

# MCDONNELL DOUGLAS MD-90 DIFFERENCES FROM MD-80

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Note: This guide is not an FCOM and does not describe every single behavior of the system.

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## INTRODUCTION

There is little information on the systems and operation of the MD-90 available. As such, this document is intended to describe the MD-90 differences for pilots familiar with its predecessor, the MD-80.

The MD-90 is very similar to the MD-80 but has several changes to systems. The MD-90 Enhanced Flight Deck (EFD) contains further differences.

## AUTOFLIGHT AND DFGS

### AUTOMATIC THRUST RESTORATION

On the MD-80, the difference in engine indications for the Automatic Thrust Restoration (ATR) system to activate is 0.25 EPR or 7% N1.

On the MD-90, a difference of 0.1 EPR or 14% N1 is needed.

Other conditions required for ATR to activate are identical.

### FLIGHT MODE ANNUNCIATOR

The MD-80 and standard MD-90 Flight Mode Annunciator (FMA) is located on its own panel.

The MD-90 EFD FMA is located on the top of the Primary Flight Display. Certain mode names are expanded when compared to the MD-80 due to additional room for characters. For example, "RETD" is displayed as the full mode name, "RETARD".

### MACH TRIM

The MD-80 Digital Flight Guidance System (DFGS) adjusts the first officer's yoke neutral position backwards to counteract mach tuck (nose down effect).

On the MD-90, Mach Trim is accomplished via nose up stabilizer commands directly from DFGS. This position offset is removed as the aircraft slows.

### PERFORMANCE AND VNAV

MD-80's equipped with a Performance Management System (PMS) have a "PERF" button on the Flight Guidance Control Panel (FGCP). PMS modes are available on the Autoflight system.

On the MD-90, PMS is not installed. The FGCP has "VNAV" and "FMS OVRD" buttons and VNAV modes are available on the Autoflight system. This is identical to MD-80's equipped with Honeywell AFMS.

## AUXILIARY POWER UNIT

On the MD-80, the Auxiliary Power Unit (APU) is the Garrett GTCP85-98DHF. No Engine Control Unit (ECU) is installed.

On the MD-90, a more capable AlliedSignal 131-9D APU is installed. The APU is controlled by the ECU.

## ELECTRICAL SYSTEM

### APU AND EXTERNAL POWER

On the MD-80, APU and external power have their own connections to the left and right AC buses. There are switches to control each connection.

On the MD-90, APU and external power connect to the AC Tie bus “in-between” the tie switches. The tie switches can be moved to the “OPEN” position to prevent APU or external power from being connected to the respective AC bus.

The MD-90 is unique in that the external power switch is normally in the “ON” position. The relay connecting external power to the tie bus is controlled by the Electrical Power Control Unit (EPCU).

### BATTERIES

The MD-80 has two 14-volt batteries in series. The MD-90 has three 9-volt batteries in series with longer runtime.

### EMERGENCY POWER

The MD-80 emergency power can be selected “OFF” or “ON”.

The MD-90 emergency power can be armed by moving the knob to the “ARM” position. If armed, emergency power will automatically turn on if power is lost to the emergency AC, emergency DC, or transfer DC buses.

### ELECTRICAL POWER CONTROL UNIT

The MD-80 electrical system is controlled manually aside from a few automatic functions. There may be a break in power when transferring sources of various buses.

Some of the MD-90 electrical system is controlled by the Electrical Power Control Panel (EPCU). The EPCU will parallel sources to buses in order to prevent a break in power when transferring. The EPCU also controls the AC and DC bus ties as well as emergency power.

## ENGINE GENERATORS

On the MD-80, engine electrical power is provided conventionally via an Integrated Drive Generator (IDG) and Constant Speed Drive (CSD).

There are not IDGs or CSDs on the MD-90. Engine electrical power is provided via a Variable Speed Constant Frequency (VSCF) system. The generators output 232-400VAC 800-1600Hz which is converted into DC power before being converted to 115VAC 400Hz.

Separate cooling is provided for the VSCFs in the E/E compartment in the front of the airplane.

## TIE BUSES

The MD-80 tie bus is controlled by a single switch. The normal position is "AUTO".

The MD-90 has two switches controlling the tie, one for each side system. The normal position of both switches is "AUTO". APU and external power connect "in-between" these switches.

## ENGINES

The MD-80 has two Pratt & Whitney JT8D-200 engines. The engines are controlled conventionally via cables from the throttles to the fuel control units. Reverse thrust is accomplished via clamshell buckets.

The MD-90 has two high-bypass, higher thrust, more efficient, International Aero Engines V2500 engines. The engines are controlled by signals from the throttles to Full Authority Digital Engine Control (FADEC) units installed on each engine. Reverse thrust is cascade-style. Activation above 60 knots provide 1.3 EPR of thrust. Below 60 knots, only 1.07 EPR is available.

## AUTOMATIC RESERVE THRUST

On the MD-80, if an engine fails during takeoff, the Automatic Reserve Thrust (ART) system automatically increases engine thrust on the remaining engine from normal to maximum takeoff thrust. ART is disarmed for FLEX takeoff.

On the MD-90, ART is not installed. This is not to be confused with Automatic Thrust Restoration (ATR), which is still available.

## IGNITION

On the MD-80, ignition is not automatic. Ignition must be selected if desired.

On the MD-90, ignition is controlled automatically. It can be overridden to "ON" if desired.

