Flight Management System (FMS)

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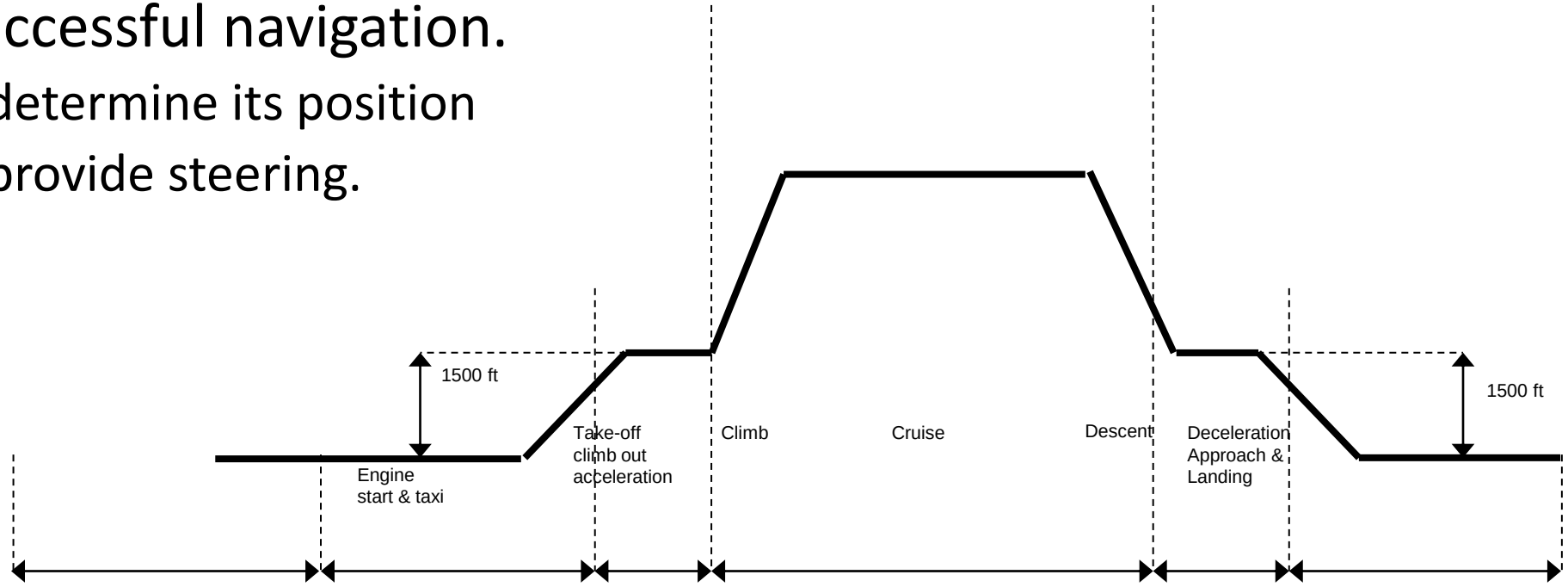
FMS

- Flight Management System (FMS) is a navigation computer. It follows ARINC characteristics for Navigation Database, Flight Management Computers and Multi-Purpose Control and Display Units.
- There are two distinct processes the FMS must accomplish in order to provide successful navigation.
  - ✓It must determine its position
  - ✓It must provide steering.



Phases of flight

Flight plan consists of two profiles namely:-

1. Lateral Profile

Consisting of waypoints, track and course information, other information related to waypoints, runways, airports.

