

what?

American Institute of Aeronautics and Astronautics (AIAA) Design/Build/Fly, international aero modeling competition

where?

Cessna Airfield, Wichita, KS, USA

when?

Aug '13 – Apr '14

who?

A part of a team of 7. My role mainly involved performing stability analysis and act like a connecting link between the aerodynamics and structures sub-teams. Being a small team we all were a part of the manufacturing process.

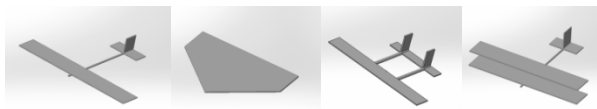


Udaan (flight in hindi) was our team's model for the AIAA Student Design/Build/Fly international aero modelling competition. The competition challenged undergraduate students to develop an aircraft that can make the highest score during the fly-off. The task involved optimizing the speed, weight and size of the aircraft. Constrained with the current draw and to accommodate and lift the specified payloads, we had to balance between propulsion, aerodynamics and structural sub systems. After testing 2 prototypes, our final model ranked 48th internationally at the fly-off in Wichita.

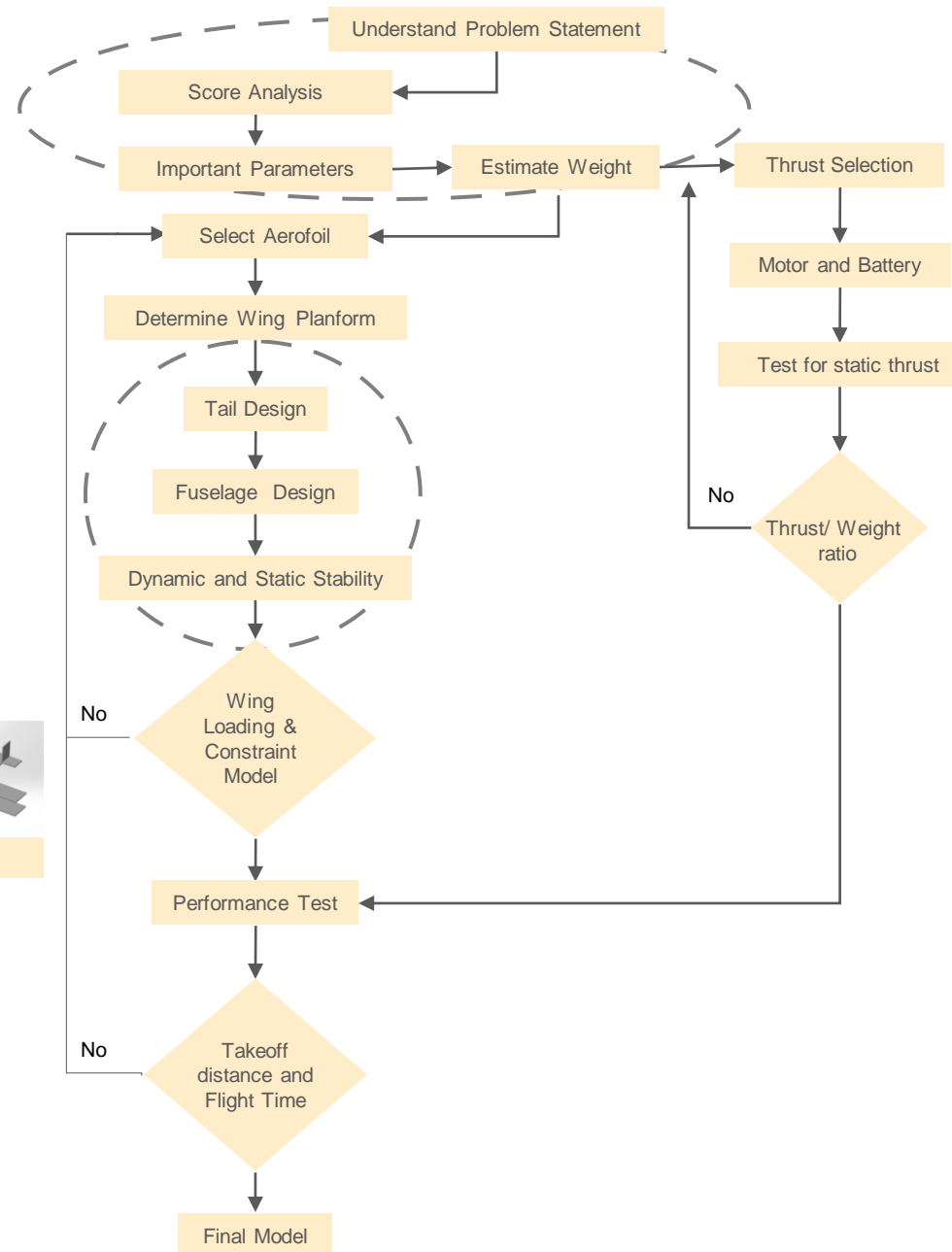
aeromodeling | engineering | prototyping

