Steady Level Flight

Spring 16.82

March 2, 2016

Assumptions

1. Steady state flight
2. Angle of attack zero
3. Thrust equals drag
4. Lift equals wieght
5. The weight is approximated by the average weight of the flight segment.
6. The average weight can be approximated by: $W_{avg} = \sqrt{W_{begin} * W_{end}}$. Where W_{begin} is the beginning of the flight segment and W_{end} is the end of the flight segment.

Variables

C_D
C_L
R
S
$W_{begin}[3]$
$W_{end}[3]$
$P_{shaft}[3]$
$\eta_{prop}[3]$
ρ
$V[3]$

Constraints

$$P_{shaft} \geq 0.5\frac{C_D W_{begin} V}{C_L \eta_{prop}} + 0.5\frac{C_D V W_{end}}{C_L \eta_{prop}}$$
$$0.5 C_L S V^2 \rho = W_{begin}^{0.5} {W_{end}}^{0.5}$$