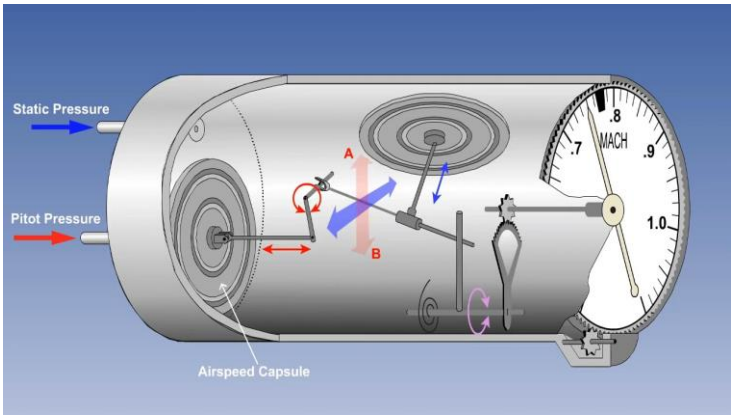
Subject Code & Name**: 23AST101 Fundamentals of Aerospace Engineering**

**Topic: Mach Meters**

Mach meters are instruments used in aircraft to indicate the ratio of the aircraft's speed to the speed of sound, known as the Mach number. Here's an overview of Mach meters:



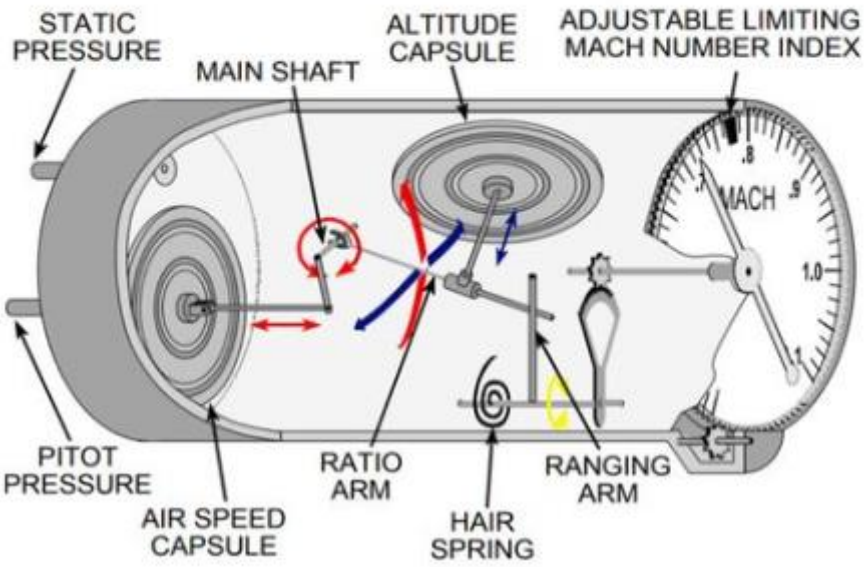

**Function:**

- **Measure Mach number:** Mach meters measure the ratio of the aircraft's true airspeed to the speed of sound. The speed of sound varies with altitude and temperature, so Mach meters are calibrated to provide accurate readings under different conditions.

**Description:**

- **Display:** Typically displayed as a decimal number, where Mach 1 represents the speed of sound.
- **Components:** Mach meters use pitot-static pressure measurements to calculate the Mach number, which is then displayed on the instrument panel.
- **Calibration:** Mach meters are calibrated to provide accurate readings at different altitudes and temperatures.

The Mach meter is an essential instrument for high-speed aircraft at high altitudes. It indicates the A/C's Mach number. To avoid TAS being beyond LSS, every A/C has its specified limiting Mach speed, called Mmo, which should not be exceeded in any circumstances.




**Importance:**

- **Transonic Flight:** Mach meters are crucial for aircraft operating in the transonic flight regime, where airflow around the aircraft can reach or exceed the speed of sound.
- **Speed Limits:** Mach meters help pilots stay within safe operating limits, as exceeding the critical Mach number can lead to aerodynamic issues such as shock waves and control problems.

**Relationship to Indicated Airspeed (IAS):**

- **Indicated Airspeed:** Indicated airspeed is the speed shown on the airspeed indicator and is used as a reference for normal flight operations.
- **Mach Number:** Mach number becomes more important at higher speeds, especially in the transonic and supersonic flight regimes.

**Use in Flight:**

- **Cruise Speed:** Mach meters are used to maintain optimal cruise speeds, as flying at a constant Mach number is more efficient than flying at a constant indicated airspeed.
- **Performance Limits:** Mach meters help pilots stay within the aircraft's performance limits, ensuring safe and efficient flight.

**Conclusion:**

Mach meters are essential instruments in high-speed aircraft, providing pilots with crucial information about the aircraft's speed relative to the speed of sound. They help

ensure safe and efficient flight operations, especially in the transonic and supersonic flight regimes. Pilots use Mach meters to maintain optimal speeds and stay within the aircraft's performance limits.