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ATTACHMENT 6

COPY OF ENGINE INSTRUMENTS AND OPERATING PARAMETERS (5 PAGES)

BY: PAUL R. MISENCIK
AIR SAFETY INVESTIGATOR

EVAN BYRNE, Ph.D.
HUMAN PERFORMANCE INVESTIGATOR

OVERVIEW

The MD-88 has two Pratt and Whitney JT8D-219 engines. Each engine has a maximum takeoff thrust rating of 21,750 pounds. Automatic Reserve Thrust (ART) and engine synchronization systems are also installed.

The MD-90 has International Aero V2500 engines and a static thrust of 28,000 pounds. Engine synchronization systems are installed.

The engine nacelles are supported from horizontal pylons by vibration isolating side mount systems. The nacelles are isolated from the fuselage by a firewall within the pylon and by a secondary fire seal at the pylon fuselage interface. The nacelle ventilation system is designed to provide adequate cooling of engine and accessories and to prevent accumulation of combustible mixtures. Each engine is equipped with an acoustic treatment in specific areas for noise suppression.

ENGINE INSTRUMENTS

For monitoring engine operation, an engine display panel (flat plate) and systems display panel are installed on the center instrument panel. The following indications/readouts are provided:

- Engine Pressure Ratio (EPR).
- N_1 and N_2 rpm.
- Exhaust gas temperature (EGT).
- Fuel flow/used.
- Oil pressure and oil temperature.
- Fuel temperature.
- Oil quantity.
- (90) Engine Vibration Display.

NOTE: N_1, N_2, EGT, and oil pressure digits will flash if their respective red line limits are exceeded. EGT and fuel flow digits will also flash if a hot start is imminent.

The left and right engine EPR indicators receive sensing signals from the respective engine air inlet pressure (P_{t2}) probe and the low pressure turbine discharge pressure (P_{t7}) probes. Engine pressure ratio (P_{t7}/P_{t2}) is a measure of thrust being developed by the engine, and is displayed on the EPR indicator.

The left and right N_1 indicators display the respective engine low pressure compressor rotor speed in percent of rpm. The left and right N_2 indicators display the respective engine high pressure compressor rotor speed in percent of rpm.

The left and right EGT indicators display the temperature of each engine in degrees centigrade. Each indicator receives signals from temperature probes located in the exhaust gas path of each engine.

The left and right fuel flow/used displays normally indicate the rate of fuel flow in pounds per hour for each engine. Pushing the FUEL USED (PPH) Button momentarily changes the display to fuel used in pounds for each engine. A FUEL USED RESET Button resets the fuel used display to zero.

The left and right engine oil pressure is indicated on the systems display panel in psi. Oil temperatures are indicated on this same panel in degrees centigrade. Oil quantity is also indicated for each engine in quarts on the systems display panel.

APPENDIX A

OPERATING PARAMETERS

OIL QUANTITY

- 8 qt. Minimum - Non-Maintenance Station (12 - 16 qt. Normal).
- 12 qt. Minimum - Maintenance Station.

EGT STARTING LIMITS

- Ground 475° C
- In Flight 625° C

NORMAL IDLE INDICATIONS

• N_2	50 - 60%.
• EGT	300 - 480° C.
• Fuel flow	800 - 1200 PPH.
• Oil pressure	45 ± 5 PSI.

AUTOMATIC RESERVE THRUST (ART) OPERATION

• READY	N_1's, SLATS, ART AUTO, WEIGHT ON WHEELS
• ARMED	N_1's > 64%.
• FIRES	N_1's SPLIT OF 30%, DFGC fails or switched or windshear.
• DISARMED	N_1's < 49% or slat retraction.

(2)

EPR LIMIT READOUT

Displays digital readout of EPR limit for selected operating mode.

CMD EPR READOUT

Digital readout of EPR reference set with CMD EPR SET Knob.

