GULFSTREAM G450

Condensed Notes

Revision 4.0

▶ TABLE OF CONTENTS ◀

For corrections, suggestions, or to be added to the revision distribution list please email:
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Thank you,

TABLE OF CONTENTS

SOURCES

GULFSTREAM
FLIGHT SAFETY INTERNATIONAL
www.CODE7700.com
IVAN LUCIANI

ACRONYMS

ACC	AIR CONDITIONING CONTROLLER
ACM	AIR CYCLE MACHINE
ACP	AUDIO CONTROL PANEL
ACS	AIR CONDITIONING SYSTEM
ADC	AIR DATA COMPUTER
ADM	AIR DATA MODULE
ADS	AIR DATA SYSTEM
	AUTOMATIC DEPENDENT SURVEILLANCE
AEER	AUX ELECTRONIC EQUIPMENT RACK
AFCS	AUTOMATIC FLIGHT CONTROL SYSTEM
AGM	ADVANCED GRAPHICS MODULE
ASC	AIRCRAFT SERVICE CHANGE
ASCB	AVIATION STANDARD COMMUNICATIONS BUS
ATN	AERONAUTICAL TELECOMMUNICATIONS NETWORK
BAC	BLEED AIR CONTROLLER
BAS	BLEED AIR SYSTEM
BIT	BUILT-IN TEST
BITE	BUILT-IN TEST EQUIPMENT
BPCU	BUS POWER CONTROL UNIT
BTMS	BRAKE TEMP MONITORING SYSTEM
CAS	CREW ALERT SYSTEM
CCD	CURSER CONTROL DEVICE
CDU	CONTROL DISPLAY UNIT
CMC	CENTRAL MAINTENANCE COMPUTER
CMF	COMMUNICATIONS MANAGEMENT FUNCTION
CPC	CABIN PRESSURE CONTROLLER
CPCP	CABIN PRESSURE CONTROL PANEL
CPOP	CO-PILOT OVERHEAD PANEL
CPSP	CABIN PRESSURE SELECTOR PANEL
CPIP	CABIN PRESSURE INDICATOR PANEL
CSD	CONSTANT SPEED DRIVE
DAU	DATA ACQUISITION UNIT
DC	DISPLAY CONTROLLER
DMU	DATA MANAGEMENT UNIT
DU	DISPLAY UNIT
EBDI	ELECTRONIC BEARING AND DISTANCE INDICATOR
ECS	ENVIRONMENTAL CONTROL SYSTEM
ECU	ELECTRONIC CONTROL UNIT
EDS	ELECTRONIC DISPLAY SYSTEM
EDM	EMERGENCY DESCENT MODE
EEC	ELECTRONIC ENGINE CONTROL
EVM	ENGINE VIBRATION MONITOR
EVS	ENHANCED VISION SYSTEM
FGCP	FLIGHT GUIDANCE CONTROL PANEL
FGC	FLIGHT GUIDANCE COMPUTER
FCOC	FUEL COOLED OIL COOLER
FPV	FLIGHT PATH VECTOR
FMU	FUEL METERING UNIT
FSECU	FLAP/STAB ELECTRONIC CONTROL UNIT
FQSC	FUEL QUANTITY SIGNAL CONDITIONER
FWC	FAULT WARNING COMPUTER
GCU	GENERATOR CONTROL UNIT
GP	GUIDANCE PANEL
GSCP	GROUND SERVICE CONTROL PANEL
HOPS	HARDOVER PROTECTION SYSTEM
HMG	HYDRAULIC MOTOR GENERATOR
HUD	HEAD UP SYSTEM
IDG	INTEGRATED DRIVE GENERATOR
I-NAV	INTEGRATED NAVIGATION
IRU	INERTIAL REFERENCE UNIT
LAN	LOCAL AREA NETWORK
LEER	LEFT ELECTRONIC EQUIPMENT RACK
LPV	LOCALIZER PERFORMANCE WITH VERTICAL GUIDANCE
LRU	LINE REPLACEABLE UNIT
MAU	MODULAR AVIONICS UNIT
MCDU	MULTIFUNCTION CONTROL DISPLAY UNIT
MWS	MONITOR AND WARNING SYSTEM
NBPT	NO BREAK POWER TRANSFER
ND	NAVIGATION DISPLAY
NIC	NETWORK INTERFACE CARD
PDP	POWER DISTRIBUTION PANEL
POP	PILOT OVERHEAD PANEL
PTU	POWER TRANSFER UNIT
REER	RIGHT ELECTRONIC EQUIPMENT RACK
RVDT	ROTARY VARIABLE DIFFERENTIAL TRANSDUCER
SAV	STARTER AIR VALVE
SEP	STANDBY ELECTRICAL POWER
SFD	STANDBY FLIGHT DISPLAY
SVO	START VALVE OPEN
SVS	SYNTHETIC VISION SYSTEM
SV-PFD	SYNTHETIC VISION PRIMARY FLIGHT DISPLAY
TCS	TOUCH CONTROL STEERING
TLA	THRUST LEVER ANGLE
TROV	THRUST RECOVERY OUTFLOW VALVE
VGP	VNAV GLIDE PATH
VSD	VERTICAL SITUATION DISPLAY

NOTES

1 GENERAL

DIMENSIONS:

LENGTH	89’ 3”
WINGSPAN	77’ 4”
TAIL HEIGHT	25’ 2”
WHEELBASE	39’ 1” X 13’ 8”
MIN TAXI STRIP FOR 180^0 TURN	55’ 3”

WEIGHTS:

MAX RAMP	75,000 LBS (ASC 016)
MAX TAKEOFF	74,600 LBS (ASC 016)
MAX LDG	66,000 LBS / 58,500 LBS (ASC 007C)
MAX ZERO FUEL	49,000 LBS / 48,000 LBS (ASC 008)

SPEEDS:

VMO / MMO	340 KTS / M.88 MT
VTURB >10,000 FT	270 KTS / 0.75 MT
VTURB <10,000 FT	240 KTS
FLAPS 10^0/20^0/39^0	250 / 220 / 180 KTS (0.60 MT)
MINIMUM MANEUVERING SPEEDS FLAPS 0^0/10^0/20^0/39^0	200 / 180 / 160/ VREF +5 KTS
VLE / VLO / EMERG	250 / 225 / 175 KTS (0.70 MT)
VA	206 KTS
TIRE LIMIT	195 KTS
VMCG / VMCA / VMCL	109 / 106 / 99 KTS
INOP TRIM (MACH/ELEC)	0.75 MT
INOP STAB / JAMMED ELEV	270 KTS / 0.75 MT
INOP YD ABOVE 20,000 FT	210 KTS MINIMUM
MAX DEMONSTRATED X-WIND	24 KTS

ALTITUDES:

MAX OPERATING:	45,000 FT
INOP YD AND MACH TRIM	41,000 FT
FLAPS 10^0 / 20^0	25,000 FT
LDG GEAR / FLAPS 39^0	20,000 FT
MAX FIELD ELEV	14,500 FT / 15,000 FT (ASC 068)

2 DOORS

- EMERGENCY EXITS
  - PRIMARY (LAND EVAC)
    - MAIN ENTRANCE DOOR
    - CABIN WINDOWS (4)
  - SECONDARY
    - BAGGAGE DOOR

3 LIGHTING

- SUBSYSTEMS
  - FLIGHT DECK LIGHTING
  - CABIN LIGHTING
  - SERVICE COMPARTMENT LIGHTING
  - EXTERIOR LIGHTING
  - EMERGENCY LIGHTING
- EXTERIOR LIGHTING
  - BEACON, STROBE, NAV, ICE INSP, LOGO, RAMP, LANDING, PULSE, TAXI, WING TIP TAXI, AND WHEEL WELL LIGHTS
  - STROBE LIGHT – 2 IN EACH LOCATION
  - STROBE LIGHT FAULT INDICATOR
  - NAV LIGHTS - 2 IN EACH LOCATION
  - TAXI LIGHTS (3) – AUTO OFF ON GEAR RETRACTION
  - LANDING LIGHTS – AUTO OFF AT **18000’**
  - LANDING LIGHT OPERATION LIMITED TO **5 MINUTES WHEN ON THE GND**
- EMERGENCY LIGHTING
  - OVERWING EGRESS, UNDERWING EGRESS, EMERG LIGHT BATTERIES, EMERG CONTROL SWITCHES, AND MAIN ENTRANCE DOOR EMERG LIGHTS
  - WHEN ON E-BATTS ONLY THE MASTER LIGHTING CONTROL KNOB FUNCTIONS
- STROBE LIGHT FAULTS
  - THE SYSTEM DEFAULTS TO THE TOP STROBE LIGHT
  - IT ONLY GOES TO THE BOTTOM STROBE IF THERE IS A PROBLEM WITH THE TOP STROBE
  - A TRIPPED FAULT INDICATOR COULD BE A BAD TOP BULB, A MOMENTARY ELEC SPIKE, OR A HARD LANDING
- ANN LIGHT TEST
  - TESTS ALL BULBS EXCEPT 5:
    - FIRE HANDLES (2)
    - FUEL CONTROL SWITCHES (2)
    - PAX OXYGEN
  - CABIN RATE OF CHANGE – FULL DESCENT

4 FIRE PROTECTION

- COMPONENTS
  - SMOKE DETECTION
    - BAG COMP
  - SMOKE EVAC HANDLE
    - DEFLATES BAG DOOR SEAL
  - ENG FIRE DETECTION
    - TWO FIRE LOOPS
    - FIRE DETECTOR CONTROL UNIT
  - PYLON OVERHEAT
    - 250^{0}F
  - APU FIRE DETECTION
    - SINGLE LOOP
    - SENSES FIRES AND FAULTS
  - PAX COMP AND TAIL COMP O’HEAT
    - THERMAL SWITCHES
    - 150^{0}F
- PAX COMP AND TAIL COMP O’HEAT DETECTION
  - LEER, REER, AEER
  - FWD, L AFT, CENTER AFT, R AFT FLOOR
  - AFT EQUIPMENT

APU:

- FIRE DETECTION
  - SEALED TUBE
    - HELIUM GAS
- HIGH GAS PRESSURE SENSOR →
  - HEAT PRODUCES HIGH PRESSURE→
    - AUTO-SHUTDOWN
- LOW GAS PRESSURE SENSOR →
  - LOOKS FOR RUPTURED TUBE→
    - NO AUTO-SHUTDOWN
- FIRE BELL (GND)
- APU FIRE TEST
  - 6 LIGHTS, 2 CAS MSGs
    - APU FIRE
    - APU FIRE DETECTOR FAIL
  - A TEST WILL NOT SHUTDOWN THE APU
  - FIRE BELL WILL ONLY SOUND ON THE GND
  - BEFORE STARTING THE APU CONFIRM
    - FIRE BOTTLE DISCHARGE, L-R
    - ESSENTIAL AC-BUS FAIL

    NOT DISPLAYED

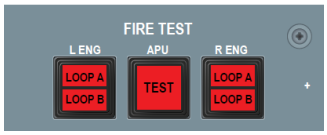
ENG:

- SENSORS *MOUNTED ON RAILS*

  SHEATHS OF STAINLESS STEEL SURROUNDED BY GLASS OXIDE MATERIAL. HEAT AFFECTS CURRENT
  - AT THE 7TH AND 12TH STAGES
  - AT THE IDG
  - AT THE BLEED AIR DUCT
  - FRONT ENG MOUNT
  - ENG ANTI-ICE DUCT (L ENG)
  - L ENG LOOP A, R ENG LOOP B – L ESS DC
  - L ENG LOOP B, R ENG LOOP A – R ESS DC
- FIRE HANDLE SHUTS OFF:
  - **FUEL** – AT THE TANK, FUEL SHUTOFF VALVE
  - **HYD** – HYD SHUTOFF VALVE BETWEEN THE HYD RESERVOIR AND THE HYD PUMP
  - **ELEC** – AT THE IDG

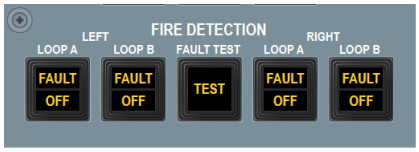
- 2 FIRE BOTTLES (L AND R)
  - HALON 1301 (CF3Br)
  - 600 PSI AT 70^{0}F
  - "BOTTLE DISCHARGE" CAS WHEN AT 200 PSI
  - RIGHT BOTTLE IS #1 SHOT
  - LEFT BOTTLE IS #2 SHOT
  - INTENTIONAL DISCHARGE: INTO THE ENG NACELLE
  - THERMAL DISCHARGE: INTO THE TAIL COMPARTMENT
- L/R ENGINE FIRE TEST

  "EIGHT LIGHTS"



  6 LIGHTS, 2 CAS MSGs:
  - LOOP A / LOOP B LIGHTS (2)
  - MASTER WARN LIGHTS (2)
  - FIRE HANDLE LIGHTS (1)
  - L/R FUEL CONTROL SWITCH LIGHTS (1)
  - THREE-CHIME AURAL WARNING TONE
  - ENGINE FIRE CAS MESSAGE (1)
  - ENGINE FIRE LOOP ALERT CAS MESSAGE (1)
- ENGINE FIRE DETECTION FAULT TEST

  "EIGHT LIGHTS"



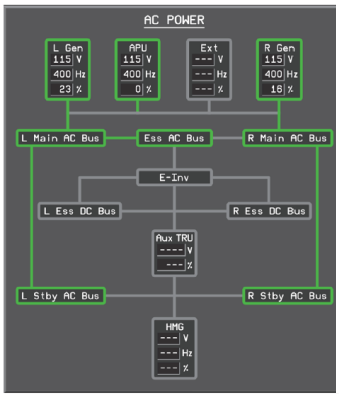
  NOTE: CHECKS THE FAULT DETECTION CIRCUIT OF THE FIRE DETECTION CONTROL UNIT, NOT THE LOOPS.

