



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35.



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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai.

DEPARTMENT OF AUTOMOBILE ENGINEERING

COURSE NAME : 19AUT302 – VEHICLE DYNAMICS AND STRUCTURES

III YEAR / V SEMESTER

Unit 4 – Longitudinal Dynamics and Control

Topic : Aerodynamic Forces and Moments



AERODYNAMICS FORCES AND MOMENTS



- ❖ Aerodynamic forces and moments are critical factors in the study of fluid dynamics and aerodynamics, particularly in the context of aircraft, automobiles, and other objects moving through a fluid medium, usually air.
- ❖ These forces and moments describe the interactions between the object and the air it moves through.
- ❖ These aerodynamic forces and moments are critical in the design, control, and stability of various vehicles and objects.



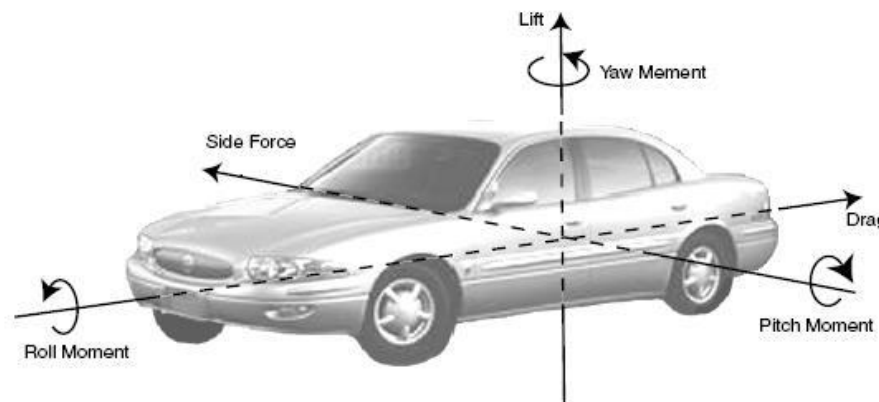
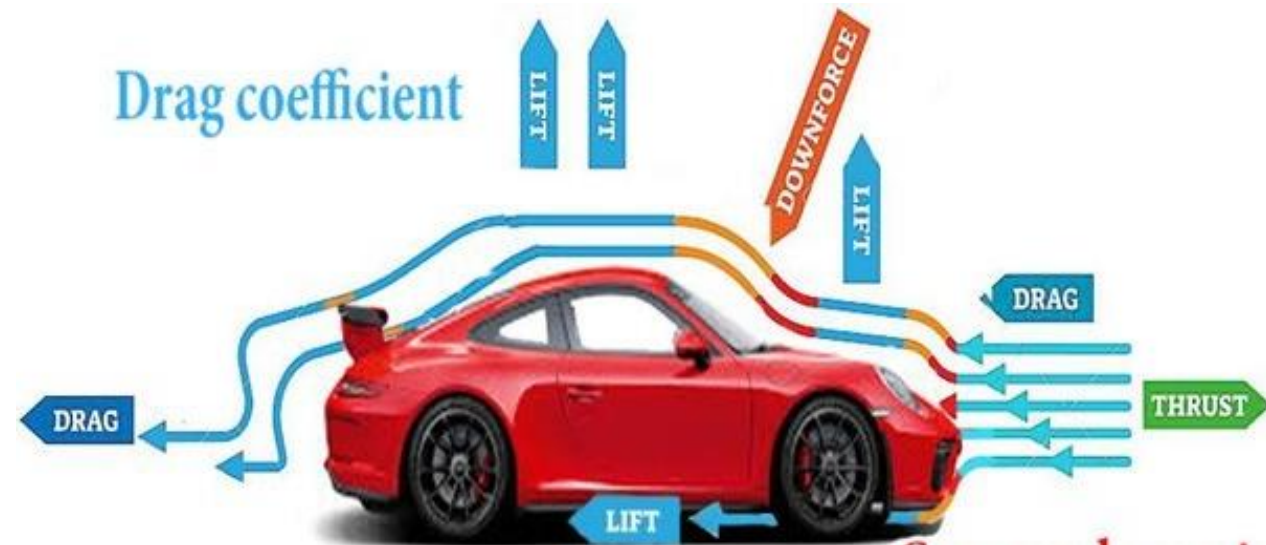
AERODYNAMICS FORCE AND MOMENT



❖ There are **three forces** and **three moments** acting on the tire from the ground.

- ✓ **Lift**
- ✓ **Drag**
- ✓ **Thrust**

- ✓ **Rolling moment**
- ✓ **Pitching Moment**
- ✓ **Yaw Moment**





LIFT



- ❖ Lift is the upward force generated as a result of the pressure difference between the upper and lower surfaces of an airfoil (e.g., the wings of an aircraft).
- ❖ Lift allows an object to counteract the force of gravity and stay airborne.
- ❖ It plays a crucial role in the flight of aircraft.



DRAG



- ❖ Drag is the resistive force that opposes the motion of an object through the air.
- ❖ It is caused by the friction and pressure differences on the object's surface.
- ❖ Reducing drag is essential to improve the efficiency and speed of vehicles.



THRUST



- ❖ Thrust is the forward force generated by engines, propellers, or other propulsion systems.
- ❖ It is the force that propels an object through the air, such as in the case of aircraft, rockets, and vehicles.



ROLLING MOMENT



- ❖ The rolling moment affects a car's stability when it tilts from side to side during cornering.
- ❖ Factors such as the vehicle's center of gravity, suspension setup, and tire characteristics influence its susceptibility to rolling.



PITCHING MOMENT



- ❖ The pitching moment can cause the front or rear of the car to tilt up or down, affecting stability and handling.
- ❖ Controlling pitch is essential for maintaining a smooth ride and predictable handling.



YAWING MOMENT



- ❖ The yawing moment influences the vehicle's tendency to rotate around its vertical axis, affecting its ability to stay on a straight path and respond to steering inputs.
- ❖ Factors like wheelbase, tire grip, and suspension geometry can influence yaw stability.



THANK YOU !!!