



Very Light Aircraft - Design Guidelines

Joint Aviation Authorities

Airworthiness Code JAR-VLA (1990)

European Aviation Safety Agency

Airworthiness Code CS-VLA (2003)

Applicability:

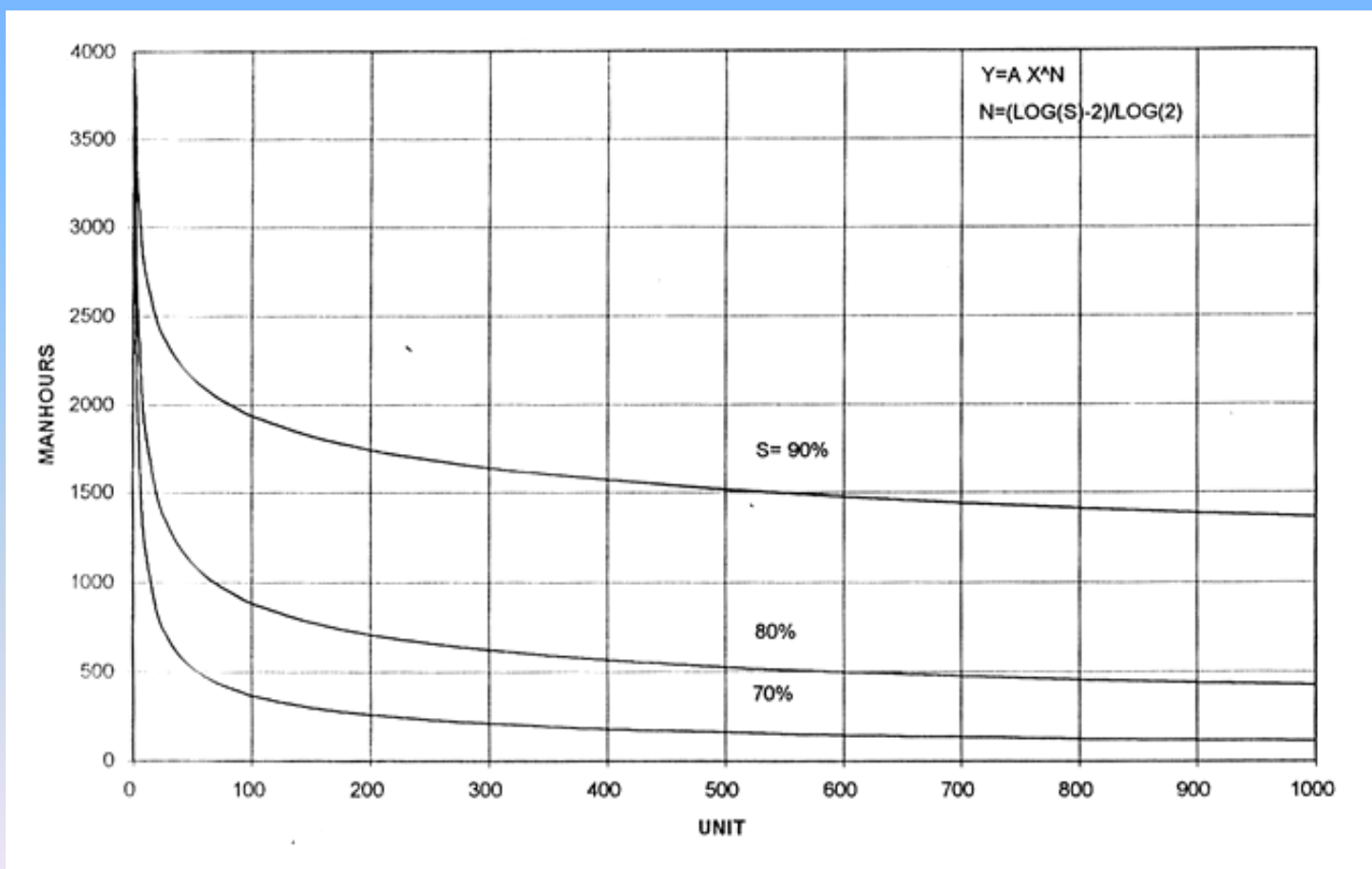
- Maximum Take Off Weight < 750 kg
- Number of seats: 2
- Number of engines: 1
- Stall speed in landing configuration: 83 km/h (45 kts) CAS
- Operation: Day-VFR



Man hours required depend on:

- Parts' complexity (number of components)
- Number and quality of the jigs used in fabrication and assembly.
- Quantitative produced
- Quality control and certifications

Learning curves





Aeroplane's Global Efficiency "Eg"

(From an energetic point of view)

- ✓ Engine's efficiency ($\eta_m = k/Cs$)
- ✓ Propulsive efficiency ($\eta_p = TV/\Pi a$)
- ✓ Aerodynamic efficiency ($E = L/D$)
- ✓ Weight efficiency ($E_w = W_u/W_t$)

$$E_g = \eta_m \cdot \eta_p \cdot E \cdot E_w$$

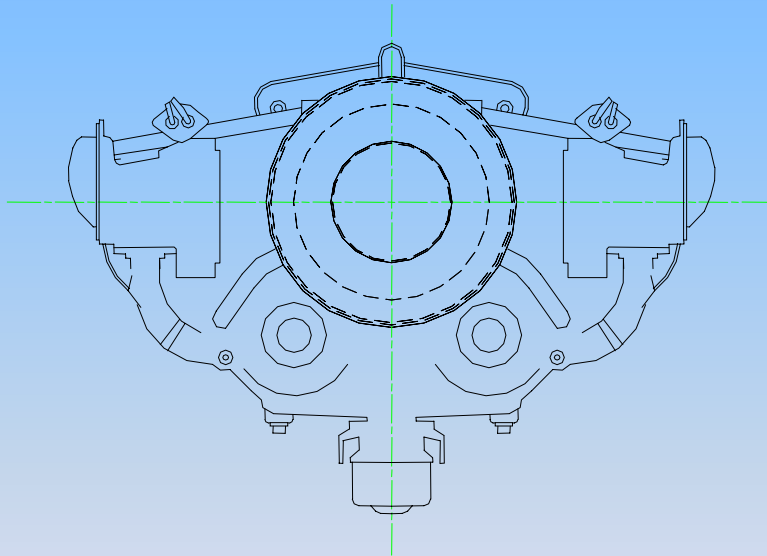
$$E_g = \left(\frac{k}{Cs} \right) \cdot \left(\frac{T \cdot V}{Pa} \right) \cdot \left(\frac{W}{T} \right) \cdot \left(\frac{W_u}{W} \right)$$

