRIFTDOWN PERFORMANCE.

- Consult ODM, Abnormals Section and low altitude charts for driftdown data.
- If FMS is available, engine out data may be obtained by selecting the ENG OUT prompt.
- The FMS may not be used for range calculations or fuel management.

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

(Continued on next page)

ENGINE FIRE or SEVERE DAMAGE (Continued)

TRANSPONDER FUNCTION SELECTOR TA

- Aircraft performance with an engine inoperative may not meet RA requirements.

LANDING FLAP CONFIGURATION 28/LAND

- In the event of a missed approach, the go-around flap setting is 11.

AUTOPILOT MUST BE DISCONNECTED PRIOR TO GLIDE SLOPE CAPTURE (FOR SINGLE ENGINE OPS ONLY).

CAUTION

If engine failure occurs at high airspeed (rudder restriction in effect), the possibility exists for the rudder to remain restricted throughout the approach and landing.

➤ *If rudder remains restricted during approach:*

➤ *To restore rudder travel for the appropriate airspeed:* **MOMENTARILY CENTER RUDDER PEDALS AND TRIM AS AIRSPEED DECREASES.**

- Ensure full unrestricted rudder travel is available.

➤ *If full rudder travel is not restored, when below 160 knots:* **GENTLY WALK RUDDER PEDALS.**

- Allows limiter to drop out of the rudder control mechanism.

➤ *If unrestricted rudder is still not attained:* **ACCOMPLISH APPROPRIATE NON-NORMAL CHECKLIST IN NNC.9, FLIGHT CONTROLS SECTION.**

———— END OF PROCEDURE ————

90

FIRE DETECTOR FAULT

90

APU FIRE DET FAULT or L or R ENG FIRE DET FAULT

NOTE: If one fire loop light has illuminated and there are no other messages, the blue **STATUS** cue light will illuminate advising of the need for maintenance after landing. No other action is required in flight. Do not move loop switch on the overhead fire loop light panel.

► **If APU FIRE DET FAULT is illuminated:**

► **If APU is not required:**

APU. OFF

► **If APU is required:**

LAND AT NEAREST SUITABLE AIRPORT

SYSTEM STATUS:

- APU fire detection not available.

——— **END OF PROCEDURE** ———

► **If L or R ENG FIRE DET FAULT is illuminated:**

LAND AT NEAREST SUITABLE AIRPORT

NOTE: Left or right engine fire detection not available.

MONITOR AFFECTED ENGINE PARAMETERS.

- For any abnormal indications.

——— **END OF PROCEDURE** ———

88

FIRE DETECTOR LOOP LIGHT WITH NO FIRE WARNING

88

FIRE DETECTOR LOOP

SELECT LOOP LIGHT SELECTOR SWITCH TO LOOP LIGHT NOT ILLUMINATED.

- Loop light should extinguish.

TEST FIRE WARNING SYSTEM (SELECTED LOOP).

- Depress LOOP TEST switch for selected loop.
- A normal fire warning test of a selected loop would provide the following indications:
 - Engine loop.
 - Fire bell.
 - Vocal warning, “FIRE LEFT (RIGHT) ENGINE”.
 - Master caution (2).
 - Fire warning light in engine fire shutoff handle (1).
 - Loop lights (3).
 - Fire detector loop message.
 - APU loop.
 - Master warning (2).
 - Master caution (2).
 - Loop lights (3).
 - Fire detector loop message.
 - Overhead panel **APU FIRE** warning light.

► *If fire warning system test is normal:*

CONTINUE OPERATION.

- LOOP LIGHT SELECTOR switch should remain in operative loop light position.
- Fire detection system is limited to single loop sensing.

(Continued on next page)

88

**FIRE DETECTOR LOOP LIGHT
WITH NO FIRE WARNING
(Continued)**

88

➤ *If fire warning system test is not normal:*

**SELECT LOOP LIGHT SELECTOR SWITCH TO PREVIOUSLY
ILLUMINATED LOOP.**

- Loop light should reilluminate.

➤ *If fire warning is now received:*

**ACCOMPLISH ENGINE FIRE / SEVERE DAMAGE
CHECKLIST, NNC.8, FIRE PROTECTION SECTION**

OR

**ACCOMPLISH APU FIRE CHECKLIST, NNC.8, FIRE
PROTECTION SECTION.**

———— END OF PROCEDURE ————

90

**FIRE DETECTOR LOOP LIGHT
WITH NO FIRE WARNING**

90

FIRE DETECTOR INOP

NOTE: *If one fire loop light has illuminated and there are no other messages, the blue **STATUS** cue light will illuminate advising of the need for maintenance after landing. No other action is required in flight. Do not move loop switch on the overhead fire loop light panel.*

➤ *If on the ground:*

MAINTENANCE OR MEL ACTION REQUIRED.

———— END OF PROCEDURE ————

➤ *If in flight:*

SYSTEM IS IN SINGLE LOOP OPERATION.

———— END OF PROCEDURE ————

88

FIRE WARNING TEST INOPERATIVE

88

➤ ***If fire detection loop light(s) is inoperative:***

SELECT LOOP LIGHT SELECTOR SWITCH TO ILLUMINATED LOOP LIGHT.

CHECK FIRE WARNING SYSTEM.

- Push A and B buttons.
- For a normal test, aural warning should sound and all lights except inoperative loop light should illuminate.

➤ ***If fire warning system test is normal:***

CONTINUE OPERATION.

- LOOP LIGHT SELECTOR switch should remain in operative **LOOP LIGHT** position.

➤ ***If fire warning system test is not normal:***

MAINTENANCE ACTION REQUIRED.

———— **END OF PROCEDURE** ————

SMOKE OR FUMES AIR CONDITIONING

OXYGEN MASKS AND SMOKE GOGGLES ON, 100% CREW COMMUNICATIONS ESTABLISH

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

NOTE: *If smoke/fumes are severe, first accomplish the smoke or fumes removal checklist.*

WARNING

Do not turn off packs in an effort to smother the fire.

➤ *If smoke or fumes are present in the cockpit:*

COCKPIT DOOR AS REQD

- Open door to ventilate if smoke or fumes confined to cockpit.

LEFT AIR CONDITIONING SUPPLY SWITCH OFF

RADIO RACK SWITCH VENTURI

➤ *If smoke or fumes continue:*

LEFT AIR CONDITIONING

SUPPLY SWITCH AUTO

RIGHT AIR CONDITIONING

SUPPLY SWITCH OFF

**LOCATE AND PULL RECIRCULATING FAN CONTROL
C/B (J7).**

NOTE: *Use of the SMOKE OR FUMES OR FIRE
ELECTRICAL checklist may aid in identifying and eliminating
the source.*

———— **END OF PROCEDURE** ————

(Continued on next page)

SMOKE OR FUMES AIR CONDITIONING
(Continued)

➤ *If smoke or fumes are confined to passenger cabins:*

COCKPIT DOOR (AND LOUVER PANEL). CLOSED

- Prevents smoke or fumes from penetrating into cockpit.

LOCATE AND PULL RECIRCULATING FAN CONTROL C/B (J7).

➤ *If smoke or fumes continue:*

RIGHT AIR CONDITIONING

SUPPLY SWITCH. OFF

NOTE: *Use of the SMOKE OR FUMES OR FIRE ELECTRICAL checklist may aid in identifying and eliminating the source.*

———— **END OF PROCEDURE** ————

88

**SMOKE OR FUMES OR FIRE
ELECTRICAL**

88

OXYGEN MASKS AND SMOKE GOGGLES ON, 100%
CREW COMMUNICATIONS ESTABLISH

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

NOTE: *If smoke/fumes are severe, first accomplish the smoke or fumes removal checklist.*

WARNING

Do not turn off packs in an effort to smother the fire.

CABIN ALT CONTROL LEVER MANUAL (DOWN)

RADIO RACK SWITCH VENTURI

EMER POWER SWITCH ON/CHECK

► If Emergency power operation is normal:

L AND R GEN SWITCHES OFF

APU L AND R BUS SWITCHES OFF

► If smoke or fumes stop:

**►► If nearest suitable airport is 30 minutes or less and
at Captain's discretion:**

AVOID IMC FLIGHT.

CAUTION

***Depressurize cabin prior to landing. Manual pressurization
control forces may be high. Apply force as required.***

SYSTEM STATUS

- Stab trim inoperative.
- Anti-skid/auto-brakes inoperative.
- Autospoilers inoperative.

(Continued on next page)

88

SMOKE OR FUMES OR FIRE ELECTRICAL

88

(Continued)

- For additional items refer to EMERGENCY POWER SUMMARY OF OPERATIVE EQUIPMENT in Volume 1, SP.6 Supplementary Procedures - Electrical.

➤➤➤ *If aircraft is trimmed and flaps are 28 or 40:*

LANDING FLAPS EXISTING
FLAP SETTING

LANDING SPEED AS APPROPRIATE
FOR FLAP SETTING

➤➤➤ *If aircraft is out of trim or flaps are less than 28:*

LANDING FLAPS 15/EXT

NOTE: *Do not reduce power until flare has been initiated and sink has been reduced.*

COMPUTE LANDING THRESHOLD SPEEDS.

- V_{REF} is flaps 15 speedbook minimum maneuver speed,

PLUS:

- Add knot value for adjusted takeoff weight C.G. Interpolate as necessary from table below:

STAB ANGLE	MD-88 TAKEOFF C.G.				
	0	5	10	15	20
-2	40	32	24	17	8
0	29	22	15	8	0
2	20	14	7	1	0
4	13	7	1	0	0
6	6	1	0	0	0

————— END OF PROCEDURE —————

(Continued on next page)

88

**SMOKE OR FUMES OR FIRE
ELECTRICAL**
(Continued)

88

➤➤ *If nearest suitable airport is more than 30 minutes:*

AC AND DC BUS X TIE SWITCHES OPEN

R GEN OR APU R BUS SWITCH ON/CHECK

➤➤➤ *If smoke or fumes do not reappear:*

EMER PWR SWITCH OFF

*NOTE: DFGC 2 may be used after electrical
system check is completed.*

——— END OF PROCEDURE ———

➤➤➤ *If smoke or fumes reappear:*

L GEN AND APU L BUS
SWITCH ON/CHECK

R GEN AND APU R BUS SWITCH OFF

EMER PWR SWITCH OFF

*NOTE: DFGC 1 may be used after electrical
system check is completed.*

——— END OF PROCEDURE ———

➤ *If smoke or fumes continue:*

L AND R GEN SWITCHES. ON/CHECK

CONTINUE AT “IF EMERGENCY POWER OPERATION IS
ABNORMAL” IN THIS CHECKLIST.

(Continued on next page)

88

**SMOKE OR FUMES OR FIRE
ELECTRICAL**
(Continued)

88

➤ ***If Emergency power operation is abnormal:***

CABIN ALT CONTROL LEVER AUTO (UP)

EMER LTS SWITCH OFF

LOCATE AND PULL THE FOLLOWING CIRCUIT BREAKERS:

- ALTERNATE EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMER DC BUS FEED (N37).
- CHARGER AND TRANSFER RELAY (C16*).
- BATTERY RELAY (C17*).
- EMERGENCY INVERTER (C18*).

EMER PWR SWITCH OFF

BATTERY SWITCH OFF

NOTE: APU, if running, will shut down.

LOCATE AND PULL THE FOLLOWING CIRCUIT BREAKER:

- BATT CHARGER (LCON).

➤ ***If smoke or fumes continue:***

**AT THE CAPTAIN'S DISCRETION, PULL THE BATTERY
DIRECT BUS FEED CIRCUIT BREAKER (LOCATED IN
THE E AND E COMPARTMENT, UNDER THE COCKPIT
FLOOR).**

RESET THE FOLLOWING CIRCUIT BREAKERS:

- ALTERNATE EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMER DC BUS FEED (N37).

EMER LTS SWITCH ARM

———— **END OF PROCEDURE** ————

(Continued on next page)

88

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

88

➤ *If smoke or fumes stop:*

RESET DC TRANSFER BUS FEED C/B (N36).

➤➤ *If smoke or fumes reappear:*

LOCATE AND PULL DC TRANSFER BUS FEED C/B
(N36).

WARNING

Fire Detection and Protection capabilities are lost.

RESET THE FOLLOWING CIRCUIT BREAKERS:

- ALTERNATE EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- EMER DC BUS FEED (N37).

EMER LTS SWITCH ARM

——— **END OF PROCEDURE** ———

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL**

90

OXYGEN MASKS AND SMOKE GOGGLES ON, 100%
CREW COMMUNICATIONS ESTABLISH

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

NOTE: *If smoke/fumes are severe, first accomplish the smoke or fumes removal checklist.*

WARNING

Do not turn off packs in an effort to smother the fire.

CABIN ALT CONTROL LEVER. MANUAL (DOWN)

RADIO RACK SWITCH VENTURI

EMER POWER SWITCH ON/CHECK

➤ ***If Emergency power operation is normal:***

L, R, AND APU GEN SWITCHES 3 OFF

L AND R BUS TIE SWITCHES OPEN

➤ ***If smoke or fumes stop:***

➤➤ ***If nearest suitable airport is 30 minutes or less and
at Captain's discretion:***

AVOID IMC FLIGHT.

CAUTION

***Depressurize cabin prior to landing. Manual pressurization
control forces may be high. Apply force as required.***

SYSTEM STATUS

- Stab trim inoperative.
- Anti-skid/auto-brakes inoperative.
- Autospoilers inoperative.

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

90

- For additional items refer to EMERGENCY POWER SUMMARY OF OPERATIVE EQUIPMENT in Volume 1, SP.6 Supplementary Procedures - Electrical.

➤➤➤ *If aircraft is trimmed and flaps are 28 or 40:*

LANDING FLAPS EXISTING
FLAP SETTING

LANDING SPEED AS APPROPRIATE
FOR FLAP SETTING

➤➤➤ *If aircraft is out of trim or flaps are less than 28:*

LANDING FLAPS 15/EXT

NOTE: *Do not reduce power until flare has been initiated and sink has been reduced.*

COMPUTE LANDING THRESHOLD SPEEDS.

- V_{REF} is flaps 15 speedbook minimum maneuver speed,

PLUS:

- Add knot value for adjusted takeoff weight C.G. Interpolate as necessary from table below:

STAB ANGLE	MD-90 TAKEOFF C.G.				
	0	5	10	15	20
-2	22	16	11	5	0
0	12	5	1	0	0
2	3	0	0	0	0

————— **END OF PROCEDURE** —————

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

90

►► *If nearest suitable airport is more than 30 minutes:*

R GEN OR APU GEN SWITCH ON

NOTE: For APU power, move R BUS TIE switch to AUTO.

►►► *If smoke or fumes reappear:*

L GEN OR APU GEN SWITCH ON

NOTE: For APU power, move L BUS TIE switch to AUTO.

R GEN SWITCH OFF

R BUS TIE SWITCH OPEN

EMER PWR SWITCH OFF THEN ARM

CABIN ALT CONTROL LEVER . . . AUTO (UP)

NOTE: Use Center tank fuel boost pumps as necessary.

—— **END OF PROCEDURE** ——

►►► *If smoke or fumes do not reappear:*

EMER PWR SWITCH OFF THEN ARM

CABIN ALT CONTROL LEVER . . . AUTO (UP)

NOTE: Use Center tank fuel boost pumps as necessary.

—— **END OF PROCEDURE** ——

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

90

➤ *If smoke or fumes continue:*

L, R, AND APU GEN SWITCHES ON
CABIN ALT CONTROL LEVER AUTO (UP)
EMER LTS SWITCH OFF
EMER POWER SWITCH OFF

WARNING

Verify First Officer's flight instruments are normal before proceeding to next step.

**LOCATE AND PULL THE FOLLOWING CIRCUIT
BREAKERS.**

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMERGENCY DC BUS FEED (N37 or D15*).
- CHARGER & TRANS RELAY (C17*).
- BATTERY RELAY (C18*).
- EMERGENCY INVERTER (D13*).

BATTERY SWITCH OFF

WARNING

Fire Detection and protection capabilities are lost.

NOTE: *APU, if operating, will shutdown.*

NOTE: *If emergency DC bus and/or DC transfer bus are not powered, use engine fire handle when engine shutdown is required.*

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

90

➤➤ *If smoke or fumes stop:*

RESET DC TRANSFER BUS FEED C/B (N36).

➤➤➤ *If smoke or fumes reappear:*

**LOCATE AND PULL DC TRANSFER BUS
FEED C/B (N36).**

**LOCATE AND RESET THE FOLLOWING
CIRCUIT BREAKERS:**

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- EMERGENCY DC BUS FEED (N37 or D15*).

———— **END OF PROCEDURE** ————

➤➤ *If smoke or fumes continue:*

**LOCATE AND PULL BATTERY DIRECT BUS FEED
C/B (D17).**

**LOCATE AND RESET THE FOLLOWING CIRCUIT
BREAKERS:**

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMERGENCY DC BUS FEED (N37 or D15*).

EMER LTS SWITCH ARM

———— **END OF PROCEDURE** ————

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL
(Continued)**

90

➤ ***If Emergency power operation is abnormal:***

CABIN ALT CONTROL LEVER AUTO (UP)
EMER LTS SWITCH OFF
EMER PWR SWITCH OFF

WARNING

Verify First Officer's flight instruments are normal before proceeding to next step.

LOCATE AND PULL THE FOLLOWING CIRCUIT BREAKERS.

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMERGENCY DC BUS FEED (N37 or D15*).
- CHARGER & TRANS RELAY (C17*).
- BATTERY RELAY (C18*).
- EMERGENCY INVERTER (D13*).

BATTERY SWITCH. OFF

NOTE: APU, if running, will shut down.

NOTE: If emergency DC bus and/or DC transfer bus are not powered, use engine fire handle when engine shutdown is required.

(Continued on next page)

90

**SMOKE OR FUMES OR FIRE
ELECTRICAL**

90

(Continued):

► *If smoke or fumes stop:*

**RESET DC TRANSFER BUS FEED CIRCUIT BREAKER
(N36).**

►► *If smoke or fumes reappear:*

**LOCATE AND PULL DC TRANSFER BUS FEED C/B
(N36).**

**LOCATE AND RESET THE FOLLOWING CIRCUIT
BREAKERS:**

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- EMERGENCY DC BUS FEED (N37 or D15*).

———— **END OF PROCEDURE** ————

► *If smoke or fumes continue:*

**LOCATE AND PULL BATTERY DIRECT FEED BUS FEED
C/B (D17).**

**LOCATE AND RESET THE FOLLOWING CIRCUIT
BREAKERS:**

- ALT EMER AC BUS FEED (L8).
- EMER AC BUS FEED (K7).
- DC TRANSFER BUS FEED (N36).
- EMERGENCY DC BUS FEED (N37 or D15*).

EMER LTS SWITCH ARM

———— **END OF PROCEDURE** ————

SMOKE OR FUMES REMOVAL

OXYGEN MASKS AND SMOKE GOGGLES ON, 100%
CREW COMMUNICATIONS ESTABLISH

PLAN TO LAND AT THE NEAREST SUITABLE AIRPORT.

CONSIDER A PASSENGER EVACUATION.

