1. GENERAL.

The turboprop power plant system consists of two Allison AE 2100A engines, driving six-bladed Dowty Aerospace Propellers (model (c) R 381-6-123-F/5).

Engine and propeller parameters are:
- Controlled and monitored by FADECs (Full Authority Digital Electronic Control) units.
- Controlled by PL via FADEC.
- Controlled by CL via PMU and FADEC.
- Indicated on EICAS.

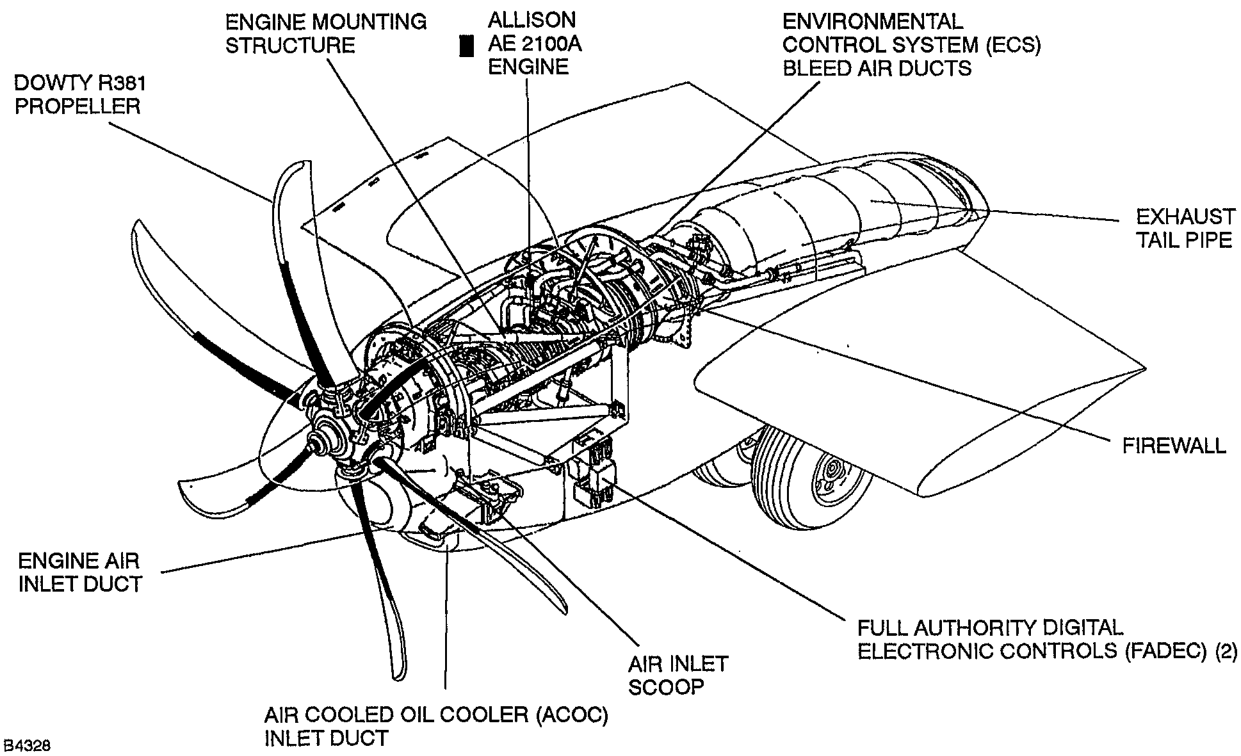


FIG. 1. General arrangement.

The engine is mounted to the wing and nacelle structure. The nacelle is ventilated and incorporates a fuel and oil drainage system to decrease fire hazard. For description of fire detection and extinguishing, see FIRE PROTECTION.

The engine air inlet duct, the torque meter and part of the foreign object damage (FOD) bypass duct are anti-iced by engine bleed air.
For description of ice protection systems, see ICE AND RAIN PROTECTION.

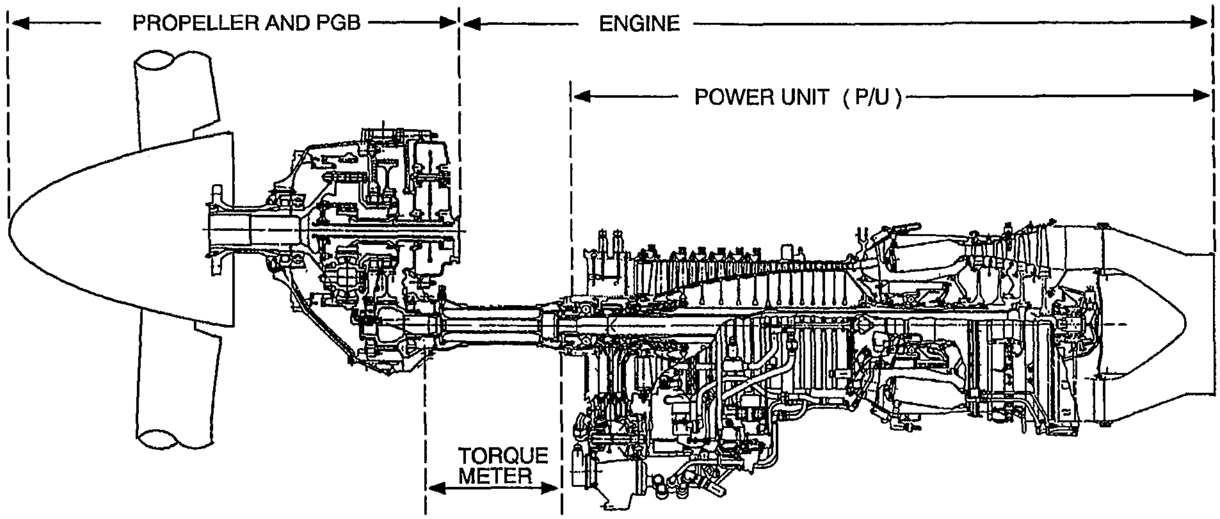


FIG. 2. General definitions.

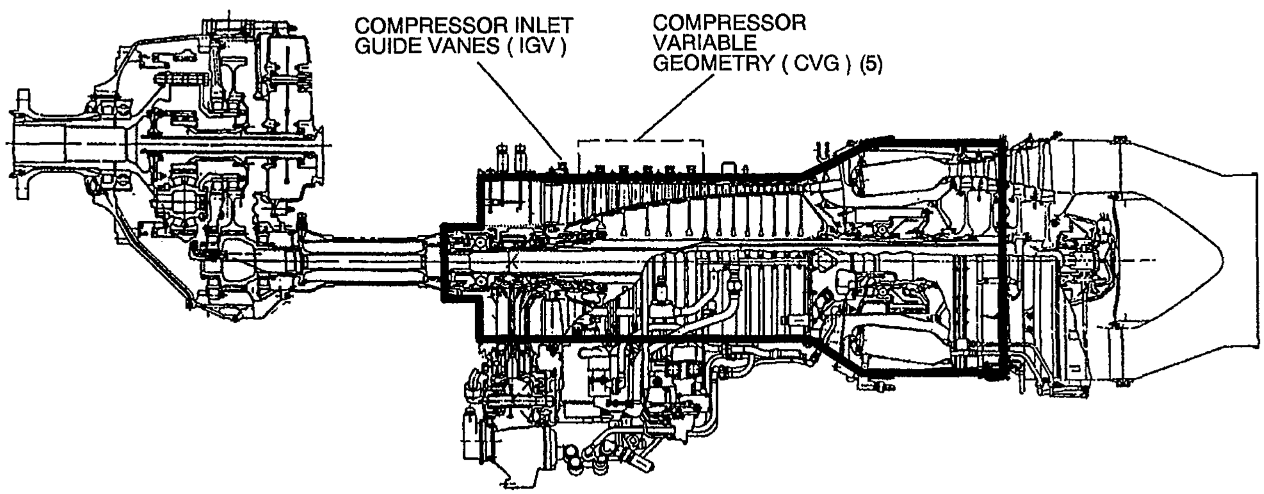


FIG. 3. Compressor – diffuser – combuster – gas generator turbine.

B4390

Components

- 14 stage compressor
- 2 start bleed valves (10 stage)
- 1 acceleration bleed valve (14 stage)
- 6 variable vane rows
- Annular type combustor
- 16 fuel nozzles
- 2 igniters
- 2 stage turbine.

Functions

- Axial flow
- Pressure ratio 16.6:1
- Mass flow 36 lbs/sec
- Ng range 70 – 103 %
- Counter- clockwise rotation
- IGV and CVG are moved and controlled by an electronic – hydraulic – mechanical system (FADEC – FPMU – turnbuckles) to provide maximum engine performance over a wide range of engine speeds
- The gas generator turbine drives the compressor.

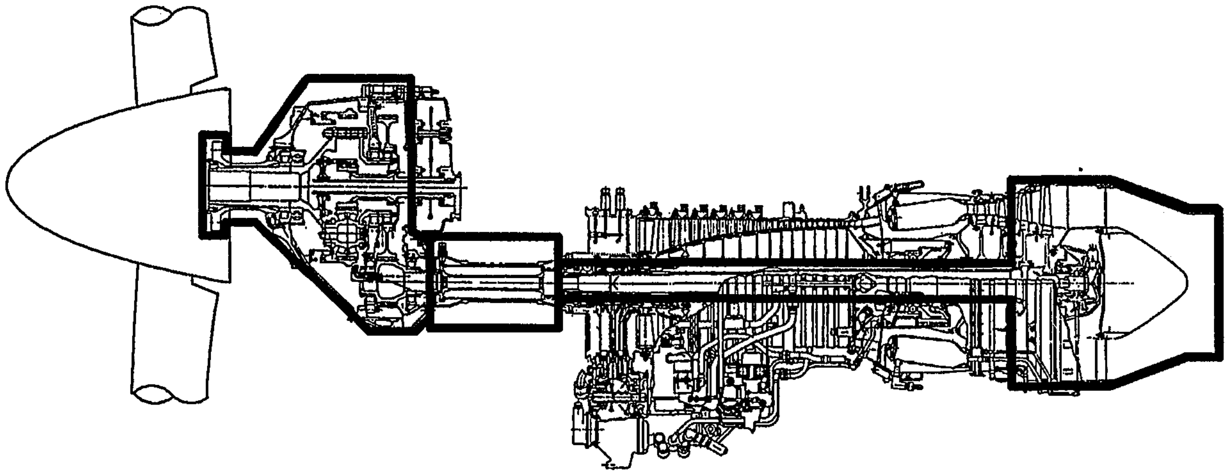


FIG. 4. Power turbine – torque meter – PGB (Propeller Gear Box).

Components

- 2 stage turbine
- Torquemeter with angular deflection.

Function

- PGB overall reduction ratio is13.98:1
- The power turbine drives the propeller via the torquemeter and the PGB.

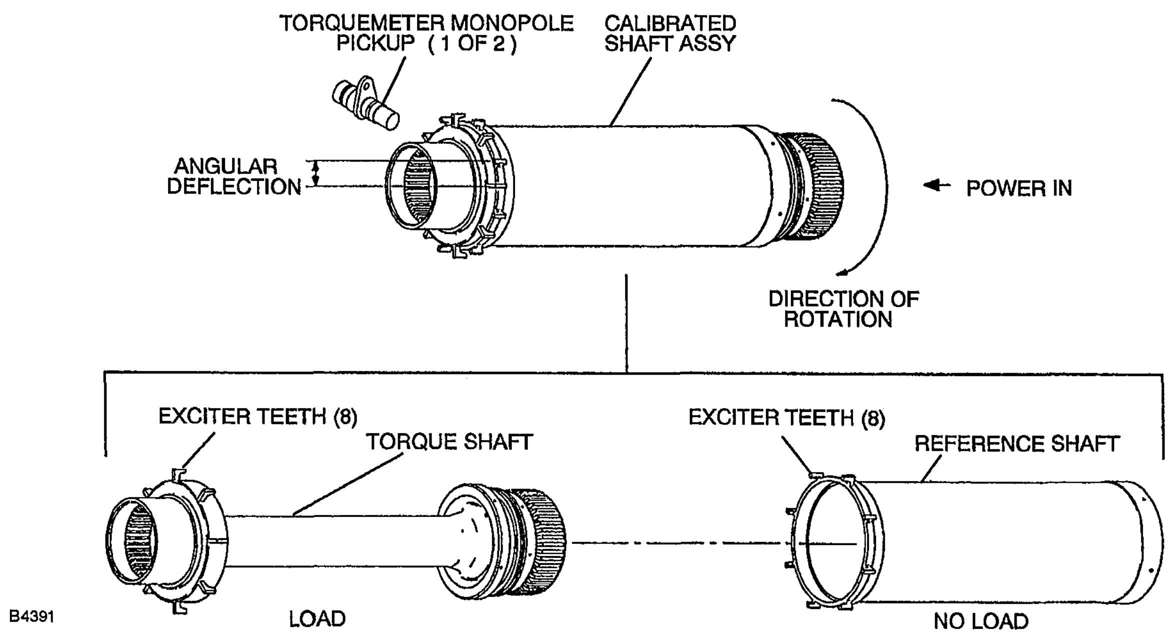


FIG. 5. Torquemeter operating theory.