2. Vertical Profile

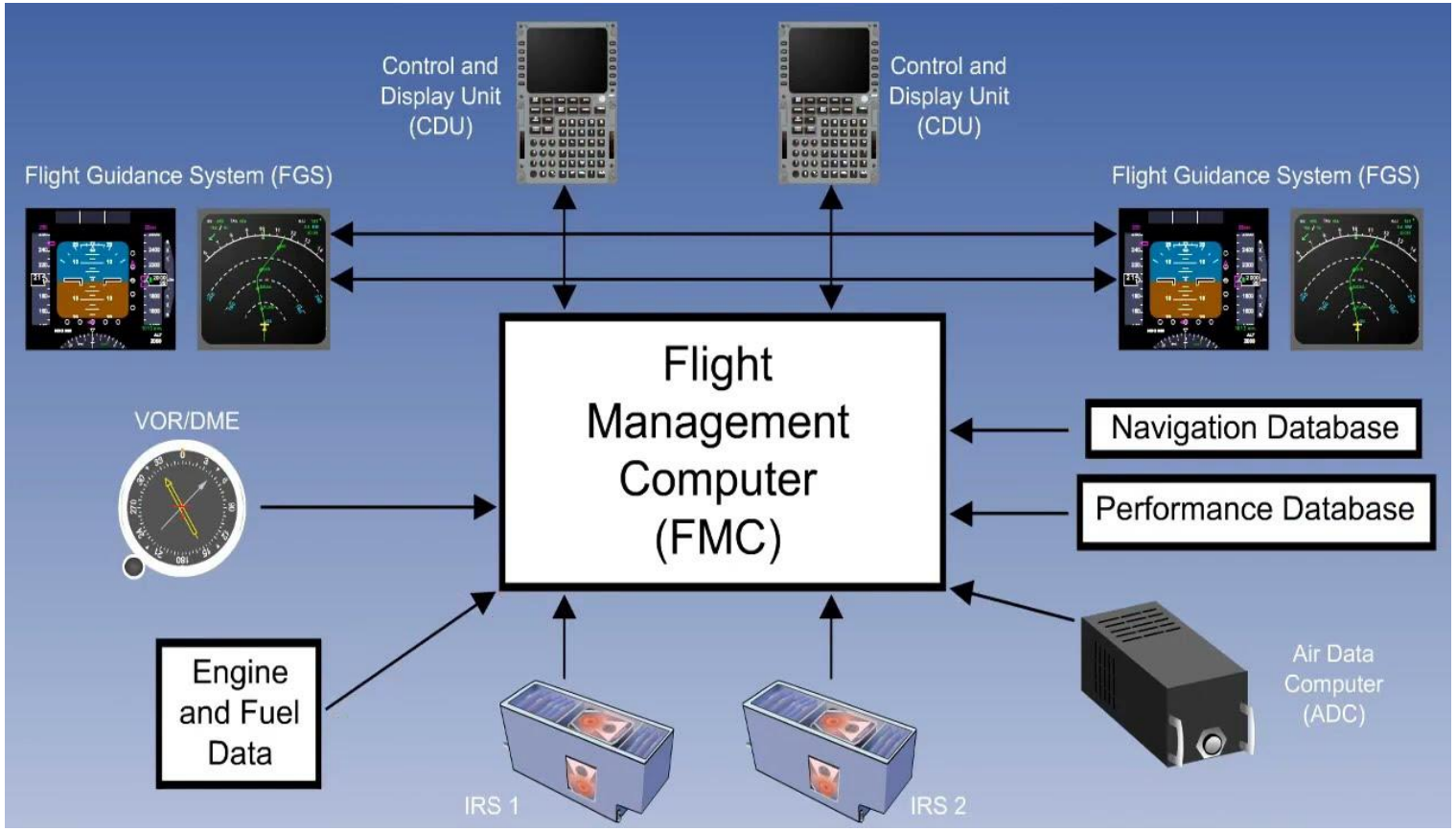
Consisting of information such as top of climb, bottom of

climb, top of descent, cruising altitudes etc.

FMS application

The FMS application can be divided into several sub-applications like :-

- ✓ Flight Management Function
- ✓ Navigation Database Server
- ✓ User Interface
- ✓ Input Output Translator



FMS Functions

- Navigation Database Server
- Flight Plan Management
- Multi-Sensor Navigation
- Lateral Guidance
- Vertical Guidance
- Approach Guidance
- Performance - Time/Fuel, RTA, Vspeeds
- MFD Map Processing
- CDU Page Interface

Navigation Database Server

- Worldwide data for airports, navaids, SIDs / STARs / Approaches, Airways.
  - ✓ The paths are known as SIDs (Standard Instrument Departure Route) and STARs (Standard Terminal Arrival Route/Standard Arrival Route). These paths dictate how aircraft enter and leave the airport, placing restrictions on speed and altitude.
- Database updated every 28 days.
- Raw data is purchased from Jeppesen.
- It provides means of accessing, retrieving and storing data in the navigation database.

Flight Plan Management

- The FMS allows the Pilot to enter two flight plans, a primary and a secondary flight plan.

What does a flight plan constitute?

- ✓ Origin and Destination airport entry
- ✓ SID / STAR / Approach procedures
- ✓ Waypoint Insert / Delete
- ✓ Airways
- ✓ Vertical Path specification

Multi-Sensor Navigation

- Uses sensors (VOR, DME, GPS, IRS) to determine location of aircraft.
  - ✓ The Very High Frequency Omni-Directional Range (VOR) is a ground-based electronic system that provides azimuth information for high and low altitude routes and airport approaches
  - ✓ The Distance Measuring Equipment (DME) is a radio navigation aid used by pilots to determine the aircraft's slant range from the DME ground station location.
  - ✓ The Global Positioning System (GPS) is a space-based radio-navigation system
  - ✓ The Inertial Reference System (IRS) calculates airplane position, acceleration, track, vertical speed, ground speed, true and magnetic heading, wind speed and direction.
- Tunes radios to VOR/DMEs within range and in the proper geometry
- Monitor sensor validity
- Performs Required Navigation Performance (RNP) / Emergency Power Unit (EPU) calculations

Lateral Navigation

- Steer aircraft laterally along planned course
- Gives bank commands to autopilot for execution
- Determines when to sequence to the next waypoint

Shortest distance between two points determined by a plane that goes thru:

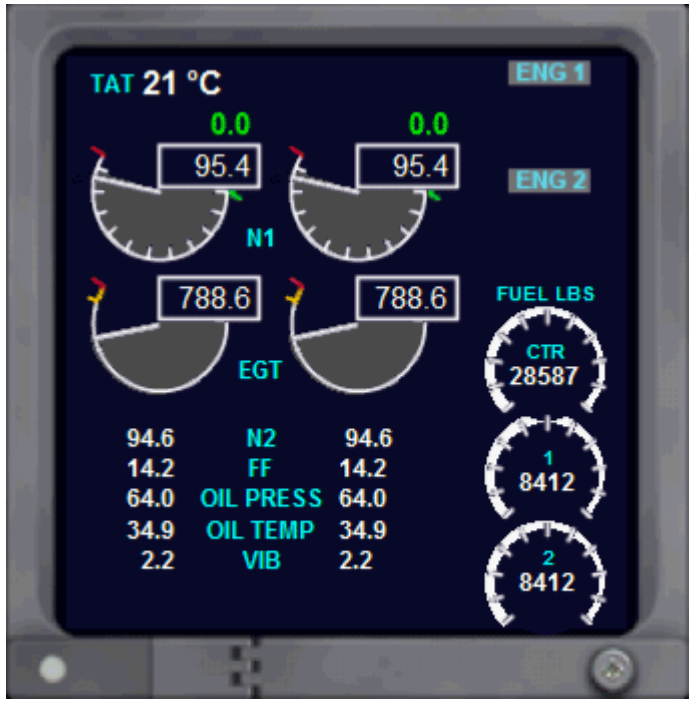
Origin
Destination
Center of the earth

Vertical Navigation

- A function to ensure altitude and speed constraints are honored
- Steers the aircraft vertically along the planned vertical descent path
- Provides pitch commands to the autopilot for execution
- Outputs the Speed Target
- Supports vertical modes
- https://www.youtube.com/watch?v=H-nCITSRuT4

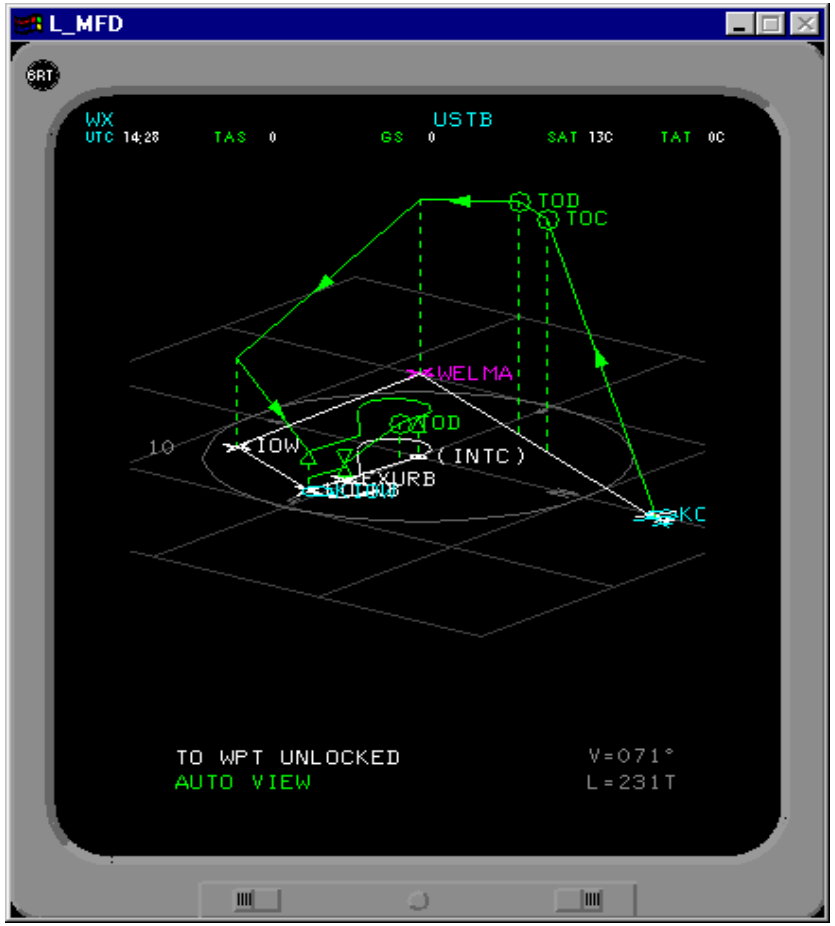
Time and Fuel Performance

- Predicts Estimated Time of Arrival (ETA) and Fuel Remaining at flight plan waypoints
- Table based calculation
- Adjust speed schedules to meet Required Time of Arrival (RTA) at waypoints



MFD Map Processing

- Draws a pictorial representation of the flight plan - this increases pilot situational awareness.
  - Point at your Present Position (PPOS) (or Track Up) map
  - North Up map (allows you to step through the entire flight plan)
- Text displays for progress data
- Optional 3-D map functionality
- New systems also have ChartLink (FMS auto selects charts)



3-D Map

Control Display Units (CDU) Page Interface

- This provides a means for the Pilot to interact with the FMS.
- Multiple pages displayed on the CDU
- Primary means of interfacing with the FMS
- Controls the MFD format and background items.
- https://www.youtube.com/watch?v=aNjQcM5dVlU