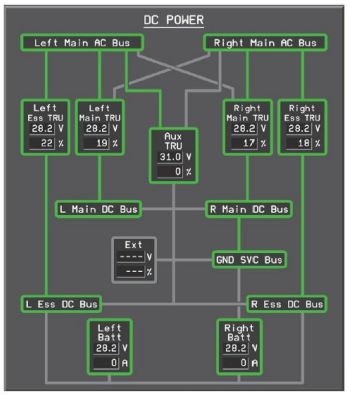
  EIGHT (8) AMBER LIGHTS:
  - TEST LEGEND IN THE FAULT TEST SWITCH
  - FAULT LEGENDS IN THE LEFT/RIGHT LOOP A/B SWITCHES
  - TWO-CHIME AURAL CAUTION TONE
  - FIRE DETECTION LOOP FAULT CAS MESSAGE
- 250^{0}F THERMAL SWITCHES - RED CAS
  - TAIL COMPARTMENT (2)
  - R AFT FLOOR NEAR HOT AIR DUCTING (3)
  - CENTER AFT FLOOR NEAR HOT AIR MANIFOLD (2)
  - L AFT FLOOR NEAR HOT AIR DUCTING (3)
- 150^{0}F THERMAL SWITCHES - AMBER CAS
  - AFT BAGG / AEER (2)
  - CABIN FLOOR BENEATH MED AREA (5)
  - LEER (3)
  - REER (2)
- PORTABLE FIRE EXTINGUISHERS
  - HALON (8.2 LBS) – OIL, GREASE, AND ELEC FIRES.
  - WATER AND ANTIFREEZE (7 LBS) – PAPER OR CLOTH FIRES.
- LAV FIRE EXTINGUISHERS
  - INTEGRATED FIRE DETECTOR AND EXTINGUISHING UNIT (9 CU IN EXT AGENT)
  - CAPPED FUSIBLE ALLOY (170^{0}F)
  - DISCHARGE INTO TRASH BINS (3-15 SEC)

5 COMMUNICATIONS

- VOICE
  - VHF (3) – TRANSCEIVERS AND ANTENNAS, MCDU OR CCD (8.33 OR 25 KHz INCREMENTS)
  - HF (2) – TRANSCEIVERS AND COUPLER, MCDU
  - HF ANTENNA ATTACHMENT MAKES ACFT AN ANTENNA
  - SATCOM
  - VHF #3 NORMALLY USED FOR DATA
- ACP
  - EMER BUTTON
    - BYPASSES ACP
    - DIRECT LINK BETWEEN HEADSET AND COMM #1
- SELCAL
  - VHF (3) AND HF (2)
  - 4 LETTER DECODER CARD IN EACH AUDIO INTERFACE UNIT (AIU)
- CVR
  - 120 MIN
  - COCKPIT VOICE RECORDER UNIT – TAIL COMP – SOLID STATE DIGITAL MEMORY, WATER ACTIVATED BEACON – INTERNAL BATTERY
  - 2.5 G IMPACT SWITCH
- DFDR
  - 25 HRS OF DATA – TAIL COMP
  - DFR/CMC EVENT SWITCH ON OVERHEAD (RECORDS -30 SEC + 1 MIN)
- ELT
  - AEER
  - 121.5 MHz, 243.0 MHz, and SAT FREQ 406.025 MHz
  - 72 HR TRANSMIT TIME
  - LAT LONG INTERFACE FROM IRS

6 ELECTRICAL





- 1 HMG (SEP) — **G450, 5 Kva, 115 V, 400 Hz, 3 PHASE AC**
- 1 E-INV / "STBY" INVERTER — **1 Kva, 115 V AC, PHASE A**
- 1 (OR 2) 60 Hz CONVERTER — **115 V, 60 Hz, SINGLE PHASE AC**
- 2 BATTERIES — **24 V, 24 CELL, 45 AMP HR, LEAD ACID**
- 2 BATTERY CHARGERS — **38 AMP CHARGE MODE, 40 AMP TR MODE**
- 2 EXTERNAL POWER — **AC (115 V, 400 Hz) & DC (28 V - 300 AMPS)**
- 2 BPCUs — BUS POWER CONTROL UNIT
- 3 GENERATORS — **40 Kva, 115 V, 3 PHASE AC**
- 4 E-BATTS — **24 V, 9 AMP HR, LEAD ACID**
- 4 GCUs
  - **2 IDG**
  - **1 APU GEN**
  - **1 HMG (SEP)**
- 5 AC BUSES
  - **2 MAIN AC BUSES, L/R**
  - **2 STBY AC BUSES, L/R**
  - **1 ESS BUS**
- 5 TRUs — **115 V AC TO 28 V DC – 250 AMPS**
  - **2 ESS TRUs, L/R**
  - **2 MAIN TRUs, L/R**
  - **1 AUX TRU**
- 5 AC SOURCES
  - **2 IDGs, L/R**
  - **1 APU GEN**
  - **1 HMG**
  - **1 EXT AC**
- 7 DC BUSES
  - **2 MAIN DC BUSES, L/R**
  - **2 ESS DC BUSES, L/T**
  - **2 BATT BUSES, L/R**
  - **1 GND SERVICE BUS**
- 8 DC SOURCES
  - **2 BATTs, L/R**
  - **5 TRUs**
  - **1 EXT DC**

AC POWER SOURCES	CONTROLLED AND PROTECTED BY GCUs (4)	
▪ CSD IDGs (2)	**40 kVA, 115 V, 3 PHASE AC**	
▪ APU GEN	**40 kVA, 115 V, 3 PHASE AC**	
▪ HMG	**5 kVA, 115 V, 400 HZ, 3 PHASE**	
↳ ➲	▪ L & R STBY AC BUSES	
	▪ AUX TRU ➲	▪ L ESS DC BUS
	➲	▪ R ESS DC BUS

AC POWER FLOW:	1) IDG/APU GEN/EXT AC	
"GENERALLY, AC POWERS HEATERS,	2) L & R MAIN AC BUSES	
MOTORS, AND CHARGERS"	3) L & R STBY AC BUSES	
L MAIN AC BUS ➲	▪ L ESS AC BUS	
	▪ L ESS **TRU** ➲	L ESS DC BUS
	▪ L MAIN **TRU** ➲	L MAIN DC BUS
	▪ AUX **TRU** (PRIMARY)	
	▪ L BATT CHARGER ➲	▪ 38AMP CRG MODE
		▪ **40AMP TR MODE**
R MAIN AC BUS ➲	▪ R ESS AC BUS	
"5 TRUs; 7 COUNTING	▪ R ESS **TRU** ➲	R ESS DC BUS
THE BATT CHARGERS"	▪ R MAIN **TRU** ➲	R MAIN DC BUS
	▪ AUX **TRU** (SECONDARY)	
	▪ R BATT CHARGER ➲	▪ 38AMP CRG MODE
		▪ **40AMP TR MODE**
TRUs (5) – **250 A** EA	115 V AC TO 28 V DC	
AUX TRU PRIORITY:	1) L ESS DC BUS	WHEN OPERATING THE
"LEFT BEFORE RIGHT,	2) R ESS DC BUS	HMG THE AUX TRU CAN
ESSENTIAL BEFORE	3) L MAIN DC BUS	POWER BOTH THE L AND
MAIN"	4) R MAIN DC BUS	R ESS DC BUSES.

DC POWER SOURCES:

▪ MAIN BATTERIES (2)	▪ **24 V, 45 AMP HR**	▪ APU START
"2 APU START	▪ LEAD-ACID	▪ AUX PUMP
ATTEMPTS + 30 MIN"		▪ L & R ESS DC BUSES
		▪ GSB (R BATT ONLY)
▪ E-BATTS (4)	▪ L & R E-BATTS ➲	▪ L & R EMERG DC BUSES
- **24 V, 9 AMP HR**		▪ ESS FLT INST BUS
- LEAD-ACID		▪ IRUs (3)
- ACTIVATES IF ESS DC BUS HAS **< 20 V**	▪ FWD & AFT E-BATTS ➲	▪ EMERG LTS

▪ AVIONICS E-BATTS (2) POWER	▪ CAPT AUDIO PANEL
	▪ CLOCKS (2)
	▪ GEAR HANDLE AND LIGHTS
	▪ EBDI
	▪ SFD
	▪ MCDU 1 – STBY ENG INST AND FUEL
	▪ MCDU 3 – BACKUP RADIO (COM,NAV,XPDR 1)

▪ GND SERVICE BUS		
▪ GND	▪ R MAIN BATT	▪ FUELING PANEL
	▪ EXT DC	▪ ENG OILER
		▪ WHEEL WELL LTS
▪ AIR	▪ R MAIN DC BUS	▪ BTM ANTI-COL LT
		▪ UTILITY LTS
▪ SWITCHES (3)	▪ FWD EXT ACCESS	
	▪ TAIL COMPARTMENT	
	▪ REMOTE REFUELING	
▪ AUTO OFF	▪ MAIN DOOR CLOSED, AND	
	▪ FWD ACCESS DOOR CLOSED, AND	
	▪ TAIL COMPARTMENT DOOR CLOSED	

BPCUs (2):	▪ L & R NETWORKS	
"LOCATED IN THE LEER	▪ POWER DISTRIBUTION	
AND REER"	▪ POWER PROTECTION	
STBY INV / (E-INV)	28 V DC TO **1 kVA, 115 V AC** ➲	ESS AC BUS, PHASE A

60 Hz CONVERTER (1 OR 2)	115 V, 60 Hz	▪ GALLEY POWER AUTO SHED
IDG LOAD LIMIT	▪ **WHEN AMBIENT >110^{0}F/43.5^{0}C, LIMIT IDG LOAD TO 45% (18kVA) TO KEEP FUEL TEMP <95^{0}C**	

7 APU – HONEYWELL 36–150

▪ SINGLE SHAFT, CONSTANT SPEED GAS TURBINE ENGINE		
▪ ACCESSORY GEARBOX DRIVES:	▪ APU GEN	
	▪ LUBRICATION PUMP (OIL PUMP)	
	▪ INTEGRAL OIL RESERVOIR (2 QTS)	
	▪ SPEED SENSOR → ECU	
▪ EXHAUST SECTION	▪ EJECTOR PUMP DRAWS AMBIENT AIR WHICH LOWERS EGT AND NOISE	
▪ ELEC – L OR R BATT BUS ➲ APU MASTER SWITCH ➲ ECU		
▪ ECU MODES	▪ NON-ESS (GND)	
	▪ ESS (AIR)	▪ 15 MIN AFTER LND
▪ FUEL COMPONENTS	▪ L TANK/L PUMP	▪ X FLOW & R PUMP
" BURNS 200 PPH	▪ FUEL SHUTOFF VLV	▪ APU MASTER
(30 GAL PER HR)"	▪ APU FUEL CONTROL	▪ FIRE
▪ APU GEN	▪ **40Kva, 115 V, 3 PHASE AC**	▪ **GND 95% + 4 SEC**
		▪ AIR 99% + 2 SEC
▪ APU AIR ➲ LOAD CNTL VLV ➲ MANIFOLD & ISO VLV: *"AVAIL 100% RPM + 90 SEC"*		▪ L/R ECS (PACKS)
		▪ ENG START
▪ STARTER LIMITS – **BATTERY** *28 V DC MOTOR MOUNTED TO THE DRIVESHAFT OF THE ACCESSORY GEARBOX*		▪ **3 ATTEMPTS**
		▪ **1 HR COOL DOWN**
▪ STARTER LIMITS – **DC CART**		▪ **3 ATTEMPTS WITH 15 MIN COOL DOWN IN BETWEEN**
		▪ **1 HR COOL DOWN**
▪ CONSECUTIVE STARTS LIMIT	**6 AT 10 MIN INTERVALS**	
▪ MAX ALTITUDE / LOAD <0.85 MT	**FL370 / 100% (40kVA)**	
▪ MAX ALTITUDE / LOAD >0.85 MT	**≥ FL300 / 85%**	
▪ GUARANTEED START ALTITUDE	**≤ FL370**	

▪ MASTER ON:	1) ECU PERFORMS BIT ("READY" FLASHES – BULB CHECK)
	2) OIL TEMP SENSED
	3) APU DOOR OPENS (65^0 OR 27^0)
	4) FUEL SHUTOFF VLV OPENS
	5) "READY" LIGHT (15 SEC)
▪ START BUTTON:	1) APU STARTER (LEFT BATT)
	2) 5% - APU FUEL CONTROL SHUTOFF VLV OPENS & IGN
"100% RPM = 62,000 RPM"	3) 7% - "READY" LIGHT GOES OUT
	4) 46-60% - STARTER CUT-OUT
MAX EGT: **973^0 (START)**	5) 95% - IGN CUT-OUT
747^0 (RUNNING)	6) **95% + 4 SEC – GEN ON**
MAX RPM: 107%	7) **100% + 90 SEC – AIR AVAIL**
▪ STOP BUTTON	1) OVERSPEED SIGNAL TO ECU (107%)
	2) FUEL CONTROL UNIT SHUTS OFF FUEL TO APU
	3) BIT TEST
	4) SURGE CONTROL VALVE CYCLES
	5) <35% RPM, ECU CLOSES INLET DOOR
	6) ECU MONITORS EGT AND RPM FOR 5 MIN
	7) AFTER 5 MIN "APU MASTER" CAS DISPLAYED
▪ SURGE CONTROL VALVE	▪ PREVENTS COMPRESSOR STALLS
	▪ > 16,500 FT OPENS AT 60% RPM

