$C_p = \dfrac{p}{\frac{1}{2}\rho V^2 S}$

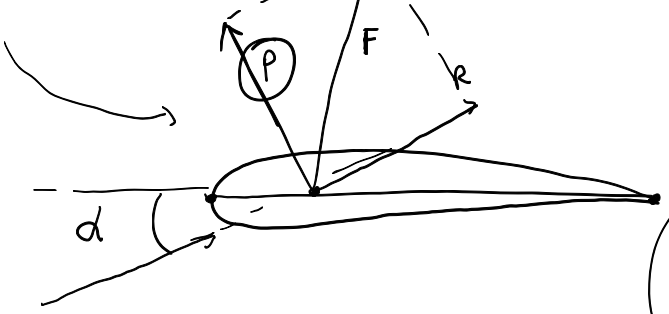
ρ: DENSITÀ DEL FLUIDO → ARIA $\quad \rho = 1.225 \ \frac{kg}{m^3}$

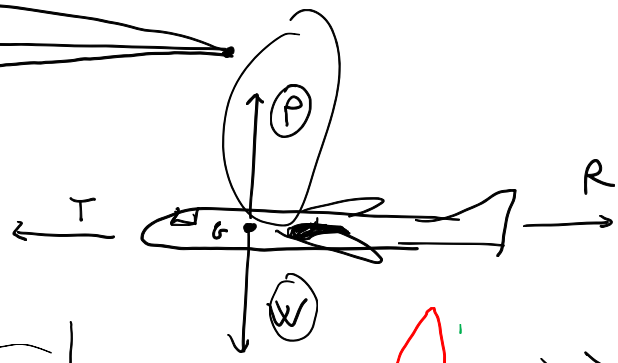
V: VELOCITÀ $[m/s]$

S: SUPERFICIE $[m^2]$

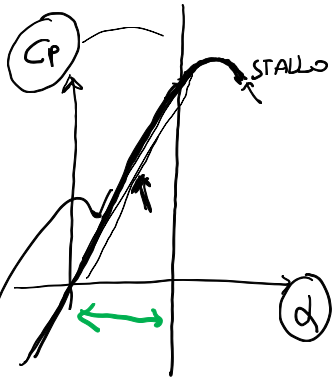
p: PORTANZA $[N]$

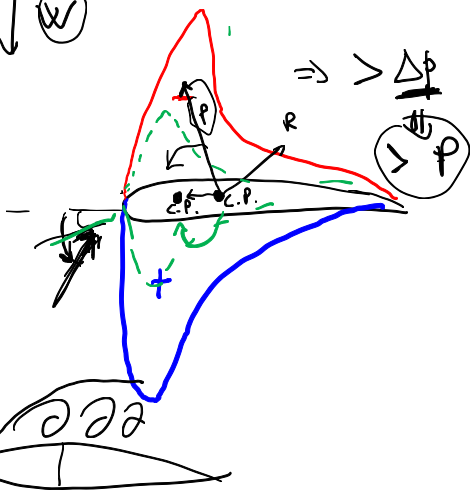
$1 \ \frac{m}{s} = 3.6 \ \frac{km}{h}$





$C_R = \dfrac{R}{\frac{1}{2}\rho V^2 S}$





ALI INFINITE (senza considerare la reale apertura delle ali)

$C_p = c_p' \cdot \alpha = 5.73 \ \alpha$

ESERCIZIO

PROFILO SIMMETRICO con superficie alare di 15 m^2 e Vento di 300 km/h, determinare la PORTANZA del profilo quando l'angolo di incidenza $\alpha = 5°$.
Diminuendo di 2.5 l'angolo di attacco di quanto si riduce la Portanza