WARNING

Do not turn off packs in an effort to smother the fire.

COCKPIT DOOR (AND LOUVER PANEL) AS REQD

- Close door and louver panel to prevent smoke or fumes from penetrating into cockpit.
- Open door to ventilate if smoke or fumes are confined to cockpit.

GALLEY POWER SWITCH OFF

► *If aircraft altitude is above 10,000 feet:*

PRESSURE RATE INCR KNOB MAX
CABIN PRESSURE LANDING
ALTITUDE SELECTOR 9,500
ALL COCKPIT AIR OUTLETS FULL OPEN
WHEN DESCENT BELOW 10,000 FEET IS COMPLETE,
ACCOMPLISH 10,000 FEET OR BELOW PROCEDURES.

► *If aircraft altitude is 10,000 feet or below:*

CABIN ALT CONTROL LEVER MANUAL (DOWN)
OUTFLOW VALVE OPEN

SMOKE OR FUMES REMOVAL

(Continued)

► *If smoke or fumes are evident in cockpit:*

REDUCE AIRSPEED TO 165 KIAS.

- Flaps and slats as required.

OPEN CLEARVIEW WINDOW.

- Open either clearview window 1/3 to 2/3, after cabin has been depressurized.
- Do not open clearview window above 165 KIAS due to resultant high noise level.

CAUTION

Noise level with a window open may prevent crew from hearing landing gear warning horn.

NOTE: *Use of the SMOKE OR FUMES OR FIRE ELECTRICAL and/or SMOKE OR FUMES AIR CONDITIONING checklists may aid in identifying and eliminating the source.*

———— **END OF PROCEDURE** ————

TAILPIPE FIRE OR TORCHING

CAUTION

Tailpipe fires are not displayed in the cockpit. The first notification of a tailpipe fire may be from an external source. Discharging the engine fire extinguishing agent will not extinguish the fire. If the fire cannot be extinguished by motoring, or if motoring is not possible, the use of ground fire fighting equipment may be required.

► ***In the event of a fire warning system indication:***

ACCOMPLISH ENGINE FIRE OR SEVERE DAMAGE CHECKLIST.

FUEL LEVER/SWITCH OFF

► ***If the engine START switch is ON:***

MOTOR ENGINE.

► ***After fire extinguishes:***

ENGINE START SWITCH OFF

ENGINE IGN SELECTOR OFF

——— **END OF PROCEDURE** ———

► ***If the engine START switch is OFF:***

N2 RPM AT 20% MAX

ENGINE START SWITCH (CRASH ENGAGE). ON

- Motoring will not be possible if the engine and APU have been shut down. Under these conditions, it will be necessary to extinguish the fire using ground equipment.

► ***After the fire extinguishes:***

ENGINE START SWITCH OFF

ENGINE IGN SELECTOR OFF

——— **END OF PROCEDURE** ———

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Blank**

Non-Normal Checklists
Flight Controls

Chapter NNC
Section 9

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ABNORMAL FLAP CONFIGURATION

NOTE: *This procedure applies only if flaps/slats are other than up/retracted. If flaps/slats are up/retracted refer to Index for NO FLAP/NO SLAT LANDING procedure.*

➤ ***If flaps fail to extend or retract to selected position:***

OPERATE FLAP / SLAT HANDLE.

- Return FLAP/SLAT handle to position which restores flap symmetry or flap and FLAP/SLAT handle position agreement.

GPWS AS REQD

- If flaps are less than 28, use **OVRD**.

COMPUTE APPROACH / THRESHOLD SPEEDS.

- Use the NON-NORMAL CONFIGURATION APPROACH/THRESHOLD SPEEDS CHART (NNM.1, Non-Normal Maneuvers, Section 1) to obtain applicable approach/threshold speeds.
- Do not use autothrottles if asymmetry exists.
- Autothrottles must be disconnected to slow aircraft to final approach speed if flaps are less than 28.
- Fly final approach at chart V_{REF} plus wind additives.
- Check ODM for landing distances.

IF FLAPS LESS THAN 28, AUTOBRAKES INOPERATIVE.

——— **END OF PROCEDURE** ———

AIRCRAFT OSCILLATING OR DISPLACED IN YAW

SELECT OPPOSITE POSITION ON DIGITAL FLIGHT GUIDANCE CONTROL SWITCH.

➤ *If oscillation or yaw displacement ceases:*

AUTOPILOT/AUTOTHROTTLES AS REQD

———— END OF PROCEDURE ———

➤ *If aircraft continues to oscillate or is displaced in yaw:*

RUD HYD CONT LEVER MANUAL

- Observe RUD CONTROL MANUAL message displayed.

➤ *If oscillation or yaw displacement ceases:*

LEAVE RUD HYD CONT LEVER IN MANUAL.

- For manual rudder approaches, maintain $V_{REF} + 5$ KIAS but not less than 135 knots until landing is assured.
- Do not execute an autoland.

➤ *If aircraft continues to oscillate or is displaced in yaw:*

YAW DAMPER OVRD

- Observe YAW DAMP OFF message is displayed.
- Yaw damper is now inoperative.

RUD HYD CONT LEVER PWR

AUTOPILOT/AUTOTHROTTLES AS REQD

———— END OF PROCEDURE ———

AUTO SLAT FAIL

AUTO SLAT FAIL

ON THE GROUND

Recycle flaps/slats. The AUTO SLAT FAIL message can be reset and the test reaccomplished by cycling the FLAP/SLAT handle to **UP/RET** and back to flap takeoff range.

If AUTO SLAT FAIL message remains on, maintenance is required.

IN FLIGHT

Illumination of the AUTO SLAT FAIL message indicates a malfunction of one or both stall warning systems. One operable system is capable of providing auto slats, but not retracting them.

CAUTION

Do not extend slats until below 240 KIAS as slats may extend to full position.

——— END OF PROCEDURE ———

AUTOSPOILERS INOPERATIVE / AUTO SPOILERS FAIL

AUTO SPOILER FAIL

**CHECK / RESET AUTO SPOILER CONTROL CB'S
(X30, P33), IF TRIPPED.**

► ***If message does not reset:***

DO NOT ARM SPOILERS.

- For rejected takeoff and landing, spoilers will have to be manually deployed.

CHECK LANDING PERFORMANCE.

- Check ODM for AUTO GROUND SPOILERS INOP landing distances.
- Autobrakes should not be used for landing.
- **Do not execute an autoland.**

► ***After aircraft touchdown:***

MANUALLY EXTEND SPOILERS.

- Move SPOILER lever up, aft and up to lock.

———— **END OF PROCEDURE** ————

90

ELEV LD FEEL INOP

90

ELEV LD FEEL INOP

NOTE: Autopilot is not available. Elevator remains powered.

NOTE: Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.

CAUTION

Airplane structural damage may occur with large control inputs above 250 KIAS.

- **If airspeed is above 250 KIAS when ELEV LD FEEL INOP message illuminates:**

EXPECT HEAVIER THAN NORMAL CONTROL COLUMN FORCES DURING LANDING.

- **If airspeed is below 250 KIAS when ELEV LD FEEL INOP message illuminates:**

**DO NOT EXCEED 250 KIAS.
ANTICIPATE NEAR NORMAL CONTROL FORCES.**

——— END OF PROCEDURE ———

90

ELEVATOR CONTROLS MANUAL

90

ELEV CONTROLS MANUAL

NOTE: Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.

- **If in flight:**

**AUTOPILOT NOT AVAILABLE.
ANTICIPATE REDUCED PITCH RESPONSE AND INCREASED COLUMN FORCES.**

——— END OF PROCEDURE ———

90

ELEVATOR SPLIT

90

ELEVATOR SPLIT

CAUTION

Avoid abrupt elevator inputs. Stabilizer trim may be used to relieve column forces.

- *If ELEVATOR SPLIT message illuminated during rotation or shortly after takeoff:*

DO NOT EXCEED 225 KIAS.

LAND AT NEAREST SUITABLE AIRPORT.

- *If ELEVATOR SPLIT message illuminated above 225 KIAS:*

DO NOT EXCEED 270 KIAS.

LAND AT NEAREST SUITABLE AIRPORT.

SYSTEM STATUS:

- Autoland is not available.

———— END OF PROCEDURE ————

FLOATING SPOILERS

Spoiler float is evidenced by rapid roll development during extension of flaps past 28.

LANDING FLAPS. 28

COMPUTE APPROACH / LANDING SPEEDS.

- Approach and threshold speeds should be computed based on V_{REF} for flaps 28 plus 10 knots.
- Landing distance will be increased approximately 20%.
- **Do not execute an autoland.**

➤ ***If time permits and retraction is necessary:***

ACCOMPLISH SPOILER PANEL STUCK IN EXTENDED POSITION PROCEDURE.

——— END OF PROCEDURE ———

88

**MACH TRIM FAILURE /
MACH TRIM INOP**

88

MACH TRIM INOP

NOTE: Mach trim failure is confirmed when MACH TRIM indicator fails to extend or retract, or when it oscillates.

DFGC SWITCH 1 OR 2

- Select opposite DFGC and verify operation of Mach trim.

➤ ***If Mach trim still inoperative:***

MACH TRIM COMP SWITCH. OVRD
CHECK MACH TRIM INDICATOR.

➤ ***If MACH TRIM indicator is retracted:***

MACH SPEED. MAX .78
• Retrim as necessary.

➤ ***If MACH TRIM indicator is not retracted:***

CHECK / RESET MACH TRIM OVERRIDE CB (X33), IF TRIPPED.

➤ ***If MACH TRIM indicator still does not retract:***

PULL MACH TRIM OVERRIDE CB (X33).

- Prevents inadvertent retraction of mach trim.

MACH SPEED MAX .78

- Retrim as necessary.

——— **END OF PROCEDURE** ———

90	MACH TRIM FAULT	90

DFGC SWITCH 1 OR 2

- Select opposite DFGC and verify operation of mach trim.

➤ ***If Mach trim still inoperative:***

MACH TRIM COMP SWITCH OFF DO NOT EXCEED .80 MACH.

——— **END OF PROCEDURE** ———

90

**PRIMARY RUD LIM FAULT /
NO BKUP RUD LIM**

90

**PRIMARY RUD LIM FAULT
NO BKUP RUD LIM**

USE LIGHT RUDDER INPUTS.

WARNING

Airplane structural failure may occur with large rudder inputs above 210 KIAS.

➤ *If NO BKUP RUD LIM message is displayed:*

DO NOT EXCEED 210 KIAS.

➤ *If NO BKUP RUD LIM message is not displayed:*

USE LIGHT RUDDER FORCES ABOVE 190 KIAS.

➤ *When below 190 KIAS and prior to approach:*

APPLY RUDDER INPUTS.

- Application of rudder inputs may allow the rudder to return to speed schedule and remove PRIMARY RUD LIM FAULT message.

CHECK RUDDER AND MESSAGE STATUS.

➤ *If rudder feels restricted and/or PRIMARY RUD LIM FAULT message remains displayed:*

SPEED AS REQD

- In landing configuration, maintain 1.3Vs + 5 KIAS but not below minimum approach of 135 KIAS until landing is assured.

(Continued on next page)

90

**PRIMARY RUD LIM FAULT/
NO BKUP RUD LIM
(Continued)**

90

LANDING CROSSWIND LIMITATION IS 12 KNOTS.

NOTE: *During engine out missed approach, approximately 9° of bank in the direction of the operating engine may be required to maintain a constant heading at V2 or 135 KIAS, whichever is higher.*

► ***If rudder feels unrestricted and PRIMARY RUD LIM FAULT message is not displayed:***
NO FURTHER ACTION IS REQUIRED.

——— END OF PROCEDURE ———

**NO FLAP / NO SLAT LANDING
(WITH HYDRAULIC PRESSURE)**

Use the longest available runway commensurate with conditions.

REDUCE GROSS WEIGHT.

COMPUTE APPROACH / THRESHOLD SPEEDS.

- Use the NON-NORMAL CONFIGURATION APPROACH/THRESHOLD SPEEDS CHART (NNM.1, Non-Normal Maneuvers, Section 1) to obtain UP/RET 1.25 Vs (V_{REF}) speeds.
- Plan a wide pattern and longer than normal final approach for speed stabilization.
- Refer to ODM for actual landing distances.

GPWS OVRD

EXTEND LANDING GEAR.

- Check for 3 green lights.

ANTI-SKID. ARM

USE AUTOSPOILERS AS REQUIRED.

- Autobrakes must not be armed as they will not actuate.

ESTABLISH AIRSPEED.

- Fly downwind and base legs at normal speedbook CLEAN speed.
- Do not use autothrottles.
- Final approach speed is UP/RET 1.25 Vs. (V_{REF})
- Make positive main gear touchdown to avoid float.
- After touchdown, fly nose gear to runway, apply brakes smoothly to full pedal deflection.
- Use normal reverse thrust procedures.
 - Use rudder control and differential braking for directional control.
 - Do not use asymmetric reverse thrust for directional control.

——— END OF PROCEDURE ———

RUDDER CONTROL MAN

RUD CONTROL MAN

RUD HYD CONT LEVER MANUAL

- For manual rudder approaches, maintain V_{REF} plus 5 KIAS but not less than 135 knots until landing is assured.
- Do not attempt a go-around at less than 135 KIAS. The 30 knot crosswind capability remains.
- **Do not execute an autoland.**

——— END OF PROCEDURE ———

88

**RUDDER TRAVEL UNRESTRICTED
FAILS TO ILLUMINATE
BELOW 144 KIAS**

88

TEST RUDDER TRAVEL UNRESTRICTED LIGHT.

➤ ***If light does not test:***

CONTINUE NORMAL APPROACH.

- Assume fault in warning light circuitry.

➤ ***If light tests:***

ASSUME RUDDER RESTRICTED.

- Approach speed is V_{REF} plus 5 KIAS but not less than 135 KIAS until landing assured.
- Maximum allowable crosswind is 12 knots.
- Engine out go-around may require up to 8° angle of bank to maintain constant heading at 135 KIAS, or V_2 whichever is higher.
- **Do not execute an autoland.**

CAUTION

If an engine failure or other asymmetric condition occurs at high speed (rudder travel is restricted) and the rudder pedals and/or trim are used to displace the rudder to or near its restricted limit, the possibility exists for the rudder to remain restricted throughout the approach and landing. If this occurs, rudder travel for the appropriate airspeed can be restored by momentarily centering the rudder pedals and trim as airspeed decreases. This will ensure that full unrestricted rudder travel is available. If full travel is not restored, when below 160 knots, gently walk the rudder pedals to allow the limiter to drop out of the rudder control mechanism.

——— **END OF PROCEDURE** ———

88	RUDDER TRAVEL UNRESTRICTED ILLUMINATED ABOVE 200 KNOTS	88

RUD HYD CONT LEVER MANUAL

- Continue flight using rudder in MANUAL mode.
- Use light rudder forces.
- Yaw damper may be used.

➤ ***When in approach configuration and below 180 KIAS:***

RUDDER / RUDDER TRIM	.NEUTRAL
RUD HYD CONT LEVER	.PWR

——— **END OF PROCEDURE** ———

RUNAWAY STABILIZER

CAUTION

Avoid manual pitch inputs until autopilot is disconnected.

NOTE: Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.

NOTE: Extended trim operation may cause trim motor thermal shutdown. Trim motor operation may return after sufficient cooling period.

**AUTOPILOT DISCONNECT
CONTROL WHEEL TRIM SWITCHES
. TRIM OPPOSITE DIRECTION OF RUNAWAY**

NOTE: Do not oppose runaway using longitudinal trim handles.

➤ ***If LONG TRIM indicator moves in opposite direction of runaway:***

PULL AUTOPILOT AND ALTERNATE LONGITUDINAL TRIM CB'S D-9, D-10, AND D-11 (UPPER EPC).

- Continue flight using primary trim system.
- Autopilot is available, but alternate trim motor is inoperative. After trimming, autopilot may be engaged, but should be disconnected/retrimmed periodically as needed.

——— **END OF PROCEDURE** ———

➤ ***If LONG TRIM indicator stops moving or continues to runaway:***

**STABILIZER TRIM BRAKE SWITCH. STOP
RETRIM USING ALTERNATE LONGITUDINAL TRIM SWITCH
PULL PRIMARY LONGITUDINAL TRIM CB'S (3 ON LEFT
GENERATOR BUS BEHIND CAPTAIN'S SEAT).**

- Continue flight using alternate trim system.
- Autopilot is available.

——— **END OF PROCEDURE** ———

SLAT DISAG LIGHT

CAUTION

Do not move the FLAP/SLAT handle until a safe airspeed has been attained.

AIRSPEED MAX 240 KIAS / .57 M

CAUTION

Do not use the autothrottles or speed command as speed schedules may not be valid.

DO NOT USE AUTOTHROTTLES.

CHECK SLAT ASYMMETRY.

- Asymmetry is indicated by lateral trim changes.

➤ If asymmetry exists:

MOVE FLAPS / SLATS TO LAST SYMMETRIC POSITION.

**➤ If this results in other than normal landing configuration:
ACCOMPLISH NO FLAP / NO SLAT LANDING (WITH
HYDRAULIC PRESSURE) OR ABNORMAL FLAP
CONFIGURATION PROCEDURE.**

———— END OF PROCEDURE ————

(Continued on next page)

SLAT DISAG LIGHT

(Continued)

- *If slat **DISAG** light illuminated on extension with no asymmetry:*

FLAP / SLAT HANDLE 15 / EXT

- *If slat **DISAG** light is illuminated:*

AIRSPED MAX 240 / .57 M

- Consider fuel requirements.

FLAPS / SLATS. AS REQD

- Since actual slat position cannot be verified, use final approach speed for 28/RET or 40/RET and minimum maneuvering speed for 15/RET.
- Use the NON-NORMAL CONFIGURATION APPROACH/THRESHOLD SPEEDS CHART (NNM.1, Non-Normal Maneuvers, Section 1) to obtain applicable approach/threshold speeds.

———— **END OF PROCEDURE** ————

- *If slat **DISAG** light is extinguished:*

CONTINUE NORMAL OPERATION.

———— **END OF PROCEDURE** ————

(Continued on next page)

SLAT DISAG LIGHT

(Continued)

- *If slat **DISAG** light illuminated on retraction with no asymmetry:*

FLAP / SLAT HANDLE. UP / RETRACT

- *If slat **DISAG** light is extinguished:*
CONTINUE NORMAL OPERATION.

——— **END OF PROCEDURE** ———

- *If slat **DISAG** light is illuminated:*
FLAP / SLAT HANDLE. 15 / EXT

- ➤ *If slat **DISAG** light remains illuminated:*
AIRSPD. MAX 240 / .57 M
• Consider fuel requirements.

FLAPS / SLATS AS REQD

- Since actual slat position cannot be verified, use final approach speed for 28/RET or 40/RET and minimum maneuvering speed for 15/RET.
- Use the NON-NORMAL CONFIGURATION APPROACH/THRESHOLD SPEEDS CHART (NNM.1, Non-Normal Maneuvers, Section 1) to obtain applicable approach/threshold speeds.

