GENERAL

The airplane is equipped with two Pratt & Whitney JT8D engines which have normal takeoff thrust rating of 20,000 pounds and a maximum takeoff rating of 20,850 thrust. An automatic Reserve Thrust (ART) system is installed. In the event of an engine failure, the ART system, when operating, increases thrust on the remaining engine.
The JT8D-217A turbofan engine in an axial flow, twin spool design utilizing a single stage fan and a six stages low pressure compressor (N1) driven by a three stage turbine. The high pressure compressor (N2) is a seven stage compressor driven by a single stage turbine. The N1 and N2 compressors are driven through concentric shafts. The airflow is divided into two airflows. Primary, the airflow that goes through the entire engine and secondary, the airflow that goes through the fan only and is ducted around the engine to provide additional thrust.
The engine exhaust system incorporates a thrust reverser system for both the primary and secondary airflows.

STARTING SYSTEM

Engine starting system is pneumatic. The air may be supplied by APU or the other operating engine. During engine start on the ground a DC powered valve opens and an air turbine starter, geared to the N2 shaft, drives the engine.

IGNITION SYSTEM

A dual ignition system, normally powered by 115 VAC, is provided for each engine. The system may be selected one at time (SYS A or SYS B) or contemporarily (BOTH). To energize the igniter plugs, the fuel shutoff lever must be moved out of the OFF position. An override (OVRD) position is provided to bypass the fuel shutoff lever and energize both systems.

FUEL SYSTEM

Fuel from the applicable tanks passes through a series of units which deliver appropriate fuel pressure and fuel flow for each engine regime. The fuel flow is governed by the thrust lever position and is modified by the Fuel Control Unit (FCU). A fuel shutoff valve is incorporated in the FCU and is mechanically controlled by the fuel shutoff lever on pedestal.

OIL SYSTEM

Each engine oil system is completely self contained.
The oil system lubricates and cools the engine bearings and accessory drives. An oil pressure pump delivers oil from the tank through an oil filter and the fuel/oil heat exchanger to the engine bearings.

REVERSE THRUST SYSTEM

The thrust reverser on each engine consists of two deflectors which form the aft nacelle fairing when stowed. When deployed, the deflectors block engine exhaust and fan air gases and deflect them forward, over and under the nacelle.
The thrust reversers are for ground use only.
The reverses system for each engine is powered by the related hydraulic system. Should the hydraulic system fail, an accumulator will provide sufficient power for reverser deployment.
Initial reverser lever movement unlocks the respective system, starts reverser deployment, and is indicated by a REVERSER UNLOCK light coming on.
The reverser system, when fully deployed, will turn on a REVERSE THRUST light and release the interlock.

ENGINE SYNCHRONIZER SYSTEM

The engine synchronizer system automatically matches the N1 or N2 RPM speed of both engines. EPR is automatically synchronized with the selector in the OFF position and the autothrottle in any mode except when clamped.

AUTOMATIC RESERVE THRUST (ART)

The ART system combines features of the Digital Flight Guidance Computer (DFGC) and JT8D200 fuel control to provide maximum rated thrust in the event of an engine failure during a normal thrust takeoff. The ART system is READY when the airplane is on the ground, the ART switch is in AUTO, either slat is extended, both engines are operating at or near idle, and the ART system self test is completed.
The ART system is actuated when the DFGC detects any one of the following: 30.2% differential in N1 RPM, invalid N1, electrical power loss, or manual DFGC switching (not simulated).
The ART switch, with AUTO and OFF positions, is in the upper instrument panel.
The READY light indicates ART has successfully passed self test. The ART light indicates the system has successfully activated.

EEDP
(Electronic Engine Display Panel)

EPR LIMIT Readout:
Displays digital readout of EPR limit for selected operating mode.

EPR Indicator:
Digital readout of EPR. EPR pointer simultaneously displays corresponding EPR value.
EPR Reference Bug:
Indicates EPR reference manually set with CMD EPR set knob or automatically set to an EPR value applicable for EPR limit thrust mode selected on thrust rating panel.

N1 Indicator:
Digital readout of N1 compressor percent RPM.

EGT Indicator:
Indicates exhaust gas temperature in degrees centigrade.

N2 Indicator:
Digital readout of N2 compressor percent RPM.

