3D Printed Aircraft Competition

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Project Background

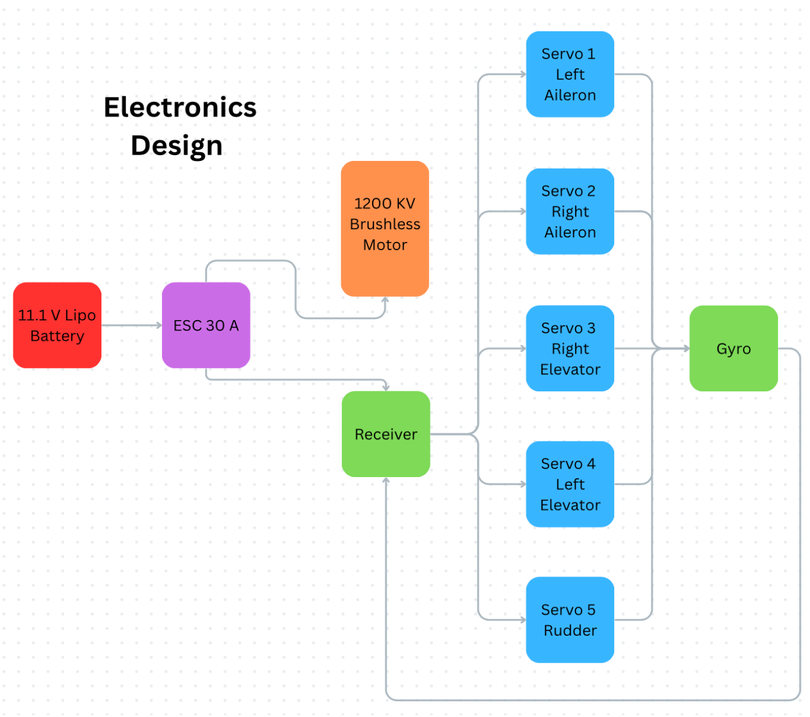
A 3-D fixed wing aircraft that is hands-on and challenging that gives us the opportunity to design build and test a 3-D printed fixed wing aircraft with the use of CAD, material selection, printing, assembly, and test flights.

Project Goal/objective

Our project goal and objective for this fixed wing aircraft competition is to successfully design build, and fly the aircraft while focusing on performance output.

Design approach

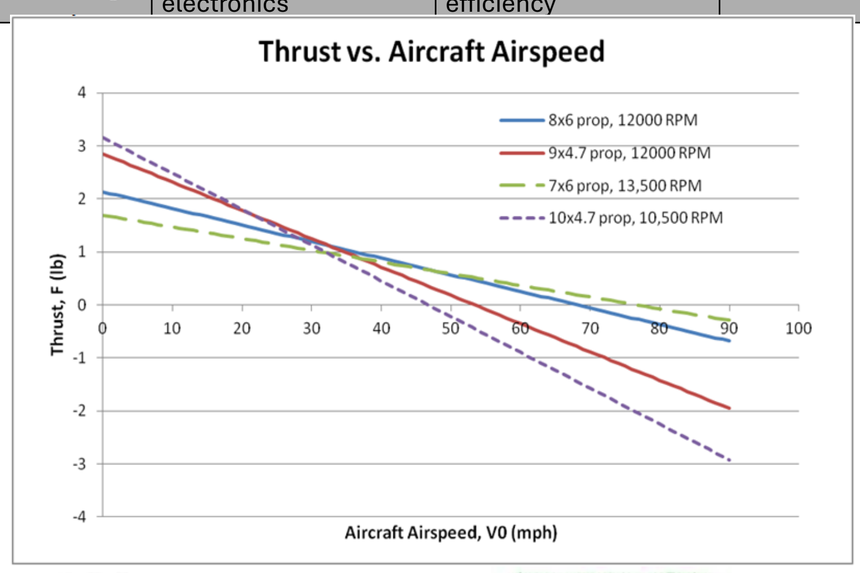
Research about factors that impacts flight/glide performance
Research and determine the ideal designs for wings/tail
Create and revise the model using SolidWorks
Print the model to test for center of gravity, reserved spacing for electronics, and if the segments are connecting properly as intended.