$$p = C_p \frac{1}{2}\rho V^2 S$$

$V = 300 \ \frac{km}{h} = \frac{300}{3.6} \ \frac{m}{s} = 833 \ \frac{m}{s}$

$\alpha_{rad} = 5° = 5° \cdot \frac{\pi}{180°} = 0.087 \ (rad)$

$C_p = c_p' \cdot \alpha$

c_p' vale sempre 5.73 per profili ∞ e sottili

$C_p = 5.73 \cdot \alpha =$

$= 5.73 \cdot 0.087 = 0.49$

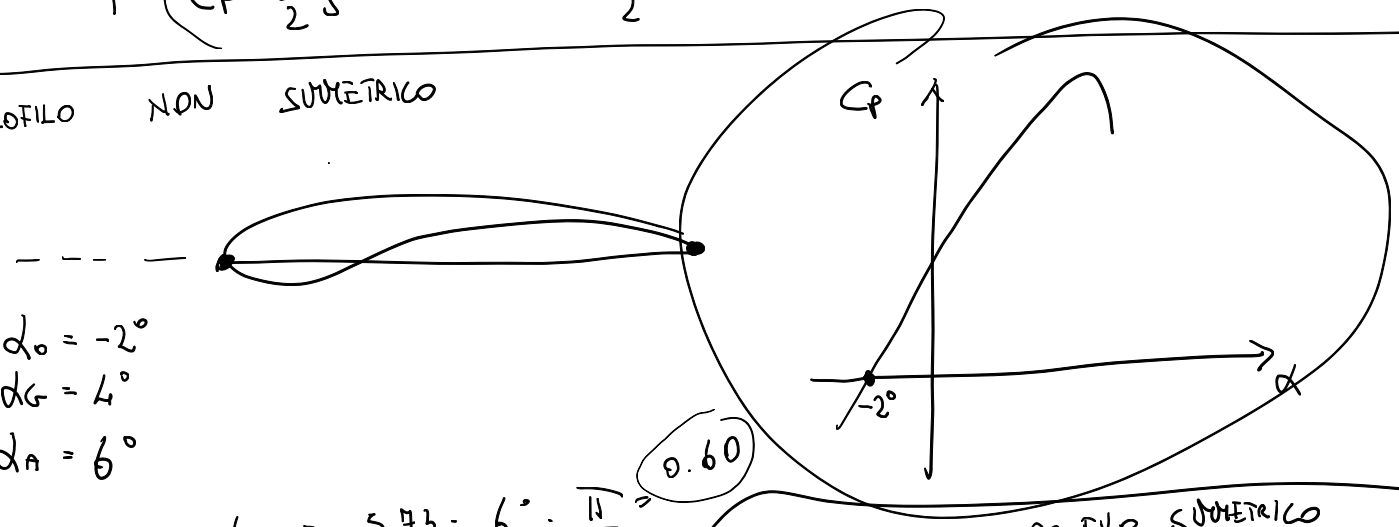
$$P = C_P \frac{1}{2} \rho V^2 S = 0.49 \cdot \frac{1}{2} \cdot 1.225 \cdot 83.3^2 \cdot 15 \qquad N = 31\,238\ N$$

$$\alpha'_{rad} = 2.5^\circ = 2.5^\circ \cdot \frac{\pi}{180} = 0.043$$

$$C_P' = 5.73 \cdot 0.043 = 0.25$$

$$P' = C_P \cdot \frac{1}{2} \rho V^2 S = 0.25 \cdot \frac{1}{2} \cdot 1.225 \cdot 83.3^2 \cdot 15 \quad N = 15\,937\ N$$