- The torquemeter transmits power to the PGB. It consists of a torque shaft (inner) and a reference shaft which is pinned to the torque shaft. The torque is measured by two pickups noting the twist.

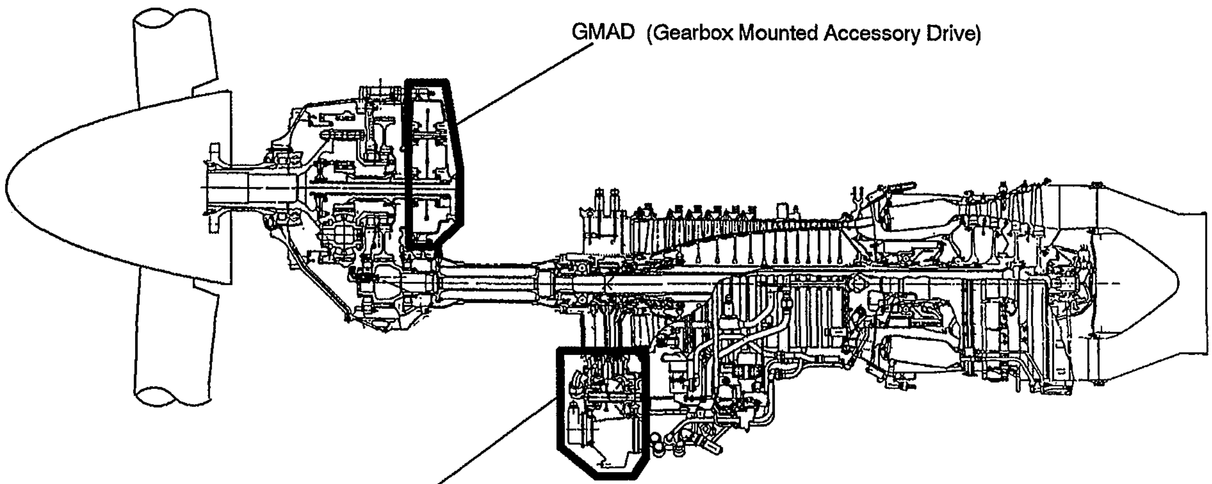


FIG. 6. Accessory drives (2).

B4409

GMAD Components

- AC generator
- Engine driven hydraulic pump (EHP)
- PGB oil pump
- Prop high pressure pump and overspeed governor
- Prop pitch control unit (PCU), (mounting only, does not rotate).

PMAD Components

- Fuel pump and metering unit (FPMU)
- Power unit oil pump
- Engine starter
- Permanent magnetic alternator (PMA).

2. IGNITION.

Components

- Permanent Magnet Alternator (PMA) (1)
- Exciters (2)
- Ignition leads (2)
- Igniters (2) on top and bottom of combustor.

The ignition is controlled by the FADEC and is a redundant system with two components of each, except the PMA, which is electrically redundant. The FADEC senses NG rate and ITT to detect an engine flameout and initiates an **autoignition**, until a successful restart is accomplished. If NG falls below 56% during the flameout event, the autoignition is deactivated.

L and R IGN switches

OFF – Ignition is off.
NORM – Ignition comes on during start.
– Autoignition armed.
CONT – Ignition is on continuously.

START switch (L/R)

- Three–position toggle switch.
- Signals FADEC to initiate engine start, with CL in START or RUN position.
- Signals FADEC to initiate motoring, with CL in FUEL OFF.

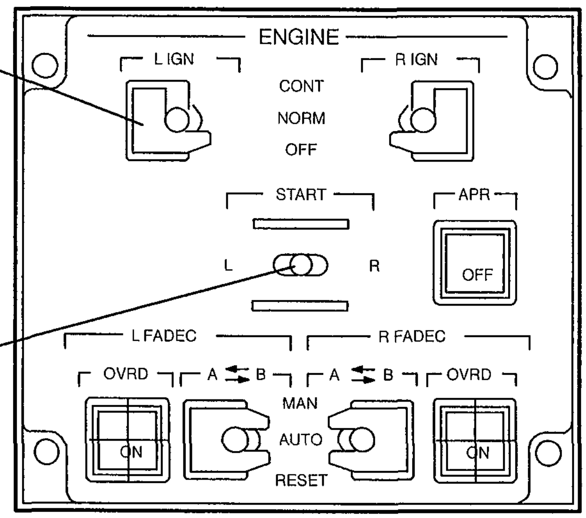


FIG. 7. Engine panel.

B4308

3. STARTING.

3.1. Air starter.

The starter is an air–turbine, mounted on the PMAD. Start air is provided by APU bleed, or by engine bleed. Left and right side bleed systems are connected via a cross valve. A FADEC controlled start valve is sequenced on and off, to start/stop air flow and to regulate air pressure.

3.2. Starting air.

The valves in the pneumatic system are automatically controlled during the starting sequence to direct airflow to the engine that is started; however, the cross-valve (XVLV) must be manually opened during a cross bleed start.

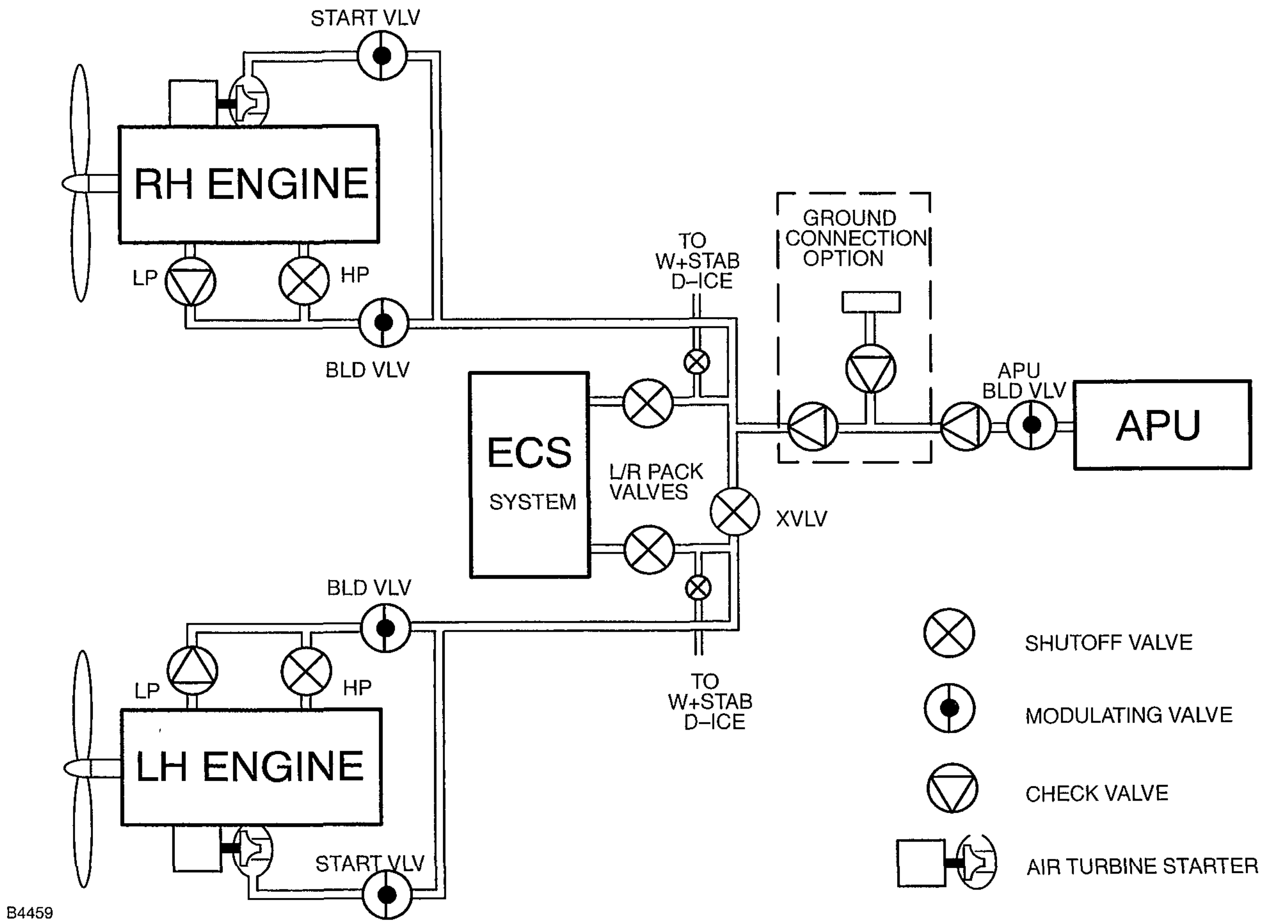


FIG. 8. Starting air.

START CONTROL

The FADECs provide automatic sequencing and control during engine starting. This involves control of the starter, ignition, fuel, and propeller systems. The starter air control valve and ignition exciters are sequenced on and off. There is an automatic motoring sequence before fuel is injected. With the CL in START or RUN and after the START switch is acticated momentarily, the fuel is injected at a specified NG and time schedule. This also apply for air restart. During windmilling restart there is no automatic motoring sequence. The fuel shutoff valve is opened automatically and the fuel metering valve positioned to regulate fuel flow, and the CVG control valve operated to position the CVG, to control NG to complete the acceleration to the required engine power level. The propeller blade angle is controlled in relation to the PL and CL positions.

On ground (not when airborne) the FADECs will automatically shut down the engine, during start after 90 seconds, in case of a hung start. There will be an automatic shut down if there is no "light–off" (ITT rise) within a specified time schedule after fuel is injected. This apply both during start on ground and air restart.

Automatic APU start–up is provided in case of an inflight engine flameout or shut down, single or dual.

Engine start can also be accomplished by windmilling. See MALFUNCTION PROCEDURES.

10 th stage bleed valves (2), bleed off compressed air during engine start to give surge–free acceleration to idle rpm. The valves are controlled by the 14 th stage acceleration bleed valve (1).

4. ENGINE AND PROPELLER OIL.

A single oil system provides pressurized oil for lubrication and propeller pitch control.

The primary lubrication system supplies regulated oil pressure, filtering and cooling, dry sump scavenge, and low pressure venting. A single self–contained oil system supplies clean pressurized oil at the proper temperature to cool and lubricate the bearings, splines, seals, shafts and gear meshes in the power unit, propeller gearbox, and accessories associated with propeller control. The major components of the lubrication system and their functions are described in the paragraphs that follow.

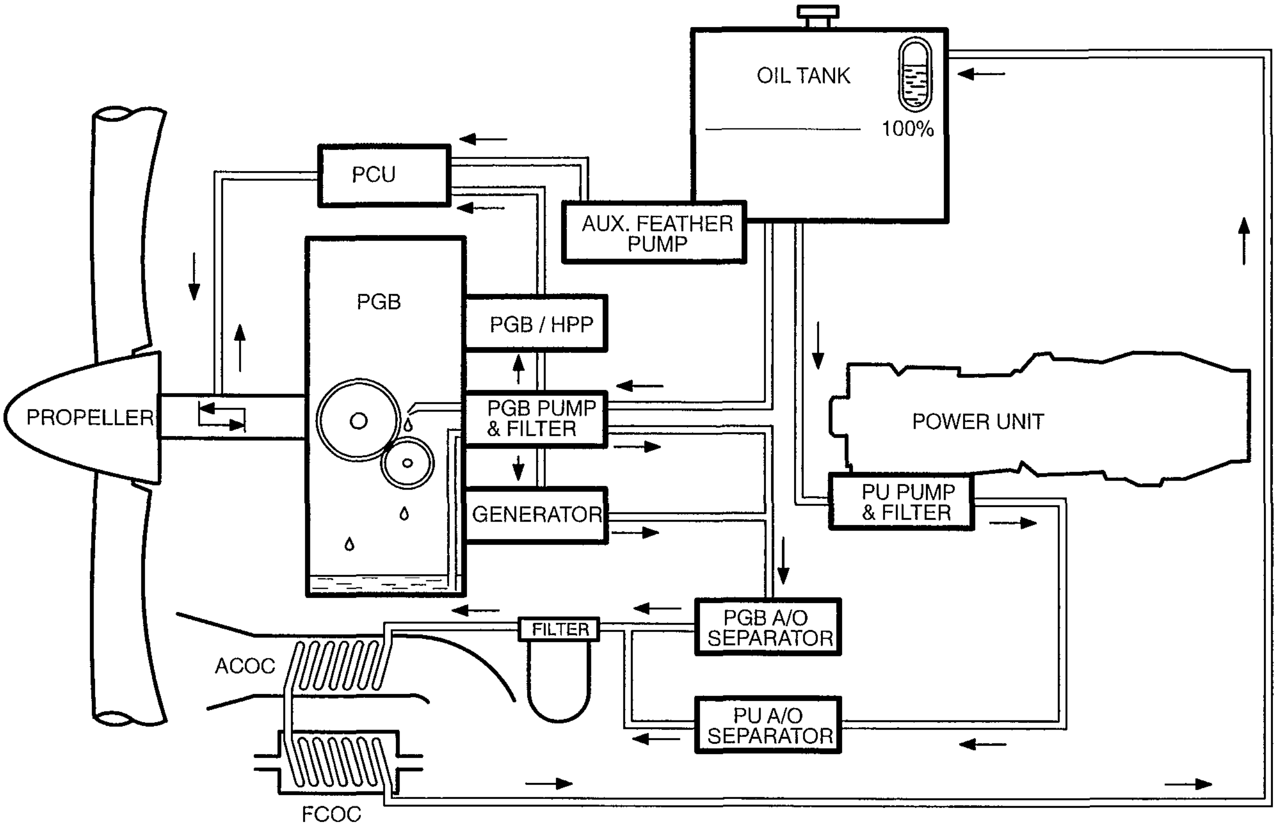


FIG. 9. Oil system.

