Introduction to Aeronautics and Astronautics

Session 1 - WIS AeroAstro

Objectives

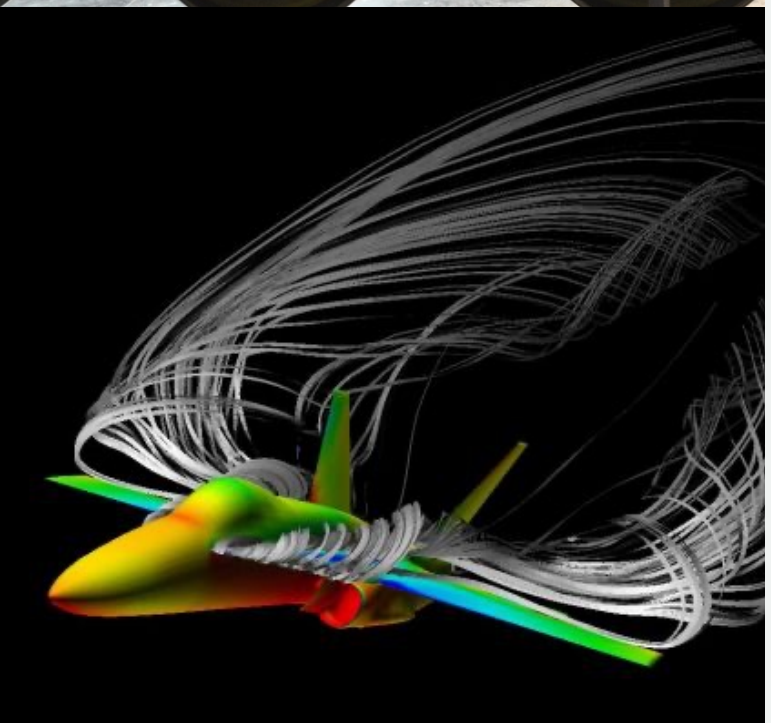
- To be able to understand the differences between Aeronautics and Astronautics.
- To be able to explore the significance of both fields and their overlapping role in other industry sectors.
- To understand how spacecrafts differ to aircrafts.

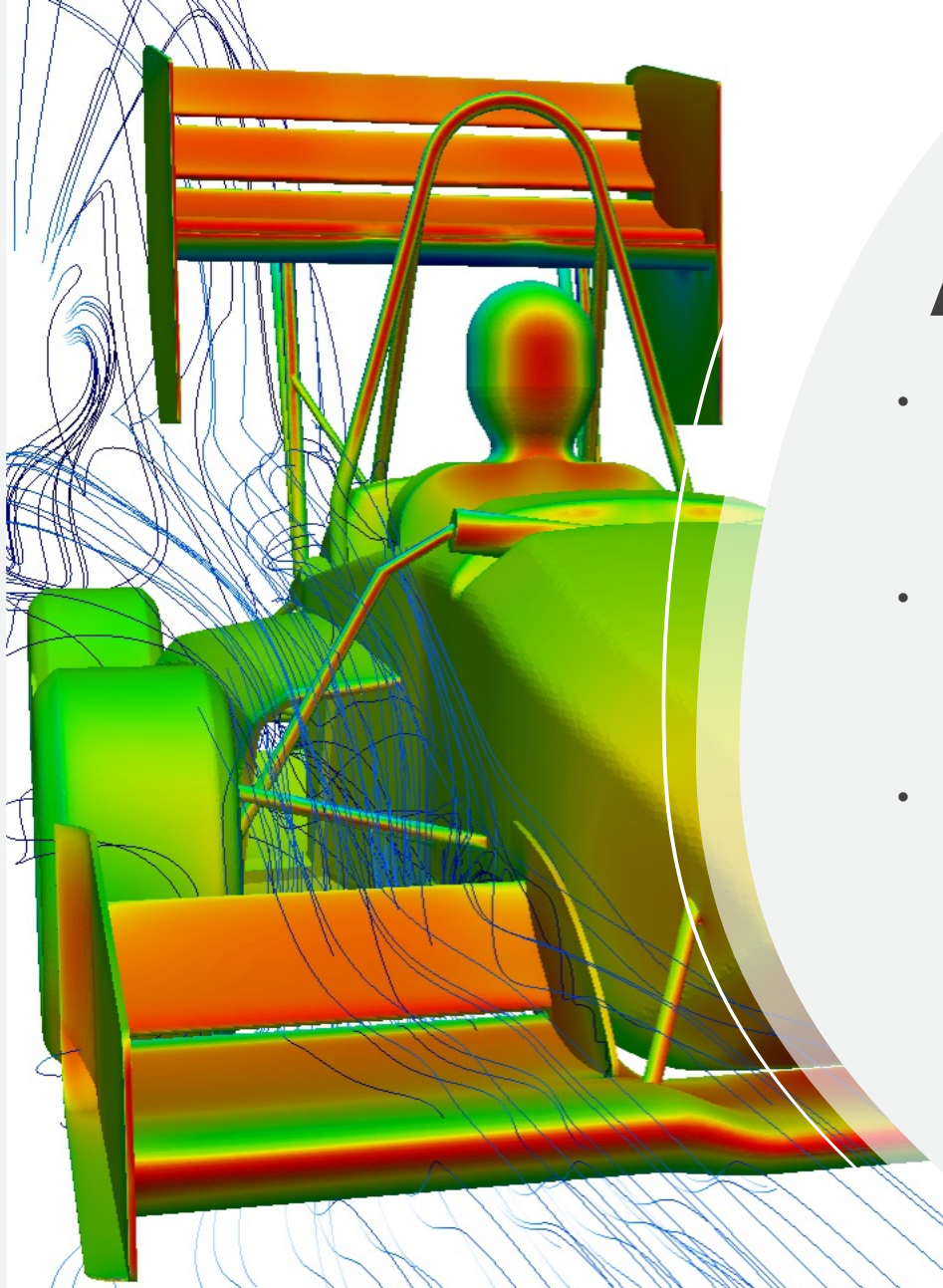
Video: What is Aerospace Engineering?