——— **END OF PROCEDURE** ———

- ➤ *If slat **DISAG** light is extinguished:*
CONTINUE OPERATION.
- Landing configuration normal.
—Either flaps 28/EXT or 40/EXT may be used.
 - If return to departure station is not desired, consider fuel requirements based on planned enroute configuration and airspeed limitations of 240 / .57M.
 - Place FLAP/SLAT handle **UP** if desired and disregard **DISAG** light if slat retraction is confirmed by visual inspection or the absence of vibration.

——— **END OF PROCEDURE** ———

90

SNGL ELEV FEEL FAULT

90

SNGL ELEV FEEL

NOTE: *Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.*

No action required. Autopilot may not be available. Forces will be lighter than normal at high speed and heavier than normal at slow speed.

———— **END OF PROCEDURE** ————

**SPOILER LEVER NOT FULLY RETRACTED
(RED ARMING PLACARD EXPOSED)**

SQUEEZE AND CHECK SPOILER LEVER.

- Squeeze the lever to attempt to retract the ground spoiler actuator.

CAUTION

The speedbrake aft stop and intermediate notches will not be engaged. Do not move lever in flight to full aft position as this will extend spoilers to the full 60° position.

SPEEDBRAKES AS REQD

- When speedbrakes are required, pull lever up and aft to speedbrake **STOP** position.
- Handle will have to be held in this position as long as speedbrakes are desired.
- Check ODM for AUTO GROUND SPOILERS INOP landing distances.

———— **END OF PROCEDURE** ————

SPOILER PANEL STUCK IN EXTENDED POSITION

➤ ***If problem occurs during approach/landing:***

TRIM AIRCRAFT AS REQUIRED.

- Some rudder trim may be required to counteract spoiler drag and effect of compensating trim.

FLAPS MAX 28

COMPUTE APPROACH / LANDING SPEEDS.

- Approach and threshold speeds should be computed based on V_{REF} for 28 flaps, plus 10 knots.
- Landing distance will be increased approximately 20%.
- Expect to use up to full aileron trim and 60-70° wheel angle to maintain wings level on final approach.
- Spoilers may be armed for landing.
- **Do not execute an autoland.**

➤ ***If time permits:***

CHECK HYDRAULIC PRESSURE / QUANTITY.

CYCLE SPEEDBRAKES WITH THE HYDRAULIC SYSTEM PRESSURIZED.

OBSERVE STUCK PANEL.

➤ ***If spoiler panel retracts:***

FLAPS MAX 28

➤ ***If spoiler panel does not retract:***

DETERMINE STUCK SPOILER PANEL BY USING VISUAL INSPECTION.

AFFECTED HYDRAULIC SYSTEM OFF

- Outboard spoilers.
 - R ENG/AUX/TRANS pumps off.
- Inboard spoilers.
 - L ENG/TRANS pumps off.

(Continued on next page)

SPOILER STUCK IN EXTENDED POSITION
(Continued)

**MOMENTARILY CYCLE SPEEDBRAKES TO
DEPRESSURIZE AFFECTED SYSTEM.**

OBSERVE STUCK PANEL.

➤➤ *If spoiler panel retracts:*

UNPRESSURIZE AFFECTED HYDRAULIC SYSTEM.

- Extend slats by moving FLAP/SLAT handle directly to 15/T.O. EXT.
- If right system is affected, extend landing gear with emergency gear extension lever and maintain a minimum of V_{REF} plus 5 KIAS but not less than 135 KIAS until landing is assured.
- Spoilers may be armed for landing.
- **Do not execute an autoland.**

FLAPS MAX 28

AUTO BRAKE SWITCH OFF

➤➤ *If spoiler panel does not retract:*

PRESSURIZE AFFECTED HYDRAULIC SYSTEM.

TRIM AIRCRAFT AS REQUIRED.

- Some rudder trim may be required to counteract spoiler drag and effect of compensating trim.

FLAPS MAX 28

(Continued on next page)

SPOILER STUCK IN EXTENDED POSITION (Continued)

COMPUTE APPROACH / LANDING SPEEDS.

- Approach and threshold speeds should be computed based on V_{REF} for flaps 28, plus 10 knots.
- Landing distance will be increased approximately 20%.
- Expect to use the full aileron trim and 60-70° wheel angle to maintain wings level on final approach.
- Spoilers may be armed for landing.
- **Do not execute an autoland.**

——— END OF PROCEDURE ———

STABILIZER INOPERATIVE

NOTE: *Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.*

CHECK STABILIZER TRIM BRAKE SWITCH NORMAL.

**CHECK / RESET PRIMARY LONGITUDINAL TRIM CB'S
(3 ON LEFT GENERATOR BUS, BEHIND CAPTAIN'S SEAT,) IF
TRIPPED.**

**CHECK / RESET AUTOPILOT AND ALTERNATE LONGITUDINAL
TRIM CB'S (D9, D10, AND D11), IF TRIPPED.**

AUTOPILOT OFF

➤ ***If stabilizer will not move with either control column
thumb switches or longitudinal trim control handles:***

ACTUATE ALTERNATE TRIM SWITCH.

- Attempt to move stabilizer using alternate trim.
- Anticipate slower rate and continue flight if normal.
- Autopilot may be used as desired.

➤ ***If stabilizer will not move:***
DO NOT USE AUTOPILOT.

DETERMINE FLAP / TRIM CONDITION.

➤➤ ***If flaps are 28 or 40 and aircraft is trimmed:***
LANDING FLAPS 28 / 40

- Do not change flap setting for landing.

➤➤ ***If flaps are less than 28 or aircraft is not trimmed:***
LANDING FLAPS 15

- Do not reduce approach thrust until landing flare is initiated and sink rate has been reduced.

SYSTEM STATUS:

- Autobrakes are inoperative.

(Continued on next page)

STABILIZER INOPERATIVE (Continued)

GPWS OVERRIDE

COMPUTE LANDING THRESHOLD SPEED.

- V_{REF} is flaps 15 speed book minimum maneuver speed,

PLUS:

- Add knot value for adjusted takeoff weight C.G. Interpolate as necessary from table below.

STAB ANGLE	MD-88 TAKEOFF C.G.				
	0	5	10	15	20
-2	40	32	24	17	8
0	29	22	15	8	0
2	20	14	7	1	0
4	13	7	1	0	0
6	6	1	0	0	0
STAB ANGLE	MD-90 TAKEOFF C.G.				
	0	5	10	15	20
-2	22	16	11	5	0
0	12	5	1	0	0
2	3	0	0	0	0

———— END OF PROCEDURE ————

STALL IND FAILURE

STALL IND FAILURE

NOTE: A malfunction of one or both stall warning systems may result in illumination of AUTOSLAT FAIL message with slat extension.

CAUTION

Do not extend slats until below 240 KIAS as slats may extend to full position.

➤ ***If message illuminates with stall warning or recognition signal:***

CHECK AIRSPEED / ALTITUDE.

- Ensure aircraft is not in actual stall.

➤ ***When flight conditions permit:***

PULL STALL WARNING COMPUTER CB'S (X23, Z23).

RESET STALL WARNING COMPUTER CB'S ONE AT A TIME.

- Identify malfunctioning stall warning system and pull appropriate stall warning computer CB.

TEST OPERATIVE STALL WARNING SYSTEM.

- Continue flight using operative stall warning system.

➤ ***If message illuminates without stall warning or recognition signal:***

TEST STALL WARNING SYSTEM.

- Test both systems to determine which, if either, has failed.
- If on ground, verify both AOA sensors are approximately faired.

➤ ***If both systems test normally:***

CONTINUE FLIGHT WITH SYSTEM OPERATING.

- Leave both stall warning systems powered.
- Stall warnings may occur at other airspeeds or configurations.

➤➤ ***If nuisance warnings occur:***

PULL STALL WARNING COMPUTER CB'S (X23, Z23).

(Continued on next page)

STALL IND FAILURE (Continued)

► ***If a system fails test:***

**PULL STALL WARNING COMPUTER CB FOR
MALFUNCTIONING SYSTEM (X23 OR Z23).**

**CONTINUE FLIGHT WITH REMAINING SYSTEM
OPERATIVE.**

——— END OF PROCEDURE ———

90

10° RUDDER RESTRICT

90

10 DEG RUD RESTRICT

ASSUME RUDDER RESTRICTED.

- Approach speed is V_{REF} plus 5 KIAS.
- Maximum allowable crosswind is 24 knots. Up to 5 degrees crab is permitted for landing.
- Engine out go-around may require up to 8° of bank to maintain constant heading.
- **Do not execute an autoland.**

CAUTION

If an engine failure or other asymmetric condition occurs at high speed (rudder travel is restricted) and the rudder pedals and/or trim are used to displace the rudder to or near its restricted limit, the possibility exists for the rudder to remain restricted throughout the approach and landing. If this occurs, rudder travel for the appropriate airspeed can be restored by momentarily centering the rudder pedals and trim as airspeed decreases. This will ensure that full unrestricted rudder travel is available. If full travel is not restored, when below 160 knots, gently walk the rudder pedals to allow the limiter to drop out of the rudder control mechanism. If unrestricted rudder is still not attained, perform the appropriate abnormal procedure in this section.

——— END OF PROCEDURE ———

UNSCHEDULED AUTOMATIC SLAT EXTENSION / AUTO SLAT LIGHT

Automatic slat extension will occur **only** if FLAP/SLAT handle is at settings from 0/T.O. EXT to 13/T.O. EXT.

CHECK AIRSPEED.

CAUTION

Do not exceed 240 kias. Do not move FLAP/SLAT handle until a safe altitude has been attained.

FLAP / SLAT HANDLE UP / RET

➤ *If slat **AUTO** light is illuminated:*

AIRSPEED MAX 240 KIAS

➤ *If slat **AUTO** light is extinguished:*

CONTINUE FLIGHT.

——— END OF PROCEDURE ———

YAW DAMP OFF

YAW DAMP OFF

VERIFY YAW DAMP SWITCH IS ON.

➤ *If message is still displayed:*

SELECT OTHER POSITION ON DFGC SWITCH.

➤ *If message is still displayed:*

SYSTEM STATUS:

- Yaw damper is inoperative.

——— END OF PROCEDURE ———

Non-Normal Checklists
Flight Instruments, Displays

Chapter NNC
Section 10

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CADC FAILURE	NNC.10.1
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STATIC SYSTEM FAILURE	NNC.10.5

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CADC FAILURE

Failure of CADC 1 or 2 may be indicated when airspeed, VSI, and altimeter instruments on associated side have OFF flags in view.

NOTE: *Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.*

NOTE: *Failure of the CADC on the side of the selected autopilot (DFGC) will cause the FMS to TIMEOUT. Correct the CADC problem, and then refer to FMS LOCKED/TIMEOUT procedure, NNC.11, Flight Management, Navigation section.*

DETERMINE INOPERATIVE CADC.

- CADC 1 operates Captain's side.
- CADC 2 operates F/O's side.

CHECK / RESET CADC 1 (C1 OVHD) OR CADC 2 (F12) CB, IF TRIPPED.

➤ ***If CADC 1 is inoperative:***

CADC SELECTOR BOTH ON 2

➤ ***If CADC 2 is inoperative:***

CADC SELECTOR BOTH ON 1

——— **END OF PROCEDURE** ———

EFIS FAILURE

NOTE: Ensure IRS and FMS are functioning properly before performing the following procedures. Refer to NNC.11, Flight Management, Navigation section for compass or FMS abnormalities. If required, refer to the ILS Airborne Equipment Requirements Chart in Volume 1, NP.10, Normal Procedures section.

► **If one screen is totally blank:**

EFIS SELECTOR SWITCH BOTH ON 1 OR 2

- Select **BOTH ON 1** or **2** as applicable and attempt to regain all displays. A partial symbol generator failure can cause a single screen failure.

► **If one screen remains inoperative:**

EFIS SELECTOR SWITCH NORM

SELECT COMPACT MODE.

- Turn dimming CONTROL knob for failed screen past full dim to **OFF**.
- Compacted ND uses ND WX knob for sky/ground brightness.

► **If both screens are totally blank:**

EFIS SELECTOR SWITCH BOTH ON 1 OR 2

- Select **BOTH ON 1** or **2** as applicable and attempt to regain all displays.

► **If both screens remain failed:**

PULL AND RESET SYMBOL GENERATOR CB'S.

- Captain.
 - (88) (C3*).
 - (90) (C4*).
- F/O.
 - (88) (F4).
 - (90) (F3).

———— **END OF PROCEDURE** ————

INSTRUMENT OFF FLAG

NOTE: *Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.*

RESET APPROPRIATE CIRCUIT BREAKER, IF TRIPPED.

INSTRUMENT	CAPTAIN		FIRST OFFICER	
	88	90	88	90
ALTIMETER	A 3*	A 3*	B 1	B 1
MACH/AIRSPEED	A 5*	A 5*	B 3	B 3
VSI	A 7*	A 7*	E 2	J 16
TA/VSI (TCAS)	A 7*	A 7*	L 10 or J 16	J 16
TAS/SAT	B 6	B 6	B 6	B 6
PFD	B 3*, B 4*	B 6*	F 11	F 11
ND	A 1* or B 3*	B 5*	B 4 or D 7	D 7
* Overhead circuit breaker panel				

➤ ***If problem is not corrected or airspeed AND altimeter flags are displayed:***

ACCOMPLISH CADC FAILURE PROCEDURE.

——— **END OF PROCEDURE** ———

MAINTENANCE CHECK MESSAGE

MAINTENANCE IS REQUIRED PRIOR TO FLIGHT.

- The MAINT CHECK message appears on the ND for two reasons.
 - If the symbol generator has not been programmed to Delta specifications prior to installation.
 - If the computer fault buffer has filled with messages.

——— **END OF PROCEDURE** ———

PITOT SYSTEM FAILURE

PITOT HEAT ON

CROSSCHECK INSTRUMENTS (MACH / IAS).

- Attempt to determine which pitot instruments are correct, considering power setting, configuration, and weight. Utilize the correct systems for continuing aircraft operation.
- During approach, the FAST/SLOW indicators may be utilized to crosscheck airspeeds, since they are independent of the pitot/static system.
- Depressurizing the aircraft prior to approach may decrease the pitot error.
- If BOTH pitot systems appear to be inoperative, refer to ODM Abnormal Section for appropriate power settings for operation without airspeed indication.

———— END OF PROCEDURE ————

STATIC SYSTEM FAILURE

NOTE: *Flight may not be permitted in RVSM airspace. Contact ATC. Refer to the Airway Manual, Navigation section, for RVSM requirements.*

STATIC SELECTORS (ONE AT A TIME). **ALTERNATE**

- Select **ALTERNATE** for each system, pausing between selections to check indications of pitot/static instruments.

➤ ***If Mach/IAS, altimeter, and VSI agree:***

CONTINUE OPERATION.

- Continue flight leaving appropriate static selector in **ALTERNATE**.

➤ ***If Mach/IAS, altimeter, and VSI do not agree:***

CROSSCHECK INSTRUMENTS.

- Attempt to determine which pitot instruments are correct, considering power setting, configuration, and weight. Utilize the correct systems for continuing aircraft operation.
- During approach, the FAST/SLOW indicators may be utilized to crosscheck airspeeds, since they are independent of the pitot/static system.
- Depressurizing the aircraft prior to approach may decrease the pitot error.
- If BOTH pitot systems appear to be inoperative, refer to ODM Abnormal Section for appropriate power settings for operation without airspeed indication.

——— **END OF PROCEDURE** ———

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Non-Normal Checklists
Flight Management, Navigation

Chapter NNC
Section 11

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VERIFY IRS POSITIONS	NNC.11.8

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ATTITUDE MODE SELECTION

► If on the ground:

FAILED IRS MODE SELECTOR ATT

- Select when directed by the MEL for dispatch with an IRU inoperative.
- Aircraft should remain stationary until alignment occurs.

► If in flight:

FAILED IRS MODE SELECTOR ATT

- Select only when **FAULT** light illuminates or IRS has temporarily lost all power, including battery power.
- Maintain straight and level unaccelerated flight for 20 seconds or until **FAULT** light extinguishes.

SYSTEM STATUS:

- Autoland is inhibited with either IRU in **ATT** mode.
- If #1 IRU in ATT mode, EGPWS is inoperative. Press EGPWS switchlight (adjacent to TRP) to OVRD.
- If both in ATT mode, MAP not available and anti-skid is inoperative.
- If PFD/ND is not recovered, select EFIS switch to operable side.

CAUTION

*A continuous **FAULT** light indicates that output from the associated IRS is invalid. **FAULT** light should extinguish approximately 20 seconds after selection of ATT; if not, then ATT mode is invalid and attitude information for the failed IRU should be disregarded. Once MODE selector has been set to ATT, IRU will remain in ATTITUDE mode even if MODE selector is subsequently rotated to NAV or ALIGN. If ALIGN or NAV mode is desired, airplane must be stationary and the IRS MODE selector rotated to OFF for 3 seconds before ALIGNMENT or NAVIGATE mode can be reestablished.*

(Continued on next page)

ATTITUDE MODE SELECTION

(Continued)

ACCESS THE POS INIT PAGE.

➤ *If on the ground:*

SELECT INIT / REF BUTTON ON MCDU.

| ➤ *If in flight, ATT selected, and **FAULT** light extinguished:*

SELECT INIT / REF BUTTON ON MCDU.

SELECT INDEX PROMPT ON INIT / REF PAGE.

SELECT POS PROMPT ON INDEX PAGE.

ENTER HEADING AT SET IRS HEADING PROMPT.

- On POS INIT page 1, enter wet compass magnetic heading into dash prompt 5R.
- If the ND on the failed side is not in the ARC or ROSE mode, the only indication of heading update will be on the opposite RDMI.
- Heading should be updated at least every 15 minutes.

———— END OF PROCEDURE ————

FMS LOCKED/TIMEOUT

Use this procedure when the FMS is locked up, that is, no keyboard entries seem to work, or after a timeout of the system.

A timeout can be caused by an actual latch/fail occurrence.

- Proceed with following steps as appropriate.

DETERMINE MCDU STATUS.

- Ascertain if any key may regain the FMS (for instance, if the SUBSYSTEM [TIMEOUT] page is displayed, you have to press the MENU key, and that will display the MENU page, and selecting line select key 1L [AFMC #1] may regain the FMS).

► If no keyboard entry will regain the FMS:

CYCLE FMS CDU CB'S (D22, F10).

► If FMS is not regained:

CYCLE FMS COMPUTER CB (D21).

► If the FMS is regained:

RELOAD / REACTIVATE DATA/ROUTE AS NECESSARY

► After a timeout or when the FMS/MCDU is repowered: THE FOLLOWING MUST BE REENTERED:

- Reentering position for IRS equipped aircraft is not possible or required.
- Verify IRS position by selecting POSITION page 2 (lines 2 and 3).
- Performance data.
- Route must be activated (it could still be loaded) and executed.
- Direct INTC page select, activate, and execute to next waypoint.

► If FMS is still not regained:

SYSTEM STATUS:

- The FMS is inoperative for the remainder of the flight.
- EGPWS Terrain feature is unavailable.

———— **END OF PROCEDURE** ————

FMS MAP FAILURE

NOTE: *Differential recognition between a compass (heading) failure and an FMS related map failure is essential prior to response and the repositioning of either switches or circuit breakers.*

SELECT ARC OR ROSE ON ND MODE CONTROL PANEL.