B4726

Main components:

Oil tank (1):
- 26 liters of which 3 liters are provided for the auxiliary feather pump
- Oil level sight gauge
- Oil level and temp set on EICAS.

Power unit pump (1):

- Provides pressurized oil for lubrication of the power unit and PMAD
- Collects and pumps oil back to tank.

PGB pump (1):

- Provides pressurized oil to PGB, GMAD and to PGB/HPP.

PGB/HPP (PGB High Pressure Pump) (1):

- Provides pressurized oil to PCU and overspeed governor (OSG)
- Provides pressurized oil to GMAD and PGB.

Filters (3):
- Mechanical and electrical (EICAS) bypass indication.

A/O (Air–Oil) separators (2):
- Provide air–free oil.

ACOC (Air Cooled Oil Cooler):

- Located in nacelle lower cowl
- Cools also hydraulic oil.

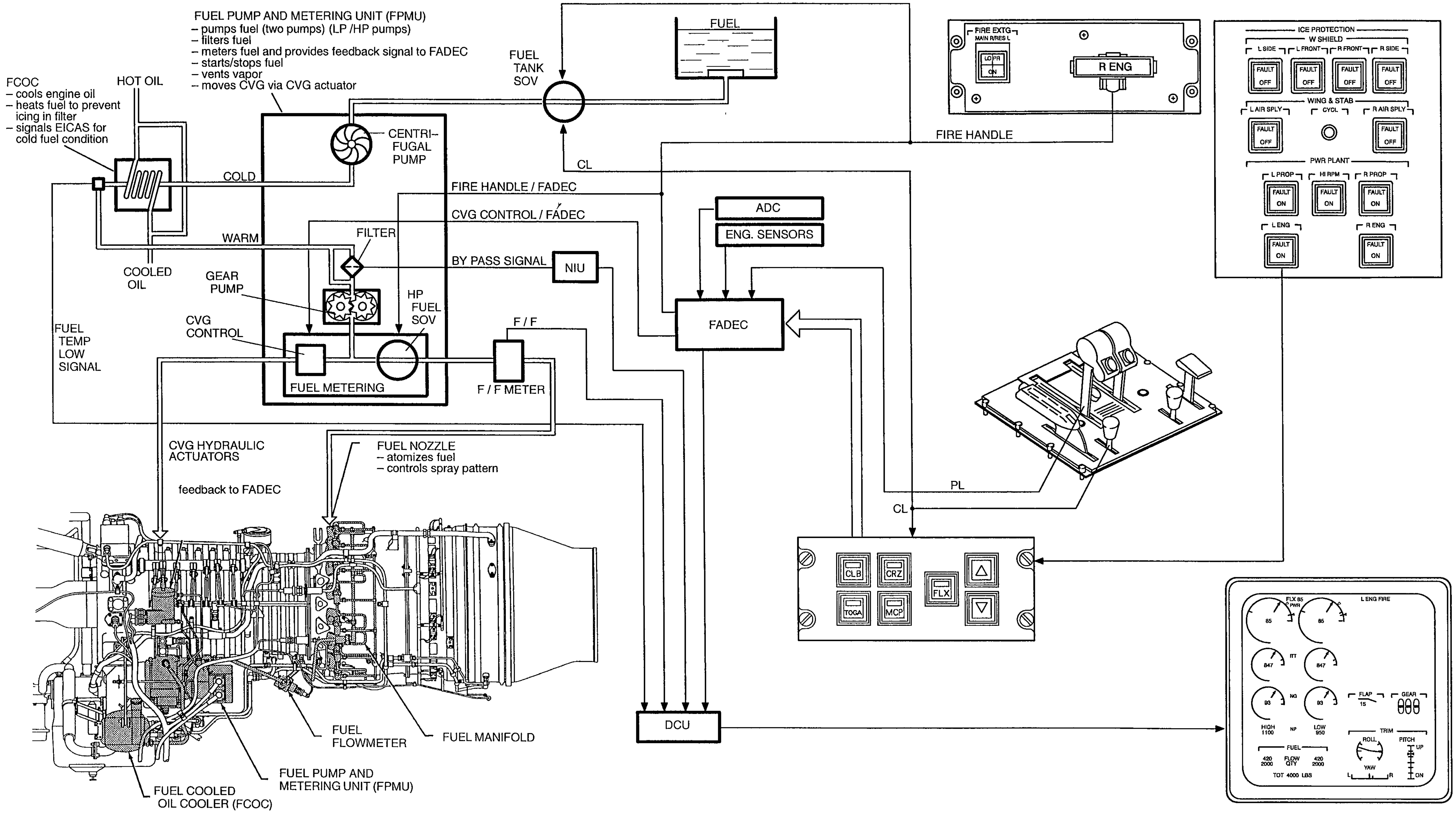
FCOC (Fuel Cooled Oil Cooler):

- Located at PMAD
- Oil cooler and fuel heater functions.

PCU:

- See ”Propeller Control System”.

5. ENGINE FUEL.



B4268

FIG. 10. Engine fuel.

6. ENGINE CONTROL.

General

The control system is a dual channel, fully redundant electronic control system. It is based on two identical, single-channel, Full Authority Digital Electronic Control units (FADECs A and B). The FADECs interface with the engine and propeller systems, the power levers (PL), the condition levers (CL) and the PMU.

The FADECs:

- Monitor engine and propeller parameters.
- Give data & status/cautions/warnings to EICAS.
- Control and regulate fuel flow, compressor variable geometry (CVG), ignition and starter, and propeller blade angle ("pitch").

The FADECs are powered from an engine-driven PMA and from the 28 V DC battery bus (redundant power).

During operation, both FADECs are operating: one is in control, the other is on standby ("Standby FADEC"). Which FADEC is in control – FADEC A or FADEC B – is determined in any one of the following ways:

- Automatic change-over at engine start on ground.
- Automatic change-over if the controlling FADEC fails.
- Manual change-over by pilot (prevented if FADEC failure is detected).

The FADECs have a continuous Built-In-Test (BIT) and fault accommodation system, which monitors;

- FADEC hardware and software
- Input sensors
- Actuators
- Data busses
- Engine-driven PMA.

The BIT runs at electric power-up, during operation, and also after engine shutdown.

If a fault is detected, the fault accommodation logic will either:

- Prevent engine start-up.
- Use secondary sensor (if primary fails)
- Change FADEC
- Change to 28 V DC (if PMA fails)
- Change to Ng control (if both torque sensors fail)
- Use simultaneous operation of ON/OFF actuators by both FADECs

Each FADEC operates with its own primary dedicated sensors. Cross-communication between the FADECs permits the sharing of sensor data for various performance and fault accommodation purposes. For example, each FADEC senses Ng; if the controlling FADEC determines that its Ng sensor has failed it will use the sensor of the standby FADEC. Another example: There are 8 dedicated ITT thermocouplers for each FADEC, which gives a total of 16 thermocouplers. The average value of all 16 is normally used to increase accuracy. If one thermocouple fails, however, an average value of 8 (the other FADEC alone) will be used.

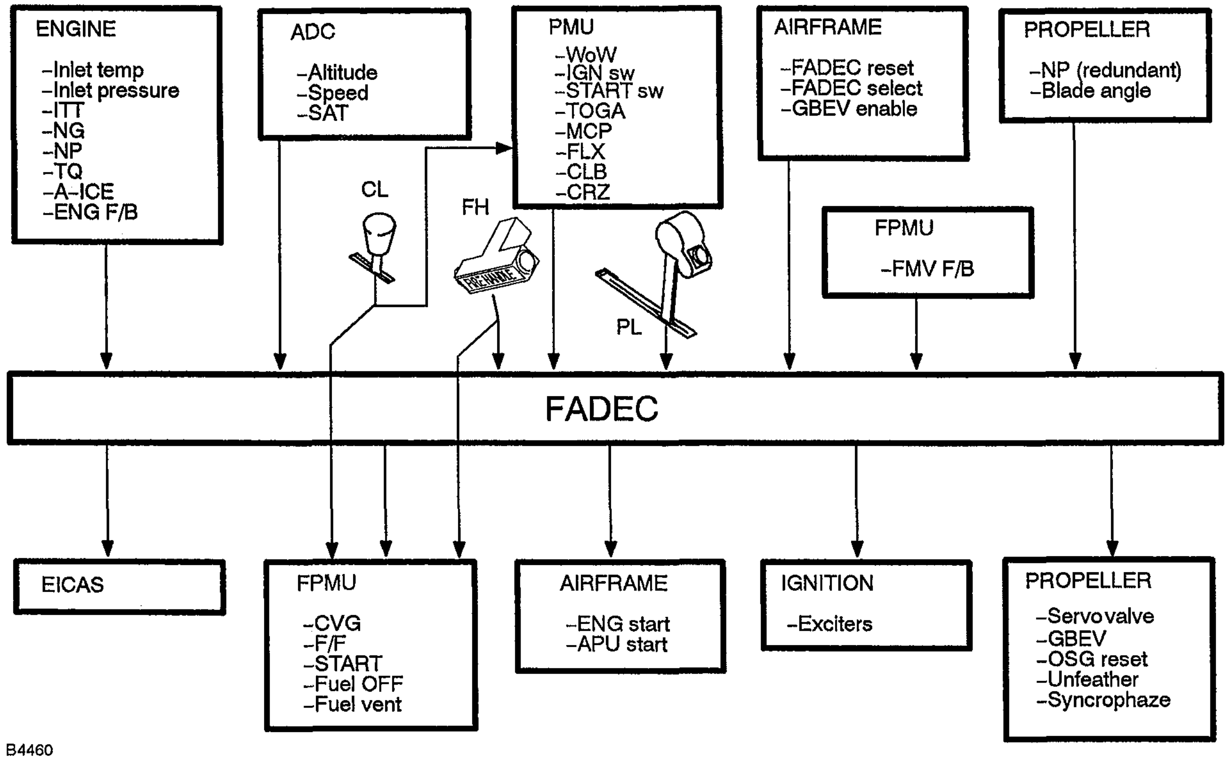


FIG. 11. Inputs and outputs.

Functions controlled by **FADEC** signals;

Propeller speed:

- Varying propeller pitch and/or fuel flow.

Thrust control:

- Sensing PLA, TQ (Power) and ADC.
- Varying propeller pitch and/or fuel flow.

Reverse thrust:

- Varying propeller pitch and fuel flow.

APR:

- Activates in TOGA or FLX mode only.
- Detect loss of power from an engine.
- Automatically increase power on the other engine by 11% of set power.

Autofeather:

- Independent function, if one engine fails, and the other engine operates normally.
- Detect loss of TQ or NG.
- Activation disables autofeather on the other engine.

Feather:

- CL signals to FADEC via PMU.
- Feathering is also provided by use of the manual feather button which bypasses FADEC to operate the auxiliary feather pump.

Starting:

- Automatic sequencing and control of starter, ignition, fuel, CVG, ITT and propeller.
- Automatic shutdown if start fails.

Ignition:

- Controls ignition in NORM/CONT modes.
- Monitors Ng and ITT for autoignition.

Synchrophazing:

- During all forward–thrust operations.
- Master propeller speed and phase transmittal to the other engine's FADECs.

Overtemp:

- Detects ITT limit.
- Cuts back fuel (not during start).

Overspeed:

- Protection for propeller, power turbine and gas generator.
- Backup/fault accommodation logic to reduce fuel flow if speed exceeds the setting of the prop governor.
- Fuel shutoff at hazardous overspeed of propeller, power turbine or gas generator.

Underspeed:

- Commands PCU to decrease blade angle.
- Overrides propeller speed and synchrophazing.
- Disabled with PL below FI.

Reversionary control:

- Backup control in case both TQ sensors fail
- Fuel scheduling based on NG.