## INSTRUMENTATION

The MD-80 has either round dials for engine instrumentation or the electronics Engine Display Panel (EDP) installed. There are no vibration indications.

The MD-90 has electronic instrumentation for the engines and has vibration indications added.

## N1 MODE

On the MD-80, Full Authority Digital Engine Control (FADEC) and thus N1 Mode is not installed.

On the MD-90, N1 Mode can be activated if EPR indication is unreliable, or the system can automatically revert to N1 Mode if a failure occurs. N1 Mode is also used for reverse thrust. Thrust limitation and the Auto Thrust System (ATS) are not available in N1 Mode.

## THRUST LIMITS

On the MD-80, thrust limits are computed by the Digital Flight Guidance System. On aircraft without Engine Display Panel (EDP), the active limit is displayed and selected on the Thrust Rating Indicator (TRI). On aircraft with EDP, the active limit is displayed on the EDP and selected on the Thrust Rating Panel (TRP). Separate "T/O" and "G/A" modes are available. "CRZ" mode is available. "EPR SEL" mode is not installed. Thrust limit selection is mostly manual aside from certain automatic transitions to "G/A" mode.

On the MD-90, thrust limits are computed by the Full Authority Digital Engine Control (FADEC) units installed on each engine. There are small differences between standard and EFD MD-90's.

On the standard MD-90, the thrust limit operates similarly to MD-80's equipped with EDP. The "T/O" and "G/A" modes are combined into the "TOGA" mode. The "CRZ" mode was removed. "EPR SEL" mode is installed.

On the EFD MD-90, thrust limits are automatically selected by the Flight Management System (FMS), aside from the takeoff to climb thrust reduction. "T/O" and "G/A" are separate modes. The "CRZ" mode is available. The thrust limit mode can be overridden in the Multifunction Control and Display Unit (MCDU). Engine rating (25K or 28K), FLEX takeoff, and "EPR SEL" mode are selected via the MCDU. FLEX takeoff is only available with the 25K rating selected.

When the "T/O" mode is active on the MD-90 EFD, the "CLB" mode can be armed by pulling the altitude knob when above 400 feet radio altitude. The "CLB" mode will automatically engage at the thrust reduction altitude. Further mode changes are automatic.

## FLIGHT CONTROLS

### ELEVATORS

The MD-80's elevators are normally manually flown by control tabs. If the elevators are commanded more than 10 degrees nose down, the elevator is hydraulically driven.

The MD-90's elevators are normally hydraulically driven. Manual reversion to control tabs is available if hydraulics fail or the ELEV CONT ELEV switch is selected "OFF".

### PYLON FLAPS

The MD-80 does not have pylon flaps.

The MD-90 has flaps on the engine pylons which deflect downward hydraulically when the yoke reaches the full nose down position. This aids downward pitching motion during stalling conditions which may be stronger than on the MD-80 due to the heavier engines.

## FUEL SYSTEM

### ALTERNATE FUEL BURN

Alternate Fuel Burn (AFB) burns the fuel tanks in an alternating order when the center tank switches are in the "AUTO" position. The MD-90 EFD has a separate AFB switch.

Not all MD-80's have AFB installed.

The fuel schedule is as follows when AFB is enabled:

- Center tank to 10,000 pounds
- Main tanks to 4,000 pounds
- Center tank to empty
- Main tanks to empty

All MD-90's have AFB installed.

The fuel schedule is as follows when AFB is enabled:

- Center tank to 3,000 pounds
- Main tanks to 4,000 pounds
- Center tank to empty
- Main tanks to empty

## FUEL HEAT AND RECIRCULATION

The MD-80 has manual fuel heat installed. A recirculation system is not installed.

The MD-90 does not have fuel heat. Return To Tank (RTT) recirculation is performed automatically instead.

## HYDRAULIC SYSTEM

On the MD-80, the left and right engine pumps have "OFF", "LO", and "HI" positions.

On the MD-90, the pumps only have "OFF" and "ON" positions.

## INSTRUMENTATION

This section will not describe what is installed in the MD-80. It will only describe what is changed on the MD-90.

### STANDARD FLIGHT DECK

#### EDP:

- Thrust rating (25K or 28K) is displayed
- EPR limit is displayed separately for each engine
- EPR command shown on the EPR indicator
- N2 is displayed as a digital value only

#### FMS:

- Honeywell AFMS is the only FMS option
- VNAV is installed on all airplanes

#### SDP:

- TAT is displayed instead of RAT
- Engine vibration is displayed

#### TRP:

- T/O and G/A buttons are replaced with TOGA.
- CRZ button is removed
- EPR SEL button is added



## ENHANCED FLIGHT DECK

The Enhanced Flight Deck (EFD) contains several major and minor changes to the flightdeck to make it similar to the upcoming Advanced Common Flightdeck in design for the MD-95 (Boeing 717).

### Major Changes:

- Six 8-inch Honeywell VIA Display Units (DU) replace conventional dials
- EFIS Control Panels (ECPs) are installed for the new Navigation Displays
- Display Control Panels (DCPs) is installed to control altimeter and minimums settings
- A new push-button overhead panel using the dark cockpit concept is installed
- A new pedestal containing new radios, audio panels, and DU controls is installed
- The transponder is relocated to the overhead
- TRP functionality is relocated to the Multifunction Control and Display Unit (MCDU)
- Exterior light switches are relocated to the overhead