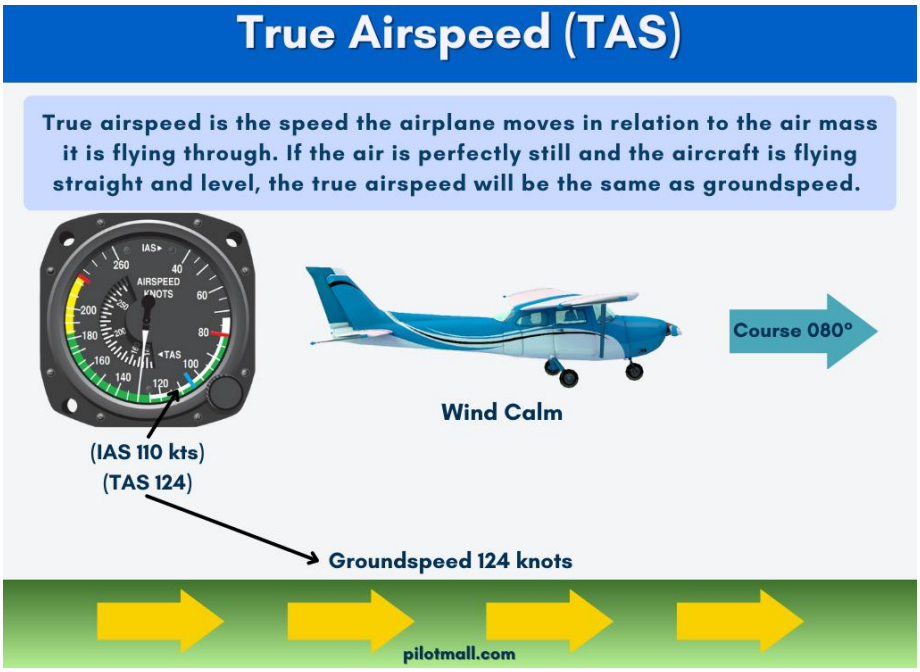
Subject Code & Name**: 23AST101 Fundamentals of Aerospace Engineering**

Topic: TAS- True Airspeed

True Airspeed (TAS) is the speed of an aircraft relative to the air mass in which it is flying. Unlike Indicated Airspeed (IAS), which is the speed shown on the airspeed indicator; TAS is corrected for altitude and non-standard temperature variations. Here's more about TAS:



True Airspeed (TAS):

Definition: True Airspeed (TAS) is the speed of an aircraft relative to the air mass in which it is flying. It is the actual speed at which the aircraft is moving through the air and is different from the Indicated Airspeed (IAS) shown on the airspeed indicator, as TAS is corrected for altitude and non-standard temperature variations.

Calculation: TAS is calculated by correcting the IAS for altitude and temperature effects. The altitude correction accounts for the decrease in air density with altitude, which results in a higher TAS at higher altitudes. The temperature correction accounts for the effect of temperature on air density, with colder temperatures leading to a higher air density and lower TAS.

Mathematically, TAS can be calculated using the following formula:

$$TAS = IAS \times \sqrt{\frac{\rho_0}{\rho}}$$

Where:

- TAS = True Airspeed
- IAS = Indicated Airspeed
- ρ_0 = Sea level standard atmospheric density
- ρ = Actual air density at altitude

Calculation:

- **Correction for Altitude:** TAS increases with altitude due to lower air density. It is calculated by correcting IAS for the decrease in air density with altitude.
- **Correction for Temperature:** TAS decreases with colder temperatures as air density increases. It is calculated by correcting IAS for the effect of temperature on air density.

Importance:

- **Navigation:** TAS is used for navigation purposes, as it represents the true speed of the aircraft over the ground when wind effects are taken into account.
- **Performance:** TAS is used to calculate fuel consumption, time en route, and range, as it provides a more accurate measure of the aircraft's actual speed through the air.

TAS and Ground Speed:

- **Wind Effect:** TAS does not account for wind, so to determine the actual speed over the ground (Ground Speed), the effect of wind must be added or subtracted from TAS.
- **Wind Correction Angle:** Pilots use the difference between TAS and Ground Speed to determine the wind correction angle needed to maintain a desired track over the ground.

TAS and IAS:

- **Relationship:** TAS is always higher than IAS at the same altitude, as TAS accounts for the decrease in air density with altitude.
- **Use in Flight Planning:** Pilots use TAS in flight planning to determine the expected ground speed and fuel consumption for a given true airspeed.

Conclusion:

True Airspeed is a critical parameter in aviation, providing pilots with an accurate measure of the aircraft's speed relative to the surrounding air mass. It is essential for navigation, performance calculations, and flight planning, ensuring safe and efficient flight operations.