



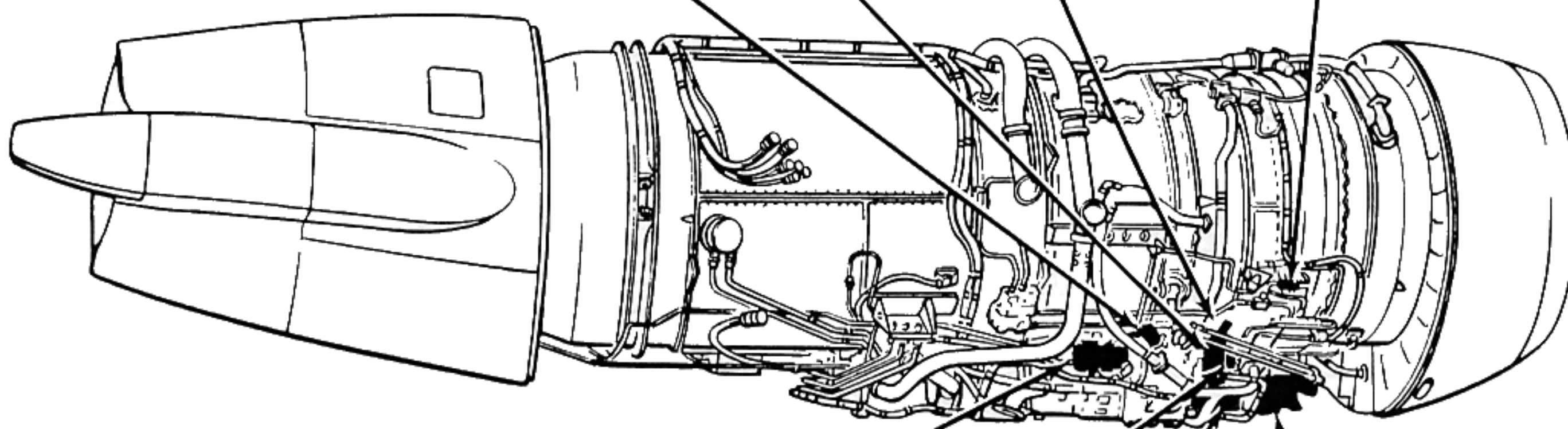
ENGINE -- MAJOR COMPONENT LOCATION (sheet 1)

TACHOMETER GENERATOR (N2)
Self generating current in proportion to N2 compressor rpm for operation of the N2 PERCENT RPM indicator on the center instrument panel.

FUEL FILTER
Filter contains internal bypass to open at approximately 9 psi when filter blockage occurs.

FUEL FILTER DIFFERENTIAL PRESSURE SWITCH
Senses filter blockage due to ice or contamination. Completes circuit to turn on annunciator panel FILTER PRESS DROP light when differential pressure reaches approximately 5 psi.

ENGINE LOW FUEL PRESSURE SWITCH
Senses low fuel pressure supply to 1st stage of engine driven fuel pump. When pressure drops to approximately 5 psi a circuit is completed to turn on the annunciator panel INLET FUEL PRESS low light and MASTER CAUTION light.



HYDRAULIC PUMP
See hydraulic system.

FUEL TEMPERATURE BULB
Senses fuel temperature at point between air fuel heat exchanger and fuel filter. Temperature information is transmitted to the FUEL TEMP indicator on the center instrument panel.

FUEL PUMP
Two stage engine driven type. 1st stage impeller low pressure supply. 2nd stage gear high pressure supply. See engine fuel schematic.

FUEL CONTROL
Schedules fuel flow as required by throttle position, compressor speed (N2), compressor inlet temperature 9 (T_{t2}) and internal burner pressure (P_{s4}). See engine fuel schematic.



ENGINE -- MAJOR COMPONENT LOCATION (sheet 2)

OIL DIFFERENTIAL PRESSURE SWITCH

Senses pressure at both sides of the filter to indicate filter differential pressure. When pressure differential reaches 35 psi the switch closes to turn on the annunciator panel OIL STRAINER CLOGGING light.

OIL LOW PRESSURE WARNING SWITCH

When engine oil pressure drops below 35 psi switch closes to turn on the annunciator panel OIL PRESSURE LOW light.

OIL PRESSURE TRANSMITTER

Provides oil pressure input to the OIL PRESS gage on center instrument panel.

OIL TEMPERATURE BULB

Senses temperature of engine oil after oil passes through fuel-oil cooler. Temperature information is transmitted to the OIL TEMP indicator on the center instrument panel.

FUEL OIL COOLER

See Engine Fuel Schematic.