- **ARC** or **ROSE** selection aids in determining type of fault.

DETERMINE PFD STATUS.

- Ascertain whether attitude information is available.

➤ ***If attitude and heading information remains available:***

CONFIRM AIRCRAFT ATTITUDE.

- Confirm no heading or attitude differences exist between EFIS and standby compass and horizon.

ACCOMPLISH **FMS LOCKED/TIMEOUT** **PROCEDURE.**

➤ ***If attitude and/or heading fail flags in view:***

DETERMINE AIRCRAFT ATTITUDE USING STANDBY OR REMAINING SYSTEM INSTRUMENTATION.

ACCOMPLISH **ATTITUDE MODE SELECTION** **PROCEDURE.**

———— **END OF PROCEDURE** ————

IRS ALIGN HOLD TEMP LOW

Message appears on FMS IRS INIT/REF page of the MCDU when internal temperature of unit is too cold or all sensors are not within temperature tolerance. The position can be entered and alignment will begin as soon as all parameters are satisfied.

———— **END OF PROCEDURE** ————

IRS ALIGN LIGHT(S) FLASHING

SELECT FMS POS INIT PAGE.

ENTER PRESENT POSITION.

- Reenter the correct present position on SET IRS POS line with mode selectors in **NAV**.
- Box prompts need not be displayed if present position has been previously entered.
- Existing position may be overwritten.

➤ **If ALIGN light continues to flash:**

IRS MODE SELECTOR(S) OFF

- Wait until ALIGN light extinguishes.

➤ **After ALIGN light extinguishes:**

MODE SELECTOR NAV

- Verify ALIGN light illuminated steady.
- Enter present position using the alternative method via the MCDU menu page as described in SYSTEM OPERATION.

➤ **If ALIGN light continues to flash:**

MAINTENANCE ACTION IS REQUIRED.

——— **END OF PROCEDURE** ———

IRS FAULT LIGHT

NOTE: **FAULT** light is located on the IRS control panel on cockpit overhead panel.

➤ **If **FAULT** light illuminates on the ground:**

SYSTEM STATUS:

- Indicates failure in the alignment process.
 - Mode switch must be cycled to **OFF** (3 seconds minimum) before attempting another alignment.

➤ **If **FAULT** light illuminates in flight:**

SYSTEM STATUS:

- Indicates IRS has detected a fault in the normal navigate mode.
- Refer to ATTITUDE MODE SELECTION, NNC.11, Flight Management, Navigation section.

———— **END OF PROCEDURE** ————

IRS NAV ONLY

Appears in scratchpad after loss of radio nav input for approximately 12 minutes. FMS position and map displays remain valid.

TUNE CLOSEST APPROPRIATE NAV FACILITY.

➤ **If message remains:**

CONTINUE FLIGHT.

EGPWS OVRD

- Pilot must verify aircraft position using other navigation systems if available.

———— **END OF PROCEDURE** ————

IRS -1 / -2 BATTERY FAIL

Indicates that respective backup battery voltage has dropped below a minimum level and AC power loss will result in immediate loss of respective IRU.

(90) NOTE: IRS -1 **BAT FAIL** may illuminate if aircraft BATTERY switch is **OFF**.

——— END OF PROCEDURE ———

IRS -1 / -2 NO AIR

NOTE: Indicates loss of cooling air to IRU.

➤ **If on the ground:**

SHUT DOWN RESPECTIVE IRU.

- Until cooling air can be restored.

➤ **If in flight:**

IRU MAY FAIL.

PLAN FLIGHT ACCORDINGLY.

——— END OF PROCEDURE ———

IRS -1 / -2 ON BATTERY

NOTE: Illuminates during self-test (switching from **OFF** position) for approximately 15 seconds.

IRS has reverted to backup power, primary AC voltage is lost.

➤ ***If respective DC bus is unpowered (L DC bus for IRU-1, R DC bus for IRU-2):***

SYSTEM STATUS:

- IRU will be operative for 30 minutes from its own battery.

PLAN FLIGHT ACCORDINGLY.

➤ ***If respective DC bus is powered:***

SYSTEM STATUS:

- IRU will operate normally from its battery.
- DC bus continues to charge unit battery.

———— **END OF PROCEDURE** ————

VERIFY IRS POSITIONS

IRS averaging function detects IRU position or velocity discrepancy outside of acceptable parameters.

SELECT POSITION PAGE (2/2 OR 2/3 & 3/3).

- Determine which IRU position is most accurate. AFMC position may be used to assist in selection.

SELECT MOST ACCURATE IRU.

- Select by depressing USE key 5L or 5R.
- Progress page will reflect choice in lower right corner.
- Deselected IRU navigation data will be disregarded, but attitude information is still valid.

———— **END OF PROCEDURE** ————

Non-Normal Checklists

Chapter NNC

Fuel

Section 12

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**APPROACH WITH LOW FUEL
(LESS THAN 1,000 POUNDS IN EITHER MAIN TANK)**

ALL OPERABLE BOOST PUMPS ON

FUEL X FEED LEVER ON

(88) IGNITION. OVERRIDE

(90) IGNITION. ON

► ***Prior to final approach:***

CHECK FUEL QUANTITY.

- Avoid excessive or sustained nose up attitudes in excess of 10°.
- Go-around with less than 500 pounds in either main tank or less than 1,500 pounds total is not recommended.
- Go-around is not recommended if both main tank aft boost pumps are inoperative.

——— **END OF PROCEDURE** ———

CENTER FUEL PRESS LO / CENTER TANK FAILS TO FEED IN FLIGHT

NOTE: This procedure is applicable when Center tank fuel boost pump is inoperative, or Center tank fuel stops feeding with greater than (88)11,000 pounds (90) 3,000 pounds or fails to feed with main fuel below 3800 pounds with center tank boost pumps in AUTO.

(88) FUEL X FEED LEVER OFF
CTR TANK BOOST PUMPS ON
MAIN TANK BOOST PUMPS ON

CAUTION

Do not reset any tripped fuel pump circuit breakers.

► *If Center Tank Fuel Quantity decreases at normal rate:*

CONTINUE NORMAL FUEL MANAGEMENT.

———— END OF PROCEDURE ————

► *If Center Tank Fuel Quantity does not decrease at normal rate:*

MAIN TANK BOOST PUMPS
(BOTH IN ONE MAIN TANK) OFF

► *If associated (L/R) INLET FUEL PRESS LO message is displayed:*

MAIN TANK BOOST PUMPS ON

CTR TANK BOOST PUMPS OFF

- Assume center tank pumps are inoperative/unavailable.

PLAN REMAINDER OF FLIGHT USING MAIN TANK FUEL ONLY.

———— END OF PROCEDURE ————

(Continued on next page)

**88 CENTER FUEL PRESS LO /
CENTER TANK FAILS TO FEED IN 88
FLIGHT**

(Continued)

➤ *If (L/R) INLET FUEL PRESS LO message is not displayed:*

**MAIN TANK BOOST PUMPS
(OTHER MAIN TANK) OFF**

➤➤ *When center tank quantity indicates 500 pounds:*

MAIN TANK BOOST PUMPS ON

NOTE: *If required, the remaining center tank fuel may
be used by operating the functioning center tank pump
to supply one engine.*

——— END OF PROCEDURE ———



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Blank

FUEL FIL PRES DROP

L or R FUEL FIL PRES DROP

CAUTION

If both L and R FUEL FIL PRESS DROP messages are illuminated, consider possibility of fuel contamination and land at nearest suitable airport.

(90) MONITOR ENGINE OPERATION.

- ***(88) If the fuel temperature gauge indicates more than 15°C:***

CONTINUE ENGINE OPERATION.

- Continued engine operation is permissible if the engine oil temperature remains within normal limits.
- The FUEL FIL PRES DROP message may be illuminated at temperatures above 15°C due to filter clogging by solid contaminants other than ice.

- ***(88) If the fuel temperature gauge indicates less than 15°C:***

FUEL HEAT SWITCHES (ONE AT A TIME) ON

- Check appropriate **FUEL HEAT ON** light illuminates for approximately one minute.
- Check that fuel temperature gauges show an increase.

- ***(88) If the FUEL FIL PRES DROP message remains illuminated:***

REPEAT PROCEDURE.

- Fuel heat applications may be repeated if required.
- Do not exceed oil temperature limitations.

——— **END OF PROCEDURE** ———

FUEL FLOW GAUGE INOPERATIVE/ FUEL FLOW GAUGE READS HIGH

➤ ***If nines are shown:***

PRESS ANNUNCIATOR TEST BUTTON.

- Pressing TEST button should clear nines indication.

➤ ***If the fuel flow gauge does not respond to throttle movement:***

**(88) CHECK/RESET FUEL FLOW GAUGE CB's
(LEFT K27, X36/RIGHT L27, C15*), IF TRIPPED.**

**(90) CHECK/RESET FUEL FLOW GAUGE CB's
(X36, C16*), IF TRIPPED.**

➤ ***If the fuel flow gauge indicates a higher than normal reading:***

THROTTLE IDLE

➤ ***If the fuel flow gauge does not follow throttle movement:***
SYSTEM STATUS:

- Fuel flow gauge is inoperative.

➤ ***If the fuel flow gauge follows throttle movement but fuel flow is high:***

CHECK FUEL CONSUMPTION.

- Check fuel consumed during a specified time to confirm higher fuel flow.
- This abnormal fuel flow would indicate an internal engine leak.

➤➤ ***If a leak is confirmed:***

**ACCOMPLISH ENGINE FAILURE/SHUTDOWN
PROCEDURE IN POWER PLANT ABNORMALS.**

➤➤ ***If fuel consumption is normal:***
CONTINUE ENGINE OPERATION.

———— **END OF PROCEDURE** ————

88	FUEL HEAT INOPERATIVE	88

With fuel heat inoperative, fuel to the engine should be maintained at 5°C (40°F) or higher to preclude ice formation in the filters and fuel control. If the fuel temp as indicated on the fuel temp gauge cannot be maintained at this level, decrease altitude or increase speed as indicated on the chart below.

MINIMUM SPEED (MACH/KIAS) REQUIRED TO MAINTAIN 5° C																
Pressure Altitude (1000 feet)	Static Air Temperature (°C)															
	-29.4	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	-4		
35	M.84	M.82	M.79	M.76	M.73	M.70	224	213	201							
34	M.84	M.82	M.79	M.76	M.73	M.70	230	217	206							
32	M.84	M.82	M.79	M.76	M.73	M.70	241	228	215	202						
30	M.84	M.82	M.79	M.76	M.73	M.70	252	239	225	212	202					
28	M.84	M.82	M.79	M.76	M.73	M.70	263	249	235	221	207					
26	340	340	M.79	M.76	M.73	M.70	274	260	245	231	216					
24	340	340	340	M.76	M.73	M.70	285	271	256	241	225	208				
22	340	340	340	340	M.73	M.70	298	282	267	251	234	217				
20	340	340	340	340	340	M.70	309	293	278	261	244	226				
18	340	340	340	340	340	M.70	322	306	289	272	254	235				
16	340	340	340	340	340	340	335	318	300	282	264	244	224	200		
14	340	340	340	340	340	340	340	330	312	294	274	254	233	209		
12	340	340	340	340	340	340	340	340	324	305	285	264	242	218		
10	340	340	340	340	340	340	340	340	337	317	295	274	251	226		
8	340	340	340	340	340	340	340	340	340	328	307	284	260	234		
6	340	340	340	340	340	340	340	340	340	340	318	294	270	243		
4	340	340	340	340	340	340	340	340	340	340	329	305	279	253		
NOTE: Cockpit fuel temperature indicators reflect fuel temperature at the fuel pump between stages and downstream of the heat exchanger. The fuel temperature in the tank may be significantly lower.																

— END OF PROCEDURE —

88

FUEL HEAT ON

88

CHECK FUEL HEAT SWITCH OFF.

PULL RESPECTIVE HEAT TIMER CB (K29, L29).

- This should force the fuel heat valve to close.

➤ ***If fuel heat valve remains open:***

ADJUST ENGINE THRUST.

- Adjust thrust as necessary to maintain oil temperature within limits.
- Consider feeding from the main tanks utilizing colder fuel.

➤ ***If unable to maintain engine oil temperature within limits:***

SHUT DOWN ENGINE.

- Engine may be restarted as desired for landing.

➤ ***When fuel heat is required:***

FUEL HEAT TIMER

CB (K29, L29). RESET FOR ONE MINUTE

——— **END OF PROCEDURE** ———

FUEL LEAK

Fuel leaks might be indicated by main tank imbalance and/or the illumination of the L or R INLET FUEL PRES LO message, significant differences between fuel quantity and fuel used, or uncommanded filling of a tank. **It may be possible to visually observe fuel/fuel vapor leaking from the wing area.**

BOOST PUMPS (TANK WITH LESSER QUANTITY) OFF

BOOST PUMPS (TANK WITH GREATER QUANTITY) ON

➤ ***If there is a leak overboard (difference between fuel quantity decrease and fuel used):***

FUEL X FEED LEVER OFF

➤ ***If engine using suction feed fails:***

THROTTLE IDLE

FUEL LEVER/SWITCH OFF

PULL ENG FIRE HANDLE (DO NOT ROTATE).

FUEL X FEED LEVER AS REQD

- Crossfeed fuel as necessary to maintain balance.

LAND AT NEAREST SUITABLE AIRPORT.

**ACCOMPLISH ENGINE FAILURE/SHUTDOWN PROCEDURE
IN POWER PLANT ABNORMALS, IF APPROPRIATE.**

➤ ***If a tank quantity changes (quantity increasing/decreasing) at other than normal rate:***

FUEL X FEED LEVER AS REQD

- Use FUEL CROSSFEED lever as required to make fuel available and to maintain balance. Do not **open** if leak overboard is suspected.
- Maintaining at least 2,500 pounds in right main tank will minimize chance of left engine drawing air if it is on suction feed.

LAND AT NEAREST SUITABLE AIRPORT.

——— END OF PROCEDURE ———

FUEL LEVEL LOW

FUEL LEVEL LOW

**ALL BOOST PUMPS ON
LEVEL AIRCRAFT.**

- If climbing level aircraft at next altitude, **or**
- If turning, complete the turn and maintain level flight during procedure.

PULL AND RESET FUEL LEVEL LOW CB.

- Pull circuit breaker S41.
 - Verify message extinguishes.
- Reset circuit breaker.
 - Observe OAP for message.

➤ If FUEL LEVEL LOW message extinguishes:

CONTINUE FLIGHT.

MONITOR FUEL STATE.

➤ If FUEL LEVEL LOW message remains illuminated or re-illuminates:

DETERMINE FUEL STATE.

- Plan remainder of flight accounting for all fuel available in the center tank plus **either**
 - 5,000 pounds **or**
 - total fuel indicated in main tanks, if lower.

➤ If center tank is empty:

DETERMINE FUEL STATE.

- Plan remainder of flight using 5,000 pounds total fuel remaining, **or** total fuel indicated in main tanks, if lower.

➤ If center tank contains fuel and will not feed:

**ACCOMPLISH CENTER TANK FAILS TO FEED IN FLIGHT
PROCEDURE.**

———— **END OF PROCEDURE** ————

INLET FUEL PRES LO

L or R INLET FUEL PRES LO

ALL FUEL BOOST PUMPS ON

- Do not use the **AUTO** position for any inoperative boost pump.
- If tank pumps in a main tank are inoperative, suction feed capability is enhanced with an increase in fuel flow. If required, descents should be made at a higher engine power and with speed brakes extended.

➤ *If INLET FUEL PRES LO message is not displayed:*

CONTINUE NORMAL FUEL MANAGEMENT.

———— **END OF PROCEDURE** ————

➤ *If INLET FUEL PRES LO message is still displayed:*

CHECK FUEL QUANTITY/FUEL MANAGEMENT SCHEDULE.

➤ *If fuel consumed versus fuel quantity is not normal and/or main tank lateral imbalance exists:*

ACCOMPLISH FUEL LEAK PROCEDURE.

➤ *If fuel consumed versus fuel quantity is normal and there is no main tank lateral imbalance:*

CONTINUE NORMAL FUEL MANAGEMENT.

- Monitor engine operation.
- Quantity remaining in each tank should be approximately equal, indicating normal fuel consumption.

———— **END OF PROCEDURE** ————

TANK QUANTITY INDICATOR ERRONEOUS

CHECK QUANTITY INDICATOR.

➤ ***If nines are shown:***

PRESS ANNUNCIATOR TEST BUTTON.

➤ ***If nothing is indicated:***

SELECT OTHER CHANNEL SELECTOR.

CHECK/RESET FUEL QUANTITY POWER CB (J17 or H14), IF TRIPPED.

(88) PUSH FUEL QUANTITY TEST BUTTON.

➤ ***If indications are erroneous:***

DISREGARD QUANTITIES/TOTALIZER.

- Fuel remaining should be calculated by using fuel consumed indications.
- **Do not use the AFB system.**

———— **END OF PROCEDURE** ————

Non-Normal Checklists
Hydraulics

Chapter NNC
Section 13

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HYD PRESS LOW

L or R HYD PRESS LOW

TRANS HYD PUMP SWITCH. OFF |

CHECK PRESSURE/QUANTITY.

NOTE: *The loss of hydraulic fluid may result in an increasing quantity indication on the affected side due to foaming.*

➤ ***If pressure is low AND quantity is low or abnormally high:***

**ACCOMPLISH HYDRAULIC QUANTITY LOW OR
DECREASING CHECKLIST, NNC.13, HYDRAULICS.**

➤ ***If pressure AND quantity are normal with message illuminated:***

CONTINUE OPERATION.

- Anticipate decrease in spoiler efficiency.

➤ ***If pressure is low AND quantity is normal:***

NOTE: *Verify rudder is neutral and rudder trim is zero before pressurizing right hydraulic system.*

AUX / TRANS HYD PUMP SWITCHES ON

CAUTION

If operating hydraulic system pressure is lost when TRANS HYD PUMP switch is moved to ON, move TRANS HYD PUMP switch to OFF. Several minutes may be required for the operating hydraulic system to regain pressure.

- Check / reset auxiliary (H17) and transfer (R27) pump control CBs, if tripped.
- Check / reset auxiliary hydraulic pump CB on left generator bus CB panel, if tripped.

AFFECTED ENG HYD PUMP SWITCH ON |

(Continued on next page)

HYD PRESS LOW

(Continued)

CHECK HYDRAULIC PRESSURE.

NOTE: *Excess air in the system may be the cause of the low pressure. If time permits and pressure is still low, turn affected ENG HYD PUMP and AUX / TRANS HYD PUMP switches OFF, wait several minutes and re-accomplish previous steps.*

➤ **If pressure remains low:**

**ACCOMPLISH LEFT OR RIGHT HYDRAULIC SYSTEM
FAILURE PROCEDURE.**

➤ **If pressure is normal:**

AUX / TRANS HYD PUMP SWITCHES OFF
CHECK HYDRAULIC PRESSURE.

➤➤ **If pressure is normal:**

CONTINUE NORMAL OPERATION.