$$E_g = k \cdot V \cdot \frac{W_u}{Cs \cdot Pa}$$



Frontal area comparison between *Lycoming & Rotax engines*

LYCOMING O-235



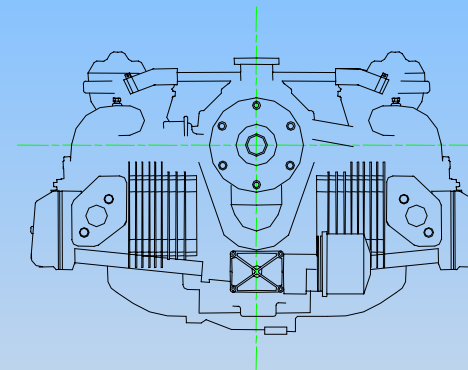
Maximum power: 115 hp @ 2600rpm

Displacement: 3851cc

Weight: 97 Kg

Frontal area: 0.273 m²

ROTAX 912S



Maximum power: 98 hp @ 2390 rpm

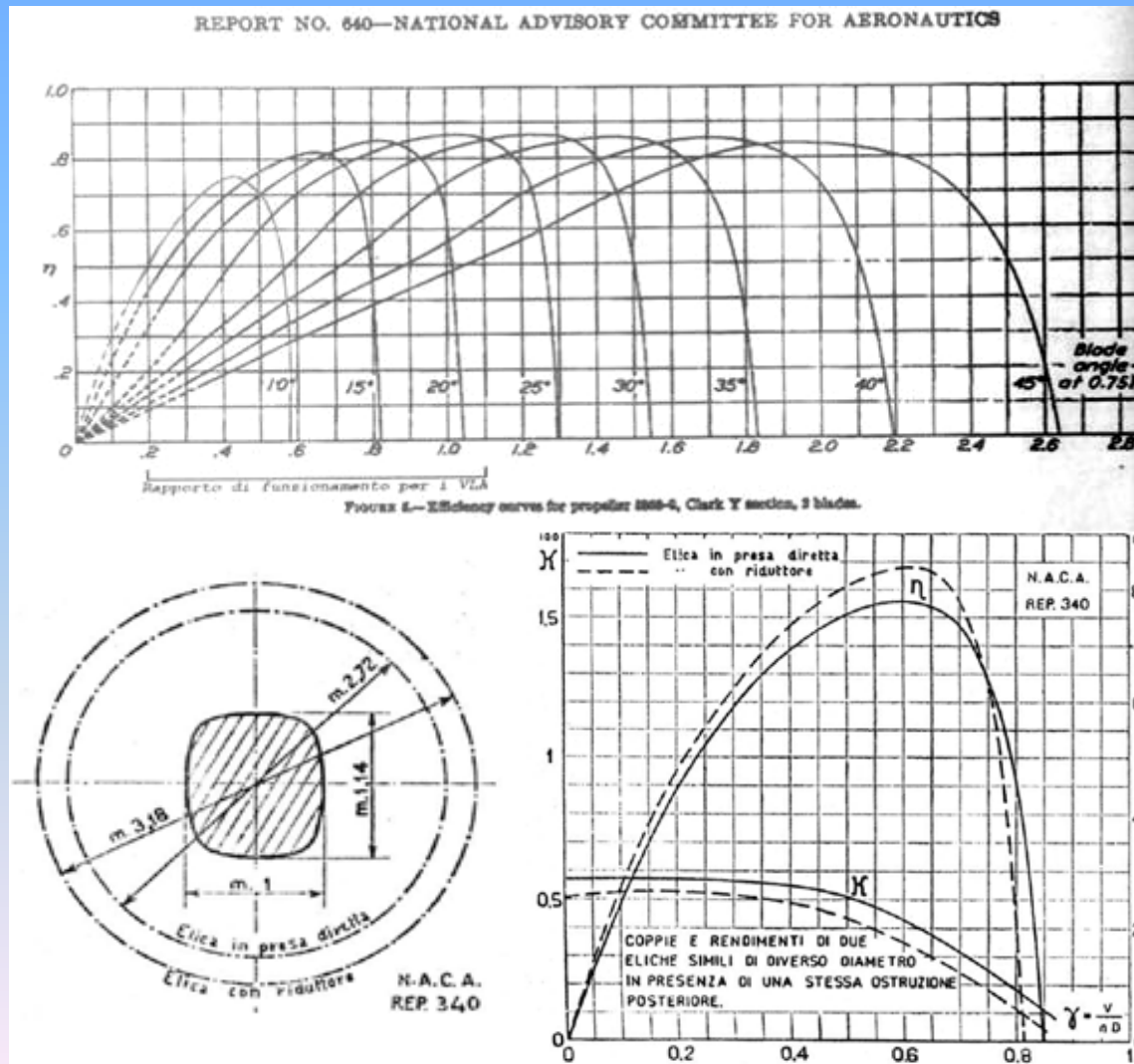
