(Very) Basics of Sailing
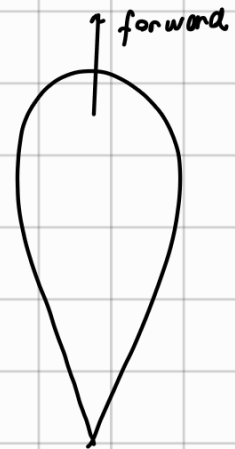
"Upward" Direction
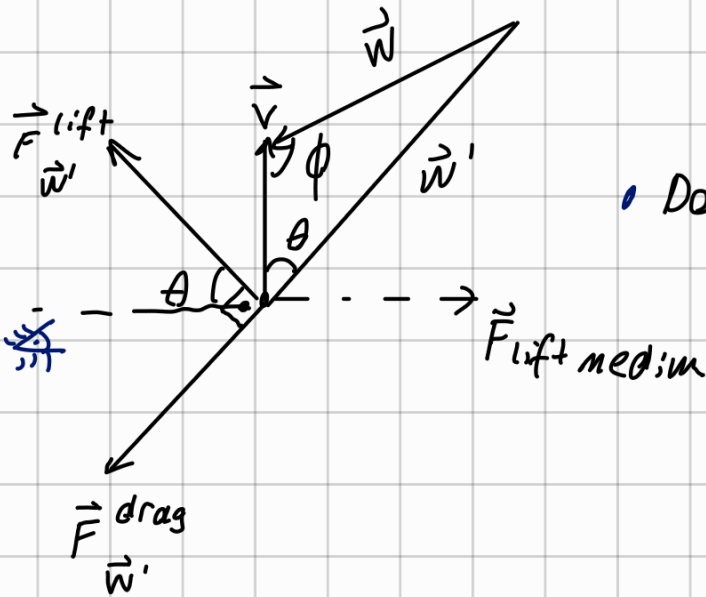
$\vec{F}^{lift}_{\vec{w}'}$

$\vec{F}^{drag}_{\vec{w}'}$

$\vec{F}^{lift}_{\text{medium on which it moves}}$ is mandatory for $\vec{v}$ constant

$\vec{F}_{lift\ medium}$

$\vec{W}' = \vec{W} - \vec{v}$

$\vec{F}_{drag}$ $\begin{array}{l}\text{medium on}\\ \text{which it moves}\end{array}$

forward

Sailing on ice

$\vec{F}^{lift}_{\vec{w}'}$

ϕ

$\vec{W}'$

θ

θ

$\vec{F}_{lift\ medium}$

$\vec{F}^{drag}_{\vec{w}'}$

• Does it goes against the wind?

No.

"Tacking" maneuver.

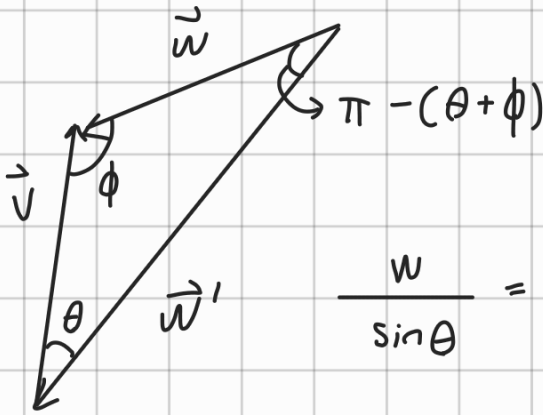$$\vec{F}^{lift}_{ice} = \vec{F}^{lift}_{w'} \cos\theta + \vec{F}^{drag}_{w'} \sin\theta$$

$$F^{lift}_{w'} \sin\theta = F^{drag}_{w'} \cos\theta \longmapsto \tan\theta = \frac{C_D}{C_L} \quad \begin{array}{l}\text{design}\\ \text{parameter}\end{array}$$

"Gerçek rüzgar arkadan da gelse, bağıl rüzgar

– arkadan geliyor"

↳ çok hızlı gidiyor.

$$F_{w'}^{lift} = \frac{1}{2} C_L A \rho \, |(\vec{w} - \vec{v})|^2$$

$$F_{w'}^{drag} = \frac{1}{2} C_D A \rho \, |(\vec{w} - \vec{v})|^2$$
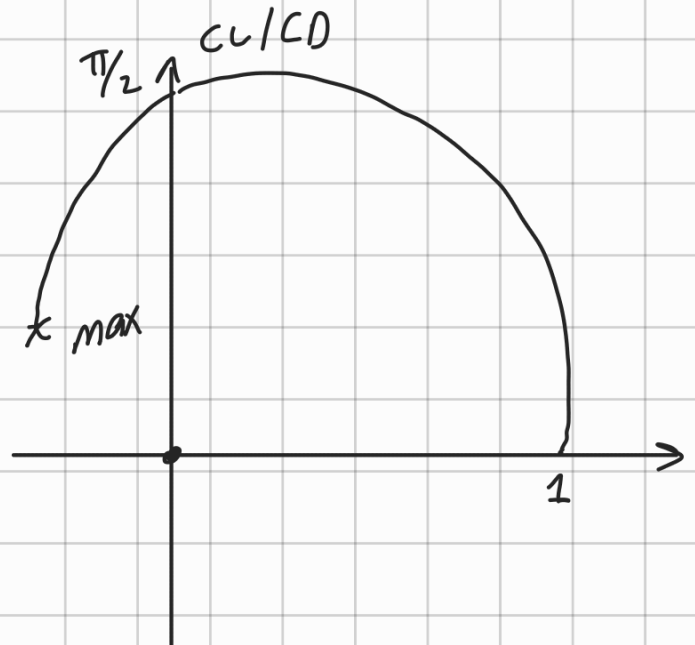

$$\frac{w}{\sin\theta} = \frac{v}{\sin(\pi - (\theta + \phi))} \longrightarrow v = w \, \frac{\sin(\theta + \phi)}{\sin\theta}$$

$$v = w \left(\cos\phi + \frac{C_L}{C_D} \sin\phi \right)$$

$$\frac{dv}{d\theta} = w \left(-\sin\phi + \frac{C_L}{C_D} \cos\phi \right) = 0$$

$$\tan\phi = \frac{C_L}{C_D} = \cot\theta$$

$$v_{max} = w \sqrt{1 + \frac{C_L^2}{C_D^2}} > w$$

"Geniş apaz"

- I missed the first class. It was about down wind (same problem