FUEL FLOW TRANSMITTER

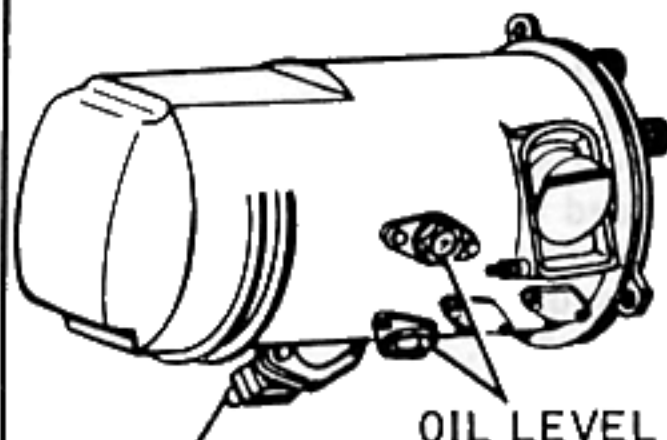
Measures fuel flow to the engine and transmits information to the FUEL FLOW indicator on the center instrument panel.

FUEL AIR HEATER

See Engine Fuel Schematic.

OIL TANK

Gravity filled tank with total capacity of 5.5 gallons (usable 4.0 gallons). A float type transmitter installed through the bottom of tank provides oil quantity information for the oil quantity gage on the center instrument panel. Windows on the tank show full and low levels.

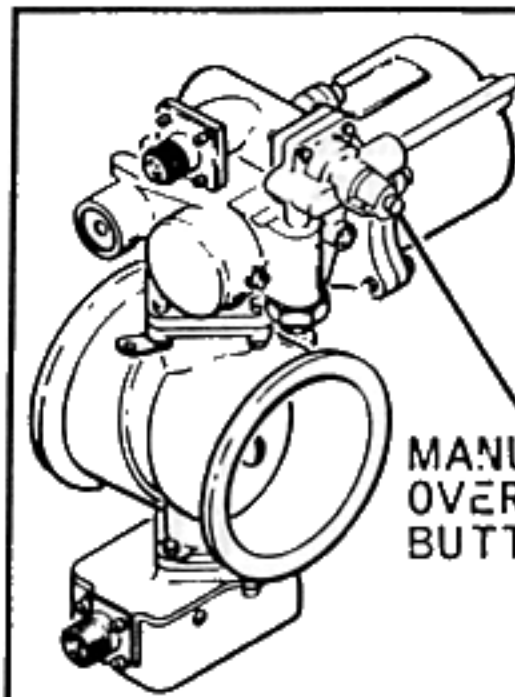


OIL QUANTITY TRANSMITTER

OIL LEVEL SIGHT GAGES

8TH STAGE BLEED MANIFOLD

Provides engine bleed air for engine anti-icing, starting opposite engine, air conditioning and cabin pressurization.