8 POWERPLANT: ROLLS-ROYCE TAY-611-8C

- MEDIUM BYPASS TURBOFAN
- **13,850 LBS OF THRUST** AT SEA LEVEL
- **THE RIGHT ENGINE IS THE CRITICAL ENGINE**
- HP AND LP COMPRESSOR SECTIONS ARE DRIVEN BY THEIR OWN COAXIAL SHAFTS/SPOOLS (SHAFT WITHIN A SHAFT) – BEARINGS
- CLOCKWISE ROTATION
- OIL COOLING VIA FUEL-OIL HEAT EXCHANGER
- 75% OF LP COMPRESSOR "FAN AIR" BYPASSES
- 25% ➲HP SECTION ➲COMBUSTION CHAMBER
- BYPASS AIR AND COMBUSTION AIR ARE MIXED BY A CRENELATED FLANGE

LP / INNER SPOOL	3 STAGE LP COMPRESSOR SECTION – ENG FRONT DRIVEN BY 3 TURBINE STAGES – AFT ENG INLET GUIDE VANES DIRECT LP AIR IN THE COMPRESSOR TO REGULATE PRESSURE
HP / OUTER SPOOL	12 STAGE HP COMPRESSOR SECTION DRIVEN BY 2 TURBINE STAGES FIXED STATORS ARE BETWEEN EACH COMPRESSOR STAGE
COMBUSTION CHAMBER	10 COMBUSTION LINER ASSEMBLIES 10 FUEL SPRAY NOZZLES TWO IGN PLUGS – LINERS 4 & 8 O'CLOCK POSITIONS
ACCESSORY DRIVES	HIGH SPEED GEARBOX ON THE HP COMPRESSOR LOW SPEED GEARBOX ON THE LP COMPRESSOR
ENG FUEL SYSTEM *THE ELEC FUEL CONTROL (EEC) IS A COMPONENT OF THE FADEC*	TANK BOOST PUMPS (ELEC) ➲ FUEL SHUTOFF VALVES ➲ LP PUMP ➲FUEL-OIL HEAT EXCHANGER ➲ FUEL FILTER ➲ LOW PRESSURE SWITCH (15 PSI) ➲ HP PUMP➲ FUEL FILTER ➲ FUEL METERING UNIT ➲ HP FUEL SHUTOFF VALVE ➲ FUEL FLOW TRANSMITTER ➲ FUEL SPRAY NOZZLES (10) THE LP PUMP CAN SUCTION FEED THE ENG <FL200
IGN	**TWO IGN PLUGS** EACH ENG (CONT IGN) ONLY ONE IS USED FOR START THE EEC ALTERNATES WHICH IGN IS USED FOR START (IF NO IGN CYCLE FUEL CONTROL SWITCH TWICE)
FADEC / EEC	THE EEC IS AT THE HEART OF THE FADEC EACH EEC HAS DUAL CHANNELS EACH EEC RECEIVES INPUT FROM THE 3 MAUs AND THE 3 ADMs EACH EEC OUTPUTS TO THE FWCs AND CMC AT >35% HP RPM A DEDICATED GEN (3 PHASE AC, **PERM MAGNET ALTERNATOR (PMA)**, RECTIFIED BY THE PSU INTO 28 V DC) POWERS THE FADEC AND EEC
EEC CONTROL MODES	PRIMARY CONTROL MODE - USES HP FOR IDLE (LOW OR HIGH) - USES EPR ABOVE IDLE ALTERNATE CONTROL MODE – LP RPM **– TAKEOFF IN ALT IS PROHIBITED** REVERSE THRUST CONTROL MODE – LP RPM "SOFT REVERSION" – EEC REVERTS TO LP "HARD REVERSION" – CREW SELECTS LP
IDLE CONTROL – HIGH IDLE	FLAPS > 22^{O} LANDING GEAR DOWN WOW IN THE AIR REMAINS IN HIGH IDLE FOR 5 SEC AFTER LANDING
THRUST REVERSERS	ELEC CONTROLLED HYDRAULICALLY OPERATED 2 LOCKING LATCH MECHANISMS MECHANICAL SPRINGS HOLD T/Rs SHUT, HYDRAULIC PRESSURE UNLOCKS THE HOOKS **MAX REVERSE – 65% LP** DECREASES TO 55% BETWEEN 60 AND 50 KTS (30 SEC MAX) **IDLE REVERSE BY 60 KTS ON LANDING** INOP T/Rs - ADD 600 FT TO THE ACC-STOP DIST IF A T/R DEPLOYS IN FLT THE ENG GOES TO IDLE, BUT THE THROTTLE DOES NOT MOVE

ENG OIL	R ENG OIL TANK – 15.5 PINTS (10.8 USABLE) L ENG OIL TANK – 14.5 PINTS (10.8 USABLE) LUBRICATES THE ROLLER/ THRUST BEARINGS AND GEARS PRESSURE REGULATED (200 PSI) TEMPERATURE CONTROLLED VIA FCOC OIL PUMP DRIVEN BY THE ACCESSORY GEARBOX FUEL-OIL HEAT EXCHANGER (FCOC), IDG FCOC **CHECK OIL BETWEEN 5-30MIN AFTER SHUTDOWN** - **LAST FLIGHT OF THE DAY** - **14 CUMULATIVE HRS** ENG OIL REPLENISHING SYSTEM – 14 PINTS OIL TANK ➲OIL QUANTITY TRANSMITTER ➲OIL PUMP ➲ FCOC ➲ OIL TEMP TRANSDUCER ➲ OIL FILTER (DPI BYPASSES AT 30 PSI) ➲ ENG BEARINGS, RADIAL DRIVE, AND ACC GEARBOX ➲ SCAVENGE PUMPS ➲ MAGNETIC CHIP DETECTORS ➲ OIL TANK…	
AIR TURBINE STARTER	APU AIR EXTERNAL AIR CROSSBLEED	STARTER IS CONNECTED TO THE ENG ACCESSORY GEARBOX AND TURNS THE HP SECTION OF THE ENG **SHOULD CLOSE AT 41-44% HP**
NORMAL START	START MASTER FUEL CONTROL SWITCH	THE EEC PROTECTS AGAINST OVERTEMPS AND OVERSPEEDS
ALTERNATE START	CRANK MASTER FUEL CONTROL SWITCH	CREW SELECTS IGN THE EEC DOES NOT PROTECT START
DRY CRANK WET CRANK	CRANK MASTER CRANK MASTER AND FUEL CONTROL SWITCH	
FUEL CONTROL SWITCH – RUN	FADEC LOGIC COMMANDS IGN IF START MASTER IS ON HP FUEL SOV OPEN IF HP RPM > 9%	
FUEL CONTROL SWITCH – OFF	HP FUEL SOV CLOSES – CUTS OFF ALL FUEL TO THE SPRAY NOZZLES EEC CHANNEL CHANGE IGN OFF QUICK RELIGHT POSSIBLE BY RETURNING SWITCH TO RUN	
GND OPS KEEP OUT OF ZONE:	60% - 72% LP RPM PROHIBITED >10 SEC AUTOMATIC PROTECTION IF PARK BRAKE IS SET	

	LP%	HP%	TGT	TIME
START – GND/AIR	-	-	**700^{O}C / 780C^{O}**	-
OVR SPD/TEMP	96.5	101.6	820^{O}C	20 SEC
TAKEOFF	**95.5**	**100.6**	**800^{O}C**	5 / 10 MIN
MAX CONT	**95.5**	**97.5**	**715^{O}C**	-
THRUST REV	**65.0**	-	-	30 SEC

ENG GND START:

- MAX TAILWIND / X-WIND — **25 KTS**
- MAX TGT TO START — **200^{O}C**
- MIN OIL TEMP — **-40^{O}C**
- OIL TEMP <-10^{O}C — PERFORM CRANK CYCLE (SEE QRH), TURN GEN OFF
- START SYNOPTIC — 800^{O} TGT SCALE (NORM 1000^{O})
- STARTER DUTY
  - **3 START CYCLES OF 3 MIN EACH**
  - **15 SEC BETWEEN START CYCLES**
  - **AFTER 3 CYCLES DELAY 15 MIN**
- START TGT — **700^{O}C**

ENG AIRSTART:

- ALTITUDE — **<FL250**
- AIRSPEED — **250-325 KTS**
- TGT — **780^{O}C**

ENG FUEL TEMP:

- MINIMUM — **-40°C**
- MAXIMUM / TRANSIENT — +95°C / 130°C (15 MIN)
- **OAT >110°F / 43.5°C** — **LIMIT IDG LOAD TO 45% (18kVA)**

FUEL **TANK TEMP**:

- MINIMUM — -40°C
- MAXIMUM — +54°C

OIL TEMP:

- MIN FOR START — **-40°C**
- MIN FOR THROTTLE ADVANCE — **-30°C**
- MIN FOR TAKEOFF THRUST — **+20°C (QRH)**
- MAX TEMP / TRANSIENT — **+105°C / +120°C (15 MIN)**

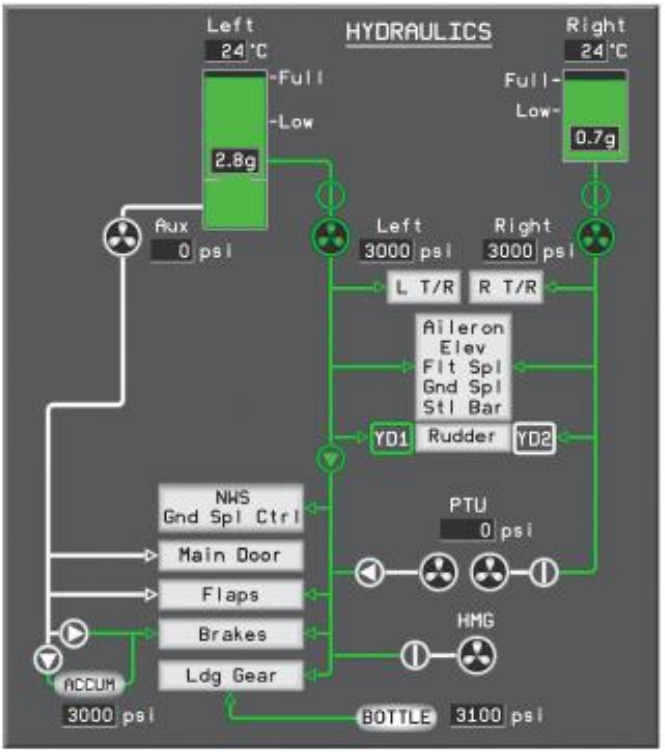
OIL PRESS – MIN:

- TAKEOFF / MCT / IDLE — **30 PSI / 25 PSI / 17 PSI**

9 FUEL

▪ WING FUEL TANKS *THE WING 3° DIHEDRAL FORMS A NATURAL GRAVITY FLOW TOWARDS THE WING ROOT*	▪ **29500 LBS** OF FUEL ▪ FIVE COMPARTMENTS ▪ 6 DRAINS ▪ VENTS ▪ QTY PROBES (20) ▪ TEMP SENSOR (LEFT HOPPER) ▪ TEST ▪ HOPPER TANK *LOW LEVEL PROBE – **650 LBS** IN HOPPER*	▪ 4370 GAL ▪ SEPARATED BY RIBS AND JOINED BY BAFFLES ▪ 5 V – CAPACITORS ▪ **MAX+54°C** ▪ **MIN -40°C** ▪ 7000/7000/14000 ▪ **190 GAL (1283 LBS)** ▪ FLAPPER VALVES ▪ EJECTOR PUMPS OVERFLOW THE HOPPER TANK ▪ HYD FLUID-TO-FUEL HEAT EXCHANGERS
▪ FQSC	▪ "FUEL QUANTITY SIGNAL CONDITIONER" ▪ PROCESSES SIGNALS FROM PROBES ▪ REPORTS QUANTITY TO MAUs ▪ **CONTROLS AUTO REFUEL PROCESS**	
▪ VENTILATION	▪ FORWARD AND AFT VENT DUCT ▪ VENT PLENUM ▪ FLOAT-OPERATED VENT / RELIEF VALVES ▪ NONRELIEVING FLOAT VENT VALVES ▪ OVERBOARD LINE VENT INLET AND FLUSH VENT INLET/OUTLET (RAM AIR INLET)	
▪ BOOST PUMPS *16 PSI MIN*	▪ L/R MAINS ▪ L/R ALT	▪ L/R ESS DC ▪ L/R MAIN DC
▪ FUEL SHUTOFF VALVES	▪ CONTROLLED BY THE FIRE HANDLE (ESS DC) ▪ FAIL FROZEN	
▪ APU SHUTOFF VALVE	▪ CONTROLLED BY THE APU MASTER (ESS DC) ▪ FAIL FROZEN	
▪ FILTRATION NOTE: G450 FUEL FILTERS WILL NOT BYPASS	▪ GRAVITY FUELING SCREENS ▪ BOOST PUMP INLETS ▪ FUEL FILTER – PRIOR TO FUEL METERING UNITS (FMUs) - 5 PSI DIFFERENTIAL – FUEL FILTER L-R CAS - 55 PSI DIFFERENTIAL – FUEL PRESSURE LOW L-R CAS	
▪ FUEL BALANCING	▪ CROSSFLOW (ESS DC) ▪ INTERTANK (ESS DC) ▪ 400 LB IMBALANCE ▪ 2000 LB IMBALANCE	▪ PRESSURIZED FUEL ▪ VALVE BETWEEN HOPPERS ▪ ≥ 60500 LBS ▪ ≤ 55000 LBS

