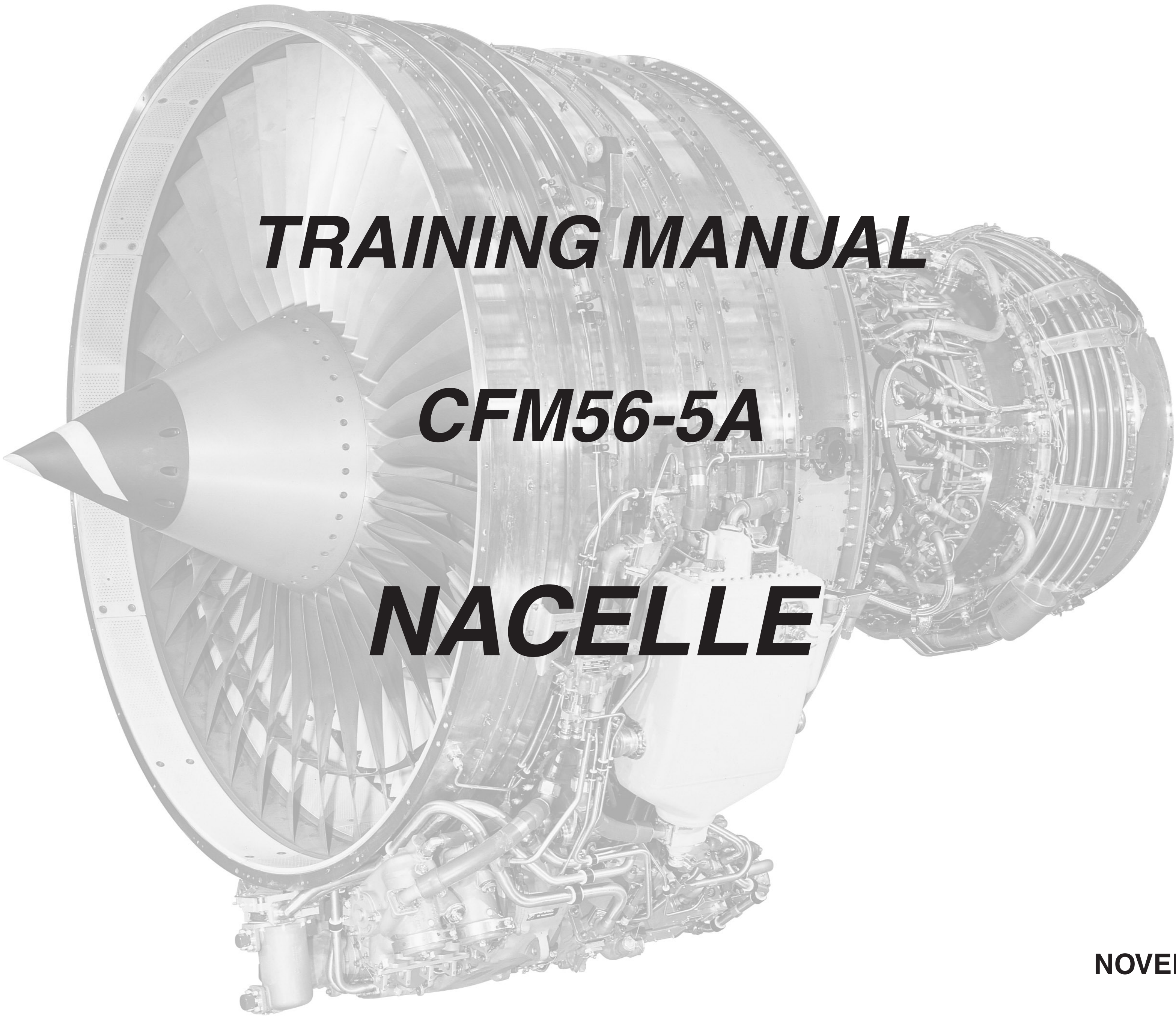

TRAINING MANUAL

CFM56-5A

NACELLE

NOVEMBER 2002

CTC-240 Level 3

TOC

NACELLE

THE POWER
OF FLIGHT

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TABLE OF CONTENTS

LEXIS

A	
A/C	AIRCRAFT
AC	ALTERNATING CURRENT
ACARS	AIRCRAFT COMMUNICATION ADRESSING and REPORTING SYSTEM
ACMS	AIRCRAFT CONDITION MONITORING SYSTEM
ACS	AIRCRAFT CONTROL SYSTEM
ADC	AIR DATA COMPUTER
ADEPT	AIRLINE DATA ENGINE PERFORMANCE TREND
ADIRS	AIR DATA AND INERTIAL REFERENCE SYSTEM
ADIRU	AIR DATA AND INERTIAL REFERENCE UNIT
AGB	ACCESSORY GEARBOX
AIDS	AIRCRAFT INTEGRATED DATA SYSTEM
ALF	AFT LOOKING FORWARD
ALT	ALTITUDE
ALTN	ALTERNATE
AMB	AMBIENT
AMM	AIRCRAFT MAINTENANCE MANUAL
AOG	AIRCRAFT ON GROUND
A/P	AIR PLANE
APU	AUXILIARY POWER UNIT
ARINC	AERONAUTICAL RADIO, INC. (SPECIFICATION)
ASM	AUTOTHROTTLE SERVO MECHANISM
A/T	AUTOTHROTTLE
ATA	AIR TRANSPORT ASSOCIATION
ATC	AUTOTHROTTLE COMPUTER
ATHR	AUTO THRUST
ATO	ABORTED TAKE OFF
AVM	AIRCRAFT VIBRATION MONITORING
B	
BITE	BUILT IN TEST EQUIPMENT
BMC	BLEED MANAGEMENT COMPUTER
BPRV	BLEED PRESSURE REGULATING VALVE
BSI	BORESCOPE INSPECTION
BSV	BURNER STAGING VALVE (SAC)
BSV	BURNER SELECTION VALVE (DAC)
BVCS	BLEED VALVE CONTROL SOLENOID
C	
C	CELSIUS or CENTIGRADE
CAS	CALIBRATED AIR SPEED
CBP	(HP) COMPRESSOR BLEED PRESSURE
CCDL	CROSS CHANNEL DATA LINK
CCFG	COMPACT CONSTANT FREQUENCY GENERATOR
CCU	COMPUTER CONTROL UNIT
CCW	COUNTER CLOCKWISE
CDP	(HP) COMPRESSOR DISCHARGE PRESSURE
CDS	COMMON DISPLAY SYSTEM
CDU	CONTROL DISPLAY UNIT
CFDIU	CENTRALIZED FAULT DISPLAY INTERFACE UNIT
CFDS	CENTRALIZED FAULT DISPLAY SYSTEM

CFMI	JOINT GE/SNECMA COMPANY (CFM INTERNATIONAL)
CG	CENTER OF GRAVITY
Ch A	channel A
Ch B	channel B
CHATV	CHANNEL ACTIVE
CIP(HP)	COMPRESSOR INLET PRESSURE
CIT(HP)	COMPRESSOR INLET TEMPERATURE
cm.g	CENTIMETER X GRAMS
CMC	CENTRALIZED MAINTENANCE COMPUTER
CMM	COMPONENT MAINTENANCE MANUAL
CMS	CENTRALIZED MAINTENANCE SYSTEM
CMS	CENTRAL MAINTENANCE SYSTEM
CODEP	HIGH TEMPERATURE COATING
CONT	CONTINUOUS
CPU	CENTRAL PROCESSING UNIT
CRT	CATHODE RAY TUBE
CSD	CONSTANT SPEED DRIVE
CSI	CYCLES SINCE INSTALLATION
CSN	CYCLES SINCE NEW
CTAI	COWL THERMAL ANTI-ICING
CTEC	CUSTOMER TECHNICAL EDUCATION CENTER
CTL	CONTROL
Cu.Ni.In	COPPER.NICKEL.INDIUM
CW	CLOCKWISE

D

DAC	DOUBLE ANNULAR COMBUSTOR
DAMV	DOUBLE ANNULAR MODULATED VALVE
DAR	DIGITAL ACMS RECORDER
DC	DIRECT CURRENT
DCU	DATA CONVERSION UNIT
DCV	DIRECTIONAL CONTROL VALVE BOEING
DEU	DISPLAY ELECTRONIC UNIT
DFCS	DIGITAL FLIGHT CONTROL SYSTEM
DFDAU	DIGITAL FLIGHT DATA ACQUISITION UNIT
DFDRS	DIGITAL FLIGHT DATA RECORDING SYSTEM
DISC	DISCRETE
DIU	DIGITAL INTERFACE UNIT
DMC	DISPLAY MANAGEMENT COMPUTER
DMD	DEMAND
DMS	DEBRIS MONITORING SYSTEM
DMU	DATA MANAGEMENT UNIT
DOD	DOMESTIC OBJECT DAMAGE
DPU	DIGITAL PROCESSING MODULE
DRT	DE-RATED TAKE-OFF

E

EAU	ENGINE ACCESSORY UNIT
EBU	ENGINE BUILDUP UNIT
ECA	ELECTRICAL CHASSIS ASSEMBLY
ECAM	ELECTRONIC CENTRALIZED AIRCRAFT MONITORING
ECS	ENVIRONMENTAL CONTROL SYSTEM
ECU	ELECTRONIC CONTROL UNIT
EE	ELECTRONIC EQUIPMENT
EEC	ELECTRONIC ENGINE CONTROL

EFH	ENGINE FLIGHT HOURS
EFIS	ELECTRONIC FLIGHT INSTRUMENT SYSTEM
EGT	EXHAUST GAS TEMPERATURE
EHSV	ELECTRO-HYDRAULIC SERVO VALVE
EICAS	ENGINE INDICATING AND CREW ALERTING SYSTEM
EIS	ELECTRONIC INSTRUMENT SYSTEM
EIU	ENGINE INTERFACE UNIT
EIVMU	ENGINE INTERFACE AND VIBRATION MONITORING UNIT
EMF	ELECTROMOTIVE FORCE
EMI	ELECTRO MAGNETIC INTERFERENCE
EMU	ENGINE MAINTENANCE UNIT
EPROM	ERASABLE PROGRAMMABLE READ ONLY MEMORY
(E)EPROM	(ELECTRICALLY) ERASABLE PROGRAMMABLE READ ONLY MEMORY
ESN	ENGINE SERIAL NUMBER
ETOPS	EXTENDED TWIN OPERATION SYSTEMS
EWD/SD	ENGINE WARNING DISPLAY / SYSTEM DISPLAY

F

F	FARENHEIT
FAA	FEDERAL AVIATION AGENCY
FADEC	FULL AUTHORITY DIGITAL ENGINE CONTROL
FAR	FUEL/AIR RATIO
FCC	FLIGHT CONTROL COMPUTER
FCU	FLIGHT CONTROL UNIT
FDAMS	FLIGHT DATA ACQUISITION & MANAGEMENT SYSTEM
FDIU	FLIGHT DATA INTERFACE UNIT
FDRS	FLIGHT DATA RECORDING SYSTEM
FDU	FIRE DETECTION UNIT
FEIM	FIELD ENGINEERING INVESTIGATION MEMO
FF	FUEL FLOW (see Wf) -7B
FFCCV	FAN FRAME/COMPRESSOR CASE VERTICAL (VIBRATION SENSOR)
FI	FLIGHT IDLE (F/I)
FIM	FAULT ISOLATION MANUAL
FIN	FUNCTIONAL ITEM NUMBER
FIT	FAN INLET TEMPERATURE
FLA	FORWARD LOOKING AFT
FLX TO	FLEXIBLE TAKE-OFF
FMC	FLIGHT MANAGEMENT COMPUTER
FMCS	FLIGHT MANAGEMENT COMPUTER SYSTEM
FMGC	FLIGHT MANAGEMENT AND GUIDANCE COMPUTER
FMGEC	FLIGHT MANAGEMENT AND GUIDANCE ENVELOPE COMPUTER
FMS	FLIGHT MANAGEMENT SYSTEM
FMV	FUEL METERING VALVE
FOD	FOREIGN OBJECT DAMAGE
FPA	FRONT PANEL ASSEMBLY
FPI	FLUORESCENT PENETRANT INSPECTION
FQIS	FUEL QUANTITY INDICATING SYSTEM

FRV	FUEL RETURN VALVE
FWC	FAULT WARNING COMPUTER
FWD	FORWARD

G

g.in	GRAM X INCHES
GE	GENERAL ELECTRIC
GEAE	GENERAL ELECTRIC AIRCRAFT ENGINES
GEM	GROUND-BASED ENGINE MONITORING
GI	GROUND IDLE (G/I)
GMM	GROUND MAINTENANCE MODE
GMT	GREENWICH MEAN TIME
GND	GROUND
GPH	GALLON PER HOUR
GPU	GROUND POWER UNIT
GSE	GROUND SUPPORT EQUIPMENT

H

HCF	HIGH CYCLE FATIGUE
HCU	HYDRAULIC CONTROL UNIT
HDS	HORIZONTAL DRIVE SHAFT
HMU	HYDROMECHANICAL UNIT
HP	HIGH PRESSURE
HPC	HIGH PRESSURE COMPRESSOR
HPCR	HIGH PRESSURE COMPRESSOR ROTOR
HPRV	HIGH PRESSURE REGULATING VALVE
HPSOV	HIGH PRESSURE SHUT-OFF VALVE
HPT	HIGH PRESSURE TURBINE
HPT(A)CC	HIGH PRESSURE TURBINE (ACTIVE) CLEARANCE CONTROL
HPTC	HIGH PRESSURE TURBINE CLEARANCE
HPTCCV	HIGH PRESSURE TURBINE CLEARANCE CONTROL VALVE
HPTN	HIGH PRESSURE TURBINE NOZZLE
HPTR	HIGH PRESSURE TURBINE ROTOR
Hz	HERTZ (CYCLES PER SECOND)

I

I/O	INPUT/OUTPUT
IAS	INDICATED AIR SPEED
ID	INSIDE DIAMETER
ID PLUG	IDENTIFICATION PLUG
IDG	INTEGRATED DRIVE GENERATOR
IFSD	IN FLIGHT SHUT DOWN
IGB	INLET GEARBOX
IGN	IGNITION
IGV	INLET GUIDE VANE
in.	INCH
IOM	INPUT OUTPUT MODULE
IPB	ILLUSTRATED PARTS BREAKDOWN
IPC	ILLUSTRATED PARTS CATALOG
IPCV	INTERMEDIATE PRESSURE CHECK VALVE
IPS	INCHES PER SECOND
IR	INFRA RED

K

°K	KELVIN
k	X 1000
KIAS	INDICATED AIR SPEED IN KNOTS
kV	KILOVOLTS

Kph	KILOGRAMS PER HOUR

L

L	LEFT
L/H	LEFT HAND
lbs.	POUNDS, WEIGHT
LCD	LIQUID CRYSTAL DISPLAY
LCF	LOW CYCLE FATIGUE
LE (L/E)	LEADING EDGE
LGCIU	LANDING GEAR CONTROL INTERFACE UNIT
LP	LOW PRESSURE
LPC	LOW PRESSURE COMPRESSOR
LPT	LOW PRESSURE TURBINE
LPT(A)CC	LOW PRESSURE TURBINE (ACTIVE) CLEARANCE CONTROL
LPTC	LOW PRESSURE TURBINE CLEARANCE
LPTN	LOW PRESSURE TURBINE NOZZLE
LPTR	LOW PRESSURE TURBINE ROTOR
LRU	LINE REPLACEABLE UNIT
LVDT	LINEAR VARIABLE DIFFERENTIAL TRANSFORMER

M

mA	MILLIAMPERES (CURRENT)
MCD	MAGNETIC CHIP DETECTOR
MCDU	MULTIPURPOSE CONTROL AND DISPLAY UNIT
MCL	MAXIMUM CLIMB
MCR	MAXIMUM CRUISE
MCT	MAXIMUM CONTINUOUS
MDDU	MULTIPURPOSE DISK DRIVE UNIT
MEC	MAIN ENGINE CONTROL
milsD.A.	Mils DOUBLE AMPLITUDE
mm.	MILLIMETERS
MMEL	MAIN MINIMUM EQUIPMENT LIST
MO	AIRCRAFT SPEED MACH NUMBER
MPA	MAXIMUM POWER ASSURANCE
MPH	MILES PER HOUR
MTBF	MEAN TIME BETWEEN FAILURES
MTBR	MEAN TIME BETWEEN REMOVALS
mV	MILLIVOLTS
Mvdc	MILLIVOLTS DIRECT CURRENT

N

N1 (NL)	LOW PRESSURE ROTOR ROTATIONAL SPEED
N1*	DESIRED N1
N1ACT	ACTUAL N1
N1CMD	COMMANDED N1
N1DMD	DEMANDED N1
N1K	CORRECTED FAN SPEED
N1TARGET	TARGETED FAN SPEED
N2 (NH)	HIGH PRESSURE ROTOR ROTATIONAL SPEED
N2*	DESIRED N2
N2ACT	ACTUAL N2
N2K	CORRECTED CORE SPEED
N/C	NORMALLY CLOSED
N/O	NORMALLY OPEN

NAC	NACELLE
NVM	NON VOLATILE MEMORY

O

OAT	OUTSIDE AIR TEMPERATURE
OD	OUTLET DIAMETER
OGV	OUTLET GUIDE VANE
OSG	OVERSPEED GOVERNOR
OVBD	OVERBOARD
OVHT	OVERHEAT

P

Pb	BYPASS PRESSURE
Pc	REGULATED SERVO PRESSURE
Pcr	CASE REGULATED PRESSURE
Pf	HEATED SERVO PRESSURE
P/T25	HP COMPRESSOR INLET TOTAL AIR PRESSURE/TEMPERATURE
P/N	PART NUMBER
P0	AMBIENT STATIC PRESSURE
P25	HP COMPRESSOR INLET TOTAL AIR TEMPERATURE
PCU	PRESSURE CONVERTER UNIT
PLA	POWER LEVER ANGLE
PMC	POWER MANAGEMENT CONTROL
PMUX	PROPULSION MULTIPLEXER
PPH	POUNDS PER HOUR
PRSOV	PRESSURE REGULATING SERVO VALVE
Ps	PUMP SUPPLY PRESSURE
PS12	FAN INLET STATIC AIR PRESSURE
PS13	FAN OUTLET STATIC AIR PRESSURE
PS3HP	COMPRESSOR DISCHARGE STATIC AIR PRESSURE (CDP)
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSID	POUNDS PER SQUARE INCH DIFFERENTIAL
psig	POUNDS PER SQUARE INCH GAGE
PSM	POWER SUPPLY MODULE
PSS	(ECU) PRESSURE SUB-SYSTEM
PSU	POWER SUPPLY UNIT
PT	TOTAL PRESSURE
PT2	FAN INLET TOTAL AIR PRESSURE (PRIMARY FLOW)
PT25	HPC TOTAL INLET PRESSURE

Q

QAD	QUICK ATTACH DETACH
QEC	QUICK ENGINE CHANGE
QTY	QUANTITY
QWR	QUICK WINDMILL RELIGHT

R

R/H	RIGHT HAND
RAC/SB	ROTOR ACTIVE CLEARANCE/START BLEED
RACC	ROTOR ACTIVE CLEARANCE CONTROL
RAM	RANDOM ACCESS MEMORY
RCC	REMOTE CHARGE CONVERTER
RDS	RADIAL DRIVE SHAFT

RPM	REVOLUTIONS PER MINUTE
RTD	RESISTIVE THERMAL DEVICE
RTO	REFUSED TAKE OFF
RTV	ROOM TEMPERATURE VULCANIZING (MATERIAL)
RVDT	ROTARY VARIABLE DIFFERENTIAL TRANSFORMER

S

S/N	SERIAL NUMBER
S/R	SERVICE REQUEST
S/V	SHOP VISIT
SAC	SINGLE ANNULAR COMBUSTOR
SAR	SMART ACMS RECORDER
SAV	STARTER AIR VALVE
SB	SERVICE BULLETIN
SCU	SIGNAL CONDITIONING UNIT
SDAC	SYSTEM DATA ACQUISITION CONCENTRATOR
SDI	SOURCE/DESTINATION IDENTIFIER (BITS) (CF ARINC SPEC)
SDU	SOLENOID DRIVER UNIT
SER	SERVICE EVALUATION REQUEST
SFC	SPECIFIC FUEL CONSUMPTION
SFCC	SLAT FLAP CONTROL COMPUTER
SG	SPECIFIC GRAVITY
SLS	SEA LEVEL STANDARD (CONDITIONS : 29.92 in.Hg / 59°F)
SLSD	SEA LEVEL STANDARD DAY (CONDITIONS : 29.92 in.Hg / 59°F)
SMM	STATUS MATRIX
SMP	SOFTWARE MANAGEMENT PLAN
SN	SERIAL NUMBER
SNECMA	SOCIETE NATIONALE D'ETUDE ET DE CONSTRUCTION DE MOTEURS D'AVIATION
SOL	SOLENOID
SOV	SHUT-OFF VALVE
STP	STANDARD TEMPERATURE AND PRESSURE
SVR	SHOP VISIT RATE
SW	SWITCH BOEING
SYS	SYSTEM

T

T oil	OIL TEMPERATURE
T/C	THERMOCOUPLE
T/E	TRAILING EDGE
T/O	TAKE OFF
T/R	THRUST REVERSER
T12	FAN INLET TOTAL AIR TEMPERATURE
T25	HP COMPRESSOR INLET AIR TEMPERATURE
T3	HP COMPRESSOR DISCHARGE AIR TEMPERATURE
T49.5	EXHAUST GAS TEMPERATURE
T5	LOW PRESSURE TURBINE DISCHARGE TOTAL AIR TEMPERATURE
TAI	THERMAL ANTI ICE
TAT	TOTAL AIR TEMPERATURE

TBC	THERMAL BARRIER COATING
TBD	TO BE DETERMINED
TBO	TIME BETWEEN OVERHAUL
TBV	TRANSIENT BLEED VALVE
TC(TCase)	HP TURBINE CASE TEMPERATURE
TCC	TURBINE CLEARANCE CONTROL
TCCV	TURBINE CLEARANCE CONTROL VALVE
TCJ	TEMPERATURE COLD JUNCTION
T/E	TRAILING EDGE
TECU	ELECTRONIC CONTROL UNIT INTERNAL TEMPERATURE
TEO	ENGINE OIL TEMPERATURE
TGB	TRANSFER GEARBOX
Ti	TITANIUM
TLA	THROTTLE LEVER ANGLE AIRBUS
TLA	THRUST LEVER ANGLE BOEING
TM	TORQUE MOTOR
TMC	TORQUE MOTOR CURRENT
T/O	TAKE OFF
TO/GA	TAKE OFF/GO AROUND
T/P	TEMPERATURE/PRESSURE SENSOR
TPU	TRANSIENT PROTECTION UNIT
TR	TRANSFORMER RECTIFIER
TRA	THROTTLE RESOLVER ANGLE AIRBUS
TRA	THRUST RESOLVER ANGLE BOEING
TRDV	THRUST REVERSER DIRECTIONAL VALVE
TRF	TURBINE REAR FRAME
TRPV	THRUST REVERSER PRESSURIZING VALVE
TSI	TIME SINCE INSTALLATION (HOURS)
TSN	TIME SINCE NEW (HOURS)
TTL	TRANSISTOR TRANSISTOR LOGIC

U

UER	UNSCHEDULED ENGINE REMOVAL
UTC	UNIVERSAL TIME CONSTANT

V

VAC	VOLTAGE, ALTERNATING CURRENT
VBV	VARIABLE BLEED VALVE
VDC	VOLTAGE, DIRECT CURRENT
VDT	VARIABLE DIFFERENTIAL TRANSFORMER
VIB	VIBRATION
VLV	VALVE
VRT	VARIABLE RESISTANCE TRANSDUCER
VSV	VARIABLE STATOR VANE

W

WDM	WATCHDOG MONITOR
Wf	WEIGHT OF FUEL OR FUEL FLOW
WFM	WEIGHT OF FUEL METERED
WOW	WEIGHT ON WHEELS
WTAI	WING THERMAL ANTI-ICING

IMPERIAL / METRIC CONVERSIONS

1 mile	= 1,609 km
1 ft	= 30,48 cm
1 in.	= 25,4 mm
1 mil.	= 25,4 μ
1 sq.in.	= 6,4516 cm²
1 USG	= 3,785 l (dm³)
1 cu.in.	= 16.39 cm³
1 lb.	= 0.454 kg
1 psi.	= 6.890 kPa
°F	= 1.8 x °C + 32

METRIC / IMPERIAL CONVERSIONS

1 km	= 0.621 mile
1 m	= 3.281 ft. or 39.37 in.
1 cm	= 0.3937 in.
1 mm	= 39.37 mils.
1 m²	= 10.76 sq. ft.
1 cm²	= 0.155 sq.in.
1 m³	= 35.31 cu. ft.
1 dm³	= 0.264 USA gallon
1 cm³	= 0.061 cu.in.
1 kg	= 2.205 lbs
1 Pa	= 1.45 10-4 psi.
1 kPa	= 0.145 psi
1 bar	= 14.5 psi
°C	= (°F - 32) /1.8

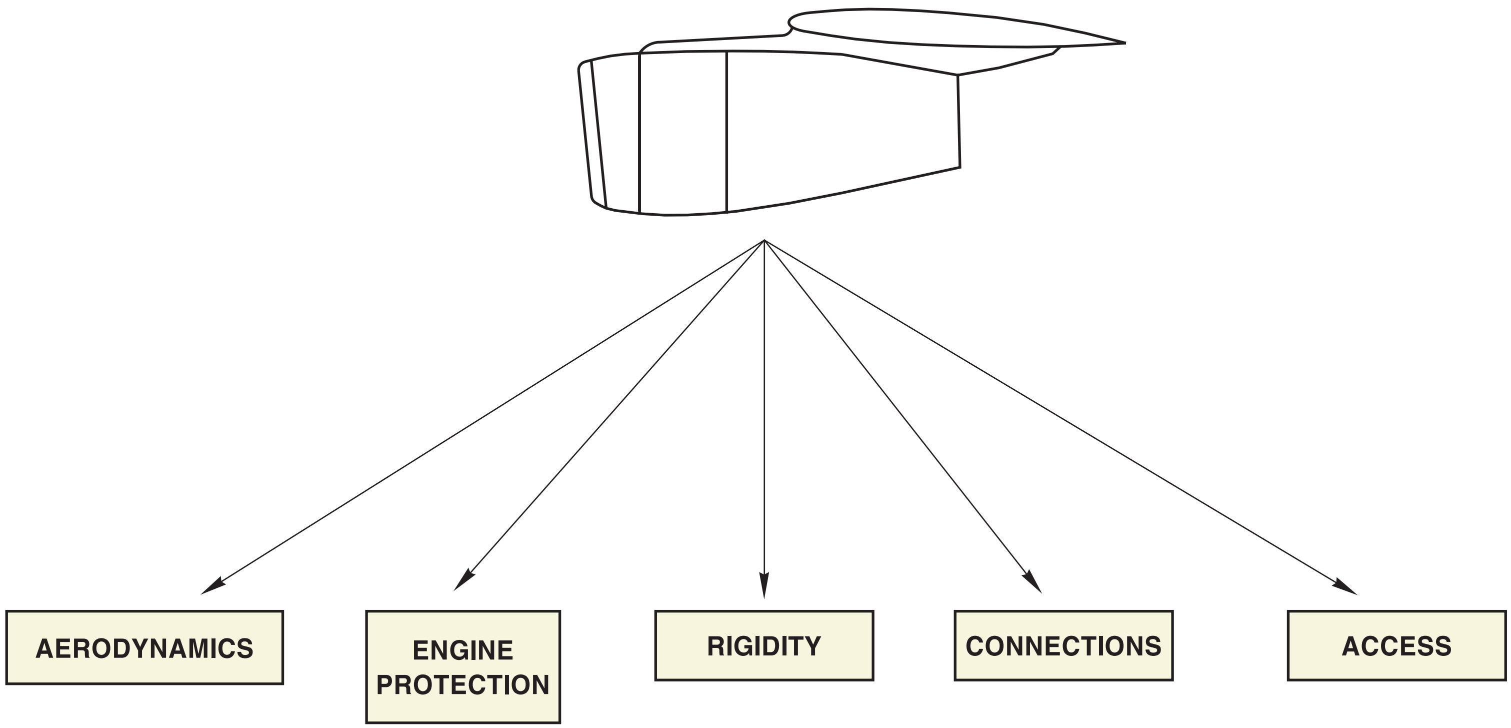
NACELLE GENERAL

NACELLE GENERAL

The cowls enclose the periphery of the engine so as to form the engine nacelle, underneath the aircraft wings.