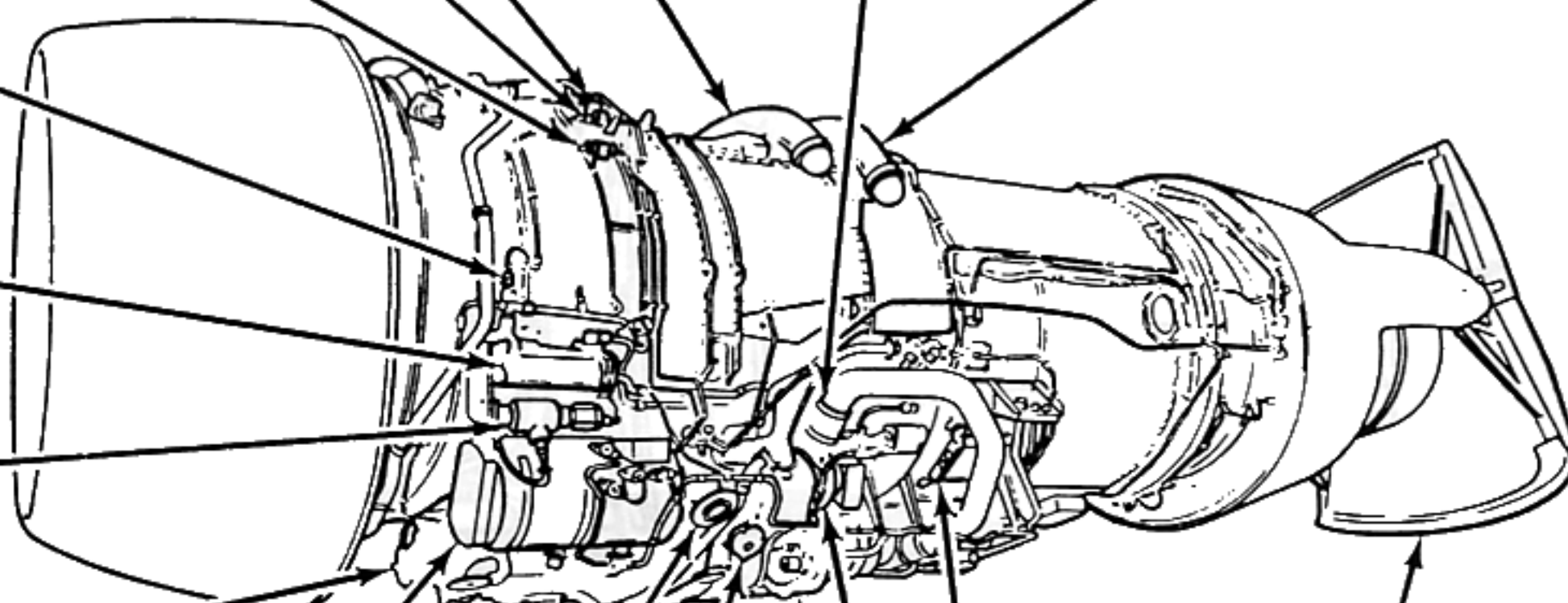
MANUAL OVERRIDE BUTTON

STARTER SHUTOFF VALVE

When open, the valve will regulate pneumatic pressure to maintain a maximum of 38 psi to the starter. The valve is electrically controlled by the cockpit ENGINE START switch and is pneumatically actuated. When the valve opens approximately 5 degrees, a circuit is completed to turn on the annunciator panel START VALVE OPEN light.

HIGH PRESSURE MANIFOLD

Provides high pressure engine bleed air for aircraft air conditioning, pressurization and de-icing systems.



THRUST REVERSER (EXTENDED)

See Thrust Reverser Schematic.

IGNITION EXITER

Provides high energy, high voltage, power to the spark ignitors.

STARTER

Pneumatic powered turbine type. Powers N₂ compressor for accelerating engine to starting speed. Aids engine acceleration after light off until self sustaining speed is reached.

OVERBOARD BREATHER
Provides internal engine with an atmospheric vent.

OIL FILTER
See Engine Oil Schematic.

CONSTANT SPEED DRIVE AND AC GEN
Refer to Electrical system.

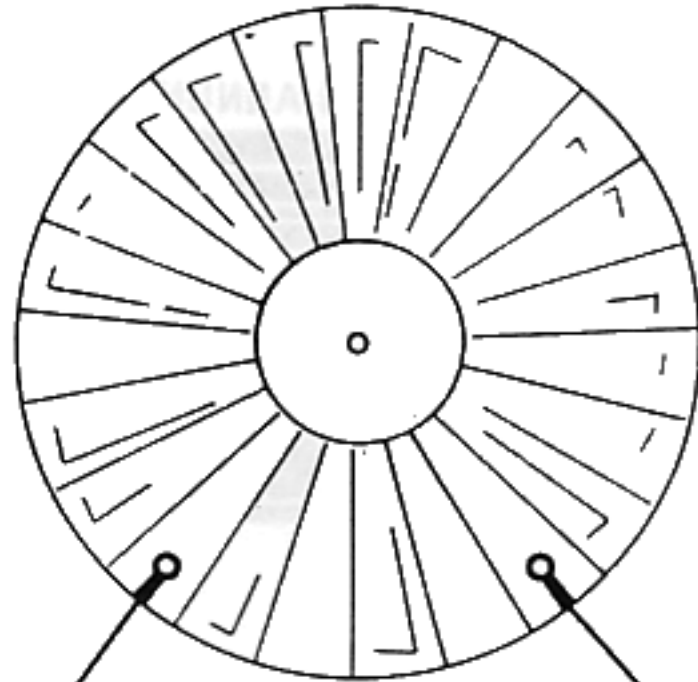
BB1-93A



ENGINE -- FUNCTIONAL SCHEMATIC

ANTISURGE VALVE SENSING CONTROL PROBE (P_{t2})

Provides inlet pressure information to anti-surge valve regulator.



ANTISURGE VALVE SENSING CONTROL PROBE (P_{t2})