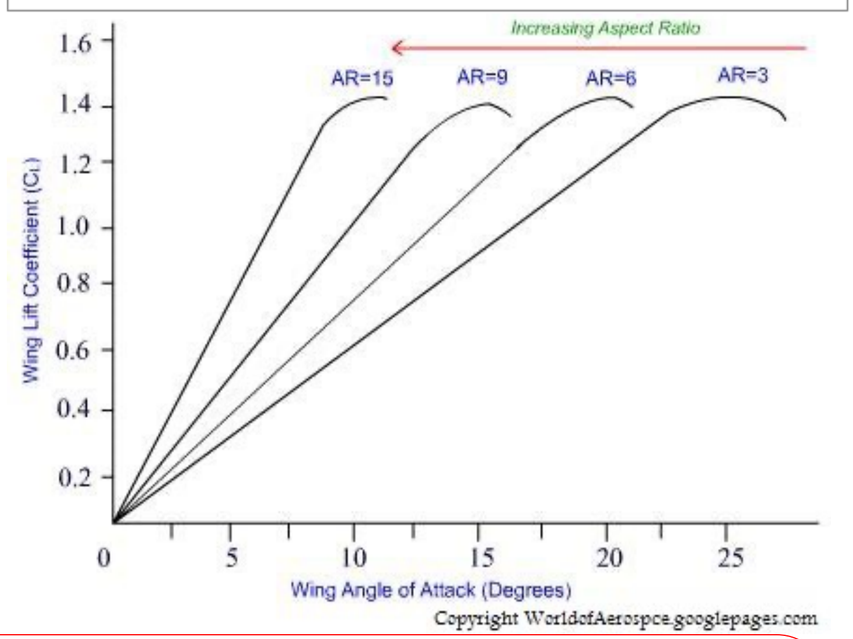


System level requirements

The main body frame of the aircraft will be completely made using 3d printing technology. The required operation system of propeller, servos, motors, controller, battery, and gyro will be purchased under a finite budget.

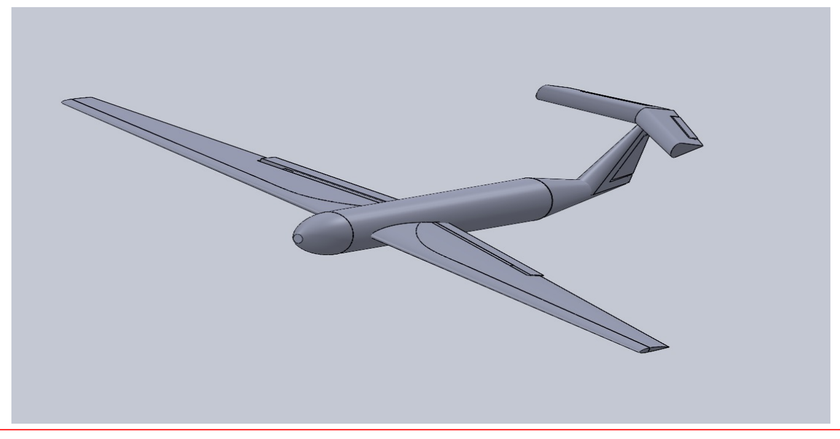
Criteria/ Requirements Description	Requirement	Reason for Requirement	Method of Verification
Cost	cost < $200	Stay within project budget	Analysis
Weight Capacity	≥1.5 kg	F.O.S. = 1.5 for system loads	Inspection
Material	ABS (3D Printed)	Common, durable print material	Design
Weight	< 1 kg	Improve flight time & performance	Inspection
Drag (Aerodynamic)	Minimize Cd	To maximize flight duration	Analysis / Simulation
Impact Capacity	≥2G	To survive belly landings	Analysis / Drop Test
Flight Time (Powered)	≤8 seconds	Competition rule	Design
Component Sourcing	Off-the-shelf electronics	Cost and time efficiency	Procurement records





Results

In unpowered throw tests, we can observe the wings are indeed providing a lift, however without electronics to balance and control the plane tends to tilt or turn off balance. The weak PLA of 3D printing often results in broken parts when landing at a bad angle. Better methods of connecting segments and electronics need to be considered.





Conclusions and findings

3D printing have size and accuracy restrictions due to the limitations of the printer. Having to cut into many segments creates instability and tolerance issues. Despite the accuracy issues 3D printing is completely capable of crafting a RC aircraft.