



# TECHSAVIATION

## *Training Center*

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# Autoflight

## Autoflight Overview

The autoflight system is made up of these systems:

- Flight Management Function (FMF)
- Autoflight Function (AFF)
- Thrust Management Function (TMF).

This group of functions operates together to decrease flight crew workload and provide automatic flight control and automatic landing capability.

Autoflight status information is shown on the Display Crew Alerting System (DCAS) displays.

### Flight Management Function

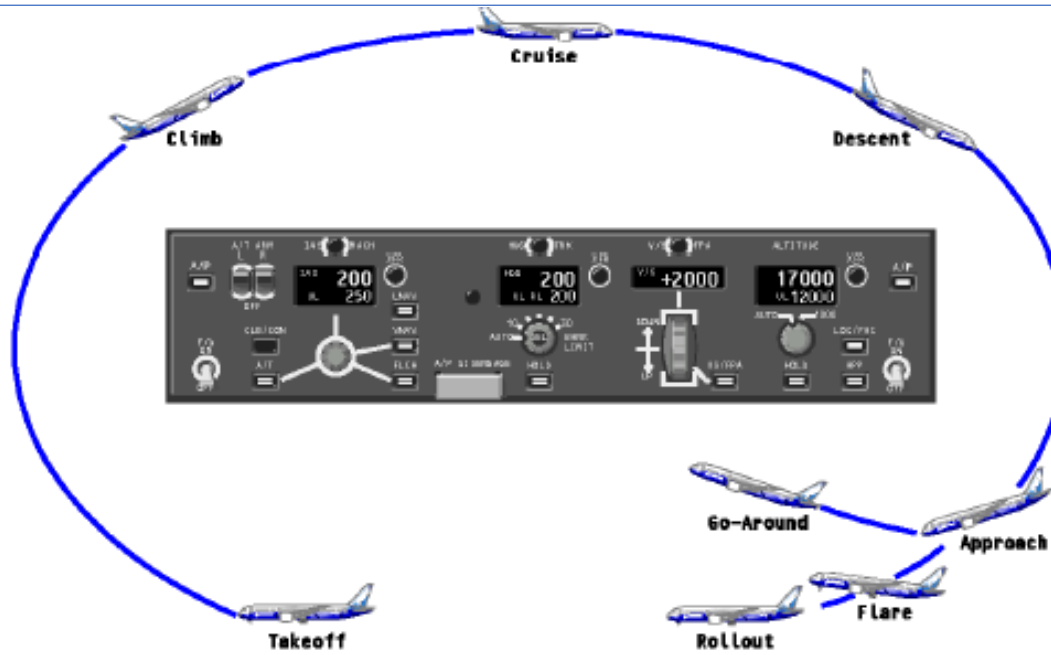
The flight crew uses the Control Display Units (CDU) to enter the route and performance data for the flight. The FMF calculates the lateral and vertical components of the flight path. It then sends these guidance commands to the AFF to follow the flight plan.

### Autoflight Function

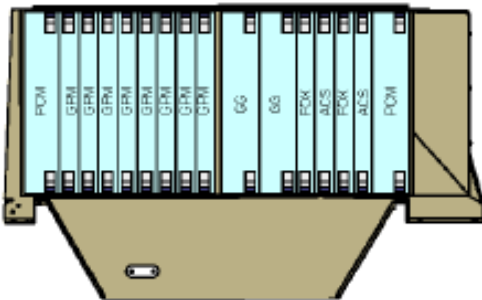
The AFF includes the autopilot and flight director. The AFF can use commands from the FMF or the flight crew can use the mode control panel to control the airplane.

### Thrust Management Function

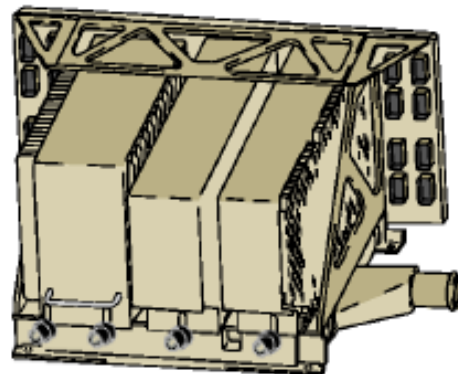
The TMF controls the engine thrust levers. The FMF sends thrust and speed targets to the TMF for best overall flight performance.