➤➤ **If pressure is low:**

**USE AUX AND TRANSFER PUMPS FOR
APPROACH AND LANDING AS REQUIRED.**

SYSTEM STATUS:

- Affected engine pump inoperative.

———— **END OF PROCEDURE** ————

HYD TEMP HIGH

L or R HYD TEMP HIGH

TRANS HYD PUMP SWITCH OFF

AFFECTED ENG HYD PUMP SWITCH OFF

► *If right system affected:*

AUX HYD PUMP SWITCH OFF

REPRESSURIZE AFFECTED SYSTEM FOR APPROACH AND
LANDING.

———— END OF PROCEDURE ————

HYDRAULIC QUANTITY LOW OR DECREASING

NOTE: The loss of hydraulic fluid may result in an increasing quantity indication on the affected side due to foaming. If reinstating pressure causes an indication of decreased quantity, consider this lower quantity to be accurate.

TRANS HYD PUMP SWITCH OFF

CAUTION

Do not operate transfer pump or both systems may lose hydraulic pressure. Several minutes may be required for the operating hydraulic system to regain pressure.

➤ **If right system is affected:**

AUX HYD PUMP SWITCH OFF
RIGHT ENG HYD PUMP SWITCH OFF

➤ **If left system is affected:**

LEFT ENG HYD PUMP SWITCH OFF

➤ **If quantity loss continues:**

ACCOMPLISH LEFT OR RIGHT HYDRAULIC SYSTEM FAILURE CHECKLIST, NNC.13, HYDRAULICS.

➤ **If quantity loss ceases (with any fluid remaining):**

OPERATE WITH THE AFFECTED HYDRAULIC SYSTEM UNPRESSURIZED UNTIL CONFIGURING THE AIRCRAFT FOR APPROACH AND LANDING.

(Continued on next page)

HYDRAULIC QUANTITY LOW OR DECREASING (Continued)

➤ ***Prior to landing (fluid remaining):***

NOTE: *Verify rudder is neutral and rudder trim is zero before pressurizing right hydraulic system.*

CAUTION

Do not operate transfer pump or both systems may lose hydraulic pressure. Several minutes may be required for the operating hydraulic system to regain pressure.

AUX HYD PUMP SWITCH ON

AFFECTED ENG HYD PUMP SWITCH ON

CHECK HYDRAULIC SYSTEM PRESSURE.

➤ ***If quantity decreases to zero, and/or system pressure is abnormal:***

**ACCOMPLISH LEFT OR RIGHT HYDRAULIC SYSTEM
FAILURE CHECKLIST, NNC.13, HYDRAULICS.**

➤ ***If system pressure is normal (any fluid remaining):***

USE NORMAL FLAP / SLAT CONFIGURATION.

➤ ***After landing:***

CAUTION

Do not start the APU unless required to power the aircraft. This will prevent ingestion of fluids into the APU inlet.

CAUTION

If APU use is required, DO NOT use APU air. This will prevent ingestion of hydraulic fluid into the air conditioning system.

——— **END OF PROCEDURE** ———

LEFT HYDRAULIC SYSTEM FAILURE

NOTE: If pressure is low/zero, but quantity is normal or increasing, accomplish HYD PRESS LOW procedure first.

LEFT ENG HYD PUMP SWITCH OFF

TRANS HYD PUMP SWITCH OFF

CAUTION

Do not operate transfer pump or both systems may lose hydraulic pressure. Several minutes may be required for the operating hydraulic system to regain pressure.

SYSTEM STATUS:

- Inboard spoiler panels are inoperative.
- The following will work on accumulator pressure.
 - Left thrust reverser.
 - (88) Elevator augmentation.
 - (90) Pylon flaps.

► Prior to landing:

DO NOT USE AUTOBRAKES / AUTOLAND.

USE NORMAL FLAP / SLAT CONFIGURATION.

- When extending slats on a single hydraulic system, slow to not less than UP/RETRACT V_{REF} speed ($1.25 V_S$), and no more than 240 KIAS/.57 Mach.
- Move FLAP/SLAT handle directly to 15° in order to achieve maximum slat deployment in the event of total hydraulic failure.

USE NORMAL LANDING GEAR EXTENSION.

(Continued on next page)

LEFT HYDRAULIC SYSTEM FAILURE (Continued)

► ***After landing:***

CAUTION

***Steering to the right will be limited in both degrees and rate.
Left hand turns should remain unrestricted.***

USE SINGLE ENGINE TAXI AS REQUIRED.

CAUTION

***Do not start the APU unless required to power the aircraft.
This will prevent ingestion of fluids into the APU inlet.***

CAUTION

***If APU use is required, DO NOT use APU air. This will
prevent ingestion of hydraulic fluid into the air conditioning
system.***

——— END OF PROCEDURE ———

LOSS OF BOTH HYDRAULIC SYSTEMS / LANDING WITH NO HYDRAULIC PRESSURE

HYDRAULIC PUMPS (ALL). OFF

RUDDER POWER CONTROL LEVER MANUAL

- Maintain at least 135 KIAS until landing is assured.

APPROACH AND LANDING CONSIDERATIONS

- Plan landing on longest runway commensurate with conditions (wet or dry, crosswind, etc.).
- Reduce landing gross weight to the lowest practicable.
- Plan approach and landing with existing flaps/slats.
- Plan a wide pattern and longer than normal final based on 2.5 to 3 degree glidepath.

COMPUTE APPROACH AND THRESHOLD SPEEDS.

- ODM Abnormals contain actual landing distances.
- Bug speed - V_{REF} plus wind additive.
 - No automatic 5 knot wind additive.

► If flaps/slats are 28/EXT or 40/EXT:

PLAN NORMAL MANEUVERING AND V_{REF} SPEEDS:

- No less than 135 KIAS until landing is assured due to manual rudder.

► If flaps/slats are UP/RET:

REFER TO CHARTS BELOW TO OBTAIN $1.25 V_S$ (V_{REF}) FOR FINAL APPROACH.

- Do not interpolate, use next higher weight.
- Use the longest available runway commensurate with conditions.

GROSS WEIGHT X 1000 LBS (UP/RET)

G.W.	90	95	100	105	110	115	120
V_{REF}	163	167	171	175	180	184	188

G.W.	125	130	135	140	145	150	155	160
V_{REF}	191	195	199	203	206	209	213	217

(Continued on next page)

LOSS OF BOTH HYDRAULIC SYSTEMS / LANDING WITH NO HYDRAULIC PRESSURE

(Continued)

➤ *If flaps/slats are between UP/RET and 28/EXT:*

**REFER TO APPROACH / THRESHOLD SPEEDS CHART IN
SECTION NNM.1, NON-NORMAL MANEUVERS.**

➤ *Prior to landing:*

DO NOT USE AUTOBRAKES / AUTOLAND.

ANTI-SKID ARM

- Do not depress brake pedals prior to landing in order to maximize accumulator capacity.

AUTOTHROTTLES AS DESIRED

- Autothrottles will not allow aircraft to slow to final approach speed unless flaps/slats are at least 28/EXT.

➤ *If flaps/slats are not 28/EXT or 40/EXT:*

GPWS OVERRIDE

➤ *If gear is not locked down:*

**ACCOMPLISH FOLLOWING ALTERNATE GEAR EXTENSION
STEPS.**

- After alternate extension, the landing gear cannot be retracted unless the right hydraulic system is pressurized.

AIRSPEED MAX 300 KIAS/.70M

LANDING GEAR HANDLE. DOWN

PULL EMERG GEAR EXT LEVER FULL UP

- Ensure lever is locked in the **UP** position.

(Continued on next page)

LOSS OF BOTH HYDRAULIC SYSTEMS / LANDING WITH NO HYDRAULIC PRESSURE

(Continued)

CHECK LANDING GEAR WARNING LIGHTS.

- Aircraft may have to slow to V_{REF} to allow nose gear to lock down.
- **GEAR DOOR OPEN** light will be illuminated.
- Stop on the runway. Gear doors will contact the runway at low speeds.

MAKE POSITIVE MAIN GEAR TOUCHDOWN TO MINIMIZE FLOAT.

**(90) ANTICIPATE SLOWER THAN NORMAL PITCH RATE FOR
LANDING.**

➤ ***At main gear touchdown:***

**APPLY BRAKES SMOOTHLY TO FULL BRAKE PEDAL
DEFLECTION.**

CAUTION

***Increasing amounts of reverse thrust significantly reduces
rudder effectiveness and thus may increase the need to use
differential manual braking to maintain directional control.***

➤ ***In the event of directional control problems:***

REDUCE REVERSE THRUST AS REQUIRED.

**SELECT FORWARD IDLE IF NECESSARY IN ORDER TO
MAINTAIN OR REGAIN CONTROL.**

(Continued on next page)

LOSS OF BOTH HYDRAULIC SYSTEMS/ LANDING WITH NO HYDRAULIC PRESSURE

(Continued)

► *After nose gear touchdown:*

THROTTLES IDLE REVERSE THRUST DETENT

- Do not use asymmetric reverse thrust to maintain directional control.
- Rudder and differential braking should be used as required for directional control. Below approximately 60 knots differential braking will be the primary means of maintaining directional control.
- Increase symmetrical reverse thrust above idle only if necessary for existing conditions.
- Maintain maximum braking to a complete stop.
- Set parking brake before releasing brake pedals. Do not attempt to taxi.

CAUTION

***Do not start the APU unless required to power the aircraft.
This will prevent ingestion of fluids into the APU inlet.***

CAUTION

***If APU use is required, DO NOT use APU air. This will
prevent ingestion of hydraulic fluid into the air conditioning
system.***

SYSTEM STATUS:

- Inoperative components.
 - Speedbrakes/spoilers.
 - Autobrakes.
 - Powered rudder.
 - Slats/flaps.
 - Nosewheel steering.
 - (90) Powered elevator.
- Operative components (using accumulators).
 - (88) Powered elevator augmentation.
 - Thrust reversers.
 - Brakes (7 - 9 applications).
 - (90) Pylon flaps.

———— **END OF PROCEDURE** ————

RIGHT HYDRAULIC SYSTEM FAILURE

NOTE: If pressure is low/zero, but quantity is normal or increasing, accomplish HYD PRESS LOW procedure first.

RIGHT ENG HYD PUMP SWITCH OFF

AUX / TRANS HYD PUMP SWITCHES OFF

CAUTION

Do not operate transfer pump or both systems may lose hydraulic pressure. Several minutes may be required for the operating hydraulic system to regain pressure.

RUDDER POWER CONTROL LEVER MANUAL

- Use normal approach speed, not less than 135 KIAS, until landing assured.

SYSTEM STATUS:

- Outboard spoiler panels are inoperative.
- Right thrust reverser will operate on accumulator pressure.

► Prior to landing:

DO NOT USE AUTOBRAKES / AUTOLAND.

USE NORMAL FLAP / SLAT CONFIGURATION.

- When extending slats on a single hydraulic system, slow to not less than UP/RETRACT V_{REF} speed ($1.25 V_S$), and no more than 240 KIAS/.57 Mach.
- Move FLAP/SLAT handle directly to 15° in order to achieve maximum slat deployment in the event of total hydraulic failure.

———— END OF PROCEDURE ————

(Continued on next page)

RIGHT HYDRAULIC SYSTEM FAILURE

► *If landing gear is not down and locked:*

ACCOMPLISH FOLLOWING ALT GEAR EXTENSION STEPS.

- After alternate extension the landing gear cannot be retracted unless the right hydraulic system is pressurized.

AIRSPEED MAX 300 KIAS / .70M

LANDING GEAR HANDLE. DOWN

PULL EMERG GEAR EXT LEVER FULL UP.

- Ensure lever is locked in the **UP** position.

CHECK LANDING GEAR WARNING LIGHTS.

- Aircraft may have to slow to V_{REF} to allow nose gear to lock down.
- **GEAR DOOR OPEN** light will be illuminated.
- Stop on the runway. Gear doors will contact the runway at low speeds.

(Continued on next page)

RIGHT HYDRAULIC SYSTEM FAILURE

(Continued)

► Prior to taxiing:

INSTALL LANDING GEAR PINS.

CAUTION

Do not stow the emergency landing gear extension lever until the malfunction has been corrected or until the main landing gear bypass lever has been activated.

STOW EMERG GEAR EXT LEVER.

- After contacting ground crew, coordinate handle stowing to allow gear doors to be latched in the **UP** position.
- Apply left pressure at base of hold open arm initially while pulling back on the emergency landing gear extension lever.

CLOSE MAIN GEAR DOORS.

CAUTION

Steering to the left will be limited in both degrees and rate. Right hand turns should remain unrestricted.

USE SINGLE ENGINE TAXI AS REQUIRED.

CAUTION

Do not start the APU unless required to power the aircraft. This will prevent ingestion of fluids into the APU inlet.

CAUTION

If APU use is required, DO NOT use APU air. This will prevent ingestion of hydraulic fluid into the air conditioning system.

——— END OF PROCEDURE ———

Non-Normal Checklists
Landing Gear

Chapter NNC
Section 14

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ALTERNATE GEAR EXTENSION (RIGHT HYDRAULIC SYSTEM LOSS)

AIRSPEED MAX 300 KIAS / .70M

LANDING GEAR HANDLE DOWN

- Aircraft may have to slow to V_{REF} to allow nose gear to latch down.

PULL EMERGENCY LANDING GEAR EXTENSION LEVER FULL UP.

- Ensure lever is locked in **UP** position.

CHECK LANDING GEAR WARNING LIGHTS.

SYSTEM STATUS:

- **GEAR DOOR OPEN** light will be illuminated.

STOP ON RUNWAY.

- Gear doors will drag the ground at low speeds.

CAUTION

Do not stow the emergency landing gear extension lever until the malfunction has been corrected or until the gear door hydraulic bypass lever has been activated.

► **Prior to taxiing:**

INSTALL LANDING GEAR PINS.

CLOSE MAIN GEAR DOORS.

- After contacting ground crew, coordinate emergency gear lever stowing to allow gear doors to be latched in the **UP** position.
- Apply left pressure at base of hold open arm initially while pulling back on the emergency landing gear extension lever.

—— **END OF PROCEDURE** ——

ANTI-SKID

L or R INBD ANTI-SKID

L or R OUTBD ANTI-SKID

**ANTI-SKID SWITCH OFF, THEN ARM
CHECK / RESET ANTI-SKID CB'S, IF TRIPPED.**

- (88) P40, R40.
- (90) P40, T38.

**ANTI-SKID TEST CKT SWITCH TEST
CHECK ANTI-SKID MESSAGE(S).**

➤ ***If ANTI-SKID message(s) extinguish after test.***

**CONTINUE APPROACH.
LAND NORMALLY.**

——— **END OF PROCEDURE** ———

➤ ***If ANTI-SKID message(s) remain illuminated after test:***

LEAVE ANTI-SKID SWITCH ARMED.

- System status: Anti-Skid inop.

CHECK LANDING FIELD LENGTH REQUIREMENTS.

- Check respective flap configuration on next page for possible landing weight restrictions.

AUTOBRAKES OFF

- Autobrake system is inoperative if any ANTI-SKID message is illuminated.

➤ ***During landing:***

APPLY BRAKES AS IN FULL MANUAL BRAKE LANDING.

**APPLY THRUST REVERSERS TO ASSIST
DECELERATION.**

(Continued on next page)

ANTI-SKID (Continued)

NOTE: The tables below provide data for determining minimum runway length requirements with an inoperative anti-skid system for landing with 28 and 40 flap settings. The charts are only applicable for in flight use; dispatch with anti-skid inoperative is not allowable. Actual stopping distances are 60% of indicated lengths and consider the runway dry. For wet runway, increase runway length required by 15%. Interpolate as necessary.

FLAPS 28								
ALTITUDE	LANDING WEIGHT (X 1,000 LBS.)							
	80	90	100	110	120	130	140	142
S.L.	5100	5590	6080	6575	7070	7560	8070	8150
2000	5340	5860	6375	6900	7425	7950	8460	8570
4000	5600	6150	6700	7265	7830	8370	8920	9020
6000	5865	6460	7050	7640	8230	8820	9310	9500
8000	6175	6800	7440	8050	8680	9310	9930	10060

FLAPS 40								
ALTITUDE	LANDING WEIGHT (X 1,000 LBS.)							
	80	90	100	110	120	130	140	142
S.L.	4875	5340	5800	6270	6730	7200	7660	7750
2000	5100	5590	6030	6575	7070	7550	8030	8170
4000	5330	5860	6375	6900	7425	7950	8470	8580
6000	5610	6170	6720	7280	7830	8375	8930	9040
8000	5875	6470	7070	7660	8260	8850	9430	9550

———— **END OF PROCEDURE** ————

BRAKE FAILURE

➤ *If aircraft does not respond to normal wheel braking:*

- RELEASE BRAKE PEDALS.**

ANTI-SKID SWITCH OFF

RE-APPLY BRAKES.

 - Modulate brakes as in a full manual brake landing.

USE REVERSE THRUST AS NECESSARY.

———— **END OF PROCEDURE** ————

BRAKE OVERHEAT

CAUTION

If a (88) 305°C/(90) 540°C temperature exists for approximately 5 minutes, wheel fuse plugs may activate and deflate tires.

➤ *If brake OVHT light illuminates after takeoff with landing gear retracted:*

CHECK BRAKE TEMPERATURE.

➤ *If brake temperature is above (88) 305° or (90) 540°, or brake OVHT light remains illuminated:*

EXTEND LANDING GEAR.

- Extend landing gear when performance conditions permit.
 - Leave gear extended until brake temperature is below (88) 260° (90) 425° and/or OVHT light extinguishes.
- Brakes, wheels, and tires require Maintenance inspection before next flight.
- Temperature should drop and/or OVHT light should extinguish within 10 minutes.
 - If it does not, assume an indicator fault and continue normal operation.

RETRACT LANDING GEAR

➤ *If brake OVHT light illuminates on the ground:*

CHECK BRAKE TEMPERATURE.

➤ *If brake temperature is above (88) 205°C / (90) 440°C, but less than (88) 305°C; (90) 540°C:*

COOL BRAKES BELOW (88) 205°C / (90) 440°C.

- (88) Brake temperature must be below 205°C.

(Continued on next page)

BRAKE OVERHEAT

(Continued)

- (90) Brake temperature maximum (440°C) applies for:
 - Takeoffs with 11° or more of flaps.
 - Field elevations of 1,100 feet or less.
 - Ambient temperatures of 100°F or less.
 - No tailwind.
- For each:
 - 1°F above 100°F, subtract 2°C
 - and/or
 - 1 knot of tail wind, subtract 15°C
- from 440°C to determine the maximum allowable brake temperature for takeoff.
- For airports above 1100 feet MSL, see the Delta Airway Manual special pages limitations charts or the ODM.
- Do not set parking brake if temperature is above (88) 300°C/(90) 500°C.

➤ ***If brake temperature is above (88) 300°C /(90) 540°C, and/or OVHT light is illuminated:***

DO NOT SET PARKING BRAKE.

- Brakes, wheels, and tires will require Maintenance inspection before next flight.

WARNING

Keep all personnel clear of main landing gear area. If a (88) 305°C/(90) 540°C temperature exists for approximately 5 minutes, wheel fuse plugs may activate and deflate tires.

