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

Topic: EAS- Estimated Airspeed

Estimated Airspeed (EAS) is a calculated airspeed used in aviation that represents the indicated airspeed corrected for compressibility effects. It is an important parameter for aircraft performance calculations, especially at high altitudes and speeds where air density and compressibility play significant roles. Here's an overview of EAS:

Definition:

- **EAS Calculation:** EAS is calculated using the formula: $EAS = IAS \times \sqrt{\frac{\rho_0}{\rho}}$
  - EAS = Estimated Airspeed
  - IAS = Indicated Airspeed
  - ρ_0 = Sea level standard atmospheric density
  - ρ = Actual air density at altitude

Importance:

- **Performance:** EAS is used in aircraft performance calculations, such as takeoff and landing distances, climb rates, and maneuvering speeds, as it provides a more accurate representation of the aerodynamic forces acting on the aircraft.

- **Safety:** EAS is important for maintaining safe speeds, especially in high-speed and high-altitude flight where compressibility effects can significantly impact aircraft performance.

Compressibility Effects:

- **At High Speeds:** As an aircraft approaches the speed of sound, the density of the air changes due to compressibility effects, affecting the aircraft's aerodynamic performance.
- **Transonic Effects:** EAS is particularly important in the transonic flight regime, where airflow around the aircraft can reach or exceed the speed of sound.

Use in Flight:

- **Flight Envelope:** EAS helps define the safe flight envelope for the aircraft, ensuring that it is operated within its design limits.
- **Cruise Performance:** EAS is used to optimize cruise performance, as it provides a more accurate measure of the aircraft's true airspeed.

Conclusion:

Estimated Airspeed is a critical parameter in aviation, especially for high-performance aircraft operating at high speeds and altitudes. It provides a more accurate representation of the aerodynamic forces acting on the aircraft, leading to safer and more efficient flight operations. Pilots and aircraft designers use EAS to ensure that aircraft are operated within their safe and optimal performance limits.