

# Introduction

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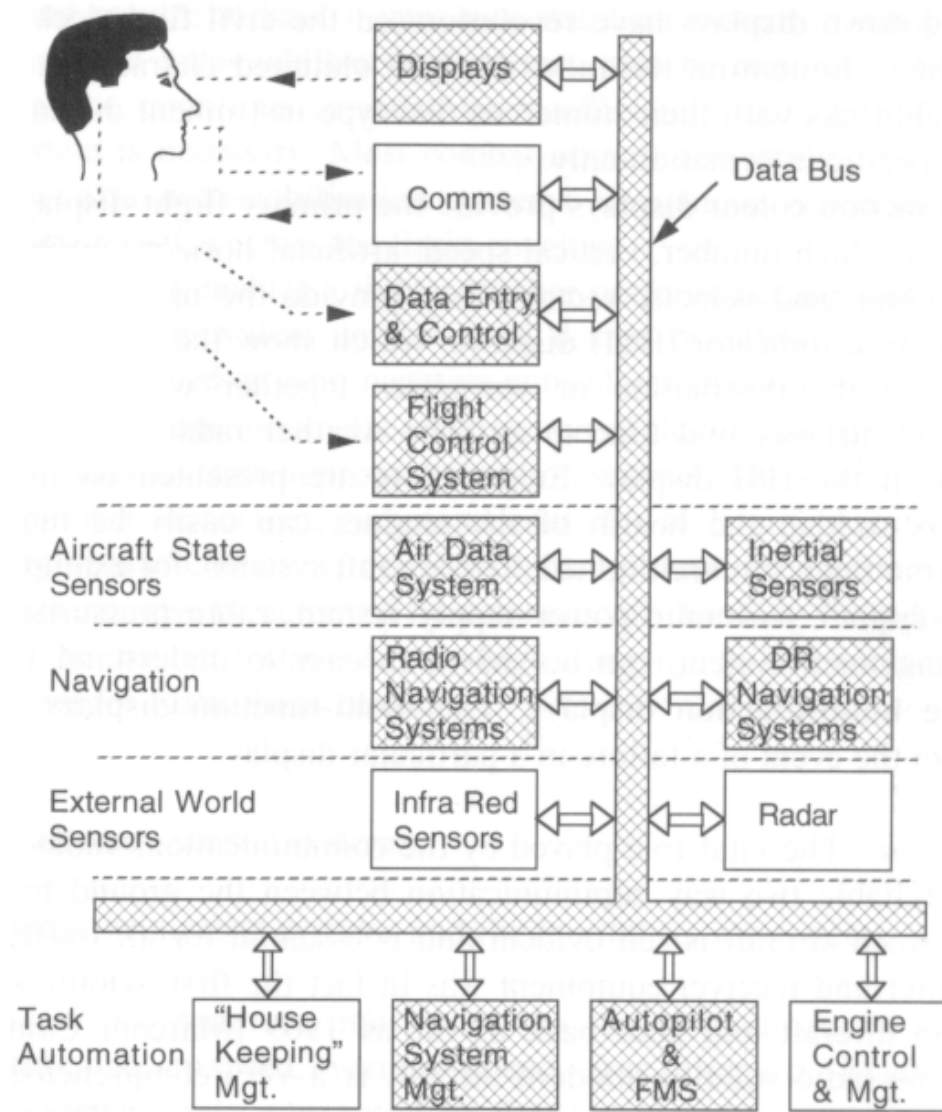
- *Navigation* is the determination of the position and velocity of a moving vehicle.
  - *Navigation sensors* may be located in the vehicle, in another vehicle, on the ground, or in space.
  - When the state vector is measured and calculated on board, the process is called *navigation*.
  - When it is calculated outside the vehicle, the process is called *surveillance* or *position location*.

- The term *guidance* has two meaning:
  - ❑ Steering toward a destination of known position from the aircraft's present position.
  - ❑ Steering toward a destination without explicitly measuring the state vector. A guided vehicle can home on radio, infrared, or visual emissions.

- Navigation systems can be categorized as *positioning* or *dead-reckoning*.
- *Positioning systems* measure the state vector without regard to the path traveled by the vehicle in the past.
- *Dead-reckoning navigation systems* derive their state vector from a continuous series of measurements relative to an initial position.

- *Radio systems* – They consist of a network of transmitters (also receivers) on the ground, in satellites, or other vehicles. The airborne navigation set detects the transmissions and computes its position relative to the known positions of the stations in the navigation coordinate frame. The aircraft's velocity is measured from the Doppler shift of the transmissions or from a sequence of position measurements.

- *Celestial systems* – They compute position by measuring the elevation and azimuth of celestial bodies relative to the navigation coordinate frame at precisely known time.
- *Mapping navigation systems* – They observe images of the ground, profiles of altitude, or other external features.



## Navigation & Guidance - Introduction