7. PROPELLER CONTROL SYSTEM.

General

The system is a counterweighted two–oil line system, controlled by the PCU in response to signals from FADEC. Counterweights on the propeller blades induce a coarse pitch force. High pressure oil, provided by a high pressure oil pump (HPP), driven by the PGB, is utilized to amplify coarse pitch force or modulate blade angle towards fine pitch. The pitch change mechanism is contained in the propeller hub. There is a common oil system for engine lubrication, PGB lubrication and propeller pitch control. Oil is routed through a beta tube which, by forward and rear movements, directs oil on either side of a piston in the pitch change mechanism. The counterweights make the propeller "fail safe towards coarse" in case of loss of oil pressure.

PCU

The PCU consists of control valves, restrictors and a beta feed–back transducer. The PCU design is such that loss of electrical signals or loss of oil pressure, results in coarse pitch. In case the control mechanically sticks in a low fine position, control will revert to overspeed governor (OSG) control, during flightconditions.

High Pressure Pump and Overspeed Governor (HPP/OSG)

Normal propeller speed governing is electrically controlled. The OSG is a mechanical feature flyweight design, driven by the HPP. If an overspeed occurs the OSG will drain oil on the "fine pitch side" and allow the counterweights to pull the blades towards coarse.

Feathering pump

A manually operated feathering pump is provided:

- As a back–up feathering device, if feathering by use of CL fails.
- To ensure full feather position after an engine shut down by CL or after an autofeather activation.
- To enable propeller feathering when NP, and hence HPP speed, is too low to provide enough oil pressure.

Unfeathering valve

Provides a facility to unfeather the propeller for maintenance purposes only. It can only be used on the ground and with the propeller stationary.

Servo valve

This valve is the main control device within the system and is used in all control modes. The valve is designed such that in case of loss of oil pressure or FADEC drive signal, the counterweights will move the propeller towards coarse.

Ground Beta Enable Valve (GBEV).

The valve provides facility for:

- An hydraulic flight fine pitch stop preventing the propeller to go into beta in flight
- Isolation of the OSG during ground operation, preventing propeller hang–up at coarse pitch or reverse pitch at rapid power modulation, into reverse and out of reverse, respectively.

The valve operates by FADEC signals:
- PL below FI.
- (WoW or wheel spin–up or BETA OVRD) and blade angle < 18°.

Back–up feather valve

This valve allows the feathering pump to override the rest of the control system and, when operated by the manual feather button, drives the propeller to feathered position.

FADEC propeller control modes

General
The FADEC provides propeller speed governing by varying propeller blade angle (pitch/beta) and/or varying engine fuel flow. The propeller pitch is hydromechanically controlled by the PCU in response to signals from the FADEC. The FADEC controls engine fuel flow by providing signals to the FPMU. These signals are determined as the result of the FADEC correlation of inputs from the aircraft (PLA, CL, PMU, ADC and dedicated inputs from aircraft system sensors and transducers).

There are three control modes: Beta control, constant speed and reverse governing.

1 Beta control:
- Drives the propeller pitch requested by the PL.

2 Constant speed:
- Holds a fixed NP, as demanded by PMU or HI RPM p/b.
- Starts when PL above FI (on ground at approx. 40 PU, in the air at all times).
- Automatic synchrophazing.

3 Reverse governing:
- Drives the propeller to negative pitch.
- Stationary at max. reverse NP will be approx. 950. At intermediate reverse PL position, with forward speed NP will be approx 950 and then decrease to an intermediate value.

Drive Fine Function

On ground when the PLs are moved towards GI the drive fine function is triggered. This function drives the propeller blades hydraulically at a high rate towards the Hydraulic Flight Fine Pitch Stop (blade angle 11°) and further down to flat pitch (–2° beta) (if the Hydraulic Flight Fine Pitch Stop is removed) or the blade angle as requested by the PL position.

To trigger the drive fine function:
- PL < 20° PLA (between FI and GI).
- Blade angle to be below a specified value which is sensed by FADEC and which is dependent on NP and KIAS.
- WoW

Hydraulic Flight Fine Pitch Stop

To prevent unintentional selection of GI/REV blade angles in the air a hydraulic flight fine pitch stop is activated while airborne which prevents the propeller blade angle from getting below 11°.

To remove the Flight Fine Pitch Stop:
- PL < FI (35° PLA).
- Blade angle < 18°.
- WoW or wheel spin–up or BETA OVRD.

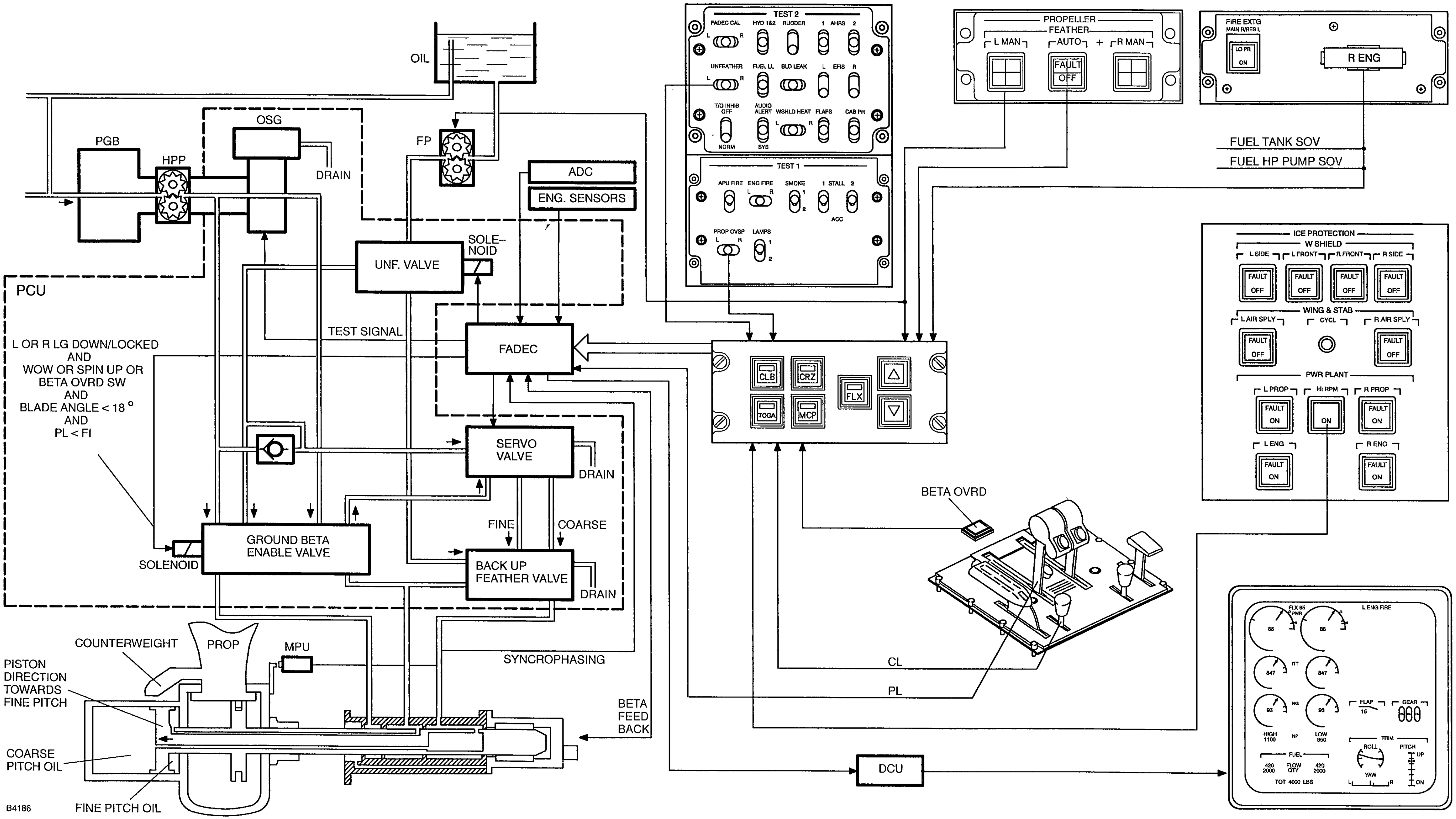


FIG. 12. Propeller control.

8. ENGINE AND PROPELLER SUBSYSTEMS.

8.1. Manual feathering.

The Condition Lever (CL) provides an input to the PMU for selecting propeller feathering. The position of the lever signals the FADEC, which in turn controls the propeller and fuel system.

A manually operated feathering pump is provided:

- As a back up feathering device, if feathering by use of CL fails.
- To ensure full feather position after an engine shut down by CL or after an autofeather activation.
- To enable propeller feathering when NP and hence HPP speed, is too low to provide enough oil pressure.

8.2. Automatic Power Reserve (APR

The FADECs automatically detect the loss of power from an engine during takeoff or go–around, and provide an automatic increase in power of the opposite engine. The increase in power is 11% of the set power.

Provided APR (p/b) Normal (black), the FADEC:

- Activates with PL above FI.
- Activates in TOGA and TOGA FLX modes only.
- Is latched, after activation, also if failed engine is restarted, until APR system is selected off.
- Is unlatched after activation, if power mode is changed.
- Can not be activated after once being unlatched.

APR FAULT will come on in PED if;

- When in TOGA or TOGA FLX mode FADEC determines that the APR function is unavailable.
- After an engine failure, if the system does not activate when it should.

8.3 Autofeather system

Provided AUTOFEATHER (p/b) is Normal (black) the FADEC automatically directs the propeller towards feather position if an engine failure is detected, and the opposite engine is operating normally.

If APR is selected OFF;

- MTOP is inhibited.
- CONFIG PWR will come on when PL advanced for takeoff

NOTE

The APR and Auto feather systems are using the same engine parameters for activation, however, the systems work independent of each other.

Two modes are using different sensing for failure detection;

HIGH mode (typical takeoff, climb and cruise) and;

LOW mode (typical approach and landing).

HIGH mode comes in above approx. 48 PU, and activates should actual PU become below approx. 74% of selected power (PLA).

LOW mode comes in below approx. 45 PU and uses NG, and activates if NG drops to below 69%, and is also acting as a backup to the high mode.

LOW mode gives a slightly longer time until activation, due to NG spool down time.

The systems use no comparison parameters between the engines, however, an autofeather activation disables autofeather on the other engine.

APR/Autofeather are FADEC functions. Should these functions fail during normal operation cautions will come on in PED and ENG MAINT will come on in STAT SED.

AUTOFEATHER INOP will come on in PED if;

- AUTOFEATHER p/b is selected to OFF or FADEC determines that the autofeather function is unavailable.
- After an engine failure, if the system does not activate when it should.

When APR is selected OFF this is indicated as APR OFF in STAT SED.