———— **END OF PROCEDURE** ————

GEAR DOOR OPEN LIGHT - GEAR POSITION LIGHTS GREEN

This procedure assumes hydraulic pressure is normal and landing GEAR handle is **DOWN**.

Performing this procedure will open the doors (if not already open) and allow door(s) to float, minimizing possible damage.

PULL EMERGENCY LANDING GEAR EXTENSION LEVER FULL UP.

- Ensure lever is locked in **UP** position.

SYSTEM STATUS:

- Main gear doors will open and float.
- **GEAR DOOR OPEN** light will remain illuminated.

CAUTION

Do not stow the emergency landing gear extension lever until the malfunction has been corrected or until the gear door hydraulic bypass lever has been pulled.

► **Prior to taxiing:**

INSTALL LANDING GEAR PINS.

CLOSE MAIN GEAR DOORS.

- After contacting ground crew, coordinate emergency gear lever stowing to allow gear doors to be latched in the **UP** position.
- Apply left pressure at base of hold open arm initially while pulling back on the emergency landing gear extension lever.

—— **END OF PROCEDURE** ——

GEAR UNSAFE LIGHT - GEAR HANDLE UP

HYDRAULIC PUMPS (ALL). ON

DECREASE AIRSPEED TO 230 KIAS/.57M OR BELOW.

- Reconfigure aircraft if necessary.

SPD BRK LEVER DISARMED

CAUTION

If SPD BRK lever cannot be disarmed, speedbrake stop and intermediate notches will not be engaged. Ensure lever is not inadvertently moved to full aft position as this would extend speedbrakes to full 60 degree position.

LANDING GEAR HANDLE DOWN

- Move gear handle to DOWN and observe gear lights illuminate green and **GEAR DOOR OPEN** light is extinguished.

CAUTION

If damage to landing gear is suspected or if previous gear malfunction has been indicated, do not raise gear as this may cause further damage and make it impossible to re-extend gear.

LANDING GEAR HANDLE UP

CHECK GEAR LIGHTS AND **GEAR DOOR OPEN** LIGHT.

➤ *If all lights are extinguished:*

AUX / TRANS HYD PUMP SWITCHES. OFF

- Configure hydraulic system for normal cruise.

———— END OF PROCEDURE ————

(Continued on next page)

GEAR UNSAFE LIGHT - GEAR HANDLE UP (Continued)

➤ ***If any light is illuminated:***

AIRSPEED MAX 300 KIAS/.70 M

CHECK OPERATION OF ELECTRICAL CIRCUITS.

NOTE: *Inoperative automatic pressurization and takeoff warning indicate ground shift is in GROUND mode.*

➤ ***If in FLIGHT mode:***

- No further action required.

——— **END OF PROCEDURE** ———

➤ ***If in GROUND mode:***

PULL GROUND CONTROL RELAY CB'S K33, L33.

CAUTION

To prevent premature system actuation, such as automatic spoiler deployment, do not reset GROUND CONTROL RELAY circuit breakers until after landing.

➤➤ ***Before landing:***

CABIN ALT CONTROL LEVER . . MANUAL (DOWN)

OUTFLOW VALVE OPEN

SPD BRK LEVER DISARMED

- Ground spoilers must be manually extended upon landing.
- Check ODM for landing distances.

AUTOBRAKES OFF

➤➤ ***After landing:***

RESET GROUND CONTROL RELAY CB'S K33, L33.

——— **END OF PROCEDURE** ———

LANDING GEAR HANDLE JAMMED UP

PULL EMERGENCY LANDING GEAR EXTENSION LEVER FULL UP.

- Check that holding latch is fully engaged.

CHECK LANDING GEAR WARNING LIGHTS.

- Aircraft may have to slow to 1.3Vs to allow nose gear to latch down.
- **GEAR DOOR OPEN** light will be illuminated.

ATTEMPT TO PLACE LANDING GEAR CONTROL HANDLE DOWN.

➤ *If landing gear CONTROL handle will move DOWN:*

STOW EMERGENCY LANDING GEAR EXTENSION LEVER.

- This will allow landing gear doors to close.
- Limit speed to 300 KIAS/Mach .70.
- Apply left pressure at base of hold open arm initially while pulling back on the emergency landing gear extension lever.

➤ *If landing gear CONTROL handle will NOT move DOWN:*

CHECK EMERGENCY LANDING GEAR EXTENSION LEVER FULL UP

- Gear doors will remain open.
- **GEAR DOOR OPEN** light will be illuminated.
- Stop on runway if possible. Gear doors will drag the ground at low speeds.

CAUTION

Do not stow the emergency landing gear extension lever until the malfunction has been corrected or until the gear door hydraulic bypass lever has been pulled.

(Continued on next page)

LANDING GEAR HANDLE JAMMED UP (Continued)

➤ ***Prior to taxiing:***

INSTALL LANDING GEAR PINS.

CLOSE MAIN GEAR DOORS.

- After contacting ground crew, coordinate emergency gear lever stowing to allow gear doors to be latched in the **UP** position.
- Apply left pressure at base of hold open arm initially while pulling back on the emergency landing gear extension lever.

—— **END OF PROCEDURE** ——

LANDING GEAR UNSAFE - GEAR HANDLE DOWN

NOTE: Main landing gear position may be verified at any time when crew duties permit utilizing the visual downlock(s) / periscope. Gear is down and locked when orange stripe on overcenter brace is a straight line.

► **If any green light(s) is NOT illuminated with no red unsafe indications:**

CHECK ANNUNCIATOR DIGITAL LIGHTS.

- Push annunciator digital lights test button and check for lamp validity.

► **If lamp test is normal:**

CYCLE LANDING GEAR.

- Cycle landing gear one time provided right hydraulic system is operating normally.

►► **If three green light(s) are NOT illuminated:
CHECK VISUAL DOWNLOCK(S).**

- NOSE GEAR.
 - Nose gear down lock indicator should extend approximately 1/4 inch when nose gear is down and locked. Aircraft may have to be slowed to V_{REF} to allow nose gear to latch down.
- MAIN GEAR (periscope is under aisle seat at fourth window aft of emergency exit, left side).
 - To visually check main gear overcenter linkage, depressurize to below 1 psi differential pressure, raise carpet over periscope, remove cover and dust cap, and turn wheel well lights **ON** (switch located adjacent to periscope). Align periscope with index mark to view desired gear. Gear is down and locked when the orange stripe on overcenter brace is a straight line

———— **END OF PROCEDURE** ————

(Continued on next page).

LANDING GEAR UNSAFE - GEAR HANDLE DOWN (Continued)

➤ *If lamp test is not normal*

CHECK VISUAL DOWNLOCK(S).

- Check visual downlocks as written above.

➤ *If any red light is illuminated:*

CHECK RIGHT HYDRAULIC SYSTEM.

- Right hydraulic pump on.
- Hydraulic pressure 3000 psi ($\pm$ 200).
- Hydraulic quantity normal.

➤ *If the right hydraulic system is not normal:*

**ACCOMPLISH RIGHT HYDRAULIC SYSTEM FAILURE
CHECKLIST, NNC.13, HYDRAULICS SECTION.**

➤ *If the right hydraulic system is normal and unsafe nose
gear warning light only:*

VISUALLY INSPECT THE NLG IND PIN.

➤➤ *If NLG IND PIN is extended:*

NO FURTHER ACTION IS REQUIRED.

➤ *If the right hydraulic system is normal and NLG IND pin is
retracted or any main gear unsafe light is illuminated:*

PULL EMERG GEAR EXT LEVER.

- Ensure lever is full up and locked.
- **GEAR DOOR OPEN** light will remain illuminated.
- It may be necessary to slow to VREF to allow nose gear to latch down.

CHECK LANDING GEAR POSITION LIGHTS.

(Continued on next page)

LANDING GEAR UNSAFE - GEAR HANDLE DOWN (Continued)

➤➤ *If all green lights are illuminated:*

STOW EMERG GEAR EXT LEVER.

- Stowing lever will allow main gear doors to close.
- Apply left pressure at the base of the hold open arm initially while pulling back on the emergency landing gear extension lever.

CHECK GEAR DOOR OPEN AND POSITION LIGHTS.

➤➤➤ *If GEAR DOOR OPEN light is extinguished and three green lights illuminated:*

———— **END OF PROCEDURE** ————

➤➤➤ *If any gear light red or GEAR DOOR OPEN light is illuminated:*

PULL EMERG GEAR EXTENSION LEVER.

SYSTEM STATUS:

- Nosewheel steering to the left is restricted.

STOP AIRPLANE ON THE RUNWAY.

**HAVE MAINTENANCE INSTALL LANDING
GEAR PINS BEFORE TAXIING.**

**HAVE MAINTENANCE CLOSE MAIN GEAR
DOORS.**

➤➤ *If any red light is illuminated:*

STOW EMERG GEAR EXTENSION LEVER.

***NOTE:** Gear warning CB (P 38) may be opened to eliminate nuisance warning.*

**ACCOMPLISH LANDING WITH ABNORMAL
LANDING GEAR CONFIGURATION CHECKLIST,
NNC.14, LANDING GEAR SECTION.**

———— **END OF PROCEDURE** ————

LANDING WITH ABNORMAL LANDING GEAR CONFIGURATION

NOTE: *Excess fuel should be consumed to decrease landing gross weight.*

**COMPLETE NORMAL DESCENT / APPROACH / BEFORE
LANDING CHECKLISTS.**

**ACCOMPLISH DITCHING / CRASH LANDING CHECKLIST, NNC.0,
UNANNUNCIATED CHECKLIST SECTION.**

REVIEW PASSENGER EVACUATION.

- All evacuation slides and the overwing exits should be usable with the aircraft stopped in any failed landing gear configuration.

PULL LANDING GEAR WARNING CB (P38).

APU MASTER SWITCH OFF

- The APU should be shut down for landing unless it is the sole source of electrical power.

CAUTION

Do not use autobrakes.

➤ ***If nose gear unsafe and both main gear extended:***

LANDING GEAR LEVER. DOWN

SPOILERS ARMED

MAKE NORMAL APPROACH.

➤ ***At touchdown:***

**PF SHOULD ACTUATE TRIM TO ASSIST IN HOLDING
THE NOSE OFF THE RUNWAY.**

- Hold the nose off until approximately 80 knots.
 - Idle reverse may be used with caution.

(Continued on next page)

LANDING WITH ABNORMAL LANDING GEAR CONFIGURATION (Continued)

- *While elevator is still effective:*
 LOWER NOSE WHEEL GENTLY TO RUNWAY.
- *Upon nose contact:*
 **USE MAXIMUM BRAKING (WITHIN LIMITS OF
 DIRECTIONAL CONTROL) TO STOP AIRCRAFT.**

➤ *If one main gear is partially or fully retracted:*

LANDING GEAR LEVER DOWN
SPOILERS DISARMED

- Do not use spoilers during landing.

MAKE NORMAL APPROACH.

- Select widest runway available due to possible directional control problems.
- Consider touching down on side of runway corresponding to extended main landing gear.

➤ *At touchdown:*
 LAND ON THE EXTENDED MAIN GEAR.

HOLD NOSE OFF THE RUNWAY AS LONG AS POSSIBLE.

➤ *While elevator control is still effective:*
 LOWER THE NOSE GEAR GENTLY TO THE RUNWAY.

**HOLD WINGS LEVEL WITH THE AILERONS AS LONG AS
 POSSIBLE.**

**MAINTAIN DIRECTIONAL CONTROL WITH RUDDER, AND
 NOSEWHEEL STEERING.**

(Continued on next page)

**LANDING WITH ABNORMAL
LANDING GEAR CONFIGURATION**
(Continued)

➤ *If any other combination of extended/retracted landing gear exists:*

LANDING GEAR LEVER. DOWN

- Land with all gear possible regardless of landing surface preparation.

SPOILERS DISARMED

- Do not use spoilers during landing.

MAKE NORMAL APPROACH.

**TOUCH DOWN ON THE MAIN GEAR, IF EXTENDED, AND
HOLD THE NOSE OFF AS LONG AS POSSIBLE.**

LOWER THE NOSE GENTLY TO THE RUNWAY.

**HOLD WINGS LEVEL WITH THE AILERONS AS LONG AS
POSSIBLE.**

**MAINTAIN DIRECTIONAL CONTROL WITH RUDDER, AND
NOSEWHEEL STEERING (IF AVAILABLE).**

——— **END OF PROCEDURE** ———

**PARKING BRAKE ON IN FLIGHT
(GEAR DOWN)**

PARKING BRAKE ON

PARKING BRAKES AND PARK BRAKE CONTROL OFF

- Depress rudder pedal brakes.
- Check parking brakes are off and park brake control is not set.

CHECK PARKING BRAKE ON MESSAGE.

➤ *If **PARKING BRAKE ON** message is illuminated:*

ANTI-SKID ARM

- Do not use autobrakes.

SYSTEM STATUS:

- Assume anti-skid inoperative.

**CONSULT ANTI-SKID INOPERATIVE PROCEDURE TO
DETERMINE ADDITIONAL STOPPING DISTANCE WITH ANTI-
SKID INOPERATIVE.**

——— **END OF PROCEDURE** ———

UNABLE TO RAISE GEAR HANDLE AFTER TAKEOFF

CHECK NOSEWHEEL STEERING.

- Use normal force to check nosewheel steering.

► *If nosewheel is steerable:*

DO NOT RETRACT LANDING GEAR.

- Leave landing gear down as there is no way to ensure centering of nose wheel.
- Limit speed to 300 KIAS/Mach 0.70.

PULL GROUND CONTROL RELAY CB'S K33, L33.

- When ground control relay circuit breakers are pulled, all associated circuits are placed in FLIGHT mode.

► *Before landing:*

CABIN ALT CONTROL LEVER MANUAL (DOWN)

OUTFLOW VALVE OPEN

SPD BRK LEVER DISARMED

- Ground spoilers must be extended manually on landing.
- Check ODM, F.A.R. DRY LANDING FIELD LENGTH for landing distance with Auto or Inboard Ground Spoilers Inoperative.

AUTOBRAKES OFF

► *During taxi:*

RESET GROUND CONTROL CB'S K33 AND L33.

——— **END OF PROCEDURE** ———

(Continued on next page)

**UNABLE TO RAISE GEAR HANDLE
AFTER TAKEOFF
(Continued)**

➤ *If nosewheel is NOT steerable with index mark centered
and it is necessary to raise the landing gear:*

PRESS AND HOLD GEAR HANDLE RELEASE BUTTON. LANDING GEAR HANDLE UP

———— **END OF PROCEDURE** ————

Non-Normal Checklists
Warning Systems

Chapter NNC
Section 15

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Intentionally
Blank

BELOW G/S ALERT

➤ *If a GLIDE SLOPE (G/S light/aural) alert occurs:*

CHECK GLIDE SLOPE SIGNAL.

➤ *If glide slope signal is valid:*
RETURN TO GLIDE SLOPE.

OR

EXECUTE MISSED APPROACH.

➤ *If glide slope signal is not valid:*
DISARM GLIDE SLOPE ALERT MODE.

- Pressing the **G/S** light inhibits the GLIDE SLOPE alert. Inhibiting the GLIDE SLOPE alert is permissible when:
 - Executing an ILS to one runway to land on the parallel.
 - Executing an ILS to one runway followed by a circling approach to another runway.
 - Executing a back course approach.
 - Glide slope touchdown is displaced well beyond threshold and Captain elects to land short of touchdown point to gain additional runway.

——— **END OF PROCEDURE** ———

GPWS FAIL

► ***If GPWS FAIL light illuminates:***

CHECK / RESET GPWS COMPUTER CIRCUIT BREAKER CB F20.

WARNING

If circuit breaker is not tripped or will not reset, consider GPWS inoperative. GPWS cannot be relied upon to provide aural and visual warnings for abnormal airplane configurations and terrain closure.

———— **END OF PROCEDURE** ————

OVERSPEED WARNING SOUNDS EARLY

The maximum speed warning will sound when V_{MO}/M_{MO} is exceeded or if slats are extended above 280 KIAS (Mach.57).

CHECK AIRSPEED / MACH.

- If warning system is operating normally, fly the aircraft at speeds below which the warning clacker sounds.

► ***If the warning system activates below 325 KIAS/.79M and slats are retracted:***

**PULL CAWS OVERSPEED ENG FIRE HORIZONTAL
STAB CB (U31).**

CAUTION

With the circuit breaker pulled, in addition to the overspeed warning, the aural (bell and voice) engine fire and horizontal stabilizer warnings are disabled.

OBSERVE SPEED LIMITATIONS.

- $M_{MO}=.79$ above 25,000 feet.
- $V_{MO}= 325$ KIAS 25,000 feet and below.

——— END OF PROCEDURE ———

TA/VS1 FAILURE / NO TCAS ANNUNCIATION

➤ *If TA/VS1 is blank:*

PULL AND RESET TA/VS1 CB.

- Consult Volume 2, Chapter 6, Electrical for circuit breaker locations.
- If unable to restore display, the pilot with an operable display should fly all resolution advisories (RA's).

➤ *If **NO TCAS** (amber) is displayed on both TA/VS1 displays:*

RADAR INDICATOR FUNCTION SWITCH TCAS

- Displays any fault message, if present.

➤ *If **TCAS PROCESSOR** fault is displayed:*

**CYCLE TRANSPONDER FUNCTION SELECTOR TO STBY
AND THEN TO TA OR TA/RA.**

- **NO TCAS** extinguishes if successful.

➤ *If the selected transponder is suspected source of fault:*
SELECT ATC SWITCH TO OPPOSITE ATC.

- Check ATC FAIL annunciator.
- **NO TCAS** extinguishes if successful.

➤ *If the selected CADC is suspected source of fault:*
SELECT ALT SWITCH TO OPPOSITE ALT.

- **NO TCAS** extinguishes if successful.

➤ *If TCAS not restored:*

TRANSPONDER FUNCTION SELECTOR ALT ON

- Leave in the **ALT ON** position for the remainder of the flight.

SYSTEM STATUS:

- TCAS is inoperative.

———— **END OF PROCEDURE** ————

Non-Normal Maneuvers

Chapter NNM

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Non-Normal Maneuvers

Non-Normal Maneuvers

Chapter NNM

Section 1

Approach to Stall Recovery

The following is immediately accomplished at the first indication of stall buffet or stick shaker.

Pilot Flying	Pilot Not Flying
Advance throttles to TOGA limit. Aggressively apply maximum thrust if ground contact is a factor*. Disconnect autopilot and autothrottle. Smoothly rotate to a pitch attitude of 5°-10° to minimize altitude loss and level the wings. Maintain existing flap/slat and gear configuration.† Note: †At high altitudes it may be necessary to decrease pitch attitude below the horizon, and accept an altitude loss, to achieve acceleration. If in the clean configuration (and below IAS/mach slat limit speed) extending the slats will significantly decrease the stall speed while minimally increasing drag.	Verify TOGA thrust. Monitor altitude and airspeed. Call out any trend toward terrain contact.
When ground contact is no longer a factor, adjust pitch attitude to accelerate while minimizing altitude loss. Adjust configuration as appropriate. Return to desired altitude and airspeed.	

