

8/27/24

Tutorials; 15:00 - 17:00 Wed
ASE 3.204

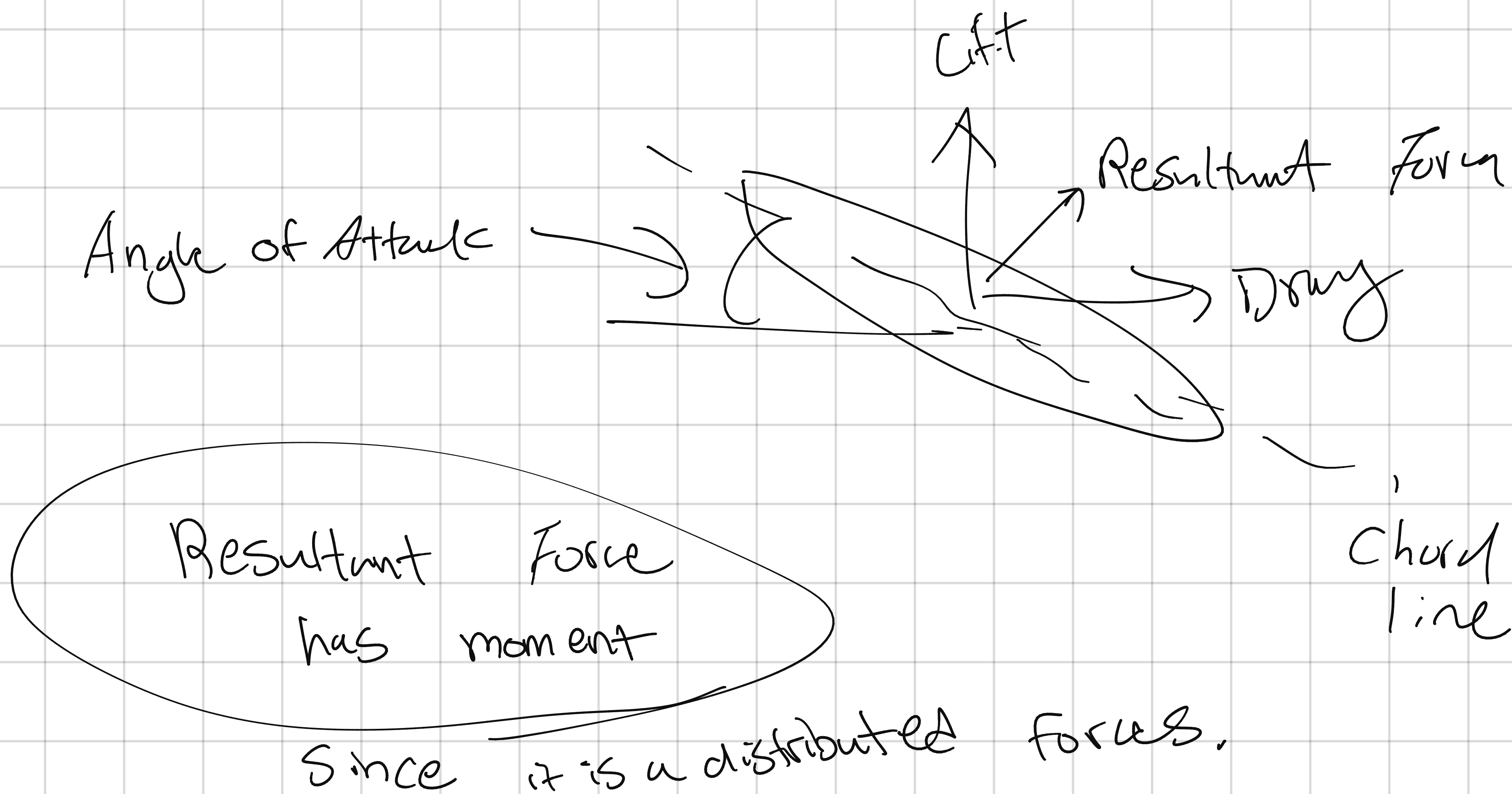
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Aircraft Basics

Lift: \perp to free stream airflow

Drag: $=$ to free flow



Most Lift is generated in the front quarter

that's why objects want to flip



this way

- Two components to drag
- Profile drag
 - Induced drag.

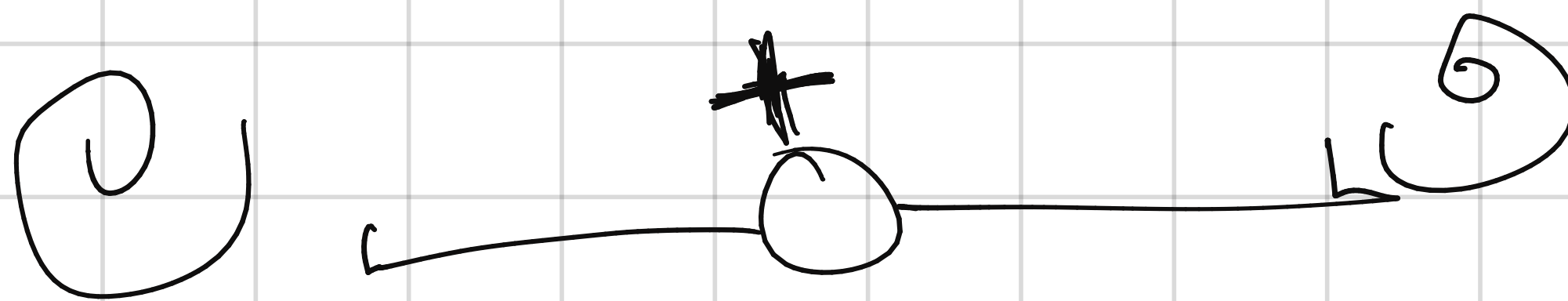
Profile drag = "form drag"