9. CONTROLS AND INDICATORS.

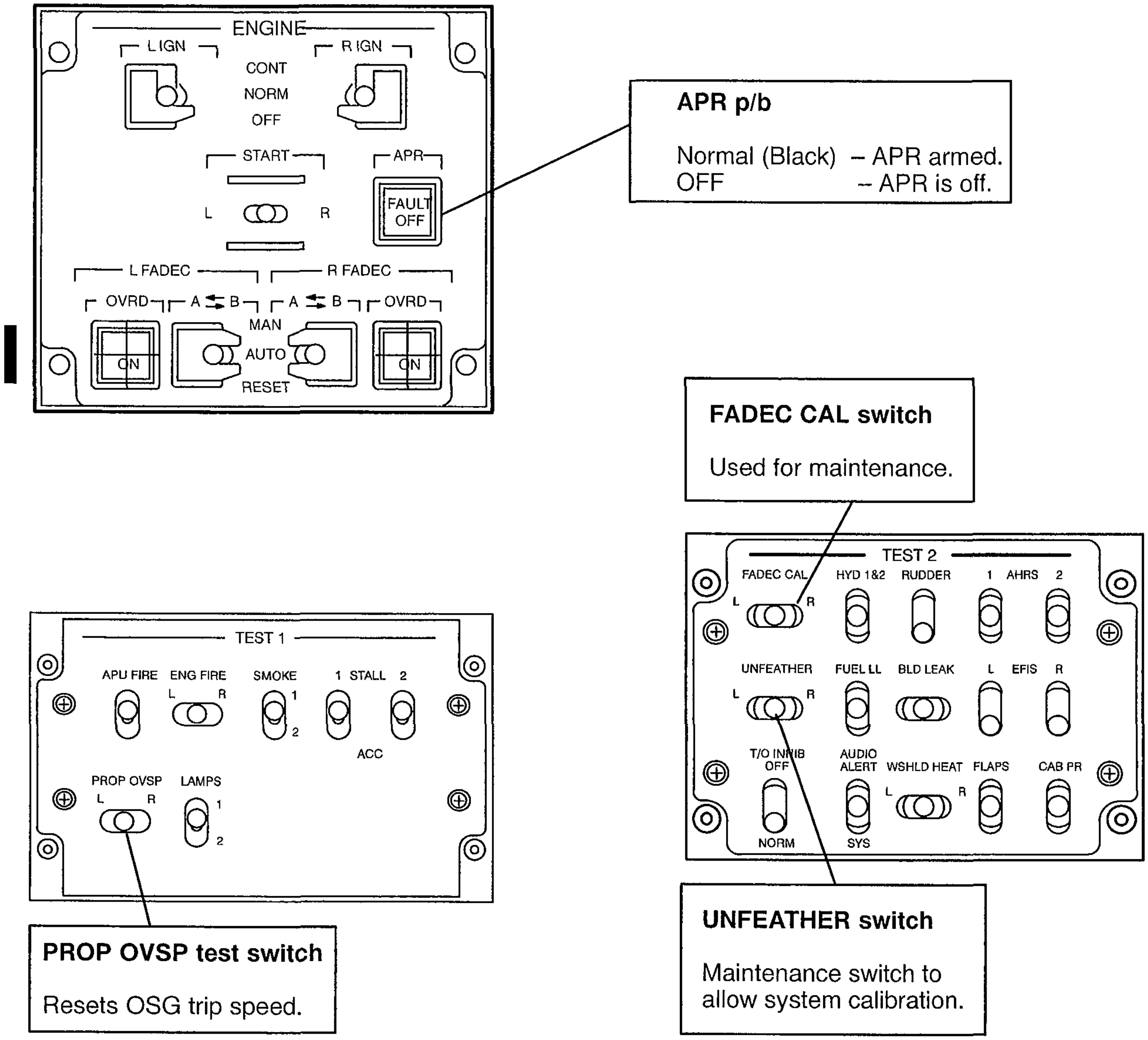


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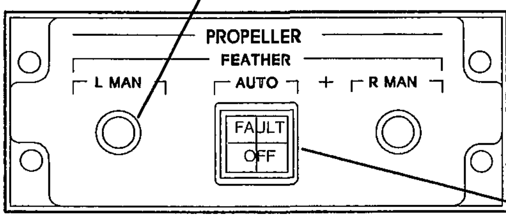
FIG. 13. Subsystem – APR.

MANUAL FEATHER p/b

IN – feather pump starts.
– signals FADEC to set FI and to feather prop.

OUT– pump stops.
– FADEC manual feather signals stop.

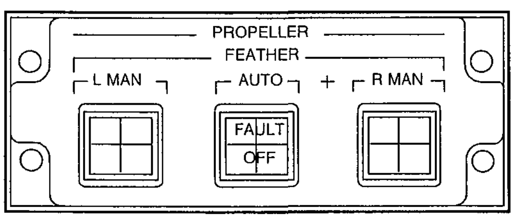


AUTOFEATHER p/b

Normal (Black) – autofeather armed.

OFF – autofeather off.

Panel without Mod No 5874 and with Mod No 5890 (guard) and 5891 (fault indication) installed



Panel with Mod No 5874, 5890 (guard) and 5891 (fault indication) installed

B11748

FIG. 14. Subsystem – Feathering.

Power/Condition Levers/Beta Override

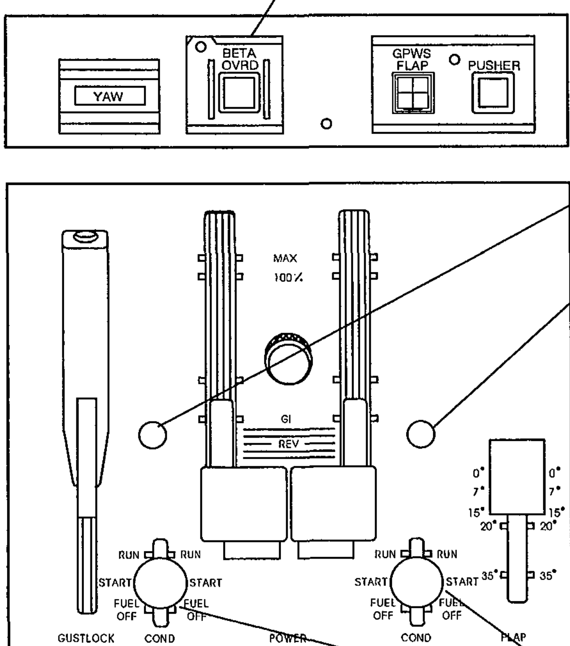
BETA OVRD p/b

Normal (black)
ON (white)
– AOG signals to FADECs to override WoW and wheel spin–up function, when LG is down and locked.
– Sets BETA OVRD ON on SED .

FAULT (amber)
– In flight immediately if p/b is ON (with LDG up and locked).
– On ground after 60 s if p/b is ON.
– Sets BETA OVRD ON (amber) on PED.

Condition Lever release (p/b) (2)

UP	CL is locked in RUN
DOWN	CL is released



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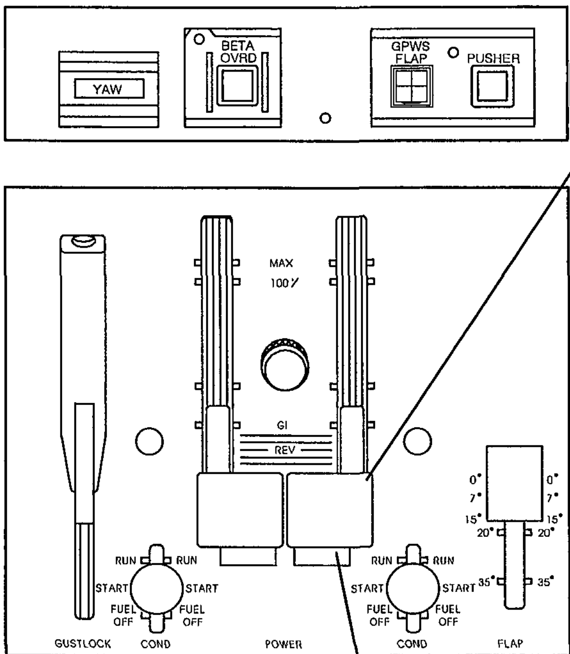
Condition Lever (CL) (2)

CLA	Pos	Functions
60°	RUN	Forward and reverse power.
45°		Unfeathering of propeller.
30°	START	Engine start with propeller feathered.
15°		Starting system arms. DC tank fuel pump starts.
0°	FUEL OFF	Fuel tank SOV and HP SOV close.

FIG. 15. Cockpit controls.

Power Levers



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Power Lever (PL) (2)

- Provides electrical inputs to FADEC.
- PLA determines the amount of power units (PU) for a selected PMU–mode.
- Provides inputs for propeller speed control.
- Provides inputs for reverse power by varying blade angle.
- Modulates power when manipulated below 100% position.

ON GROUND and IN FLIGHT:
- PLA 35° – 85°; NP is governed either to 950 or 1100.
- PLA 80° (Pos 100%) – gives 100% of rated power for that actual Power Mode which is selected.
- PLA >80° gives MTOP (APR normal (black)).
- PLA >80° gives NTOP (APR OFF).

ON GROUND:
- In PLA 33° – 16°, beta is varied to provide thrust modulation for taxi, and NP is controlled by FADEC and governed to 770, when reached.
- In PLA 16° – 0° reverse power is applied and NP is controlled to approx. 950.

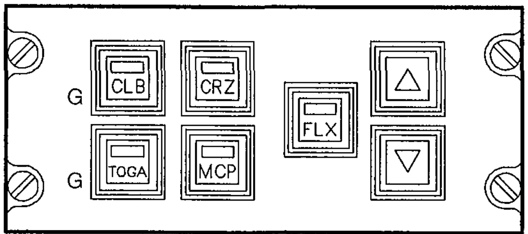
Palm switch (2)

- Selects TOGA–mode when depressed.
- Sets MAX bug at NTOP.

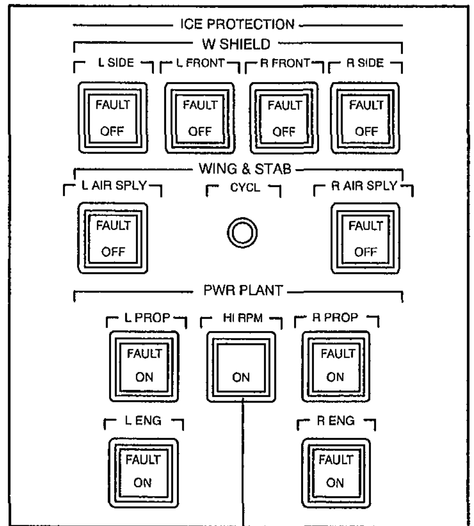
NOTE
For all modes except TOGA;
- Advancing only one PL > PLA 80° sets ENG PWR MODE FAULT and PMU p/b light disappears. Any mode can be reselected with both PLs < PLA 80°.

PLA	Pos	Power Ranges	
85°	MAX	MTOP	
80°	100%	NTOP	FLIGHT
		MCP	
		Max CLB	
		Max CRZ	
35°	FI		
33°			BETA / GROUND OPERATION ONLY
16° GI			REV
0°	Max. reverse		

FIG. 16. Cockpit controls.

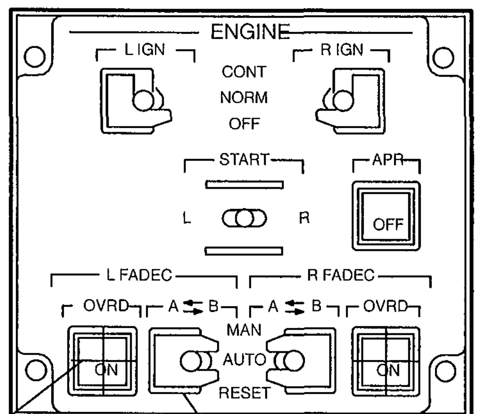


Power Management Unit (PMU)	
Power mode p/b (green) (5) – Sets MAX bug to max power for selected modes and environmental conditions (ADC).	
Modes	Functions
TOGA	– 1100 PRPM – NTOP at PLA 80°
MCP	– 1100 PRPM – Max cont power at PLA 80°
CLB	– 950 PRPM – Max climb power at PLA 80°
CRZ	– 950 PRPM – Max cruise power at PLA 80°
FLX	– 1100 / 950 PRPM depending on selected mode. – TOGA 91 (91% of rated NTOP). – CLB 95 (95% of max climb power). – CRZ 88 (88% of max cruise power).
Δ	– 1% PU increase / push.
∇	– 5% PU decrease / push. – Automatic FLX–power setting at PLA 80° (100%) position).



HI RPM p/b

Normal (black)
ON – Propeller speed increases from 950 to 1100 PRPM in CLB and CRZ modes.



L/R FADEC OVRD p/b (guarded)

Normal (black)
ON – Manual selection of FADEC reversionary mode.
– Simplifies engine control logic. Schedules fuel flow based on corrected NG instead of torque.
– L/R ENG MAN MODE is indicated on the PED.

L/R FADEC A ⇄ B switches

MAN – Manual transfer between A and B

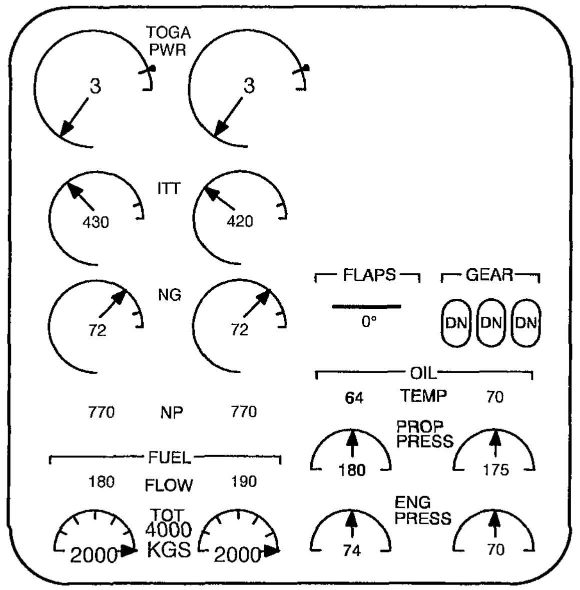
AUTO – Automatic transfer between A and B at ground start, and at FADEC malfunction.

RESET – Simultaneously clears FADEC A and B fault indication.

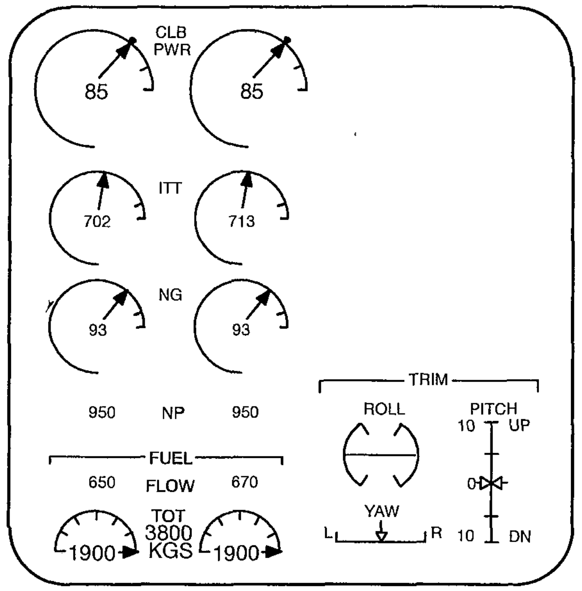
NOTE
Automatic or manual FADEC transfer will cause small momentary power changes.