The nacelle is the aerodynamic structure around the basic engine and has several purposes :

- To smooth the airflow around and into the engine, in order to decrease drag and give better engine performance.
- To prevent damage to the external surface of the engine.
- To give extra strength to the engine structure.
- To make connections for air, fluids and electricity.
- To enable access to the engine, or direct access to some engine equipment.



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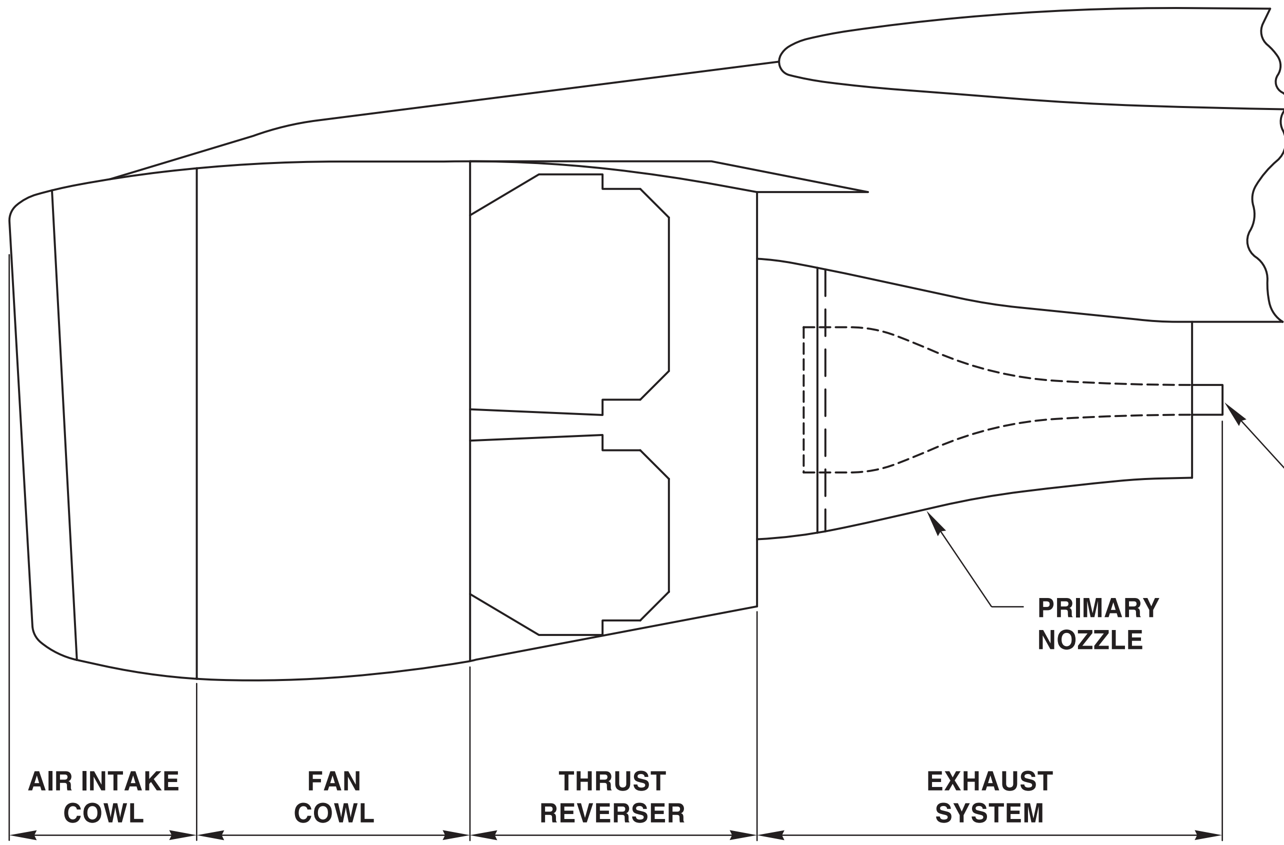
NACELLE PURPOSES

NACELLE GENERAL

The nacelle is made up of different major sections along the engine and includes :

- The fan inlet cowl.
- The fan cowl doors.
- The thrust reverser.
- The exhaust system (comprising the primary nozzle and the centerbody).



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NACELLE SECTIONS

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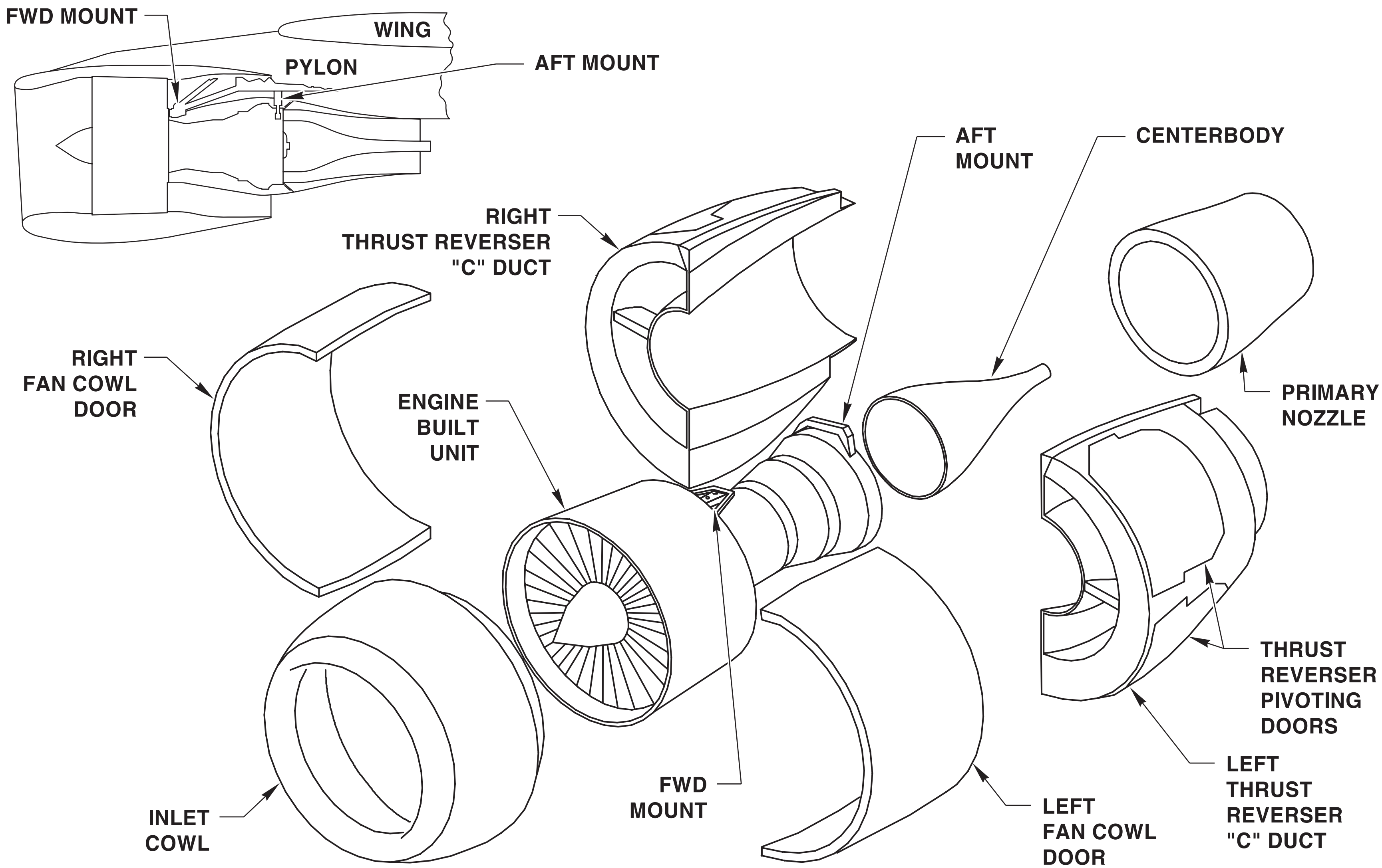
POWERPLANT PRESENTATION

POWERPLANT PRESENTATION

The engine is attached to the wing pylon by mounts, located forward and aft of the core section.

Cowls enclose the periphery of the engine so as to form the nacelle, which is the aerodynamic structure around the engine.

The cowling assembly consists of :
- The air intake cowl.
- The fan cowls.
- The thrust reverser cowls.
- The primary exhaust (primary nozzle and centerbody).



CTC-240-001-00

POWERPLANT PRESENTATION

POWERPLANT PRESENTATION

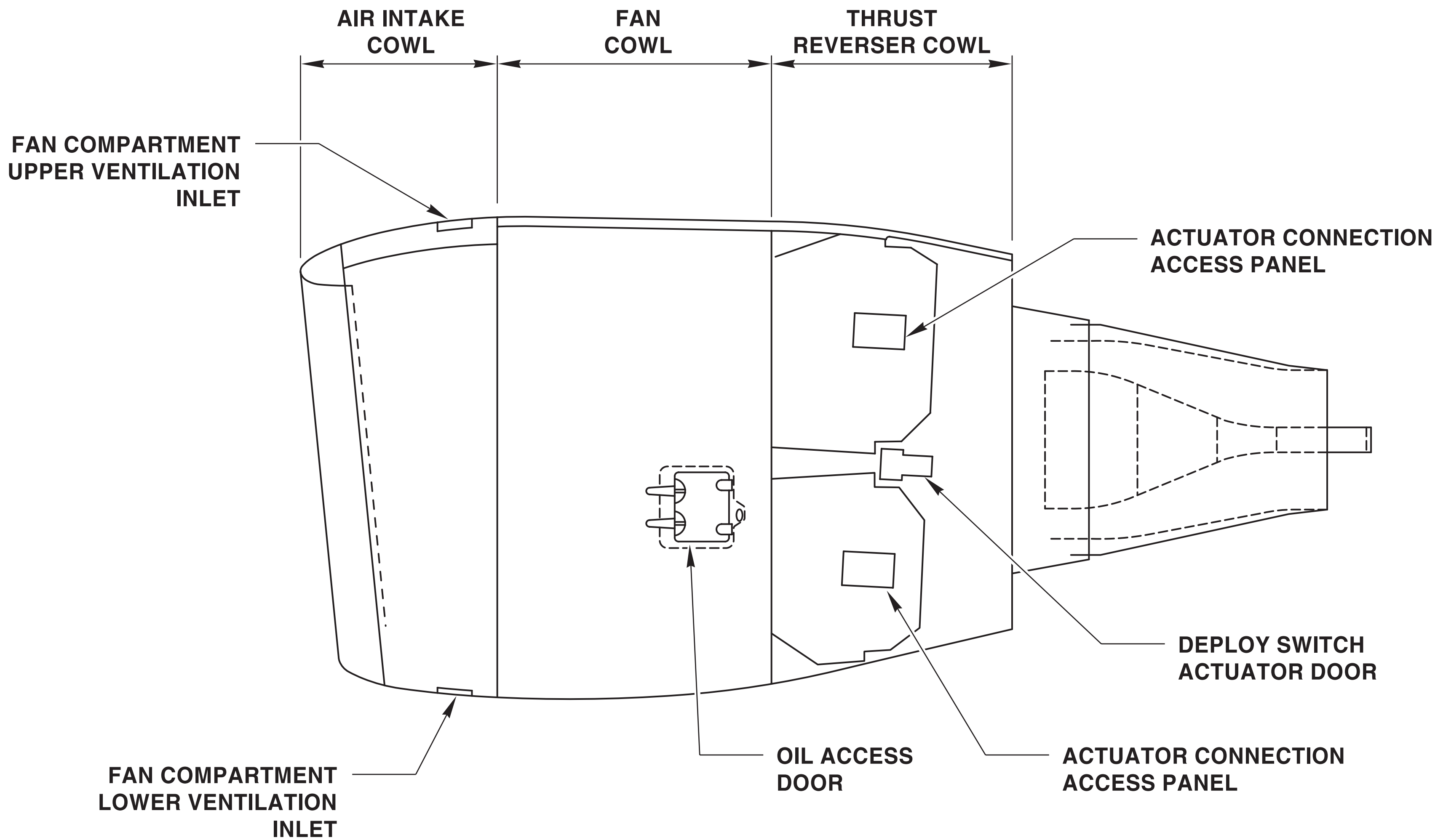
For quick servicing, the nacelle is equipped with various access panels and inspection doors.

Nacelle left side.

On the fan cowl left side, an oil access door is provided for engine oil servicing, and visual inspection of the Master Chip Detector (MCD) electrical indicator.

The thrust reverser cowl features doors to access actuator connections and deploy switches.

Various ducts allow cooling and venting of the inlet and fan compartments.



CTC-240-002-00

NACELLE LEFT SIDE

Nacelle right side.

On the fan cowl right side, a starter valve access door is provided for manual override operation.

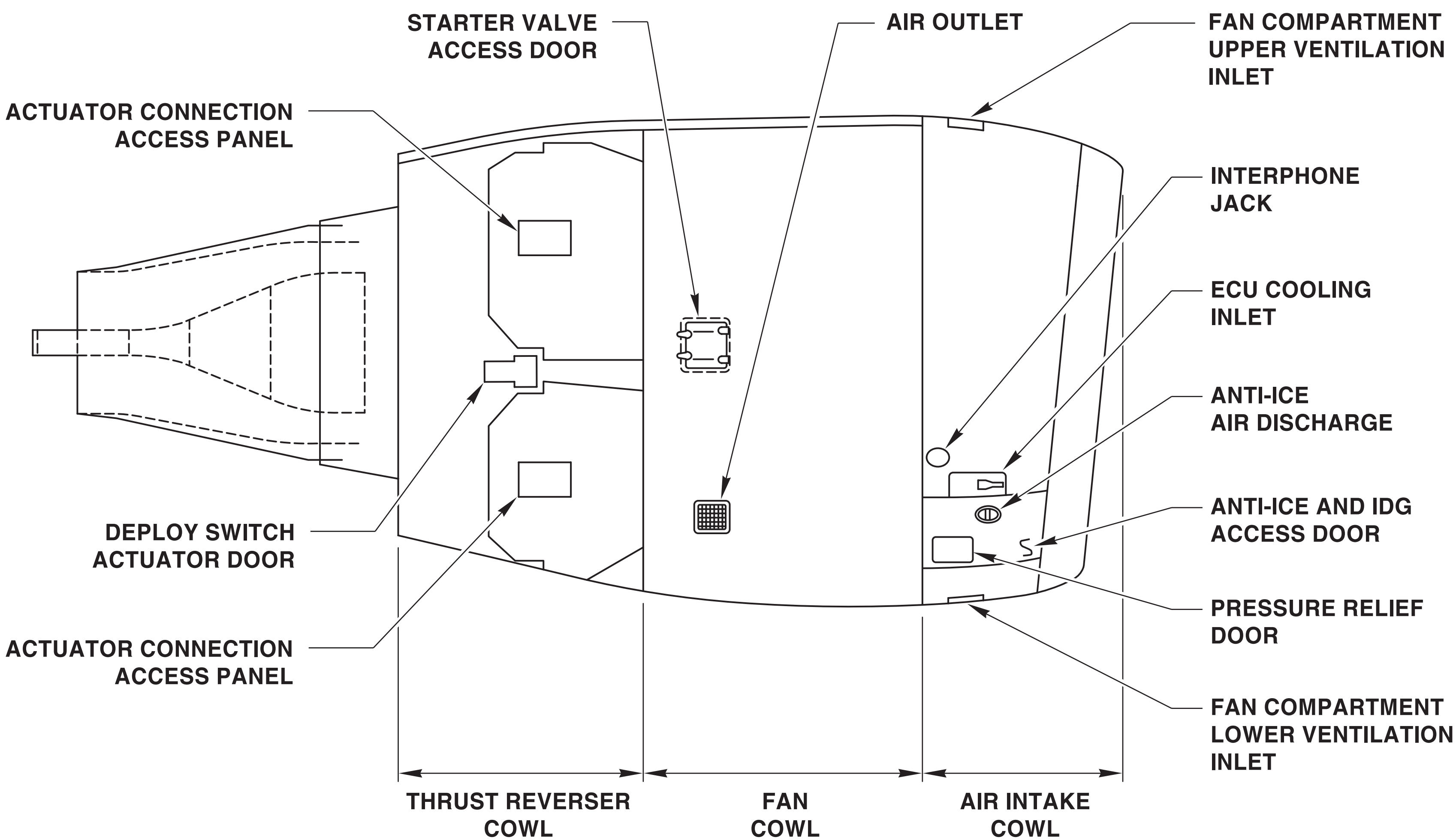
The inlet cowl anti-icing duct and the IDG are accessible via a panel.

A pressure relief door protects the inlet cowl structure.

An interphone jack enables ground communication with the cockpit.

Various air inlet and outlet ducts allow the cooling and venting of the inlet and fan compartments.

The thrust reverser cowl features doors to access actuator connections and deploy switches.



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NACELLE RIGHT SIDE

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ENGINE MOUNTS

ENGINE MOUNTS

The engine is connected to the pylon by two mounts :

- the forward mount.
- the aft mount.

Both mounts are designed to :

- withstand all the loads acting upon the nacelle.
- transmit these loads to the pylon structure.

Forward mount.

The forward mount carries the engine thrust, vertical and lateral loads.

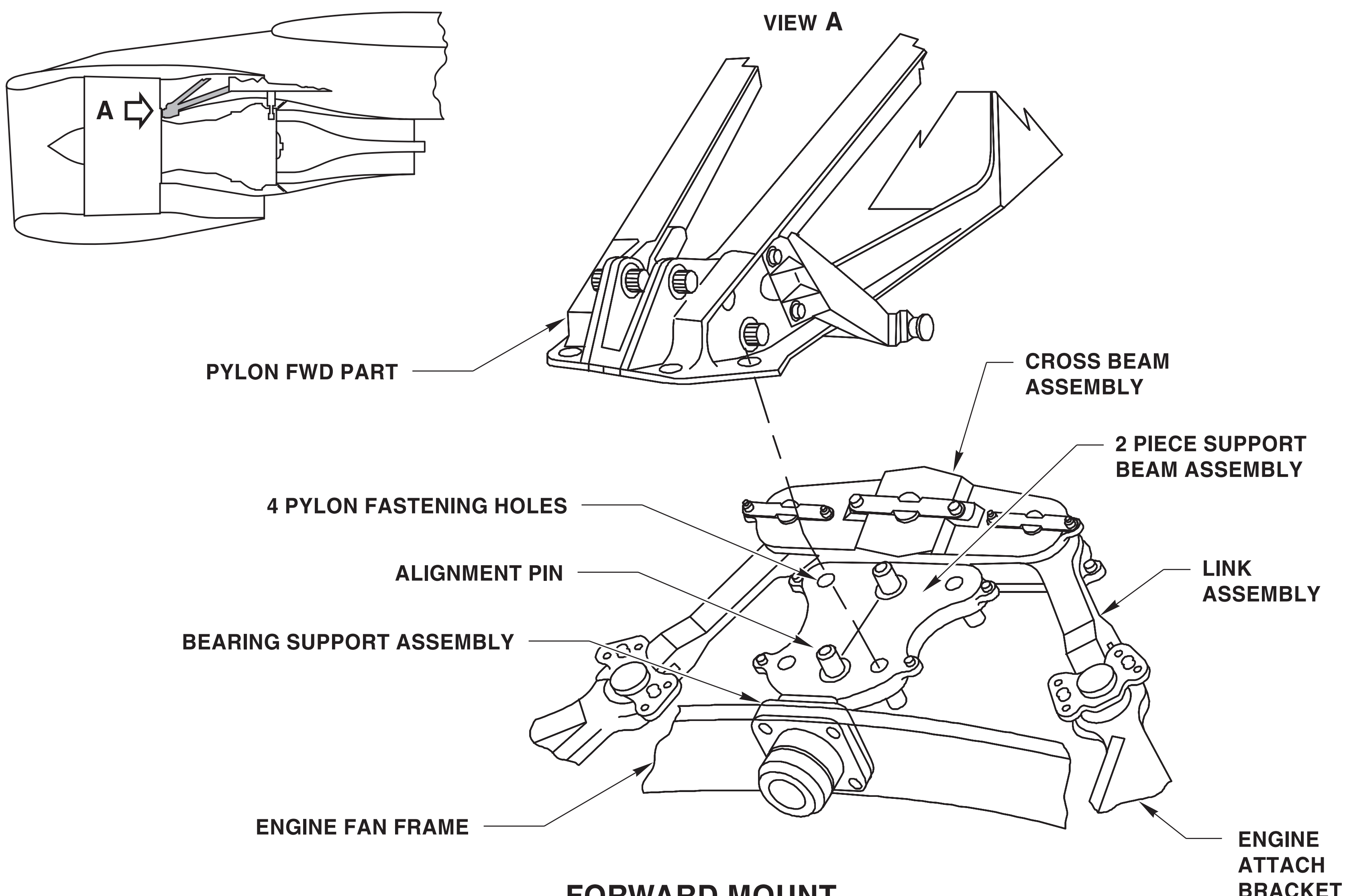
It is made up of the following :

- a two-piece support beam.
- a one-piece crossbeam.
- two thrust links.

It is attached to the engine fan frame with four bolts and two brackets at 12 o'clock, and to the pylon forward structure by means of four tension bolts and two alignment pins.

The bearing fitted on the support beam assembly, carries lateral and vertical loads.

The assembly formed by the links, crossbeam and bracket, carries thrust loads.



FORWARD MOUNT

CTC-240-004-00

Aft mount.

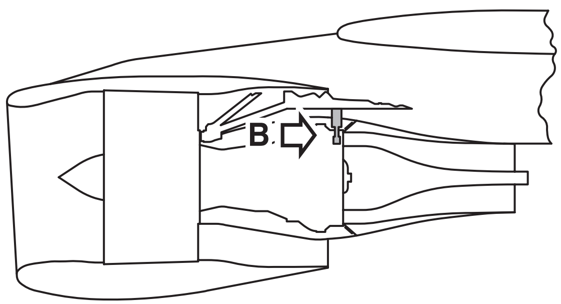
The aft mount connects the engine turbine frame to the pylon.

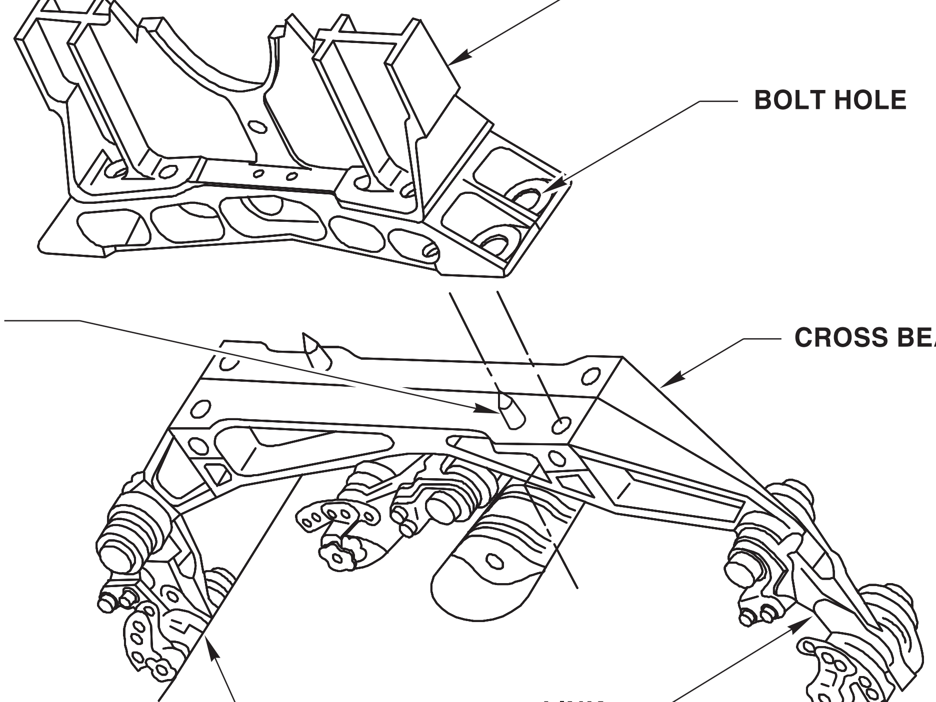
It is designed to restrain engine movements in all directions, except forward and aft.

It is made up of the following :

- Three fail-safe links that provide attachment to the engine casing lugs.
- A crossbeam with three lugs for attachment of the 3 links.

The crossbeam attaches to the pylon by means of four tension bolts, and two shear pins.