Displacement: 1352cc

Weight: 65 Kg

Frontal area: 0.147 m²



Propeller efficiency

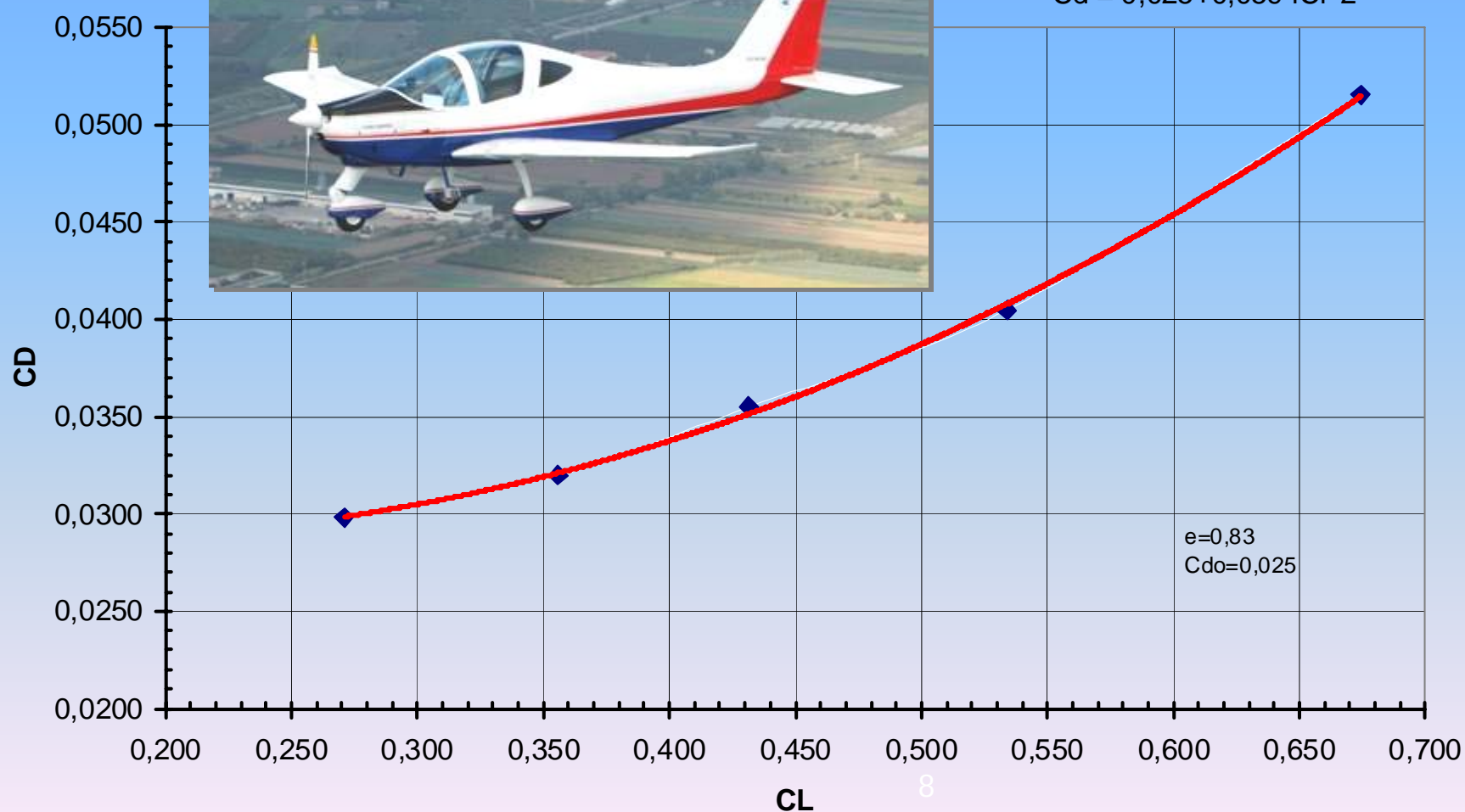




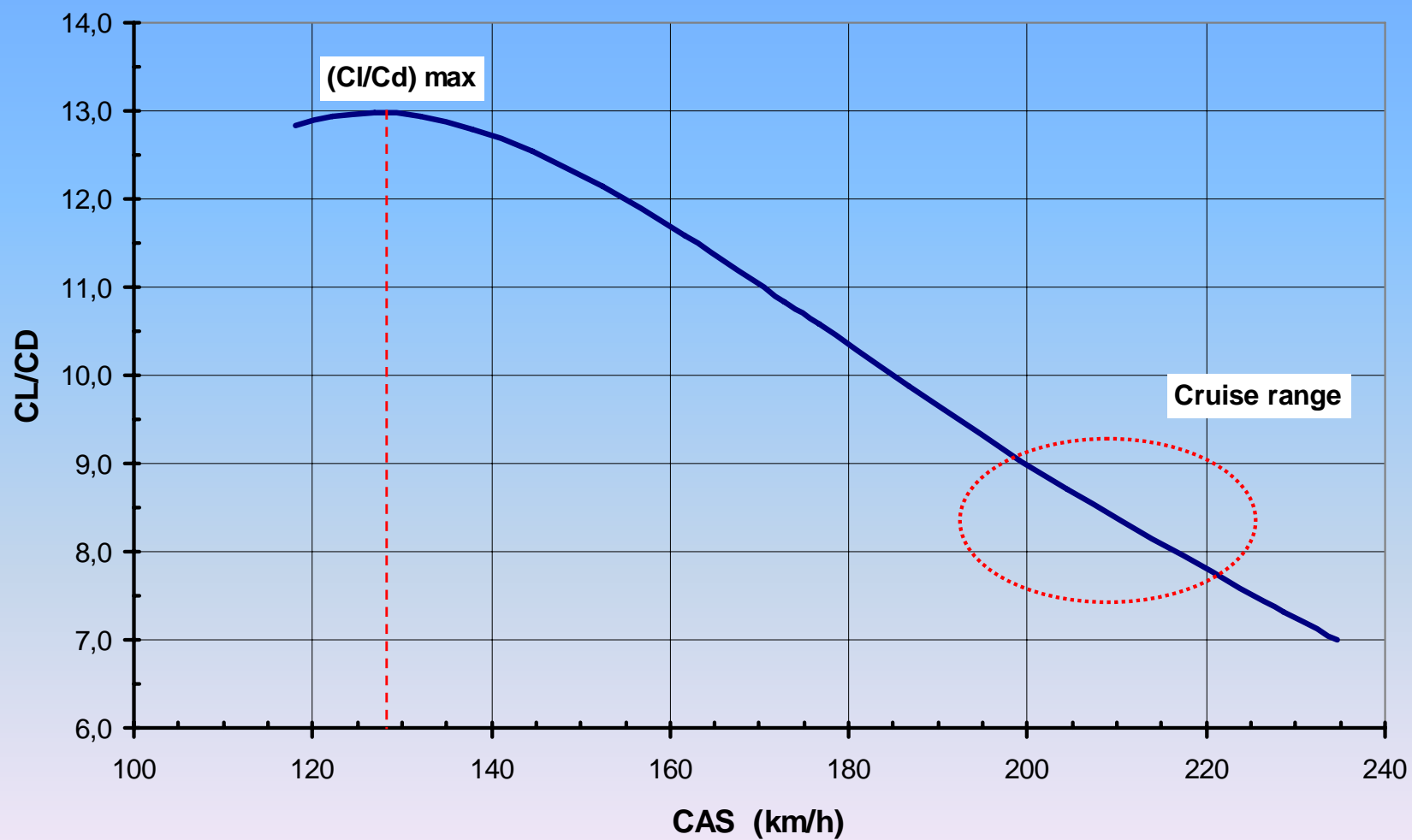
P2002 – C_d vs. C_l

Experimental validation

$$C_d = 0,025 + 0,0594 C_l^2$$

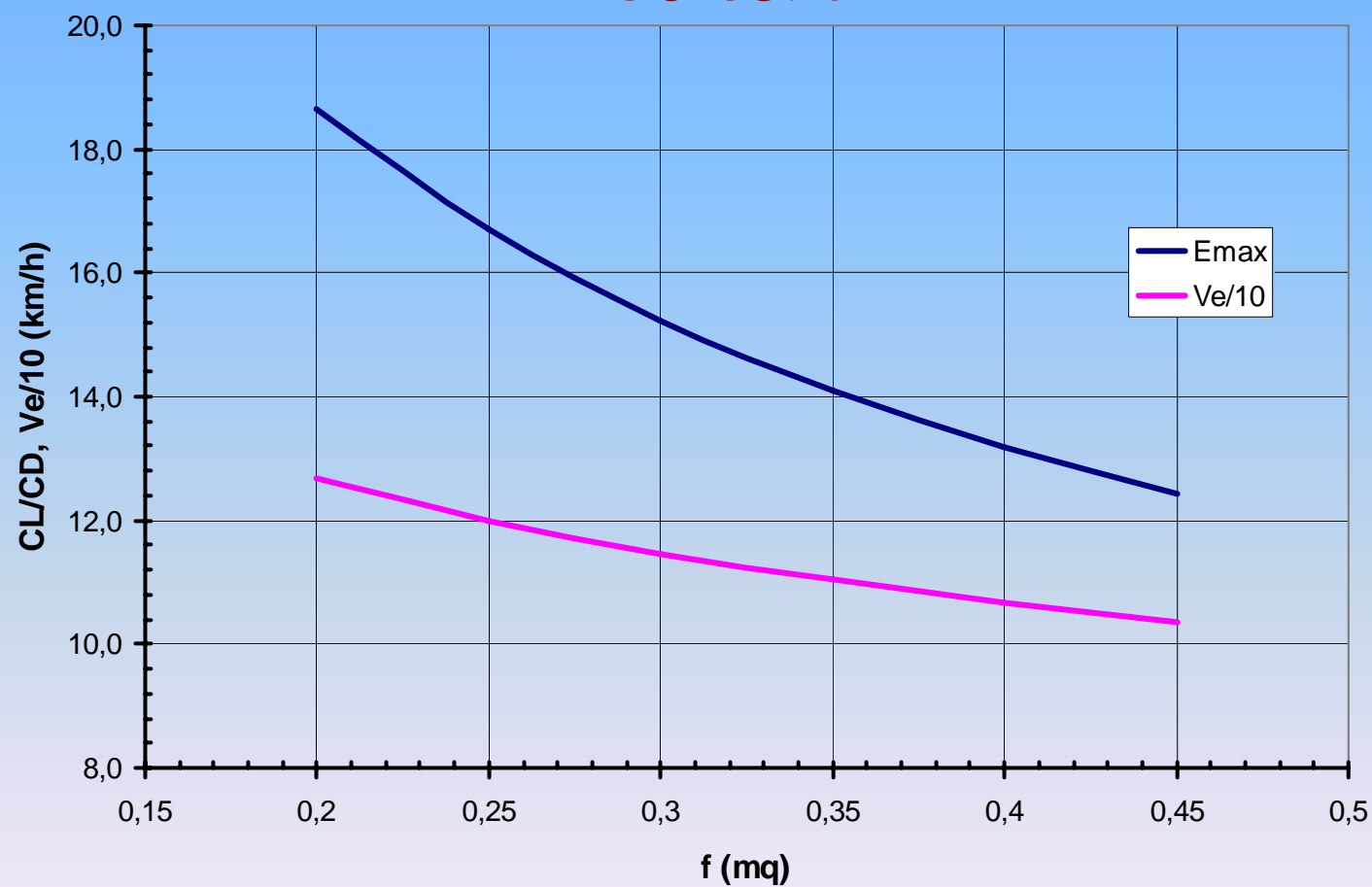


P2002 – Cl/Cd vs. $V(CAS)$



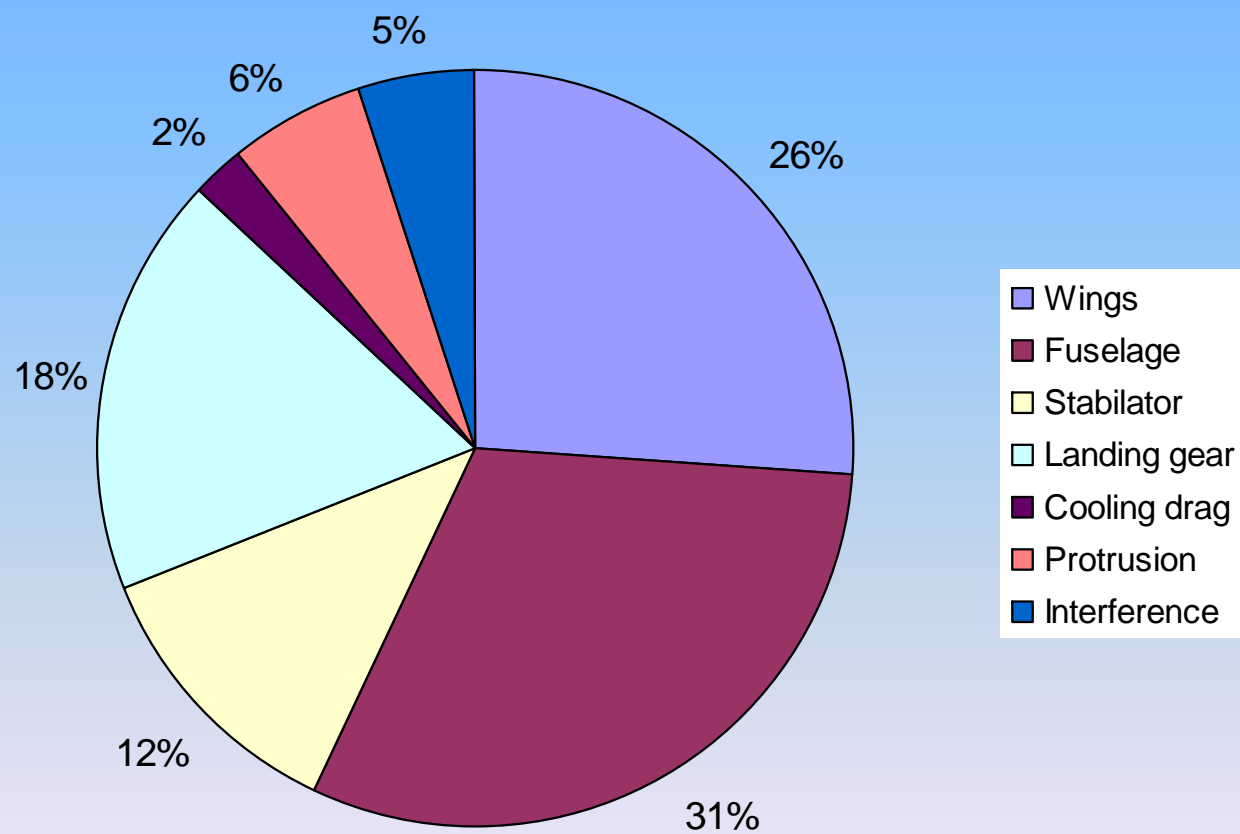