B4525

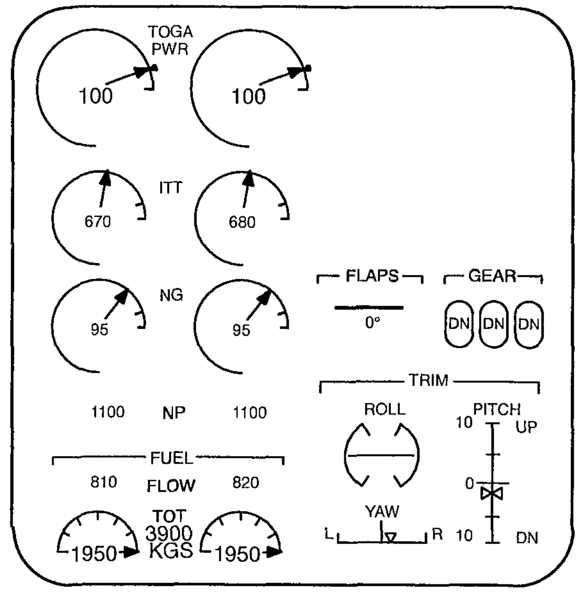
FIG. 17. Cockpit Control.



PED (After engine start – typical)



PED (Climb – typical)



PED (Takeoff – typical)

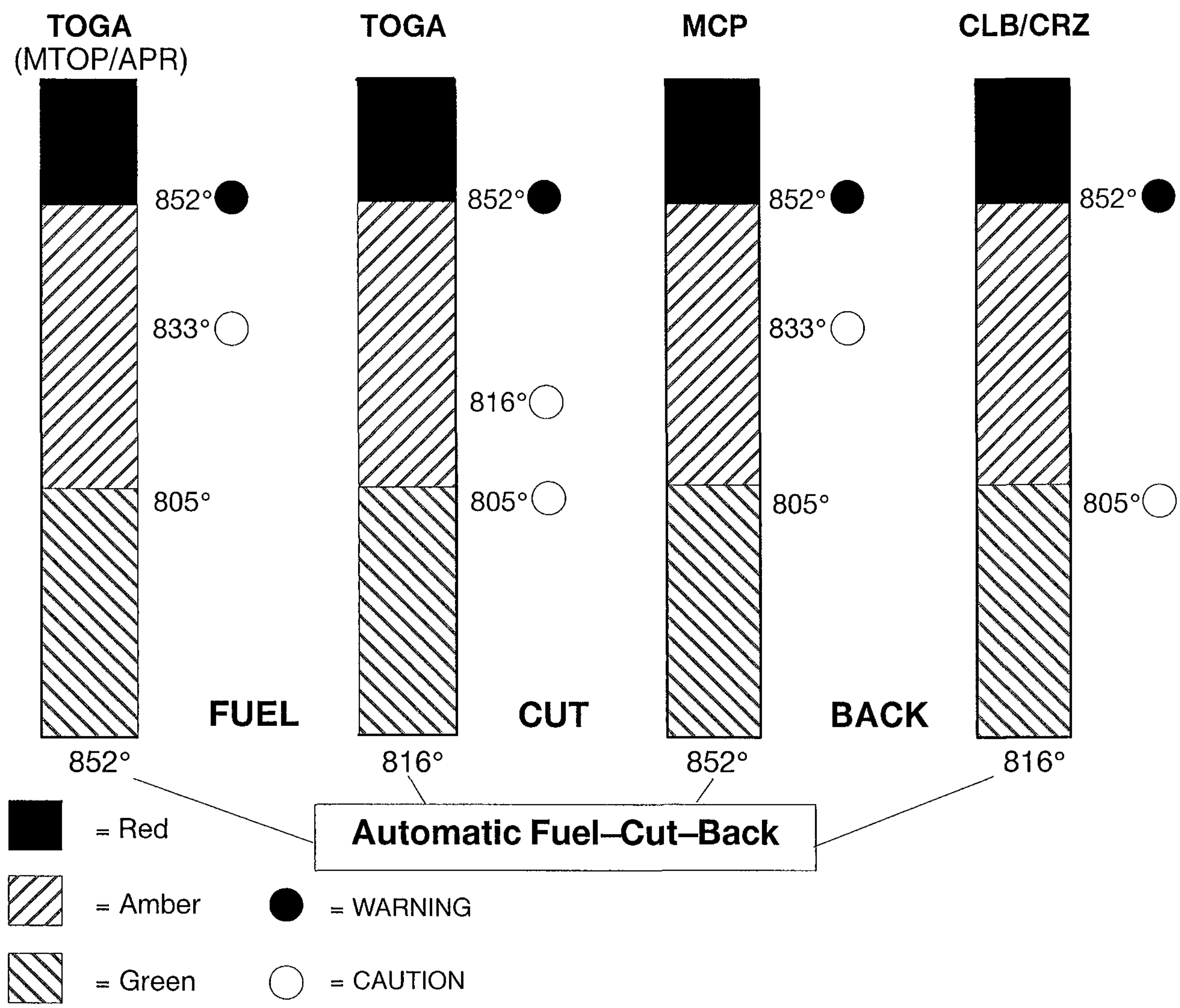
B10210

Indication ranges

	PWR	ITT	NG	NP
GREEN	0 – 100	See fig. 18.	0 –101	0 – 1110
AMBER	101 – 112		NA	1111 – 1165
RED	≥ 113		≥ 102	≥ 1166

	OIL				
	TEMP	ENG PRESS	PROP PRESS vs NP		
			≤ 750	>750 <945	≥ 945
LOWER RED	NA	0 –35	≤ 15	≤ 110	≤ 110
LOWER AMBER	≤ 44	36 –40	NA	NA	111 – 170
GREEN	45 – 88	41 – 89	16 – 209	111 – 209	171 – 209
UPPER AMBER	89 – 92	≥ 90	≥ 210	≥ 210	≥ 210
UPPER RED	≥ 93				

FIG. 18. Engine Indications – typical.



- Maximum ITT during engine start; 816°C. CAUTION at 816°C only in TOGA.
- TOGA (MTOP/APR) will give CAUTION at 833°C after 10 minutes.
- TOGA will give CAUTION at 805°C after 10 min.
- WARNING will always be provided at 852°C.
- Color of display; – green to 805°C and amber to 852°C for all power modes.

FIG. 19. EICAS ITT indication ranges and logic versus power modes.

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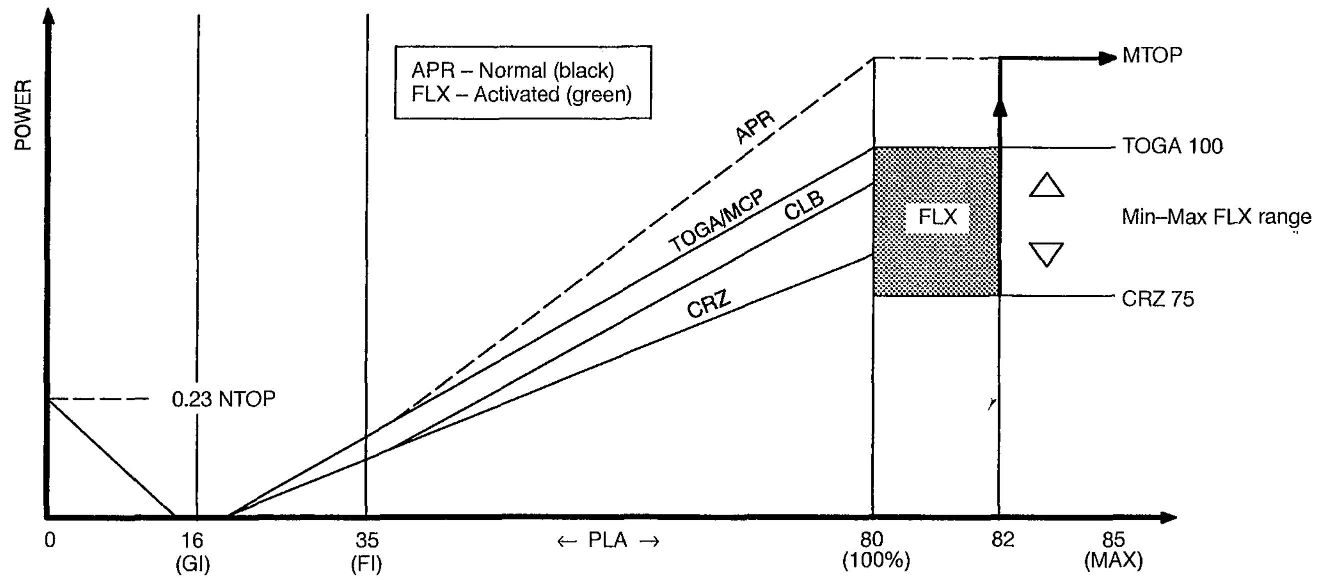
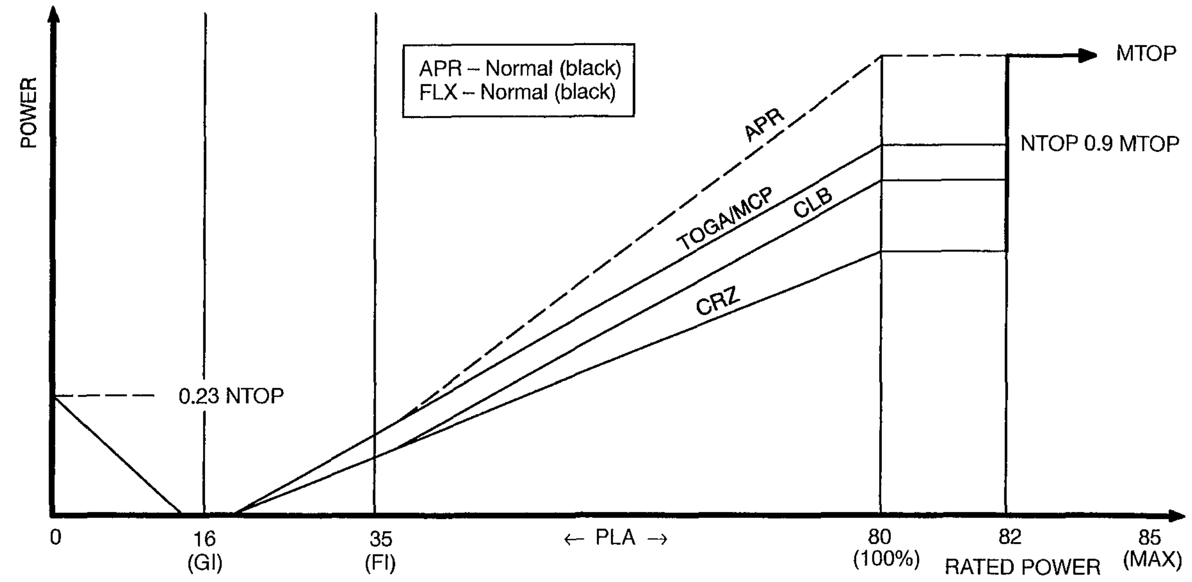
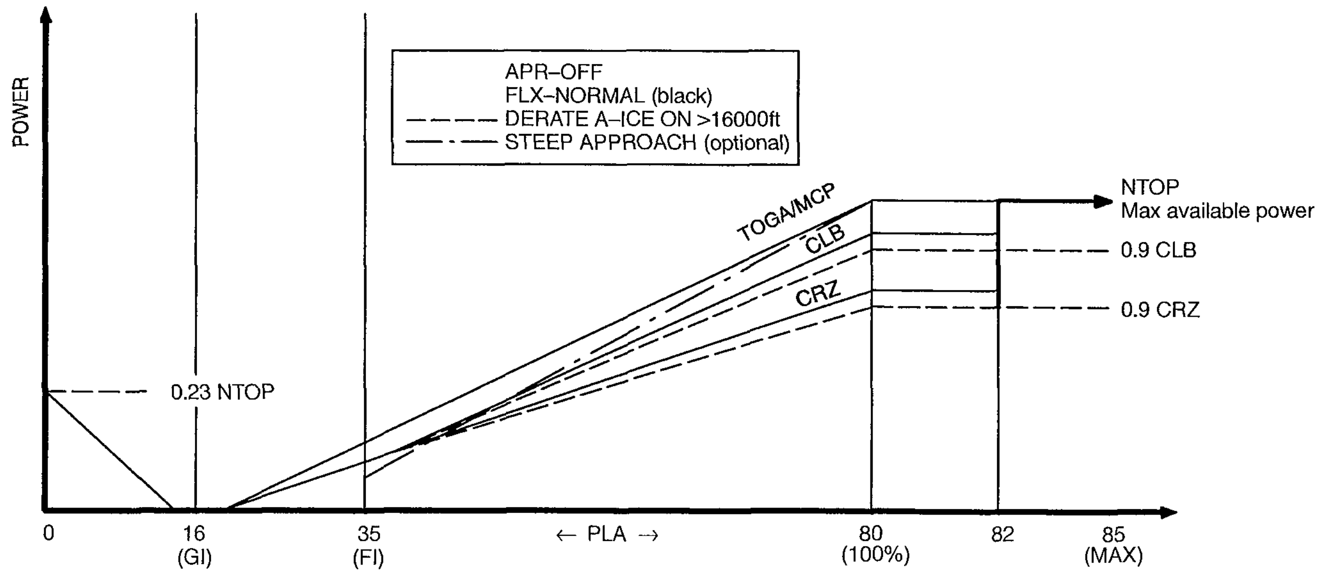