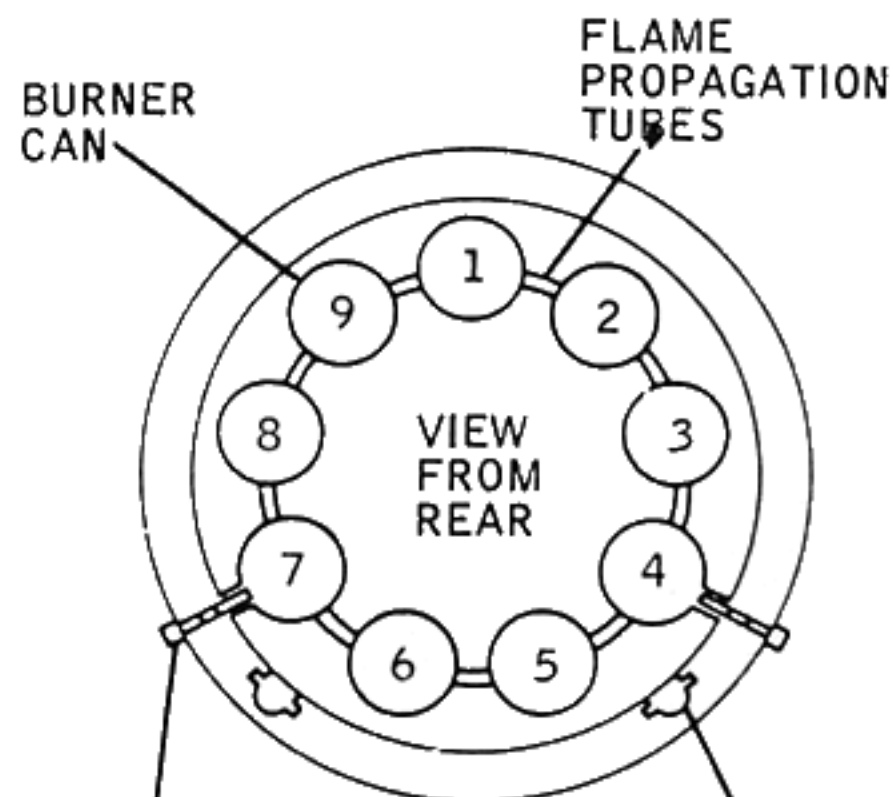
FUEL CONTROL TEMPERATURE SENSING PROBE (T_{t2})

FUEL CONTROL TEMPERATURE SENSING PROBE (T_{t2})

Provides inlet temperature input required for fuel control unit operation.

IGNITOR PLUGS

Ignitor plugs in the number 4 and 7 burner cans provide initial ignition of the fuel air mixture. Once combustion has occurred the flame propagation tubes carry combustion to all burner cans. Combustion will continue until the fuel air mixture is interrupted or a malfunction occurs. Ignition is controlled from the cockpit by the ENGINE IGNITION switch and the pedestal fuel control lever position.