Note: *Maximum thrust can be obtained by advancing the throttles to (88) Firewall, (90) through ORT gate.

Note: Premature recovery may result in a secondary stall or inability to accelerate to cruise mach with thrust available.

Rejected Takeoff

Rejected Takeoff Decision

The Captain has the sole responsibility for the decision to reject the takeoff. The decision must be made in time to start the Rejected Takeoff Maneuver by V1.

During the takeoff, the crew member recognizing a malfunction will call it out clearly and precisely.

The takeoff should be rejected for the following:

Event	Prior to 80 knots	80 knots to V1	Above V1
Activation of the Master Caution	X		
System Failures	X		
Unusual noise or vibration	X		
Tire Failure	X		
Abnormally slow acceleration	X		
Unsafe takeoff configuration warning	X		
Engine failure	X	X	
Fire or fire warning	X	X	
Predictive Windshear Caution or Warning	X	X	
If the airplane is unsafe or unable to fly	X	X	X

If the Captain is making the takeoff, the Captain must:

- clearly announce "ABORT," and
- immediately start the Rejected Takeoff Maneuver.

If the Captain is not making the takeoff, the Captain must:

- clearly announce "ABORT,"
- immediately start the Rejected Takeoff Maneuver,
- assume control of the airplane,
- announce "I HAVE THE AIRCRAFT."

Note: The First Officer will maintain control of the airplane until the Captain makes a positive input to the controls and states, "I HAVE THE AIRCRAFT."

Rejected Takeoff Maneuver

Captain	First Officer
Without delay, simultaneously: - Retard throttles to IDLE. - Disengage the A/T(s). - Apply maximum wheel brakes (AUTO or Manual). Note: If RTO autobrakes is selected, monitor performance and apply manual wheel brakes as required.	Verify actions as follows: - Ensure throttles at IDLE. - A/T(s) disengaged. - Maximum brakes applied.
Apply maximum reverse thrust consistent with conditions.	Verify reverse thrust applied.
Extend ground spoilers (if not deployed)*.	SPD BRK lever UP. Call "SPOILERS UP". If SPD BRK lever not UP, Call "SPOILERS NOT DEPLOYED."
Continue maximum braking until certain the airplane will stop on the runway.	Call out any omitted action items.
Field length permitting: Initiate movement of the reverse thrust levers to reach the idle reverse detent by 60 knots.	Call out 60 knots.
CAUTION: If difficulty in maintaining directional control is experienced during reverse thrust operation, reduce reverse thrust to reverse idle (or forward idle thrust if required), regain directional control, and reapply reverse thrust as necessary. Do not attempt to maintain directional control by using asymmetrical reverse thrust. Notify the tower of the abort and request emergency equipment, if necessary. As soon as practical, make the appropriate RTO PA in accordance with the FOM.	

Note: * The Captain has the option to manually deploy the spoilers prior to thrust reverser actuation.

Post Reject Considerations

- Complete Non-Normal checklist for the condition causing the RTO.
- Brake cooling schedule and precautions in the ODM.
- The possibility of wheel fuse plugs melting and/or remote parking.
- The need to clear the runway. Check entry door/exit status and ensure passengers are seated prior to taxi.
- Wind direction in case of fire.
- Not setting the parking brake unless evacuation is necessary.
- Advising the ground crew of the hot brake hazard.
- Contact Flight Control.

Terrain Avoidance

Ground Proximity Caution

Accomplish the following maneuver for any of these aural alerts*:

- GLIDESLOPE
- SINK RATE
- DON'T SINK
- TOO LOW FLAPS
- TOO LOW GEAR
- TOO LOW TERRAIN
- TERRAIN
- CAUTION TERRAIN

Pilot Flying	Pilot Monitoring
Correct the flight path or the airplane configuration.	

The below glideslope deviation alert may be cancelled or inhibited for:

- localizer or backcourse approach
- circling approach from an ILS
- when conditions require a deliberate approach below glideslope
- unreliable glideslope signal.

Note: If a caution occurs when flying under daylight VMC, and positive visual verification is made that no obstacle or terrain hazard exists, the alert may be regarded as cautionary and the approach may be continued.

Note: * As installed, some repeat.

Ground Proximity Warning

Accomplish the following maneuver for any of these conditions:

- activation of the “PULL UP” warning
- activation of the “TERRAIN TERRAIN PULL UP” warning
- other situations resulting in unacceptable flight toward terrain.

Note: This alert normally occurs approximately 60 seconds before terrain conflict. The terrain awareness display will be automatically displayed on each navigation display (ND) and may assist in gaining situational awareness.

Pilot Flying	Pilot Monitoring
Disconnect autopilot and autothrottle. Aggressively apply maximum* thrust. Simultaneously roll wings level and rotate to an initial pitch attitude of 20°. Retract speedbrakes, if extended. If terrain remains a threat, continue rotation up to the pitch limit indicator or stick shaker or initial buffet.	Verify maximum* thrust. Verify all required actions have been completed and call out any omissions.
Do not change gear or flap configuration until terrain separation is assured. Monitor radio altimeter for sustained or increasing terrain separation. When clear of the terrain, slowly decrease pitch attitude and accelerate.	Monitor vertical speed and altitude (radio altitude for terrain clearance and barometric altitude for a minimum safe altitude). Call out any trend toward terrain contact.

Note: Aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Note: Do not use flight director commands.

Note: *Maximum thrust can be obtained by advancing the throttles to (88) Firewall, (90) through ORT Gate.

Note: If positive visual verification is made that no terrain hazard exists when flying under daylight VMC conditions prior to a terrain warning, the alert may be regarded as cautionary and the approach may be continued.

Note: The suggested rate of pitch increase in this maneuver is 3-4 degrees per second. A rate significantly greater than this will produce stick shaker due to acceleration, particularly at high gross weights.

Traffic Avoidance

The following is accomplished immediately by recall whenever a TCAS traffic advisory (TA) or resolution advisory (RA) occurs.

WARNING: Comply with the RA if there is a conflict between the RA and air traffic control.

WARNING: Once an RA has been issued, safe separation could be compromised if current vertical speed is changed, except as necessary to comply with the RA. This is because TCAS II-to-TCAS II coordination may be in progress with the intruder aircraft, and any change in vertical speed that does not comply with the RA may negate the effectiveness of the other aircraft's compliance with the RA.

CAUTION: The pilot flying should respect cockpit warnings, such as stall warning, windshear or GPWS, that have priority over an RA. If windshear or GPWS warning occurs during an RA, TCAS will revert to a TA only mode.

Note: If stick shaker or initial buffet occurs during the maneuver, immediately accomplish the APPROACH TO STALL RECOVERY procedure.

Note: If high speed buffet occurs during the maneuver, relax pitch force as necessary to reduce buffet, but continue the maneuver.

Note: Do not use flight director pitch commands until clear of conflict.

For TA:

Pilot Flying	Pilot Monitoring
Look for traffic using traffic display as a guide. Call out any conflicting traffic.	
If traffic is sighted, maneuver as required.	

Note: Treat a TA just like an ATC callout of conflicting traffic. Do not deviate from an assigned clearance based only on a TA.

For RA, except a climb in landing configuration:

Pilot Flying	Pilot Monitoring
If maneuvering is required: Disengage the autopilot and autothrottle. Smoothly adjust pitch (V/S in green arc on TA/VSI) and thrust to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	
Attempt to establish visual contact. Call out any conflicting traffic.	

For a climb RA in landing configuration:

Pilot Flying	Pilot Monitoring
Disengage the autopilot and autothrottle. Advance throttles forward to ensure maximum thrust is attained and call for FLAPS 15. Smoothly adjust pitch (V/S in green arc on TA/VSI) to satisfy the RA command. Follow the planned lateral flight path unless visual contact with the conflicting traffic requires other action.	Verify maximum thrust set. Position flap lever to 15 detent.
After positive rate of climb established, call for GEAR UP.	Position gear lever up.
Attempt to establish visual contact. Call out any conflicting traffic.	

Note: INCREASE DESCENT RAs are inhibited below approximately 1,450 feet radio altitude.

Note: DESCEND RAs are inhibited below approximately 1,100 feet radio altitude.

Note: RA alerts are inhibited below approximately 1,000 feet radio altitude. When the TA/RA mode is selected, the TA Only mode is automatically enabled below 1,000 feet.

Note: All audible TCAS alerts are inhibited below 500 feet radio altitude.

Upset Recovery

An upset can generally be defined as unintentionally exceeding the following conditions:

- pitch attitude greater than 25 degrees nose up, or
- pitch attitude greater than 10 degrees nose down, or
- bank angle greater than 45 degrees, or
- within above parameters but flying at airspeeds inappropriate for the conditions.

The following techniques represent a logical progression for recovering the airplane. The sequence of actions is for guidance only and represents a series of options to be considered and used depending on the situation. Not all the actions may be necessary once recovery is underway. If needed, use pitch trim sparingly. Careful use of rudder to aid roll control should be considered only if roll control is ineffective and the airplane is not stalled.

These techniques assume that the airplane is not stalled. A stalled condition can exist at any attitude and may be recognized by continuous stick shaker activation accompanied by one or more of the following:

- buffeting, which could be heavy at times
- lack of pitch authority and/or roll control
- inability to arrest descent rate.

If the airplane is stalled, recovery from the stall must be accomplished first by applying and maintaining nose down elevator until stall recovery is complete and stick shaker activation ceases.

Nose High Recovery

Pilot Flying	Pilot Monitoring
Recognize and confirm the situation.	
- Disconnect autopilot and autothrottle. - Apply as much as full nose down elevator. - Apply thrust as appropriate. *Apply appropriate nose down stabilizer trim. *Roll (adjust bank angle) to obtain a nose down pitch rate. - Complete the recovery: - when approaching the horizon, roll to wings level -check airspeed and adjust thrust -establish pitch attitude.	- Call out attitude, airspeed and altitude throughout the recovery. - Verify all required actions have been completed and call out any omissions.

Nose Low Recovery

Pilot Flying	Pilot Monitoring
Recognize and confirm the situation.	
- Disconnect autopilot and autothrottle. - Apply thrust as appropriate. - Recover from stall, if required. *Roll in the shortest direction to wings level (unload and roll if bank angle is more than 90 degrees). - Recover to level flight: - apply nose up elevator - *apply nose up trim, if required - adjust thrust and drag as required.	- Call out attitude, airspeed and altitude throughout the recovery. - Verify all required actions have been completed and call out any omissions.

WARNING: *Excessive use of pitch trim or rudder may aggravate an upset situation or may result in loss of control and/or high structural loads.

Windshear

Takeoff Precautions During Unstable Weather Conditions

- Use normal takeoff thrust.
 - Do not use alternate thrust.
- Set V1, VR, and V2 based on actual takeoff weight.
- Using Runway Allowable Takeoff Weight (RATOW) from the AWABS, compute a higher VR speed. Do not use climb limit weight (CLIMB LIM).
 - Use the ODM to compute the higher VR.
 - Do not increase VR more than 20 KIAS.
 - Mentally note the higher VR speed. Do not set a bug on the higher speed.
 - Rotate when the speed reaches the higher VR.

(88) Predictive Windshear Caution

Predictive windshear caution alert during takeoff roll (“MONITOR RADAR DISPLAY” aural):

- prior to V1, reject takeoff.
- after V1, ensure maximum takeoff thrust is set (normal power). Maneuver as required to avoid the windshear.

Predictive windshear caution alert during approach (“MONITOR RADAR DISPLAY” aural):

- perform normal go-around. Maneuver as required to avoid windshear.

WARNING: If actual windshear conditions are encountered, perform the Windshear Escape Maneuver.

(88) Predictive Windshear Warning

Predictive windshear warning during takeoff roll: (“WINDSHEAR AHEAD, WINDSHEAR AHEAD” aural)

- Prior to V1, reject takeoff.
- After V1, perform the Windshear Escape Maneuver.

Predictive windshear warning during approach: (“GO-AROUND, WINDSHEAR AHEAD” aural)

- perform Windshear Escape Maneuver or, at pilot’s discretion, perform a normal go-around.

Windshear Encounter During Takeoff Roll

Windshear encountered during takeoff roll:

- If airspeed stagnation is experienced due to windshear prior to V₁, there may not be sufficient runway remaining to stop if an RTO is initiated at V₁. Ensure maximum thrust is set ((88) Firewall, (90) through ORT Gate) and rotate at a normal rate toward a pitch attitude of 15° at VR. Once airborne, perform the Windshear Escape Maneuver.
- If windshear is encountered near the normal rotation speed and airspeed suddenly decreases, there may not be sufficient runway left to accelerate back to normal takeoff speed. If there is insufficient runway left to stop, initiate a normal rotation at least 2,000 feet before the end of the runway even if airspeed is low. Higher than normal attitudes may be required to lift off in the remaining runway. Ensure maximum thrust is set ((88) Firewall, (90) through ORT Gate) and rotate at a normal rate toward a pitch attitude of 15°. Once airborne, perform the Windshear Escape Maneuver.

Windshear Encounter During Flight

Windshear encountered in flight:

The Windshear Escape Maneuver is immediately accomplished by recall if windshear conditions are encountered. The following conditions are indications of windshear encounters:

- activation of the “WINDSHEAR” caution.
- activation of the “WINDSHEAR” warning (two-tone siren followed by “WINDSHEAR, WINDSHEAR, WINDSHEAR”)
- inadvertent windshear encounter or other situation resulting in unacceptable flight path deviations.

Note: Unacceptable flight path deviations are recognized as uncontrolled changes from normal steady state flight conditions below 1000 feet AGL, in excess of any of the following:

- 15 knots indicated airspeed
- 500 FPM vertical speed
- 5 degrees pitch attitude
- 1 dot displacement from the glideslope
- unusual thrust lever position for a significant period of time.

Windshear Escape Maneuver

Pilot Flying	Pilot Monitoring
• Disconnect autopilot and autothrottle. • Press TO/GA. • Aggressively apply maximum* thrust. Consider TO/GA thrust setting if ground contact is not a factor. • Simultaneously roll wings level and rotate toward an initial pitch attitude of 15°. • Follow flight director TO/GA guidance (if available). • Retract speedbrakes.	• Assure maximum* thrust. • Verify all required actions have been completed and call out any omissions. • Advise when windshear guidance is activated (W/S is displayed in pitch window on the FMA).
• Do not change gear or flap configuration until windshear is no longer a factor. • Monitor vertical speed and altitude. • Do not attempt to regain lost airspeed until windshear is no longer a factor.	• Monitor vertical speed and altitude. • Call out any trend toward terrain contact, descending flight path, or significant airspeed changes.

Note: *Maximum thrust can be obtained by advancing the throttles to (88) Firewall, (90) through ORT Gate.

Note: Aft control column force increases as the airspeed decreases. In all cases, the pitch attitude that results in intermittent stick shaker or initial buffet is the upper pitch attitude limit. Flight at intermittent stick shaker may be required to obtain positive terrain separation. Smooth, steady control will avoid a pitch attitude overshoot and stall.

Note: When recovery is complete, report windshear to tower using the term PIREP.

Non-Normal Configuration Approach/Threshold Speeds Chart

NOTE: Do not interpolate. Use next higher weight.		FINAL APPROACH: BUGSPEED = V_{REF} + WIND ADDITIVE (NO AUTOMATIC 5 KNOT ADDITIVE)															
		LANDING WT. X 1000 LBS.															
		90	95	100	105	110	115	120	125	130	135	140	145	150	155	160	160
MIN MNVR SPEEDS (KIAS)	15° / RET 1.4 V _S	163	167	172	176	180	184	188	191	196	199	203	207	211	214	218	218
	UP° / RET 1.25 V _S	163	167	171	175	180	184	188	191	195	199	203	206	209	213	217	217
	0° / TO 1.35 V _S	141	144	148	152	155	158	162	166	169	172	175	178	181	184	187	187
	11° / TO 1.3 V _S	126	129	132	136	139	142	146	148	151	154	156	160	162	165	168	168
	15° / TO 1.3 V _S	123	126	129	133	135	138	141	145	147	150	153	156	158	161	164	164
V _{REF} SPEEDS (KIAS)	28° / RET 1.3 V _S	140	144	148	151	155	159	163	166	169	172	176	179	182	185	188	188
	28° / RET 1.3 V _S	143	146	150	154	158	161	164	168	171	174	177	181	184	187	190	190
	40° / RET 1.3 V _S	132	135	138	141	145	148	152	155	158	161	164	167	169	173	176	176
	40° / RET 1.3 V _S	138	141	145	149	153	156	159	163	166	169	172	175	178	181	184	184

Non-Normal Maneuver Tolerances

Basic Aircraft Tolerances

Maneuver Component	Tolerance
Airspeed	± 10 knots
Heading	$\pm 10^\circ$
Altitude	± 100 feet

Engine Failure after V1

Maneuver Component	Tolerance
Initial Climb Airspeed	V2 to V2 + 10 knots
Initial Climb Heading	$\pm 10^\circ$
Altitude at 1000 feet AFE	- 50 to + 250 feet

Category I Approach - One Engine Inoperative

Maneuver Component	Tolerance
Final Approach Airspeed	-5/ +10 knots
LOC Course	$\pm 1/2$ dot at DA
Glide path	± 1 dot at DA

Missed Approach - One Engine Inoperative

Maneuver Component	Tolerance
Initial Climb Airspeed	Go-Around speed (minimum)
Altitude at 1000 feet AFE	- 50 to + 250 feet

Intentionally
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Non-Normal Maneuvers

Flight Patterns

Chapter NNM

Section 2

Flight Pattern Principles

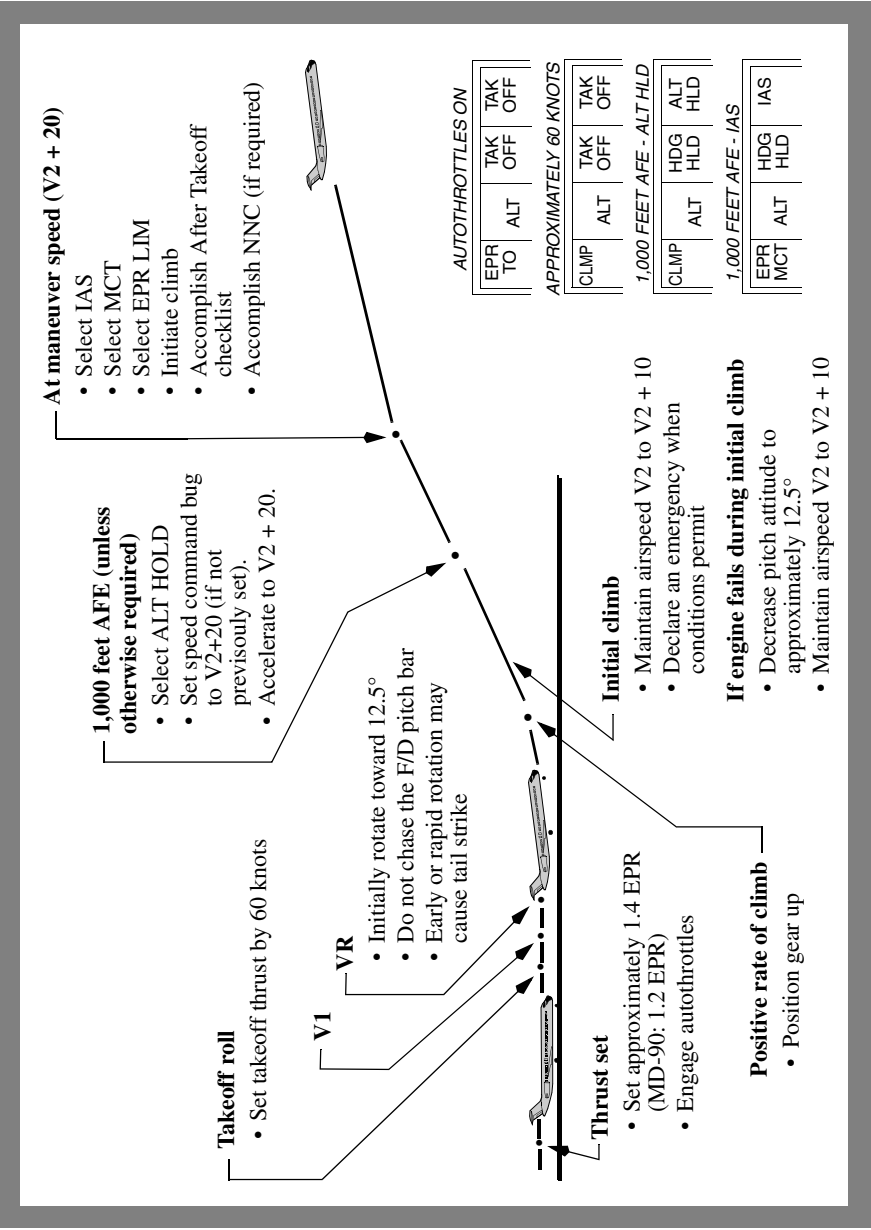
Flight patterns in this section are not designed to be comprehensive in nature. They have been developed as a tool for the experienced crew member. A quick review may be obtained by referencing a flight pattern and its associated text. For a complete analysis of a particular maneuver, the Flight Crew Training Manual should be referenced in addition to the material found in this section.

