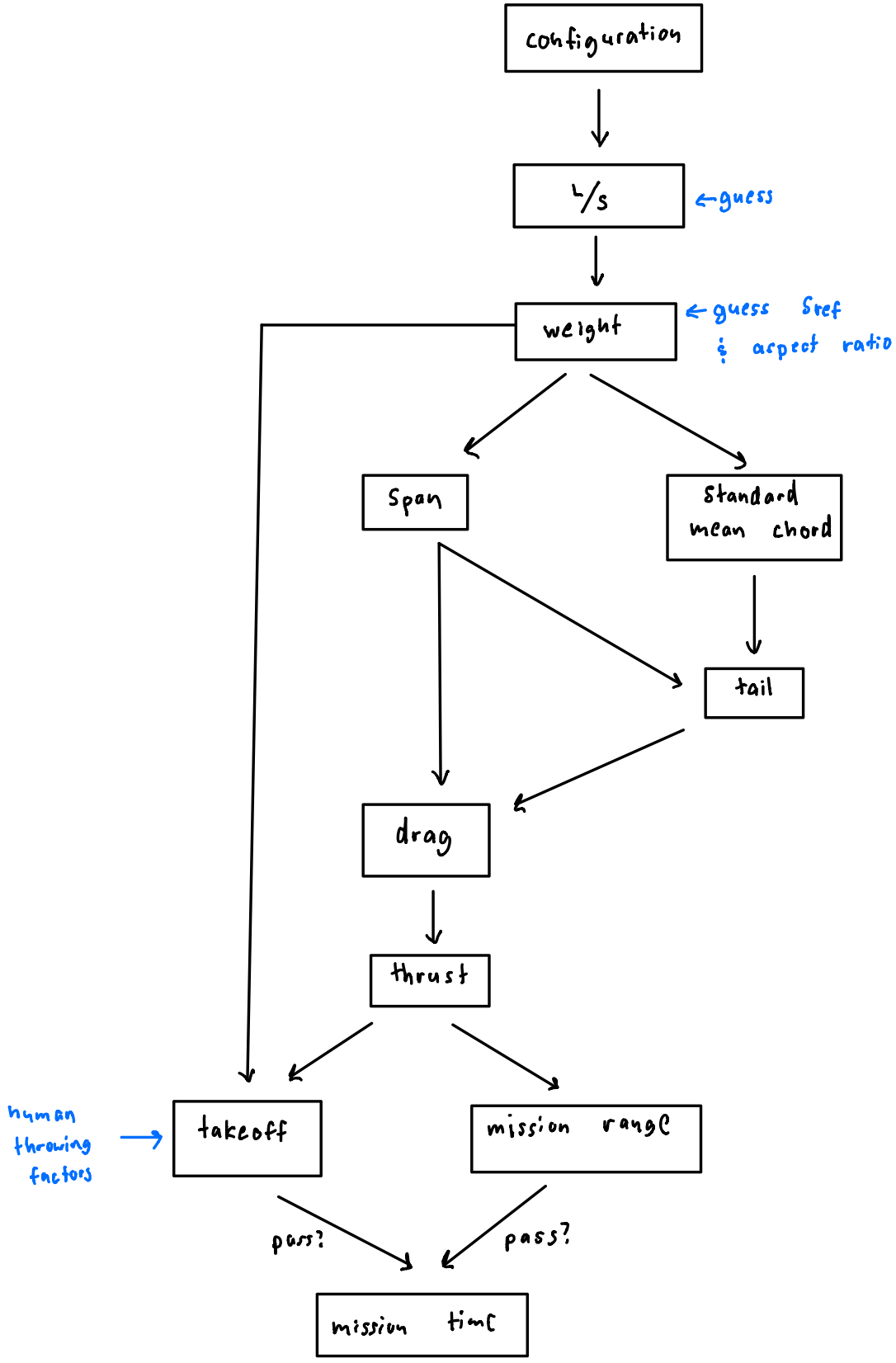

configuration
L/S
guess
weight
guess Sref & aspect ratio
Span
Standard mean chord
tail
drag
thrust
human throwing factors
takeoff
mission range
pass?
pass?
mission time

Red are required inputs

Wing loading:

$W/S = L/S = \frac{1}{2}\rho V^2 C_L$ ⟶ - speed is output of drag?

- or input speed

S_{ref}

$AR = \frac{b^2}{S}$

↓

w/ S_{ref} we can get L = weight aircraft

Taper ratio = $\frac{\text{Cord tip}}{\text{Cord root}}$

How to figure out drag? (Nicolai) cruise speed

Total drag wing:

$C_D = C_{D_0} + K C_L^2$

w/ $K = \frac{1}{\pi AR e}$

$C_{Df} = C_F \frac{S_{wet}}{S_{ref}}$

$C_F = \frac{0.455}{[\log_{10} Re_f]^{2.58}}$ or $C_F = \frac{1.328}{\sqrt{Re_f}}$

↳ assume $Re > 5 \times 10^5$ ↳ $Re < 50{,}000$

$$C_{F_{cone}} = \frac{2}{\sqrt{3}} C_{F_{flat\ plate}}$$

Flat plate

p. 53 Nicolai:

$$[C_{DF}] = C_{F_{fuse}} \cdot \frac{S_{l=}}{S_{ref}} + C_{F_{nose}} \frac{S_N}{S_{ref}} + C_{F_{wing}} \frac{S_U}{S_{ref}} + C_{F_{tail}} \frac{S_T}{S_{ref}}$$

Now have drag for aircraft:

Range:

$$R_f = \frac{L}{D} \underbrace{\eta_p \eta_{int} \eta_e}_{\text{total efficiency}} \frac{e_b}{g} \frac{m_b}{m_{to}}$$

$$\left(\frac{L}{D}\right)_{MAX} = \frac{1}{(2\sqrt{C_{D_0} K})}$$

e_f = battery specific energy

m_b = battery weight

m_{to} = Take off gross weight

$L/D = 8$

$L/8 =$

$\eta_{prop} \simeq 0.80$ $\eta_{motor} = 0.70$

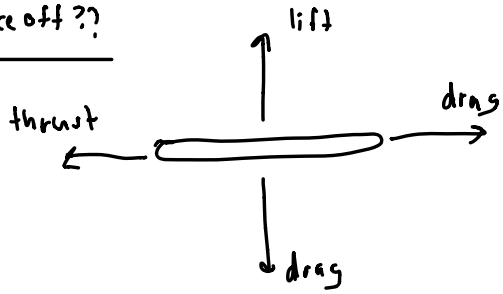
$[60 \rightarrow 68\%]$

$\sim 46\%$ for total

$= 37.4\%$

$$AR = \frac{b^2}{S_{ref}} \quad \frac{b^2}{b \cdot c}$$

take off ??



$$V_{to} = 1{,}2\sqrt{\frac{W_{to}}{S_{ref}}\frac{2}{\rho C_{L\,max}}} + V_0 ??$$