Power schedule

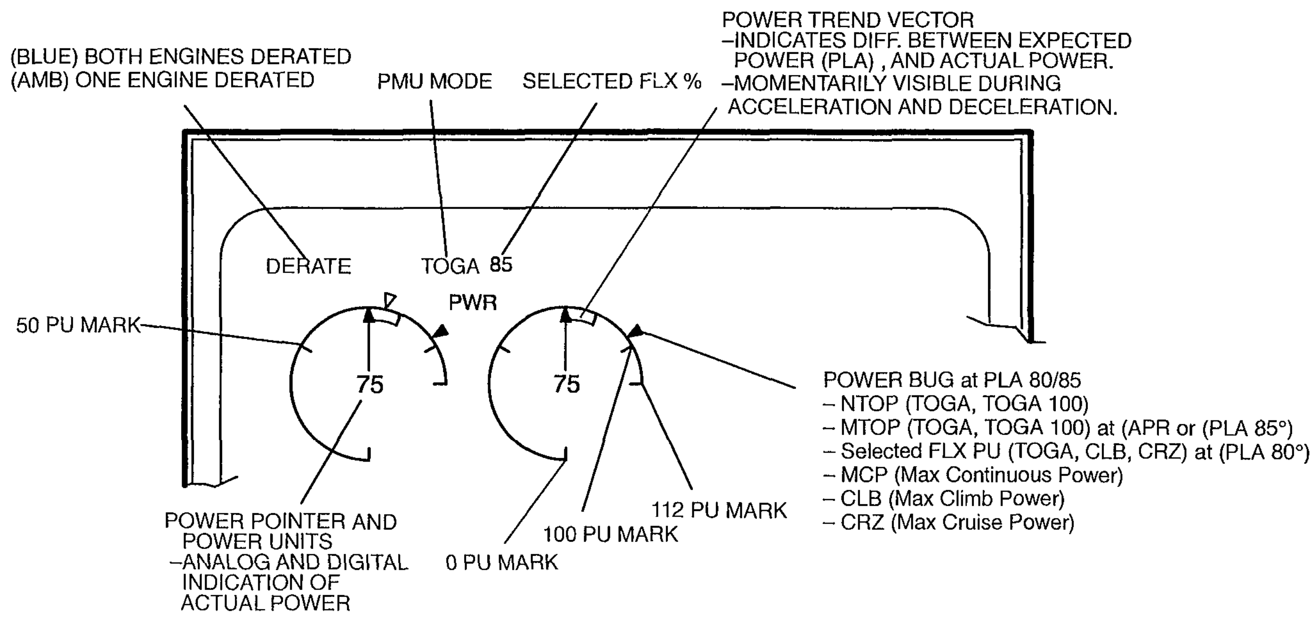


Power schedule



B10051

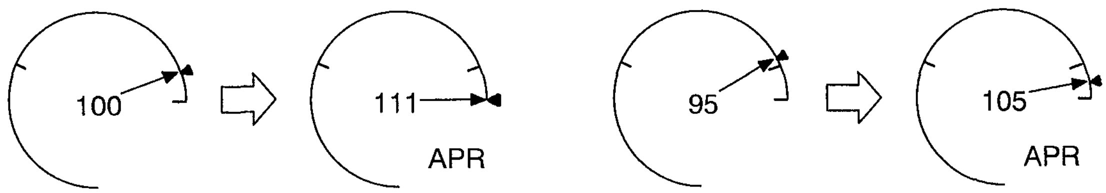
Power schedule



Power indication

NOTE
The CLB/CRZ DERATE A–ICE ON lines give only a rough picture of the derate power curves.

FIG. 20. Power schedule and Power indication.



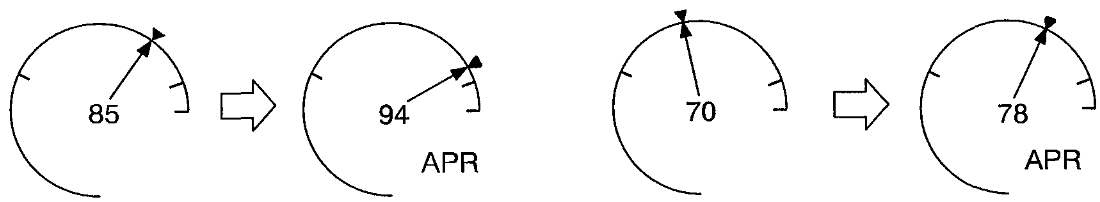
TOGA
–NTOP
–RATED NORMAL POWER INSIDE FLAT RANGE
–PLA 80°

TOGA
–APR ACTIVATION
–111% OF NTOP
–RATED MAX PWR INSIDE FLAT RANGE
–PLA 80°

TOGA
–NTOP
–RATED NORMAL PWR OUTSIDE FLAT RANGE
–PLA 80°

TOGA
–APR ACTIVATION
–111% OF NTOP
–PLA 80°

TOGA and APR indication.



TOGA 85
–85% OF NTOP (85% OF RATED PWR INSIDE FLAT RANGE)
–PLA 80°

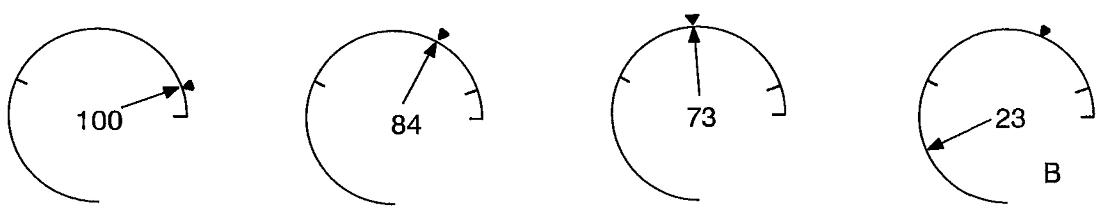
TOGA 85
–APR ACTIVATION
–111% OF SET PWR
–PLA 80°

TOGA 85
–85% OF NTOP (85% OF RATED PWR OUTSIDE FLAT RANGE)
–PLA 80°

NOTE: THIS EX. NTOP 82 PWR UNITS

TOGA 85
–APR ACTIVATION
–111% OF SET PWR
–PLA 80°

FLX and APR indication.



MCP
–100 PWR UNITS INSIDE FLAT RANGE
–DECREASES DURING CLIMB
–PLA 80°

CLB
–84 PWR UNITS INSIDE FLAT RANGE
–DECREASES DURING CLIMB
–PLA 80°

CRZ
–73 PWR UNITS INSIDE FLAT RANGE
–DECREASES WITH IN–CREASED ALTITUDE
–PLA 80°

REV PWR
–MAX BUG POSITION DEPENDENT ON PWR MODE

B (BETA)
–INDICATES THAT THE PROPELLER IS IN BETA MODE
–PLA<16 °

B4355

MCP–, CLB–, CRZ–, REV indication.

FIG. 21. Power Mode indication.

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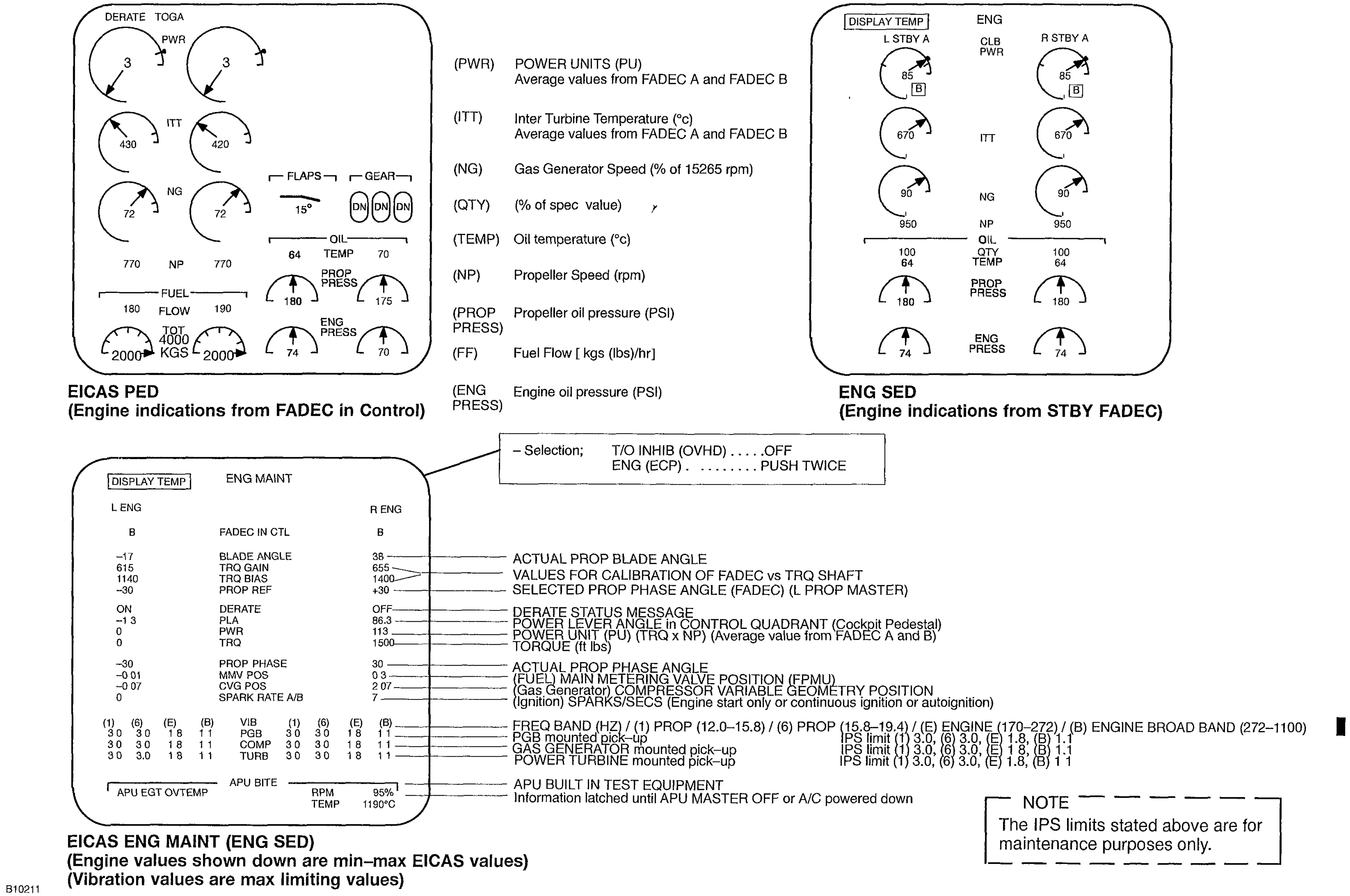


NOTE
The IPS limits stated above are for maintenance purposes only.

FIG. 22. EICAS Display.

10. ELECTRICAL POWER SUPPLY.

Engine starting

			— ENG —
L eng	L BAT BUS	J–12	L START
R eng	R BAT BUS	R–9	R START

Engine control

			— ENG —
PMU ch A	L BAT BUS	J–17	PMU A
PMU ch B	R BAT BUS	R–14	PMU B
L eng FADEC A	L BAT BUS	J–16	L FADEC PWR A
L eng FADEC B	R BAT BUS	R–13	L FADEC PWR B
R eng FADEC A	L BAT BUS	J–15	R FADEC PWR A
R eng FADEC B	R BAT BUS	R–12	R FADEC PWR B

Propeller control

			— PROPELLER —
L feather pump	L BAT BUS	K–15	L PUMP
R feather pump	R BAT BUS	S–10	R PUMP
L /R manual feather ch A	L BAT BUS	K–17	MAN–F A
L /R manual feather ch B	R BAT BUS	S–12	MAN–F A
L /R beta enable ch A	L BAT BUS	K–14	BETA A
L /R beta enable ch B	R BAT BUS	S–9	BETA B
L /R ovsp test ch A	L BAT BUS	K–16	OVSP TEST A
L /R ovsp test ch B	R BAT BUS	S–11	OVSP TEST B
L maint. manual unfeather	L BAT BUS	K–18	L UNF TEST
R maint. manual unfeather	R BAT BUS	S–13	L UNF TEST

1. AUXILIARY POWER UNIT (APU).

For fire warning and fire extinguishing, see Section FIRE PROTECTION.

