E230 Aircraft Systems

Dials and Gauges

6th Presentation

School Of Engineering

Aircraft Instrument Systems

- Aircraft instruments are the eyes of the aircraft.
- Improves safety during poor visibility conditions such as flying in clouds and night time.
- Provide information to flight crew about the flight
- Help them in making correct decisions during flight

Information presented by Instrument

- Visual information (By sight)
  - Cockpit indications
  - Flashing lights
  - Changing colors

- Audio information (By sound)
  - Fire bell
  - Warning horn
  - Chime

- Tactile information (By touch)
  - Stick shaker

Process to get reading from Instruments

- Detecting
  - Detect changes in physical quantity or condition
- Measuring
  - Measure the value of the physical quantity
- Coupling
  - Magnify and transmit the measurements to the indicating element
- Indicating
  - Display the measured quantity

Classification of Aircraft Instruments according to Function

- Flight instruments
  - Shows aircraft flight characteristics
- Navigation instruments
  - Guides pilot along flight course
- Engine instruments
  - Provides information about the engine
- System instruments
  - Provides system operation status

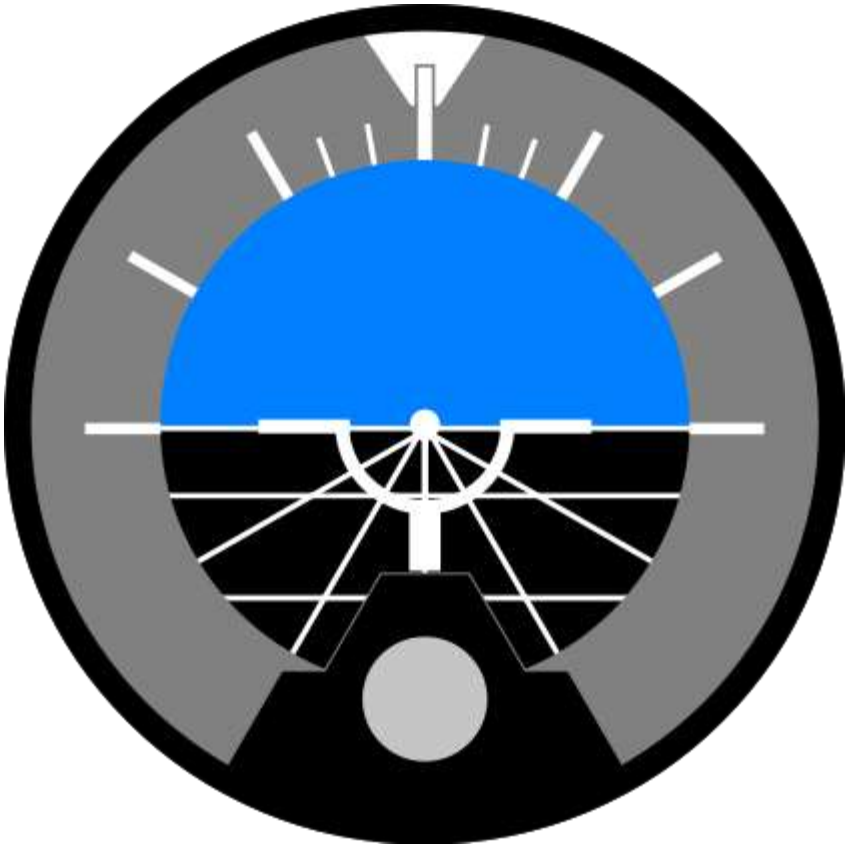
Main instruments in Aircraft cockpit

Flight Instruments	Navigation Instruments	Engine Instruments	Systems Instruments
• Airspeed Indicator • Altimeter • Attitude Indicator • Vertical Speed Indicator • Turn Coordinator	• Heading Indicator • Compass • VOR Receiver • Glide Slope	• Oil pressure indicator • Oil temperature indicator • Exhaust Gas Temperature • Fuel Flow Indicator • Fuel Gauge • Tachometer	• Hydraulic pressure indicator • Vacuum gauge • Ammeter

Altimeter (ALT)

- Measures the height of the aircraft above sea level.
- Uses pressure information given from the static system
- Adjustable to suit local barometric pressure.
- Works on the principle that higher altitude has lower pressure and vice versa