What are your thoughts on this? From watching, how can you define aerospace engineering?

Aeronautics

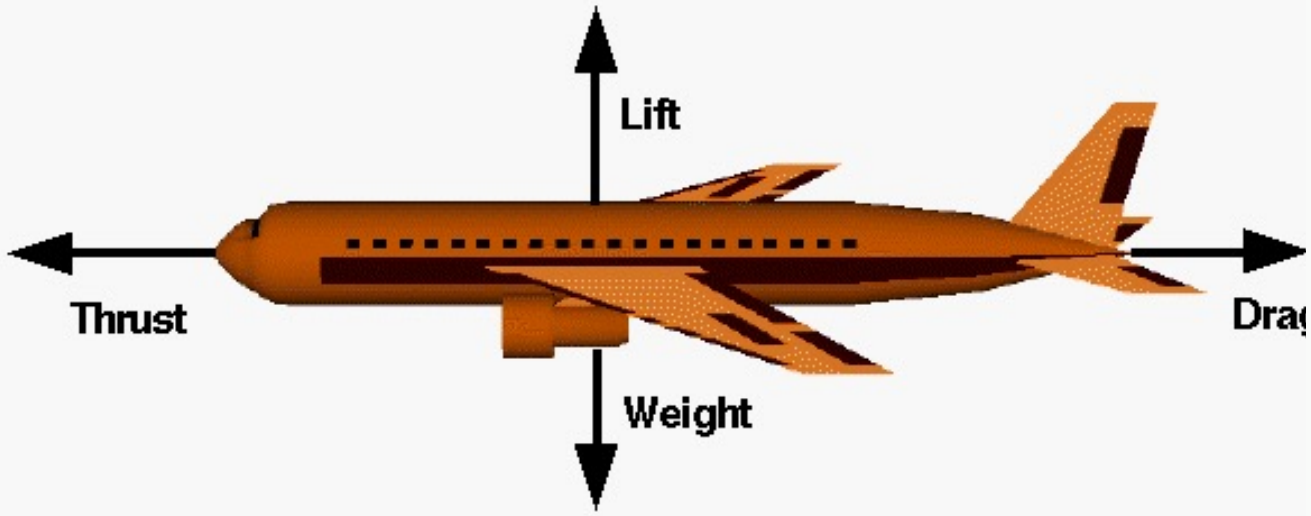
- The field concerning designing aircraft which operate within the Earth’s atmosphere.
- Aerospace engineers specializing in aeronautics work on building aircrafts such as commercial airplanes, helicopters, drones and etc.
- In Aeronautics, key physics principals such as aerodynamics and lift apply.





Aerodynamics

- The study of different forces applying on a motional object in Air
- In a simple way Aerodynamics is **the way objects move through air**.
- The rules of aerodynamics explain how an airplane is able to fly. Anything that moves through air is affected by aerodynamics, from a rocket, to a kite flying. Since they are surrounded by air, even cars are affected by aerodynamics.



Flight Condition	Effect
Lift > Weight	Plane Rises
Weight > Lift	Plane Falls
Drag > Thrust	Plane Slows
Thrust > Drag	Plane Accelerates

For an example;
we can have a little discussion about 4 main forces acts on an airplane