The APU is installed in the tail cone, behind the pressure bulkhead, and supplies electrical power (AC) and bleed air. An Electronic Sequencing Unit (ESU), located behind the cargo compartment, is provided for automatic control and monitoring during APU start up, stop and sustained operation.

Fuel is taken from the LH crossfeed line, through an automatic shut off valve and boost pump.

Power supply is 28 VDC via L BAT BUS.

Manual start and stop is performed via pushbuttons on the APU panel. In addition, an APU panel is located in the LH wing fairing, for shut down and fire extinguishing purposes.

The APU air intake door, on the upper right side, opens at APU start and closes at stop.

Integrated control and monitoring logics provide:

- Automatic start up, in flight, in case of engine flame out or shut down.
- Automatic shut down, in flight, in case of APU overspeed or other limited internal failures.
- Automatic shut down on ground in case of fire.

Normal indications on EICAS:

- RPM 98 - 99%
- TEMP 450°C.

APU OVSPEED (automatic shut down):

- RPM 108%.

APU OVTEMP:

- 1032°C during start up and 718°C during sustained operation, with automatic shut down, on ground only.

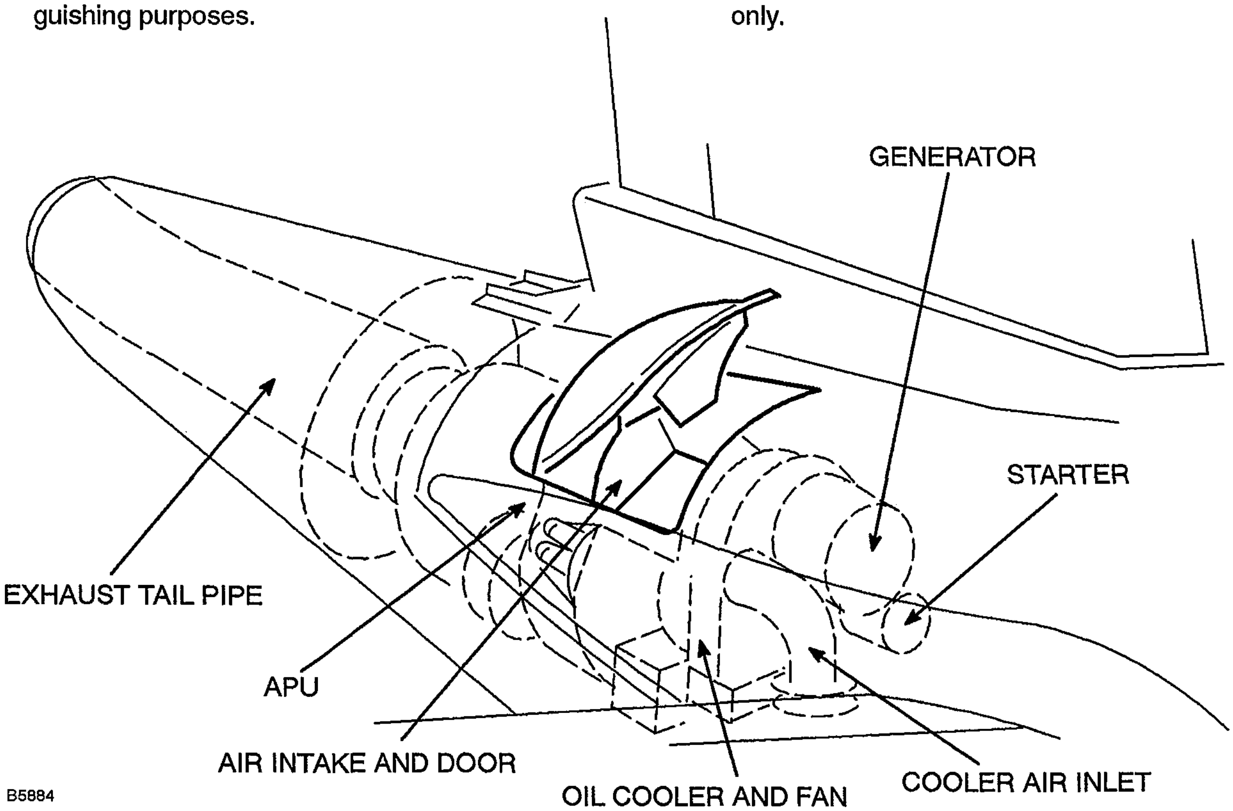
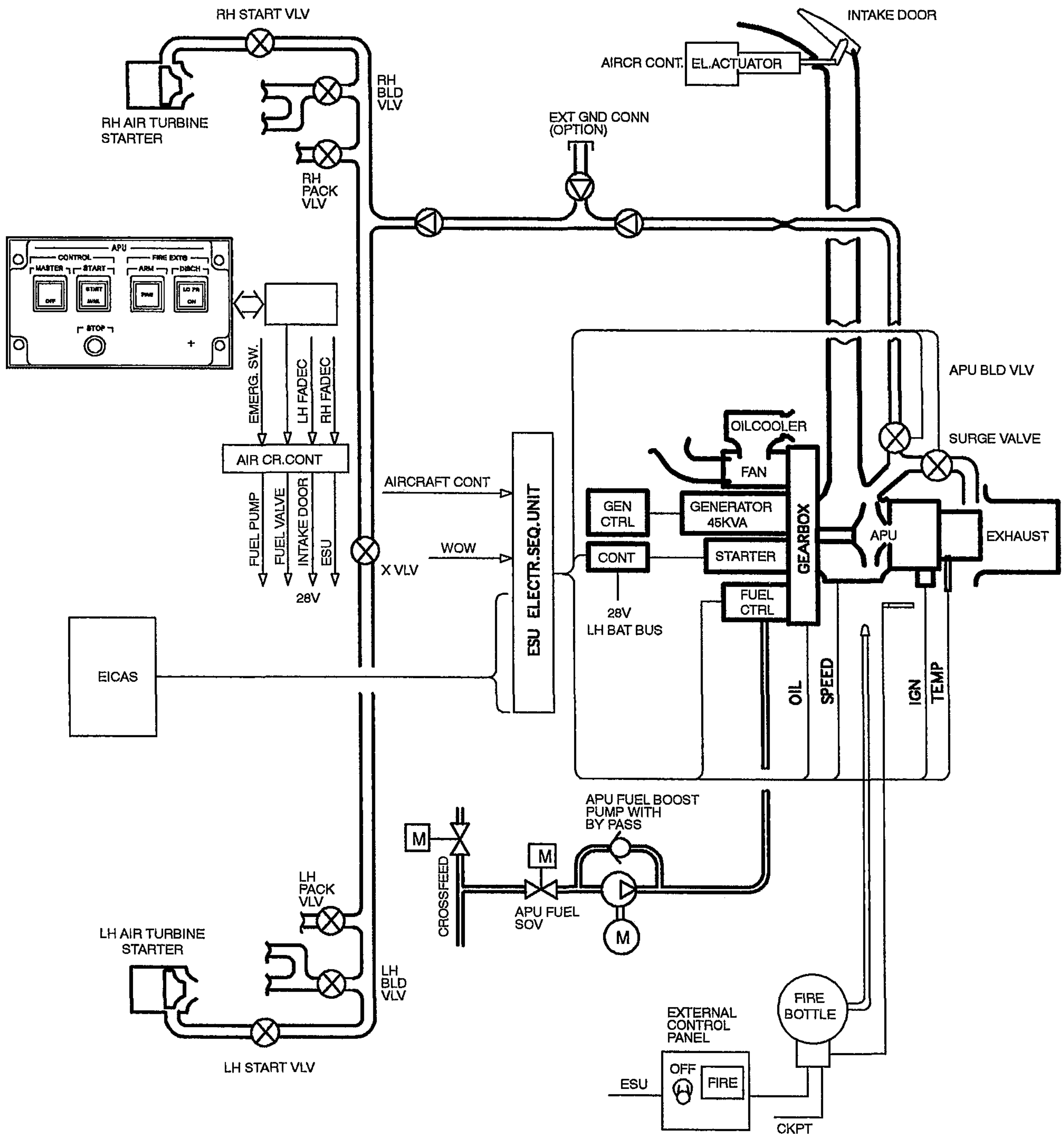


FIG.1. Tail mounted APU.



APU SYSTEM SCHEMATIC, SIMPLIFIED

B4526

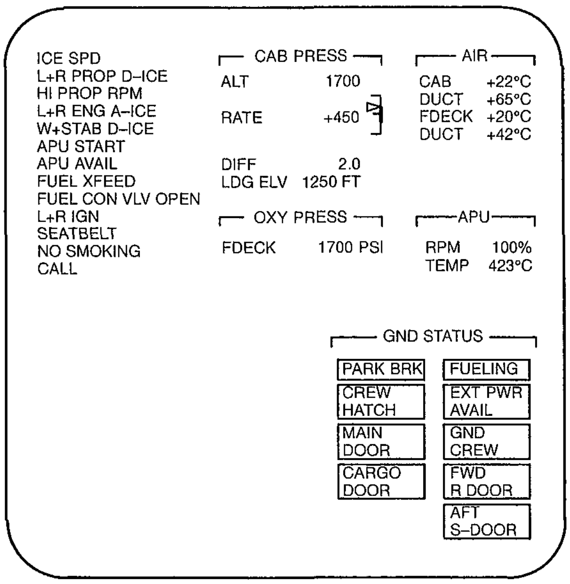
FIG. 2. APU System schematic.

MASTER p/b

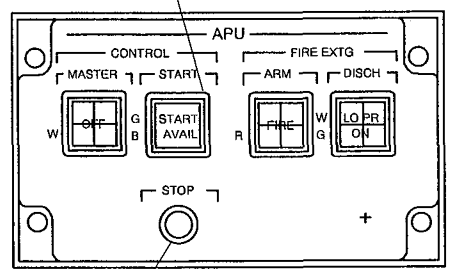
Black – Manual and automatic start function enabled.
OFF – Starting inhibited.
– Stops APU.

START p/b

Black – No function.
START – Depressed, and APU is starting up.
AVAIL – Stabilized speed and APU ready to supply electrical power (AC) and bleed air.

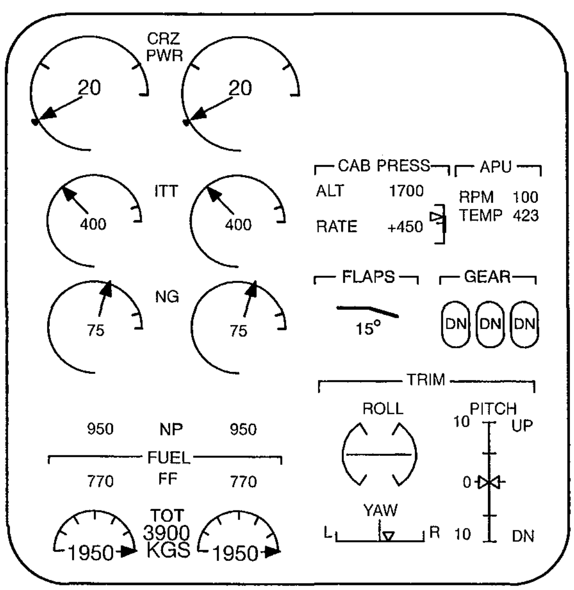


STAT SED page



STOP p/b

This button should be used to stop APU from cockpit.



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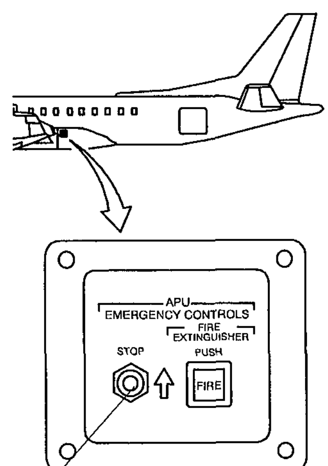
PED CONDENSED page



APU EXTERNAL PANEL

APU STOP switch

This switch is used to stop APU from outside aircraft.

FIG. 3. APU controls.

2. ELECTRICAL POWER SUPPLY.

APU control

			— APU —
Bleed valve	L BAT BUS	K–36	BLEED AIRVLV
Starting	L BAT BUS	K–35	START &CTL
Intake actuator pwr	L BAT BUS	K–34	INTK PWR
Fuel and intake control	L BAT BUS	K–33	FUEL & INTK CTL
Fuel pump	L BAT BUS	K–32	F–PUMP PWR
Fuel valve	L BAT BUS	K–31	F–VLV PWR