$(Cl/Cd)_{max}$ vs. f

V_e vs. f



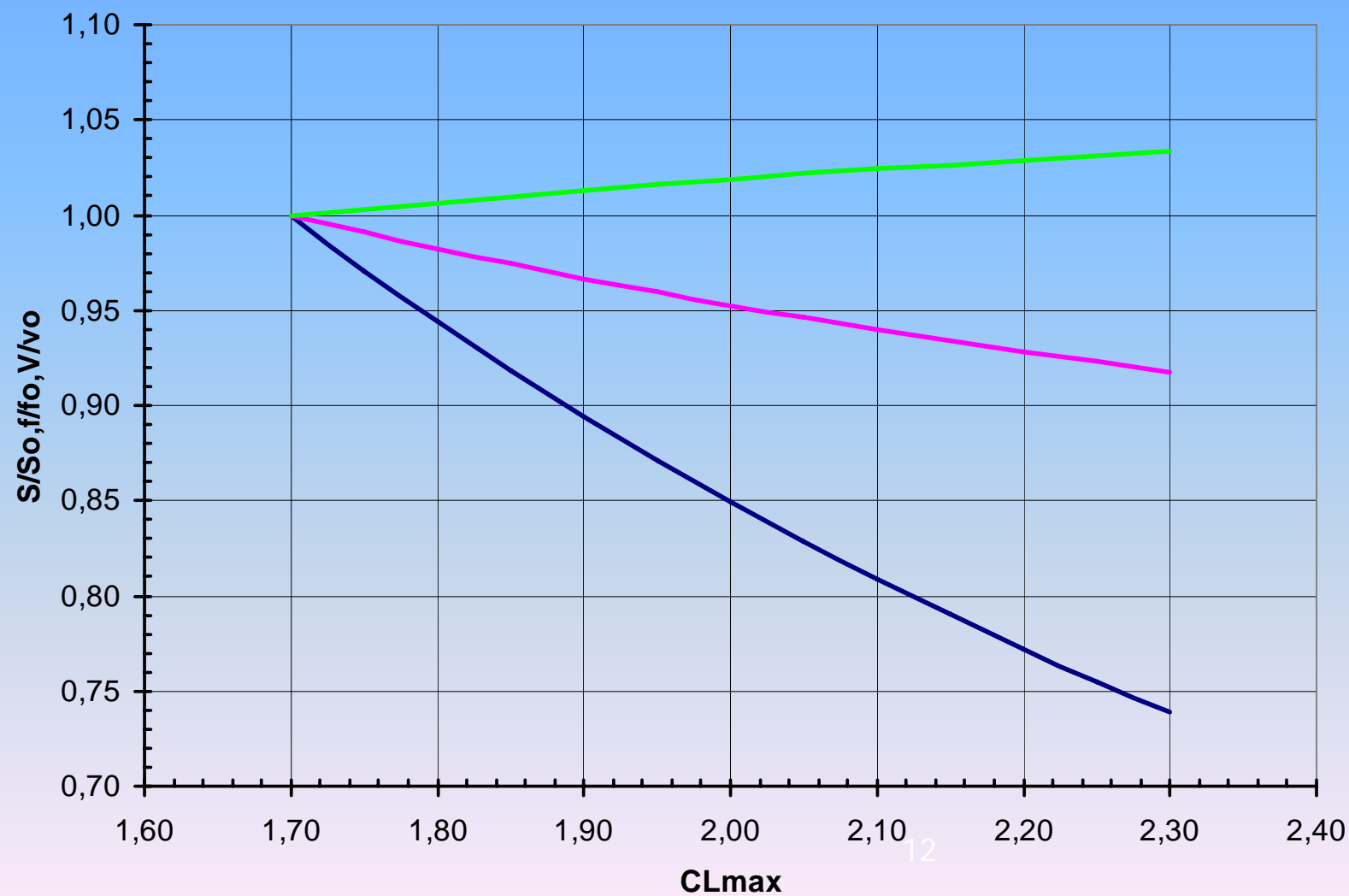


Parasite drag breakdown

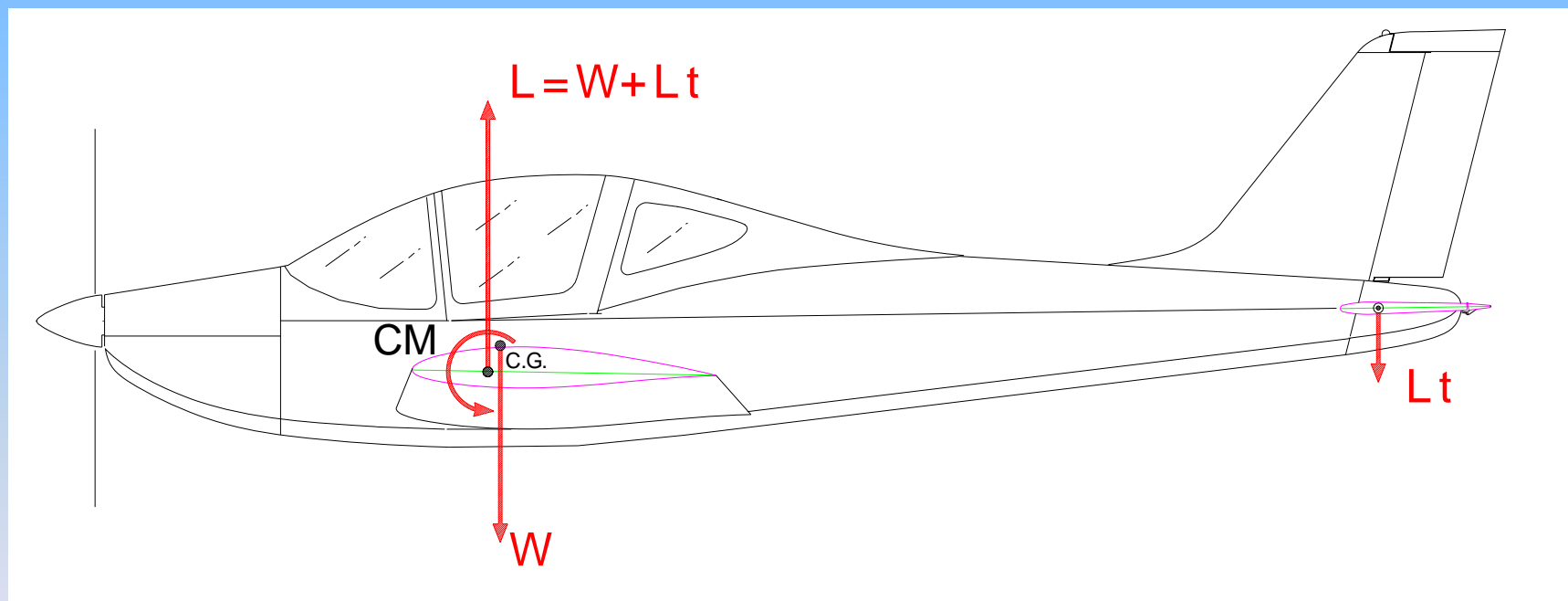




S, f, V vs. CL_{max}

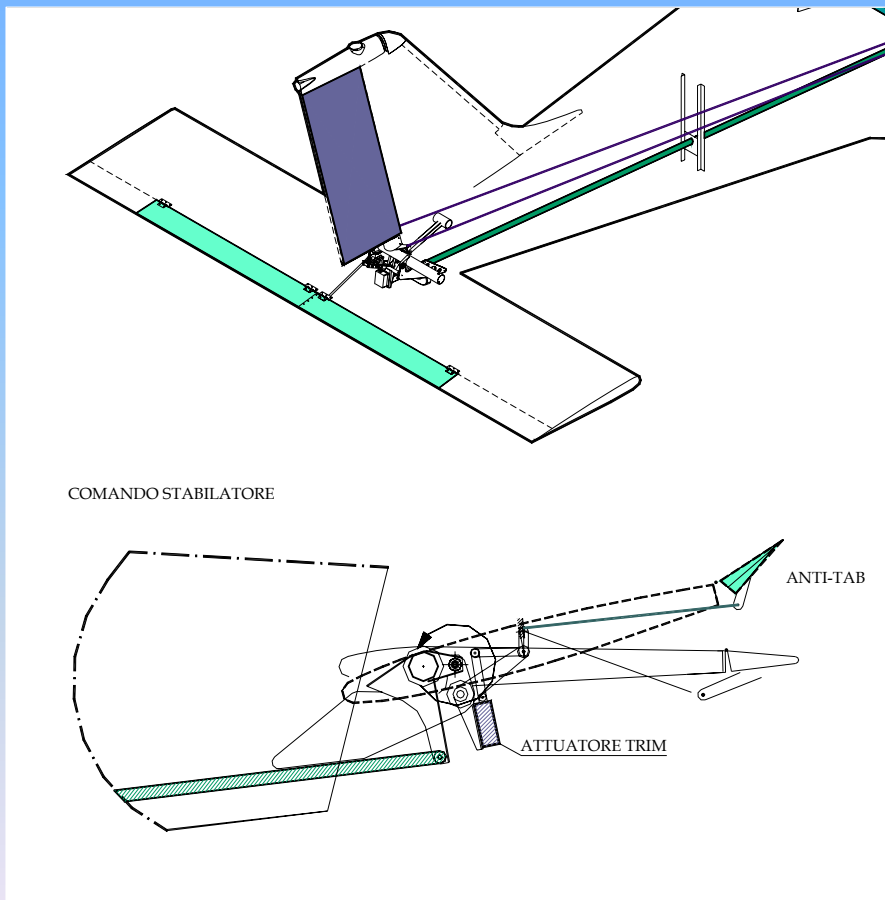


Longitudinal balance & Trim Drag





Stabilator with anti-tab



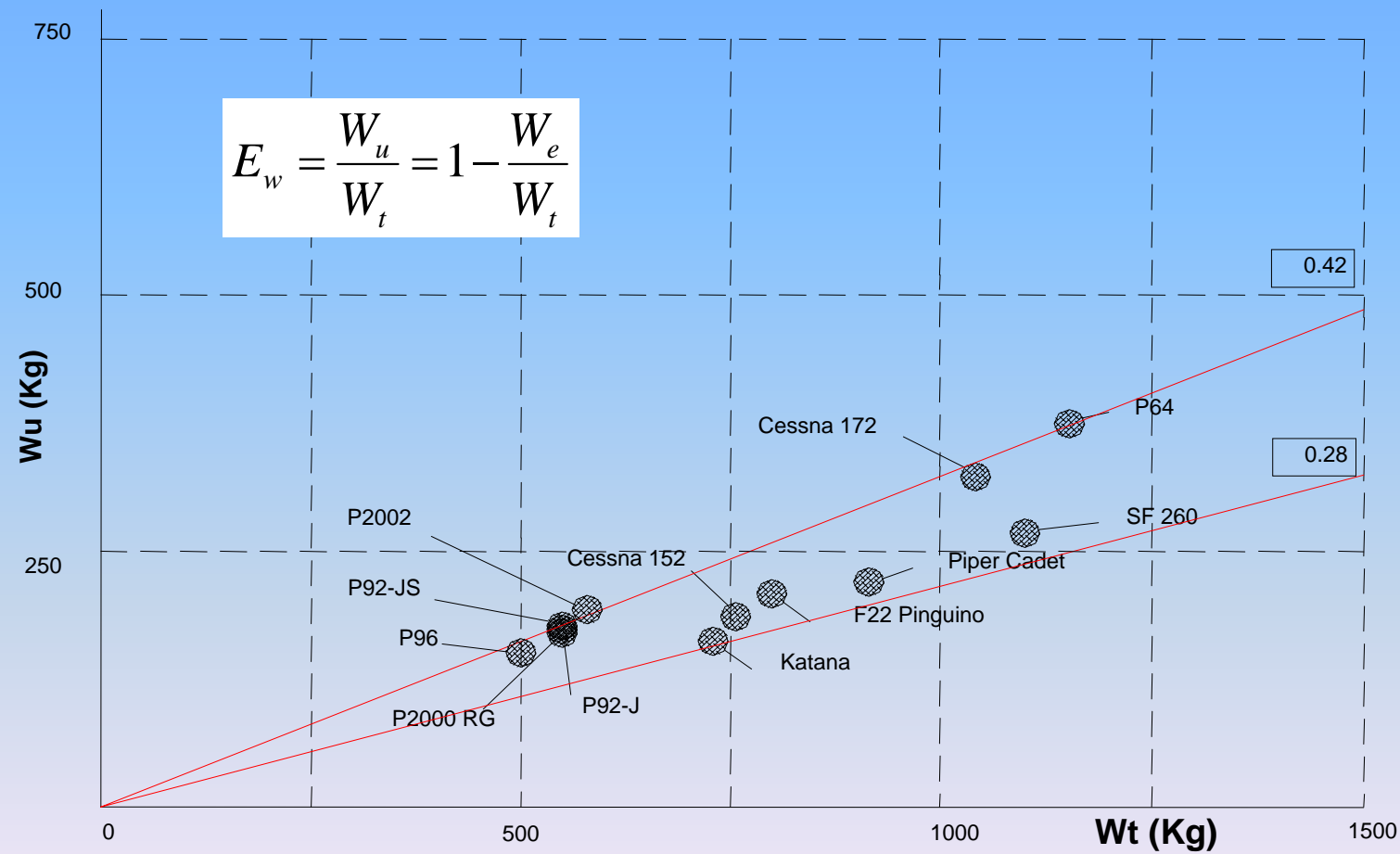