MAN EPR SET KNOB:
Pull knob and rotate to set desired EPR in CMD EPR readout. EPR reference bug will move to corresponding value of EPR indicator.

FUEL FLOW/USED Readout:
Fuel flow is normally shown. Push FUEL FLOW/USED button readouts indicate total fuel used by engine

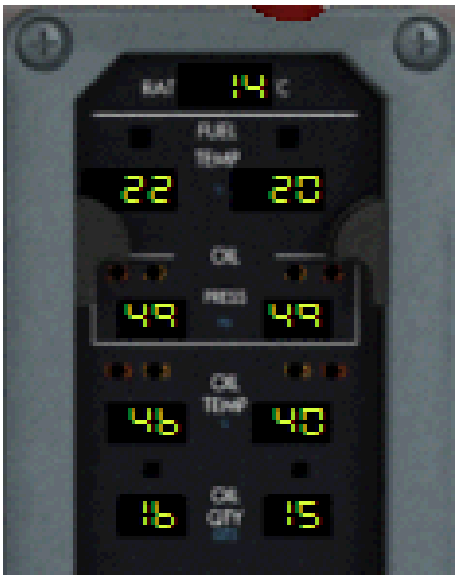
EPR CMD Readout:
Digital readout is blank until CMD EPR reference set with MAN EPR knob.

FUEL FLOW/USED Button:
Pushing the button will display fuel used and light up FUEL USED readout light for 10 seconds.

FUEL USED RESET Button:
Pushing button will result in fuel used to reset to 0.

ESDP
(Electronic System Display Panel)

RAT Readout:
Displays digital readout of RAT (Ram Air Temperature)



FUEL TEMP Readout:
Indicates temperature of fuel after fuel has flowed through the air/fuel heat exchanger.

ENGINE OIL PRESS 40PSI Light:
ON: Amber light comes one at 40 PSI

ENGINE OIL PRESS 35PSI Light:
ON: Red light comes on at 35 PSI.

ENGINE OIL PRESS Readout:
Indicates oil pressure in distribution lines on engine side of main filter.

ENGINE OIL TEMP Readout:
Indicates temperature of oil that has passed through fuel/oil cooler.

ENGINE OIL TEMP 165°C Light:
ON: Red light comes on at 165°C.

ENGINE OIL TEMP 135°C Light:
ON: Amber light comes on at 135°C.

ENGINE OIL QUANTITY Readout:
Indicates usable oil in tank

FUEL HEAT

OVERHEAD PANEL

FUEL HEAT L,R Switches:
ON: (momentary) Opens the fuel heater valve and delivers hot bleed air to the fuel heater. A timer keeps the valve open for one minute.
OFF: Normal position.

FUEL HEAT ON L,R Lights:
Indicates that the fuel heat valve is fully open.

ANNUNCIATOR PANEL

STARTING

ENG IGNITION Selector:
OFF: Ignition system deenergized.
SYS A: Energizes in each engine igniter A provided the related FUEL shutoff lever is out of the OFF position.
SYS B: Energizes in each engine igniter B provided the related FUEL shutoff lever is out of the OFF position.
BOTH: Energizes in each engine both igniters provided the related FUEL shutoff lever is out of the OFF position.
OVRD: Both igniters on each engine are energized regardless of the position of the FUEL shutoff lever.

OVERHEAD PANEL

ENG START L, R Switches:
Guarded and spring loaded to OFF.
ON: Opens the start valve.
OFF: Closes the start valve.
NOTE: The starter valve is electrically controlled and pneumatically operated. To operate the starter valve, the pneumatic manifold must be pressurized.

THRUST RATING PANEL

T.O. FLX Mode Button:
Pushing button will cause a reduced EPR limit for flexible takeoff thrust mode to be displayed in the EPR LIM readout. Reduced EPR is determined by selecting an assumed temperature that is higher then ambient temperature.
NOTE: When using T.O. FLX, the ART switch must be OFF.

T.O. Mode Button:
Pushing button will cause EPR limit for takeoff thrust mode to be displayed in the EPR LIM readout. After airplane reaches 60 KIAS the throttles will clamp (if autohtrottle is engaged). Computer is re-activated when another mode is selected.