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AFT MOUNT

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AIR INLET COWL

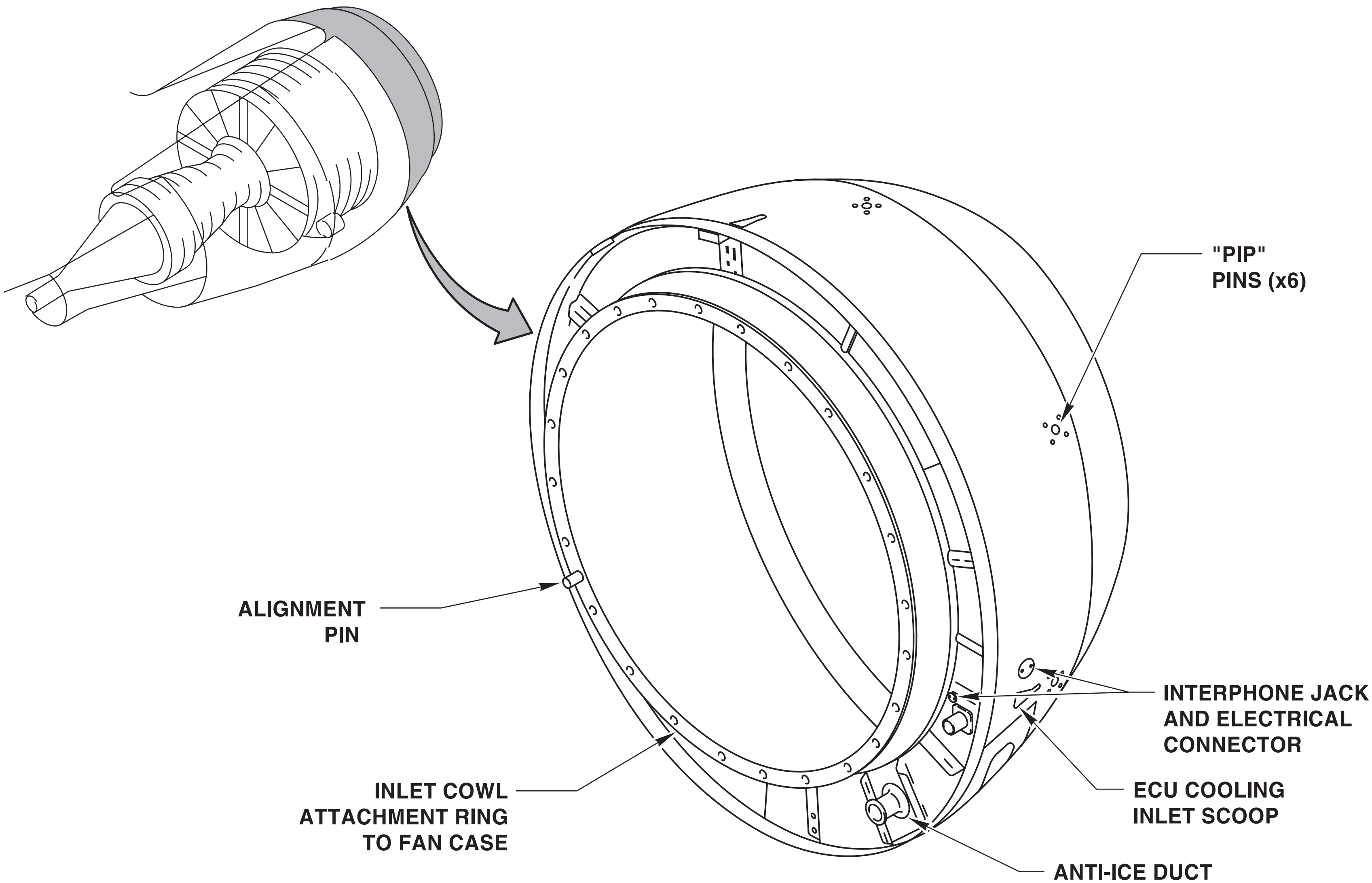
AIR INLET COWL

The air inlet cowl is at the forward section of the nacelle and its rear flange is attached to the engine fan case.

Its provides a smooth airflow into the engine during all aircraft operational sequences and also prevents ice formation at the front of the power plant.

The air inlet cowl has an anti-ice inlet duct, an interphone connector and jack and an air inlet scoop for ECU cooling.

Six receptacles, called 'pip' pins, and located 60° apart all around the front of the cowl, enable fan inlet cover installation on ground.



AIR INLET COWL

CTC-240-008-00

AIR INLET COWL

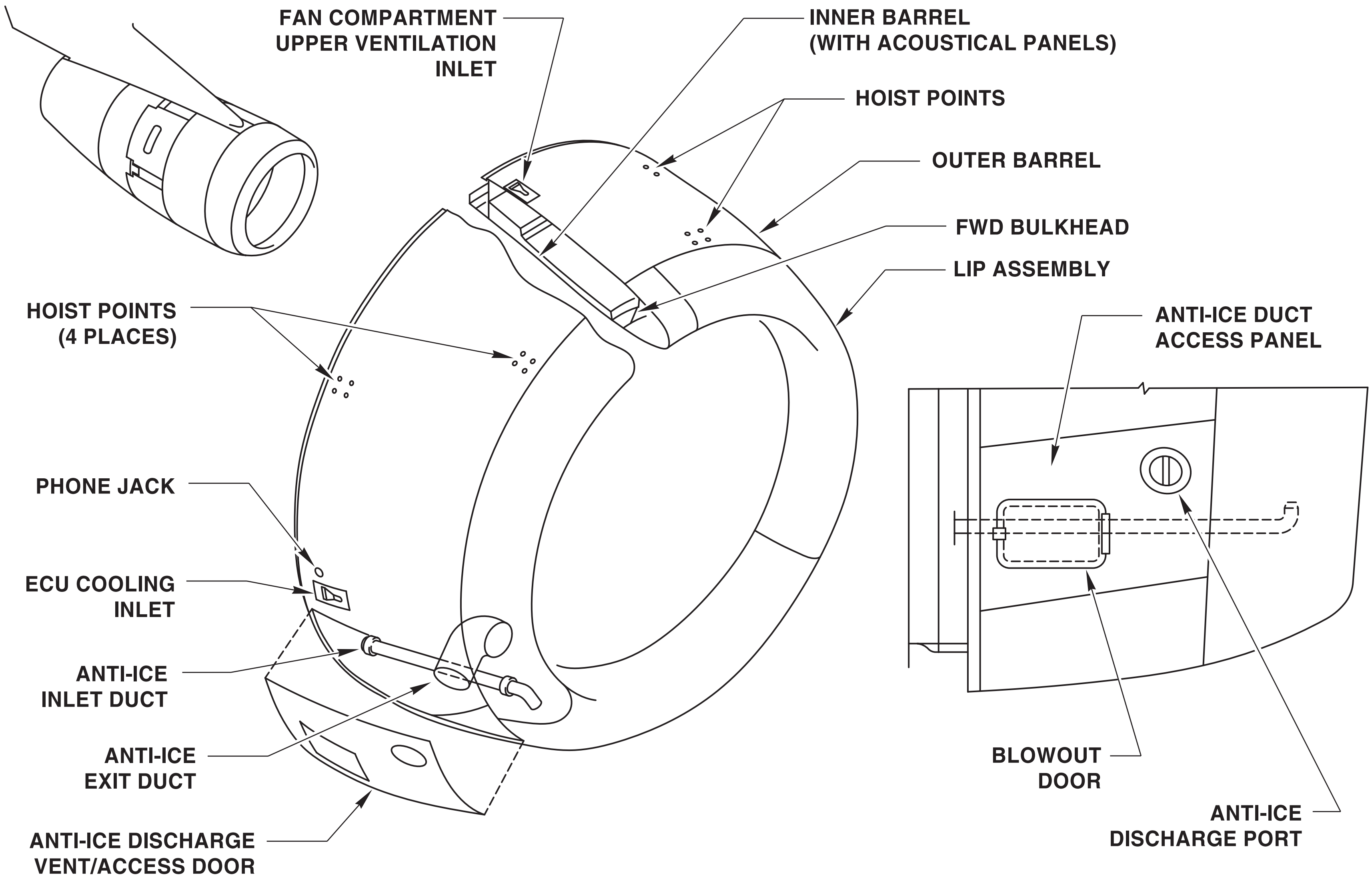
The air inlet cowl is secured on the forward flange of the engine fan case and consists of :

- An inner barrel featuring 3 acoustical panels, which attaches the air inlet assembly to the engine fan frame.
- An outer barrel, which is the outer cowl of the assembly.
- A nose lip, which connects the inner and outer barrels.
- A duct to supply anti-ice air.
- A forward and aft bulkhead to connect the inner and outer barrel.

The outer barrel features :

- Two fan compartment cooling air inlet scoops, at 12 and 6 o'clock, to supply ambient air around the engine and accessories.
- Four hoist points, at 10 and 2 o'clock, for inlet cowl assembly removal/installation.
- A phone jack to enable ground communication with the cockpit.
- An ECU cooling air inlet scoop, at the 3:30 clock position.
- An anti-ice duct access panel, at the 4:30 clock position, to access the valve.
- An anti-ice air discharge port, at the 5:30 clock position.

A blowout (pressure relief) door is installed on the access panel to prevent damage of the inner or outer cowl barrel in case of excessive leakage.



AIR INLET COWL DESIGN

CTC-240-009-00

Anti-ice system.

The engine inlet cowl is provided with an anti-ice system, located on the right hand side at 5 o'clock (ALF).

The system prevents ice accumulation on the inlet cowl leading edge to protect the engine from ice ingestion.

The anti-ice system is connected to the 5th and 9th stages of the High Pressure Compressor (HPC) and consists of :

- An anti-ice air duct
- An anti-ice valve
- A command pressure line
- A swirl nozzle

Hot bleed air is taken from the HPC 5th stage and directed through a tube to the anti-ice valve. It enters the anti-ice air duct and is supplied to the inlet cowl 'D' duct through a swirl nozzle.

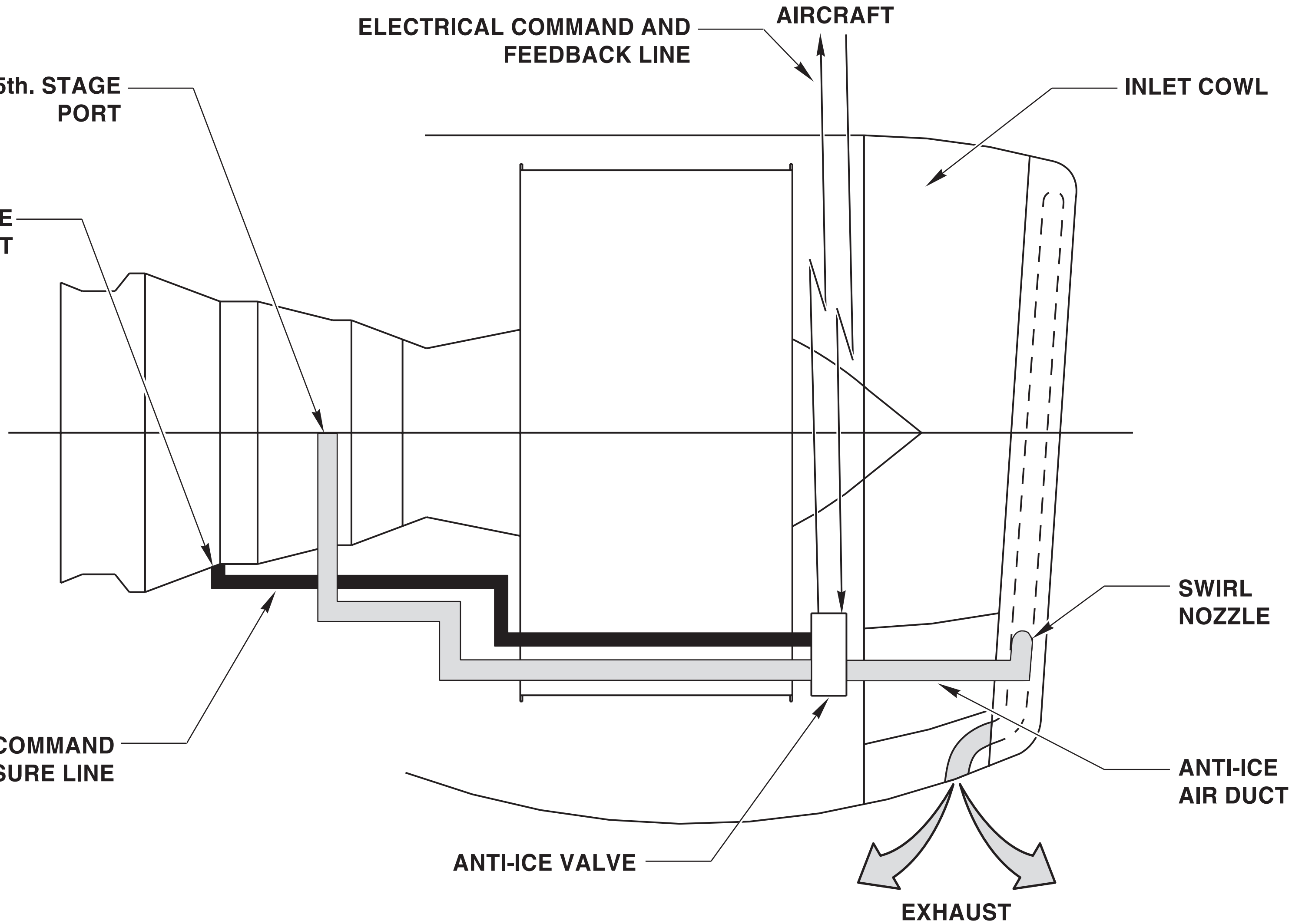
The 'D' duct is formed by the nose lip and the forward bulkhead of the inlet cowl.

The airflow is controlled by the anti-ice valve, which is operated from the cockpit, through an ON-OFF switch.

Command pressure for valve operation is taken from the HPC 9th stage manifold.

An electrical connection between the anti-ice valve and the aircraft provides the cockpit with valve position indication.

The anti-icing air is exhausted through a dedicated exit duct, connected to the forward bulkhead and the outer barrel.



ANTI-ICE SYSTEM

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FAN COWL DOORS

FAN COWL DOORS

The fan cowl door assemblies enclose the fan case and gearbox area between the air intake cowl and the thrust reverser.

When they are closed, the fan cowl doors provide continuity of the aerodynamic airflow around the engine.

They also provide access to the power plant equipment, air cooling for the fan compartment and play a role in the fire and lightning protection systems.

Strakes on both fan cowls improve the angle of attack and lift of the aircraft at low speed.

Note : On A320 aircraft, only the inboard fan cowl features a strake.

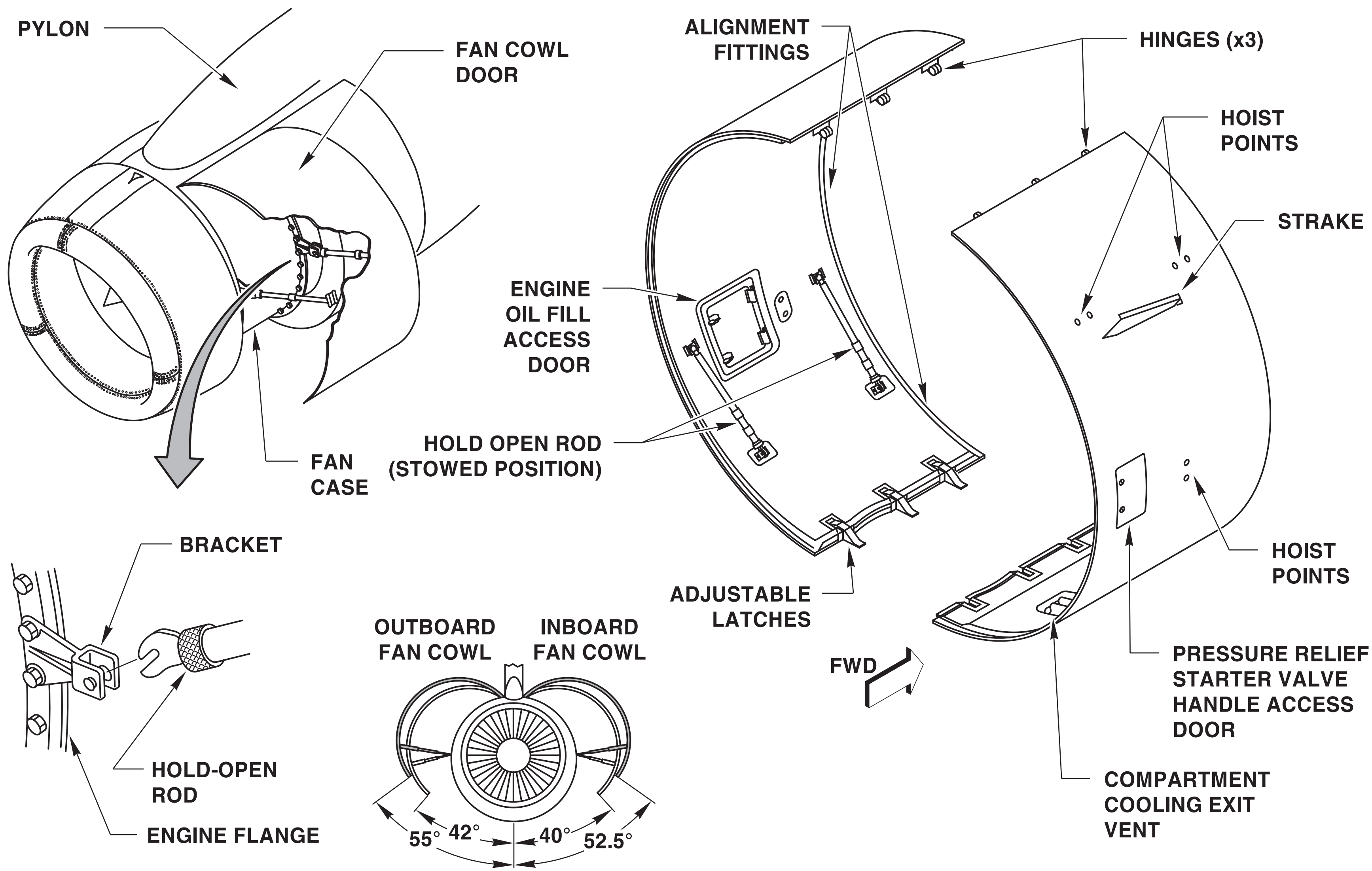
Three hinges at the pylon support each assembly. The door assemblies are latched at the bottom with three tension hook latches, adjustable when the doors are closed.

The fan cowl doors are manually opened, or closed, and can be held open at about 40 or 55 degrees, for engine maintenance purposes.

Each fan cowl door has three hoist points and two telescopic hold-open rods which support the doors in the open position.

One cowl door provides direct access to the starter valve, and the other provides direct access to the oil tank and MCD visual indicator.

A pressure relief door located on the right fan cowl door opens when the internal pressure in the nacelle is too high, in case of a burst duct.



CTC-240-011-00

FAN COWL DOORS

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THRUST REVERSER COWL OPENING

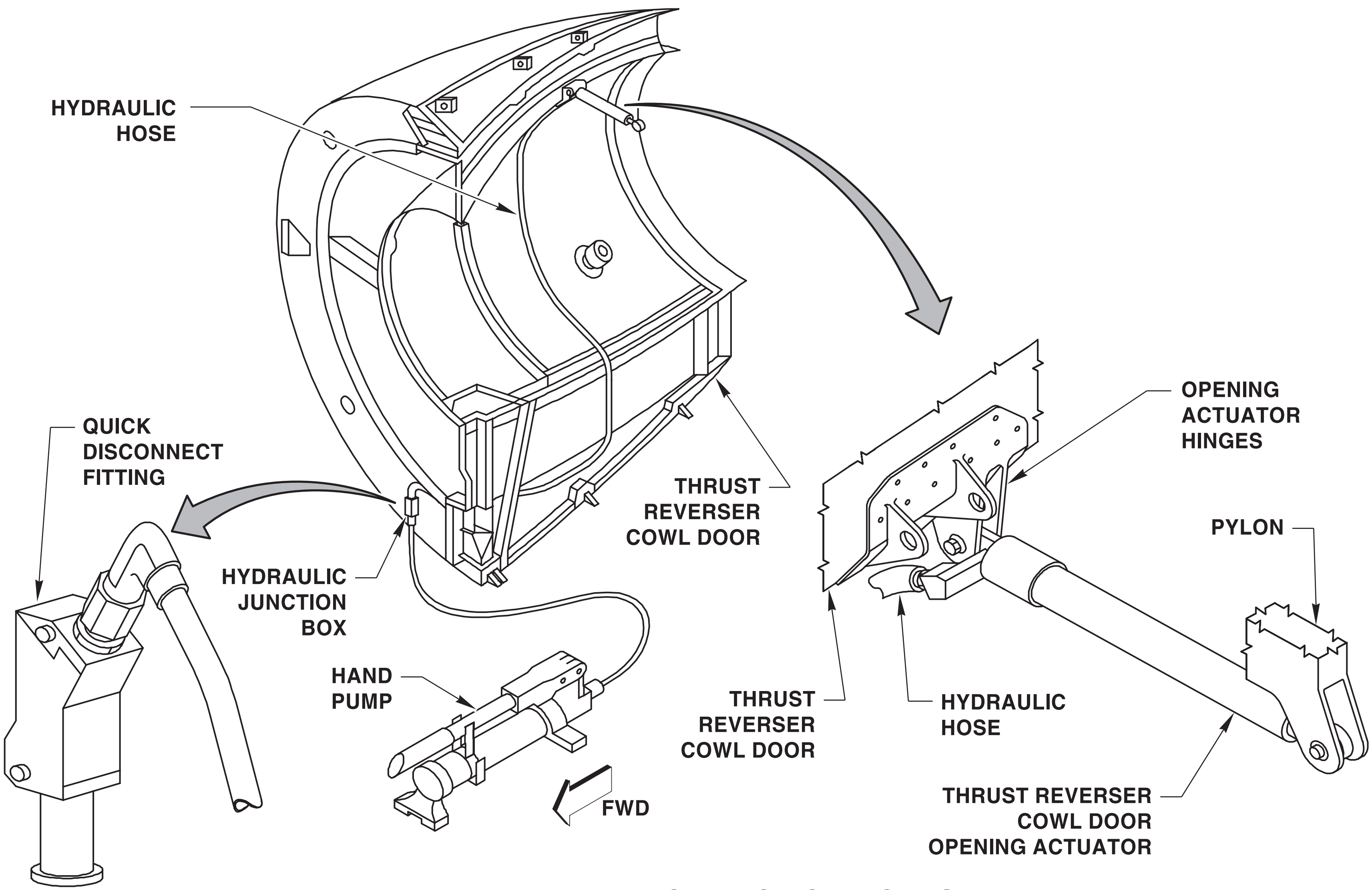
THRUST REVERSER COWL OPENING

Hydraulic junction boxes.

Hydraulic junction boxes are installed on the lower portion of the thrust reverser structure forward frame.

They are equipped with a quick connect/disconnect fitting to attach the ground support equipment hydraulic hand pump.

There are two hydraulic opening actuators located between the pylon and the two thrust reverser cowls.



HYDRAULIC JUNCTION BOXES

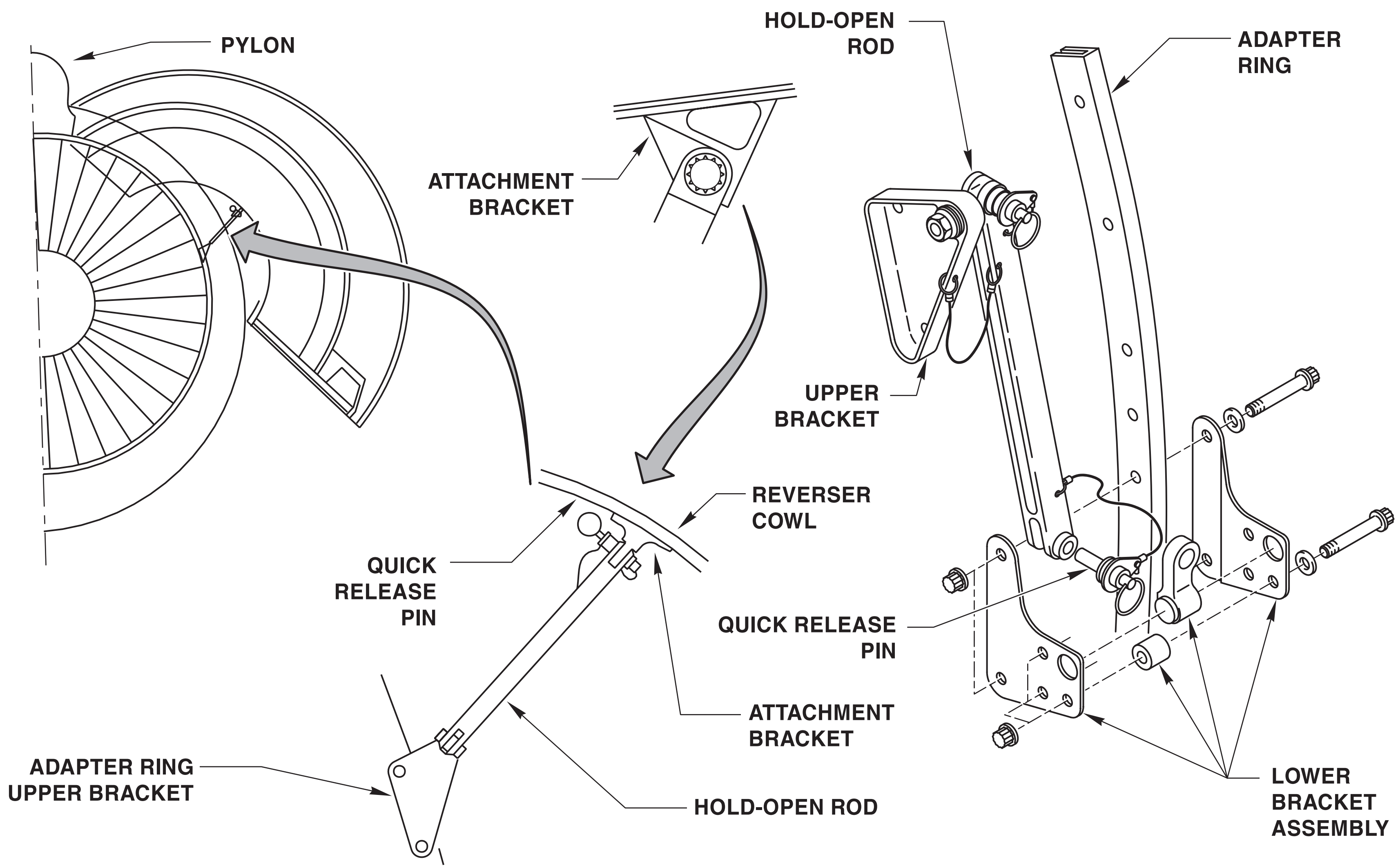
CTC-240-013-00

THRUST REVERSER COWL OPENING

Hold-open rods.