drag is way to dissipate energy

Induced drag

Wing tip : there are air vortices due to pressure differences.

due to lift



Lift

angle of attack

$$C_L = L / (0.5 \rho v^2 S) \leftarrow \text{linear with } \alpha$$

↑ fudge factor ↑ thickness and area of wing matters,

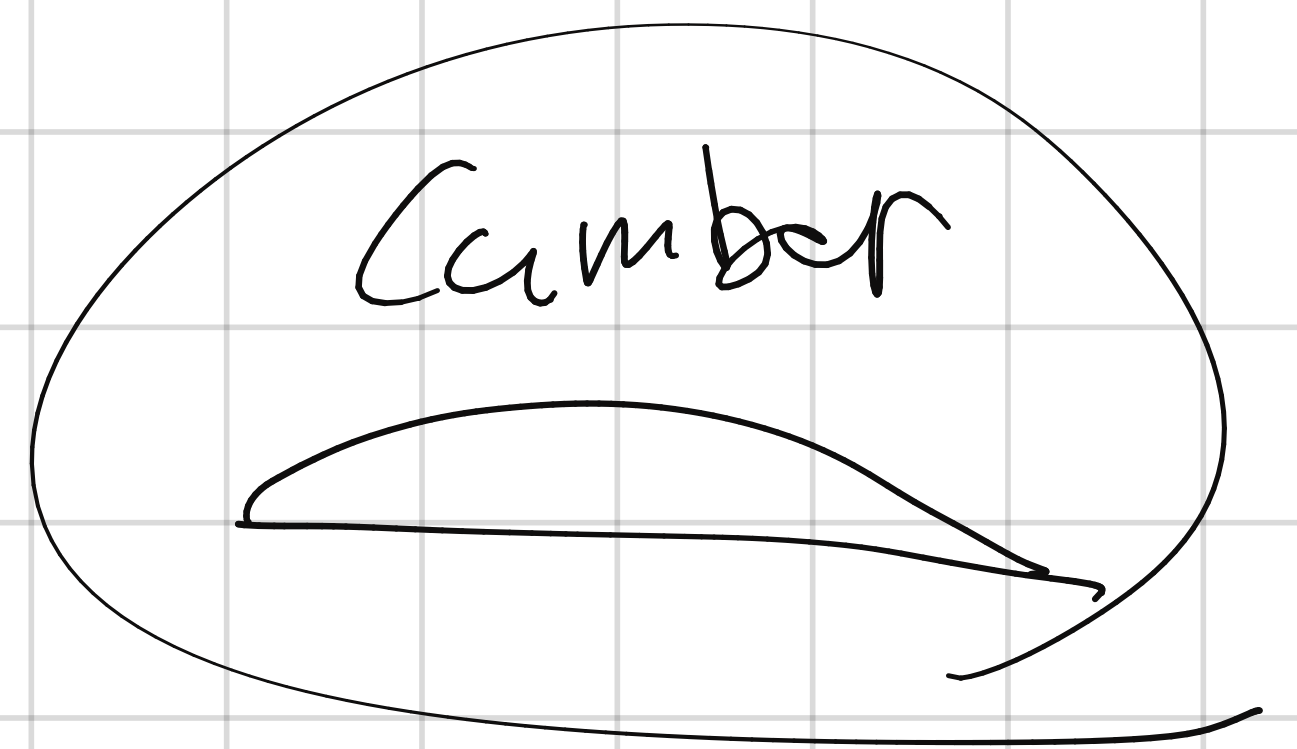
$$L = q S C_L$$

Kinetic Theory

pressure

$$p = \text{kinetic energy}$$

Bernoulli's equation



Wings

upwash: Suction of air to the top

Downwash: top air smack down bottom

Lift C_L vs angle of Attack α

Uncamber

NACA - 0012

Symmetric
wings



0 camber 12% thickness

wing with no camber has $C_L = 0$

$$\alpha = 0$$

No lift

$$C_{L0} = \text{Lift at } \alpha = 0^\circ$$

A380

After $C_{L \max}$, the eddies are too big
that air flows are detached,

? we design...

Force wing to stall before it actually
does

Command

Beneficial to dry

Stall? why does flow need to
be attached?

Drag = thrust
Lift = weight

free stream is always towards my
direction of my travel
Lift is \perp to my travel direction.