PROFILO NON SIMMETRICO



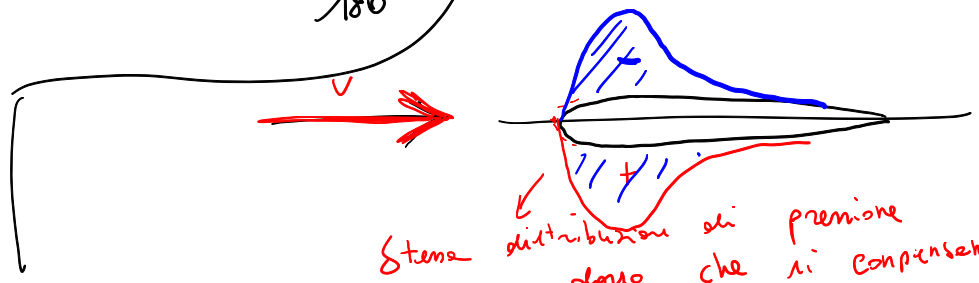
$\alpha_0 = -2^\circ$

$\alpha_G = 4^\circ$

$\alpha_A = 6^\circ$

$$C_P = 5.73 \cdot \alpha_A = 5.73 \cdot 6^\circ \cdot \frac{\pi}{180} = 0.60$$

PROFILO SIMMETRICO



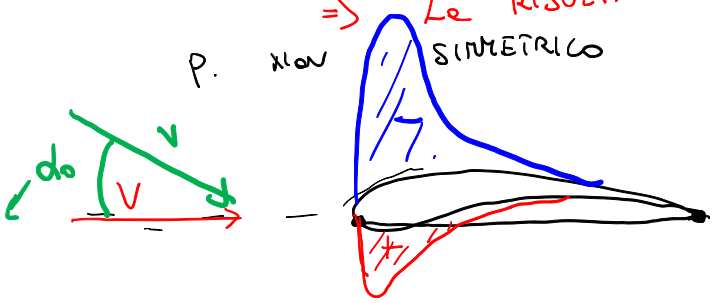
$\alpha = 0 \Rightarrow P = 0$

$\Rightarrow$ Profilo ha solo RESISTENZA

Stessa distribuzione di pressione su faccia e dorso che si compensano

$\Rightarrow$ La RISULTANTE è NULLA

P. NON SIMMETRICO



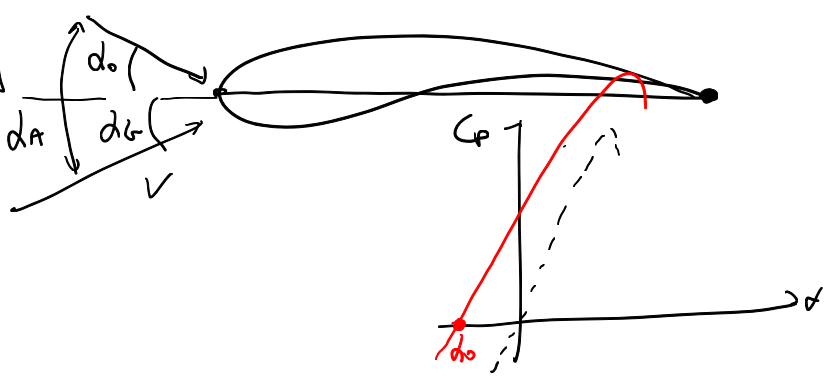
$\alpha = 0 \Rightarrow P \neq 0$

ANGOLO DI PORTANZA NULLA

$\exists$ un angolo di incidenza < 0 per cui la portanza è nulla.

$$\alpha_A = \alpha_G + \alpha_0$$

$$C_P = C_P' \cdot \alpha_A$$

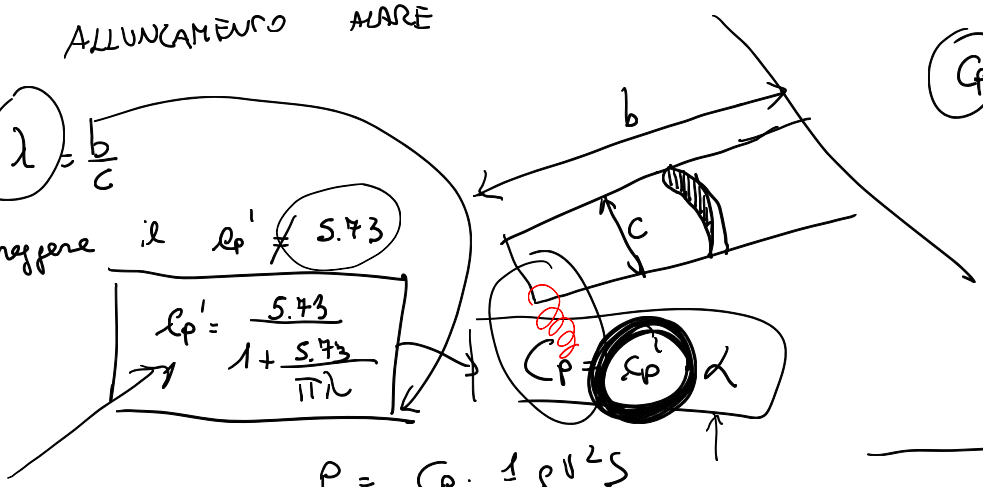


ALLUNGAMENTO ALARE

$\lambda = \frac{b}{c}$

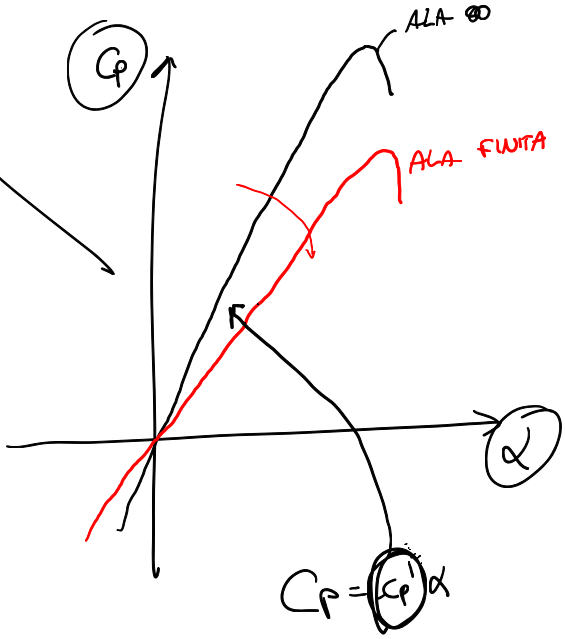
Conoscere il $c_p' \neq 5.73$

$$c_p' = \frac{5.73}{1 + \frac{5.73}{\pi\lambda}}$$



$$P = C_p \cdot \frac{1}{2}\rho v^2 S$$

TEORIA DI PRANDT



$$c_p' = \frac{5.73}{1 + \frac{5.73}{\pi\lambda}}$$