The two hold-open rods are installed on the adapter ring at the 3 and 9 o'clock positions.

When the cowls are closed, they are secured with a pin to an adapter ring bracket.



CTC-240-014-00

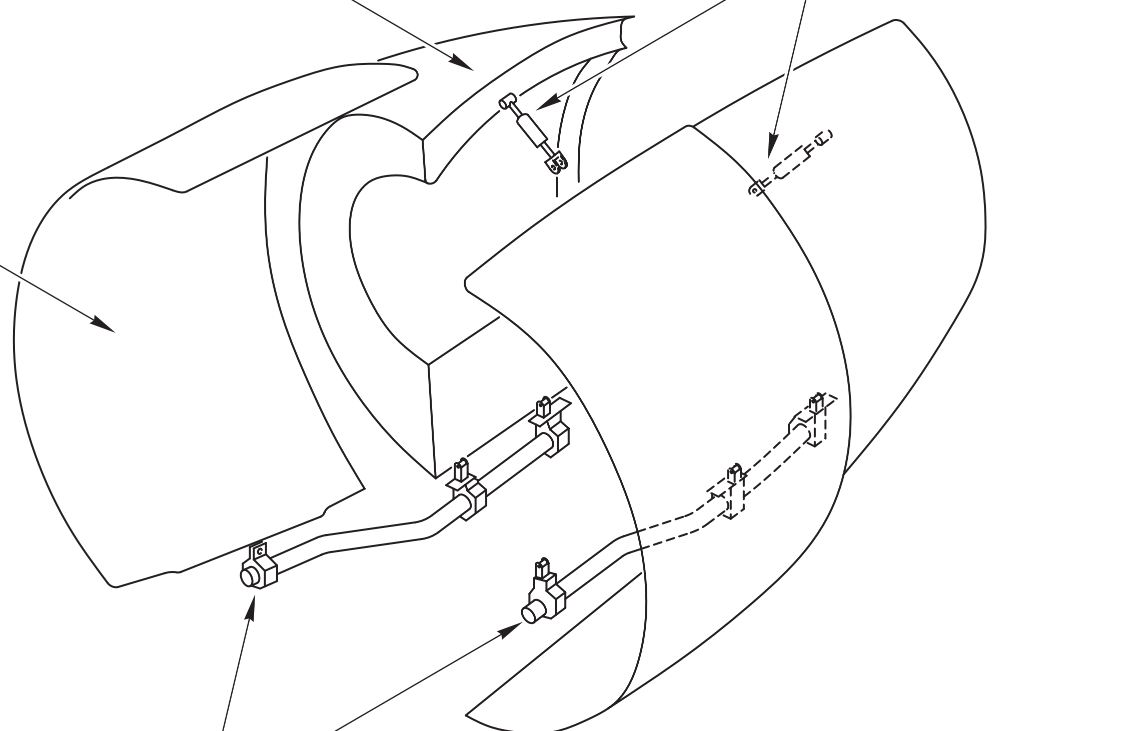
HOLD-OPEN RODS

THRUST REVERSER COWL OPENING

Attachment of T/R cowls to fan cowls.

For engine removal or installation purposes, both fan and T/R cowls need to be help open together.

Provisions are available on both fan and T/R cowls, for the installation of braces, which hold the cowls together in the open position.



CTC-240-015-00

FAN AND T/R COWLS HELD OPEN TOGETHER

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THRUST REVERSER - GENERAL

THRUST REVERSER - GENERAL

The Thrust Reverser (T/R) system provides additional aerodynamic braking during aircraft landing.

This braking effect enables to reduce the aircraft stopping distance.

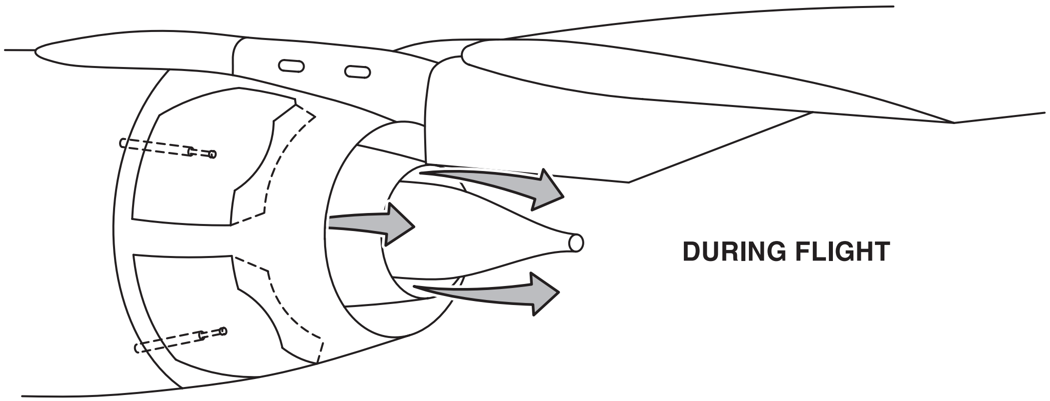
It can only be operated on ground, with the engines at idle speed and the throttle lever in the reverse position.

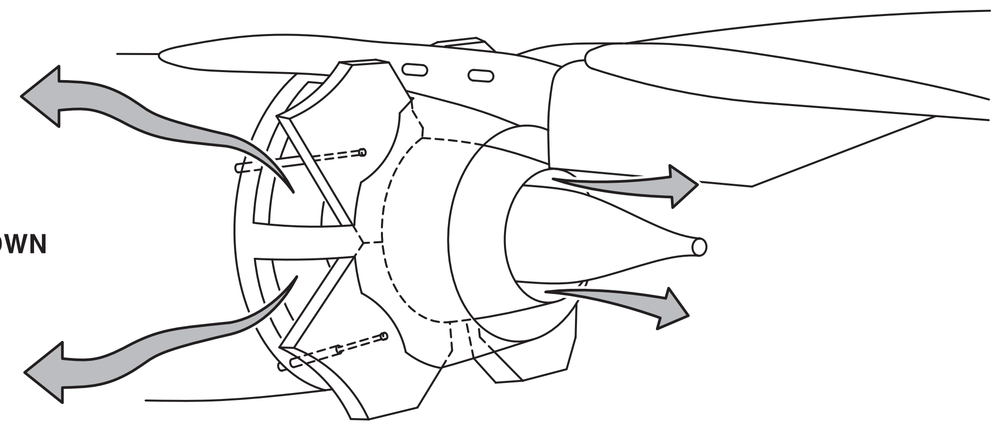
The fan thrust reverser is part of the exhaust system and is located just downstream of the fan frame. It consists of 4 hydraulically actuated blocker doors opening on cockpit order.

In direct thrust configuration, during flight, the cowlings mask the blocker doors, thus providing fan flow ducting.

In reverser thrust configuration, after landing, the blocker doors are deployed in order to obstruct the fan duct. The fan flow is then rejected laterally with a forward velocity.

A hydraulically actuated cowl opening system allows each thrust reverser cowl to be opened independently for maintenance operations.





CTC-240-012-00

THRUST REVERSER OPERATION

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THRUST REVERSER MECHANICAL STRUCTURE

THRUST REVERSER - MECHANICAL STRUCTURE

The thrust reverser is constructed in two half doors, also called C-ducts, with the split line in a vertical direction.

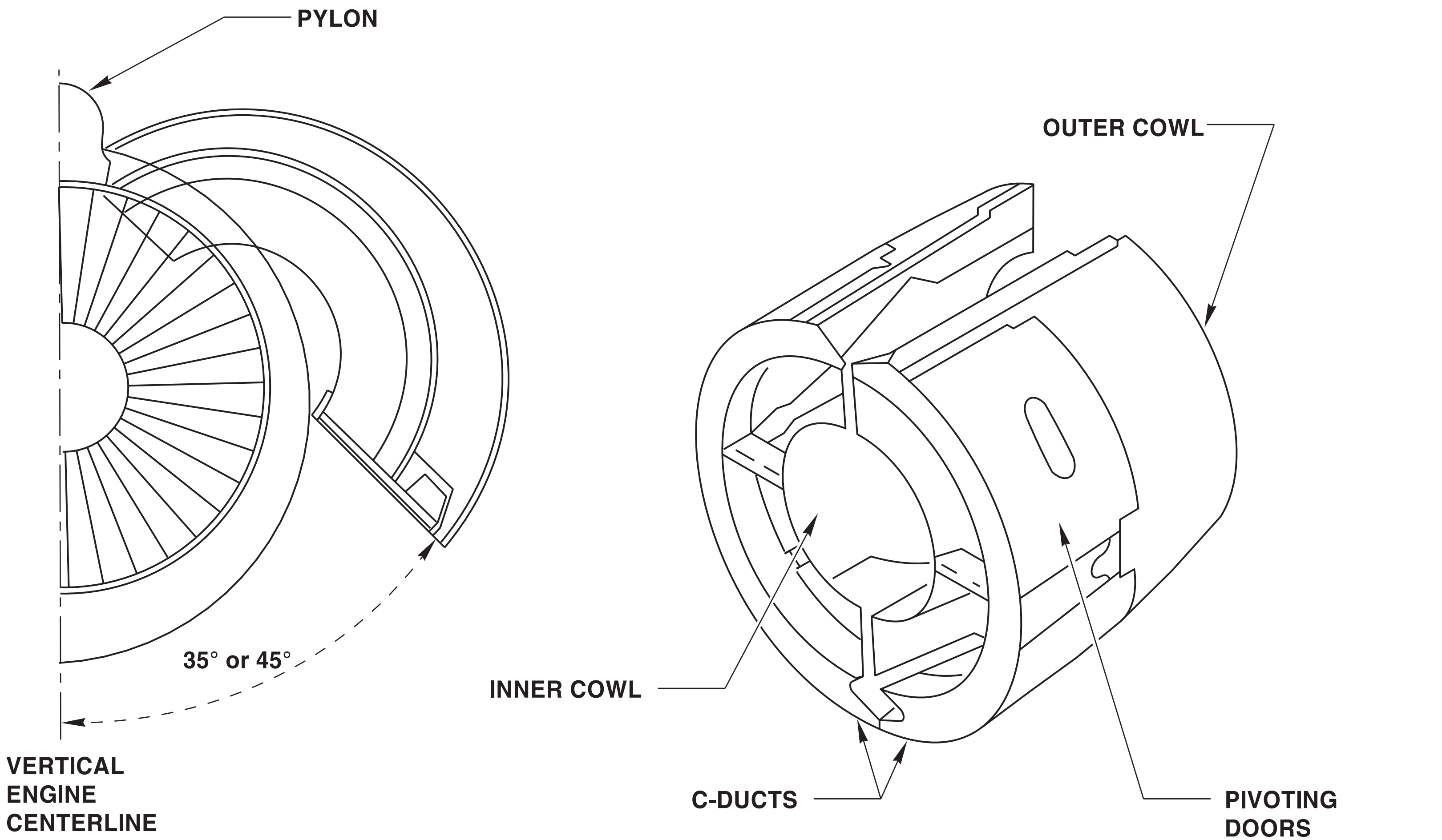
The two halves can be opened to 45 degrees, for engine removal/installation or to 35 degrees for routine maintenance.

Its mechanical structure includes :

- An outer cowl, which forms the fan discharge flow outer contour.

- An inner cowl, which forms the fan flow inner contour, and engine outer envelope.

- Pivoting doors going into the fan stream, blocking and redirecting the secondary airflow outward and forward.



CTC-240-016-00

THRUST REVERSER MECHANICAL COMPONENTS

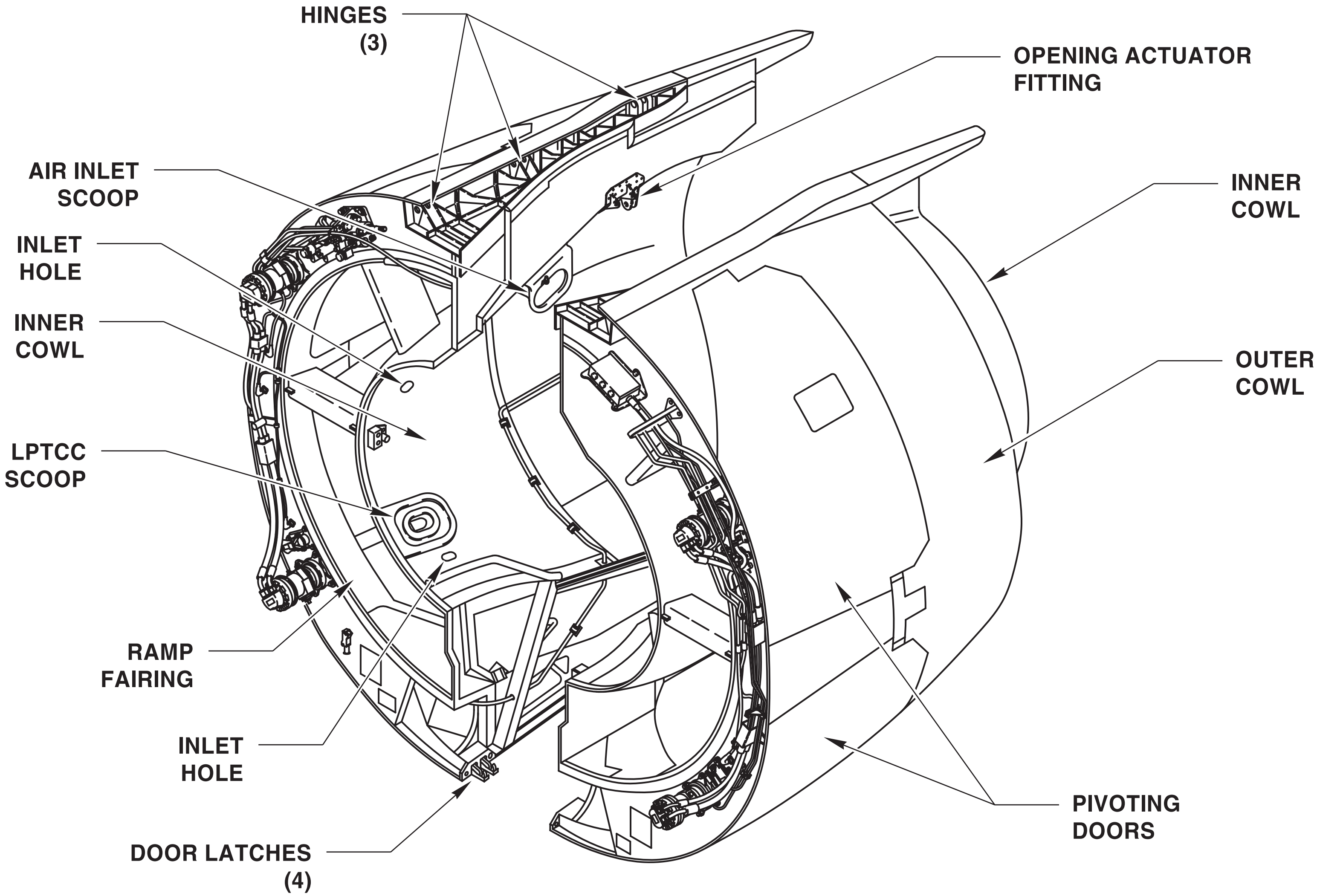
THRUST REVERSER MECHANICAL STRUCTURE

T/R cowls.

The C-ducts consist of :

- The outer cowl, which, in the stowed position, encloses the pivoting doors.
- Three hinges which attach the cowl to the pylon.
- Two hoist points (not shown) on each outer cowl for removal/installation maintenance operations.
- Four tension hook latches, to keep the cowls closed.
- Two opening actuator fittings.
- A ramp fairing, to smooth the airflow passing from the engine to the thrust reverser.
- The inner cowl, which smooths the secondary airflow inner passageway and provides air to the core engine.
- An air inlet scoop, at 12 o'clock, to duct air to the precooler.
- An LPTCC inlet scoop at the front of the R/H inner cowl, to duct secondary flow bleed air for LPT cooling and clearance control.
- Inlet holes, in the front section of the cowl, to duct air to the core engine internal cavity.

The inner and outer cowls have a honeycomb structure with sound suppressing surfaces.



CTC-240-017-00

THRUST REVERSER COWLS

THRUST REVERSER MECHANICAL STRUCTURE

Pivoting doors.

There are two pivoting doors on each thrust reverser half door.

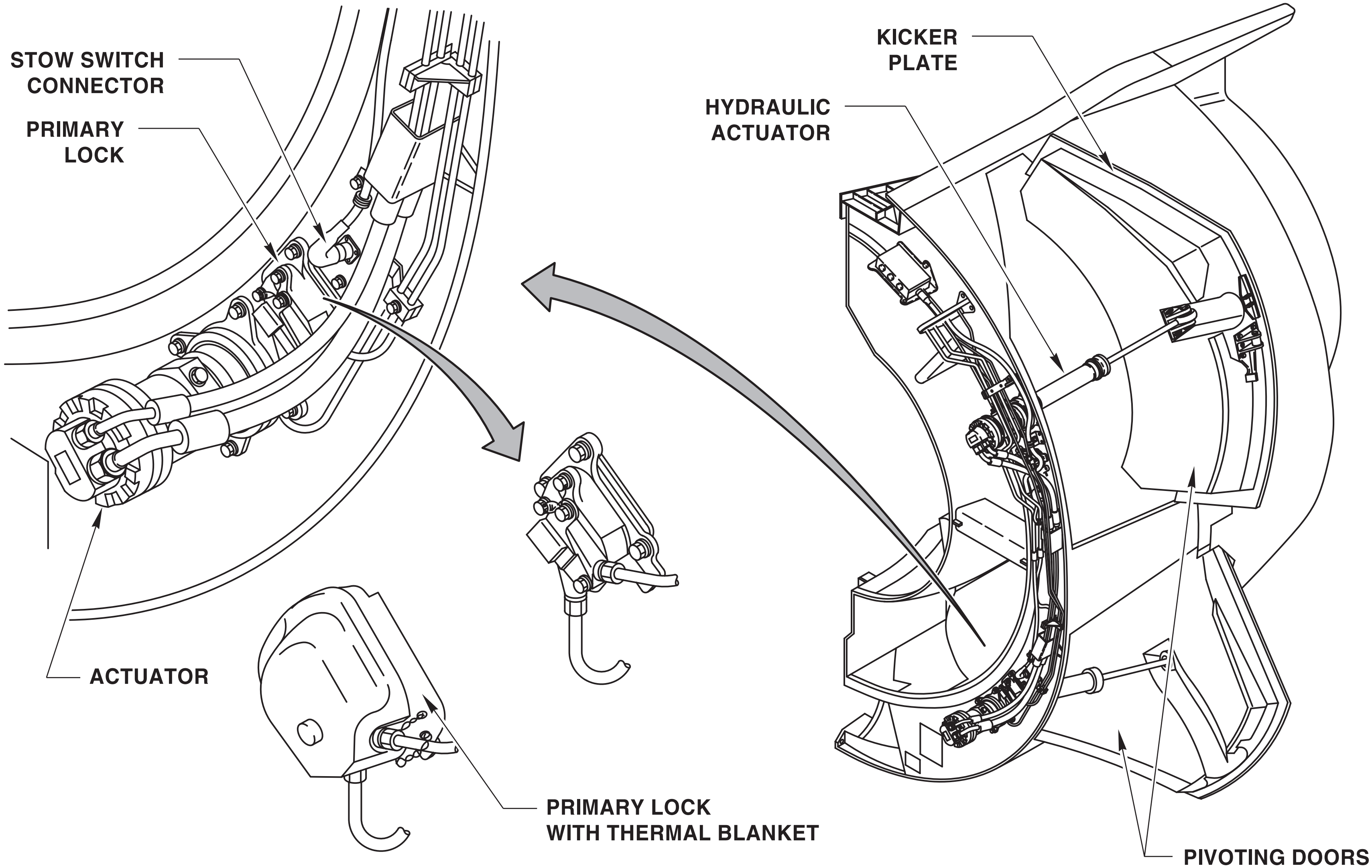
They are installed on pins that make them pivot when hydraulic pressure is applied.

They are operated by four individual hydraulic actuators, which move them independently to the deployed or stowed position during thrust reverser operation.

Each pivoting door is locked on the forward frame with a primary lock, which keeps it in the stowed position.

When the four doors have reached the fully deployed position, the fan air is blocked and redirected forward.

The doors feature kicker plates which provide sealing in the stowed position, and prevent reverse thrust re-injection in the deployed position.



CTC-240-018-00

PIVOTING DOORS

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THRUST REVERSER SYSTEM

THRUST REVERSER SYSTEM

The thrust reverser system includes :

- an electrical system.
- a hydraulic system.

Electrical system.

The electrical system includes :

- The two thrust reverser latching levers.
- Two pivoting door dual deploy switches and four pivoting door stow switches, which allow different thrust reverser processes during stow and deploy sequences.
- An electrical wiring harness.

Hydraulic system.

The hydraulic system includes :

- A shut-off valve, which isolates the reverser hydraulic system from the aircraft hydraulics.
- A hydraulic filter, used to filter fluid from the aircraft hydraulic system.
- A hydraulic control unit, which manages and operates the actuating and latching systems.
- Four hydraulic actuators, which independently operate the pivoting doors.
- Four hydraulic pivoting door latches, to lock the pivoting doors in the stow position.

THRUST REVERSER SYSTEM

ELECTRICAL

- T/R LATCHING LEVERS
- CONTROL SWITCHES
- WIRING HARNESS

HYDRAULIC

- SHUT-OFF VALVE
- HYDRAULIC FILTER
- HYDRAULIC CONTROL UNIT
- HYDRAULIC ACTUATORS (x4)
- PIVOTING DOOR HYDRAULIC LATCHES (x4)

CTC-240-019-00

THRUST REVERSER SYSTEM

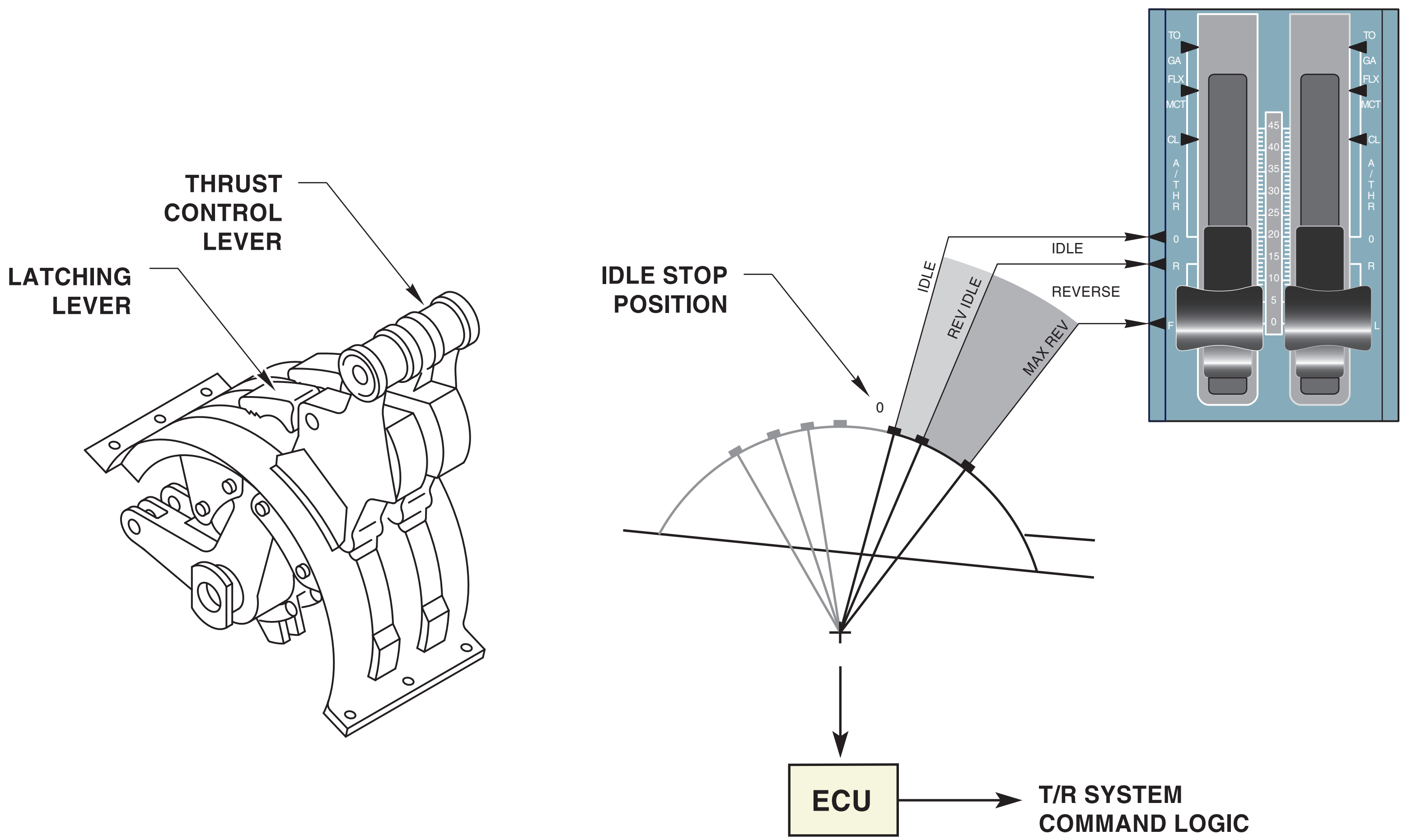
THRUST REVERSER SYSTEM

The thrust reversers can be activated when the thrust lever is at idle stop and the aircraft is on ground with engines running.

Releasing the reverser latching lever allows to pull the thrust lever from the stop position to the reverse idle position.

The thrust reverser is then controlled by the ECU, which commands the deployment of the pivoting doors.

After all doors are fully deployed, max reverse thrust can be applied.



CTC-240-020-00

THRUST REVERSER CONTROL LEVER POSITIONS

Deploy switches.