EPR REFERENCE BUG

Indicates EPR setting selected by Thrust Rating Panel or manually set using the CMD EPR SET Knob.

EPR INDICATOR

Digital readout of engine EPR. EPR pointer simultaneously displays a corresponding EPR value.

N_1 INDICATOR

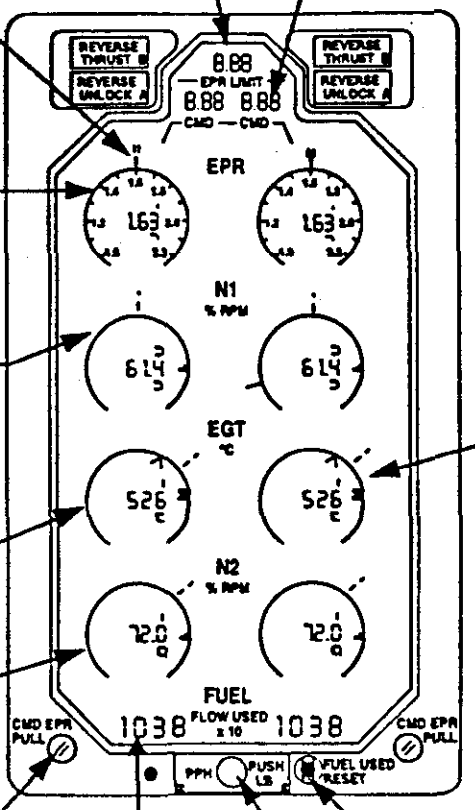
Digital readout of engine N_1 compressor in percent of rpm. Pointer indicates corresponding N_1.

EGT INDICATOR

Digital readout of exhaust gas temperature in degrees centigrade. Pointer indicates corresponding EGT.

N_2 INDICATOR

Digital readout of N_2 compressor in percent of rpm. Pointer indicates corresponding N_2.



GROUND START LIMIT CHEVRON

Amber chevron pointer indicates ground start limit of 475°C.

FUEL FLOW/USED READOUTS

Readouts normally indicate fuel flow rate delivered to engine. Flashing flow indicates possibility of engine overtemp during start.

CMD EPR SET KNOB

Pull knob and rotate to set desired EPR in CMD EPR readout. EPR reference bug will move to corresponding value on EPR Indicator. When knob is pushed in, EPR reference bug will move to EPR value applicable for EPR limit thrust mode.

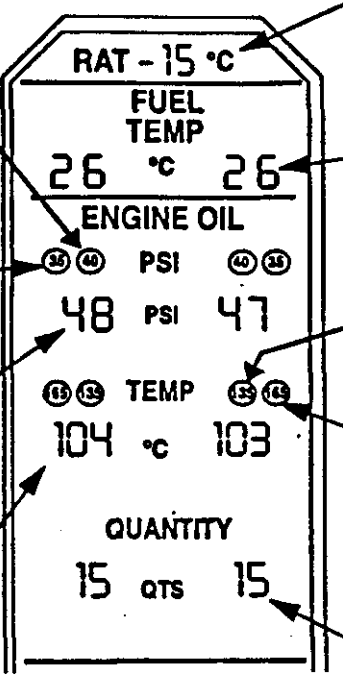
FUEL USED RESET BUTTON

Pushing this button results in fuel used being displayed momentarily, before resetting to zero.

PPH BUTTON

Fuel flow is normally shown. Pushing the button will display fuel used, and illuminate the FUEL USED READOUT Light for 10 seconds.

ENGINE DISPLAY PANEL (MD-88)



RAT READOUT

Displays digital readout of ram air temperature.

ENGINE OIL PRESS 40 PSI LIGHT

Amber light illuminates at 40 psi and below

FUEL TEMP READOUT

Indicates temperature of fuel after it has flowed through the air/fuel heat exchanger.

ENGINE OIL PRESS 35 PSI LIGHT

Red light illuminates at 35 psi and below.