## FMF & TMF



## AFF



## Displays



## Flight Management Function

The Flight Management Function (FMF) provides vertical and lateral guidance for all phases of flight except the takeoff roll and final approach/touchdown. This reduces the flight crew workload and, most importantly, provides improved economical benefits for the customer.

The Common Computing Resource (CCR) cabinets have three FMFs. They are designated as:

- Master
- Hot spare
- Backup.

The master FMF sends lateral guidance commands and vertical guidance commands to the Autoflight Functions (AFF) with mode requests from the MCP.

The primary crew interfaces for the FMF are the Display Crew Alerting System (DCAS) Control Display Units (CDU).

The FMF has these functions:

- Navigation
- Performance
- Guidance.

The navigation function calculates airplane position, altitude, velocity, and navigation performance data.

It also autotunes these navigation radios for position update and as part of the flight plan:

- Distance Measuring Equipment (DME) system
- VHF Omnidirectional Range (VOR) system
- Instrument Landing System (ILS)
- GPS Landing System (GLS).

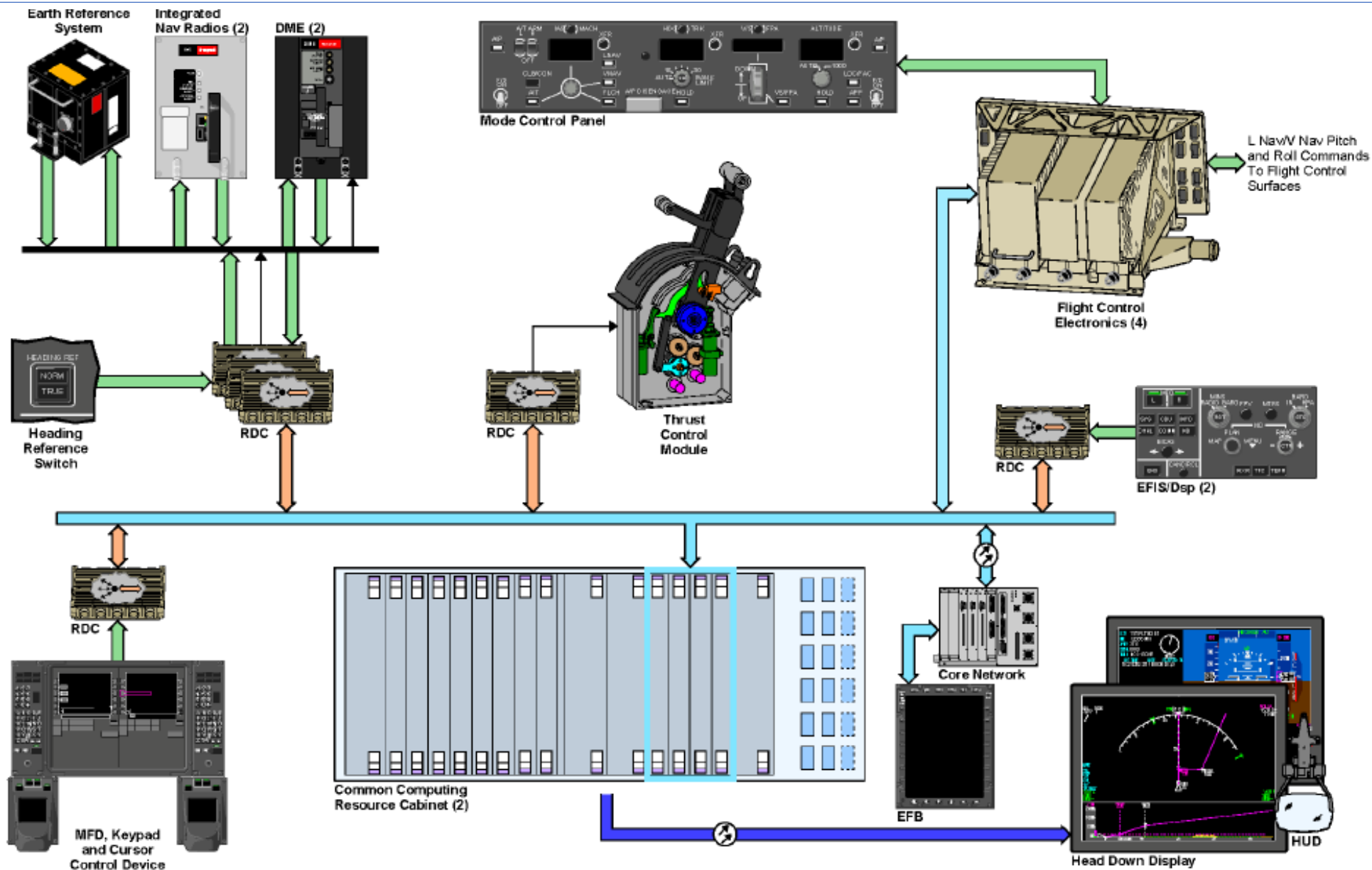
The performance function uses the airplane aerodynamic model and flight crew entries to calculate the most economical vertical flight path.