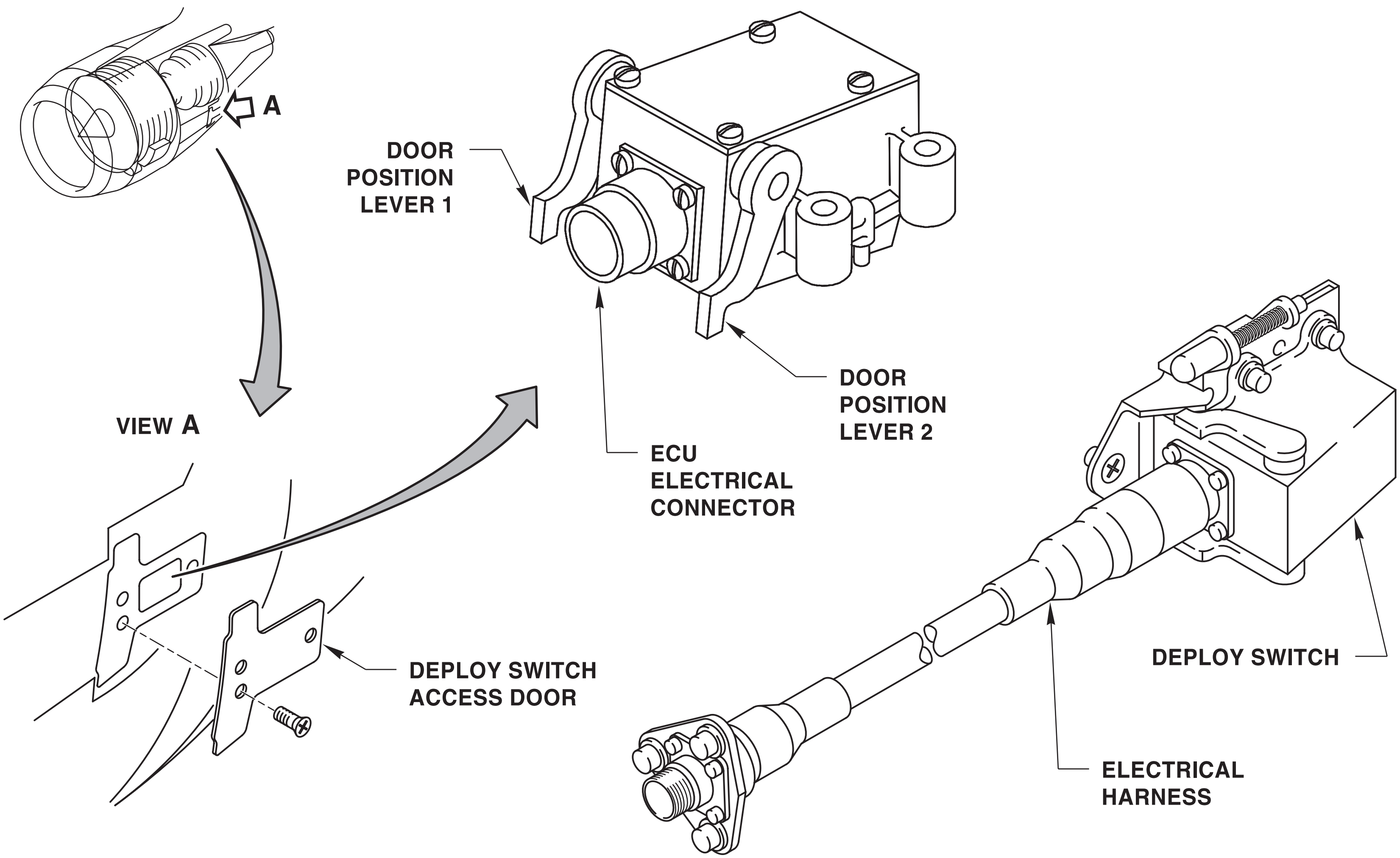
The deployed position of the pivoting doors is sensed by two double deploy switches, one for the 2 R/H doors, and one for the 2 L/H doors.

They are located on the thrust reverser beams, two at 3 o'clock ant two at 9 o'clock, and are accessible through access doors on each side of the thrust reverser outer cowl.

Each of them monitors two pivoting doors.

They are contact switches, connected in series, and change signal when the monitored door has reached a near fully deployed position.

They are connected to the ECU via the electrical junction box.



CTC-240-021-00

PIVOTING DOOR DEPLOY SWITCHES

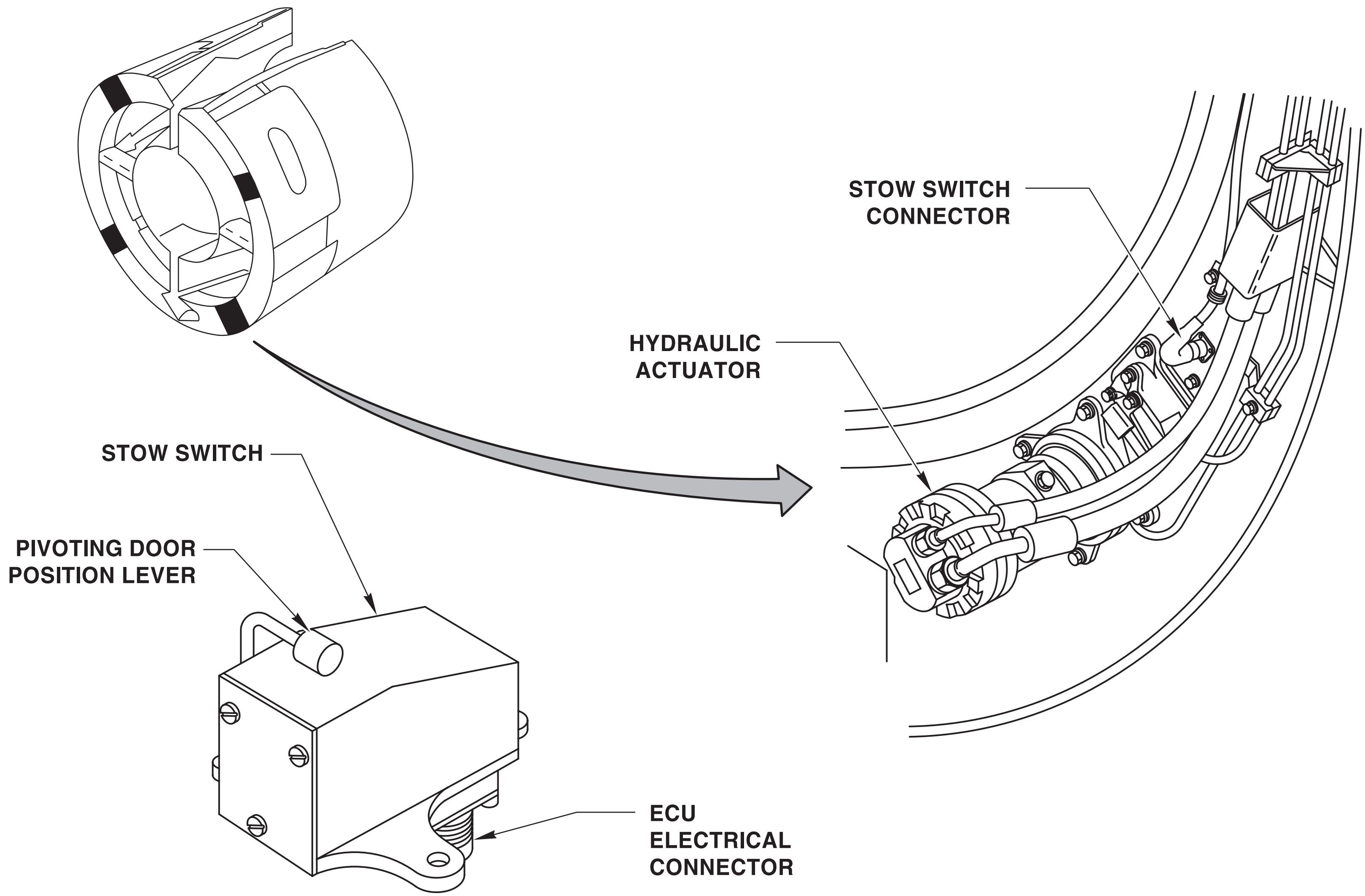
Stow switches.

The stowed position of the pivoting doors is sensed by four single stow switches, one per door, located on the forward frame rear side, next to the door latches.

They are accessible once the fan cowls are opened and the doors deployed.

They are connected in parallel, and change signal when the monitored door has started to close.

The switches are connected to the ECU via the electrical junction box.



CTC-240-022-00

PIVOTING DOOR STOW SWITCHES

THRUST REVERSER SYSTEM

The thrust reverser system is hydraulically supplied by the corresponding hydraulic pump on the engine.

It is isolated from the hydraulic supply by a shut-off valve, which connects to a hydraulic filter and a hydraulic control unit (HCU).

Shut-Off Valve.

The Shut-Off Valve (SOV) is located in the front section of the pylon, above the fan inlet case forward flange.

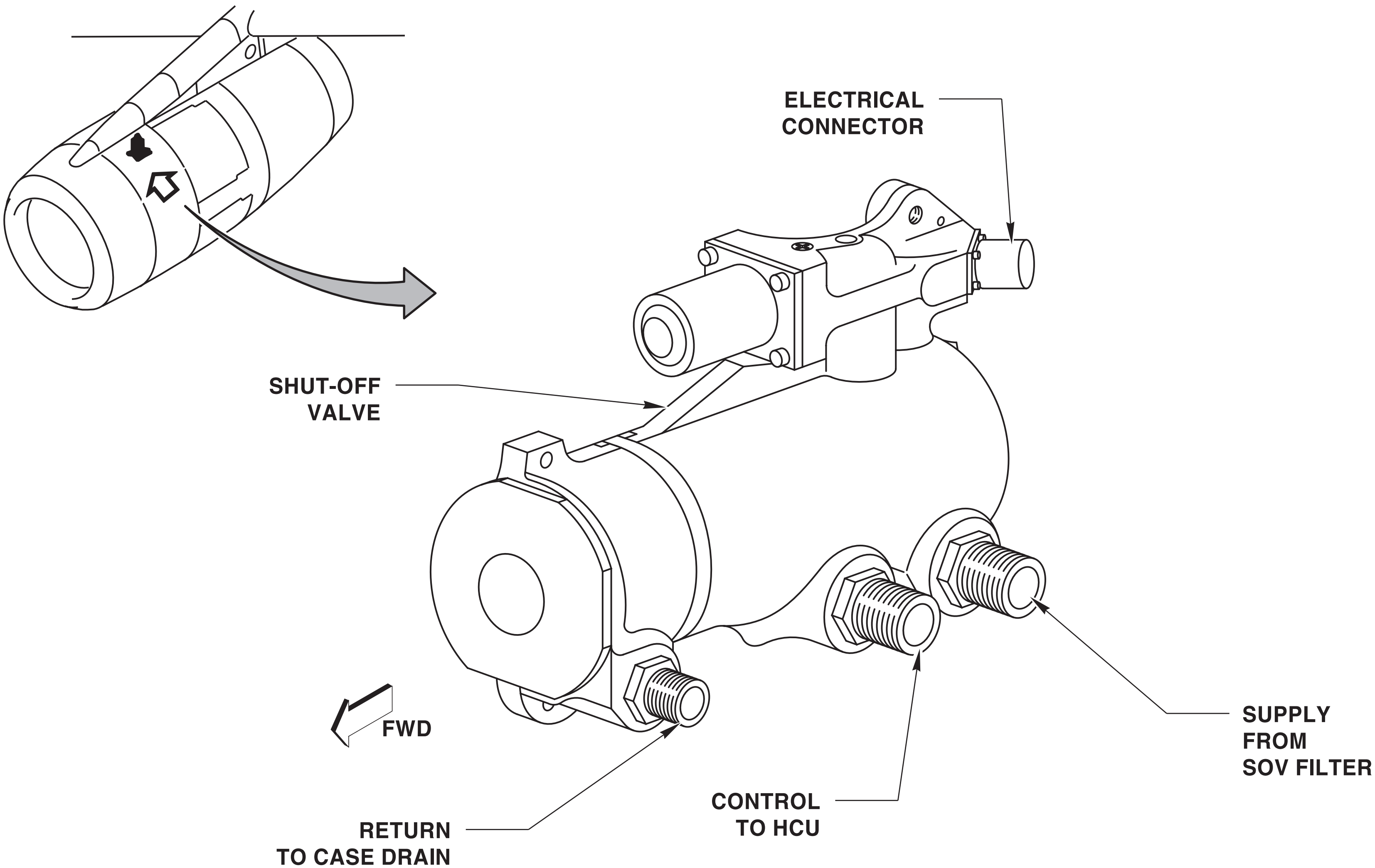
The fan cowl doors must be opened to access the SOV.

The SOV isolates the thrust reverser from system pressure.

When energized, it enables the thrust reverser to be operated.

The SOV is hydraulically connected to the hydraulic filter and the HCU.

The SOV solenoid is electrically connected to the aircraft 115 VAC power supply.



CTC-240-023-00

SHUT-OFF VALVE

Hydraulic filter.

The Hydraulic Control Unit filter module is installed at the bottom of the pylon, in front of the HCU. Its purpose is to prevent unwanted matter from entering the thrust reverser hydraulic system.

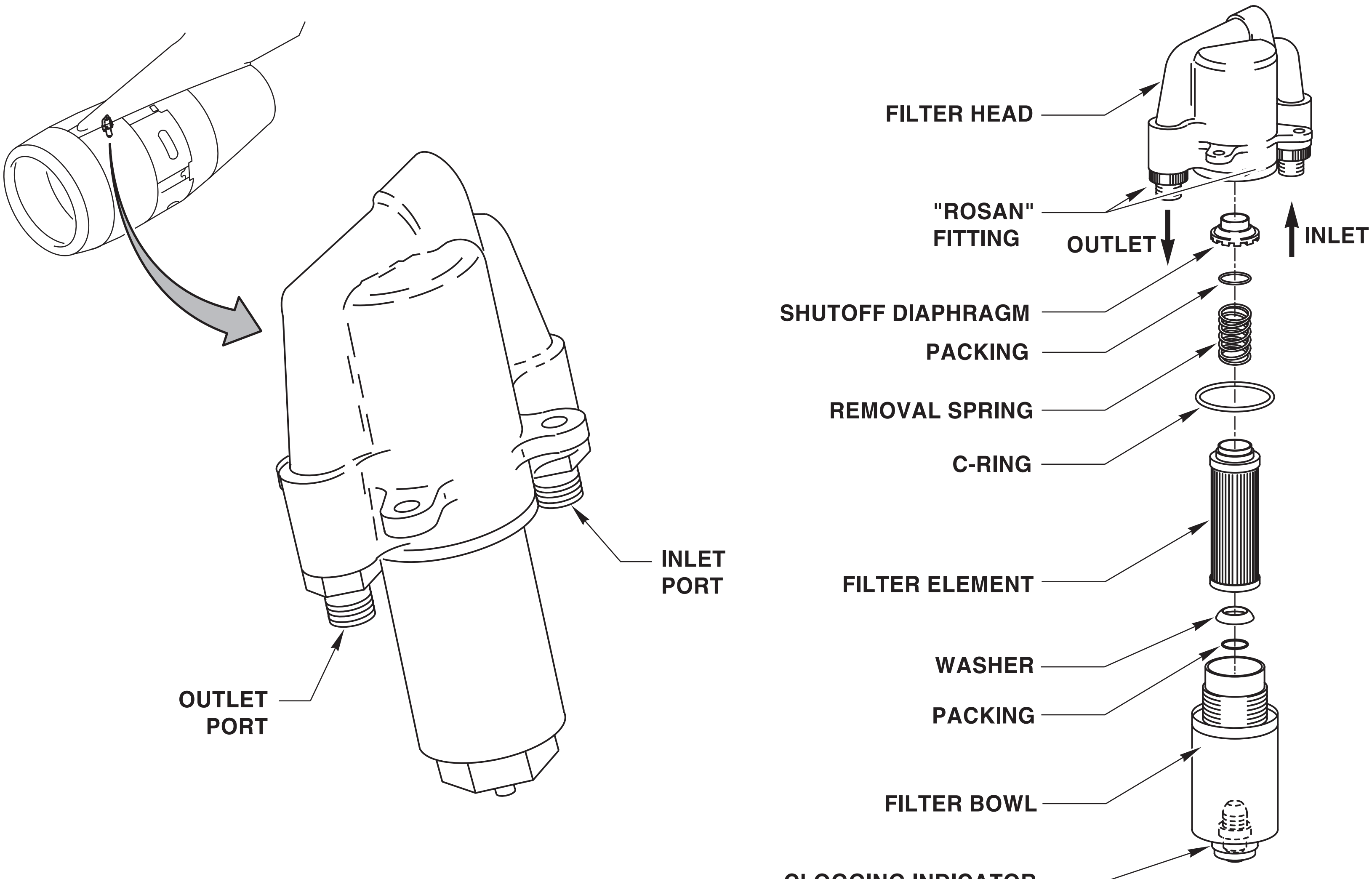
It is accessible once the fan cowl doors are open.

A differential pressure pop-out indicator at the bottom of the filter bowl provides a visual indication of filter clogging.

To access and change the filter element, the bowl is turned counter-clockwise to remove it from the head.

When the filter bowl is removed, the C-ring and packing must be replaced. Care must be taken not to damage the differential pressure indicator, or bowl, with metal tools when the packing is removed, or installed.

If the differential pressure indicator is replaced, the entire filter assembly must be removed from the aircraft and a complete acceptance test procedure carried out.



CTC-240-024-00

T/R HYDRAULIC FILTER

Hydraulic Control Unit.

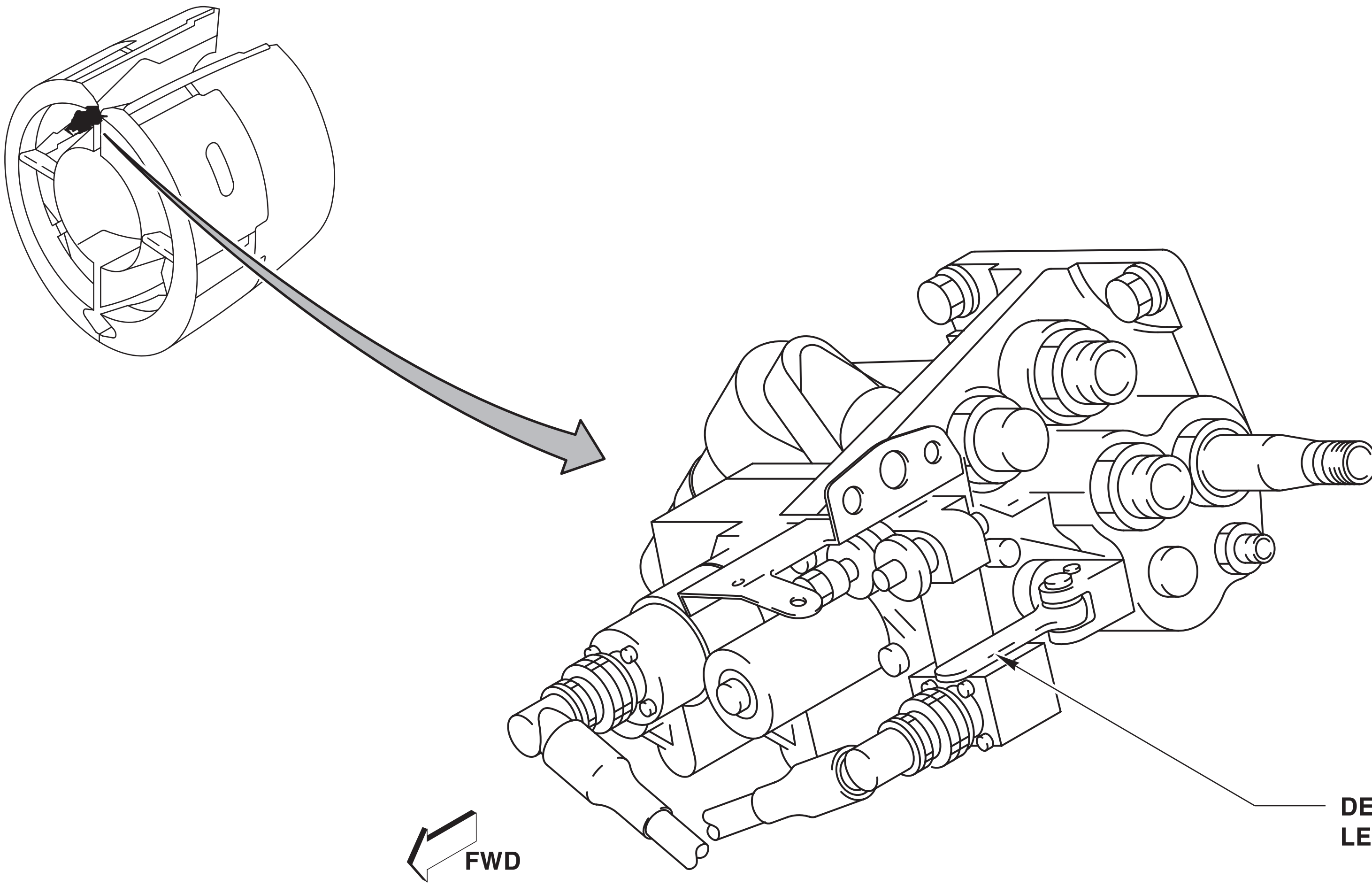
The Hydraulic Control Unit (HCU) controls the flow of hydraulic fluid to the thrust reverser latches and pivoting door actuators during all thrust reverser operation phases.

Control and feedback signal are exchanged with the ECU.

The HCU is accessible once the thrust reverser cowls and the fan cowls are opened.

It is installed on the right-hand forward frame of the thrust reverser structure, at 1 o'clock.

The HCU is equipped with a lever, which permits de-activation of the thrust reverser before maintenance operations.



CTC-240-025-00

HYDRAULIC CONTROL UNIT

Pivoting door latches.

The four pivoting door latches (one for each pivoting door) are installed on the C-ducts forward frame, between the door actuators and the stow switches.

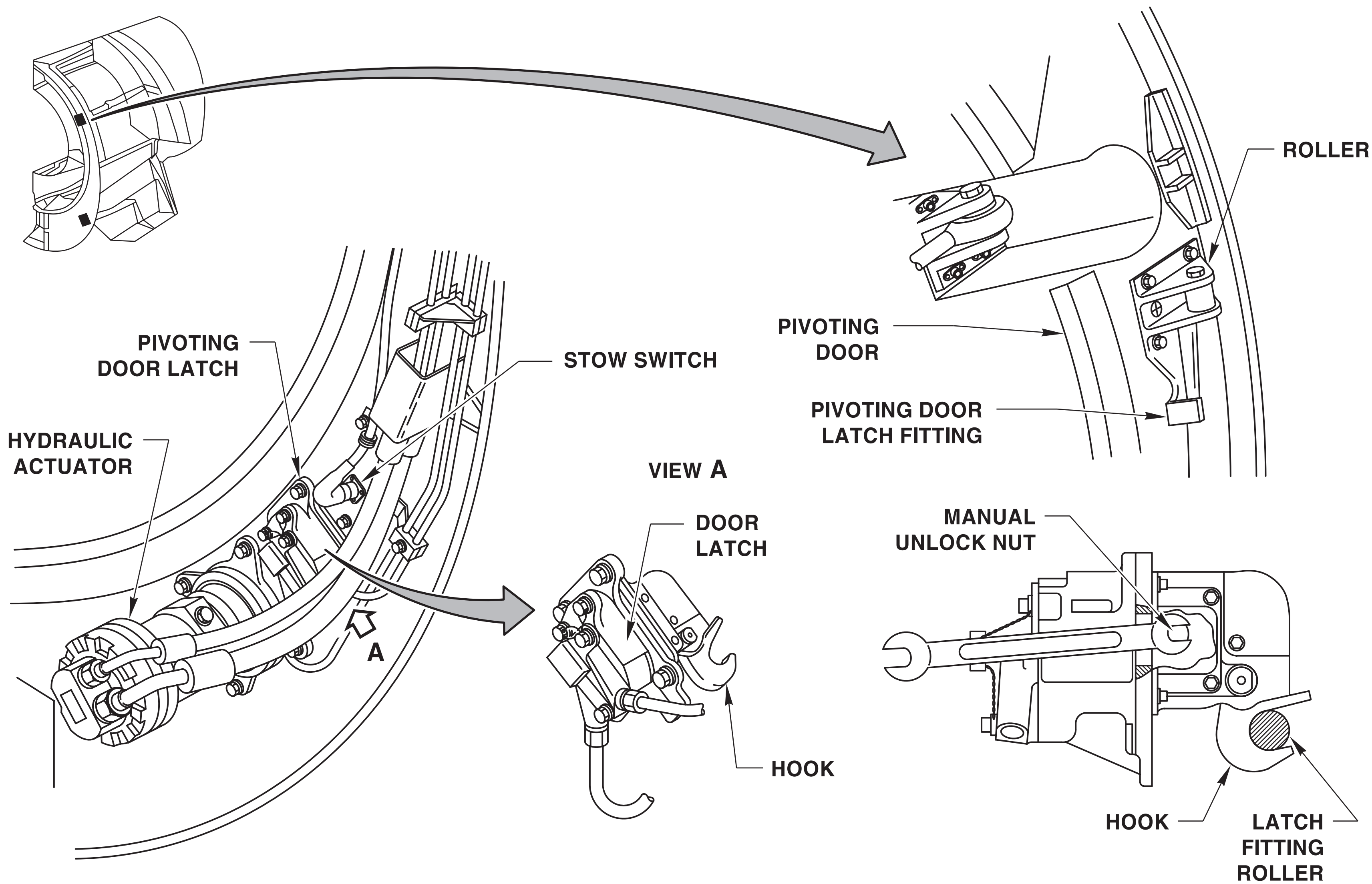
They are accessible once the fan cowls are open.

They lock the doors in the stowed position.

Each latch consists of a hook, lever and spring-loaded hydraulic actuator which operates the hook.

The latches are actuated in series : it is only after one latch is unlocked that pressure is applied to the next.

Acting on the latch manual unlock nut is the first step to manually releasing the pivoting doors open for maintenance purposes.



CTC-240-026-00

PIVOTING DOOR LATCHES

Pivoting door actuators.