Attitude Indicator (AI)



- Shows the aircraft attitude relative to the horizon.
- Tells whether wings level or nose up/down.
- Uses the principle of gyroscope rigidity.
- Also known as artificial horizon

Airspeed Indicator (ASI)

- Shows the aircraft speed relative to the surrounding air
- Uses pressure information from the pitot-static system
- Units usually given in knots

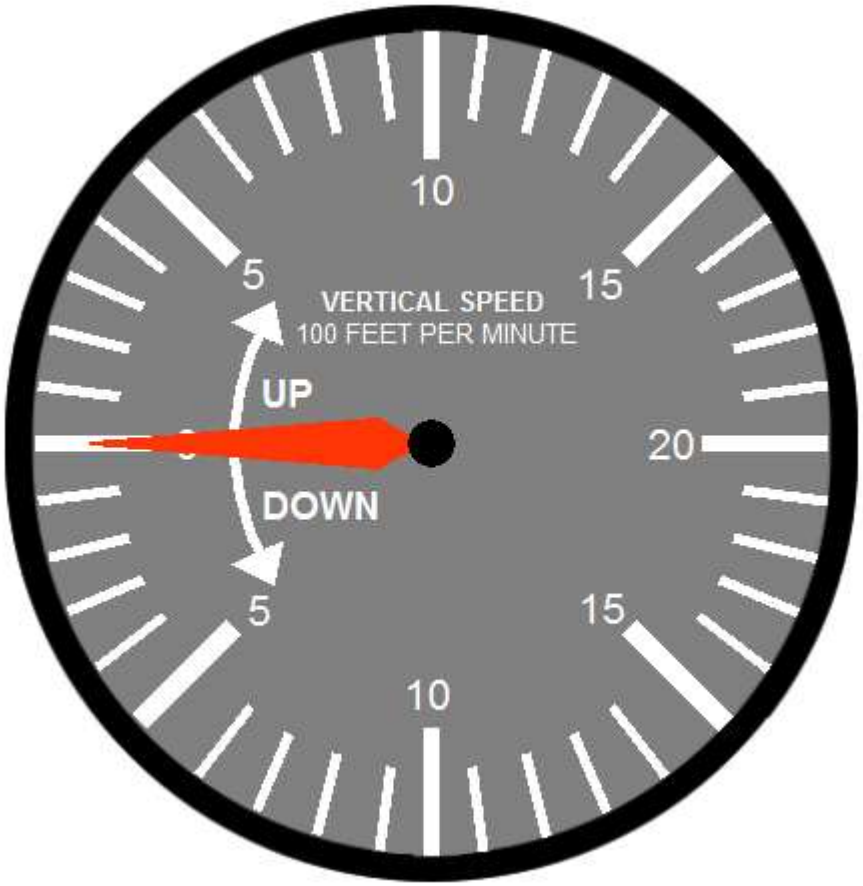
Directional Gyro (DG)

- Displays aircraft heading with respect to true north.
- Principle of operation is gyroscopic rigidity
- DG is also known as heading indicator

Turn Coordinator

- Displays aircraft direction of turn and rate of turn.
- Determines whether the aircraft turn is coordinated.
- Principle of operation is gyroscopic precession.

Vertical Speed Indicator (VSI)



- Displays aircraft rate of climb or descent
- Principle of operation is sensing changing air pressure
- Units in feets per minutes, meters per second or knots.

Instrument layout in cockpit

- Basic T instrument layout
  - •Most light aircraft add the two lower instruments to the basic T. Some call this the ‘basic six’.

Standard PFD Indications

Standard Cockpit Layout

Requirements for Aircraft Instruments

- Reliable
- Light-weight
- Able to withstand vibrations and acceleration forces during flight
- Corrosion-resistant
- Shielded from interference from radio and magnetic sources
- Easy installation, removal and adjustment

Learning Objectives

- Identify the basic aircraft instruments
- Describe the function of basic aircraft instruments
- Recognise the common cockpit layouts
- Describe the process to get reading from aircraft instruments
- Describe the classifications of aircraft instruments
- Describe the design considerations for aircraft instruments