IGNITOR PLUGS IN BURNER CANS 4 AND 7

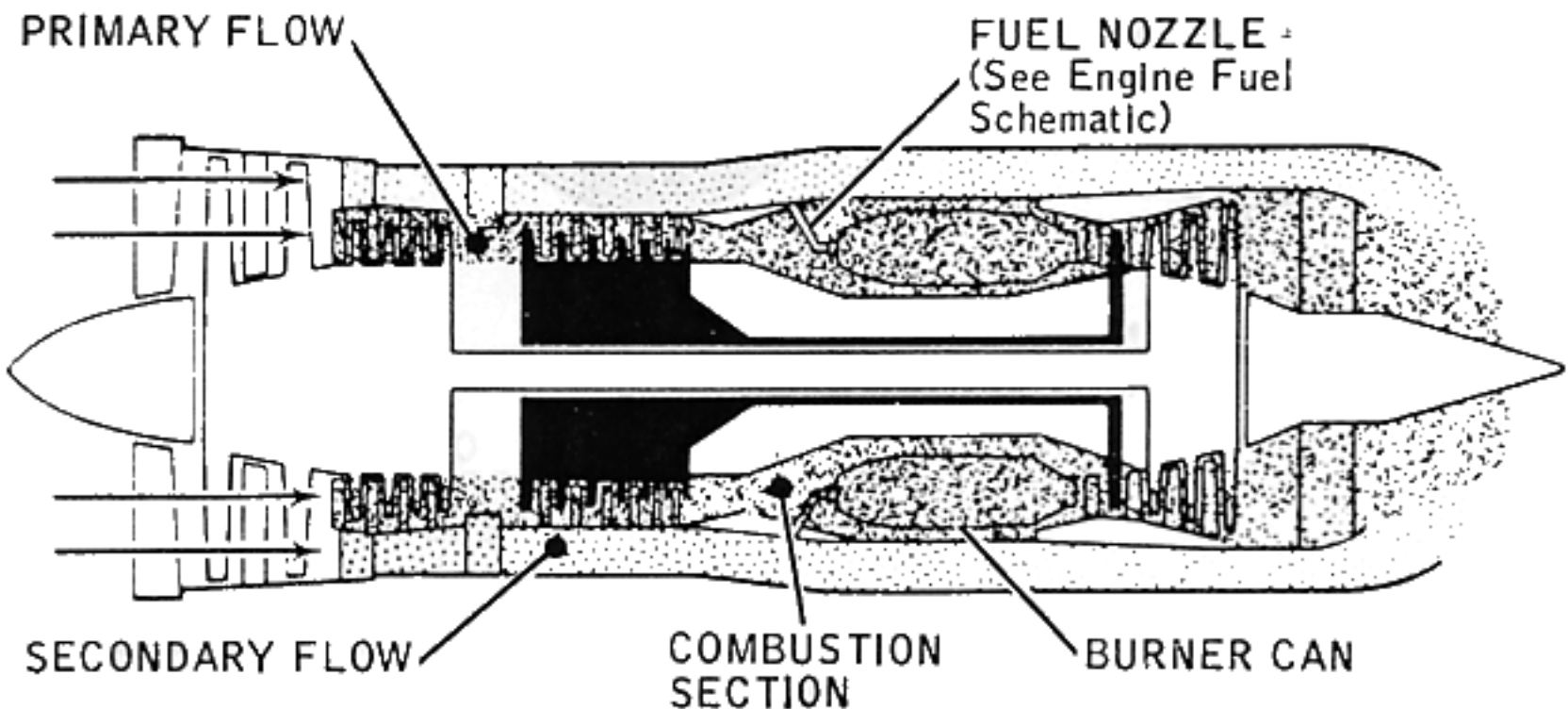
ANTISURGE BLEED VALVES

ANTISURGE VALVE

Controls compressor instability by exhausting rear compressor air into fan duct.

PRIMARY FLOW

As combustion of fuel and air at normal pressure will not produce sufficient energy for efficient operation, air entering the engine is progressively compressed by the front compressor rotors (N_1) and the rear compressor rotors (N_2). At maximum compression the air passes a diffuser which slows velocity and straightens airflow prior to reaching the combustion section. Fuel nozzles at the front of the burner cans spray fuel for rapid mixing with air prior to combustion. Combustion within the burner section adds heat energy to the gases accelerating their mass to provide thrust and to drive the turbines.



SECONDARY FLOW

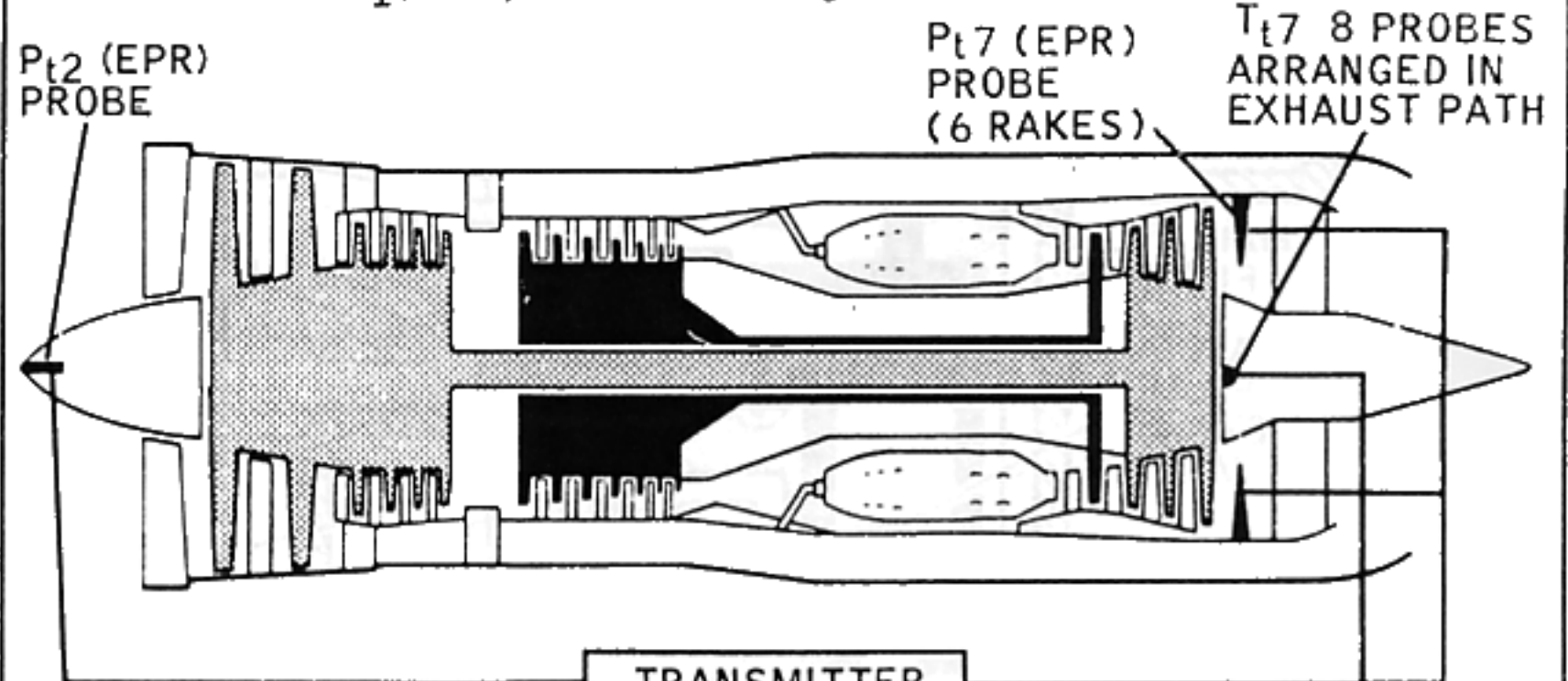
Air in the secondary flow is compressed by the fan blades and is ducted around the engine. This results in movement of greater air mass to increase thrust, aids in cooling the engine and in suppressing exhaust noise.