The flight crew entries are:

- Cost index
- Cruise altitude
- Airplane gross weight.

The guidance function calculates lateral and vertical commands and sends them to the AFFs in the Flight Control Electronics (FCE). It also sends thrust and speed commands to the Thrust Management Function (TMF).

The guidance function also sends the commands and navigation map data to the DCAS displays.



## Autopilot Flight Director System

The Autopilot Flight Director System (AFDS) has these components:

- One Mode Control Panel (MCP)
- Two Takeoff/Go-around (TOGA) switches
- Two autothrottle disconnect switches
- Three Back-drive Actuators (BDA).

The Autoflight Function (AFF) is a software application in three of the Flight Control Electronics (FCE).

The AFF automatically controls airplane heading, track, speed, altitude, navigation paths, and go-around.

The flight director provides guidance commands for these functions plus for takeoff. The airplane can do fail-operational and fail-passive approach and landings.

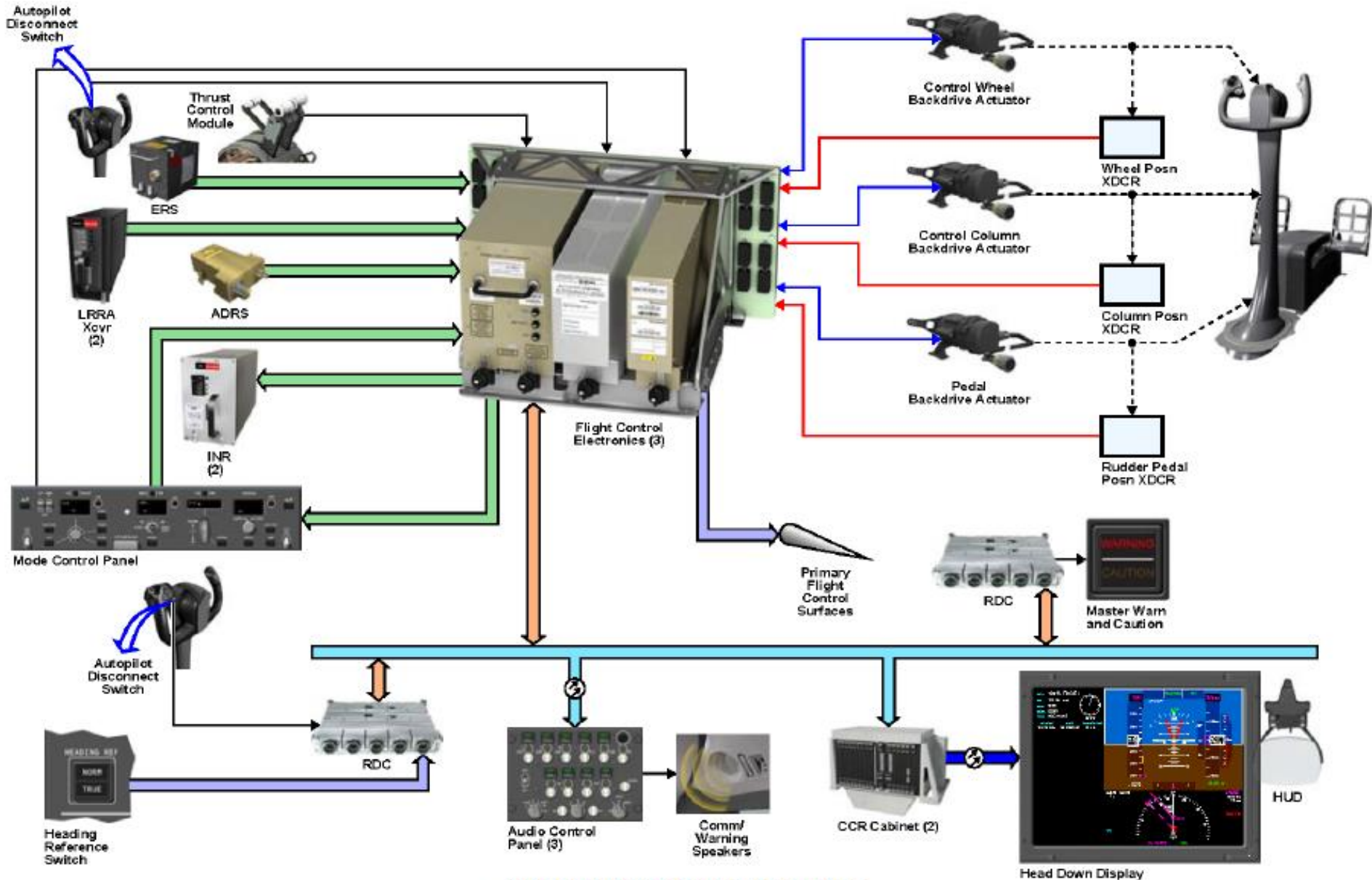
The AFFs send commands to the Primary Flight Control Functions (PFCF), which control the Power Control Units (PCU) to move the control surfaces.

There are two autopilot engage switches on the MCP. All available autopilot channels engage when the flight crew pushes either switch.

The PFCFs process and change the autopilot commands into surface commands that go to the PCUs and back-drive commands that go to the BDAs.

The BDAs move the control columns, control wheels, and rudder pedals to a position that represents the autopilot command.