Astronautics

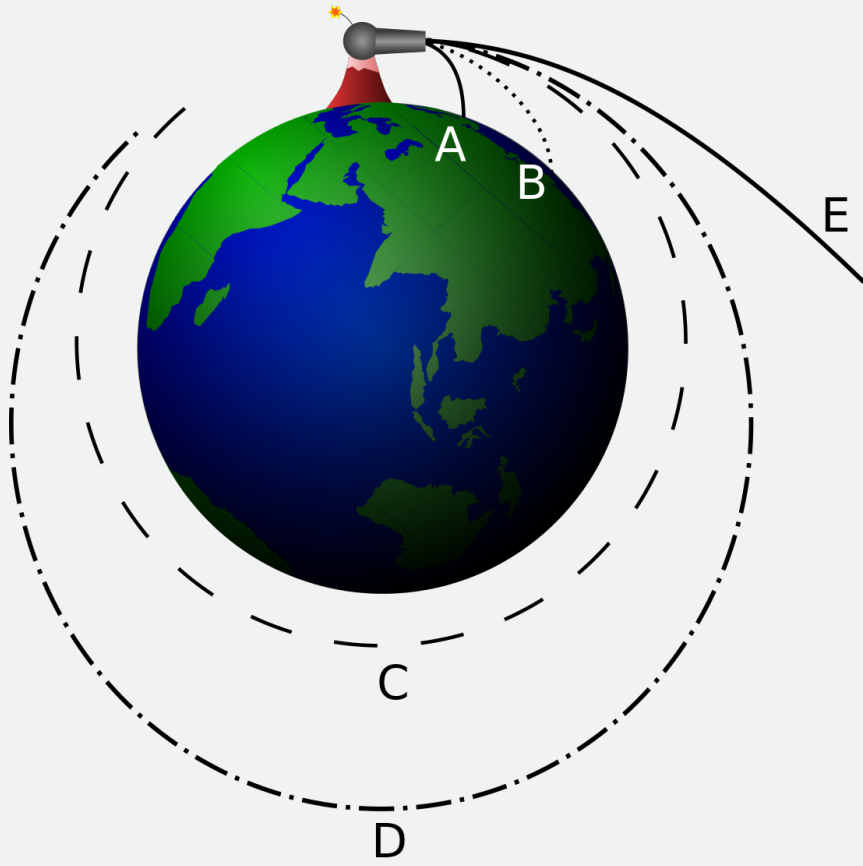
- The field concerning the development of spacecraft which operate outside of the earth’s atmosphere.
- Spacecraft can operate either within the Earth’s orbit or can conduct missions within the solar system and possibly beyond!
- In astronautics, principals such as orbital mechanics, rocketry and escape velocity apply.

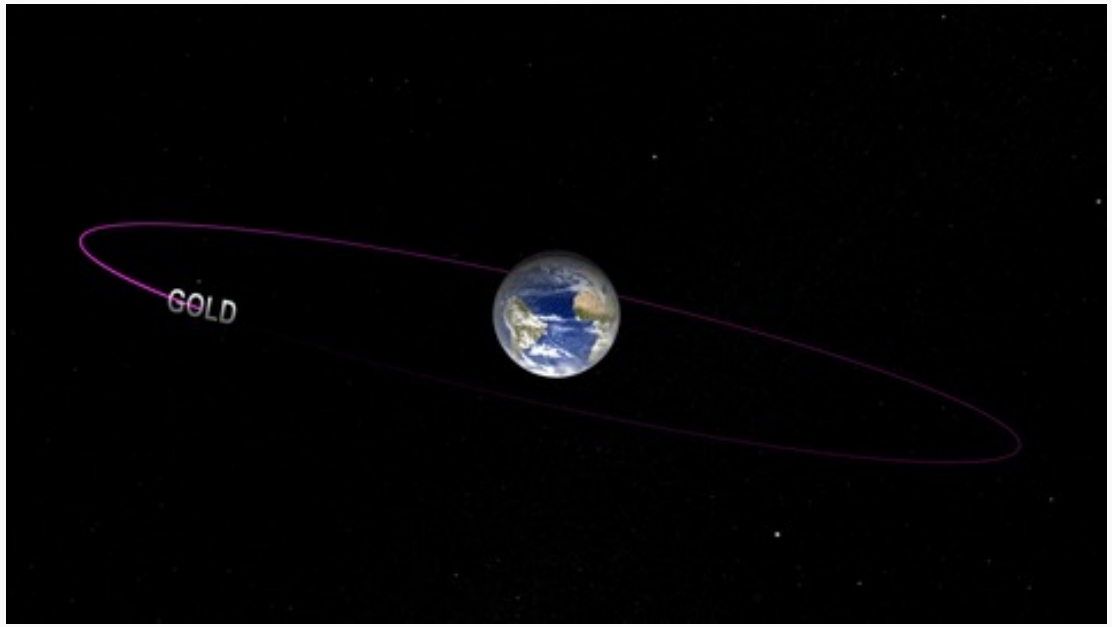
Key principals in Astronautics

- Orbital mechanics: Kepler’s laws of planetary motion concerning orbits. Planets orbit faster when closer to the star they are orbiting.
- Rocketry: The rocket equation looks at how much mass can be loaded onto a rocket in relation to the rocket velocity, exhaust velocity and the mass of the fuel.

$$\Delta v = v_e \ln \frac{m_0}{m_f}$$

- Escape velocity: The transition from a closed elliptical orbit into a parabolic open orbit where a spacecraft orbiting a planet escapes from the orbit at a specific velocity.





Animation of Orbit

Applications of Aeronautics and Astronautics

Aeronautics:

- Commercial aviation – aircrafts built to transport people around the world.
- Military – Drones and fighter jets are built for military uses such as reconnaissance and combat.

Astronautics:

- Space exploration – spacecraft are built to explore the solar system and different planets.
- Satellites and Television – Satellites help provide your TV subscriptions and Geostationary satellites even provide your cellular services on your phone!