TURBINE SECTION

The first stage turbine powers the rear compressor rotor (N_2). The second, third and fourth stage turbines power the fan and the front compressor rotor (N_1).

DARK AREA - N_2 and 1st stage turbine.

LIGHT AREA - N_1 , 2nd, 3rd and 4th stage turbines.



SIMPLIFIED ENGINE PRESSURE RATIO ARRANGEMENT



ENGINE INLET PRESSURE PROBE (P_{t2}) AND ENGINE EXHAUST PRESSURE PROBE (P_{t7})

These probes measure pressure at the engine inlet and at the engine exhaust. The difference in pressure is expressed as engine pressure ratio and is a measure of thrust. Pressure ratio information is transmitted to the PRESS RATIO indicators on the center instrument panel.

TOTAL TEMPERATURE PROBE #(T_{t7})

Energy, created by heat at the probes, operates the EXH TEMP indicator on the center instrument panel. The indicator shows temperature of the jet exhaust. BB1-92B



ENGINE -- COCKPIT CONTROLS & INDICATORS [sheet 2]

ENGINE REVERSER LIGHTS

(See thrust reverser functional schematic)

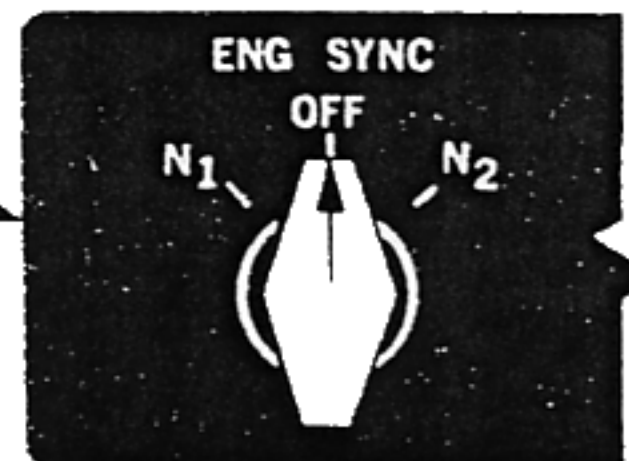
R ENG
REVERSE
UNLOCK

R ENG
REVERSE
THRUST

RIGHT ENGINE LIGHTS SHOWN
(TYPICAL)

ENGINE SYNCHRONIZER (-50)

The engine synchronizer automatically matches the N₁ or N₂ RPM of both engines as selected by the ENG SYNC selector. A difference in RPM when both throttles are set together manually will cause the left engine compressor speed to be trimmed to match the speed of the right engine compressor within the tolerance of the synchronization system. The system is designed to operate after takeoff and prior to landing and reversing, and can be overridden at any time by the throttle control levers.



MASTER CAUTION LIGHTS

Provide indication to both the captain and first officer that malfunction has been indicated on the annunciator panel.

MASTER
CAUTION
PUSH TO RESET

PNEUMATIC CROSSFEED
VALVE LEVERS
(See pneumatic functional
schematic)

FUEL CROSSFEED LEVER

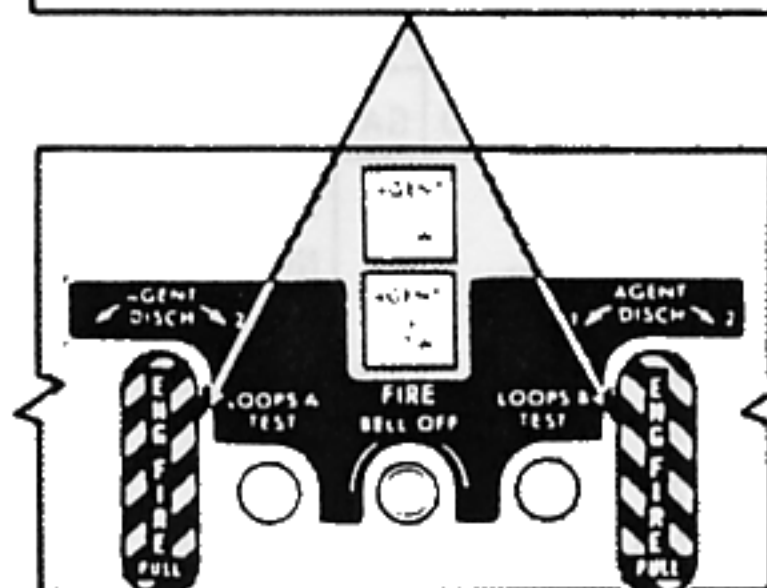
Lever must be pulled out from the pedestal to unlock lever prior to actuation of lever to the ON or OFF position. The fuel crossfeed lever is cable connected to the fuel system crossfeed valve. When the lever is placed at the ON position, the valve opens to route fuel from either main tank to both engines and the APU. Use of the fuel boost system will determine which tanks fuel supply will be used.