"Saw tooth" leading edge





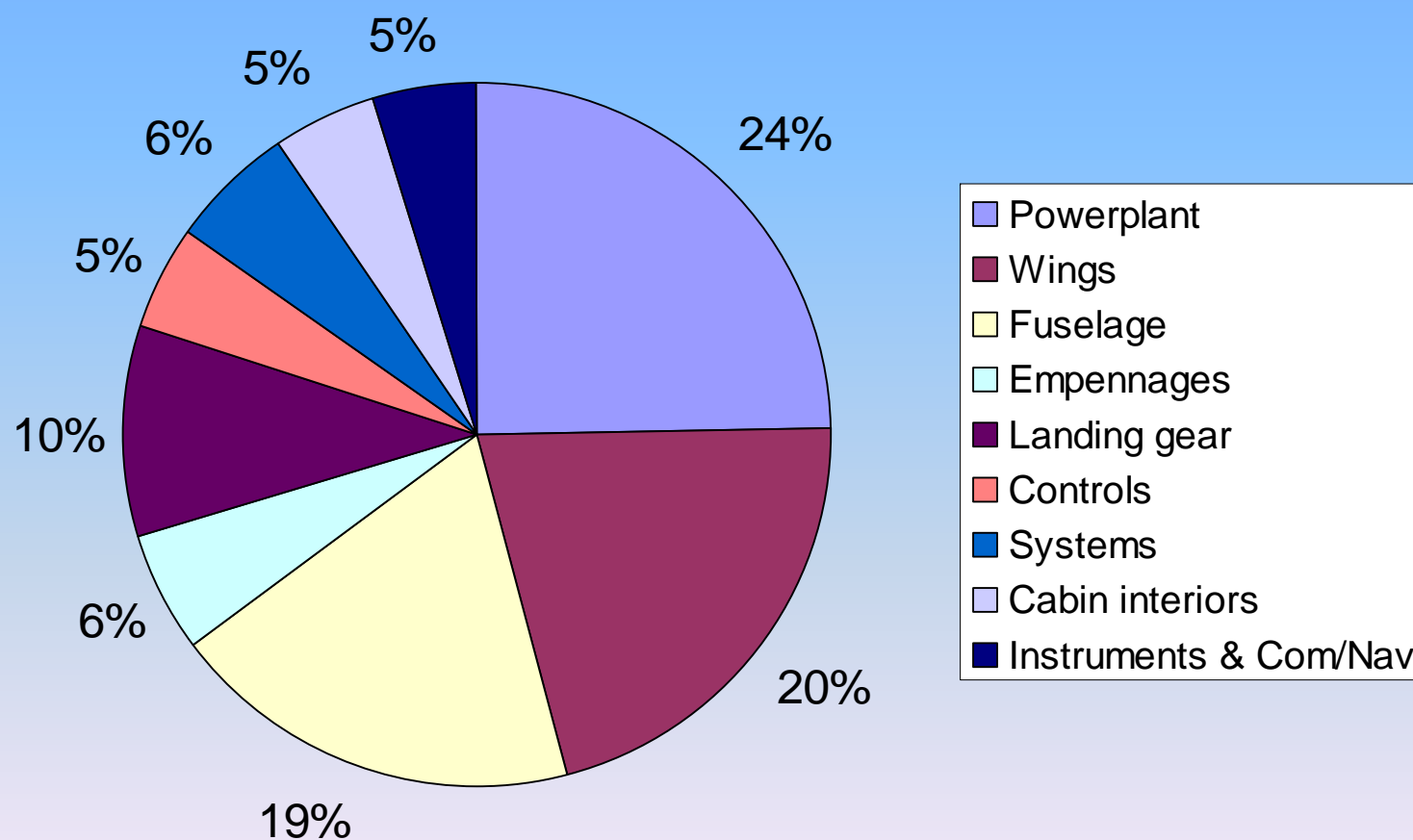
Useful load vs. MTOW





Weight breakdown

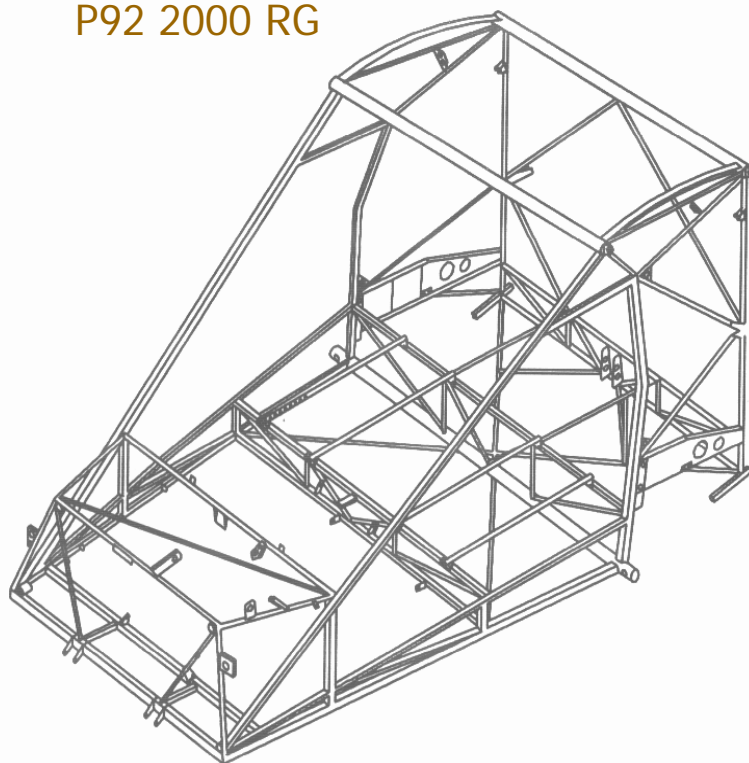
(based on empty weight)



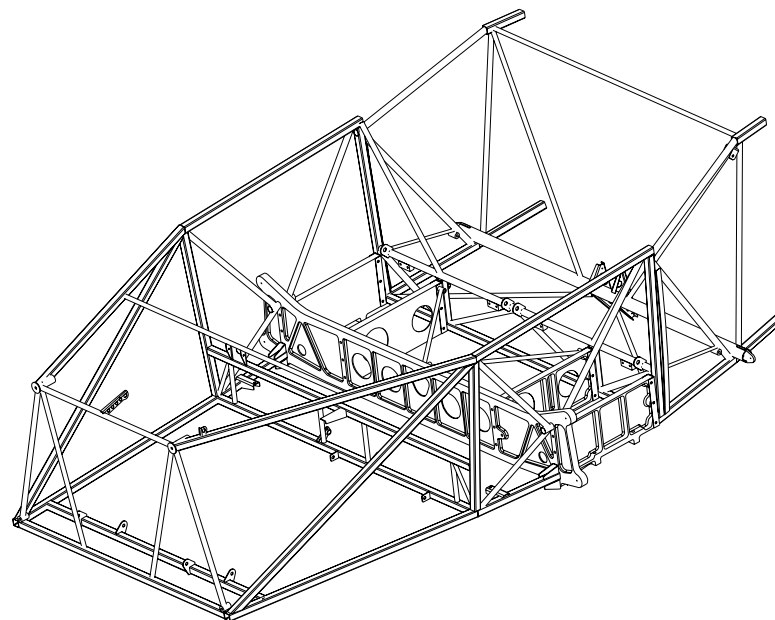


Cabin Framework structure

P92 2000 RG



P2002





COSTRUZIONI AERONAUTICHE
TECNAM s.r.l.

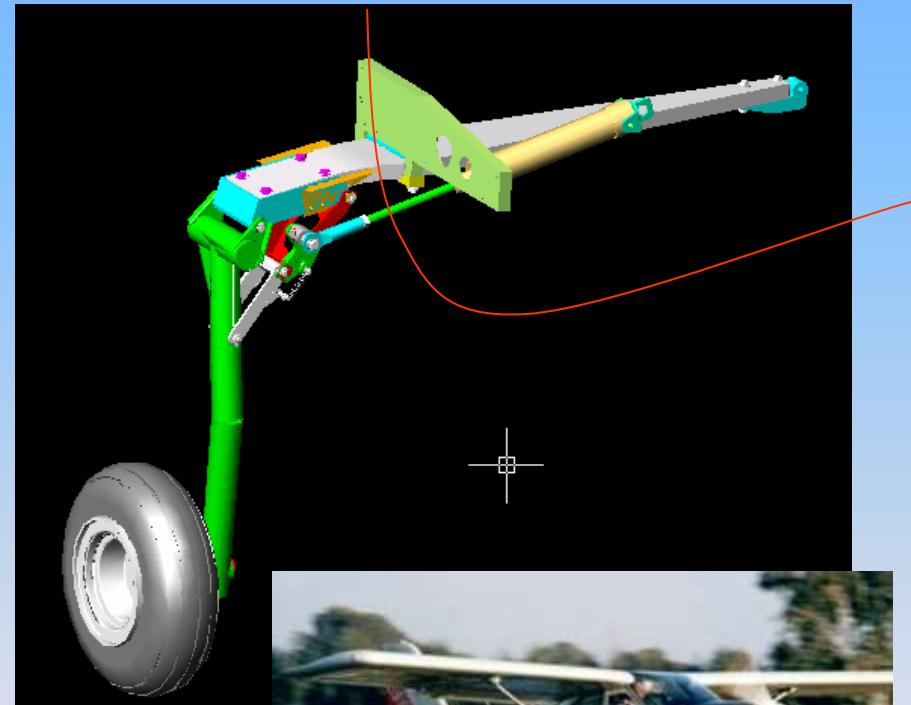