10 HYDRAULIC



▪ LEFT SYSTEM 18.4 GAL	▪ RESERVOIR – STORAGE ▪ MANIFOLD – DISTRIBUTION ▪ SHUTOFF VALVE ▪ FILTER MANIFOLD	▪ 6.4 GAL (4.4 FOR LEFT, 2.0 FOR AUX) ▪ **FULL SHOWN AT 2.8 GAL** ▪ **MIN 2.75 GAL** ▪ CLOSED BY FIRE HANDLE (PUMP ISOL FROM RES)
▪ RIGHT SYSTEM 7.5 GAL	▪ RESERVOIR ▪ MANIFOLD – DISTRIBUTION ▪ SHUTOFF VALVE ▪ FILTER MANIFOLD	▪ 1.5 GAL ▪ **FULL SHOW AT 0.7 GAL** ▪ **MIN 0.7 GAL** ▪ CLOSED BY FIRE HANDLE (PUMP ISOL FROM RES)
▪ ENG DRIVEN HYD PUMPS		▪ 3000 PSI ▪ 20.5 GAL/MIN – TAKEOFF ▪ 14.5 GAL/MIN – FLT IDLE ▪ 10.5 GAL/MIN – GND IDLE
▪ ELEC DRIVEN AUX HYD PUMP		▪ 3000 PSI ▪ 1 OR 2 GAL/MIN (ASC)
▪ L & R HEAT EXCHANGERS	▪ IN THE L & R FUEL HOPPERS	
▪ AUX PUMP	▪ ARMED TO ACTIVATE WHEN L SYS/PTU PRESS <1500 PSI AND BRAKE >10°,WOW – GND	
▪ PTU	▪ ARMED TO ACTIVATE WHEN L SYS PRESS <1500 PSI ▪ 3000 PSI ▪ 10 GAL/MIN	
▪ PREVENTS AUTO PTU OPERATION	▪ L HYD LOW (<1 GAL) ▪ R HYD HOT (>104°C)	
▪ HMG	▪ POWERED BY L SYS OR PTU	▪ **5kVA, 115 V, 400 Hz AC**
▪ ACCUM PRECHARGE – SHOCK ABSORPTION	▪ LEFT SYSTEM ▪ RIGHT SYSTEM ▪ AUX SYSTEM	▪ 1200 PSI ▪ 1200 PSI ▪ 1200 PSI

COMPONENT	SYSTEM				
	LEFT	RIGHT	PTU	AUX	EMER
ELEVATOR	√	√			
STALL BARRIER	√	√			
AILERONS	√	√			
SPOILERS (FLT & GND)	√	√			
GND SPOILER SERVO	√		√		
RUDDER	√	√			
YAW DAMP	√	√			
L THRUST REV	√				
R THRUST REV		√			
PTU MOTOR		√			
FLAPS	√		√	√	
LDG GEAR/DOORS	√		√	GND	√
NOSEWHEEL STEERING	√		√		
BRAKES	√		√	√	√
HMG MOTOR	√		√		
PARK BRAKE PRESSURE				√	
MAIN ENTRANCE DOOR				√	

▪ L HYD FAIL	LOSE: ▪ L THRUST REVERSER ▪ L YAW DAMPER
▪ R HYD FAIL	LOSE: ▪ R THRUST REVERSER ▪ R YAW DAMPER ▪ PTU

11 LANDING GEAR

▪ EXTENSION AND RETRACTION (NORM)	▪ LANDING GEAR HANDLE ▪ REQUIRES ELEC (ESS DC) TO OPERATE ▪ REQUIRES HYD (L SYS OR PTU) TO ACTUATE COMPONENTS ▪ SEQUENCING VALVES
▪ NITROGEN (EMERG)	▪ OPENS GEAR DOORS AND UPLOCKS ▪ PRESSURIZES THE HYD LINES WITH NITROGEN ▪ DRIVES THE GEAR DOWN AND LOCKED
▪ ANTI-SKID BRAKES	▪ TOUCHDOWN PROTECTION – LOCKED WHEEL ▪ TOUCHDOWN/HYDROPLANE PROTECTION – HYD PRESS REMOVED FROM BRAKES TIL 30KTS SENSED OR 5 SECONDS OF GND CONTACT ▪ BRAKE SNUB – ON RETRACTION (FOR 3 SEC) ▪ NO PROTECTION BELOW 10 KTS ▪ WHEEL-SPEED TRANSDUCERS (70% DIFFERENTIAL) ELECTRONIC LOGIC ▪ SWITCH ON – BRAKES SYNOPTIC 3000 PSI SCALE ▪ SWITCH OFF – BRAKES SYNOPTIC 800 PSI SCALE
▪ DISPATCH WITH ANTI-SKID INOP REQUIRES:	▪ **OPERATIVE GROUND SPOILERS** ▪ **FLAPS 20°** ▪ **COWL/WING ANTI-ICE OFF** ▪ **DRY RUNWAY**
▪ NOSEWHEEL STEERING	▪ ELEC CONTROLLED "STEER BY WIRE"- ELEC SIGNAL TO A TRANSDUCER ▪ HYDROMECHANICAL ACTUATION (L HYD / PTU SYS) ▪ TILLER – **80° TO 82°** (<18 KTS) ▪ PEDAL STEERING – **7°** (16° – TILLER MALFUNCTION) ▪ SHIMMY DAMPENING
▪ WOW	▪ WOW ON EACH MAIN ▪ FWC PRESUMPTIONS: *FWC WARNS OF DISAGREEMENT* ▪ COMBINED WOW ▪ AIR: RA >150 FEET ▪ GND: <50 KT AIRSPEED
▪ WHEEL SPEED SENSORS (>47 KTS)	▪ GROUND SPOILERS ▪ THRUST REVERSERS
▪ GEAR UNSAFE WARNING	▪ GEAR UP ▪ < 345 FT ▪ TLA < 5° ▪ GEAR HORN ▪ SILENCE AVAIL IF FLAPS < 22°
▪ DUMP VALVE, IF PRESSED	▪ ELEC MOVES THE DUMP SHUTTLE VALVE TO THE HYD FLUID POSITION FROM THE NITROGEN GAS EXTENSION POSITION ▪ REMOVES HYD PRESS FROM DE-SPIN SYSTEM. IF GEAR PINS ARE LEFT IN AND THE HANDLE IS RAISED THE DE-SPIN SYSTEM APPLIES BRAKE PRESSURE. TO RELEASE THE BRAKE PRESSURE BEFORE LANDING THE DUMP VALVE MUST BE PRESSED.
▪ PARK BRAKE	▪ 1700 PSI MIN TO SET (3000 PSI RECOMMENDED)

12 FLIGHT CONTROLS

▪ ELEVATOR	▪ CABLES, CRANKS, AND PUSHRODS ▪ HYDRAULIC BOOST ACTUATOR (L, R HYD) ▪ TWO TRIM TABS, L & R
▪ AILERONS	▪ CABLES, CRANKS, AND PUSHRODS ▪ HYDRAULIC BOOST ACTUATORS (L, R HYD) ▪ L WHEEL →L AILERON, R WHEEL → R AILERON ▪ CONTROL WHEELS ARE JOINED ▪ THE TWO OUTBOARD SPOILERS ASSIST ROLL AUTHORITY (55°) ▪ TRIM TAB IN THE LEFT AILERON ONLY
▪ RUDDER	▪ CABLES AND BELLCRANKS ▪ DUAL TANDEM HYDRAULIC ACTUATOR (L, R HYD) ▪ 22° ▪ TRIM ADJUSTS THE NEUTRAL POSITION OF THE RUDDER ▪ DUAL CHANNEL YAW DAMPER (L, R HYD)
▪ FLAPS (0° TO 39°)	▪ FOWLER TYPE FLAPS ▪ MOVES IN CONJUNCTION WITH STABILIZER VIA FSECU ▪ ELECTRICALLY CONTROLLED – RVDTs (2) ▪ HYDRAULICALLY OPERATED (L,PTU,AUX HYD) – FLAP DRIVE GEAR BOX (2 FLAP HYD MOTORS) ▪ JACKSCREWS DRIVEN BY TORQUE TUBES DRIVEN BY GEARBOX – HYD MOTOR ▪ FORCE LIMITERS ▪ ALT FLAP – SECONDARY CONTROL – BYPASSES THE FSECU (ALT FLAP = "FSECU BYPASS")
▪ STAB (-1.0° TO -4.6°)	▪ ELECTRICALLY CONTROLLED ▪ ELECTRICALLY POWERED/OPERATED - ELEC MOTOR/GEARBOX & TORQUE TUBE - PRIMARY CHANNEL – MAIN DC BUS - SECONDARY CHANNEL (EMER STAB) – R STBY AC BUS (HMG) ▪ COMMAND SIGNALS: - PRIMARY – FLAP HANDLE - SECONDARY – YOKE ELEV TRIM (EMER STAB)
▪ FSECU	▪ SIGNALS THE FLAP POWER DRIVE UNIT TO HYDRAULICALLY MOVE THE FLAPS ▪ SIGNALS 2 AC MOTORS TO DRIVE THE STAB ▪ MONITORS: FLAP ASYMMETRY, FLAP/STAB MISCOMPARE, ETC…
▪ EMER STAB	▪ STAB POSITION IS CONTROLLED WITH YOKE ELEC PITCH TRIM, "PULL IT DOWN"
▪ SPOILERS	▪ ROLL AUGMENTATION (2 OUTBOARD PANELS – 55° LIMIT) ▪ FLT SPOILERS (6 PANELS – 26° LIMIT) ▪ GND SPOILERS (6 PANELS – 55°) ▪ ELECTRICALLY CONTROLLED ▪ HYDRAULICALLY OPERATED (L AND R HYD) ▪ DISABLED WITH "LATERAL CONTROL" OFF

- GND SPOILERS
  - R ESS DC
  - ARMED
  - PLA – IDLE
  - WOW – GND
  - OR, WHEEL SPIN UP (>47 KTS) IF FLAPS > 22 ^{O}
  - OR, WHEEL SPIN UP (>47 KTS) W/ GPWS GND SPLR O'RIDE ON

DISPATCH WITH GND SPOILERS INOP REQUIRES:
- **OPERATIVE ANTI-SKID**
- **FLAPS 20^{0}**
- **COWL/WING ANTI-ICE OFF**

- STALL BARRIER
  - PLI VISIBLE AT 0.70 AOA
  - SHAKER AT 0.85 AOA
  - PUSHER AT 1.00 AOA
- GUST LOCK
  - MECHANICAL LATCHES
  - AILERONS, ELEVATOR, AND RUDDER
  - ≤ 60 KT GUSTS

HOPS *"FORCELINKS". HOPS CAN BE RESET WITH CBs ONLY*
- AILERON
  - BOTH L AND R HYD FLUID IS SHUTOFF TO BOTH AILERON AND BOTH SPOILER ACTUATORS (GND/FLT)
- ELEV
  - BOTH L AND R HYD FLUID IS SHUTOFF
- RUDDER
  - L AND/OR R HYD FLUID SHUTOFF DEPENDENT UPON WHICH SYSTEM EXPERIENCED THE HARDOVER

13 PNEUMATICS

- SOURCES OF PNEUMATIC AIR:
  - ENGINES *(NORMALLY 500 ^{O}F, 40 PSI)*
    - FAN INLET
    - 7TH STAGE
    - 12TH STAGE
  - APU
  - EXTERNAL AIR
  - PRESSURE REGULATED BY LOAD CONTROL VALVE
- TWO SEPARATE AND INDEPENDENT PNEUMATIC SYSTEMS
- CAPABLE OF OPERATING CONNECTED VIA ISOLATION VALVE
- BLEED AIR VALVES AKA "MANIFOLD PRESSURE REGULATING VALVES"
  - CONTROLLED BY→
    - BLEED AIR SWITCHES
    - RAM AIR SWITCH
    - ENG START SWITCHES
  - MODULATED BY THE BAC
  - 40 ±3 PSI GOAL
- BLEED AIR CONTROLLERS (BAC) *(ESS DC BUS)*
  - OPENS AND CLOSES 12TH STAGE AIR TO SUPPLEMENT 7TH STAGE AIR AS NECESSARY
  - CONTROLS TEMP VIA PRE-COOLER
  - CONTROLS PRESSURE VIA BLEED AIR VALVES
- PRESSURE TARGET
  - IF 7TH < 15 PSI IN CRUISE 12TH STAGE OPENS
  - IF 7TH < 26 PSI IN DESCENT 12TH STAGE OPENS
  - IF 7TH <35 PSI SINGLE PACK 12TH STAGE OPENS
- TEMPERATURE TARGET (AT PRE-COOLER OUTPUT)
  - NORMAL:
    - 400^{O}F MAX
  - SINGLE BLEED OR SINGLE WING A/I:
    - 500^{O}F MAX
- ISOLATION VALVE
  - OPENS:
    - MANUALLY ON
    - APU AIR ON
    - START MASTER
    - CRANK MASTER
- PNEUMATIC USERS:
  - PACKS
  - ENG ANTI-ICE
  - WING ANTI-ICE
  - STARTER
- VALVES
  - L/R BLEED AIR VALVES (**ESS** DC, FAIL CLOSED)
  - L/R COWL ANTI-ICE VALVES (**ESS** DC, FAIL OPEN)
  - L/R WING ANTI-ICE VALVES (**ESS** DC, FAIL CLOSED)
  - L/R STARTER VALVES (**ESS** DC, FAIL CLOSED)
  - ISOLATION VALVE (**ESS** DC, FAILS FROZEN)
  - L/R PACK VALVES (**ESS** DC, FAIL OPEN)

SUBCOMPONENTS:
- MANIFOLD PRESSURE REGULATING VALVES
- HIGH STAGE BLEED VALVES
- FAN AIR VALVES
- CHECK VALVES

- "BLEED AIR CONFIGURATION"
  - APU AND ENG BLEED AIR – ON
  - BOTH ENG BLEED ON AND ISOL VALVE OPEN

14 AIR CONDITIONING

- FUNCTIONS:
  - CABIN AIRFLOW
  - TEMP CONTROL
  - EQUIPMENT COOLING
- CABIN AIRFLOW AND TEMP CONTROL
  - MODULATED VIA AIR CONDITIONING CONTROLLERS (ACC) VIA PACKS VIA TRIM AIR VALVES AND DELIVERED VIA 3 ZONE DELIVERY DUCTS.
  - MANUAL TEMP CONTROL: **35^{0}F - 230^{0}F**
  - AUTO TEMP CONTROL: **60^{0}F - 90^{0}F**
- EQUIPMENT COOLING
  - FANS FOR LEER AND REER (L/R PSUs) HIGH SPEED <FL350, LOW SPEED >FL350
  - (PSU) FANS FOR TRUs; LOW SPEED <FL350, HIGH SPEED >FL350