Autopilot commands go to the rudder system only during automatic approach and landings.





## Thrust Management Function

The Thrust Management Function (TMF) can control the thrust levers from takeoff to touchdown. It gives maximum fuel conservation through smooth, precise thrust control. As with other flight management subsystems, the autothrottle design gives maximum operational and cost benefits.

The TMFs are in the Common Computing Resource (CCR) cabinets. The TMF operates the thrust levers through two independent servomotors. The TMF controls the engines independently to get the best performance from each engine.

These are the TMF controls in the flight compartment:

- Arm switches on the Mode Control Panel (MCP).
  - Arm the autothrottle.
- Takeoff/Go-around (TOGA) switches on the Thrust Levers (TL)
  - Select the takeoff or go-around modes
- Disconnect switches on the TLs
  - Disconnect the autothrottle
- Mode select pushbuttons on the MCP
  - Select thrust or speed control.

The flight crew can select the TMF mode with the mode select pushbuttons on the MCP. The Autoflight Function (AFF) usually selects the correct autothrottle mode for the flight phase. The active autothrottle mode shows on the Flight Mode Annunciator (FMA) displays.

The TMF moves the TLs to control thrust or airspeed.

For thrust control, the Flight Management Function (FMF) calculates the correct thrust setting for the flight phase.

For airspeed control, the TMF accepts Mach and airspeed commands from the FMF or MCP.

The TMF operates with the electronic engine control to give improved performance.