1 Design Process

Starting with Score analysis we could determine the critical factors and their relationship with design parameters. The identified parameters were used to perform a Figure of Merit Analysis to determine the best aircraft configuration. After selecting the conventional configuration an iterative design process as shown in the chart alongside was followed until all the conditions were satisfied.

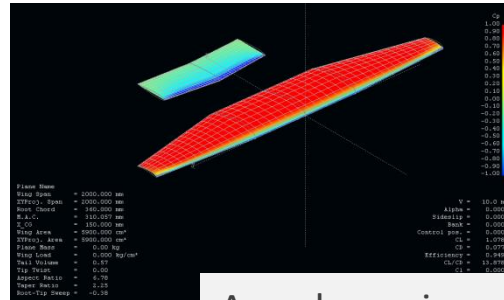


Parameter	Weight	Conventional	Flying wing	Twin boom	Biplane
Weight	35	1	1	0	-1
L/D	30	1	1	0	-1
Drag	20	0	0	-1	-1
Stability	10	1	-1	0	0
Manufacturability	5	1	-1	0	0
Total	100	80	50	-20	-85



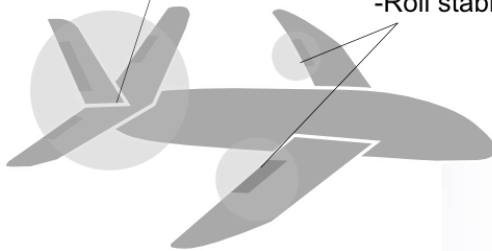
Designing

My role in stability analysis involved empennage and aileron sizing and checking the moments for static and in-flight stability of the aircraft.

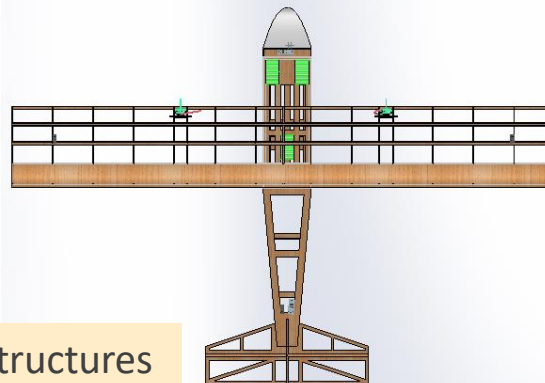


Aerodynamics

- Position and sizing of vertical and horizontal tail
- Longitudinal and directional stability
- Position and sizing of ailerons
- Roll stability



Structures



3 Manufacturing

Prototypes were developed mainly using balsa wood and balsa ply. Critical components such as airfoils were laser cut and some components were hand fabricated. Carbon fiber tubes were used in strengthening the wing. Nose was made from foam to give it the desired aerodynamic shape without adding much weight.



4

Testing

First prototype was tested to check different battery packs with the flight performance.



Second prototype was designed after considering all the constraints mentioned in the problem statement. The structure turned out to be over designed and heavier than expected.



Third prototype accounted for the failings of the previous one, was lighter and smaller.