AER 1214 Ass-2

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(1.) Payload Mass → 5 Kg

4 Rotors → 30 cm Dia (2 Kg)

$T \Rightarrow \frac{(2+5)}{4} \Rightarrow (1.75 \times 10)$

$\Rightarrow 17.5\,N$

$P = \sqrt{\frac{T^3}{2\rho A}}$; $A = \frac{\pi (0.3)^2}{4}$

$\Rightarrow 0.0706$

Air → $\rho = 1\,Kg/m^3$

$\Rightarrow (194.822\,W) \times 4$ motors

$\Rightarrow 779.29\,W$

6 Rotors → 25 cm Dia (2.5 Kg)

$T \Rightarrow \frac{(2.5+5)}{6} \Rightarrow (1.25 \times 10)$

$\Rightarrow 12.5\,N$

$P \Rightarrow \sqrt{\frac{T^3}{2\rho A}}$; $A \Rightarrow \frac{\pi (0.25)^2}{4}$

$P \Rightarrow (141.0293\,W)_{\times 6}$ $\Rightarrow 0.0491$

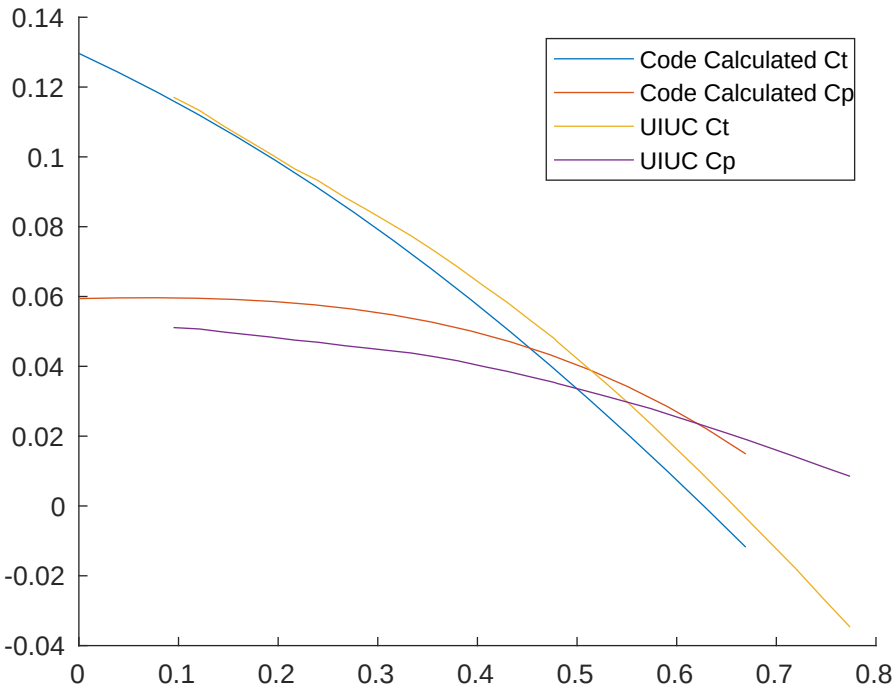
$\Rightarrow 846.17\,W$

Same Capacity Batter.

$t_f \propto \frac{C}{Power}$

$\therefore \frac{t_{f_4}}{t_{f_1}} \Rightarrow \frac{Power_1}{Power_4}$

$\Rightarrow 1.0858$


0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Code Calculated Ct
Code Calculated Cp
UIUC Ct
UIUC Cp

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*(3.) $b = 10\,m$

$S = 20\,m^2$

% red^n in D_i ; $g = 3\,m$

$g/b \Rightarrow \underline{0.3} \Rightarrow \sigma \Rightarrow 0.38$

Biplane → $C_{Di} \Rightarrow (1.38)\left(\frac{C_L^2}{\pi AR_{Biplane}}\right) \Rightarrow \left(\frac{1.38}{2}\right)\frac{C_L^2}{\pi AR_{mono}}$

Mono plane → $C_{Di} \Rightarrow \left(\frac{C_L^2}{\pi AR_{mono}}\right)$

$\therefore$ % Red^n $\Rightarrow$ $\frac{(C_{Di})_{mono} - (C_{Di})_{Bi}}{(C_{Di})_{mono}} \times 100$

$\Rightarrow \frac{(1 - 0.69)}{1} \times 100$

$\Rightarrow \underline{31\%}$ red^n.

(4.) (a) Relaxed Longitudinal Stability ~~is a mat~~ and Drag reduction are main reasons for choosing ~~longitudin~~

(b) [redacted] Relaxed Longitudinal Stability & Control

(b) Drag Red^{n}, stall proofness & High Manueverability

(c) High Manueverability & Drag Reduction

(d) More Weight Capacity, & Reliability

(e) Better Manueverability & far more stability.