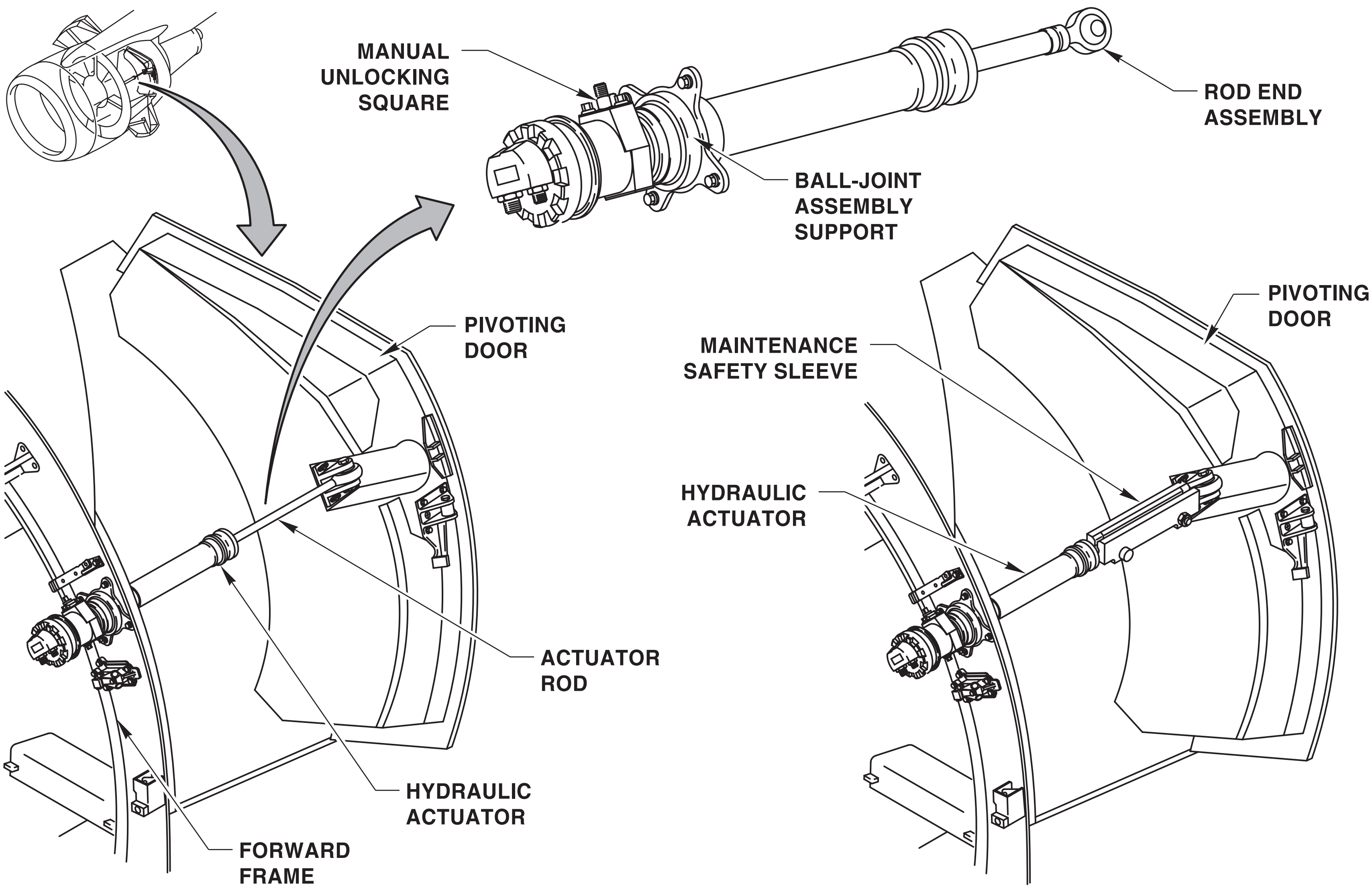
Four hydraulic actuators provide the force necessary to deploy and stow the thrust reverser pivoting doors.

They are installed on the T/R forward frame by a ball-joint support.

The piston rod of the actuator is attached to the pivoting door structure by the rod end assembly.

Acting on the actuator manual unlock square after unlocking the latch, allows manual opening of a pivoting door during maintenance operations.

A safety sleeve is installed on the actuator to prevent door closing.



HYDRAULIC ACTUATORS

Deploy mode sequence.

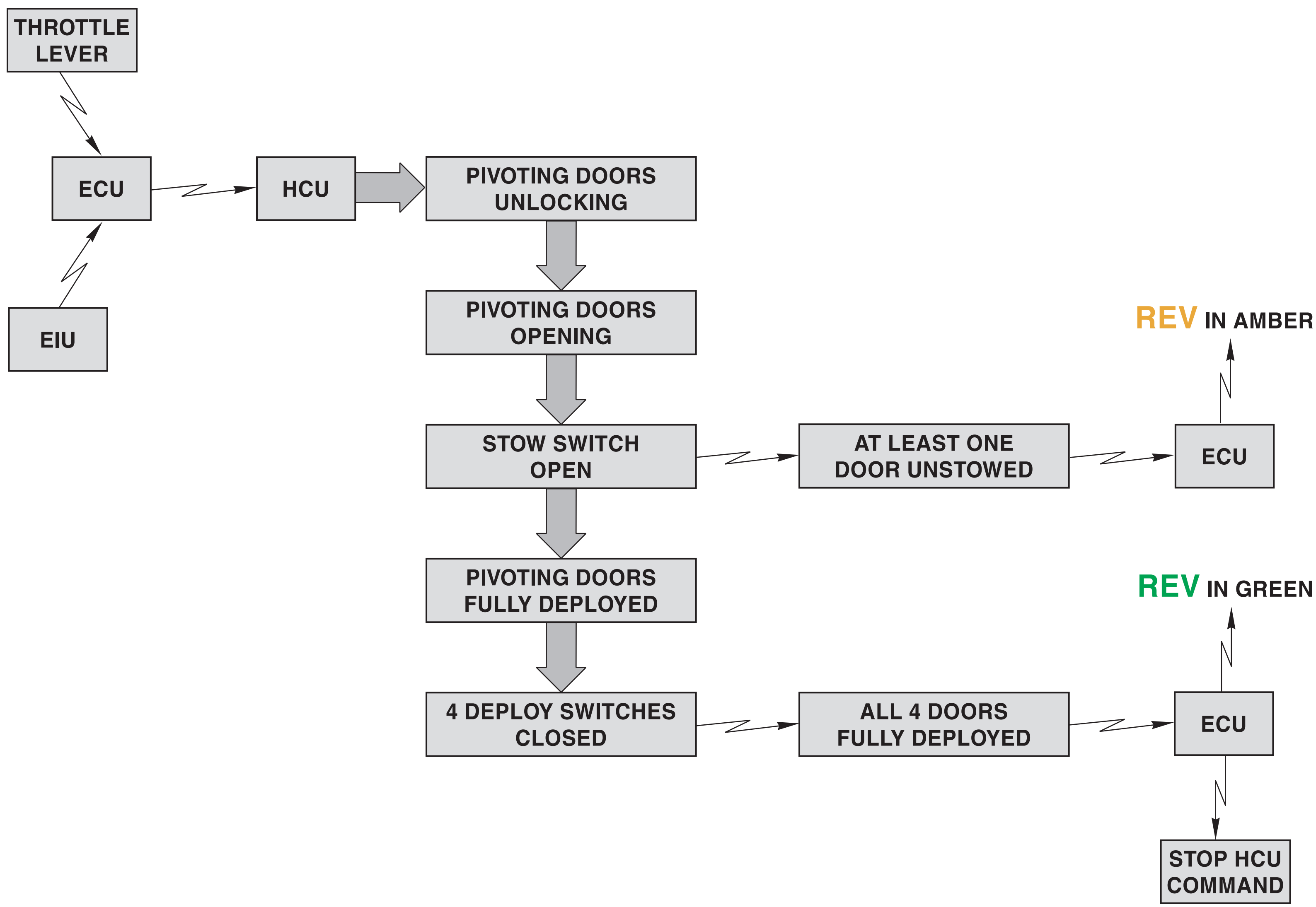
In the deploy mode, when the aircraft is on ground and reverse thrust is set from the flight compartment, the EIU and ECU send electrical signals to the Hydraulic Control Unit, if the deploying conditions are met.

The HCU sends hydraulic pressure to unlock each pivoting door.

When all pivoting doors are unlocked, the hydraulic pressure is sent to the hydraulic actuators extend side until they are fully deployed.

An unstow message is sent to the flight compartment.

When the four pivoting doors are deployed, the ECU receives the signal «deployed doors» and stops the electrical signal to the HCU.



CTC-240-028-00

DEPLOY SEQUENCE

Stow mode sequence.

When the thrust reverser stow sequence is selected, the EIU and ECU send an electrical signal to the HCU.

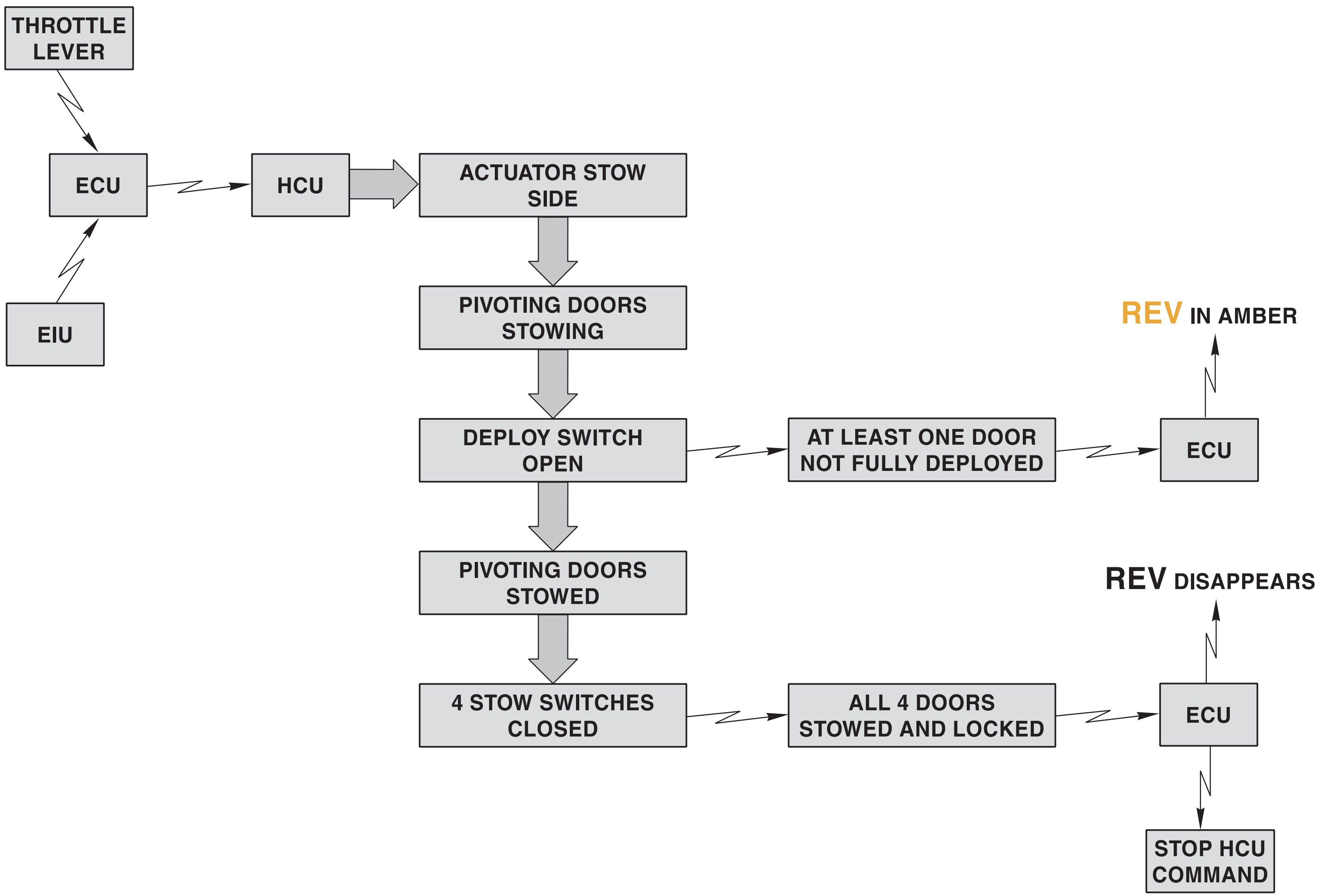
The HCU sends hydraulic pressure to the hydraulic actuators retract side.

The hydraulic actuators are connected to the aircraft hydraulic return system.

When the pivoting doors are in their stowed position, they actuate stow indication switches, which send the “stowed” signal to the flight compartment.

The ECU removes electrical power from the HCU with a closure delay of one to two seconds, which enables the pivoting doors to lock.

A pressure switch transmits a “without pressure” signal to the ECU.



STOW SEQUENCE

CTC-240-029-00

T/R inhibition.

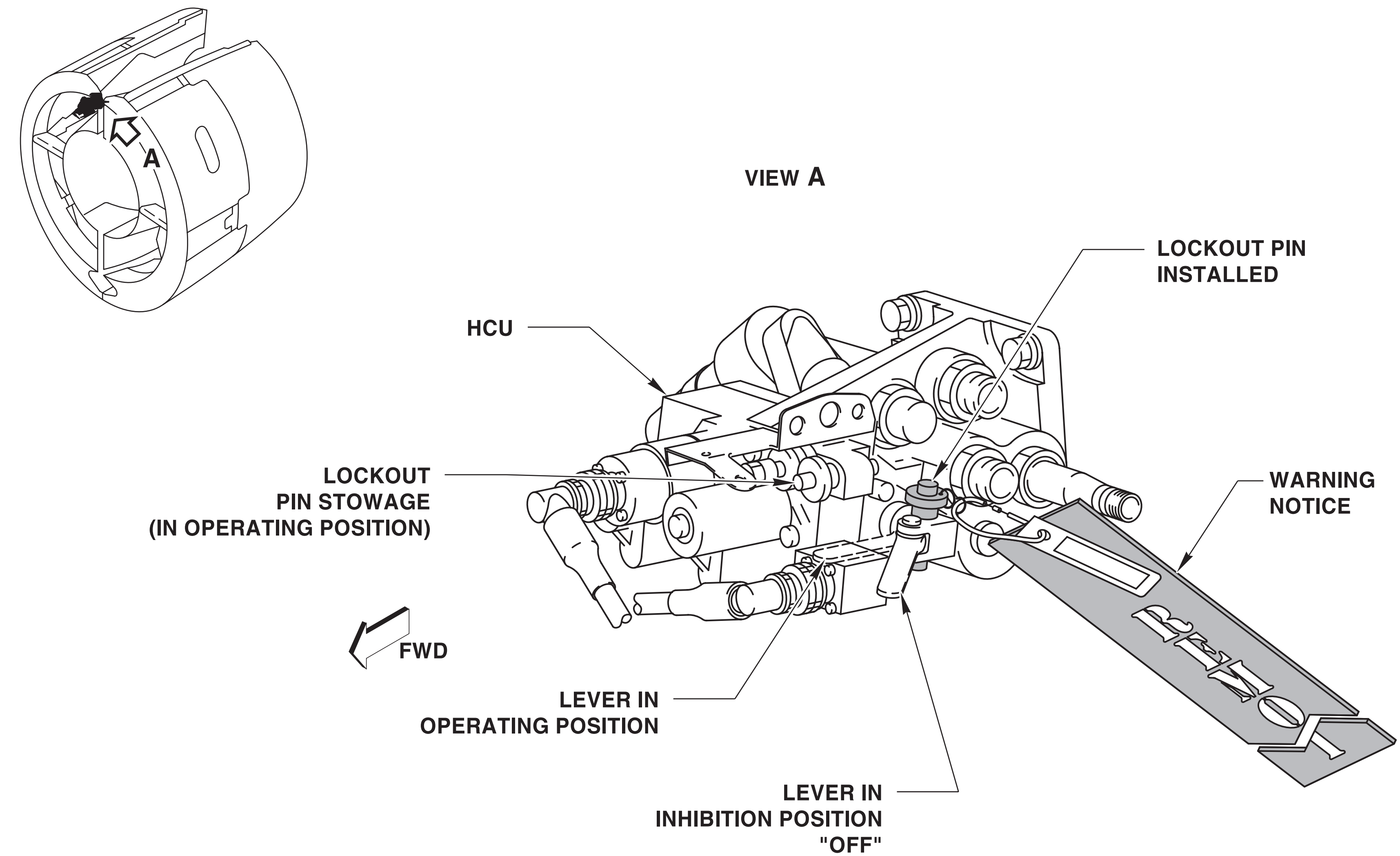
For safety reasons during maintenance operations, it is necessary to make the thrust reverser unserviceable.

The T/R can be inhibited by removing the lockout pin from its stowage position, and moving the HCU deactivation lever forward, to the inhibition position.

This way, no hydraulic pressure is delivered to the pivoting door latches and actuators.

A lockout pin is then installed through the lever to lock it in the unserviceable position.

A warning notice is placed on the lever, telling persons not to remove the lockout pin.



CTC-240-030-00

THRUST REVERSER INHIBITION

T/R deactivation.

The thrust reverser is deactivated if :

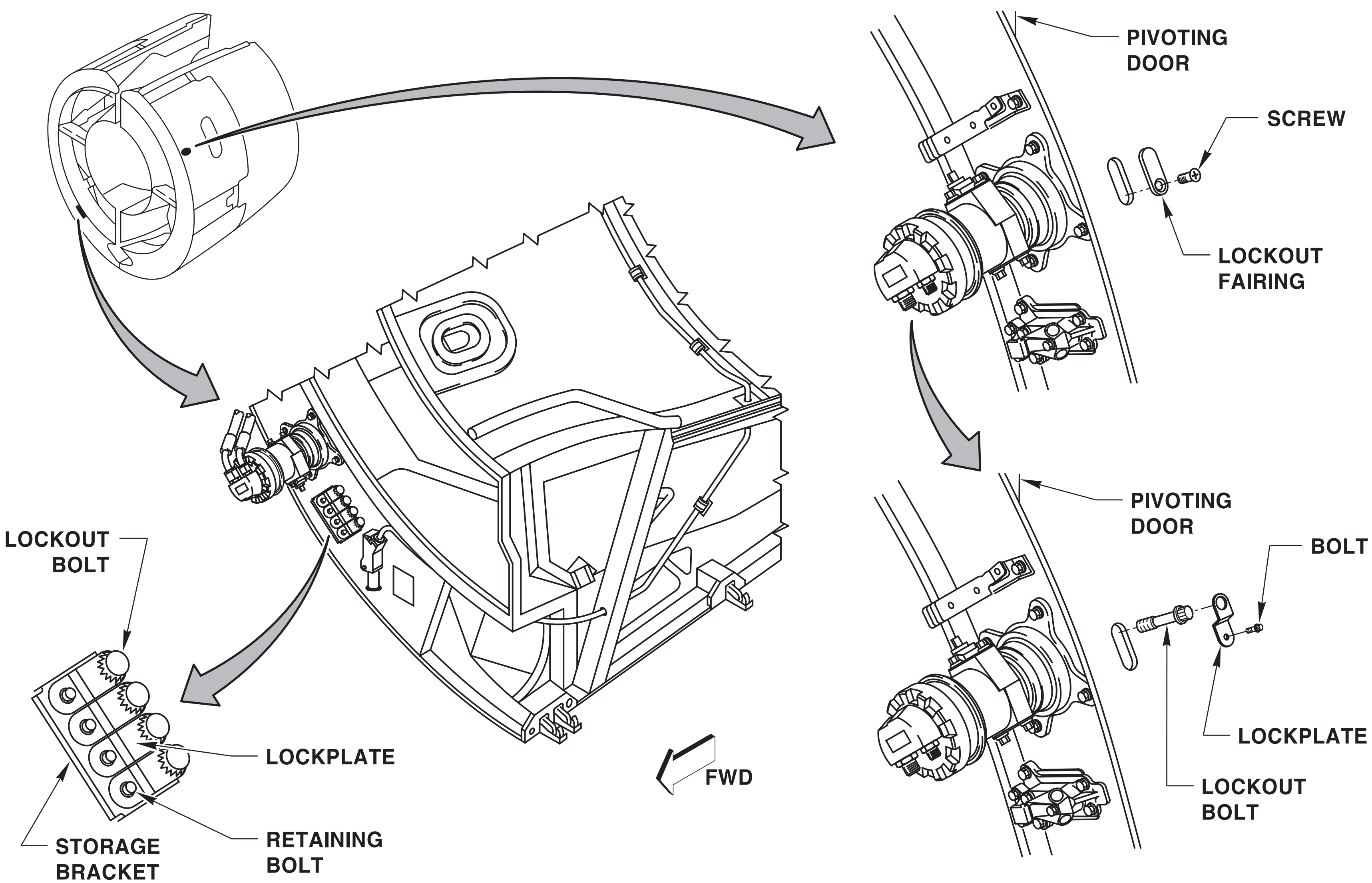
- the HCU lever is moved to the inhibit position and locked in place.

- the lockout bolts provided to secure the pivoting doors in the stowed position are installed.

The lockout bolts and red lockplates are installed on a storage bracket mounted on the forward face of the right-hand T/R cowl door.

The lockout fairings and screws are removed from the pivoting doors and installed on the storage bracket.

The lockout bolts and lockplates are then installed on the pivoting doors to attach them to the forward frame of the thrust reverser.



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THRUST REVERSER DEACTIVATION

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EXHAUST SYSTEM

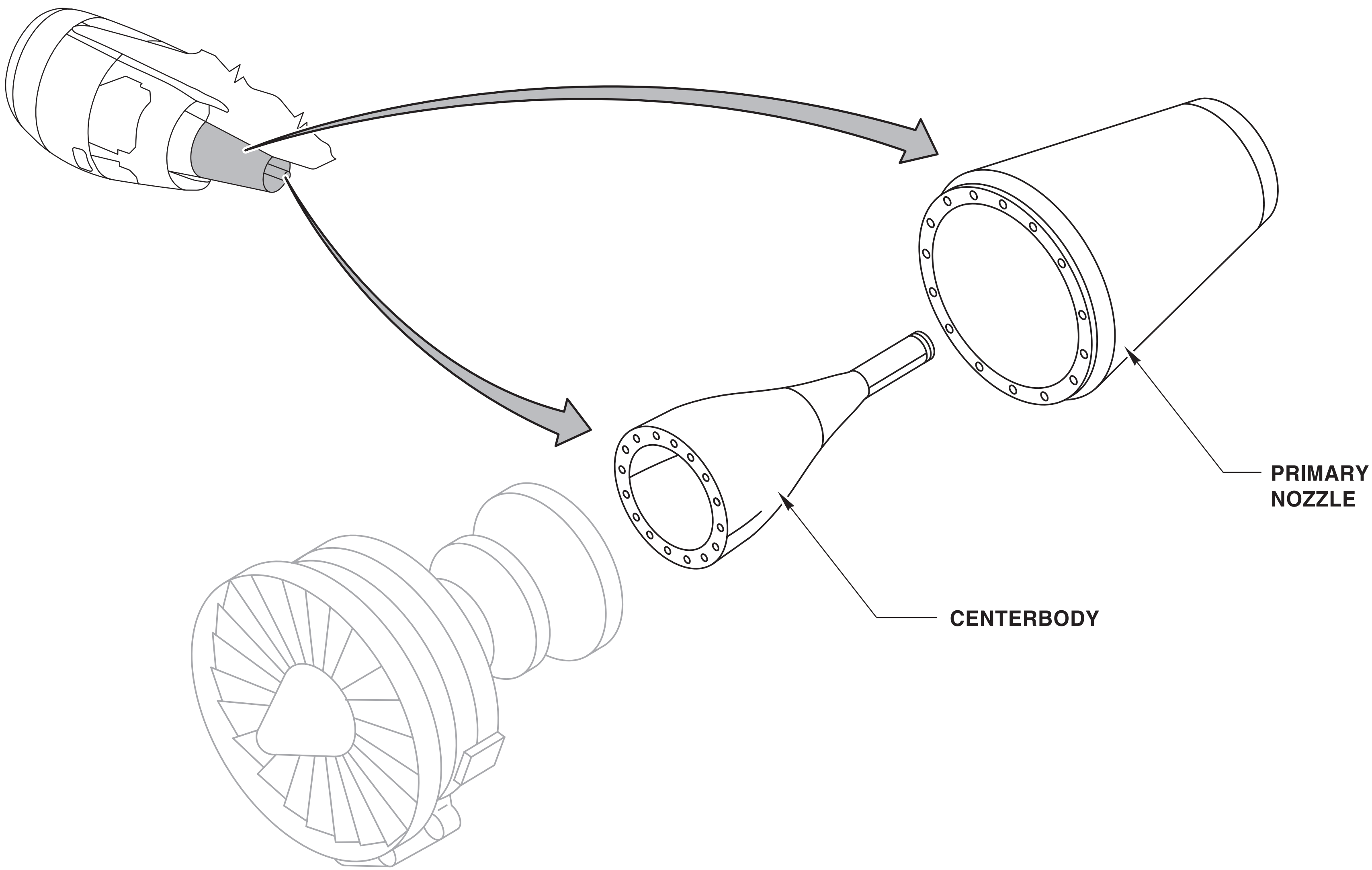
EXHAUST SYSTEM

The purpose of the exhaust system is to provide thrust by discharging the primary airflow to atmosphere.

The exhaust system is composed of :

- The primary nozzle.
- The centerbody.

The centerbody is only accessible when the primary nozzle is removed.



CTC-240-032-00

EXHAUST SYSTEM LOCATION

EXHAUST SYSTEM

The primary nozzle and centerbody are attached to the aft end of the turbine rear frame.

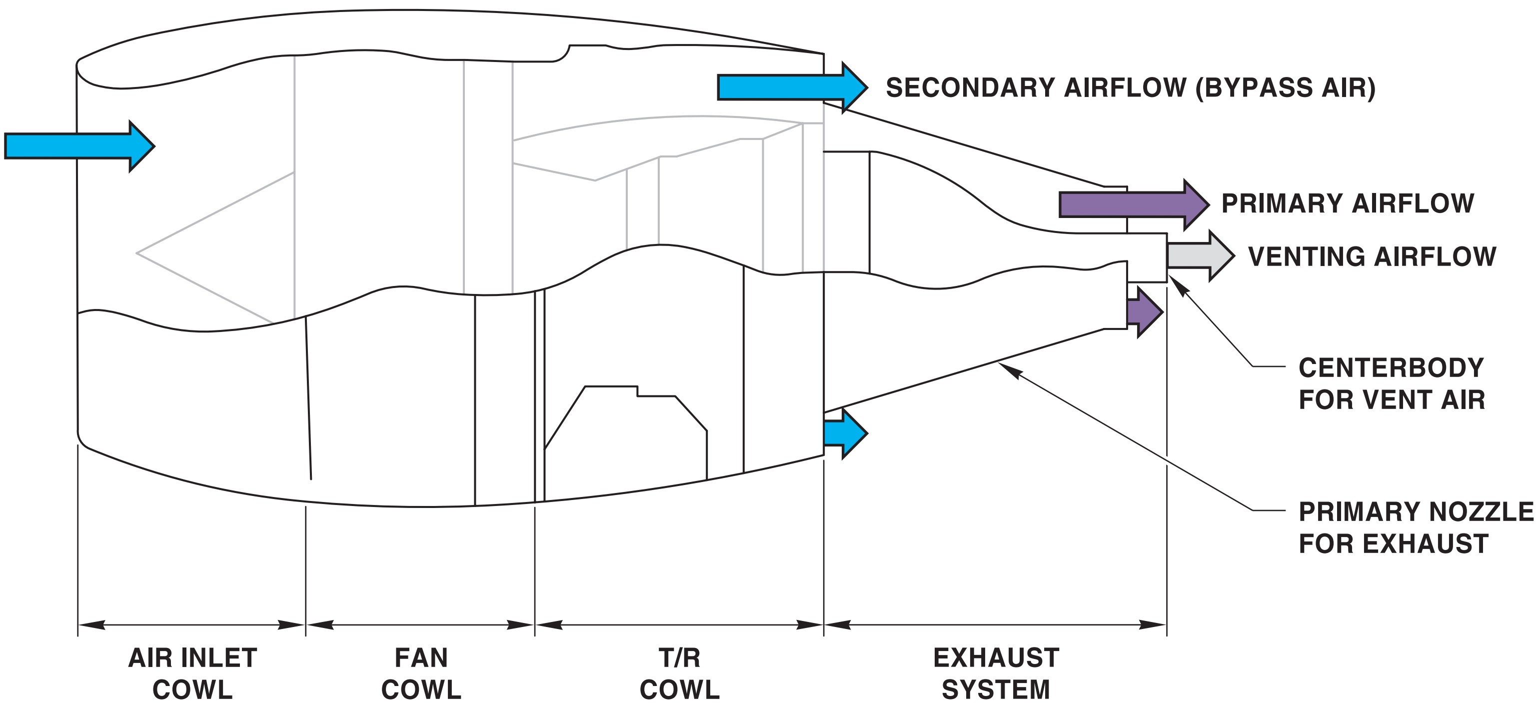
They give :

- An annular exhaust passage to the primary airflow.
- A passage to bypass air.
- A passage to vent air.