THROTTLES

Each throttle is cable connected to its respective engine fuel control unit to regulate engine thrust. For thrust reverser operation see thrust reverser schematic.

FIRE SHUTOFF HANDLES

Pulling applicable engine handle will silence the fire bell, trip the generator control relay, shut off engine fuel and hydraulic pump supply, and close the pneumatic crossfeed valve for the respective engine.



AUTOTHROTTLE
ENGAGE LEVER

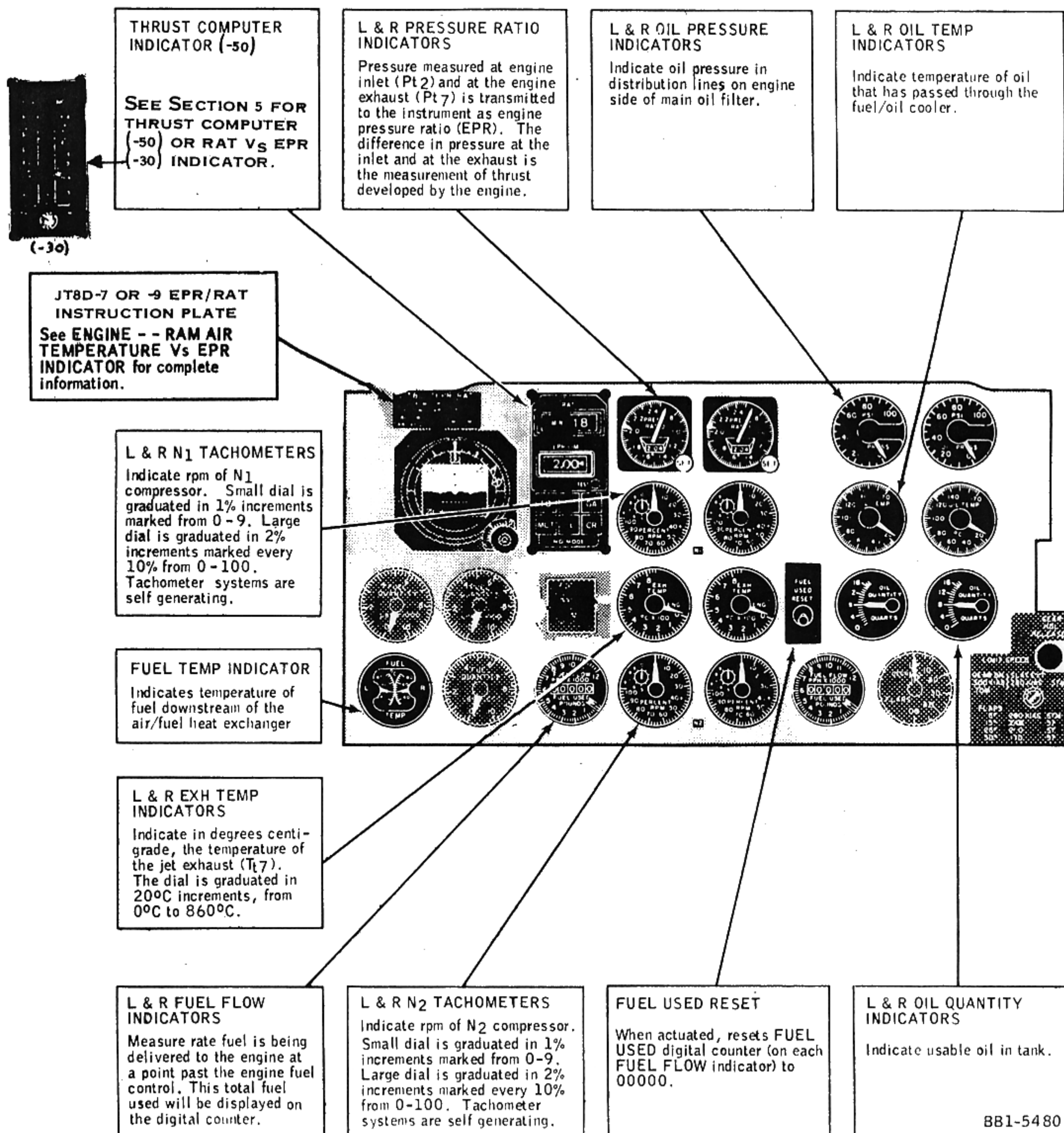
FUEL CONTROL LEVERS

The fuel control pushrod must be depressed to unlock lever prior to actuation of lever to the ON or OFF position. Each fuel control lever is cable connected to a shutoff valve in the engine fuel control unit. ON position opens the valve to supply fuel to the applicable engine. Movement of each lever also controls engine ignition. As the lever is moved forward from the OFF position it completes the ignition circuit first, then turns on the fuel. As the lever is moved aft from the ON position it shuts off fuel first and then shuts off ignition. (See engine fuel system functional schematic)