Flight patterns in this section do not include all standard callouts.

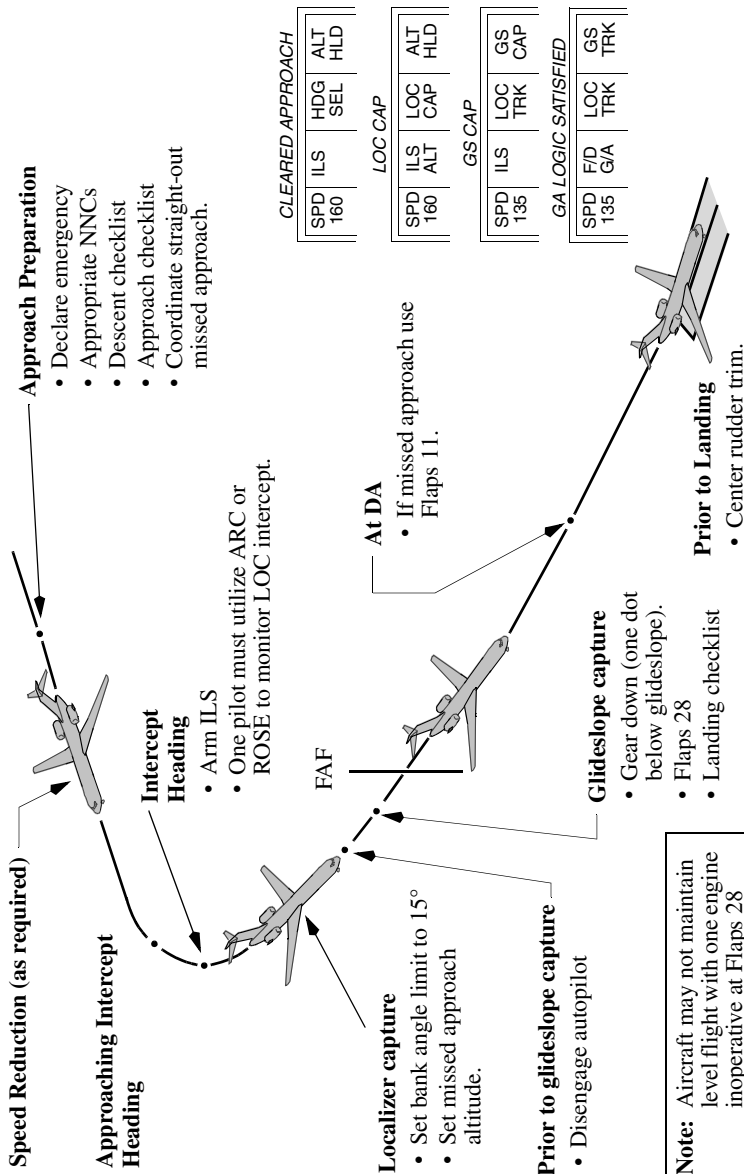
Flight patterns in this section do not include every pilot action recommended to fly a particular flight pattern.

Certain maneuver depictions in this section may imply a certain order in which checklists should be accomplished. However, the Captain, after assessing the situation, shall determine the order and call for the appropriate checklist(s) to be accomplished.

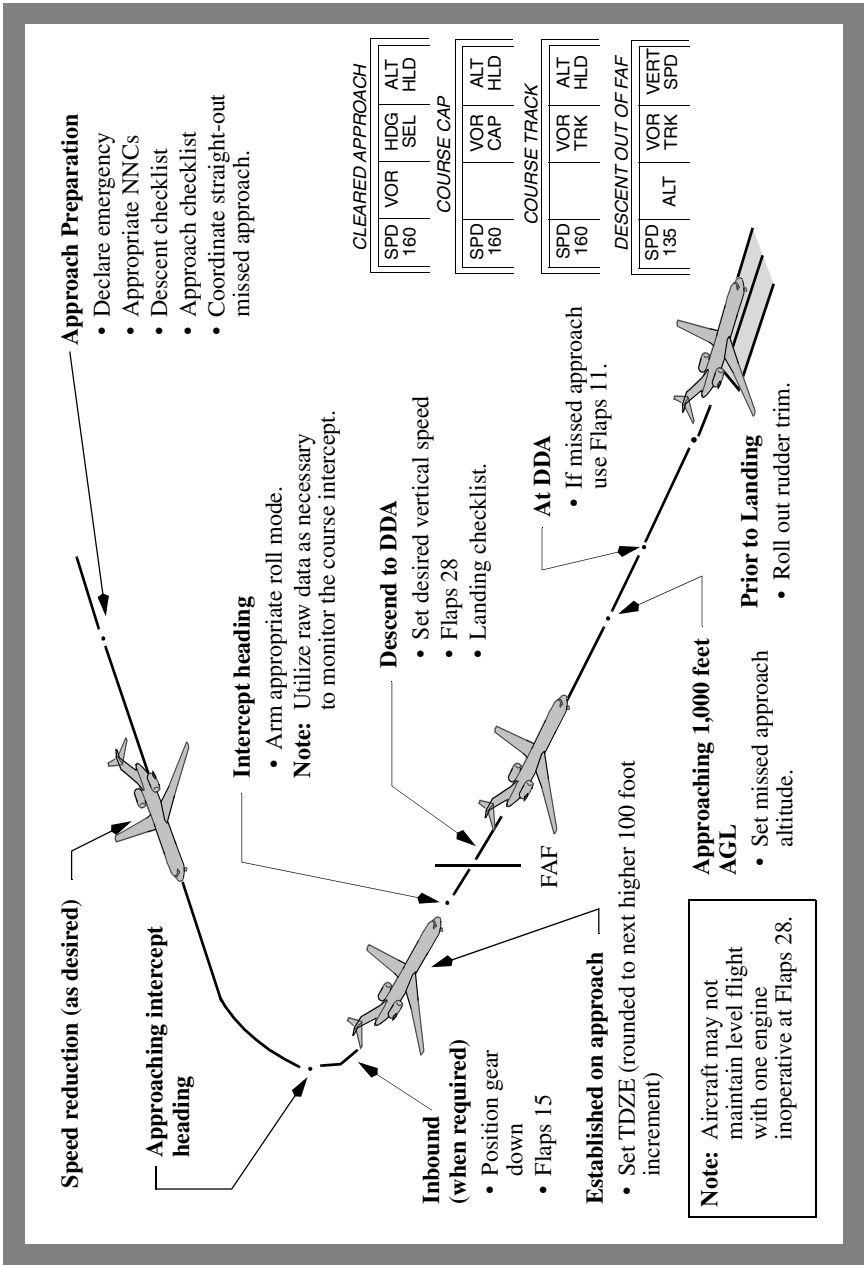
Takeoff Profile - Engine Failure



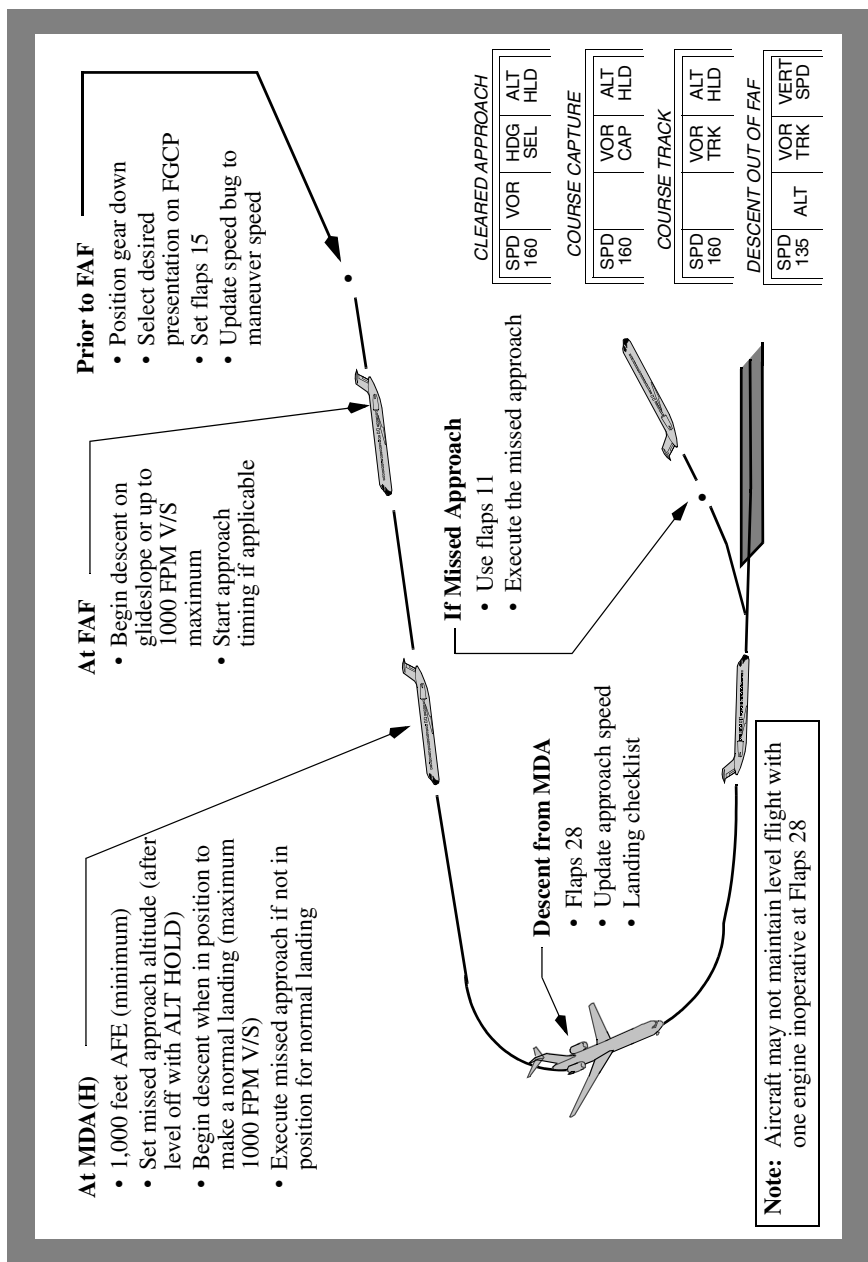
ILS Approach Profile - One Engine Inoperative



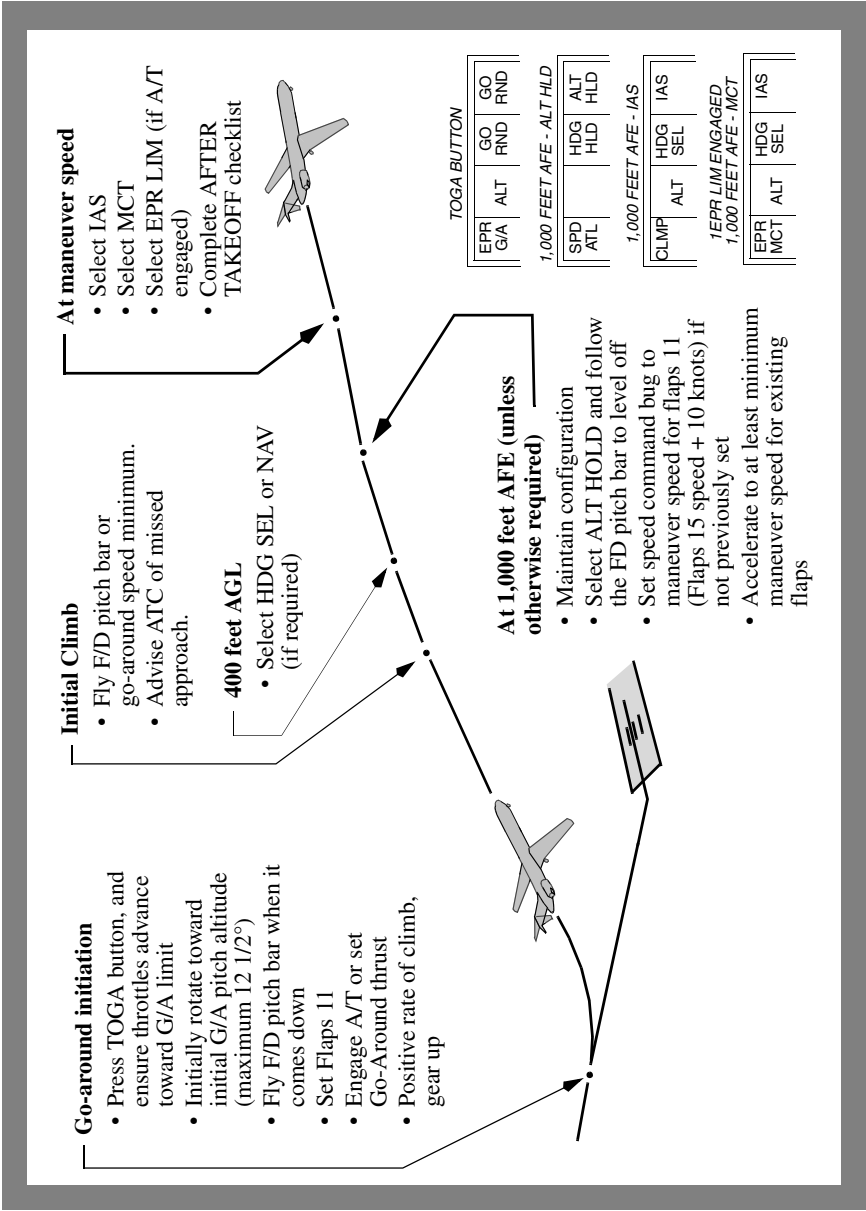
**Instrument Approach Using V/S Profile (CANPA) -
One Engine Inoperative**



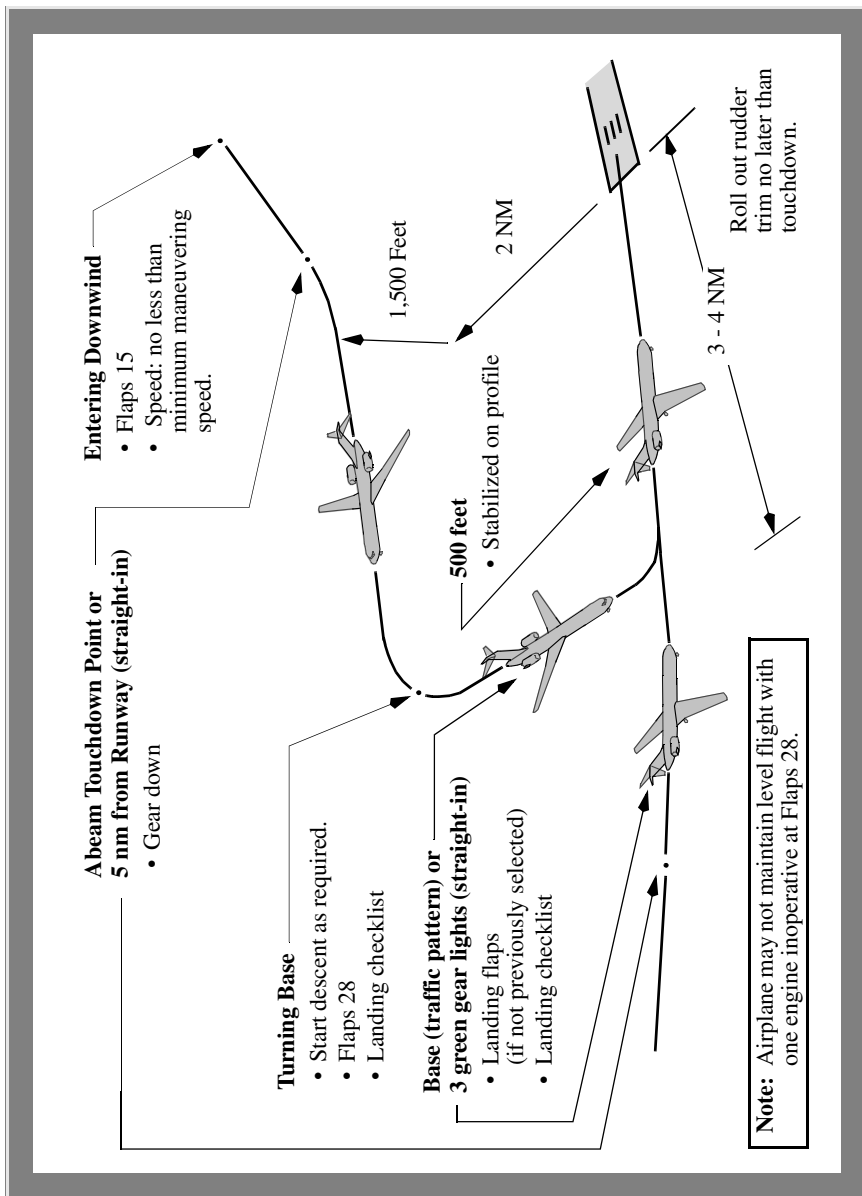
Circling Approach Profile - One Engine Inoperative



Missed Approach/Go-Around Profile - One Engine Inoperative



Visual Traffic Pattern Profile - One Engine Inoperative



Intentionally
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Non-Normal Checklists

Chapter NNC

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