The engine exhaust passes between the inner surface of the primary nozzle and the outer surface of the centerbody.

Engine bypass air passes over the outer surface of the primary nozzle.

The centerbody is open at the aft end to let the engine vent to atmosphere.



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EXHAUST SYSTEM OPERATION

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NOZZLE DESIGN

NOZZLE DESIGN

The primary nozzle directs the primary exhaust gas aft and regulates the gas flow.

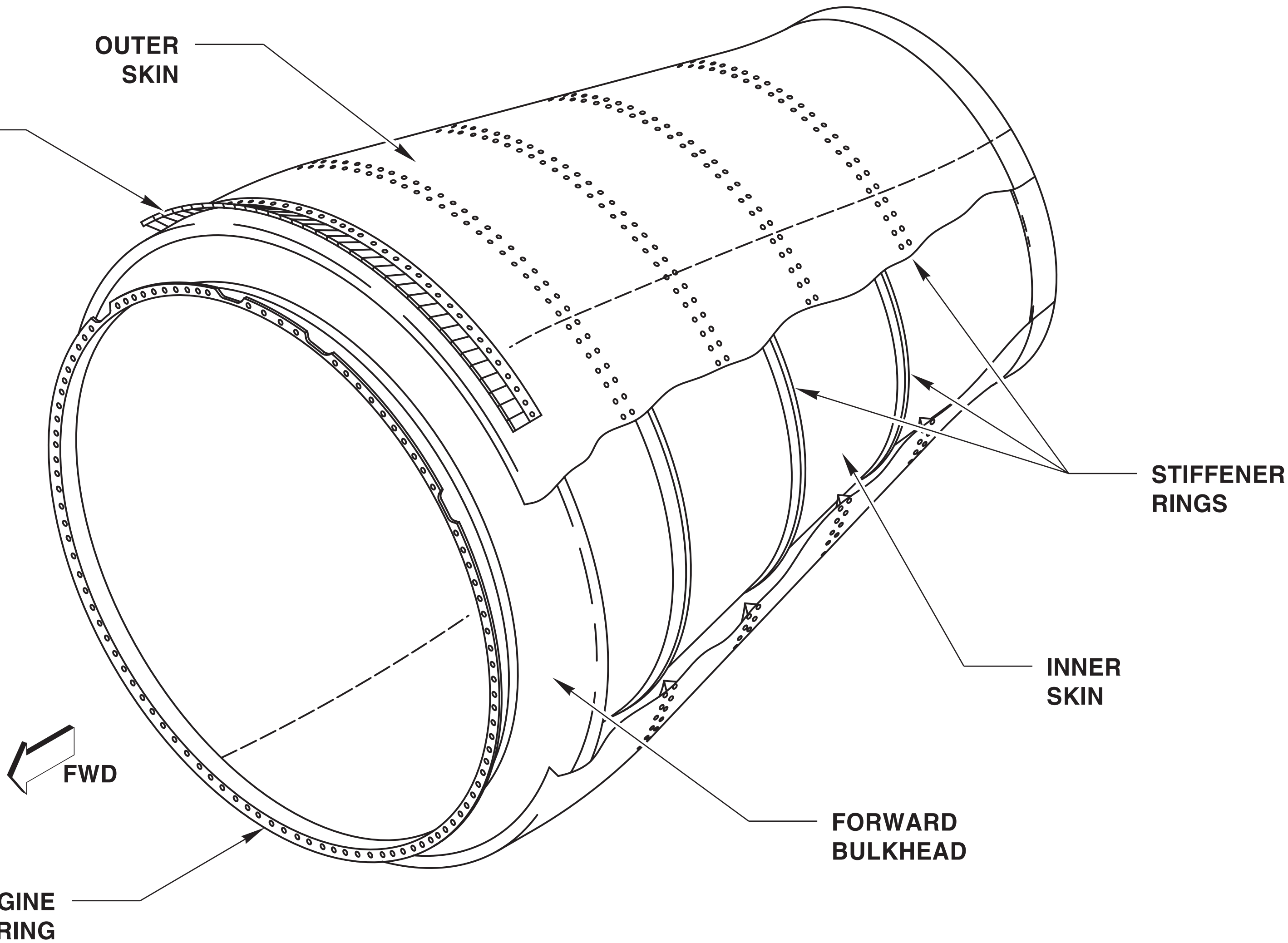
It is fastened to the outer aft flange of the engine turbine rear frame (TRF).

The primary nozzle consists of :

- A forward flange for attachment to the TRF aft flange.
- Inner and outer skins made of conventional stiffened sheet metal.
- A forward bulkhead to link the two skins.
- A spring seal, attached to the outer barrel, to interface with the pylon.

Water drainage is provided by holes in both the inner and outer skins :

- One hole located at the lowest point of the inner skin.
- Five holes located aft of each outer skin stiffener.



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PRIMARY NOZZLE DESIGN

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CENTERBODY

CENTERBODY

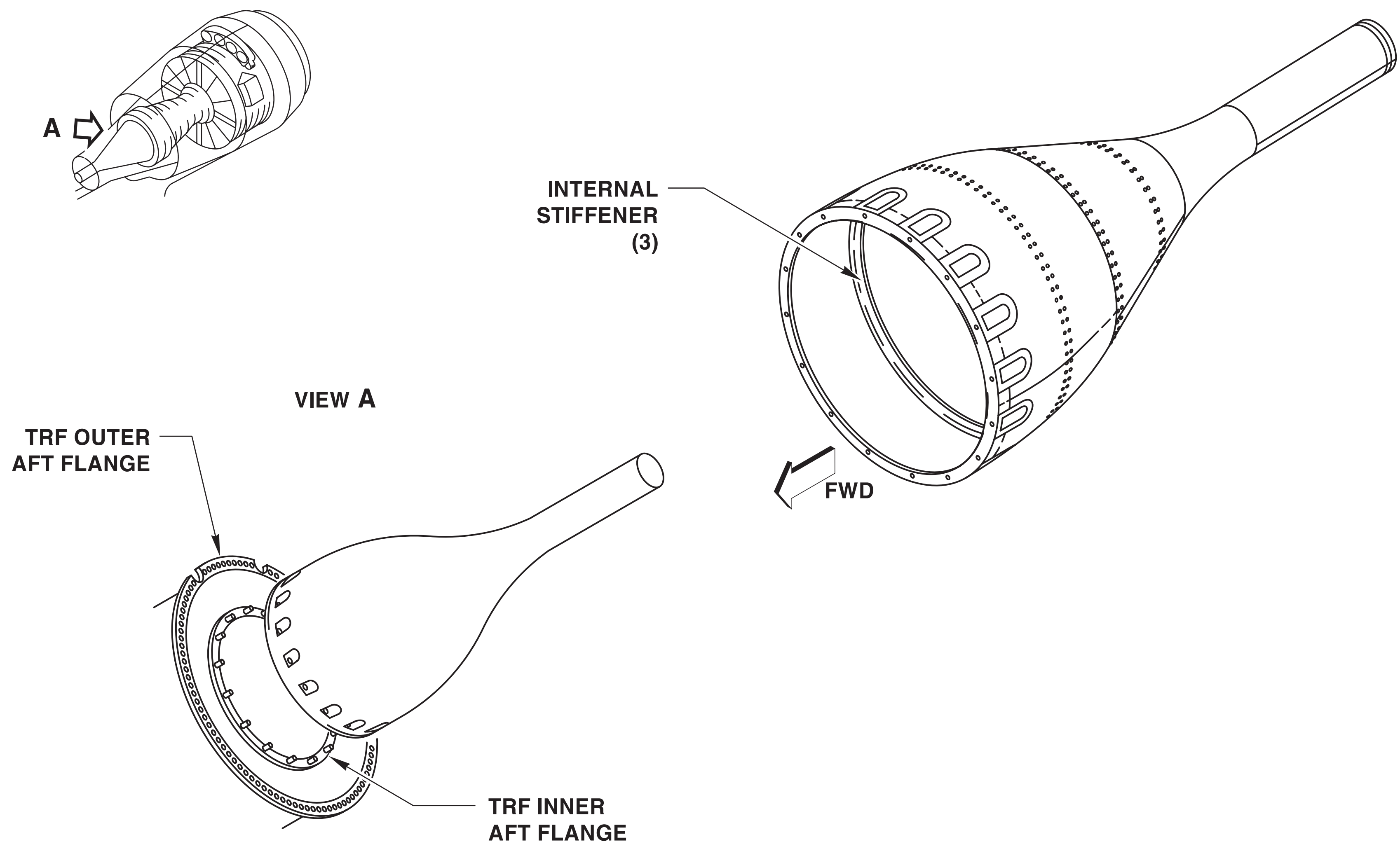
The centerbody is located at the aft section of the nacelle, installed in the center of the primary nozzle.

It is bolted to the inner aft flange of the engine turbine rear frame (TRF), and can be accessed after the primary nozzle has been removed.

The purpose of the centerbody outer surface is to calibrate the exhaust areas, while smoothing the primary exhaust gasses.

The inner portion of the centerbody vents the engine sumps to atmosphere.

It features 3 internal stiffeners which ensure its rigidity, and behind each stiffener, 2 drain holes.



CTC-240-035-00

CENTERBODY LOCATION

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ENGINE HYDRAULIC SYSTEM

ENGINE HYDRAULIC SYSTEM

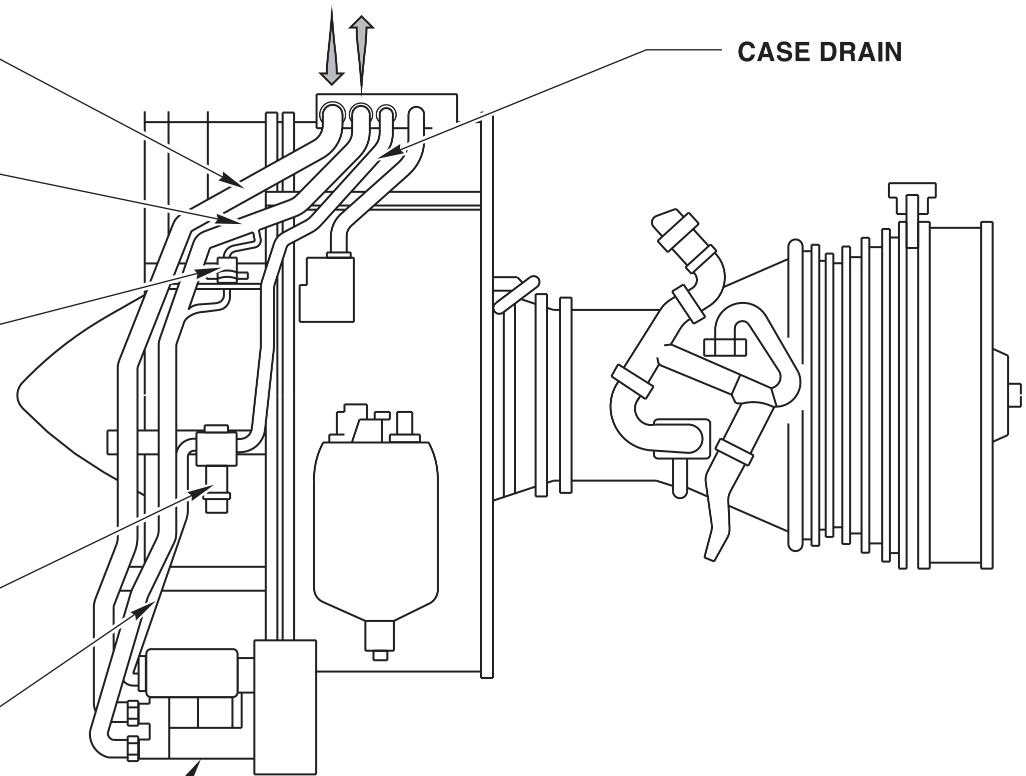
The purposes of the hydraulic system are :

- To pump hydraulic fluid from the reservoir to different aircraft equipment and the engine thrust reverser.
- To supply clean pressurized hydraulic fluid to the dedicated aircraft hydraulic circuits.
- To drain and clean hydraulic leakage from the hydraulic pump and return it to the aircraft hydraulic reservoir.
- To indicate a low output pressure from the hydraulic pump, and a hydraulic filter clogged condition.

The engine hydraulic system is located around the engine fan case, on the left hand side, and consists of the following equipment :

- The engine driven hydraulic pump, installed on the forward flange of the accessory gearbox.
- The suction line.
- The pressure line.
- The case drain hydraulic filter, installed at 9 o'clock, which filters the return flow of fluid.
- The case drain line.
- The low pressure indicating switch, installed at the 9.30 o'clock position, which monitors the supply pressure.

To access the engine hydraulic system equipment, the left hand side fan cowl must be opened.



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ENGINE HYDRAULIC SYSTEM

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ENGINE BLEED AIR SYSTEM

ENGINE BLEED AIR SYSTEM

The purposes of the bleed air system are :

- to extract air from the High Pressure Compressor.
- to select the air source from the HPC 5th or 9th stage.
- to regulate the output pressure and temperature before the air is delivered to the aircraft distribution system.

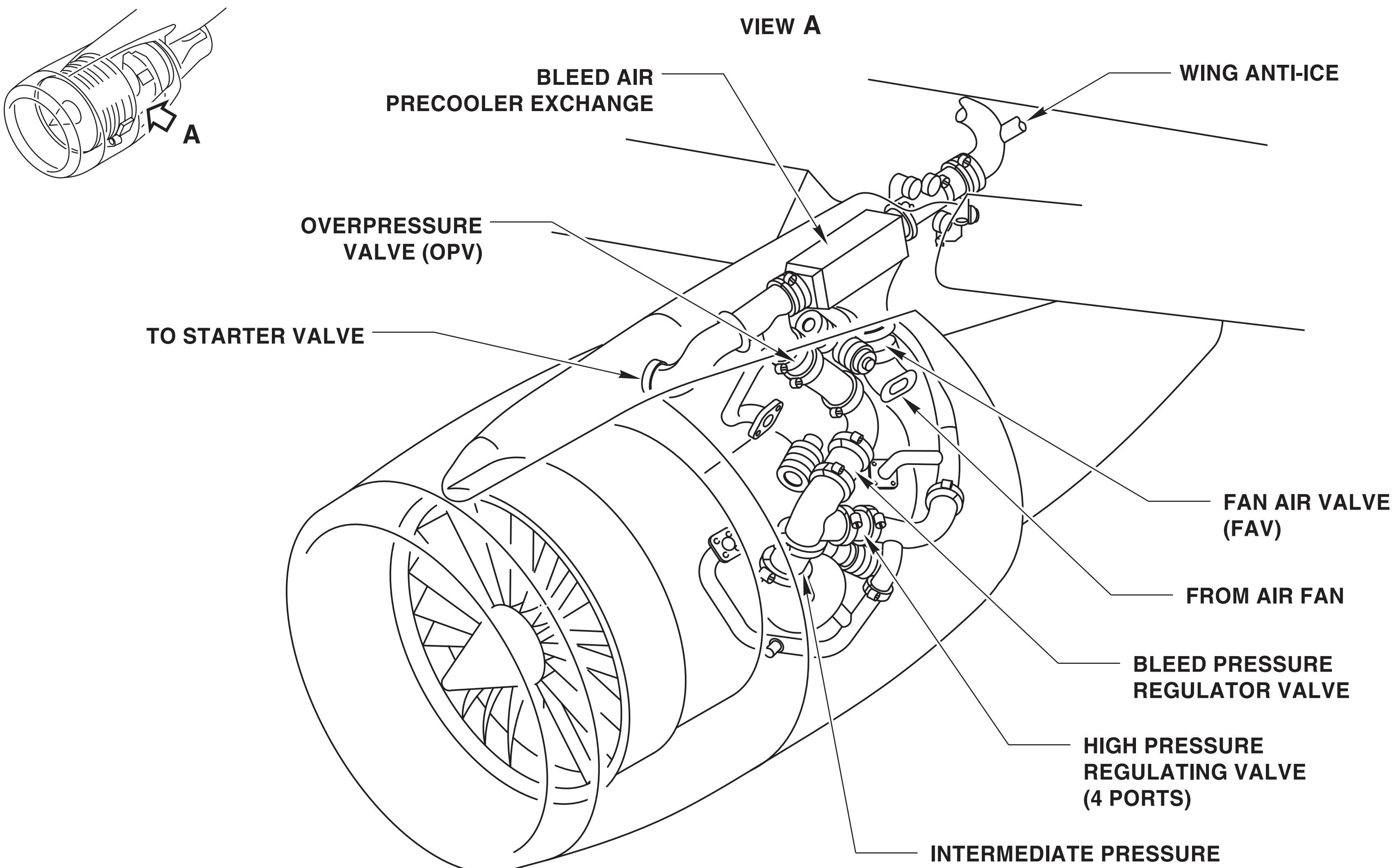
The engine bleed air system is installed in the nacelle within the core compartment, on the left hand side of each engine between the 8 and 2 o'clock positions (ALF).

The main elements of the system are the :

- Intermediate Pressure Check Valve (IPCV), that uses HPC 5th stage air.
- High Pressure Regulating Valve (HPRV), that uses HPC 9th stage air.
- Bleed Pressure Regulating Valve (BPRV).
- Overpressure Valve (OPV).
- Bleed air precooler exchanger.
- Air ducts.
- Electrical harnesses.

To access the system, the left hand side fan cowl and the thrust reverser "C" duct must be opened.

All the valves are fitted with E-seals that require inspection, and, if necessary, replacement.



CTC-240-037-00

ENGINE BLEED AIR SYSTEM

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ENGINE FIRE PROTECTION SYSTEM

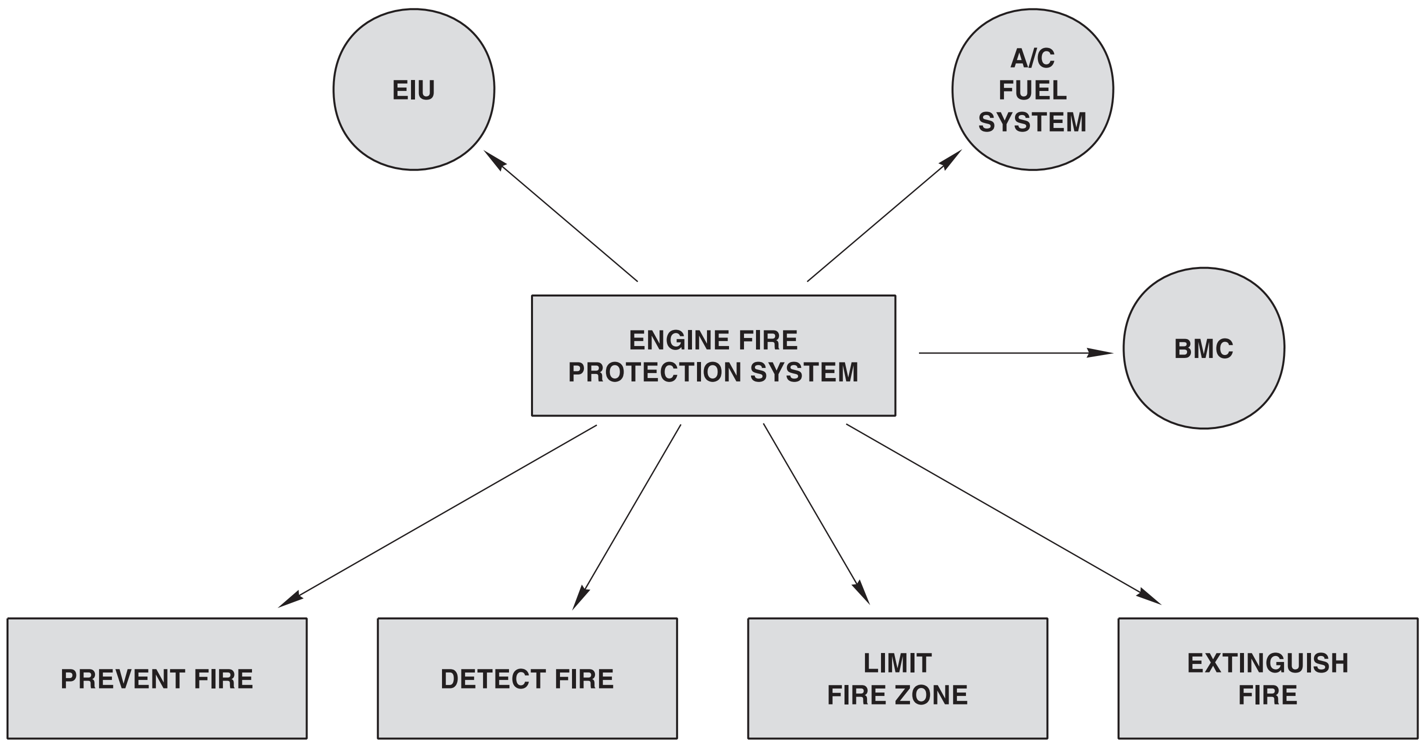
ENGINE FIRE PROTECTION SYSTEM

The engine fire protection system is integrated within the general engine nacelle components and also at the bottom forward section of the aircraft pylon.

The purposes of the engine fire protection system are :

- To prevent fire occurrence.
- To detect the fire.
- To limit the fire area.
- To extinguish the fire.

The system interfaces with the low pressure fuel shut-off valve, the EIU and the Bleed Monitoring Computer (BMC).



CTC-240-038-00

FIRE PROTECTION SYSTEM PURPOSES

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ENGINE FIRE DETECTION SYSTEM

ENGINE FIRE DETECTION SYSTEM

The purpose of the engine fire detection system is to detect and identify any fire source, and to transmit this information to the cockpit.

On each engine, there are two independent and continuous loops for fire detection. The loops are connected in parallel to separate channels of a Fire Detection Unit (FDU).

One FDU, located in the avionics compartment, is provided for each engine and they process signals received from the fire detectors.

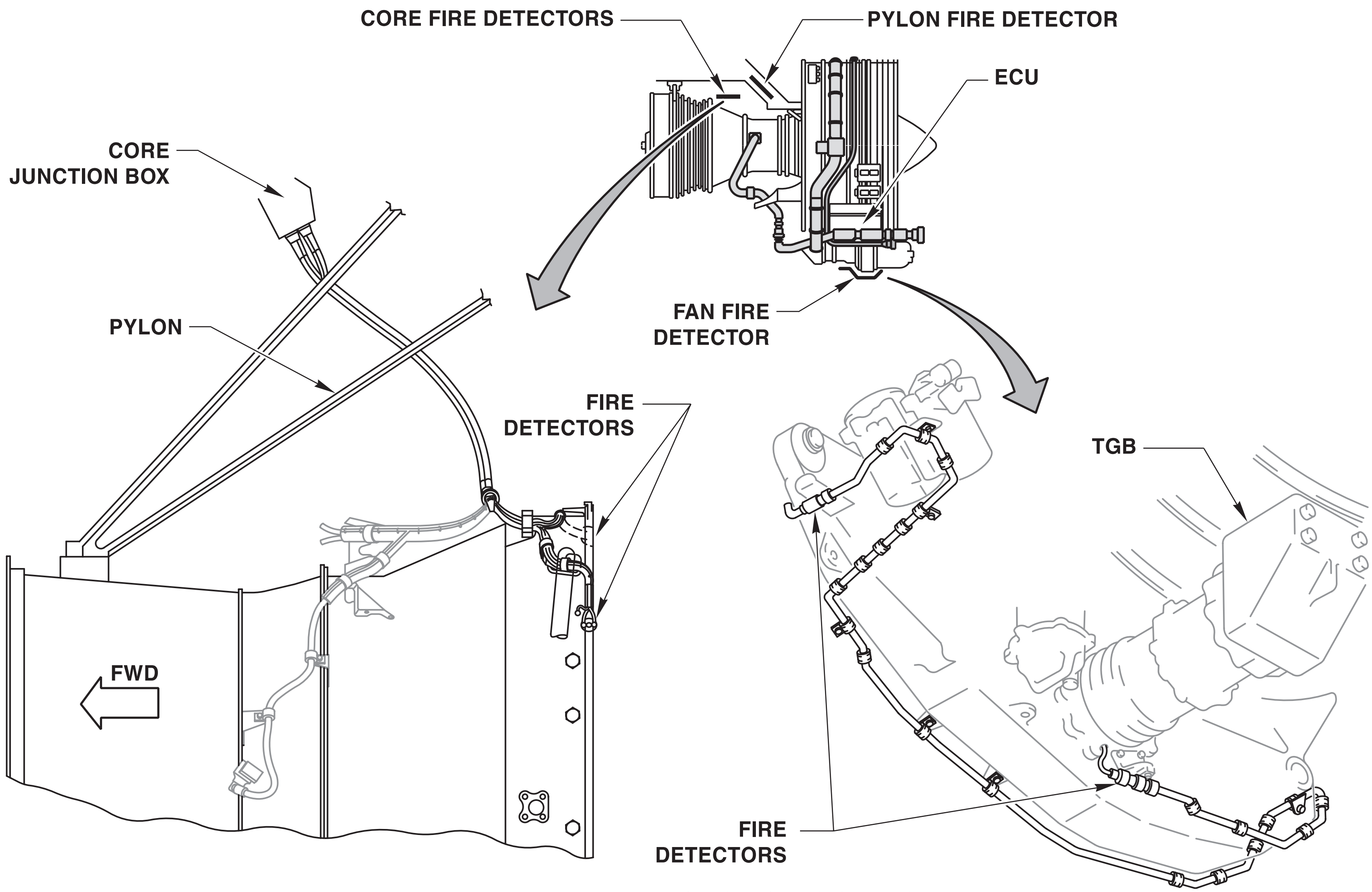
The fire detection system is located in 2 areas around the engine, and one at the engine/aircraft interface.