ECS PACKS
- PACK VALVE CLOSES WHEN: *"ENERGIZED CLOSED, FAIL OPEN"*
  - PACK SWITCH - OFF
  - RAM AIR SWITCH - ON
  - START/CRANK MASTER – RIGHT PACK (WOW IN GND)
  - ENG START SWITCH – LEFT PACK (WOW IN GND)
- RAM AIR
  - COOLS THE PACK HEAT EXCHANGER
  - A FAN RUNS WHEN ON THE GND TO DRAW AIR IN
  - AIR EXHAUSTED THROUGH LOUVERS
- PNEUMATICALLY DRIVEN TURBINES
- DIFFUSERS
- HEAT EXCHANGERS
  - PRIMARY AND SECONDARY "RADIATORS"
  - MAX TEMP 450^{0}F
- WATER EXTRACTORS *"NO SOCK"*
  - AIR IS CENTRIFUGALLY SPUN FORCING MOISTURE OUT
  - MOISTURE IS ALSO VAPORIZED VIA HEAT
- MANIFOLDS:
  - COLD AIR MANIFOLD→
    - GASPERS
    - THREE DUCTS
  - HOT AIR MANIFOLD
    - OZONE SCRUBBERS
    - 400^{0}F
- TRIM AIR VALVES
  - MIX HOT AIR WITH COLD AIR

15 PRESSURIZATION

- COMPONENTS:
  - CABIN PRESSURE CONTROLLER (CPC) - REER
  - CABIN PRESSURE CONTROL PANEL (CPCP)
  - CABIN PRESSURE SELECTOR PANEL
  - CABIN PRESSURE INDICATOR PANEL
  - THRUST RECOVERY OUTFLOW VALVE (TROV)
  - CABIN PRESSURE RELIEF VALVE
- PRESSURIZATION MOTORS (3)

NOTE: THE ACTIVE CPC CHANNEL AUTOMATICALLY SWITCHES EVERY FLIGHT.

NOTE: CPC CHANNELS CAN BE MANUALLY SWITCHED BY CYCLING THE CPCP MANUAL PUSH-BUTTON.

AC MOTOR #1
- CPC CHANNEL 1 (MODE: AUTO1) CONTROLLED IN BOTH AUTO AND SEMI
- **ESS AC** POWERED

AC MOTOR #2
- CPC CHANNEL 2 (MODE: AUTO2) CONTROLLED IN BOTH AUTO AND SEMI
- R **MAIN AC** POWERED

DC MOTOR
- MANUALLY CONTROLLED, BYPASSES THE CPC
- L **ESS DC** POWERED

- MODES:

AUTO & SEMI HAVE DUAL CHANNELS (R MAIN AC & L ESS AC)

- AUTO *↑500/↓300 FPM*
  - ADS, FMS, MAU
  - FLIGHT AT 9 KTS OR PLA >15°
  - LDG AT -1,000 DESCENT
- SEMI
  - CREW PROG CPCP
  - CREW SEL FLT/LDG
- MANUAL

AFTER LANDING THE CPCS
- CLIMBS THE CABIN AT 500 FPM FOR ONE MINUTE, THEN
- CLIMBS THE CABIN AT 2000 FPM UNTIL THE TROV IS FULLY OPEN
- 90 SECONDS AFTER LANDING THE CPRV OPENS

- CABIN PRESSURE RELIEF VALVE
  - PARTIALLY OPENS AT **9.74 PSI**
  - FULLY OPENS AT 9.94 PSI TO 10.15 PSI
  - NEG DIFF PRESSURE RELIEF AT -0.25 PSI
- LIMITATIONS
  - MAX DIFF - AIR — **9.94 PSI**
  - MAX DIFF - GND — **0.3 PSI**
- CABIN PRESSURE LOW TRIP POINTS
  - **8000'**
  - **10000'**
  - **14500'**
  - **15500'**
  - **10000'**
  - **LFE <7500'**
  - **LFE 7500'-9500'**
  - **LFE 9500'-14000'**
  - **LFE >14000' (ASC 068)**
  - **MANUAL MODE**
- O2 MASK DROP
  - **14750' ± 250'**
  - **15750' ± 250' (HIGH ALT SWITCH, ASC 068)**
- EDM ARMED:
  - ≥FL400 &
  - AUTOPILOT ENGAGED
- EDM MODE ACTIVATED

THE AIRCRAFT AUTOMATICALLY:
- "CABIN LOW PRESS"
- A/T ENGAGE – GO TO IDLE
- GP SPEED – MAN 340 KTS
- GP HDG – 90° LEFT TURN
- GP ALT – 15000'
- GP FLCH
- AIRCRAFT TURN LEFT 90°, DESCENDS AT VMO/MMO, CAPTURES 15000'
- GP SPEED – MAN 250 KTS

16 ICE AND RAIN

- PROTECTED COMPONENTS
  - WING LEADING EDGES — BLEED AIR HEAT (130°F)
  - ENG COWL INLET LEADING EDGES — BLEED AIR HEAT
  - WINDSHIELDS — ELEC HEAT (114°F)
  - CABIN WINDOWS — ELEC HEAT
  - EVS WINDSHIELD — ELEC HEAT
  - PROBE SENSORS — ELEC HEAT
    - AOA PROBES
    - PITOT PROBES
    - TAT PROBES

COWL ANTI-ICE:
- **SAT < 10°C, VISIBLE MOISTURE**
- **SAT < 1°C, VISIBLE MOISTURE, GND OPS**

A/I ON FOR TAXI AND TAKEOFF
-SET 85% LP FOR 2 SEC PRIOR TO T/O
-SET 85% LP FOR 1 MIN EVERY HR

- COWL ANTI-ICE VALVES FAIL OPEN – ELEC CONT, PNEUM DRIVEN.
- 7TH AND 12TH STAGE BLEED AIR DOWNSTREAM OF THE ENGINE BLEED PRESSURE REGULATING SHUTOFF VALVE – NO PRECOOLER.

WING ANTI-ICE:
- THE BLEED AIR CONTROLLER CONTROLS THE WING ANTI-ICE CONTROL VALVES.
- 12TH STAGE AIR AUGMENTS 7TH STAGE AIR TO PROVIDE 400°F (500°F S.E.) TO THE BLEED AIR MANIFOLD.
- THE WING ANTI-ICE CONTROL VALVES FAIL CLOSED.
- CROSS-OVER DUCT PROVIDES REDUNDANCY.
- LEADING EDGE TARGET TEMP: **130°F.**
- OVER TEMP PROTECTION AT **180°F.**

- ICE DETECTORS — VIBRATING SENSOR — 40,000 Hz
- AUTO MODE: ON
  - **INHIBITED > FL350**
  - TAKEOFF — **OFF < 1500 FT AGL**
  - LDG — **TIL TOUCHDOWN**
- AUTO MODE: OFF — TIME DELAY
  - **ICE DETECT – 1 MIN**
  - **COWL A/I – 3 MIN**
  - **WING A/I – 5 MIN**

- COLD WEATHER OPERATIONS
  - REFERENCE AOM CH 7 – ALL WEATHER OPERATIONS AND PROCEDURES
  - REFERENCE COLD WEATHER OPERATIONS MANUAL (CWOM)
  - ≤ 0 °C CONSULT CWOM – WATER DRAINING
  - ALTIMETRY: QRH-NG ALTERNATE NORMALS

NOTE: DURING VERY COLD TEMPERATURES BAROMETRIC ALTIMETERS READ ERRONEOUSLY HIGH, THUS CAUSING THE ACTUAL AIRCRAFT ALTITUDE TO BE SIGNIFICANTLY LOWER THAN INDICATED ALTITUDE. G450 AIRCRAFT WITH ASC 059B HAVE TEMP COMPENSATION CAPABILITY THROUGH LANDING INIT IF SELECTED ON FLIGHT CONFIG PAGE 2.

ENG START:
- QRH-NG, ALTERNATE NORMALS "COLD WEATHER START AND OPERATIONS"
- -40°C: MINIMUM OIL TEMP FOR START
- ≤ -10 °C OIL TEMP – PERFORM CRANK CYCLE (QRH-NG). TURN GEN SWITCHES OFF FOR START.
- ALLOW MAX LP AND HP RPM FOR 45 SEC PRIOR TO SELECTING FUEL CONT ON

COWL ANTI-ICE (GND AND FLT):
- SELECT ON IF SAT ≤+10°C (50°F) WITH VISIBLE MOISTURE / CONTAMINATED SURFACE CONDITIONS

ENG ICING NOTES
- CAN OCCUR BELOW 8°C
- AS AIR IS DRAWN INTO THE ENGINE THE TEMPERATURE DROPS AND THE MOISTURE CONDENSES INTO DROPLETS. THESE DROPLETS CAN STRIKE METAL PARTS AND FREEZE
- ICE SHEDDING PROCEDURE: REDUCE POWER LEVER (ONE AT A TIME) TO IDLE FOR 5 SEC, ADVANCE TO 85% LP FOR 2 SEC, THEN RETURN TO NORMAL SETTING

TAXI:

- -30°C: MINIMUM OIL TEMP FOR TAXI
- TAXI WITH FLAPS UP
- HEAT BRAKES TO 100°C. THIS DISSIPATES MOISTURE FROM THE BRAKES; PREVENTS FROZEN BRAKES ON LANDING
- WHILE STOPPED EXERCISE BRAKES TO 3000 PSI – DON'T SET PARKING BRAKE FOR EXTENDED PERIODS
- AVOID USING REV THRUST IF POSSIBLE
- MIN OIL TEMP FOR TAKEOFF IS +20°C
- PERFORM CONTAMINATION CHECK

IF OAT <1°C PERFORM ENG RUN UP (<60 MIN INTERVALS):

- LP RPM....85%, PAUSE 1 MIN, RETURN TO IDLE

TAKEOFF PLANNING:

- DO NOT USE REDUCED (FLEX) THRUST
- CONSIDER USING MIN V1

PRIOR TO TAKEOFF PERFORM ENG ICE CLEARING PROCEDURE:

- LP RPM.....85%, PAUSE 2 SEC
- ENG OPERATION.....CHECK NORMAL
- TAKEOFF POWER.....SET

AFTER TAKEOFF:

- DELAY GEAR RETRACTION, IF PRACTICAL
- CONSIDER CYCLING THE GEAR
- WARM WHEEL WELLS USING WING ANTI-ICE

NOTE: PERIODICALLY DISENGAGE AUTOPILOT TO CHECK TRIM AND HANDLING

MINIMUM MANEUVERING SPEEDS:

- FLAPS 0°: 200 KCAS
- FLAPS 10°: 180 KCAS
- FLAPS 20°: 160 KCAS
- FLAPS 39°: VREF + 5 KTS

PITOT SYSTEM ICING:

- CRUISE AOA: 0.2-0.3 (3-5° PITCH)
- APPROACH AOA: 0.4 (3-5° PITCH)
- VREF AOA: 0.5 (3-5° PITCH)

PITOT SYSTEM AND AOA VANE ICING:

- USE GPS GROUND SPEED

BEFORE LANDING:

- EXTEND LANDING GEAR EARLIER THAN NORMAL
- SELECT ANTI-SKID OFF, PERFORM SEVERAL BRAKE APPLICATIONS TO 3000 PSI, THEN SELECT ANTI-SKID ON

LANDING:

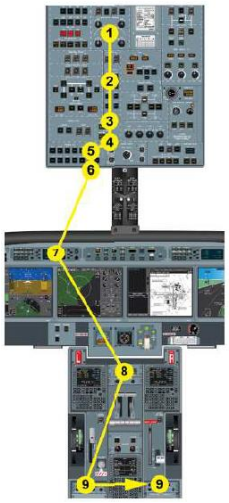
- PERFORM FIRM TOUCHDOWN
- CONSIDER PULLING SPEED BRAKE HANDLE AS A BACKUP TO THE AUTO GND SPLR SYSTEM
- LOWER NOSE IMMEDIATELY
- APPLY MODERATE-TO-FIRM BRAKE PRESSURE SMOOTHLY AND SYMMETRICALLY
- MAINTAIN CONSTANT BRAKE PRESSURE ALLOWING THE ANTI-SKID TO WORK
- BE PREPARED FOR DOWNWIND DRIFT
- NO TURNS UNTIL VERY SLOW TAXI SPEED IS ATTAINED

17 OXYGEN

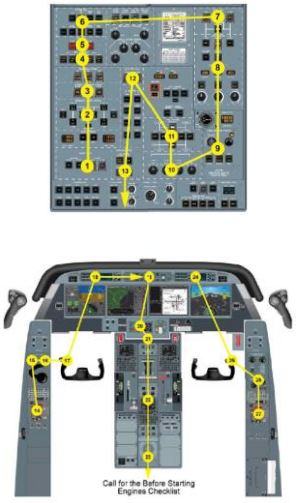
- OXYGEN BOTTLES (2)
- 1800 PSI NORMAL, 1500 PSI MINIMUM
- 230 CUBIC FEET TOTAL
- LOCATED BENEATH THE FLOORBOARDS
- PRESSURE REGULATORS REDUCE PRESSURE TO 55-60 PSI
- OVERBOARD DISCHARGE LINE (GREEN DISK)
  - OVERPRESSURE
  - OVERTEMPERATURE
- CREW/PAX O2 VALVE LEVER - ON/OFF
- PAX O2 SYSTEM CONTROL KNOB - AUTO/OFF/MAN
- THE MASKS DEPLOY AT 14750' ± 250' (15750' ± 250' – ASC 068) AND FLOWS UNTIL THE CABIN REACHES 13750 ± 250'
- QUICK-DONNING EROS O2 MASKS
  - N: DILUTED
  - 100%
  - EMERGENCY OXYGEN ROTARY KNOB – POSITIVE PRESSURE FLOW
  - AUTO POSITIVE PRESSURE FLOW AT FL350. CERTIFIED TO FL400.