ENGINE OIL TEMP 135° LIGHT

Amber light illuminates at 135°.

ENGINE OIL PRESS READOUT

Indicates oil pressure on engine side of main oil filter. Flashing numbers indicate oil overpressure.

ENGINE OIL TEMP 165° LIGHT

Red light illuminates at 165°.

ENGINE OIL TEMP READOUT

Indicates temperature of oil that has passed through the fuel/oil heat exchanger.

ENGINE OIL QUANTITY READOUT

Indicates oil in tank.

SYSTEMS DISPLAY PANEL

ASSUMED TEMP SELECTOR

Rotate knob to set assumed temperature for derated takeoff flexible (T.O. FLX) mode operation. Temperatures from 1° to 59° can be selected. Assumed temperature will be displayed in ATS readout of FMA's.

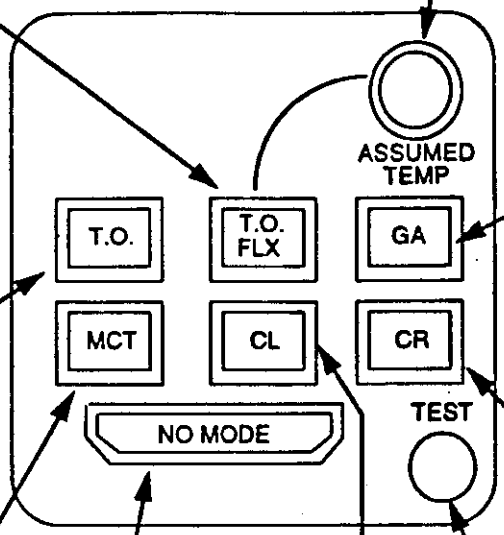
The EPR displayed will be based on the maximum thrust EPR limit at the assumed temperature. However, if an assumed temperature of 00° C is selected and the T.O. FLX MODE Button is pushed, the EPR displayed will be based on the normal thrust EPR limit.

NOTE: *When using T.O. FLX, the ART Switch must be OFF. Delta currently uses 45° or 50° for alternate power takeoffs.*

T.O. FLX MODE BUTTON

Pushing button causes a reduced EPR limit for flexible takeoff thrust mode to be displayed in the EPR LIMIT readout and automatically positions the EPR reference bug on EPR Indicator. Reduced EPR limit is determined by selecting an assumed temperature that is higher than ambient temperature.

NOTE: *When using T.O. FLX, the ART Switch must be OFF.*



GA MODE BUTTON

Pushing button causes EPR limit for go-around thrust mode to be displayed in the EPR LIMIT readout and automatically positions the EPR reference bug on the EPR Indicator.

T.O. MODE BUTTON

Pushing button causes EPR limit for takeoff thrust mode to be displayed in the EPR LIMIT readout and automatically positions the EPR reference bug on the EPR Indicator.

CR MODE BUTTON

Pushing button causes EPR limit for cruise thrust mode to be displayed in the EPR LIMIT readout and automatically positions the EPR reference bug on the EPR Indicator.

MCT MODE BUTTON

Pushing button causes EPR limit for max continuous thrust mode to be displayed in the EPR LIM readout and automatically positions the EPR reference bug on the EPR Indicator.

TEST BUTTON

Pushing button causes following readout displays:

- RAT: Displays 12 PLUS ± 1.
- EPR LIMIT: Displays 2.08 ± .01.
- All lights on the panel to extinguish.

When button is released, NO MODE Light illuminates, and all mode button lights remain extinguished.

NO MODE ANNUNCIATOR LIGHT

Indicates that an EPR limit mode has not been selected, or an abnormal engine bleed configuration exists, or takeoff flex has been selected and ART Switch has not been placed **OFF**.

CL MODE BUTTON

Pushing button causes EPR limit for climb thrust mode to be displayed in the EPR LIMIT readout and automatically positions the EPR reference bug on the EPR Indicator.

THRUST RATING PANEL