AE630 HOMEWORK2

NAME – Pushpanjali Kumari

Roll no – 180569

Chosen design of quadrotor after varying all parameters -

Payload	R	dl	nr	nb	c	theta	cl_alpha	P	I	Pmax	Imax	kv	capacity
0.2	0.01	55	4	2	0.09	0.87266	5.73	0.010263	0.00092458	0.029028	0.0026151	0.00050695	3

est_weight	prev_weight	current_weight	rotormass	batterymass	motormass	escmass	airframemass
0.59215	0.59553	0.59215	2.214e-06	0.37836	0.005149	0.0062972	0.002349

- Weights are in kg.
- Pitch angle is assumed to be constant.
- Theta is in radian.
- Length dimension are in meter(m).
- Current weight or estimated weight show the final weight of quadrotor designed.

Variation of GTOW (5 times of payload assumed) -

est_weight	prev_weight	current_weight	rotormass	batterymass	motormass	escmass	airframemass
0.59217	0.59589	0.59217	2.214e-06	0.37836	0.0051612	0.0063021	0.002349

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1×14 table

Payload	R	dl	nr	nb	c	theta	cl_alpha	P	I	Pmax	Imax	kv	capacity
0.2	0.01	55	4	2	0.09	0.87266	5.73	0.010272	0.00092542	0.029054	0.0026175	0.0005071	3

Taking high value of initial GTOW causes final weight estimated to increase. Simulation approaches final solution from below and simulation gets stopped just after we meet convergence criteria for first time.

Variation of pitch angle (60deg) –

incre

est_weight	prev_weight	current_weight	rotormass	batterymass	motormass	escmass	airframemass
0.59122	0.5959	0.59122	2.214e-06	0.37836	0.0044932	0.0060223	0.002349

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×14 table

Payload	R	dl	nr	nb	c	theta	cl_alpha	P	I	Pmax	Imax	kv	capacity
0.2	0.01	55	4	2	0.09	1.0472	5.73	0.0097367	0.00087718	0.02754	0.002481	0.00048066	3

increase in pitch angle causes increase in drag and thus power consumption rises. Which in return causes powerplant weight to increase and thus whole weight of quadrotor increases.

Variation of R (10 mm to 18mm)-

est_weight	prev_weight	current_weight	rotormass	batterymass	motormass	escmass	airframemass
0.61327	0.61705	0.61327	7.455e-06	0.37836	0.019359	0.010572	0.004975

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×14 table

Payload	R	dl	nr	nb	c	theta	cl_alpha	P	I	Pmax	Imax	kv	capacity
0.2	0.018	55	4	2	0.09	0.87266	5.73	0.018902	0.0017028	0.053462	0.0048164	0.00090111	3

Weight of battery depends on powers of rotor radius, and airframe mass depends on battery mass. Increase in radius causes increment in these and thus, weight of quadrotor increases.

Variation of number of cells in battery (3 to 4) –

est_weight	prev_weight	current_weight	rotormass	batterymass	motormass	escmass	airframemass
0.74919	0.74955	0.74919	2.214e-06	0.51511	0.022503	0.0088708	0.0027061

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×14 **table**

Payload	R	dl	nr	nb	c	theta	cl_alpha	P	I	Pmax	Imax	kv	capacity
0.2	0.01	55	4	2	0.09	0.87266	5.73	0.020494	0.0013847	0.057966	0.0039166	0.00060324	3

Increase in number of cells in a battery causes its weight to increase. Airframe maa too increases due to this. Thus, whole weight increases.