P92-JS

Spring leg Main landing gear



P92 2000 RG

Retractable Main landing gear



Tecnam High Wing



Tecnam Low Wing





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MODEL	P2006T
Specifications	
wingspan (m)	10,30
wing area (mq)	14,40
cabin width (m)	1,14
landing gear type	retractable, tricycle
Engine	
manufacturer	Rotax
model	2x 912 S
power	2x98hp @ 2400 rpm
Propeller	
type	Const. speed, 2 blade
diameter (m)	1,78
Design weight & Loading	
max. gross weight (kg)	1090
std. empty weight (kg)	630
useful load (kg)	460
seating capacity	4
fuel capacity (lt)	195
Wing loading (kg/mq)	75,7
Power loading (kg/hp)	5,56
Performance	
max. level speed s.l. (kts)	155
cruise speed (kts)	147 (75% 7000 ft)
stall speed, flaps down, pwr off (kts)	48
best rate of climb (ft/m')	1400
service ceiling (ft)	16500
cruise range w/reserve (30') nm	750
takeoff, ground roll (m)	235
takeoff, total distance (50 ft) (m)	460
landing ground roll (m)	180
landing distance (50 ft) (m)	420
* Single engine rate of climb (s.l.), ft/m'	350
Single engine ceiling, ft	7500