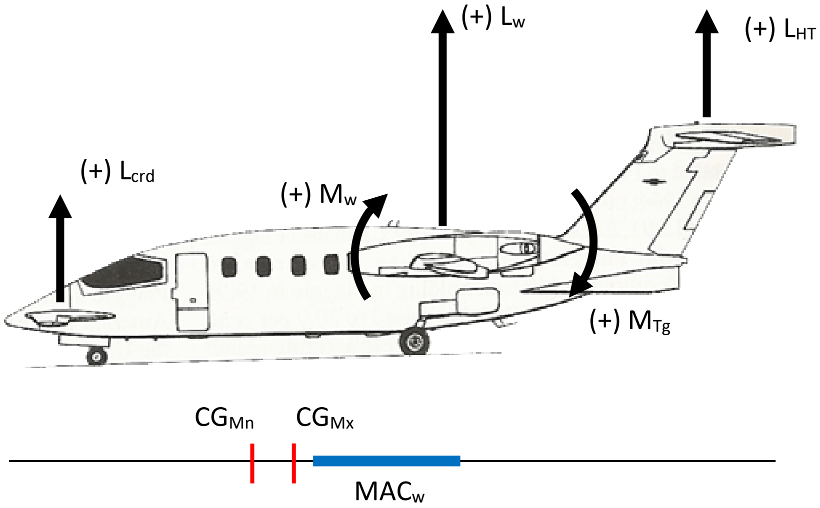

Most forward CG position (%MAC) – Limit of maneuverability

To be checked for the most critical flight condition (landing)

$$\overline{AC}_{w+fus} = \overline{AC}_{arf} + 100 \cdot \left(-0.6 \cdot \left(\frac{L_w}{l_{fus}} - 0.1 \right) \cdot \left(\frac{l_{fus} \cdot w_{fus}}{S_w} \right) \cdot \left(\frac{w_{fus}}{MAC_w} \right) \right)$$

$$\overline{CG}_{Mn} = \frac{100}{MAC_w} \cdot \left[AC_{w+fus} - \left(\frac{\left(M_w - L_{HT} \cdot \left(L_{AC_{HT}} - L_{AC_{w+fus}} \right) + L_{crd} \cdot \left(L_{AC_{w+fus}} - L_{AC_{crd}} \right) + M_{Tg} \right)}{L_w + L_{HT} + L_{crd}} \right) \right]$$

To move $\overline{CG}_{Mn}$ forward :

↗ fuselage contribution (move the wing backward, increase the fuselage maximum width)

↘ wing lift or flight weight
↗ M_w or <u>reduce</u> the nose down pitching moment

↘ $F_{y\,HT}$ or <u>increase</u> the downward force on the horizontal tail
↗ elevator **<u>up</u>** deflection
↗ horizontal tail area
Move the horizontal tail in the propeller slipstream

↗ $F_{y\,crd}$ or <u>increase</u> the upward force on the canard surface
↗ elevator **<u>down</u>** deflection
↗ canard area
Move the canard surface in the propeller slipstream
Replace the All-Moving type by a Fixed surface and trailing edge device

Most aft CG position (%MAC) – Limit of stability

$$\overline{AC}_{arp} = \overline{AC}_{w+fus} \cdot \frac{a_{0_{w+fus}}}{a_{0_{arp}}}$$

$$+\frac{q_{HT}}{q} \cdot \frac{a_{0_{HT}}}{a_{0_{arp}}} \cdot \left(1 - \frac{d\varepsilon_{HT}}{d\alpha}\right) \cdot \frac{S_{HT}}{S_w} \cdot \left(100 \cdot \frac{\left(L_{AC_{HT}} - L_{AC_w}\right)}{MAC_w} + \overline{AC}_{arf_w}\right)$$

$$-\frac{q_{crd}}{q} \cdot \frac{a_{0_{crd}}}{a_{0_{arp}}} \cdot \left(1 + \frac{d\varepsilon_{crd}}{d\alpha}\right) \cdot \frac{S_{crd}}{S_w} \cdot \left(100 \cdot \frac{\left(L_{AC_w} - L_{AC_{crd}}\right)}{MAC_w} - \overline{AC}_{arf_w}\right)$$

$$\overline{CG}_{Mx} = \overline{AC}_{arp}$$

To move $\overline{CG}_{Mx}$ backwards :

- ↗ $a_{0_{HT}}$
- ↘ ε_{HT}
- ↗ S_{HT}/S_w
- ↗ q_{HT} (put the horizontal tail in the propeller slipstream)
- ↗ $\left(L_{AC_{HT}} - L_{AC_w}\right)$

- ↘ $a_{0_{crd}}$
- ↘ ε_{crd}
- ↘ S_{crd}/S_w
- ↘ q_{crd} (put the canard surface out of the propeller slipstream)
- ↘ $\left(L_{AC_w} - L_{AC_{crd}}\right)$