18 FLOWS

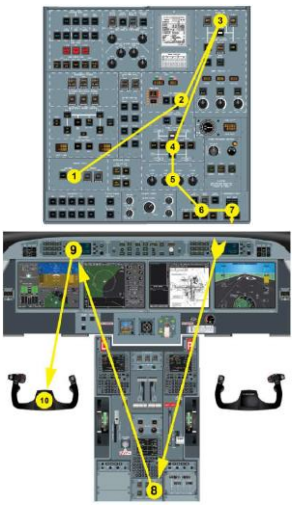
AFTER APU START



BEFORE STARTING ENGINES



AFTER ENGINE START



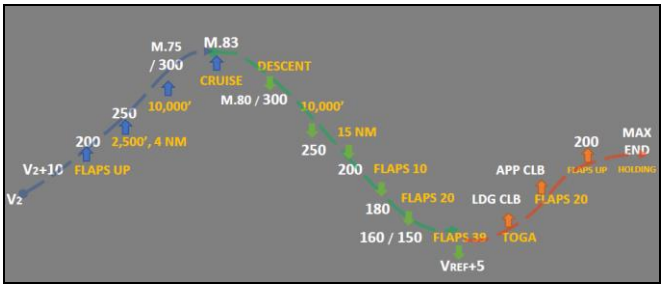
AFTER LANDING

MISSED APPROACH

19 PLANEVIEW AVIONICS

- HONEYWELL PRIMUS EPIC PLANEVIEW AVIONICS
  - LCDs (4) – DUs
  - SFD
  - EBDI
  - DCs (2)
  - CCDs (2)
  - (EDS) ELECTRONIC DISPLAY SYSTEM
  - INTERNAL IRU
  - MAGNETOMETER
  - IRS 1/2/SFD
- MAUs (3)
  - COMPUTERS
  - RECEIVE AND TRANSMIT DATA VIA ASCBs
  - MAU 1 & 3 – LEER, MAU 2 – REER
  - PLUG IN CARDS (16 IN EACH MAU) – LINE REPLACEABLE UNITS/MODULES
  - EACH MAU HAS DUAL PWR SUPPLIES (A&B)
    - MAU 1A: L ESS DC & R MAIN DC
    - MAU 1B: R ESS DC & L MAIN DC
    - MAU 2A: R MAIN DC & L MAIN DC
    - MAU 2B: R ESS DC & L MAIN DC
    - MAU 3A: L MAIN DC & R MAIN DC
    - MAU 3B: L ESS DC & R MAIN DC
- MAU MODULES
  - AIRCRAFT PERSONALITY
  - CONTROL MODULES
    - GP
    - WEATHER CONTROLLER
    - TCAS (TA < 500')
    - MCDU
    - TONE, MWS
  - ACTUATOR MODULES
    - AP/FD, YD, AT
    - TRIM (PITCH,AUTO,MACH)
    - STALL PROTECTION
  - AGM MODULES
    - PFD
    - ND
    - CAS
    - SYSTEMS
    - WEATHER
    - CAMERA
    - ANNUNCIATION
  - GPS MODULES (2)
    - 1 IN MAU 2 AND 3
  - CMC MODULES
  - DATABASE MODULES
    - NAV (IN EACH AGM)
    - TERRAIN
- AGMs (4)
  - CREATE AND DISPLAY GRAPHICS ON DUs
  - AGMs ARE IN EACH MAU
    - MAUs 1 & 2 HAVE 1 AGM EACH
    - MAU 3 HAS 2 AGMs
  - CONTROLLED BY "DISPLAY SYSTEM CONTROL" SWITCHES (4) (OPERATE ON THE GND ONLY)
  - OPERATES AUTOMATICALLY WHEN AIRBORNE
  - SYS LOGIC BORROWS FROM DU#3/AGM#3 WHEN FAILURES OCCUR
- DU POWER SOURCES
  - DU 1 – L ESS DC
  - DU 2 – L MAIN DC
  - DU 3 – R MAIN DC
  - DU 4 – R ESS DC
- IRU (3) LASER RING GYROS
  - ATTITUDE INFO FROM GRAVITY
  - TRUE NORTH FROM EARTH'S TRUE EAST ROTATION
  - UPDATED BY GPS (2)
  - PRIMARY PWR IF INPUT >18 V DC < 36 V DC
  - SECONDARY PWR (E-BATTS) IF PRIMARY PWR < 18 V DC
  - STATIONARY ALIGNMENT (5-17 MIN)
  - ALIGN IN MOTION (15-30 MIN) – REQUIRES GPS INPUT; TURNS HELP
  - AUTO REALIGN – UPDATES WHEN NOT IN MOTION
  - HYBRID IRS – GPS, H IRS, DME/DME, VOR/DME, IRS
- AIR DATA SYSTEM (ADS)
  - 3 AIR DATA MODULES (ADMs)
  - SOURCES: PITOT/STATIC AND TAT
  - DIGITAL DATA TRANSMITTED TO THE EDS, SFD, EBDI, FMSs, FADECs, & CPAM
- AUTOMATIC SENSOR REVERSION *IN FLIGHT ONLY (>60 KTS)*
  - IRS
  - ADS
  - RAD ALT
  - FWC
- MONITOR AND WARNING SYSTEM (MWS)
  - FWCs (2) WITHIN 2 MAUs
  - WARNINGS (RED, TRIPLE CHIME)
  - CAUTION (AMBER, DOUBLE CHIME)
  - ADVISORY (BLUE, SINGLE CHIME)
- PFDs
  - PLI
  - THRUST DIRECTOR
  - AIRSPEED TREND VECTOR
  - ALTITUDE TREND VECTOR
  - **VISIBLE AT 0.70 AOA**
  - WHEN A/Ts OFF
  - AIRSPEED IN 6 SEC
  - ALTITUDE IN 6 SEC
- CCDs
  - FUNCTIONS THAT THE CCD DOES THAT THE DC CAN'T DO:
    - GRAPHIC FLIGHT PLANNING
    - RADIO TUNING
    - AMEND ROUTE
    - CHART SELECTION
    - RANGE CHANGES, ETC
- RNP VALUES
  - OCEANIC/REMOTE – 4.0
  - ENROUTE – 2.0
  - TERMINAL (DEST<30NM OR ON SID/STAR) – 1.0
  - RAD (RADIO) – 0.5
  - APPROACH (2 NM FROM FAF) – 0.3
- AOA GUIDE
  - CRUISE – **0.2 TO 0.3 AOA (3^0 TO 5^0 PITCH)**
  - APPROACH – **0.4 AOA**
  - VREF – **0.5 AOA**
- VSD
  - ACTUAL FLIGHT PATH ANGLE
  - SPEED PREDICTION CIRCLE
  - TERRAIN UNDER FLIGHT PLAN / TERRAIN UNDER TRACK
- AUTO SPEEDS
  - V2 ON TAKEOFF
  - AT 400' WITH FLAPS UP AND FLCH – 200 KTS
  - AT 1500' V1, VR, V2 DISAPPEAR
  - AT 2500'/ + 4NM – 250 KTS
  - AT 10000' – 300/.75

AUTOTHROTTLE SPEED SCHEDULE EXAMPLE



- DC VREF
  - FLAP HANDLE POSITION
  - CURRENT AIRCRAFT WEIGHT
- FLAP INOP VREF

HANDLE	ACTUAL	CORRECTION
10^O	0^O	*+10 ±2KTS*
20^O	10^O	*+5 ±2 KTS*
39^O	20^O	*+5 ±2 KTS*

- WARN INHIBIT
  - GEAR MUST BE DOWN
  - ON TAKEOFF – COMES OFF AT 400'
  - AFTER LANDING – MUST BE DESELECTED BY CREW
  - INHIBITS AMBER AND BLUE CAS CHIMES – NOT CAS MSG
  - EXCEPTIONS:
    - CAT 2 INVALID
    - LATERAL CPL DATA INVALID (LATERAL OR VERTICAL)
    - LPV UNAVAILABLE

▪ TERRAIN INHIBIT	▪ SELECT WITHIN **15 NM** OF AN AIRPORT THAT: - HAS NO PUBLISHED IAP - < 3500' RUNWAY - NOT IN TERRAIN DATABASE - IF QFE ALTIMETER IS BEING USED IN NON WGS-84 COUNTRIES	
▪ TERRAIN AWARENESS	▪ TERRAIN RANGE ▪ CFIT DISPLAY	▪ 20 NM ▪ **5 NM INNER RING** ▪ 10 NM OUTER RING
▪ WINDSHEAR WARNING	▪ TAKEOFF ▪ APPROACH ▪ MISSED APPROACH	▪ **GND TO 1500' AGL** ▪ **1500' TO 10' AGL** ▪ **TO 1500' AGL**
▪ RADAR - HONEYWELL PRIMUS 880	▪ WHILE REFUELING ▪ DIST FROM FUELING ▪ DIST FROM PERSONNEL ▪ TO TURN ON (GND)	▪ **NEVER** ▪ **300'** ▪ **49'** ▪ STAB 4 TIMES IN 3 SEC
▪ AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS)	▪ TWO CHANNELS (1 & 2) - EACH CHANNEL HAS ITS OWN FLIGHT GUIDANCE CONTROL SYSTEM (FGCS) - EACH FGCS HAS ITS OWN: - AUTOPILOT - FLIGHT DIRECTOR - AUTOTHROTTLE - YAW DAMPER - STALL PROTECTION ▪ AFCS INPUTS: - FMS, IRS, & GP	
▪ FLIGHT MODE ANNUNCIATIONS:	▪ LATERAL ▪ PERFORMANCE ▪ VERTICAL	▪ FMS, HDG, LOC, VOR, ETC.. ▪ IAS, FLCH, GA, HOLD, ETC.. ▪ ALT, ASEL, FPA, GA, ETC..
▪ FLCH PERFORMANCE MODE	▪ IAS OR MACH MODE (SPEED HOLD MODE)	▪ FOR ALT CHANGE > 6000': - CLIMB THRUST - IDLE THRUST
▪ HOLD PERFORMANCE MODE	▪ ENGAGES AT 60 KTS ▪ DISENGAGES AT 400'	▪ THE AUTOTHROTTLE DRIVE MOTORS DE-ENERGIZE AND THE CREW CAN EASILY MOVE THROTTLES
▪ TO (TAKEOFF) PERFORMANCE MODE	▪ ARMED WHEN	▪ EPR TARGET (RATED/FLEX) ▪ V2 IN GP ▪ ISOL VALVE IS CLOSED
	▪ ENGAGE WHEN	▪ EPR > 1.05 ▪ AIRSPEED < 60 KTS ▪ A/T ENGAGE PRESSED
▪ TO (TAKEOFF) VERTICAL MODE	▪ BOTH ENG RUNNING	▪ INITIALLY 8^{O} PITCH ▪ THEN V2 TO V2 + 10 ▪ UNTIL FLAP CHANGE
	▪ ONE ENG INOP	▪ INITIALLY 8^{O} PITCH ▪ THEN V2 TO V2 + 10 UNTIL 1500 ' AGL ▪ AT 1500 ' AGL - VSE
▪ GA VERTICAL MODE	▪ AVAIL: - < 16500' MSL - < 200 KTS - < 2000' AGL	
TO/GA PRESSED:	▪ COMMANDS: - WINGS LEVEL - INITIALLY 8^{O} PITCH - THEN FLAP SPEED SCHEDULE UP TO 17 ^{O} PITCH LIMIT	
▪ GP - BANK	▪ HIGH BANK ▪ LOW BANK	▪ 28^{O} (AUTO < 28500') ▪ 17^{O} (AUTO > 29500')
▪ PFD-CMD	▪ L & R LIT	▪ ILS APP < 1200' AGL

▪ HUD	▪ BOX FOR EVS OPERATIONS	▪ FLIR ▪ EVS ▪ AUTO, H OR L
	▪ AIRPORT LINES / EXTENDED CENTERLINE	▪ APPEAR AT **2000' RA** ▪ DISAPPEAR AT 325'AGL ▪ DEPICTS 800'/8000' RWY
	▪ RUNWAY LINES / EXTENDED CENTERLINE	▪ APPEAR AT **350' RA** ▪ DISAPPEAR AT 60' RA ▪ DEPICTS 150'/8000' RWY ▪ 1000' AIM POINT LINE
	▪ FLARE CUE	▪ < **100' RA**

AUTOPILOT

▪ MIN ENGAGE HEIGHT	▪ **200 FT**
▪ MIN DISENGAGE HEIGHT	▪ PRECISION APPROACH **- 60 FT** ▪ NON-PRECISION **- 50 FT < MDA** ▪ **LNAV/VNAV – AT DA**

COLD WEATHER

▪ **65^{O} F (18^{O} C)**	▪ **MIN TEMP FOR:** - **DUs, IRUs, EERs** - **SFD (CB – POP E-9)** - **EBDI (CB – CPOP D-9)**
▪ 50^{O} F (10^{O} C)	▪ ICING CONDITIONS EXIST WHEN IN VISIBLE MOISTURE (COWL HEAT)
▪ 32^{O} F (0^{O} C)	▪ PURGE WATER IF AIRCRAFT IS LEFT UNHEATED > 90 MIN
▪ 14^{O} F (-10^{O} C)	▪ GEN SWITCHES OFF FOR ENG START
▪ 5^{O} F (-15^{O} C)	▪ PURGE WATER SYSTEM REGARDLESS OF CABIN TEMP
▪ -4^{O} F (-20^{O} C)	▪ REMOVE BATTs
▪ -20^{O} F (-28^{O} C)	▪ REMOVE LIFE RAFTS
▪ -40^{O} F (-40^{O} C)	▪ MIN FOR ENG START