BB1-5303A



ENGINE -- ENGINE INDICATORS





ENGINE -- ENGINE (starting) PANEL

START PUMP SWITCH

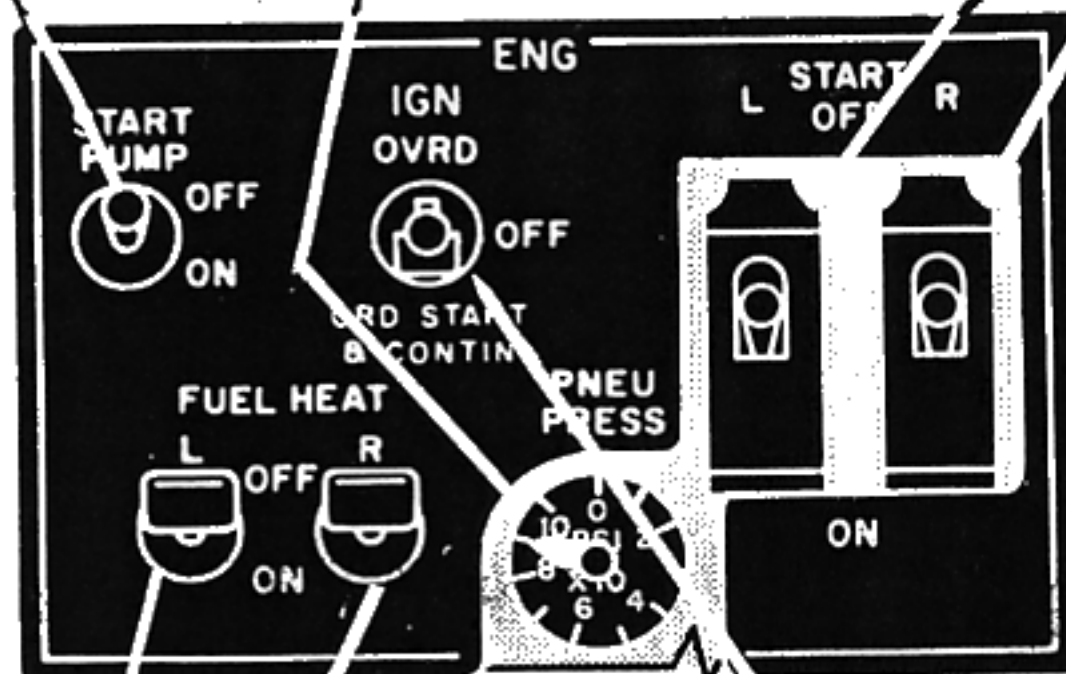
Controls a battery powered fuel boost pump. Is used for engine starting when no external or APU electrical power is available. Refer to fuel system.

PNEU PRESS INDICATOR

Indicates, in psi, the pneumatic pressure available for engine starting. The pressure should show a drop as the engine starter valve opens.

ENG START SWITCHES (Spring loaded to OFF position)

The ON position completes circuit to energize the solenoid controlled, pneumatically actuated, starter valve. When the starter valve butterfly opens 5 degrees a circuit is completed to turn on the annunciator panel START VALVE OPEN light. The valve ports pneumatic pressure to the engine starter turbine.



FUEL HEAT L & R ENG SWITCHES

Used to prevent or remove ice at the engine fuel filter. Placing the switch momentarily at ON energizes a timer for one minute. The timer electrically opens a pneumatic shutoff valve supplying air to the air/fuel heat exchanger. When the valve opens, a circuit is completed to turn on the annunciator panel FUEL HEAT ON light. After one minute the timer closes the valve and the light goes off.

The on position of the FUEL HEAT switch is used to prevent or remove ice at the engine fuel filter.

ENGINE IGNITION SWITCH

The 3 position leverlock switch controls operation of the engine fuel ignitor plugs in burner can No. 4 and No. 7.

OVRD (override position)

Provides 20 joule dc energy to all ignitors in both engine by-passing engine start control switches and fuel control lever switches.

NOTE: Normal duty cycle is 2 minutes on and 3 minutes off
2 minutes on and 23 minutes off.

OFF position: No energy available to ignitors.

GRD START & CONTIN position:

Provides 20 joule dc energy to both ignitors with start switch and fuel control lever placed in on position.

Provides 4 joule ac energy to No. 7 ignitor plug with ENG START switch OFF and fuel control lever in ON position.