The system consists of :

- 2 fire detectors under the accessory gearbox.

- 2 fire detectors on the core engine at 10 and 2 o'clock.

- 2 fire detectors near the pylon fire wall.



FIRE DETECTORS LOCATION

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ENGINE/AIRCRAFT CONNECTIONS

ENGINE/AIRCRAFT CONNECTIONS

For engine removal purposes, it is necessary to disconnect hydraulic, electrical and pneumatic lines, on both sides of the engine, according to the instructions in the Aircraft Maintenance Manual (AMM).

The connections concerned are :

- Hydraulic lines.
- Fuel lines.
- Starter duct.
- Pneumatic system.
- Fan and core electrical harnesses.

Fluid connections.

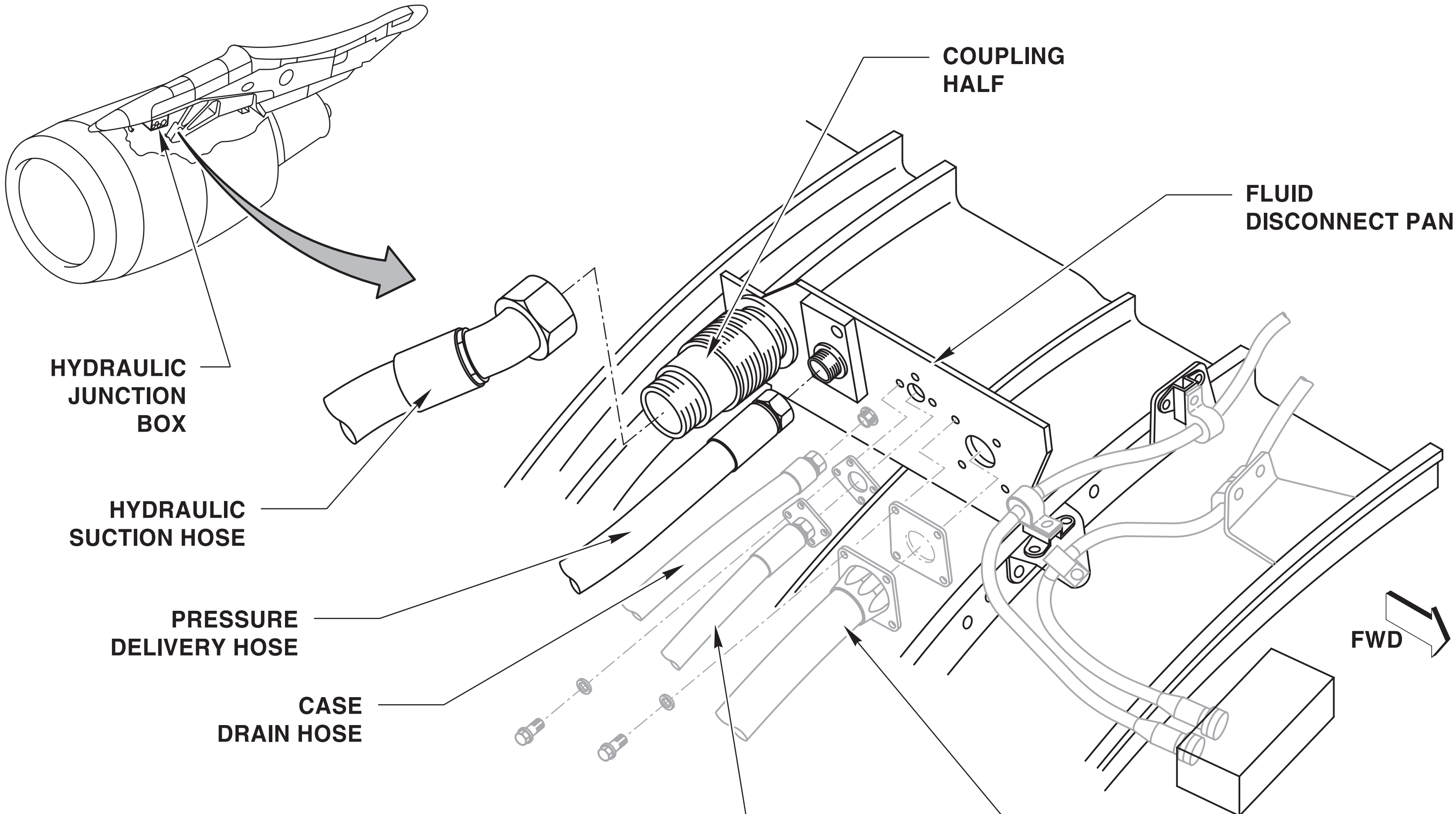
The engine hydraulic lines are connected on the left side of the pylon, at the fluid disconnect panel.

They consist of the suction line, pressure line and case drain line.

The hydraulic suction line is connected with a coupling half, which is a self-sealing quick-disconnect fitting .

The pressure line and case drain line are connected with regular “B nut fittings”.

The fuel distribution supply and return lines are also connected at the fluid disconnect panel.



FLUID CONNECTIONS

CTC-240-040-00

ENGINE/AIRCRAFT CONNECTIONS

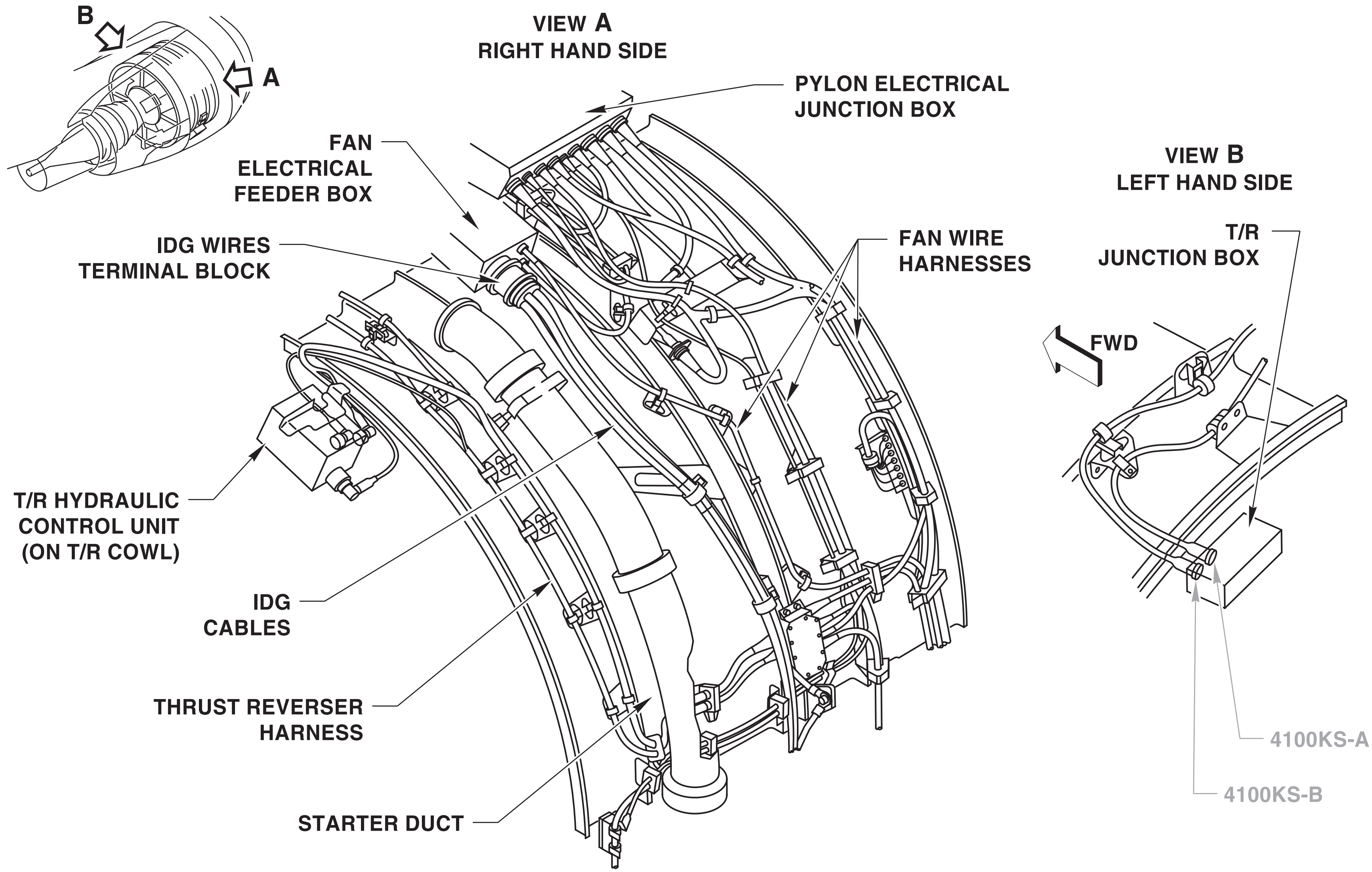
Fan area electrical and pneumatic connections.

Many electrical connections are located in the upper fan area of the powerplant.

Connection points include :

- The pylon electrical junction box.
- The fan electrical feeder box.
- The IDG feeder wires terminal block.
- The hydraulic control unit.
- The T/R junction box.

The starter upper air duct is connected to the pylon duct by means of a coupling.



CTC-240-041-00

FAN AREA CONNECTIONS

ENGINE/AIRCRAFT CONNECTIONS

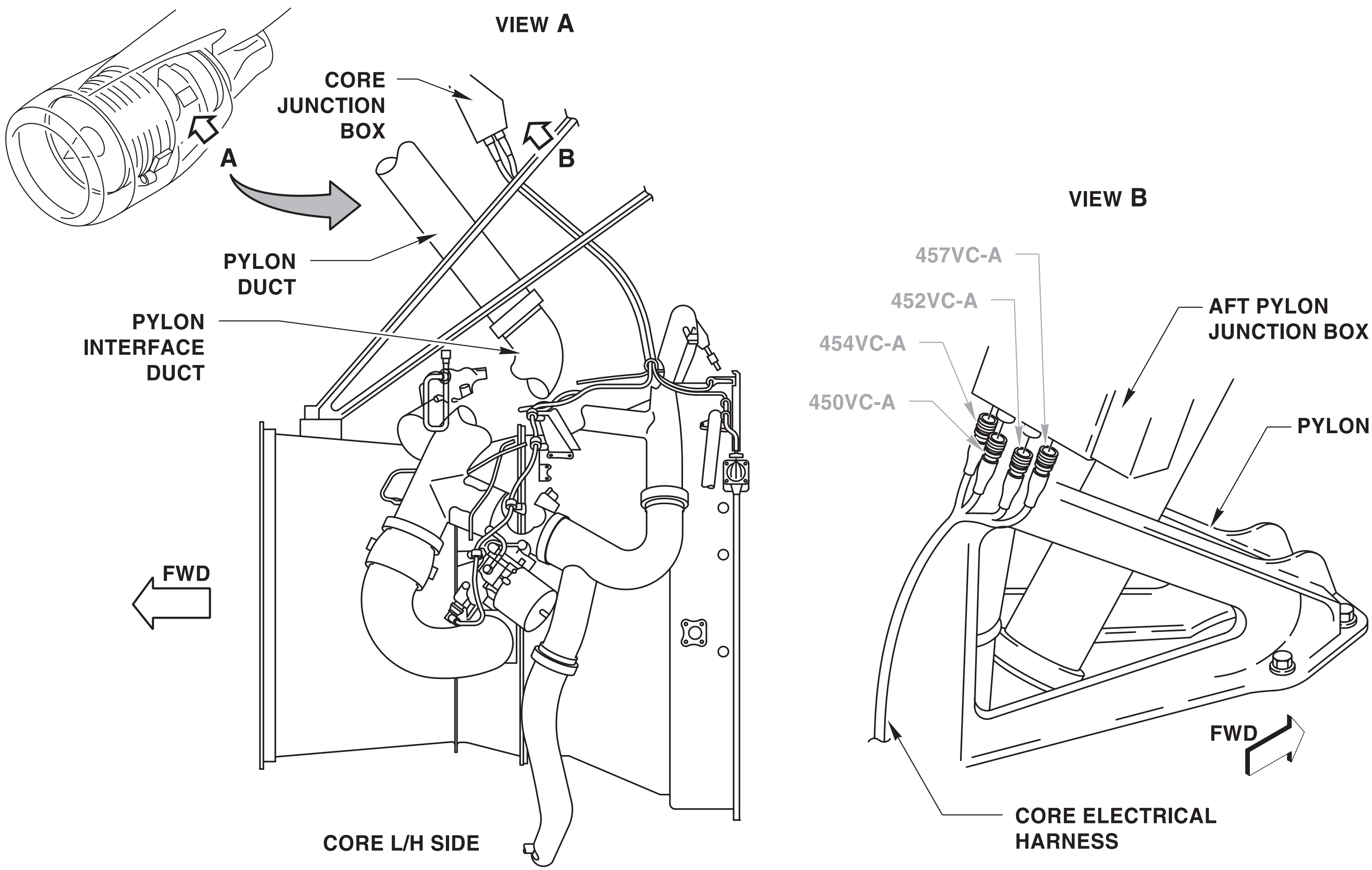
Core area electrical and pneumatic connections.

Electrical connections in the core area are made at the pylon junction box.

The pylon junction box has connections for :

- The core regulating valves.
- The fire detector loops.
- The TRF vibration sensor.
- The customer bleed valve.

The pneumatic system interface duct is connected to the pylon duct by means of a coupling.



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CORE AREA CONNECTIONS

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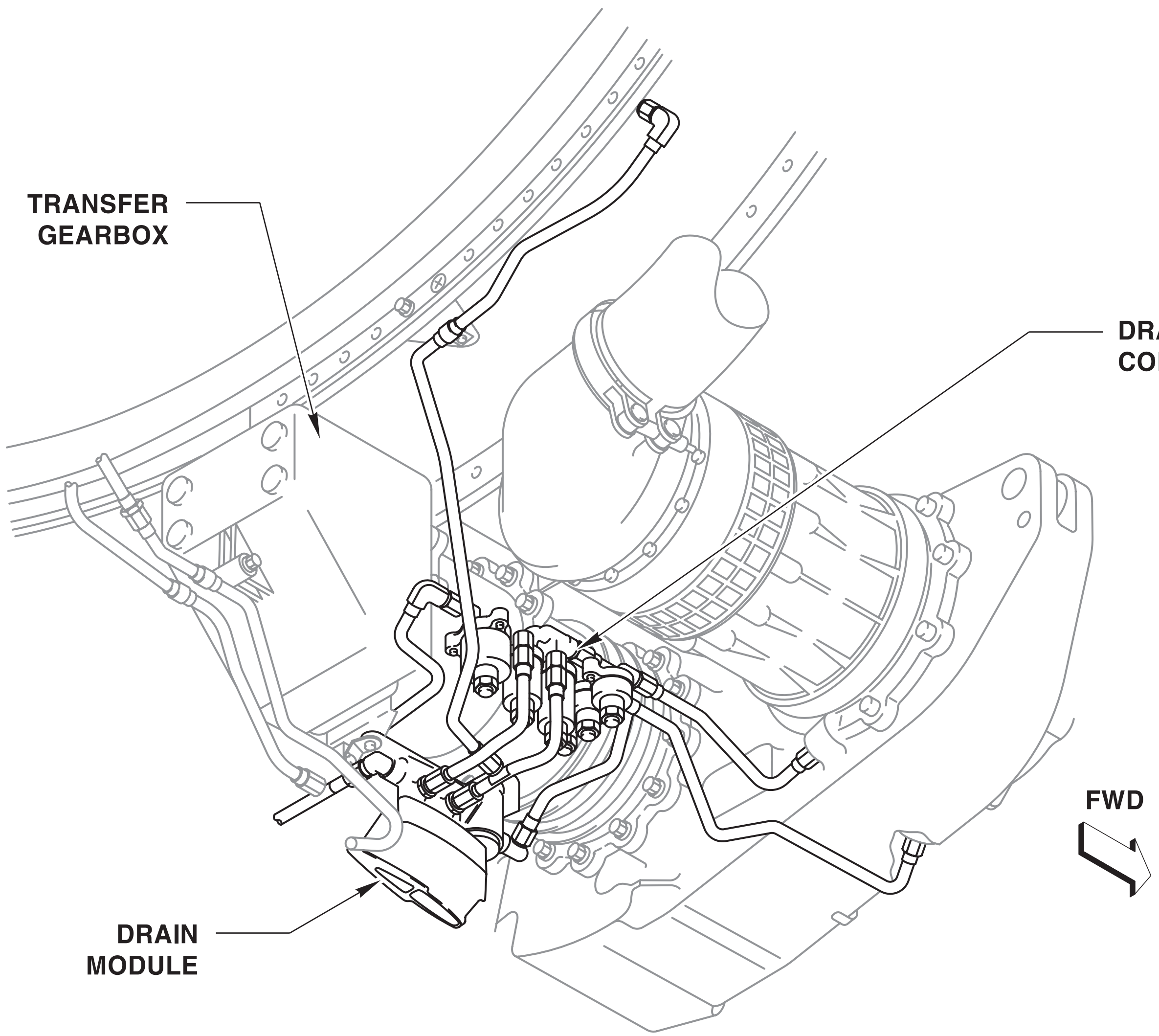
POWER PLANT DRAINS

POWER PLANT DRAINS

Lines are provided on the engine to collect waste fluids and vapours that come from engine systems and accessories and drain them overboard.

The system consists of a drain collector assembly, a drain module and a drain mast (not shown).



CTC-240-043-00

POWERPLANT DRAINS

POWER PLANT DRAINS (CONTINUED)

Drain collector assembly

The drain collector assembly is installed between the AGB and the TGB.

It is composed of 4 drain collectors with manual drain valves and 2 holding tanks.

The drain collectors enable leakages to be collected separately from 4 seals :
- Fuel pump
- IDG
- Starter
- Hydraulic pump

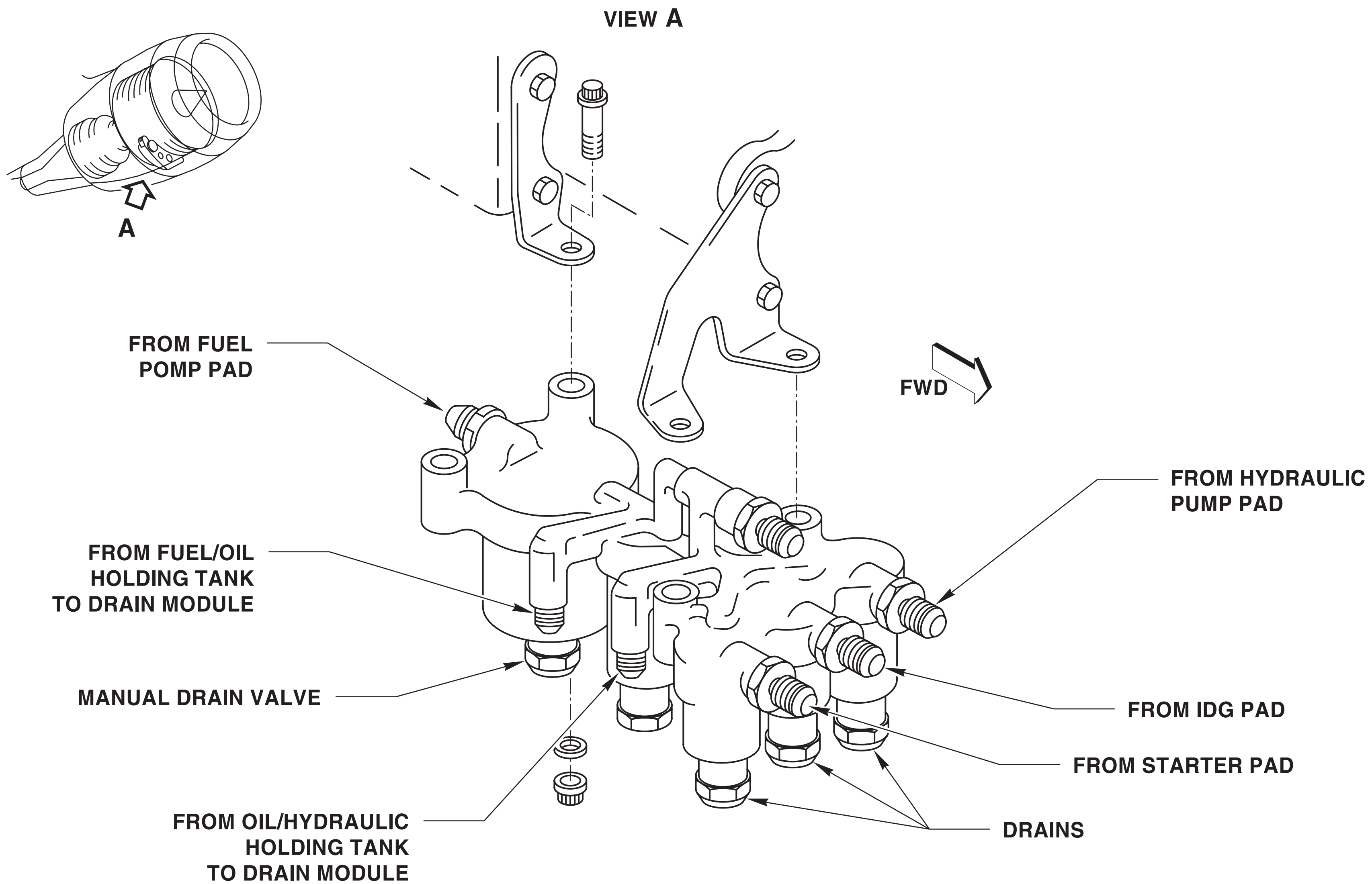
Each collector is identified with the accessory seal pad to which it is connected.

The manual drain valves are installed at the bottom of each collector, enabling the source of leakages to be found during troubleshooting.

The collector retains fluids until it is full, then the overflow goes to 2 tanks, called the fuel/oil holding tank and the oil/hydraulic holding tank.

The first receives the fuel pump overflow and the second receives the IDG, starter and hydraulic pump overflows.

Fluids are expelled during flight.



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DRAIN COLLECTOR ASSEMBLY

POWER PLANT DRAINS (CONTINUED)

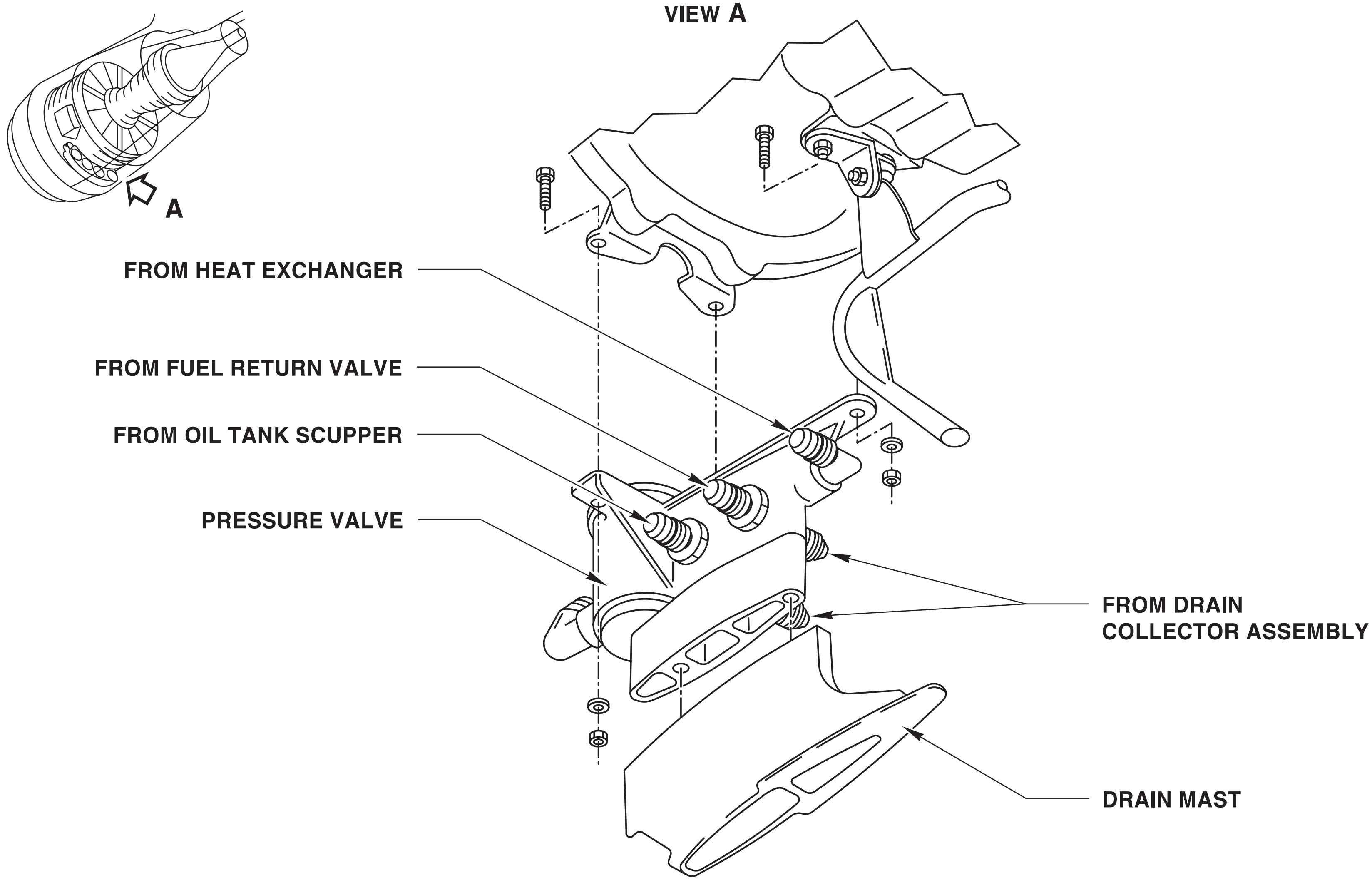
Drain module

The drain module is directly attached under the engine transfer gearbox and supports the drain mast, that protrudes through the fan cowl doors into the airstream.

It receives the overflow from the drain collector assembly. A valve pressurizes the holding tanks and enables fluid to be discharged overboard through the drain mast.

It also receives fluids that are discharged directly overboard through the drain mast :

- The oil tank scupper
- The forward sump
- The fan case
- The oil/fuel heat exchanger
- The VBV
- The VSV
- The turbine clearance control
- The aft sump
- The 6 o'clock fire shield
- FRV



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DRAIN AND DRAIN MAST

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