MCT Mode Button:
Pushing button will cause EPR limit for maximum continuous thrust mode to be displayed in the EPR LIM readout and automatically position the EPR reference bug on EPR indicator.

CL Mode Button:
Pushing button will cause EPR limit for climb thrust mode to be displayed in the EPR LIM readout.

ASSUMED TEMPERATURE Selector:
Rotate knob to set assumed temperature for derated takeoff flexible (TO FLX) mode operation. Assumed temperature will be displayed on ATS readout of FMA.
NOTE: When using T.O. FLX, the ART switch must be OFF.

TEST Button:
Pushing button causes the following readout display:
- RAT: 12°C
- EPR Limit: 2.04
When buttons are released, NO-MODE light will come on.

GA Mode Button:
Pushing button will cause EPR limit for go-around thrust mode to be displayed in the EPR LIM readout.

CR Mode Button:
Pushing button will cause EPR limit for cruise thrust mode to be displayed in the EPR LIM readout

NO MODE Annunciator Light:
ON: Comes on to indicate that EPR limit mode has not been selected or uncertified engine bleed has been selected.

ABNORMAL BLEED CONFIGURATION

ABNORMAL BLEED CONFIGURATION THAT CAUSE A NO-MODE LIGHT	
TRP MODE SELECTED	**BLEED CONFIGURATION**
T.O., T.O. FLEX, GA, MCT, CL or CR	• AIR FOIL ICE PROTECION ON • ONE OR BOTH PNEU X-FEED OPEN • ENGINE ANTI-ICE OFF
T.O. or T.O. FLEX	• ENGINE ANTI-ICE ON • RAT GREATER THEN 10°
GA	• ENGINE ANTI-ICE ON • RAT GREATER THEN 14°
MCT	• AIRFOIL ICE PROTECTION ON • BOTH PNEU X-FEED OPEN
CL	• AIRFOIL ICE PROTECTION ON • ONE PNEU X-FEED CLOSED
MCT, CL or CR	• BOTH PACKS OFF

When any of the above condition occurs NO-MODE light will come ON, EPR LIM readout will go blank and ATS will not work properly.

REVERSE SYSTEM

REVERSE THRUST Lever:
Select reverse thrust. Cannot be actuated if corresponding Thrust Lever is out of the idle position.

TAKEOFF AND GO-AROUND Button:
(T/O-GA), refer to chapter 03 Automatic Flight.

FUEL SHUTOFF Lever:
ON: Opens the fuel shutoff valve on the FCU of the related engine. Energize one or both igniters according to the ENG IGNITION selector position.
OFF: Closes the fuel shutoff valve on the FCU of the related engine. Deenergizes igniters except when the ENG IGNITION selector is in the OVRD position.

ENG REVERSE THRUST Light (L, R):
ON: Indicates that the reverser is in the fully extended position.

ENG REVERSE UNLOCK Light (L, R):
ON: Indicates that the reverser is unlocked.

CENTER INSTRUMENT PANEL

ART – AUTOMATIC RESERVE THRUST

ART Switch:
AUTO: Automatic reserve thrust system is enabled.
OFF: Automatic reserve thrust system is disabled.
NOTE: When using T.O. FLX, the ART switch must be OFF.

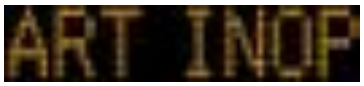
READY and ART Lights:
READY: Comes on to indicate that self-test of ART checks out properly.
ART: Comes on to indicate that ART has been activated.

ENGINE SYNCHRONIZER

ENG SYNC Selector:
OFF: Engine synchronization system is disabled.
EPR: Left engine provide EPR value for synchronization.
N1: Left engine N1 RPM is matched to the right engine N1 RPM
N2: Left engine N2 RPM is matched to the right engine N2 RPM

CAUTION ANNUNCIATION

Indicates ENG SYNC selector is not in the OFF position and landing gear is down.



Comes to indicate a system failure (not implemented) or the ART switch is OFF.

Indicates that the starter valve is out of the closed position.

Indicates low fuel pressure upstream of the 1st stage engine pump.

Indicates an engine oil low pressure condition.

Indicates that one of the fire loops has detected fire or overheat condition, or during test.

Hydraulic Annunciations

Indicates a low pressure condition of the reverser accumulator.