20 SOP

NOTE: AOM ⇨ CHAPTER 6 GROUND/FLIGHT CHARACTERISTICS AND PROCEDURES

BRIEFINGS

CREW:	DEPARTURE:	TAKEOFF:
• Trip Release	• Taxi Routes	• Runway and Condition
• Aircraft Status	• HOT Spots	• Configuration
• Data Bases/VOR	• Noise Abatement	• Takeoff Data
• Weather	• Obstacles	• Callouts
• NOTAMs / TFRs	• Terrain / MSA	• Abort Criteria
• Routing / Fuel	• APG / RWA	• Clearance
• Turb / PIREPs		• Contingencies
• Baldwin / SMS		

GULFSTREAM HAS ADVISED THAT THE INITIAL, CRITICAL PILOT RESPONSES FOR THE FOLLOWING EMERGENCY PROCEDURES SHOULD BE PERFORMED PROMPTLY WITHOUT REFERENCE TO A CHECKLIST:

IMMEDIATE ACTION:

- **REJECTED TAKEOFF**
- **ENGINE FAILURE/FIRE AFTER V1**
- **EMERGENCY DESCENT**
- **RAPID DECOMPRESSION**
- **AUTOPILOT OR AUTOTHROTTLE UNCOMMANDED DISCONNECT**
- **ENGINE EXCEEDANCE**
- **OVERSPEED**
- **STALL PROTECTION/STALL WARNING ACTIVATION**
- **FLIGHT CONTROL JAMS**
- **TOTAL LOSS OF BRAKING**
- **EGPWS ALERT**
- **WINDSHEAR ALERT**
- **TCAS ALERT**
- **IN ADDITION, PILOTS ARE EXPECTED TO DON OXYGEN MASKS PROMPTLY WHEN APPROPRIATE (e.g. WHEN SMOKE IS DETECTED)**

- NORMAL START, RIGHT ENG:
  - BLEED AIR PRESS
  - START MASTER-PUSH
  - R ENG START-PUSH
  - VERIFY LP (2%) AND HP (20%)
  - R FUEL CNTL – RUN
  - AT 44% HP
  - MIN ENG IDLE
  - MIN **OIL PRESS**
  - **HYD** PRESSURES
  - **"SINGLE RUDDER"**
  - 28 PSI MIN
  - R ECS PACK TURNS OFF
  - L ECS PACK TURNS OFF "**SVO**"
  - "**IGN**"
  - **"SVO/IGN OUT"**
  - 49% HP
  - 17 PSI
  - **0,0,3000,3000**
  - ON

NOTE: ENSURE RESIDUAL TGT IS < 200°C, IF NOT, PERFORM A CRANK CYCLE.

NOTE: WITH TAILWINDS > 10 KTS, ACHIEVE MAX CRANKING RPM AND VERIFY POSITIVE LP RPM PRIOR TO SELECTING RUN.

NOTE: PRESS AND HOLD THE START SWITCH UNTIL SVO IS DISPLAYED. OTHERWISE YOU'LL GET A SAV MAINTENANCE CAS MESSAGE. QRH - START MASTER OFF, CYCLE FUEL CONTROL, ATTEMPT ANOTHER START.

NOTE: WHEN THE ENG START PAGE TGT TEMP SCALE CHANGES FROM 800° TO 1000° THE ENG START IS COMPLETE.

- ENGINE START ABNORMALS
  - **ENGINE FAILURE TO START** (QRH EB-29 FIRST STEP: **FUEL CONTROL**…OFF)
  - **HOT START** (QRH EB-31 FIRST STEP: **FUEL CONTROL**…OFF)
  - **STARTER VALVE FAILS TO OPEN** (QRH EB-29 FIRST STEP: **START MASTER**…OFF)
  - **STARTER VALVE FAILS TO CLOSE** (QRH EB-30 FIRST STEP: **START MASTER**…OFF)
  - **CROSSBLEED START** (ALTERNATE NORMALS QRH NG-16)
  - **AIR START** (QRH EB-17)

- NORMAL TAKEOFF
  - ROTATE TO 14°
  - PM, "POSITIVE RATE"
  - PM, "400 FT"
  - PF, "GEAR UP"
  - PF, "FLAPS UP, FLCH"

- STEEP TURNS
  - 15000', 250 KTS
  - DISENGAGE
    1. HDG
    2. A/T
    3. A/P

NOTE: WHEN ROLLING THROUGH ≥32° BANK, AN INVERTED TRIANGLE APPEARS AT THE 45° POSITION. IT DISAPPEARS FROM VIEW AT ≤30°.

- APPROACH TO STALL - CLEAN
  - SET MAN SPEED 160 KTS
  - BRIEF **"STOP TRIM AT VREF"** & **"CALL 140"**
  - IDLE THRUST
  - STOP TRIMMING AT VREF

STALL WARNING ACTIVATION
IMMEDIATE ACTION:
- ANNOUNCE **"STALL"**
- REDUCE AOA, SELECT TO/GA POWER
- ROLL, UNLOAD THE WING
- ATTITUDE – TO RECOVER TO LEVEL FLIGHT

- APPROACH TO STALL – TAKEOFF CONFIGURATION
  - FLAPS 20°
  - SET HEADING CHANGE
  - IDLE THRUST
  - STOP TRIMMING AT VREF

STALL WARNING ACTIVATION
IMMEDIATE ACTION:
- ANNOUNCE **"STALL"**
- REDUCE AOA, SELECT TO/GA POWER
- ROLL, UNLOAD THE WING
- ATTITUDE – TO RECOVER TO LEVEL FLIGHT
- DURING RECOVERY CALL **"SYNC HEADING"**

- APPROACH TO STALL – LANDING CONFIGURATION
  - GEAR DOWN, FULL FLAPS
  - VERTICAL SPEED -700 FPM
  - IDLE THRUST
  - STOP TRIMMING AT VREF

STALL WARNING ACTIVATION
IMMEDIATE ACTION:
- ANNOUNCE **"STALL"**
- REDUCE AOA, SELECT TO/GA, CALL **"FLAPS 20"**
- ROLL, UNLOAD THE WING
- ATTITUDE – TO RECOVER TO LEVEL FLIGHT
- AT POSITIVE RATE, CALL **"GEAR UP, HDG, FLCH"**
- AT 160 KTS, CALL **"FLAPS UP"**

- **JAMMED STABILIZER**

IMMEDIATE ACTION:
- REDUCE PITCH WITH BANK / INCREASE PITCH WITH TRIM
- CALL "JAMMED STABILIZER CHECKLIST"

- **RUNAWAY PITCH TRIM**

IMMEDIATE ACTION:
- A/P DISC – PUSH AND HOLD
- PITCH TRIM – DISENGAGE
- A/P DISC - RELEASE
- CALL "RUNAWAY PITCH TRIM CHECKLIST"

- **EMERGENCY DESCENT**

EDM PROCEDURE:

NOTE: THE GUIDANCE PANEL WILL BE LOCKED UNTIL THE ADM HAS BEEN TERMINATED BY DISCONNECTING THE AUTOPILOT.

NOTE: DONNING OXYGEN MASKS:
- REMOVE GLASSES
- REMOVE HEADSET, PUT THEM AROUND YOUR NECK
- DON OXYGEN MASK, SELECT MIC TO MASK
- REPLACE HEADSET OR SELECT SPEAKER ON

NOTE: CPC CHANNELS CAN BE SWITCHED BY SELECTING MANUAL AND RETURNING TO AUTO.

EDM ARMED:
- ≥FL400 &
- AUTOPILOT ENGAGED

EDM ACTIVATED:
- "CABIN PRESSURE LOW"

IMMEDIATE ACTION:

PF DUTIES: **"MASKS MASKS!"**

OXYGEN MASK ..... **DON**
EDM ..... MONITOR
SPEEDBRAKES ..... DEPLOY (NEARING MMO/VMO)
CALL ..... "LOSS OF PRESSURIZATION CHECKLIST"

PM DUTIES: **"MASKS MASKS!"**

OXYGEN MASK ..... **DON**
PASSENGER OXYGEN MASKS..... DEPLOY
EXTERIOR LIGHTS ..... ON
TRANSPONDER..... SET 7700
ATC..... NOTIFY, ASK MSA ALTITUDE
LOSS OF PRESSURIZATION CHECKLIST.... COMPLETE

THE AIRCRAFT AUTOMATICALLY:
- A/T ENGAGE – GO TO IDLE
- SPEED – MAN 340 KTS
- HDG – 90^0 LEFT TURN
- ALT – 15000'
- FLCH
- AIRCRAFT TURNS LEFT 90^0, DESCENDS AT VMO/MMO, LEVELS 15000'
- GP SPEED – MAN 250 KTS

NOTE: DO NOT REMOVE OXYGEN MASK UNTIL BELOW 10,000 FT – THE AIRCRAFT WILL LEVEL AT 15,000 FT.

MANUAL PROCEDURE:

PERFORM EMERGENCY DESCENT:

IMMEDIATE ACTION:

PF DUTIES: **"MASKS MASKS!"**

OXYGEN MASK ..... **DON**
POWER LEVERS ..... IDLE
TCS ..... PRESS AND HOLD
HEADING ..... TURN 90 DEG
AIRSPEED .... MMO/MVO (IF NO STRUCTURAL DAMAGE)
SPEEDBRAKES..... DEPLOY

NOTE: AN INITIAL PITCH ATTITUDE OF 8^0 TO 10^0 NOSE DOWN IS RECOMMENDED. AS SPEED APPROACHES VMO/MMO EXTEND SPEED BRAKES. ADJUST PITCH TO AVOID OVERSPEED.

CALL: "SET 15,000 FT", "SYNC HEADING", "MAN SPEED, SYNC", "FLCH"
TCS ..... RELEASE
CALL..... "LOSS OF PRESSURIZATION CHECKLIST"

PM DUTIES: **"MASKS MASKS!"**

OXYGEN MASK ..... **DON**
PASSENGER OXYGEN MASKS..... DEPLOY
EXTERIOR LIGHTS ..... ON
TRANSPONDER..... SET 7700
GP ..... SET (ALT, HDG, SPEED, FLCH)
ATC..... NOTIFY, ASK MSA ALTITUDE
LOSS OF PRESSURIZATION CHECKLIST.... COMPLETE

NOTE: DO NOT REMOVE OXYGEN MASK UNTIL BELOW 10,000 FT.

NOTE: A LEFT ENG FAILURE WILL CAUSE A BREAK POWER TRANSFER. IF USING FGC1 THE LATERAL MODE MAY CHANGE.

NOTE: A -8000 FPM V/S DESCENT CAN BE DIALED, THE AIRCRAFT WILL NOT OVERSPEED WHEN ON AUTOPILOT DUE TO OVERSPEED PROTECTION.

NOTE:

SLOW DECOMPRESSION: >10 SEC

RAPID DECOMPRESSION: 1-10 SEC

EXPLOSIVE DECOMPRESSION: <1 SEC

- ENGINE FAILURE IN FLIGHT

NOTE: QRH STEP "*MATCH FGC TO OPERATING ENGINE*." THIS SHOULD OCCUR AUTOMATICALLY WITH THE LOSS OF THE IDG.

- QRH OPTIONS:
  - **ENGINE SHUTDOWN IN FLIGHT**
  - **ENGINE FAILURE ABOVE V1**
  - **AIRSTART – WINDMILLING**

NOTE: DO NOT ATTEMPT AIRSTART IF:
- FIRE
- FOD
- FROZEN

NOTE: USE OF THE AUTOTHROTTLE DURING SINGLE ENGINE APPROACH IS PROHIBITED.

NOTE: THE QRH HAS ENGINE OUT DRIFTDOWN CHARTS (EB-14).

- DUAL ENGINE FAILURE

NOTE: MAXIMUM GLIDE HAPPENS AT ABOUT 0.30 AOA.

- QRH OPTIONS:
  - **DUAL ENGINE FLAMEOUT**
  - **DUAL ENGINE FAILURE – MID-ALTITUDE**
  - **DUAL ENGINE OUT LANDING PROCEDURE**

NOTE: ENG AIRSTART ENVELOPE ≤ 25,000 FT, ≥ 250 KTS (G450); APU START ENVELOPE ≤ 37,000 FT (G450).

NOTE: USE OF THE STANDBY ELECTRICAL POWER (HMG) IS NOT POSSIBLE WITH BOTH ENGINES WINDMILLING.

Quick Reference Handbook GULFSTREAM IV

Dual Engine Out Speeds For Maximum Range CCM

Weight	75,000	70,000	65,000	60,000	55,000	50,000	45,000
KIAS	203	196	188	181	173	164	155

Glide Ratio = Approximately 15:1

- **ENGINE FIRE / FAILURE AT V1**

IMMEDIATE ACTION:
- CALLOUT **"ENGINE FAILURE"**
- AT POSITIVE RATE, CALL **"GEAR UP, MANUAL SPEED, FLCH"**
- HOLD V2 TO V2+10
- AT 1500' AGL (OR CLEAR OF OBSTACLES), CALL **"AUTO SPEED"**
- AT V2+10, CALL **"FLAPS UP"**
- AT VSE, CALL **"SET MCT"** (715^{0}C / 860^{0}C)
- CALL **"ENGINE FIRE CHECKLIST"** OR **"ENGINE FAILURE ABOVE V1 CHECKLIST"** (AS APPROPRIATE)
- CALL **"START THE APU"** (APU INFLIGHT OPERATION – ALTERNATE ELECTRICAL POWER SOURCE, QRH EA-20
- CALL **"TRAFFIC PATTERN CHECKLIST"**
- CALL **"ONE ENGINE INOPERATIVE LANDING PROCEDURE CHECKLIST"**

- **ENGINE FIRE IN FLIGHT**

IMMEDIATE ACTION:

AFFECTED ENGINE ..... **IDENTIFY**
AFFECTED ENGINE **POWER LEVER** ..... IDLE
AFFECTED ENGINE **FUEL CONTROL**..... OFF
AFFECTED ENGINE **FIRE HANDLE** ..... PULL
AFFECTED ENGINE FIRE HANDLE .... **ROTATE** OUTBOARD
CALL "ENGINE FIRE IN FLIGHT CHECKLIST" (EC-3)

- ENGINE SHUTDOWN GUIDELINES

SHUTDOWN FOR THE FOLLOWING:
- **ENGINE FIRE**
- **VIBRATION** - EXTREME ENG VIB FELT IN THE AIRPLANE, OR IF VIB IS ACCOMPANIED BY OTHER FAILURE INDICATIONS
- **LOSS OF POWER** - EXCESSIVE OR UNCONTROLLABLE POWER LOSS
- **OIL PRESSURE** - SUDDEN INCREASE OR DECREASE IN OIL PRESSURE BEYOND LIMITS, OR SUSTAINED HIGH OIL PRESS ABOVE LIMITS
- **TGT** - SUDDEN UNCONTROLLABLE INCREASE IN TGT BEYOND LIMITS
- ANY OTHER ADVISABLE CONDITION

- ENGINE **EMERGENCIES**
  - ENGINE FAILURE CONSIDERATIONS (QRH EB-1)
  - ENGINE FAILURE BELOW V1 (QRH EB-1)
  - ENGINE FAILURE ABOVE V1 (QRH EB-2)
  - ENGINE SHUTDOWN IN FLIGHT (QRH EB-13)
  - ONE ENGINE INOPERATIVE LANDING PROCEDURE (QRH EB-18)
  - ONE ENGINE INOPERATIVE GO-AROUND PROCEDURE (QRH EB-20)

- DECLARING AN EMERGENCY

NOTE: GAC IN-FLIGHT EMERGENCY SUPPORT:
912-965-4178

NOTE: MEDLINK IN-FLIGHT EMERGENCY SUPPORT:
602-239-3627

STATE:
- AIRCRAFT IDENTIFICATION
- NATURE OF EMERGENCY
- SOULS AND FUEL ON BOARD (IN TIME)
- PILOT'S DESIRES
- "STANDBY, KEEP AN EYE ON US"
- AFTER LANDING INTENTIONS

FLIGHT ATTENDANT BRIEF:
- T - TYPE OF EMERGENCY
- E - WHETHER AN EVACUATION WILL BE NECESSARY
- S - WHAT SIGNAL WILL BE USED (AND WHEN) FOR BRACE AND EVACUATE; "EASY VICTOR, EVACUATE, ETC"
- T - TIME AVAILABLE TO PREPARE

- APRCH ANNUNCIATOR
  - FOR FMS FLOWN APPROACHES THE APRCH ANNUNCIATION MUST TURN ON 2NM BEFORE THE FAF
  - THIS CONFIRMS SENSOR CONFIGURATION IS CORRECT AND SENSOR INTEGRITY IS WITHIN LIMITS FOR THE APPROACH

- BLUE NEEDLE APPROACHES — NAV SOURCE: FMS

APCH TYPE	GP BUTTON	APCH MINS	ALT PRESELECT	VERTICAL MODE	LATERAL MODE
RNP (LPV)	APR	DA	MAA	VGP LPV	FMS
RNAV (LNAV / VNAV)	APR	DA	MAA	VGP	FMS
RNAV (LNAV)	APR	DDA(1)	MAA	VGP	FMS
VOR(2)	APR	DDA(1)	MAA	VGP	FMS
RNAV (CIRCLE)	LNAV / VNAV	MDA	MDA	VPATH	FMS
VOR(2) (CIRCLE)	LNAV / VNAV	MDA	MDA	VPATH	FMS

- GREEN NEEDLE APPROACHES — NAV SOURCE: NAV

APCH TYPE	GP BUTTON	APCH MINS	ALT PRESELECT	VERTICAL MODE	LATERAL MODE
ILS	APR	DA	MAA	GS	LOC
LOC	LNAV	DDA(1)	MAA(4)	VS/FPA	LOC
LOC (CIRCLE)	VS/FPA (3)	MDA	MDA	VS/FPA	LOC
VOR	APR	DDA(1)	MAA(4)	VS/FPA	VORAP
VOR (CIRCLE)	VS/FPA (3)	MDA	MDA	VS/FPA	VORAP
BC LOC	BC	DDA(1)	MAA(4)	VS/FPA	BC
BC LOC (CIRCLE)	VS/FPA (3)	MDA	MDA	VS/FPA	BC

(1) DDA = MDA + 60 FT
(3) MATCH VERTICAL TRACK (DASHED MAGENTA ON VSD) TO FMS DEPICTED VERTICAL PATH
(4) VS/FPA WILL HONOR THE ALT PRESELECT, SET MAA WHEN APPROPRIATE TO NOT INTERFERE WITH DESCENT

NOTE: APR AND VS/FPA BUTTONS ARE USED FOR A GREEN NEEDLE VOR APPROACH (VORAPP), THE ALTITUDE WINDOW WILL BE HONORED.

- GO AROUND – TWO ENGINE*

*WITH ENHANCED NAV

- CALL, **"GO AROUND, FLAPS 20"**
- SELECT TO/GA, PITCH INTO FD
- AT POSITIVE RATE, CALL **"GEAR UP, SET UP THE MISSED APPROACH"**
- PM SELECTS:
  1. GEAR UP
  2. GROUND SPOILERS OFF
  3. SET/CONFIRMS MISSED APPROACH ALT
  4. CONFIRMS PF GP IN FMS
  5. SELECTS MAN SPEED 200 KTS
  6. SELECTS FLCH
- AT VREF +20, CALL **"FLAPS UP"**
- CALL **"TRAFFIC PATTERN CHECKLIST"**

ENHANCED NAV NOTE: WHEN GA MODE IS SELECTED WITH THE ACTIVE LATERAL MODE BEING LNAV, THE LATERAL MODE DOES NOT TRANSITION TO WINGS LEVEL/HEADING HOLD; IT REMAINS IN LNAV.

NOTE: A FULLY COUPLED AUTO MISSED APPROACH IS POSSIBLE WITH ONLY – "TOGA, FLAPS 20, POSITIVE RATE, GEAR UP, 400', FLAPS UP" – EVERYTHING ELSE WORKS AUTOMATICALLY, - AS LONG AS THE MISSED APPROACH ALTITUDE IS SET IN THE ALTITUDE PRESELECT.

- GO AROUND – SINGLE ENGINE*

*WITH ENHANCED NAV

NOTE: USE OF THE AUTOTHROTTLE DURING SINGLE ENGINE APPROACH IS PROHIBITED.

NOTE: SINGLE ENGINE AUTOPILOT COUPLED GO-AROUND IS NOT APPROVED.

- CALL, **"GO AROUND, FLAPS 20"**
- SELECT TO/GA, PITCH INTO FD
- AT POSITIVE RATE, CALL **"GEAR UP, SET UP THE MISSED APPROACH"**
- PM SELECTS:
  1. GEAR UP
  2. GROUND SPOILERS OFF
  3. SET/CONFIRMS MISSED APPROACH ALT
  4. CONFIRMS PF GP IN FMS
  5. SELECTS MAN SPEED (NOT 200 KTS)
  6. SELECTS FLCH
- AT 1500' AGL (OR CLEAR OF OBSTACLES) AND VREF +20, CALL **"FLAPS UP, SET VSE"** (VSE=0° FLAP VREF)
- AT VSE (0° FLAP VREF), CALL **"SET MCT"** (715°C)
- CALL **"ONE ENGINE INOPERATIVE GO-AROUND PROCEDURE CHECKLIST"**
- CALL **"TRAFFIC PATTERN CHECKLIST"**
- CALL **"ONE ENGINE INOPERATIVE LANDING PROCEDURE CHECKLIST"**

- MIN SPEED FOR FLAP RETRACTION
  - TAKEOFF, NORMAL & V1 CUT: V2+10
  - GO AROUND, NORMAL AND S.E.: VREF(20) +20

- **WINDSHEAR / CFIT ESCAPE**

QRH: SUPPLEMENTAL DATA, S-7 WINDSHEAR / MICROBURST

QRH: RED TAB, MA-9 AND AMBER TAB, MB-54 - OTHER WARNING ANNUNCIATIONS

IMMEDIATE ACTION:
- DISCONNECT AUTOPILOT AND AUTOTHROTTLES
- MAX POWER (ENSURE SPEEDBRAKES ARE RETRACTED)
- 3° TO 4° PER SECOND ROTATION
- PITCH UP TO 25° OR PLI
- SPD, VREF -20 KTS OR PLI
- NO CONFIG CHANGES TILL CLEAR

NOTE: A PITCH ATTITUDE OF 25 DEG HAS BEEN DEMONSTRATED AT MAX LNDG WT WITH FULL FLAPS.

POST WINDSHEAR:
- CALL "**MAN SPEED 250, FLCH**"
- ENGAGE AUTOTHROTTLES

- **TCAS ALERT**

IMMEDIATE ACTION:
- TCS – PRESS AND HOLD
- PITCH – FLY-TO-BOX
- ATC – NOTIFY "TCAS RA"
- WHEN CLEAR, "RETURNING TO ASSIGNED ALTITUDE"

▪ CONTAMINATED RUNWAY RESTRICTIONS	▪ TAKEOFF	▪ FLAPS 20^{O} ONLY ▪ OPERATIVE ANTI-SKID ▪ OPERATIVE AUTO GROUND SPOILERS ▪ OPERATIVE THRUST REVERSERS ▪ MAX STANDING WATER – 0.39IN ▪ RATED THRUST ONLY, ETC…
	▪ LANDING	▪ FLAPS 39^{O} ONLY ▪ OPERATIVE ANTI-SKID ▪ OPERATIVE THRUST REVERSERS ▪ MAX STANDING WATER – 0.59IN ▪ THRESHOLD SPEED VREF TO VREF+10
▪ LANDING DIST ADJUSTMENTS "RULE OF THUMB"	▪ EXCESS AIRSPEED	▪ DRY RUNWAY, AN ADDITIONAL **300 FT** PER 10 KTS ▪ WET RUNWAY, AN ADDITIONAL **500 FT** PER 10 KTS ▪ EXTENDED FLARE, AN ADDITIONAL **2500 FT** PER 10 KTS
	▪ DOWNHILL	▪ AN ADDITIONAL **10%** OF LANDING DISTANCE PER 1% DOWN SLOPE
	▪ FLOATING	▪ AN ADDITIONAL **230 FT** PER SECOND
	▪ EXCESSIVE TCH	▪ AN ADDITIONAL **200 FT** PER 10 FT ABOVE TCH
	▪ DELAYED BRAKING	▪ AN ADDITIONAL **220 FT** PER SECOND
▪ FLEX TAKEOFF RESTRICTIONS (AFM APPENDIX A)	▪ NO TAILWIND ▪ NO DOWNHILL SLOPE ▪ NO CONTAMINATION ON RUNWAY (BUT WET IS OK) ▪ NO WING ANTI-ICE ▪ ANTI-SKID MUST BE OPERATIVE ▪ AUTO GROUND SPOILERS MUST BE OPERATIVE IF FLAPS 10^{O}, ETC…	
▪ **TOTAL LOSS OF BRAKING**	***IMMEDIATE ACTION:*** ▪ **THRUST REVERSE – MAXIMUM** ▪ **PTU AND AUX PUMP – ON** ▪ **BRAKES – RELEASE** ▪ **ANTI-SKID – OFF** ▪ **BRAKES – APPLY 400 PSI MAXIMUM** ▪ **PARKING BRAKE – APPLY 400 PSI MAXIMUM IF BRAKE PEDALS INOPERATIVE**	
▪ **UNCOMMANDED NOSEWHEEL STEERING**	***IMMEDIATE ACTION:*** ▪ **DIFFERENTIAL BRAKES AND RUDDER - USE** ▪ **NOSEWHEEL STEERING SWITCH – OFF**	
▪ **REJECTED TAKEOFF**	***IMMEDIATE ACTION:*** ▪ **"ABORT"** ▪ **IDLE POWER, MAX BRAKES** ▪ **MAX REVERSE** ▪ **EXTEND SPEED BRAKES** ▪ **NOTIFY ATC** ▪ SET PARKING BRAKE ▪ ADVISE PAX, "REMAIN SEATED – REMAIN SEATED" ▪ QRH OPTIONS: - **REJECTED TAKEOFF** (QRH MISCELLANEOUS INDEX, EI-12) - **ENGINE FAILURE BELOW V_1** - **THRUST REVERSER UNLOCK OR DEPLOY DURING TAKEOFF**	

▪ **EMERGENCY EVACUATION**

QRH LAST PAGE

NOTE: THE FIRE HANDLE RELEASE BUTTON WILL NEED TO BE PRESSED.

PARK / EMERG BRAKE ..... SET
L / R FUEL CONTROL SWITCHES ..... OFF
L / R FIRE HANDLES ..... PULL (IF REQ DISCH 1 / 2)
CABIN PRESSURE CONTROL ..... MANUAL
OUTFLOW VALVE ..... FULL OPEN
APU MASTER ..... OFF
L / R MAIN BATTERIES ..... OFF
PASSENGERS / CREW ..... EVACUATE

EVACUATION COMMANDS:
"OPEN SEAT BELTS, LEAVE EVERYTHING, COME THIS WAY, GET OUT, RUN AWAY FROM THE AIRCRAFT"